NORTHWEST TRANSMISSION LINE PROJECT

ASSESSMENT REPORT

With Respect to

the Application by British Columbia Hydro and Power Authority

for an Environmental Assessment Certificate

pursuant to the *Environmental Assessment Act,* S.B.C. 2002, c.43

Prepared by:

Environmental Assessment Office

January 13, 2011

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Preface

The Environmental Assessment Office (EAO) manages the assessment of proposed major projects in British Columbia (BC), as required by the *Environmental Assessment Act* (Act). The process includes:

- opportunities for the involvement of all interested parties;
- consultations with First Nations and Treaty Nations;
- technical studies to identify and examine potential significant adverse effects;
- strategies to prevent, or reduce, adverse effects; and,
- development of comprehensive reports summarizing input and findings.

At the conclusion of each environmental assessment (EA), EAO provides a comprehensive assessment report (Assessment Report), and makes recommendations to the Minister of Environment and to the Minister responsible for the project sector. The Ministers may decide to certify a proposed project, decline to certify a proposed project, or require further assessment.

This Assessment Report considers the proposed project's potential to cause significant adverse environmental, social, economic, heritage and health effects. It identifies measures to prevent or reduce adverse effects, and sets out EAO's analysis and conclusions. A separate report, titled "Northwest Transmission Line Project: First Nations and Nisga'a Nation Consultation Report", documents the work undertaken by EAO to consult and accommodate First Nations in keeping with the Supreme Court of Canada's direction in *Haida v. Minister of Forests* and related case law, and it describes the nature of the Province's obligations under the Nisga'a Final Agreement (NFA) and the extent to which the Province's environmental assessment has conformed with those obligations.

Information and records relating to environmental assessments is available on the EAO website at www.eao.gov.bc.ca. Questions or comments can be directed to:

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Acronyms Used in this Report

%H/An:	percent highly annoyed
AAC:	annual allowable cut
AC:	alternating current
Act:	Environmental Assessment Act
Agency:	Canadian Environmental Assessment Agency
AIA:	Archaeological Impact Assessment
AIR:	Application Information Requirements
ALR:	Agricultural Land Reserve
AOA:	Archaeological Overview Assessment
APLIC:	Avian Power Line Interaction Committee
ARD:	Acid Rock Drainage
ASCE:	American Society of Civil Engineers
AWPRV:	Approved Work Practices for Managing Riparian Vegetation
BC:	British Columbia
BCTC:	British Columbia Transmission Corporation
BEC:	Biogeoclimatic Ecological Classification
BC CDC:	British Columbia Conservation Data Centre
BMP:	best management practices
CCME:	Canadian Council of Ministers of the Environment
CEAA:	Canadian Environmental Assessment Act
CO:	Carbon Monoxide
CO_2:	Carbon Dioxide
CSA:	Canadian Standards Council
CTA:	Canadian Transport Authority
CWH:	coastal western hemlock
dBA:	decibels
DFO:	Department of Fisheries and Oceans Canada
EA:	Environmental Assessment
EAA:	Environmental Assessment Act
EAC:	Environmental Assessment Certificate
EAO:	Environmental Assessment Office
EC:	Environment Canada
ECA:	equivalent clear cut areas
EMP:	Environmental Management Plan
EMF:	electromagnetic field
EPP:	Environmental Protection Plan
ESSF:	Engelmann spruce sub-alpine fir
FRPA:	Forest and Range Practices Act
FSR:	Forest Service Road
FTE:	full-time equivalent
GDP:	Gross Domestic Product
GHG:	Greenhouse Gases

ha:	Hectares
HADD:	Harmful Alteration, Disruption or Destruction
HCA:	Heritage Conservation Act
ICH:	interior cedar hemlock
ICNRP:	International Commission on Non-Ionizing Radiation Protection
IEC:	International Electrotechnical Commission
ILMB:	Integrated Land Management Bureau
INAC:	Indian and Northern Affairs Canada
INFC	Infrastructure Canada
IVMP:	Integrated Vegetation Management Plan
km:	Kilometre
kV:	Kilovolt
$ktCO_2$:	kilotonnes of CO_2 equivalent
Ldn:	day-night sound level
Leq:	equivalent sound level
LSA:	Local Study Area
LRMP:	Land and Resource Management Plan
MEMPR:	Ministry of Energy, Mines and Petroleum Resources
mG:	milligauss
MH:	mountain hemlock
ML:	Metal Leaching
MNRO :	Ministry of Natural Resource Operations
MoE :	Ministry of Environment
MoFR:	Ministry of Forests and Range
MoTI:	Ministry of Transportation and Infrastructure
NCD:	non-classified drainage
NFA:	Nisga'a Final Agreement
NO_2:	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NFA:	Nisga'a Final Agreement
NGO:	non-government organizations
NLG:	Nisga'a Lisims Government
NRCan:	Natural Resources Canada
NTL:	Northwest Transmission Line
NWPA:	Navigable Waters Protection Act
OGMA:	old growth management areas
PAG:	potentially acid generating
PM:	Particulate Matter
RA:	Responsible Authority
RDKS:	Regional District of Kitimat-Stikine
ROW:	right of way
RSA:	Regional Study Area
RVMA:	Riparian Vegetation Management Area
SARA:	Species At Risk Act

SF6:	sulphur hexafluoride
SO_2:	Sulphur Dioxide
SRMP:	Sustainable Resource Management Plan
TC:	Transport Canada
TFL:	Tree farm License
THLB:	timber harvest land base
THREAT:	Tahltan Heritage Resources Environmental Assessment Team
TK:	traditional knowledge
TOR:	terms of reference
TRIM:	Terrain Resource Inventory Mapping
TSA:	Timber Supply Area
UWR:	ungulate winter range
UNBC:	University of Northern British Columbia
VC:	Valued Component

SUMMARY OF THE ASSESSMENT REPORT

Overview of Proposed Project

British Columbia Hydro and Power Authority (Proponent) (BC Hydro) is proposing to construct a new 287 kilovolt (kV) alternating current (AC) overhead high voltage electric transmission line 344 kilometres (km) long that extends from the existing BC Hydro Skeena Substation south of Terrace to a new substation near Bob Quinn Lake, in northwest BC. This proposed Project is called the Northwest Transmission Line (NTL) Project (proposed Project).

Overview of the Environmental Assessment

The EAO assessed whether the proposed Project would result in any significant adverse environmental, social, economic, heritage and health effects. The EA focused on assessing specific potential effects on the following:

- Air Quality
- Surface water and groundwater
- Soils
- Wildlife and wildlife habitat
- Wetlands
- Terrestrial ecosystems and vegetation
- Archaeology and heritage resources
- Land and resource use
- Geotechnical stability
- Fish and aquatic habitat
- Economic opportunities
- Population, infrastructure and services
- Private properties
- Visual quality
- Transportation and utilities
- Human health
- Nisga'a Nation and First Nations

The EAO assessed relevant issues raised by First Nations and the Nisga'a Nation during the course of the EA and whether the Crown has fulfilled its obligations for consultation and accommodation and its duty to adhere to the NFA. This Assessment Report and EAO's First Nations and Nisga'a Nation Consultation Report have been provided to the provincial ministers for consideration in their decision of whether or not to issue an EA Certificate for the proposed Project.

The EAO is satisfied that:

- consultations with government agencies and the public have been adequately carried out by the Proponent;
- relevant issues identified by the public and government agencies were duly considered and assessed by the Proponent during the review of the Application;
- the Crown's First Nation consultation duty has been discharged;
- the Crown's obligations under the NFA have been discharged; and,
- the proposed Project would not result in any significant adverse effects.

PART A – INTRODUCTION AND BACKGROUND

1 Purpose of the Report

The purpose of this Report is to summarize the EA of the Application by BC Hydro for an EA Certificate for the proposed Project. The EAO is required to prepare this Report for provincial ministers who are responsible for making a decision on the proposed Project under section 17 of the Act. For energy projects the deciding ministers are the Ministers of the Environment and Energy. However, because the Proponent for the proposed Project is a Crown Corporation who reports to the Minister of Energy, the second deciding minister will be the Minister of Forests, Mines and Lands.

The Report:

- describes the proposed Project, provincial and the federal EA (under subsection 17(1) of the *Canadian Environmental Assessment Act* (CEAA)) processes, and consultations undertaken during the EA;
- identifies the potential environmental, social, economic, heritage and health effects of the proposed Project, and how the Proponent proposes to mitigate effects;
- identifies the commitments proposed by the Proponent; and,
- sets out conclusions based on the proposed Project's potential for significant adverse effects.

2 Project Overview

2.1 Proponent Description

The Proponent for the proposed Project is BC Hydro, a provincial Crown Corporation responsible for the generation and distribution of electricity, including the transmission of electricity which was formerly facilitated by the British Columbia Transmission Corporation (BCTC). As of July 5, 2010, under the *Clean Energy Act*, BCTC and BC Hydro were consolidated into a single entity, BC Hydro, that plans and delivers clean energy to meet BC's demand for electricity throughout the province.

2.2 Project Scope and Description

Project Scope

The scope of this assessment, as set out in the section 11 Order, of the proposed Project consists of the following components:

- a 287 km kV transmission line energized at 138 kV Meziadin, extending north to Bob Quinn Lake BC, for a length of 126 km;
- temporary station at Meziadin to connect the new 287 kV line to the existing 138 kV line (no longer proposed at the time this Report was prepared);
- a 287 kV transmission line from Skeena extending north to Meziadin for a length of 206 km and connecting to the phase one transmission line;
- an upgrade to the Skeena substation to incorporate the new 287 kV line termination;
- a new substation at Bob Quinn Lake, which would incorporate the 287 kV line terminations and related equipment, plus provisions for future transformation to lower voltages; and,
- consideration of alternate transmission line routes.

Project Description

The Proponent is proposing to construct a new 287 kV AC overhead high voltage electric transmission line, 344 km long, between the existing Skeena Substation near Terrace and a new substation near Bob Quinn Lake, BC (see Figure 1).

The proposed Project would be located within the Regional District of Kitimat-Stikine (RDKS), on portions of Crown and private lands, within portions of Nisga'a Lands (western route), Nass Wildlife Area and Nass Area, pursuant to the NFA, and areas subject to seven Land and/or Sustainable Resource Management Plans (discussed further in Land Use section of this report). Along the transmission line corridor, from south to north, the communities and settlements in close proximity to the proposed Project, include the City of Terrace, Old Remo, Rosswood, New Aiyansh, Irene Meadows, Nass Camp, Ellsworth Camp, Meziadin Lake, Bell 2, and Bob Quinn Lake. The proposed Project would cross the Nisga'a Lands (western route only – Figure 5 of this Report), Nass Wildlife Area and Nass Area as defined in the NFA; and portions of the asserted territories of: Gitanyow Hereditary Chiefs (*Wilp* Watakhayetsxw, *Wilp* Gamlayetsxw, *Wilp* Wii Litsxw, and *Wilp* Malii),

Gitxsan Hereditary Chiefs (*Wilp* Tenim Gyet, *Wilp* Wii Hlengwax, *Wilp* Lelt, and Skii km Lax Ha), Kitselas First Nation, Lax Kw'alaams First Nation, Metlakatla First Nation, Kitsumkalum First Nation and the Tahltan Nation (Iskut First Nation and Tahltan Indian Band).

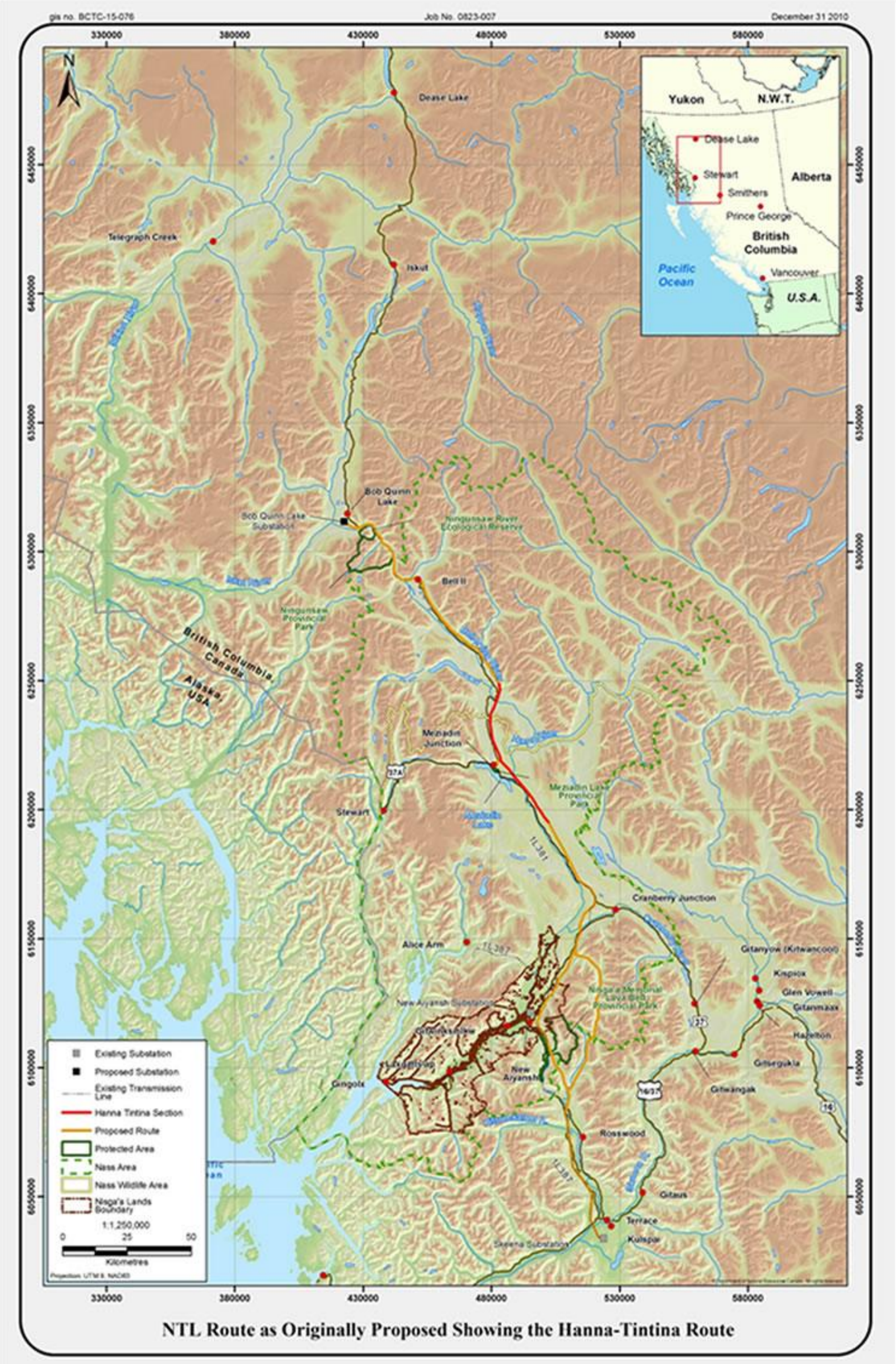
The proposed Project includes two alternate route segments: the western route option, which crosses Nisga'a Lands as described in the Nisga'a Final Agreement and skirts Nisga'a Memorial Lava Bed Provincial Park, and the eastern route option which traverses the Cedar and Kiteen valleys in the Nass Area and Nass Wildlife Area as defined in the Nisga'a Final Agreement.

Project Components

As proposed in the Application, the proposed Project would consist of permanent infrastructure including: a new right of way (ROW), a new high voltage electric transmission line and associated structures and conductors, and new line terminators and shunt reactors at the Skeena Substation, a new substation at Bob Quinn Lake and some new roads and stream crossings. Temporary infrastructure would be required to support the construction of the transmission line, including construction camps and equipment laydown and staging areas, access roads, trails, and stream crossings for road access.

The Proponent proposes to use existing Forest Service Roads, public roads, private roads and some new access roads to access the proposed Project ROW during construction and operation/maintenance phases. The exact amount and location of new temporary and permanent access roads for the proposed Project is not known at this time. Helicopter access may also be used within specific segments of the ROW where there are access restrictions or challenging terrain.

Figure 1: Proposed Project Transmission Line Route



NTL Route as Originally Proposed Showing the Hanna-Tintina Route

Transmission Line Right of Way

The transmission line ROW would be approximately a minimum of 28 m wide to a maximum of 38 m wide, depending on whether the new transmission line structures would be built adjacent to the existing ROW or within a new ROW. Also, the width of the ROW at some locations may vary depending on the terrain and site conditions. Vegetation would be cleared from the ROW, to varying degrees, ranging from no clearing in some areas where there would be substantial clearance between vegetation and the proposed conductors, to the clearing of all vegetation except for low lying brush in other areas. BC Hydro would develop long term vegetation management objectives with the view of protecting environmental and heritage values while allowing for access to the ROW and tower construction areas and ensuring adequate clearance between vegetation and the conductors.

The Application states that trees at the edge of a newly cleared area are not wind-hardened and, depending on their height, may have a tendency to fall into the ROW with the potential to also cause a flashover from the conductors. Consequently, in addition to the clearing and maintenance of a cleared width of 38 m, the ROW may also be cleared one time only to an additional width between 38 m and 120 m (averaging 80 m) to remove dangerous trees. In some cases the ROW may not require any additional clearing because the area is not vegetated or vegetated with low lying brush. In other cases the trees at the edge of the 38 m ROW may be very high and require additional clearing beyond the 38 m, in some cases up to a width of up to 120 m.

After the initial clearing, the cleared ROW width would be maintained to a maximum width of about 38 m, or less in areas where the ROW is shared with the existing transmission line. See Figures 2 and 3 which illustrate the proposed Project ROW and the Hazard Tree Management Area for the southern and northern portions of the transmission line.

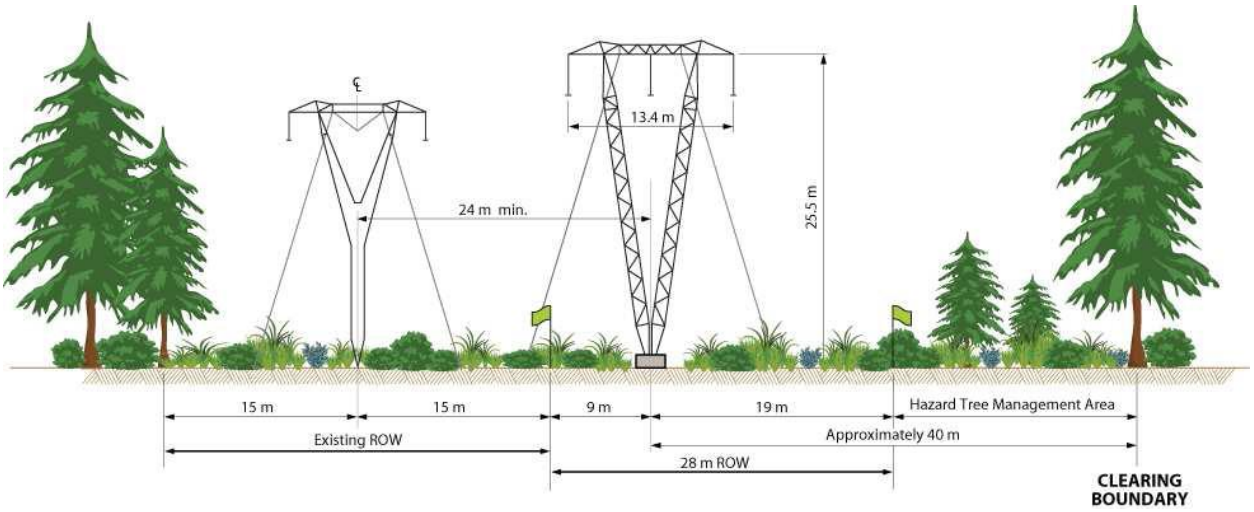


Figure 2 – Design for southern portion of the transmission line ROW

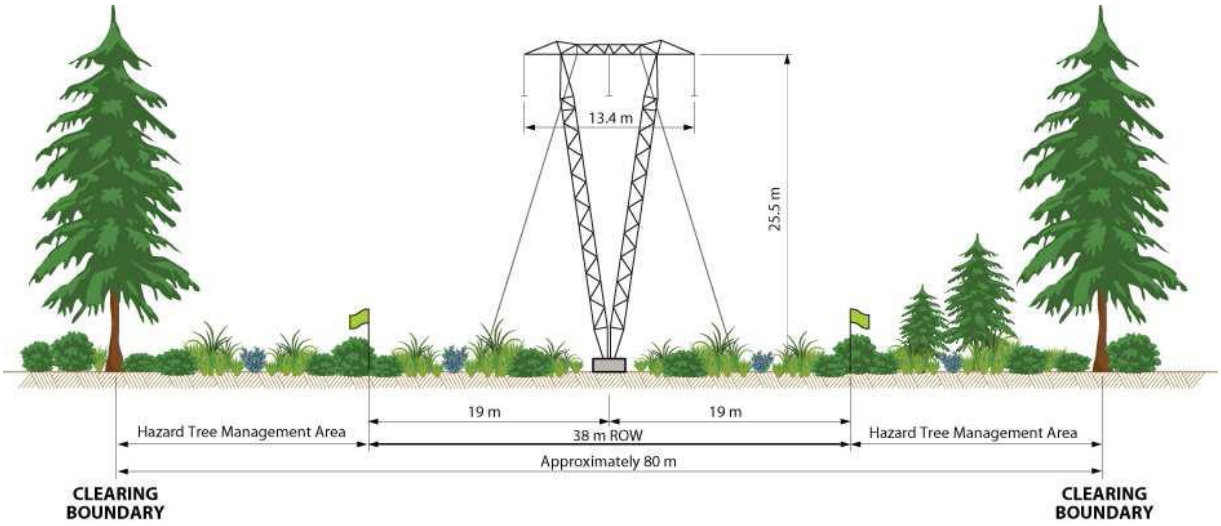


Figure 3 – Design for the northern portion of the transmission line ROW

Transmission Line System and Structures

The proposed transmission line would consist of three conductor wires strung along support structures in a V or Y guyed steel lattice design (see Figure 4). The average spacing between the structures would be 325 m, but may vary depending on terrain, engineering, and environmental considerations. The pole structures would vary in height between 18 m and 34 m high, depending on the terrain and span. The detailed engineering and type of structure to be used will be determined during the final design-build stage for the proposed Project.

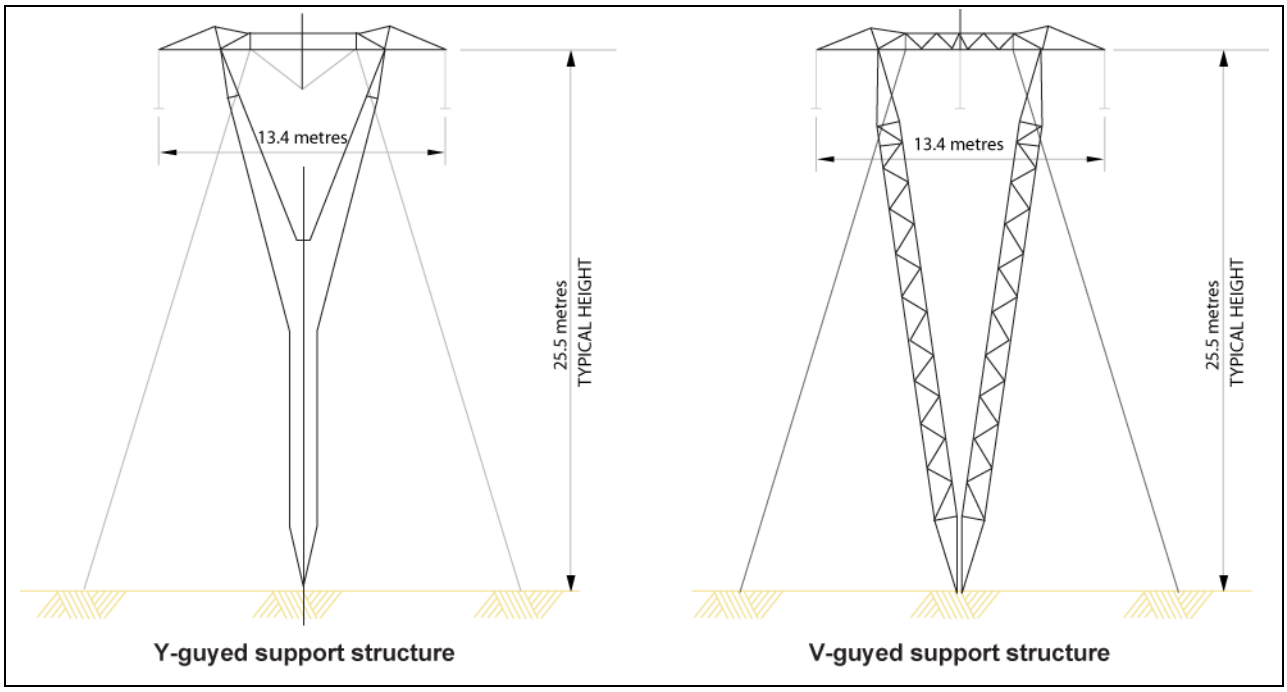
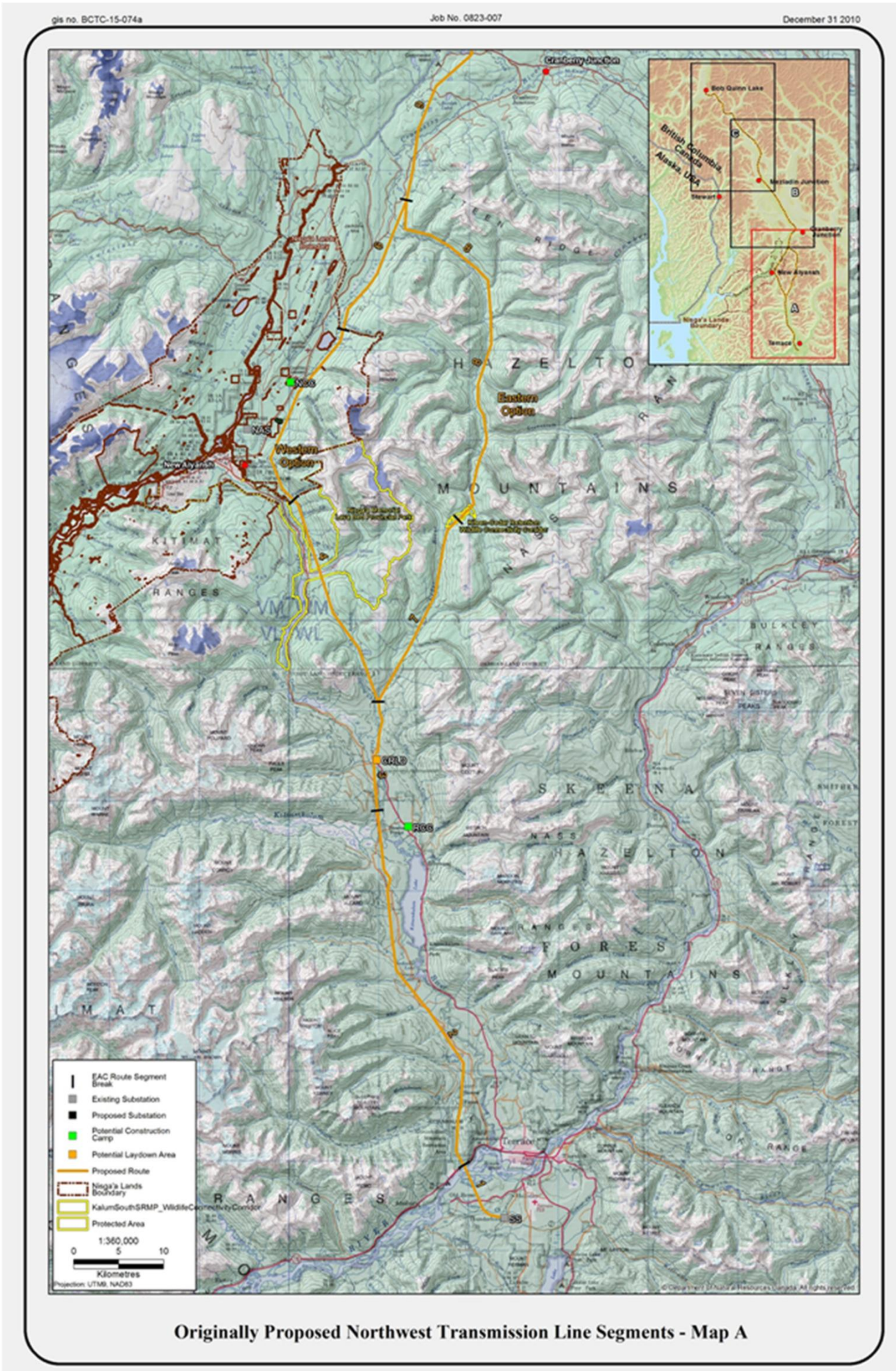


Figure 4 – Examples of transmission line support structure designs.

Proposed Transmission Line Route

At the time the Application was submitted to EAO, the Proponent proposed a transmission line route that included one route from the Skeena Substation to the confluence of the Cedar River and Sterling Creek, two options (western and eastern routes, Figure 5, Maps A and B) for the route between the Cedar River and the Cranberry River, and one route (segments 9 through 15) from the Cranberry River north to the northern terminus substation near Bob Quinn Lake (see Figure 5, Maps B and C).

Figure 5: Maps A, B and C: Proposed Project Transmission Line Route Segments, as originally proposed in Application



Originally Proposed Northwest Transmission Line Segments - Map A

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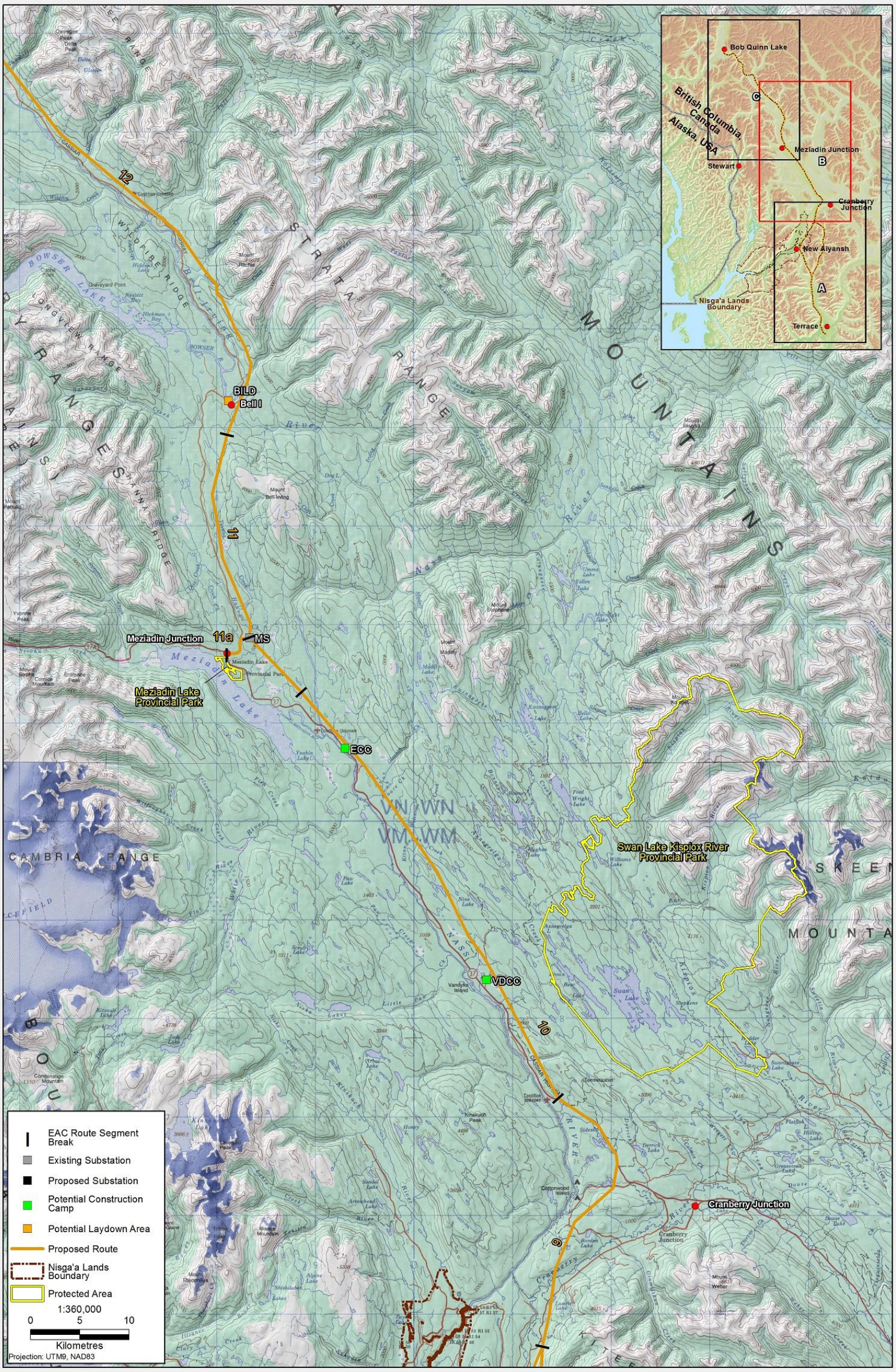
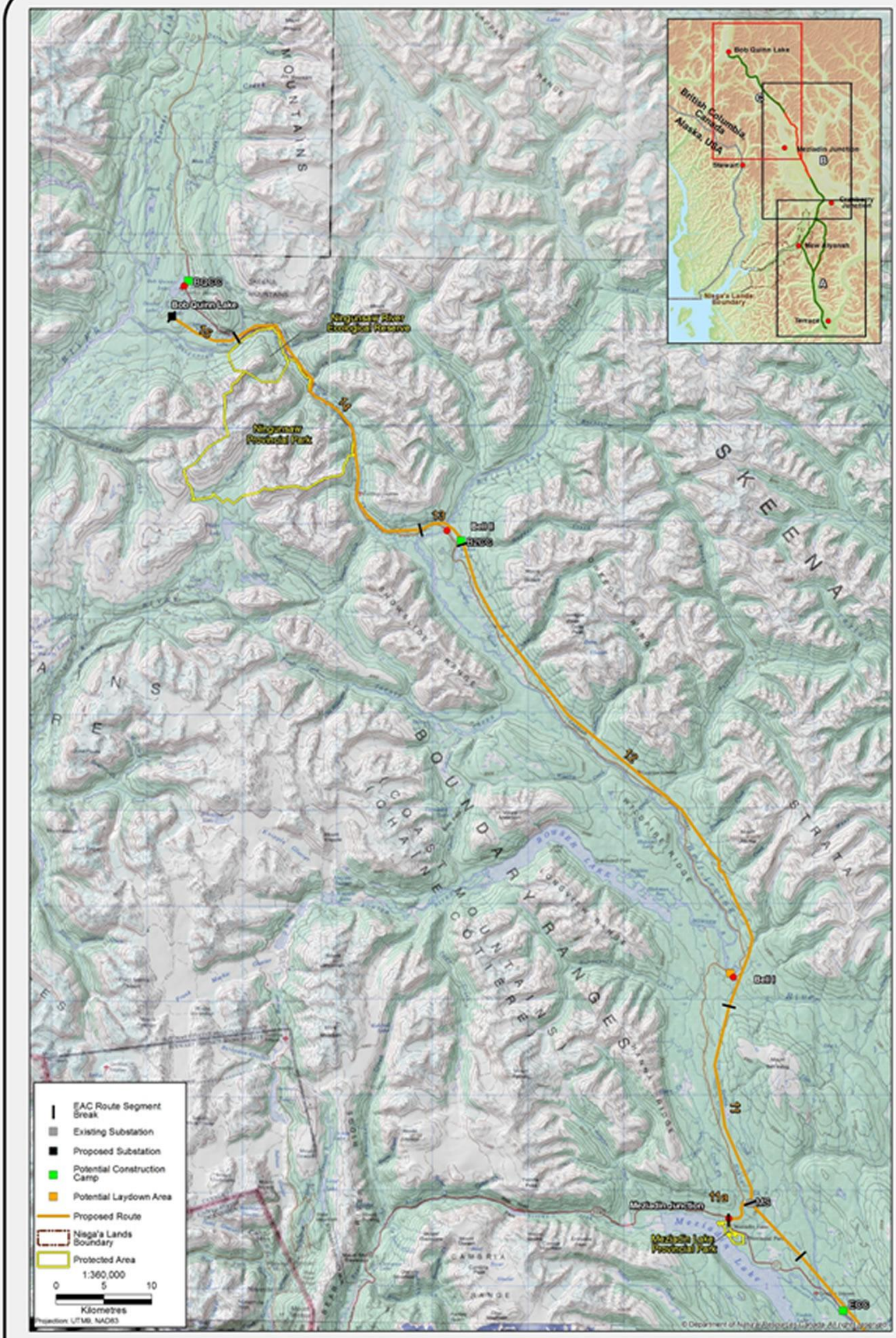


Originally Proposed Northwest Transmission Line Segments - Map B



Originally Proposed Northwest Transmission Line Segments - Map C

The originally-proposed transmission line route would begin at the existing southern terminus, at the Skeena Substation, south of Terrace. From the Skeena Substation, the transmission line would proceed northwest and parallel the existing 138 kV transmission line to the Kitsumkalum River crossing (segments 2 and 3, Figure 5, Map A,). North of the Kitsumkalum River the proposed 287 kV transmission line would require a separate new ROW, and continue north across the lower Cedar River to the confluence of the Cedar River and Sterling Creek.

From the confluence of Cedar River and Sterling Creek, the transmission line would proceed north to the Cranberry River crossing, along either one of the two routes proposed: an eastern route (segments 7 and 8, Figure 5, Maps A, B or C) following the Cedar River and the Kiteen Valley; and a western route (segments 4, 5 and 6, Figure 5) through Sterling Creek, then northerly across the Anhluut ‘ukwsim Laxmihl Angwinga ‘asanskwhl Nisga’a, (Nisga’a Memorial Lava Bed Provincial Park) and north-easterly through Nisga’a Lands. Then both routes would converge at the Nass Forest Service Road (Cranberry Connector) west of Cranberry Junction.

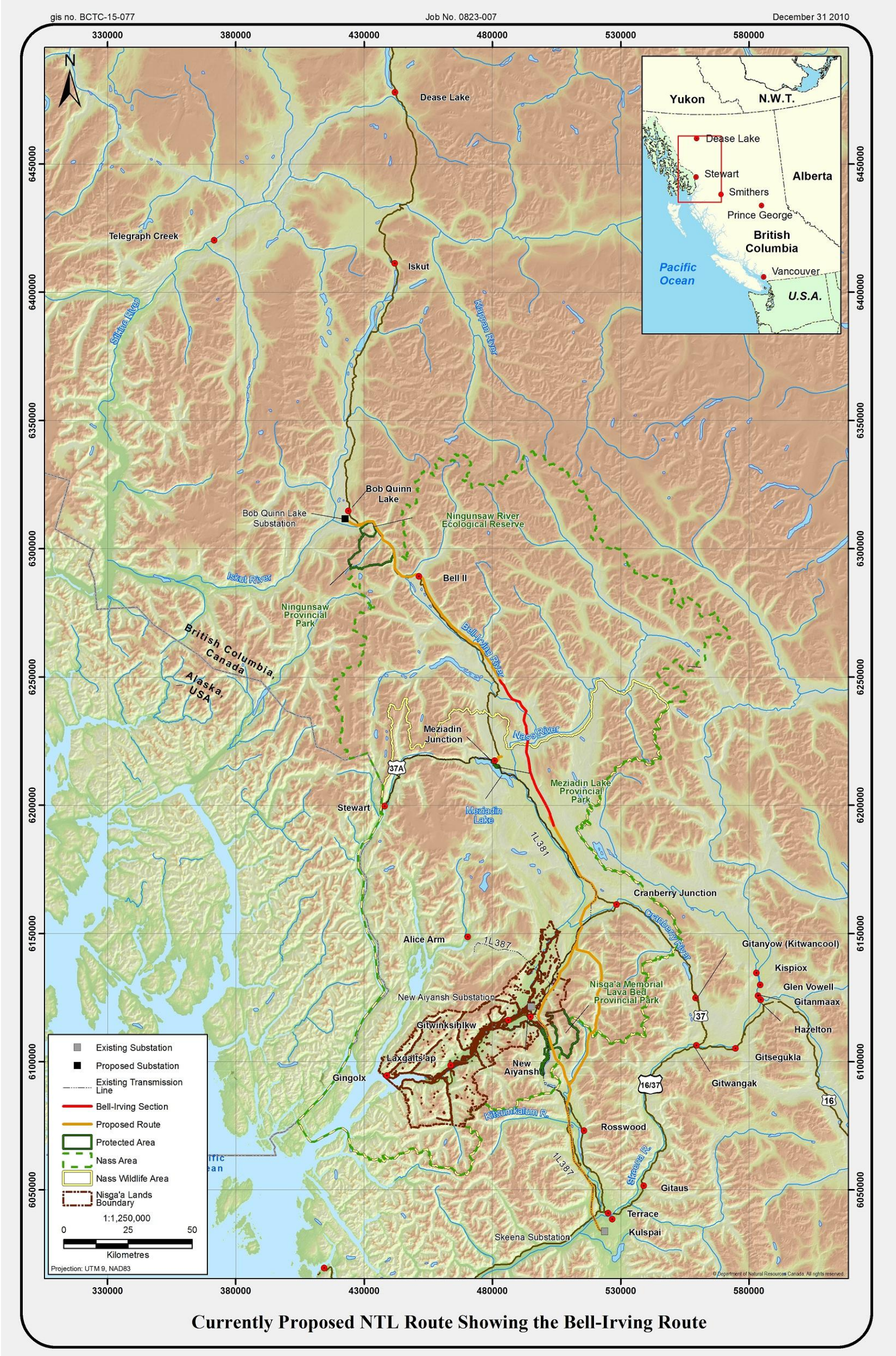
From the Cranberry River, the route would proceed north, east of and paralleling Highway 37 to the Meziadin Camp substation at the junction of Highway 37 and Highway 37A (segments 9 and 10, Figure 5, Map B). From Meziadin Junction (segment 11, Figure 5, Map B and C), the route would proceed north to northwest, parallel east of Highway 37 to the Bell-Irving River crossing (segment 12, Figure 5, Map C) at Bell 2 (segment 13, Figure 5, Map C). After crossing the Bell-Irving River, the route (referred to as the Hanna-Tintina Route) would travel west, then north-northwest, through the Ningunsaw Pass region, east of Ningunsaw Provincial Park (segment 14, Figure 5, Map C) and Ningunsaw River Ecological Reserve to Echo Lake. At Echo Lake the route travels west to the northern terminus at the new Bob Quinn Substation site (segment 15, Figure 5, Map C) alongside Eskay Creek Mine Road.

Figure 5 above includes the route segments of the proposed transmission line route, as proposed in the Application. The details of the route segments are described in section 4.2.3 and in Table 1.3 -1 of the Application.

The Proponent subsequently considered and accepted an alternative route (referred to as the Bell-Irving Route) that would avoid the Hanna and Tintina watersheds. The proposed Bell-Irving alternative route extends for approximately 60 km from a turning point approximately 20 km south of the Nass River, north across the Nass River about 12 km east of Meziadin Junction, then north to cross the Bell-Irving River, and then northwest to rejoin the originally proposed Project route about 7 km north of Bell-Irving 1 Highway 37 crossing (see Figures 6 and 7). See section 2.3, Alternative Means of

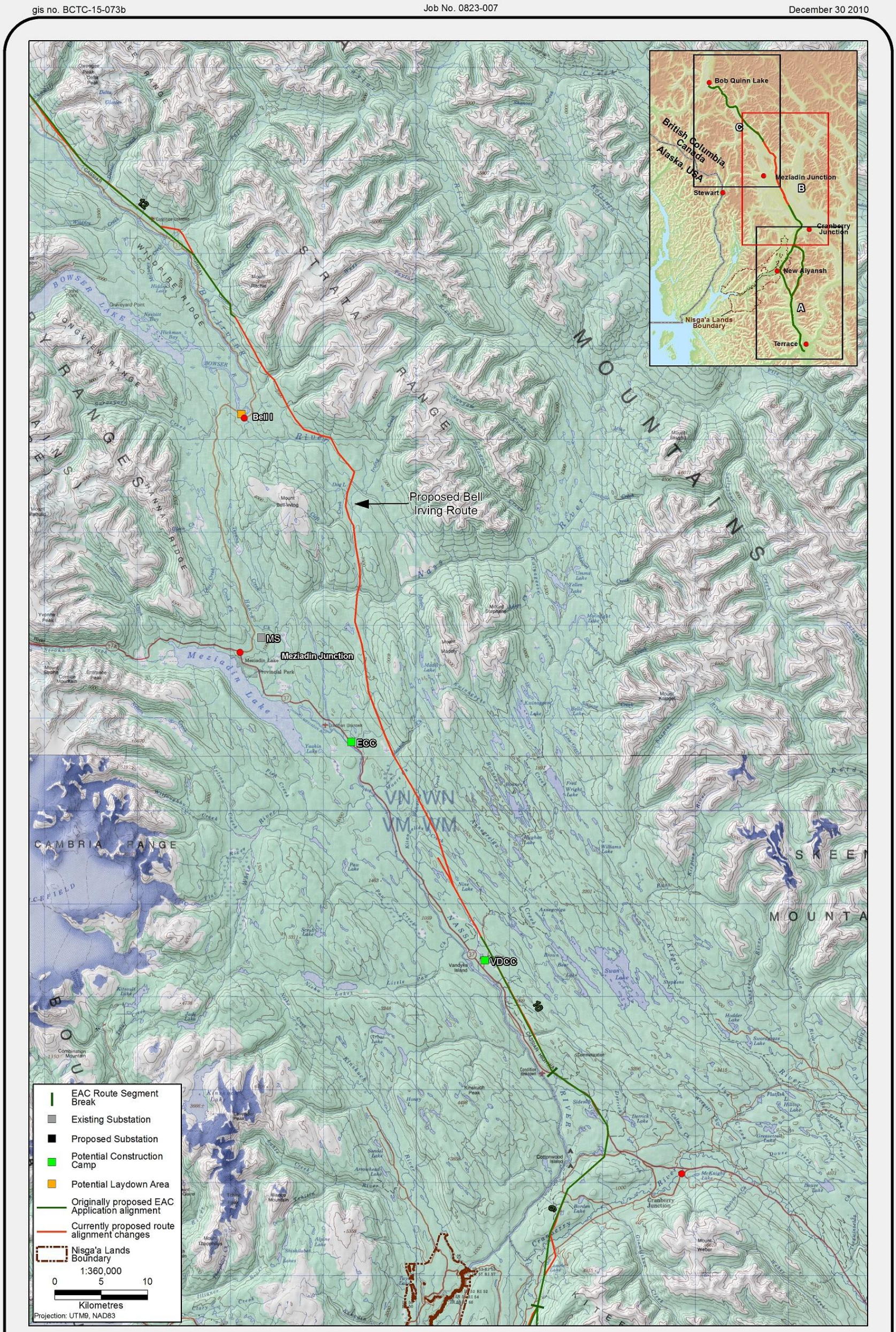
Undertaking the Proposed Project, of this Report, for more details on the proposed Bell Irving route.

Figure 6: Proposed Project Transmission Line Route with Bell-Irving Section



Currently Proposed NTL Route Showing the Bell-Irving Route

Figure 7: Map B: Proposed Project Transmission Line Route Segments including Bell-Irving Route



Substations

At the time the Proponent's Application was submitted to EAO, the Proponent proposed upgrades to the existing Skeena Substation, 8 km south of Terrace. The Skeena substation would be the southern terminus for the proposed transmission line. To accommodate the connection of the new 287 kV transmission line, there would be the need for additional components:

- a new 287 kV line termination; and,
- a three-phase shunt reactor.

Also, originally proposed in the Application was a new temporary station at Meziadin Junction to complete the construction of the southern portion (from Meziadin to Terrace) of the transmission line, and a temporary 3.8 km transmission line to tie in the northern portion of the transmission line into a new temporary Meziadin Junction Substation. A line termination, circuit breaker, and shunt reactor was also proposed at the existing Meziadin Camp Substation, north of Meziadin Lake. At this time, BC Hydro no longer proposes a temporary substation and tie-in to the existing 138 kV transmission line at Meziadin Junction, nor the facilities at the Meziadin Camp station because the 'Bell-Irving route' (see section 2.3 – Alternate Means of Undertaking the Proposed Project - of this Report) now proposed by the Proponent, would not require a new temporary station at Meziadin Junction or the temporary 3.8 km transmission line.

The northern terminus for the proposed Project would be at the new Bob Quinn Substation, 2.5 km west of the junction of Highway 37 and alongside the Eskay Creek Mine Road. The substation would occupy less than 4.2 hectares (ha) and include a line termination, three terminators, several transformers, and shunt reactors.

2.3 Alternative Means of Undertaking the Proposed Project

As outlined in the Application Information Requirements (AIR), this Report includes an evaluation of the alternatives to the proposed Project and the reasons behind selecting the preferred alternative. In addition, this section includes an analysis of the alternative means of carrying out the proposed Project that are technically and economically feasible.

"Alternative means" of carrying out the proposed Project are defined as the various technically and economically feasible ways that the proposed Project can be implemented. The Proponent considered alternative means of undertaking the proposed Project in the Application, including the evaluation of alternative routes, locations of substations, and voltage considerations.

Alternatives for Supplying Electrical Power to Northwest BC

Over the years, consideration has been given to extending the electricity transmission line grid, and providing alternate reliable sources of electricity to local communities, to meet the demands for anticipated industry and economic development and community growth in northwest BC. In the absence of a connection to the provincial electric power grid, developments and communities in northwest BC could potentially be served by alternate sources of electricity including:

- onsite power generation from diesel;
- regional power generation through conventional sources such as hydroelectric power generation or natural gas; or,
- regional power generation through unconventional sources such as geothermal, coal-bed gas, wind, biomass or cogeneration.

Proposed Route Alternatives

During consultations with government agencies, Nisga'a Nation, First Nations, and community members prior to the Application being submitted to EAO, a number of suggestions were made to the Proponent on route options for the proposed transmission line. The identification of the proposed routes in the Application was based on the results of these consultations and environmental baseline studies within the proposed Project corridor and a route selection preference guide. The route selection preference guide includes a list of key attributes (i.e. wildlife, fish, wetlands, etc). The Proponent reviewed the initial proposed 28 alternate route segments against each attribute and each route segment was ranked as preferred, neutral or least preferred, based on the level of impact to the attribute. For example, a route was preferred if fewer wetlands were affected and no changes to the riparian habitat were anticipated; neutral if the conditions were similar for all the routes and no one option is distinguishable; and least preferred if a higher number of wetlands or higher valued wetlands were affected or crossed and some change to the riparian environment was anticipated.

The Proponent undertook further evaluation of the route options and key environmental, engineering, social and cultural features were considered in the evaluation of routes. At the time the Application was submitted, the Proponent was considering two potential route options from the Cedar River to the Cranberry River: a western route that would pass through Nisga'a Lands in the Nass Valley, and an eastern route that would bypass Nisga'a Lands via the Cedar and Kiteen valleys.

Since the inception of the proposed Project, First Nations, Nisga'a Nation, and members of the Working Group expressed concern about the potential impacts of the proposed Project, specifically, the portion of the transmission line route north of Cranberry Junction, on the ecologically sensitive Hanna and Tintina watersheds. During the Application review of the EA, the proposed transmission line routes were reviewed by the members of the Working Group as well as the First Nations and Nisga'a Nation. Several members of the Working Group suggested that the Proponent consider an alternate transmission line route that would avoid the Hanna and Tintina watersheds. The Gitanyow Hereditary Chiefs initially proposed three alternate transmission line routes to attempt to minimize impacts in sensitive areas of concern. Through further discussion between the Proponent and the Working Group, one alternate route was selected: an 'easterly' route (referred to as the "Bell-Irving Route") which would avoid the Hanna-Tintina watersheds and run along the eastern side of Mt. Bell-Irving.

The proposed Bell-Irving Route extends for approximately 60 km from a turning point approximately 20 km south of Nass River, north across the Nass River about 12 km east of Meziadin Junction, then north to cross the Bell-Irving River, and then northwest to rejoin the originally proposed NTL route about 7 km north of Bell-Irving 1 Highway 37 crossing (see Figures 6 and 7 – for the proposed Bell-Irving route).

A comparative analysis of the route proposed in the Application, known as the 'Hanna-Tintina Route', and the proposed alternate Bell-Irving Route was undertaken, and a joint report was prepared by Gitanyow and BC Hydro (*Hanna-Tintina Route Alternates Evaluation Report*, Appendix 4*)* summarizing the findings of the analysis.

The analysis concluded that the Bell-Irving Route would be the preferred route because the lands and resources within the Bell-Irving Route have been impacted in the past, mainly through forestry activity, and presently through harvesting of timber by existing forest tenure licence holders. Whereas, the proposed Hanna-Tintina route would potentially impact the culturally and ecologically rich floodplain-wetland complex of the Hanna-Tintina watersheds abundant in salmon, wildlife (moose), food and medicinal resources that are highly valued by First Nations and Nisga'a Nation. The area of the Bell-Irving route is not as highly valued as the Hanna Tintina watersheds.

After further review of the findings from the analysis mentioned above and the additional fieldwork conducted on the Bell-Irving route during summer 2010, the members of the Working Group, including First Nations and Nisga'a Nation, recommended that the Proponent choose the Bell-Irving route over the Hanna-Tintina route as the preferred northern portion of the transmission line route. On October 28, 2010, the Proponent informed EAO, by letter, that BC Hydro will no longer pursue the Hanna Tintina route

alternative for the proposed Project and the Bell Irving Route was selected as the preferred route for proposed Project.

Despite the Proponent's decision to not pursue the Hanna-Tintina route alternative, the Hanna-Tintina Route Alternatives Evaluation Report, and all the information about the Hanna-Tintina watersheds included within the Application and supporting studies, remain on record in the EA to assist in the evaluation of the potential effects of the proposed Project, including the potential effects of the proposed Project using the Bell-Irving Route alternative.

At the time this report was prepared, the Proponent is still considering both the western route through the Nass Valley, crossing the *Anhluut 'ukwsim Laxmihl Angwinga* '*asanskwhl Nisga*'*a, (*Nisga'a Memorial Lava Bed Provincial Park) and Nisga'a Lands, and the eastern route following the Cedar River up to the Kiteen Valley for the proposed Project transmission line route.

Substation Location Alternatives

Two locations were considered for the northern terminus for the proposed transmission line:

1. a new substation at Bob Quinn along the existing Eskay Creek Mine Road, west of Highway 37; and,
2. a new substation at Echo Lake, within or adjacent to unused land at the existing Ministry of Transportation and Infrastructure (MOTI) maintenance yard east of Echo Lake and Highway 37.

In determining the preferred substation option, the Proponent considered a number of factors, including distances from watercourses and fish habitat, visual aesthetics, and access and security. The Bob Quinn location was determined to be the preferred option because it is further from Highway 37, and is considered to have less visual impact and greater security than Echo Lake.

Voltage Alternatives

The Proponent analyzed options for the minimum voltage of the proposed transmission line, including the possibility of 138 kV and 230 kV. The analysis concluded that 287 kV was the minimum voltage required to serve projected loads in the northwest. In the Application, the Proponent did not consider any higher voltage options.

Right of Way Configuration Alternatives

The proponent considered two ROW configurations for the proposed Project:

1. a single ROW; and,
2. a widened ROW parallel to the existing 138 kV line.

Both ROW options are proposed as a single ROW configuration would be required where a new ROW is cleared and a widened ROW configuration would be required where the proposed route is parallel to the existing 138 kV transmission lines.

Structure Configuration Alternatives

The Proponent evaluated three basic structure configurations for the proposed Project:

1. typical lattice steel V-guyed tangent structures;
2. alternate lattice steel or steel pole guyed Y tangent structures with V-string; or,
3. wood pole H frame structures.

The final selection of the structure type would not be made until the detailed engineering design-build phase. However, the Proponent has indicated that it would select steel lattice configurations because wooden poles are difficult to procure and steel has a longer lifespan.

Camp and Laydown Alternatives

The Proponent has not confirmed the location and total number of locations that would be required, as they would depend on the construction contractor schedule, logistics and staging decisions. The possible construction camps and laydown areas are illustrated in Appendix 9 (maps showing locations of construction camps and laydown areas), attached to this Report.

2.4 Project Benefits

The proposed Project would provide the future extension of the transmission system to communities (i.e. Iskut and Eddontenajon) in northwest BC where there is presently no electricity infrastructure and electricity is currently being provided by alternate means such as diesel generation. At this time, the existing high voltage electricity grid does not extend north of Meziadin Junction. This present lack of power supply to the northwest is seen as a barrier to economic and community development. Transmission infrastructure in the northwest would benefit communities north of Meziadin by providing a clean, reliable regional power supply, and connecting potential mining projects to the grid and providing the opportunity for potential power projects to deliver power through the grid.

By providing local generated power rather than diesel-electric power, the proposed Project would reduce environmental effects of new mining developments, specifically, greenhouse gas (GHG) emissions.

During the three year construction period, the proposed Project would generate approximately 860 person-years (or full time equivalent) of direct employment. The Proponent estimates a total of 550 jobs with direct suppliers, 260 jobs with indirect suppliers, and 670 induced jobs with a variety of industries would be created. The Proponent estimates 87 person-days per year would be required to operate and maintain the proposed Project. This estimate is based on operations and maintenance required for other BC Hydro transmission lines.

The total capital cost of the proposed Project is estimated to be $404 million. This estimate was developed in 2007 based on an analysis conducted by BC Hydro's consultants and by BC Hydro Engineering Services. This estimate was based on the originally proposed Nass Valley (western) transmission line route and the Hanna-Tintina route, and an in-service date of 2011 which has now been extended to 2013. The details of the costs associated with the proposed Project are described in Table 4.5-1 of the Application. During the three year construction period, the Proponent expects expenditures to be $300 million, including $137 million in labour costs, plus $104 million in overhead costs, interest during construction and contingency.

The Proponent has identified general hiring and procurement policies to encourage construction contractors to hire regional residents to the extent practical. The Proponent also intends to negotiate contracts with First Nations and Nisga'a Nation for clearing and access road construction for major portions of the route. The Proponent expects that local and regional suppliers will be used when they can provide goods and services competitively.

The government tax revenue resulting from the proposed Project's direct, indirect and induced effects is expected to total $55.2 million during construction (see Table 1 below). The Application states that the proposed Project would generate approximately $32 million in government tax revenue throughout the construction phase, with approximately $20 million payable to the federal government ($1.3 million in commodity taxes, $17.4 million in personal income taxes and $1 million in corporate income taxes) and $12 million to the provincial government ($3.7 million in commodity taxes, $7.6 million in personal income taxes, and $0.5 million in corporate taxes). Additional revenue is expected from industry suppliers: $6 million from direct suppliers, $3 million from indirect suppliers and $15 million from induced household suppliers. Of the approximate $23 million in tax revenue from suppliers, the Proponent anticipates that $11 million would be paid to the federal government, $10 million to the provincial government, and $2 million to municipal governments.

For the life (50+ years) of the proposed Project, the total government tax revenue would be approximately $97 million, including commodity taxes ($10.9 million), personal taxes ($9.6 million) and corporate taxes ($1.7 million) paid to provincial government, and property taxes ($75 million) paid to local government.

Table 1: Government Revenues from the Proposed Project Construction

	CDN$ (Millions)			
	Direct	**Indirect**	**Induced**	**Total**
Project derived federal government net revenue	$19.8	-	-	$19.8
Project derived provincial government net revenue	$11.8	-	-	$11.8
Total Project Government Net Revenue	$31.6	-	-	$31.6
Supply industry derived federal government net revenue	$3.3	$1.4	$6.6	$11.3
Supply industry derived provincial government net revenue	$2.4	$1.1	$6.9	$10.4
Supply industry derived municipal government net revenue	$0.4	$0.3	$1.2	$1.9
Total Supply Industry Government Net Revenue	$6.1	$2.8	$14.7	$23.6
Total Government Net Revenue				$55.2

2.5 Project Land Use

The proposed Project is located within the boundaries of seven provincially approved or proposed Land and/or Sustainable Resource Use and Management Plans:

- Kalum Land and Resource Management Plan (LRMP);
- South Kalum Sustainable Resource Management Plan (SRMP);
- Cassiar Iskut Stikine LRMP;
- Nass LRMP;
- Nass South SRMP (draft);
- Draft Cranberry SRMP (proposed); and,
- Nisga'a Land Use Plan.

The proposed Project is consistent with all LRMPs and the Nass South SRMP. The Nass South SRMP includes an allowance to accommodate a utility ROW. The Nisga'a Land Use Plan does not specifically exclude the opportunity for a utility ROW and the requirements for such are specified in the NFA.

There are several provincial parks and protected areas in close proximity to the proposed Project alignment. The proposed transmission line ROW would cross a portion of the Anhluut 'ukwsim Laxmihl Angwinga 'asanskwhl Nisga'a, (Nisga'a

Memorial Lava Bed Provincial Park) (western route only) and skirt the edge of Ningunsaw Provincial Park. The Proponent intends to submit an application for a park boundary amendment(s) if the western route option is chosen. The amendment(s) will require provincial cabinet approval and Nisga'a Lisims Government (NLG) consent.

Two forest districts, four Timber Supply Areas (TSAs), one tree farm licence, and 10 forest licensee holders overlap portions of the proposed transmission line route. There are also two semi-active logging camps which are close to the proposed Project. Timber is presently being harvested within the proposed Project area and much of the area has been extensively logged. There are also a number of mineral tenures, mainly for gold, copper and coal exploration, within the proposed Project area.

The proposed Project footprint also crosses land which is subject to other land use interests such as forest tenures, mineral tenures, fishing and hunting for domestic purposes, traplines, traditional harvesting, and utilities.

The Proponent estimates that 71.9 ha of the proposed Project would be within the Agricultural Land Reserve (ALR). The Proponent is responsible for obtaining any exclusions or permissions that may be required prior to any construction activity in the ALR.

3 Assessment Process

3.1 Provincial EA Process

In May 2007, the Proponent submitted a Project Description and applied to EAO to request that the proposed Project be designated as a reviewable project under section 7 of the Act because the proposed Project may potentially impact First Nations' interests and Nisga'a Treaty rights set out in the NFA; may be of interest to members of the public; and the EA facilitates an effective, coordinated approach to consultations with the public, Nisga'a Nation, and First Nations. On May 31, 2007, EAO designated the proposed Project to be a reviewable project under section 7(3)(a) of the Act.

3.1.1 Pre-Application Stage

Before this Application was accepted for the review, the following steps occurred:

1. May 31, 2007 – EAO determined that the proposed Project required an EA and issued an Order to this effect under section 10 of the Act.

2. November 6, 2007 – EAO established a Working Group comprised of federal, provincial and local government agencies, Nisga'a Nation and First Nations representatives, to participate in the EA of the proposed Project (see Appendix 1 for a list of Working Group members). The purpose of the Working Group is to

provide technical and Nisga'a Nation and First Nations input throughout the review process, and to comment on documentation prepared by EAO and the Proponent. It should be noted that this Assessment Report was prepared in large part prior to the restructuring of a number of provincial ministries and refers to the contribution of staff from the Ministry of Environment (MOE), Ministry of Energy, Mines and Petroleum Resources (MEMPR), Ministry of Forest and Range (MOFR) and Integrated Land Management Bureau (ILMB) who now reside in the new Ministry of Natural Resource Operations.

3. November 12, 2007 – EAO issued a procedural Order, pursuant to section 11 of the Act, defining the scope of the proposed Project, and the procedures and methods for conducting the EA. This included directing the Proponent to prepare draft "Terms of Reference" (TOR) which set out the information to be gathered and studies to be completed before an EA application could be submitted.

4. November 13, 2007 – Copies of the draft TOR were posted on the EAO website and placed in local libraries.

5. November 13 to December 13, 2007 – EAO held a public comment period and open houses in Terrace, Smithers and Stewart, BC to seek input on the draft Terms of Reference. Comments were received from four individuals and organizations and approximately 110 people attended the open houses. The EAO also sought comments on the draft TOR from the Working Group, First Nations and Nisga'a Nation.

6. December 5, 2007 – The Proponent requested that the public comment period be cancelled, the EA suspended and that further Working Group meetings be put on hold. The Proponent requested this suspension because NovaGold and Teck Cominco suspended the development of the Galore Creek Mine Project and as a result, the Proponent was re-evaluating its options for the proposed Project.

7. November 17, 2008 – The Proponent wrote to inform EAO that Premier Campbell had announced in September 2008 that BC would provide funding for the Proponent to prepare an application for an EA Certificate, and to request BCTC (now BC Hydro) re-engage the EA.

8. March 16, 2009 – Copies of the revised draft TOR were posted on the EAO website and placed in local libraries.

9. March 18 to April 20, 2009 – EAO held a public comment period and open houses in Terrace, Smithers and Stewart to seek input on the draft TOR. Comments were received from 242 individuals and organizations and

approximately 150 people attended the open houses. The EAO also sought comments on the draft TOR from the Working Group and First Nations.

10. September 2, 2009 – EAO issued a section 13 Order to amend the section 11 Order to redefine Skii km Lax Ha from a First Nation to a *wilp*, or house of the Gitxsan Nation, for the purposes of consulting and accommodating First Nations.

11. December 7, 2009 – EAO approved the final Application Information Requirements (AIR) (formerly the Terms of Reference) and issued the AIR to the Proponent.

12. On January 27, 2010 – The Proponent submitted the Application for an Environmental Assessment Certificate for a 30-day evaluation.

13. On March 1, 2010 – EAO determined that the Application contained some deficiencies and could not be accepted for review.

14. On April 9, 2010 – The Proponent submitted additional information and revisions to the Application.

15. April 14, 2010 – The EAO determined that the Application contained the information required by the AIR.

16. April 14, 2010 - EAO assessed the Proponent's First Nations, Nisga'a Nation and public consultation activities during the Pre-Application Stage, and activities proposed during the Application Review Stage. The EAO determined that the consultation activities were adequate and allowed sufficient opportunities for the public, Nisga'a Nation and First Nations to review and comment on the proposed Project.

3.1.2 Application Review Stage

1. April 15, 2010 – The 180-day review period of the Application was initiated. The Application was posted to EAO's electronic Project Information Centre and made available in local libraries.
2. April and May 2010 – The public comment period and open houses were advertised in three local newspapers.
3. April 26, 2010 to June 10, 2010 – EAO held a 45-day public comment period on the Application. A total of 740 public comments were received on the Application.
4. April 27, 28 and 29, 2010 – EAO held open houses in Dease Lake, Smithers and Terrace to provide information about the project and allow the public an opportunity to identify issues or concerns about the proposed Project and to ask

questions. Representatives of both EAO and the Proponent made presentations at these open houses. A total of approximately 235 people attended the three open houses.

5. July 22, 2010 – The Proponent submitted the "Proposed Northwest Transmission Line Project Hanna-Tintina Route Alternatives Evaluation Report" as supplementary information to its Application.
6. August 11, 2010 to August 25, 2010 – EAO held a 14-day public comment period on the "Proposed Northwest Transmission Line Project Hanna-Tintina Route Alternatives Evaluation Report". No open houses were held. A total of three public comments were received on the Evaluation Report.
7. August 24, 2010 – EAO issued a section 13 Order to further amend the section 11 Order to change the Proponent from BCTC to BC Hydro.
8. August 27, 2010 – EAO received a letter from the Proponent requesting a timeline suspension to the 180-day application review period. The suspension was requested by the Proponent to allow time to complete additional fieldwork on the Bell-Irving Route option, Nisga'a Lands, and stream crossings, watercourses and waterbodies; prepare a draft preliminary Access Plan and draft Construction Environmental Management Plan (EMP); undertake further work on cumulative effects assessment; complete a study on Coastal Tailed Frog; prepare a report on the additional information; and allow the Working Group to review the results.
9. On September 2, 2010 – EAO granted the Proponent's request to suspend the EA on day 141 of the 180-day timeline and requested additional information.
10. On September 27, 2010 – The Proponent submitted the additional information to EAO as outlined in EAO's letter, dated September 2, 2010, granting the Proponent's request to suspend the EA timeline. The Working Group was provided with the opportunity to review and comment on the additional information.
11. On October 22, 2010 –EAO determined that the additional information provided was sufficient to resume the review of the Application. The EAO lifted the timeline suspension and the EA process resumed.
12. On November 23, 2010 – EAO received a letter from the Proponent requesting a timeline suspension on day 173 of the 180-day application review period. The suspension was requested by the Proponent to allow Infrastructure Canada (INFC) an additional 15 days to review the supporting studies on the Application submitted by BC Hydro. The EAO granted the Proponent's request to suspend the EA.

13. On December 7, 2010 – EAO received a letter from the Proponent requesting another timeline suspension to the 180-day application review period, until January 5, 2011. The suspension was requested by the Proponent to allow INFC additional time to continue its review of the Application and supporting studies. The EAO granted the Proponent's request to suspend the EA with seven days remaining in the 180-day application review period.
14. On January 5, 2011 – EAO lifted the timeline suspension with seven days remaining in the 180-day application review period.
15. On January 13, 2010 – EAO referred the Proposed Project to the Minister of Environment and the Minister of Forests, Mines and Lands.

The Proponent also consulted with, and gave presentations to, local government officials, regional community representatives and economic development organizations on a number of occasions.

A copy of the Proponent's consultation report, which contains details of public consultations, can be found at www.eao.gov.bc.ca.

3.2 Delegated Federal EA

A Federal EA of a proposed project is required (i.e. triggered), under CEAA, SC 1992, c.37, as amended, if a federal authority would be required to exercise certain powers or perform certain duties or functions for the purposes of enabling the proposed Project to be carried out, in whole or in part. A Federal EA is required in relation to the proposed Project because Fisheries and Oceans Canada (DFO) may issue an authorization under the Fisheries Act, Transport Canada (TC) may issue approval under the Navigable Water Protection Act (NWPA), Canadian Transport Authority (CTA) may require an authorization under the Canadian Transportation Act because the transmission line crosses a railway line, and INFC may contribute funding to enable the proposed Project to proceed.

Per the Canada-British Columbia Environmental Assessment Delegation Agreement (Agreement), signed in November 2009, Canada delegated the screening of the proposed Project and the preparation of the screening report to the BC EAO, pursuant to subsection 17(1) of the *Canadian Environmental Assessment Act.* The Agreement is attached as Appendix 5. It should be noted that the Agreement does not apply to First Nations and Nisga'a Nation consultation, and therefore, each level of government is responsible for their independent consultation with First Nations and Nisga'a Nation.

During the EA, TC informed EAO by letter (December 8, 2010) that the approvals required for the proposed Project under section 5(3) of the NWPA do not trigger TC to conduct an EA under CEAA and, therefore, TC would no longer be a Responsible

Authority (RA) for the Federal EA. Should the proposed Project be granted an EA Certificate, TC will work directly with the Proponent on the approvals required under the NWPA. Prior to the conclusion of the EA, the Proponent signed an agreement with CN Rail on the railway crossing. Therefore, the Canadian Authority will no longer require the issuance of an authorization.

Comments provided by the federal agencies are reflected in this Assessment Report and have informed the analysis and conclusions. The Assessment Report also serves as the federal EA screening report, as prescribed in the Agreement.

Should provincial and federal EA decisions allow the proposed Project to proceed, the Proponent would also be required to obtain the necessary provincial licences, leases and other approvals, as well as regulatory approvals from the federal responsible authorities. Should the proposed Project cross Nisga'a Lands, the Proponent will also be required to obtain Nisga'a licences, leases or other approvals, in addition to approvals for the ROW.

3.3 First Nations and Nisga'a Nation Consultation

First Nations

The proposed Project is situated within portions of the asserted territories of the following First Nations:

- Kitselas First Nation;
- Kitsumkalum Band;
- Gitxsan Hereditary Chiefs, specifically the house territories of *wilp* Tenim Gyet, *wilp* Wii Hlengwax, *wilp* Lelt, and *wilp* Skii km Lax Ha;
- Gitanyow Hereditary Chiefs, specifically the house territories of *wilp* Watakhayetsx, *wilp* Gamlaxyeltxw, *wilp* Wii'litsxw and *wilp* Malii;
- Lax' kwa'aalams First Nation;
- Metlakatla First Nation; and,
- Tahltan Nation (Iskut First Nation, Tahltan Indian Band).

First Nations were kept fully informed of progress of the EA and were provided with information that was sent to the Working Group. First Nations were invited to participate in the EA as members of the Working Group. Metlakatla First Nation did not actively participate in the Working Group, while the other First Nations participated to varying degrees. The EAO also offered to directly consult with each First Nation in a manner consistent with "deep consultation" in relation to the Haida spectrum of consultation, by actively seeking meetings, and offering approaches to address any procedural or technical issues raised by First Nations. The EAO also shared information and views or

positions on matters relating to the potential for impacts on aboriginal rights from the proposed Project with each First Nation and sought feedback.

Nisga'a Nation

One of the two proposed alternate routes for the proposed Project – the western route option - is situated within portions of Nisga'a Lands (segment 5), the Nass Wildlife Area (segments 4 to 6, and 8 through 11) and the Nass Area (segments 4 to 6, and 8 through 14) as defined in the NFA. (See Figure 5 in this Report). The EAO offered to consult with the NLG in a manner that respects the NFA, by actively seeking meetings and offering approaches to address procedural or technical issues raised by NLG. The NLG was invited to participate in the EA as members of the Working Group and actively participated throughout the EA. The EAO also shared information and views or positions on matters pertaining to the NFA and the potential for impacts from the proposed Project with the NLG and sought feedback.

Chapter 10 of the NFA – Environmental Assessment and Protection – applies to any process in which there is an evaluation of the impacts of the proposed project on the environment. In addition, in view of the ongoing application of NFA to any development on Nisga'a Lands, the Proponent would also be required to obtain the necessary Nisga'a licenses, leases or other approvals, in additional to approvals for the removal of lands for the ROW if the western route is chosen.

EAO has also prepared a Northwest Transmission Line First Nations and Nisga'a Nation Consultation Report which provides a more detailed review of First Nations and Nisga'a Nation consultations, and EAO conclusions with respect to the consultation process, treaty rights or asserted aboriginal rights and the potential for impacts to those rights.

3.4 Public Consultation

The Proponent initiated a public consultation program in May 2007. The public consultation program provided opportunities for the public and stakeholders to learn about the proposed Project and provide input. To assist in providing information to the public about the proposed Project, the Proponent:

- advertised Project-related events (i.e. open houses and public comment periods) through newspaper advertisements, public service announcements, paid advertisements on the radio and posters;
- developed a Project Update database of members of the public interested in the progress of the proposed Project, and provided regular project updates and information handouts to these individuals;

- sent personal invitation letters, copies of advertisements and information directly to tenure holders and property owners potentially affected by the proposed Project, and stakeholder[1] groups;
- maintained a Project website accessible to members of the public that was regularly updated through the EA ;
- responded to and tracked email, fax and phone inquiries; and,
- held community information open house meetings and gave presentations to, and answered questions raised by, community groups, associations and municipalities.

The Proponent met with a number of municipal and regional officials and staff, community associations, economic groups, business associations, businesses, community groups, tenure holders, property owners and community members along the proposed corridor, educational institutions, environmental groups and Non-Government Organization's (NGO's).

Public comments are addressed in Part B and in Appendix 2A of this Report. However, public comments that were received that relate to matters outside the scope of the EA are identified below.

- **Proposed Project Support**: 93 comments expressed support for the proposed Project and the economic benefits and developmental opportunities that would result from the construction of the proposed Project, and two comments expressed opposition to the proposed Project
- **Length of Transmission Line and Voltage:** 10 comments enquired why the proposed Project would not be extended beyond Bob Quinn Lake, BC to Dease Lake, BC and why only a 287 kV transmission line was proposed and not a 500 kV transmission line.

[1] Stakeholders groups include: Economic development groups, including Chambers of Commerce, Terrace Economic Development Authority and Kitimat Terrace Industrial Development Society; Crown land tenure holders (trappers, guide outfitters, recreational facilities, etc.); Property owners (prior to involvement of BC Hydro Properties); Environmental and other Non-Government Organizations (ENGOs/NGOs); and Mining community

PART B – ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION, AND SIGNIFICANCE OF RESIDUAL EFFECTS

4 General

4.1 Assessment Methodology

4.1.1 Assessment of Potential Significant Adverse Effects Methodology

In undertaking this evaluation, EAO assessed whether the project as proposed would have significant adverse environmental, social, economic, heritage and health effects, including cumulative impacts, and potential effects on First Nations' asserted aboriginal rights and interests, and potential effects on the NFA, having regard to the mitigation measures proposed in the Application or otherwise developed through the EA process.

More specifically, for each issue under consideration in this part, this Report will:

- set out a summary of relevant background information (which is set out in considerably more detail in the Application);
- discuss the potential for residual adverse effects, including cumulative impacts, having regard to mitigation measures proposed in the Application or developed subsequently as a result of public consultations, input from the Working Group and consultations with First Nations and Nisga'a Nation;
- assess, with input from the Working Group, First Nations, and Nisga'a Nation whether any residual adverse effects, including cumulative impacts, would be significant.

The development and refinement of mitigation measures was a key component of the EA process and one where EAO spent an extensive amount of time facilitating discussion and negotiation among the Proponent, interested parties, Nisga'a Nation, and First Nations. For the proposed Project, the Proponent has made 71 commitments which are set out in detail in Appendix 3. Key commitments will be discussed in the following sections of this Report but for a full explanation and consideration of commitments readers are advised to consult Appendix 3.

In addressing what may constitute a "significant" adverse effect, EAO considers the following factors[2]:

- **Magnitude:** This refers to the magnitude or level of disturbance to an existing condition. Low magnitude effects may have little to no disturbance to an existing

[2] This is generally consistent with the analysis used in federal environmental assessments under the *Canadian Environmental Assessment Act*, although EAO has added the factor of "probability".

condition, while high magnitude suggests this is a threatening disturbance to an existing condition.

- **Probability:** The likelihood that an adverse effect will occur.
- **Geographic Extent:** This refers to the extent of change over the geographic area of the proposed Project. The geographic extent of effects can be local or regional. Local effects may have a lower impact than regional effects.
- **Duration and Frequency:** This refers to the length of time the effect lasts and how often the effect occurs. The duration of an effect can be short term or long term. The frequency of an effect can be frequent or infrequent. Short-term and/or infrequent effects may have a lower impact than long-term and/or frequent effects.
- **Reversibility:** This refers to the degree to which the effect is reversible. Effects can be reversible or permanent. Reversible effects may have lower impact than irreversible or permanent effects.
- **Context:** This refers to the ability of the environment to accept change. For example, the effects of a project may have an impact if they occur in areas that are ecologically sensitive, with little resilience to imposed stresses.

4.1.2 Determining whether significant adverse effects (if any) are justified

As a result of the extensive commitments and mitigation measures that are typically made through the EA process, significant adverse effects are usually avoided. However, if EAO concludes that a proposed project is likely to cause significant adverse effects, EAO then assesses whether the proposed Project could be considered justified. In assessing whether a proposed project that is likely to cause significant adverse effects may be justified, EAO will consider all relevant factors, including the following:

- the number, type and extent of significant adverse effects that are expected;
- the economic benefits that would be provided by the projects (including taxes, jobs and infrastructure development), and the degree to which those who would otherwise be adversely effected by the project would benefit;
- the degree to which the proposed Project would contribute to community development; and,
- the allocation of costs and benefits of the projects as between present and future generations.

4.1.3 Ensuring the Crown's duties to consult and accommodate First Nations are met

The EAO is also required to ensure that the honour of the Crown is discharged by ensuring appropriate consultation and accommodation of First Nation interests in respect of the decision by ministers as to whether to issue an EA Certificate. There is often considerable overlap between the interests of First Nations and the assessment of

environmental, economic, social, heritage and health effects. As a result, First Nations comments and interests in terms of consultation are specifically factored into the analysis in EAO's First Nations and Nisga'a Nation Consultation Report. First Nations comments and interests that directly relate to the environmental, economic, social, heritage and health assessments are discussed in Part B. In addition, further and more specific consideration is given to the Crown's duty to consult and accommodate First Nation interests in EAO's First Nations and Nisga'a Nation Consultation Report.

4.1.4 Ensuring the Crown's obligations to uphold the terms of the NFA are met

The EAO is also required to ensure that the Crown's obligations under the NFA are met by ensuring that all applicable provisions of the NFA are upheld, in particular Chapter 10 of the NFA – Environmental Assessment and Protection. In addition to specific treaty interests, there is also considerable overlap between Nisga'a Nation interests and the assessment of environmental, economic, social, heritage and health effects. As a result, Nisga'a Nation comments and interests in terms of consultation are specifically addressed in EAO's First Nations and Nisga'a Nation Consultation Report. Nisga'a Nations comments and interests that directly relate to the environmental, economic, social, heritage and health assessments are also discussed in Part B. In addition, further and more specific consideration is given to the Crown's duty to meet the requirements of the NFA in the First Nations and Nisga'a Nation Consultation Report.

4.2 Spatial Boundaries

A study area was defined by the Proponent for each valued component. The study area, or the zone of influence, is anticipated to be directly affected by the activities associated with the proposed Project. Regional study areas were established to include the proposed Project and surrounding region encompassing the zone of influence for proposed Project-specific effects. A map of the local and regional study areas and rationales for the boundaries selected are provided in the Application within the effects assessment section for each component. Tables 2 and 3 below provide an overview of the spatial boundaries established for each assessment component.

Table 2 Spatial boundaries established for the assessment of biophysical components

Component	Local Study Area	Regional or Other Study Area
Climate/GHGs	Not applicable - global	Not applicable - global
Ambient Air Quality	Length of the proposed transmission line route (route) plus a 5 km buffer	Similar to Local Study Area in Application - Length of the proposed transmission line route (route) plus a 5 km buffer

Surface Water	Proposed route	Regional: Community watersheds & other regional scale watersheds
Groundwater	Proposed new and existing substation sites and potential construction camps, plus registered groundwater wells within 200 m of the proposed route	Groundwater flow path down-gradient of proposed project footprint
Geotechnical Stability and Soils	80 m ROW, length of the proposed route and proposed access road ROW	2 km wide study area for the length of the proposed route
Fish & Aquatic Habitat	Proposed route plus 100 m buffer	Regional: Watersheds that the transmission line would traverse
Wetlands,	80 m wide corridor/ROW for the length of the proposed Project route, plus proposed access roads and substations	Wetlands affected by proposed Project footprint or direct effects to hydrology of wetlands downstream
Ecosystems and vegetation	80 m ROW for the length of the proposed route	2 km wide corridor for the length of the proposed route
Wildlife	80 m ROW for the length of the proposed route	2 km wide corridor for the length of the route

Table 3: Spatial boundaries established for the assessment of social, economic, heritage and health components

Component	**Local Study Area**	**Regional or Other Study Area**
Archaeology & heritage resources	ROW of the proposed route	AOA informed by First Nation territory-based archaeological potential
Land & resource use	1 km either side of the proposed route and substation locations, and potential sites identified for laydown areas and construction camps	Arial
Socio-economic (economic opportunities, private property values and businesses, and Nisga'a Nation and First Nations)	City of Terrace, District Municipality of Stewart, rural settlements, First Nations communities and asserted territories (listed in Section 3.3 of this Report), and Nisga'a Nation: (Nisga'a Lands, Nass Wildlife Area, Nass Area),	Regional: Regional District of Kitimat Stikine, Stikine Valley Provincial: BC Areas defined in the Nisga'a Final Agreement

Visual quality	10 km buffer from the edge of the proposed route	Same as Local Study Area
Noise	5 km buffer from the centreline of the proposed route	Same as Local Study Area
Electric and Magnetic Field	20 m from the edge of the proposed ROW	Same as Local Study Area
Domestic Water Quality	1 km either side of the centreline of the proposed route, plus construction camps and laydown areas.	Community watersheds
Local/Country Foods	80 m wide corridor/ ROW for the length of the proposed route	2 km wide corridor either side of the ROW for wildlife harvested as country food. (i.e. same as wildlife RSA)
Transportation	All roads and highways extending 2 km either side of the proposed route	Major highway corridors
Aviation	1 km buffer either side of the proposed Project route	Major aviation corridors
Utilities	80 m wide corridor/ROW for the length of the proposed route	Same as Local Study Area

4.3 Temporal Boundaries

Temporal boundaries for the effects assessment are defined by the characteristics of the proposed Project and the valued components being assessed, and include the time prior to project-related activity (i.e. baseline) and the periods when the valued components (VC) may be affected by the proposed Project.

Baseline – describes pre-existing ecological, physical and human-related characteristics of the environment, and is primarily based on studies conducted from 2007 to the summer of 2010.

Construction – the Proponent plans to commence construction in early 2011, lasting for approximately three years. Activities associated with proposed Project construction include:

- establishing temporary construction camps and equipment laydown/storage areas;
- preparing and clearing the transmission line system ROW;

- constructing new (temporary and permanent) access roads, and upgrading existing access roads along the proposed Project corridor;
- constructing (or upgrading) clear span bridges on fish-bearing watercourses, and installing culverts on non-fish bearing watercourses along the proposed Project corridor;
- preparing sites for the structure foundations and producing concrete for the structure foundations;
- producing and placing concrete for structure foundations;
- assembling and installing structures;
- installing conductors;
- constructing a new substation at Bob Quinn and upgrading the existing Skeena Substation;
- restoring the ROW, including replacing stockpiled topsoil, contouring and seeding disturbed areas;
- deactivating temporary access roads, temporary construction camps and laydown areas;
- testing and commissioning the transmission line;
- servicing of construction equipment; and,
- managing construction waste.

Operations and Maintenance – would last 50 plus years following construction, with activities including:

- operating a 287 kV transmission line system;
- maintaining the vegetation of the ROW; and,
- maintaining the overhead structures, substations and permanent access roads.

Decommissioning and Closure – A Decommissioning Management Plan was not developed at the time this Report was prepared. However, the Proponent would prepare a Decommissioning Management Plan prior to eventual decommissioning of the proposed Project in accordance with all applicable regulations and guidelines relevant at that time.

4.4 Cumulative Impacts

The EAO integrated potential cumulative impacts into the significance analysis of relevant valued environmental, social, economic, heritage and health components as

identified by EAO, the Proponent, Working Group members, including First Nations and Nisga'a Nation, or the public. The EAO considered potential cumulative impacts through:

- an examination of background information on relevant VC including:
  - approved land use plans that designate the most appropriate activities on the land base; and,
  - historical data, trends and comprehensive baseline studies that set out the current conditions and factor in effects of prior developments;
- an identification of potential impacts of the proposed Project on relevant VC;
- an identification of potential overlapping impacts due to other developments, even if not directly related to the proposed Project;
- an identification of predicted impacts from future developments that are reasonably foreseeable and sufficiently certain to proceed;
- an assessment of the potential for residual adverse effects, taking into account the mitigation measures proposed by the Proponent for the proposed Project; and,
- an assessment of the significance of any residual effects after mitigation, including cumulative impacts, considering the following factors: magnitude, geographic extent, duration and frequency, reversibility, context and probability.

The cumulative impacts of the proposed Project on VC are evaluated by EAO in conjunction with past, present and reasonably foreseeable project and/or activities as described in Table 4 (below).

Table 4: Projects and activities included in the cumulative impacts assessment

Project/Facility/Activity	Description	Status/Action
Eskay Creek Mine Project	80 km north of Stewart	Environmental Assessment Certificate (EAC) issued in July 1997
Forrest Kerr Hydroelectric Power Project	195 MW, 100 km northwest of Stewart on the Iskut River	EAC issued in March 2003, and a fifth amendment was issued in March 2010 to increase capacity.
Red Chris Copper and Gold Mine Project	20 km southeast of Iskut	EAC issued in August 2005

Project/Facility/Activity	Description	Status/Action
Galore Creek Copper and Gold Mine Project	150 km northeast of Stewart	EAC issued in February 2007
Kerr-Sulphurets-Mitchell Project	65 km northwest of Stewart	In EA process
Mount Klappan Coal Project	100 km southeast of Iskut	In EA process
Schaft Creek Copper and Gold Mine Project	60 km south of Telegraph Creek	In EA process
Kinskuch Hydro Project	80 MW, 28 km northeast of Alice Arm	In EA process
Kitsault Mine Project	140 km north of Prince Rupert	In EA process
Kutcho Copper-Zinc-Silver-Gold Project	390 km north of Smithers	In EA process
Kalum, Nass and Kispiox Timber Supply Areas	Forestry activities within the TSAs	Active
Communities (Terrace, Rosswood, New Aiyansh, and other communities in the broader study area)	Communities most likely to increase in population because of future mining activities	Active
Roads and vehicle traffic	Current low levels of traffic with the potential for new and improved access and increased traffic levels	Active
Recreation and tourism activities	It is anticipated that existing recreation use would increase	Active
Existing transmission lines	138 kV line within the proposed Project area	Operating

EAO's consideration of cumulative impacts is summarized as part of the review of issues, effects and proposed mitigations identified during the Application review in Sections 5 through 9 of this Report, including the following VC: atmospheric

environment, surface hydrology, soils, geotechnical stability, fish and aquatic habitat, wetlands, ecosystems and vegetation, ungulates, bears, furbearers, birds, amphibians, economy, population, transportation and air quality.

4.5 Cumulative Effects for Federal Analysis

EAO's methodology to assess cumulative impacts differs from that of the federal government's methodology as defined under Section 16(1)(a) of CEAA. As a result, this Report includes both the assessment of potential cumulative impacts as an integrated aspect of the VC analysis as noted in section 4.4 above, and as a federal cumulative effects chapter (Section 15) to assess potential cumulative residual effects. As such, this section and section 15 in part C are included to meet federal EA requirements.

Section 16(1)(a) of CEAA requires that the factors to be considered in every environmental screening include cumulative environmental effects that are likely to result from the proposed Project in combination with other projects or activities that have been or will be carried out. The federal cumulative environmental effects assessment is based on residual effects that are predicted to remain after implementation of the mitigation measures (i.e. post mitigation).

Cumulative effects were assessed when environmental residual effects for the proposed Project had the potential to combine with the effects of other known projects or activities (existing or likely to occur in the foreseeable future) within the specified cumulative effects study area boundary and timeframe as described above in Table 4.

Cumulative effects assessments were completed by the Proponent following the approach for addressing cumulative environmental effects under CEAA. Steps completed for each cumulative effects assessment included scoping, defining the context, describing the study boundaries, and determining the significance of the residual cumulative effects.

This cumulative effects assessment relies on the predicted residual environmental effects of the proposed Project on VCs. The cumulative effects assessment was evaluated by RAs using the following federal criteria:

- if the proposed Project would result in a demonstrable or measurable residual effect on a component of the biophysical or human environment;
- if the residual effects would be likely to act cumulatively with components of existing and future projects and activities in the area; and,
- if the cumulative environmental effects of the proposed Project would cause significant adverse environmental effects.

The cumulative environmental effects assessment considered:

- changes in the environment caused by the proposed Project;
- the effects of any such changes on:
    - health and socio-economic conditions;
    - physical and cultural heritage;
    - current use of the lands and resources for traditional purposes by aboriginal persons;
    - any structure, site or thing that is of historical, archaeological, paleontological and architectural significance.
- Any change to the proposed Project caused by the environment.

Section 25 of this Report summarizes the cumulative effects assessment as required by the approach for addressing cumulative effects under CEAA.

5 Assessment of Potential Environmental Effects

5.1 Atmospheric Environment

In the assessment of the potential impacts of the proposed Project on the atmospheric environment, greenhouse gas emissions (GHG) and dust were examined and are summarized in the section below.

5.1.1 Background Information

The Proponent collected regional climate and ambient air quality data by means of existing information to assess the potential effects of the proposed Project on the atmospheric environment.

The Proponent recorded wind, temperature and precipitation at three meteorological stations that they deemed representative of the climate at the northern, middle, and southern portions of the proposed transmission line ROW. The meteorological data at these three stations were obtained from Environment Canada (EC). The data is summarized in Tables 7.2-2, 7.2-3 and 7.2-4 of the Application.

The region is characterized by long and cold winters and short cool summers. Overall, the region experiences greater wind speeds during the winter due to ocean storms.

The potential effects from the proposed Project on climate change would occur through the release of GHGs. The climate effects assessment is limited to the effect on atmospheric GHG's from the proposed Project construction activities. The effect on climate from the incremental increase in atmospheric GHGs from a single source cannot be quantified. Therefore, the Proponent assessed the proposed Project's

potential effects on climate by comparing the proposed Project's estimated GHG emissions to provincial and national standards (see Table 7.2-8 in the Application).

To assess ambient air quality, the Proponent monitored dust fall at nine dust fall collection stations established throughout the proposed Project corridor, and the dust samples collected were analyzed for sulphate, nitrates and total metals. The dust fall measurements recorded were lower than the BC Pollution Control Objectives. The Proponent reports in the Application that based on the baseline data collected, the air quality along the proposed Project corridor is very good. To further assess air quality, potential air emissions, including concentrations of sulphur dioxide (SO_2), Nitrogen Dioxide (NO_2), carbon dioxide (CO), fugitive dust (particulate matter - PM_{10} and $PM_{2.5}$) resulting from the proposed Project activities were predicted using air quality modelling. The results of the 24 hour modelling were compared to the BC and Canada Air Quality Objectives and Standards and the concentrations of SO_2, NO_2, CO, PM_{10} and $PM_{2.5}$ in the ambient air were found to be below the objectives and standards. The results of the air quality modelling are presented in Tables 7.2-23 through 7.2-27a & b of the Application.

5.1.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Proponent states in the Application that the issues related to the atmospheric environment identified through community consultation included increased GHGs, affects on climate change, and the release of carbon into the atmosphere from deforestation as a result of the proposed Project construction activities.

The proposed Project construction activities are estimated to emit 107 kilotonnes of CO_2 equivalent (kt CO_2-eq) of GHG annually. The Proponent concluded this to be minor in comparison to 62,300 kt CO_2-eq of GHG emitted by BC in 2008; this is also the case when compared to global GHG emissions. The anticipated GHGs emitted by the proposed Project would be associated with fuel consumption, slash burning, deforestation emissions from diesel, gasoline, and propane fuel energy consumption from the operation of equipment used during construction of the proposed Project. GHG emissions are expected to decrease once the construction phase has ended. The Proponent expects that minimal GHG emissions would be emitted during the operation phase of the proposed Project, and as a result, the magnitude and extent of potential effect would be negligible

The GHG emissions from ongoing and foreseeable future activities are not known. There is no quantifiable accounting of GHG emissions from current forest development, tourism and transportation activities in the region, therefore a cumulative assessment of GHG emissions could not be completed. However, it is expected that the proposed Project has the potential of reducing GHG emissions from proposed future projects as

offering a viable alternate energy source to diesel. In addition, it is anticipated that the proposed Project may provide clean hydroelectricity to communities currently dependent on diesel-generated power.

The potential effects from the proposed Project construction activities on ambient air quality, particularly an increase in particulate matter, may result from increased fugitive dust emissions from vehicles traveling along access roads, emissions from construction equipment, down-draft from helicopters, slash burning, and rock blasting.

The aggregate particulate emissions from ongoing and foreseeable future activities are not known. There is no quantifiable accounting of particulate emissions from current forest development (slash burning, truck traffic), transportation, domestic heating (including wood stoves), and recreation in the region. Particulate emissions predictions for proposed future projects are not yet known. The Proponent predicted that human activities and projects within 40 km of the proposed Project could interact with particulate emissions from the proposed Project, namely the Galore Creek Mine, ongoing forestry activities and the emissions from the communities of Terrace, Gitwangak, Gitanyow, Rosswood and Nisga'a Villages. However, the temporal overlap between intermittent particulate emissions from the aforementioned sources could not be ascertained. Due to the sporadic nature of emissions, both in time and space, from the construction of the proposed Project, the cumulative air quality effects on the physical environment are predicted to be negligible.

The potential air quality effects on human health from the proposed Project are discussed in the Health Effects section of this Report.

Summary of Mitigation Proposed in the Application

Mitigation strategies proposed by the Proponent to avoid or reduce potential adverse effects to atmospheric conditions, including minimizing GHGs during construction of the proposed Project, are:

- conduct regular maintenance programs for diesel powered equipment;
- use of low sulphur fuels, where practical (depending on the fuel grades available in the region);
- restrict speed limits for mobile diesel equipment;
- use modern diesel engines with pollution control technology;
- implement practices to reduce engine idling;
- develop and implement Project-specific slash management and disposal measures in the environmental management program;
- include procedures within the slash management and disposal measures to ensure compliance with the Open Burning Smoke Control Regulation;
- manage air emissions during the proposed Project construction phase through the adoption of best management practices (BMP). Emissions management would involve:

    - maintaining construction vehicles and equipment according to manufacturers' specifications;
    - implementing practices to plan and reduce the length and duration of helicopter flights;
    - applying water to access roads and materials handled in dry conditions and strong wind;
    - using blasting mats to reduce dust generation; and,
- adopt BMPs for mitigating fugitive dust from vehicle activity and heavy equipment movement which would further act to reduce total particulate matter emissions.

5.1.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by First Nations. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- Gitanyow First Nation raised the concern that the Proponent did not consider the cumulative impacts of greenhouse gas emissions as a result of projects enabled by the proposed Project during the EA.
    - *Response*: According to the Canadian Environmental Assessment Agency's (the Agency) 2003 report *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners*, the effect on climate and meteorology from the incremental increase in atmospheric GHGs from any single source cannot be quantified. The atmosphere assimilates GHGs from many industrial sources. It is difficult to demonstrate that any one source has caused an increase in the global concentration of atmospheric GHGs, therefore the potential impact of the proposed Project on GHGs cannot be determined.

5.1.4 Conclusion

Residual Adverse Effects and Significance Analysis for Atmospheric Environment

In consideration of the EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there are potential adverse residual effects on the atmospheric environment as a result of the proposed Project. These effects include the following:

- increased air emissions from construction activities of the proposed Project, which may contribute to global GHG and particulate matter levels in the relevant airsheds.

Although increased GHG emissions are expected from the construction activities, these effects are anticipated to be insignificant on a regional, national and global scale. Furthermore, the new transmission line would supply clean, renewable electricity, and therefore reduce emissions from fossil fuel based power generation. The clean energy would replace the estimated 158 million litres of diesel fuel used annually, for domestic and industrial purposes which would reduce GHG emissions by 403 kt of CO_2-eq on an annual basis.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on the atmospheric environment, as follows:

- increases in GHG emissions and contribution to global GHGs, and potential to affect climate change by consuming fuel and through deforestation; and,
- increases in particulate matter and related effects on airsheds along the ROW.

The GHG emissions from the proposed Project construction activities would interact on a cumulative basis with emissions produced by other human activities and projects, and potentially contribute to global climate change. After mitigation it is expected that the proposed Project would have an insignificant contribution to cumulative GHG emissions on a global scale.

Ambient emissions from human activities and other active or proposed projects within 40 km were considered in the cumulative impact assessment on the atmospheric environment. Most activities and projects likely to emit air contaminants (SO2, NO2, CO, PM10 and PM2.5) are estimated to be more than 40 km from the proposed Project. Those within the 40 km effects boundary would likely be sporadic and spatial and temporal overlaps uncertain and likely infrequent; therefore, no cumulative impacts on receptors in the local study area are anticipated.

EAO's analysis of the significance of potential residual effects on the atmospheric environment is as follows:

- **Magnitude:** the magnitude of the potential effects on the atmospheric environment would be low, because the incremental contribution of air contaminants and GHGs to the total atmospheric levels and global GHGs is minimal.
- **Probability:** There is a moderate likelihood that there would be an effect on the atmospheric environment, given the mitigation measures proposed.
- **Geographic Extent:** The potential effect on the atmosphere from GHGs would be at a trans-boundary extent. The potential effect on the atmosphere from air contaminants would be at a local extent.

- **Duration and Frequency:** The duration of effect on the atmospheric environment would be short term and the frequency would be intermittent. Air contaminants and GHG emissions would be emitted during the three year construction phase, and the atmosphere is expected to recover following the decrease or discontinuation of emissions post construction.
- **Reversibility:** The effect on the atmospheric environment would be reversible as portions of air contaminants and GHG emitted, predominately CO_2, as a result of construction activities over three years would be absorbed and dispersed. In addition, the proposed Project would create a reduction in overall GHG emissions as it would deliver renewable energy to industrial projects in lieu of fossil fuels, and enable the transmission of power from clean energy projects.
- **Context:** The resilience of the atmospheric environment is high because of the natural tendency of airsheds to disperse low quantities of air contaminants. Air contaminant levels are predicted to be well below Canada-wide standards. The proposed project's GHG contributions are insignificant on a global scale.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a Certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse effects on atmospheric conditions.

5.2 Surface Water and Groundwater

5.2.1 Background Information

Surface Water Hydrology

The Proponent's assessment considered the potential effects on surface water hydrology and quantity along the full length of the proposed Project transmission line route, at the local, landscape and regional scale. The assessment included locations (at the local scale) that would be potentially affected by the proposed Project, downstream of stream crossings along the proposed route. The Proponent's assessment also considered points of interest near the proposed Project, transmission line ROW, including surface water points of diversion with active water licences, existing highway drainage structures, community watersheds considered at a local scale and other watersheds of special interest considered at a regional scale. The list of surface points of diversion and the list of community watersheds and other watersheds of special interest considered are in Table 7.3-3 and Table 7.3-4 of the Application.

The potential effects on surface water quality are addressed in the Fish and Aquatic Habitat and the Human Health Effects sections of this Report.

Groundwater

The Proponent's assessment considered potential effects on groundwater in the areas surrounding the new proposed substation sites and the existing Skeena substation, as well as seven potential construction camp locations. The Proponent also examined impacts on six registered groundwater wells that are within 200 m of the proposed transmission line corridor.

5.2.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

Surface Water Hydrology

The concerns identified through the Proponent's community consultation regarding surface water hydrology and potential effects are reported by the Proponent in the Application as follows:

- potential effects from the alteration of the land cover during the construction of access roads and the clearing of the ROW may result in potential effects to surface water hydrology along the proposed route and effects on the biophysical environment, such as fisheries and aquatic resources; and,
- potential effects on surface water hydrology may lead to direct effects on the existing (human) water users and watercourse infrastructure along the proposed route.

Vegetation plays a considerable role in surface water hydrology in the watersheds by affecting surface run-off rates, infiltration, evaporation, temperature, snow accumulation and snowmelt. The Proponent predicts that potential effects on surface hydrology during operations and maintenance activities would likely occur because of the sustained changes to the vegetation cover (amount and type) along the proposed ROW and new access roads, which may result in changes in annual run-off, peak flow rates, and low flow from altered run-off volumes.

The Application states that the effect of change in the land cover on surface hydrology depends on the scale of alteration compared to the size of the watershed; the greater the percentage of change in the land cover within the watershed, the greater the potential effect on surface hydrology. Theoretically, any alteration to land cover could lead to effects on surface hydrology. The threshold of watershed alteration that may have a detectable effect on hydrology would vary between watersheds because of watershed sensitivity as well as the type of disturbance or alteration. The Application states that, based on scientific literature, effects on peak flow rates are generally not detectable until watershed disturbance caused by road building exceeds 4% of the watershed area for watersheds with high sensitivity. The Proponent estimates that effects on surface hydrology, specifically peak flow rates, are generally not detectable

until watershed disturbance caused by alteration to the land cover exceeds 4% for highly sensitive watersheds, 15% for moderately sensitive watersheds, and 30% for watersheds with low sensitivity.

For the proposed Project, a threshold of 4% change in vegetation cover area within the watersheds was used to assess the number of potentially affected stream crossing watersheds, community watersheds and other watersheds of special interest within the study area. The Proponent predicted that watersheds affected by more than 4% could have a marginal residual effect on surface hydrology. Of the 590 streams crossed along the proposed transmission line route, 45 stream crossing watersheds (eastern route), 46 stream crossing watersheds (western route) and 42 stream crossing watersheds (Bell-Irving route) are expected to experience greater than a 4% change to vegetation cover because of clearing for the ROW, substation and laydown areas, and therefore, would experience potential surface hydrology effects from the development of the proposed Project. The community watersheds and other watersheds of interest are not predicted to experience more than 4% change in land cover; thus the potential effects to surface hydrology in these watersheds are anticipated to be negligible.

The prediction of potential effects on surface water hydrology at downstream surface water points of diversion and drainage structures along Highway 37 and the Nisga'a Highway (listed in Tables 7.3-3 and 7.3-4 of the Application) was based on whether effects were expected at upstream of proposed Project stream crossings, community watersheds or other watersheds of interest. The Proponent's assessment resulted in anticipated potential effects on five downstream highway stream crossing watershed areas that would be affected by more than 4%, and may result in potential effects on surface hydrology.

Groundwater

The Application states that the likelihood of potential effects on groundwater from the proposed Project construction and maintenance activities are expected to be limited to the local scale. Potential effects could result from changes to the local topography during road building, structure site preparation or grading of sites for camps, temporary work areas or laydown areas that may affect surface water run-off. Construction activities may disturb or compact natural soils that may have a minor effect on groundwater levels; however, the Proponent expects such effects to be undetectable. High groundwater levels may be present in areas with certain types of soils, terrain and vegetation. Poorly drained soils that remain saturated for much of the year, or areas subject to flooding, generally have high groundwater levels. The Application states that 10% of the proposed corridor has areas with poorly or very poorly drained soils. High groundwater levels encountered during road and foundation excavation would be controlled by temporary sumps or installation of ditches or drains. Foundation designs

developed would be suitable for the type of material or groundwater levels; for example, excavations for the foundations are expected to be shallow in areas of high groundwater levels.

Because changes in the groundwater flow regime caused by proposed Project construction, maintenance and operation are not expected, the Proponent anticipates that there would be no residual effects on groundwater hydrology.

Summary of Mitigation Proposed in the Application

Mitigation measures proposed by the Proponent to avoid or reduce potential adverse effects to surface water hydrology from the proposed Project construction and maintenance are as follows:

- minimize disturbed areas;
- implement BMPs that conform with the *BC Forest and Range Practices Act* standards;
- reduce the degree of altered land cover by establishing and maintaining low growing, stable plant communities in the ROW in accordance with BC Hydro's Vegetation Maintenance Standard: Site Objectives (see Chapter 11 of the Application);
- maintain the new access roads to minimize erosion; and,
- conduct inspections of existing stream crossing structures.

No adverse effects on groundwater are anticipated, therefore, no mitigation measures were proposed by the Proponent.

5.2.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Nisga'a Nation. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- NLG raised concerns related to surface water hydrology and groundwater quantity with respect to the crossing of community watersheds on Nisga'a Lands. NLG requested more information on the potential watersheds where low flows would be impacted as a result of clearing and changes to land cover.
    - *Response:* Further assessment of hydrology was included in Nisga'a Land Supplementary Report. The Supplementary Report states the maximum post-development ECA for watersheds will be 2.5%, therefore none of the transmission line stream crossings or community watersheds will have

forest clearing in excess of EECA thresholds outlines in the Kalum or Nass South SRMPs.

5.2.4 Conclusion

Residual Adverse Effects and Significance Analysis for Surface Water Hydrology

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation; EAO finds that there may be adverse residual effects on surface water hydrology as follows:

- potential change in magnitude of annual run-off, peak flows and low flows due to changes in the percentage of land cover in watersheds within the study area.

Residual effects on surface hydrology are expected to be negligible for the majority of the streams crossed by the proposed Project route. However, marginal residual effects may occur for the 45 (eastern route option) and 46 (western route option) stream crossing watersheds along the proposed Project route and five highway stream crossing watersheds downstream of the proposed ROW (listed in Tables 7.3-8 and 7.3-9 in the Application). Each of these watersheds would be affected from clearing the area for the transmission line ROW, new access roads, or proposed substations, resulting in sustained alteration to the vegetation cover.

Based on the known projects or activities (existing or likely to occur in the foreseeable future) listed in Table 4 of this report within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on surface water hydrology.

The alteration of the land cover, specifically changes to forested areas from the proposed Project construction activities, in combination with continued forestry operations within the Kalum, Nass and Kispiox TSA's, may have the potential to generate cumulative residual effects on surface hydrology if the total harvested areas exceed the maximum allowable equivalent clear cut areas (ECA) threshold set by MOFR District Managers. This may lead to cumulative residual effects on surface water hydrology in terms of changing annual run off, peak flows and low flows. However, because planning of ECAs is part of the management plan for TSAs to preserve the hydrological function of the watersheds and thresholds set for ECA within watersheds for each TSA would include the forested areas cleared by the proposed ROW, the cumulative impact would be included in regulatory forestry management decisions.

EAO's analysis of the significance of potential residual effects on surface water hydrology is as follows:

- **Magnitude:** the magnitude of the potential effect on surface water hydrology from the proposed Project would be marginal as the affected area for each of the

watersheds would be less than 20%. Impacts are not detectable until watershed disturbance caused by alteration to the land cover exceeds 4% for highly sensitive watersheds, 15% for moderately sensitive watersheds, and 30% for watersheds with low sensitivity. Sensitive watersheds are not predicted to experience more than 4% change in land cover. The magnitude of cumulative impacts would be low to moderate, as managed by the provincial forestry authority.

- **Probability**: The likelihood of the effect from the proposed Project on surface water hydrology would be low, given the relative area of clearing during construction and the revegetation during operation. The probability of cumulative effects on hydrology would vary, depending on the extent and timing of forestry development during the 3 year construction period of the proposed Project.
- **Geographic Extent**: The geographical extent of the effect on streams that cross the proposed transmission line route would be local and extent for the stream crossings that are downstream would be regional, as these streams are outside the immediate proposed Project footprint. The geographic extent of cumulative effects would be regional, including all watershed crossed by the proposed Project.
- **Duration and Frequency**: Residual effects on surface hydrology would result from the sustained alternation to the land cover for the long-term along the ROW. The duration of effect on surface water hydrology would extend into the future, for the life of the proposed Project; therefore, the frequency of the residual effect would be continuous. The duration of cumulative effects would be medium term, until reforestation of industrial forested areas would restore the natural hydrological function over time.
- **Reversibility**: The residual effect on surface water hydrology would be partially reversible as the proposed Project corridor becomes re-vegetated. Growth of the vegetation along the corridor would occur gradually and be maintained, over the life of the proposed Project; therefore, the effects are considered partially reversible over the long term. The cumulative effects, including forestry, would be partially reversible, as areas are reforested and others cleared.
- **Context:** Surface water hydrology is considered to have a high resilience to the potential effects from the proposed Project, because a relatively substantial (>30%) change in or effect on the watershed land cover would be necessary to result in a detectable change in stream flows. The Equivalent Clearcut Area is managed by MOFR with the objective of avoiding significant impacts to surface hydrology. The change and effect is expected to be relatively small. Also, because the watersheds are in a region with a relatively humid environment, the proposed Project area is resilient to land cover change.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse effects on surface water

hydrology.

The effects of the proposed Project on groundwater are anticipated to be negligible; and therefore, EAO finds that there would not be adverse residual effects on groundwater.

5.3 Soils

5.3.1 Background Information

The Proponent collected and reviewed existing terrain mapping information, terrestrial ecosystem mapping, soil surveys and Terrestrial Resource Information Maps (TRIM) and undertook soil surveys as part of the terrestrial ecosystem mapping to assess potential effects on soils from the proposed Project construction and maintenance activities.

The study area comprises a 2 km wide corridor the length of the proposed Project transmission line route, including the western and eastern route options.

5.3.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The principal issues identified during the Proponent's community consultation, prior to submitting the Application, were potential soil erosion and degradation, and site contamination, from the alteration of the land cover during construction.

The Proponent states in its Application that the proposed Project construction activities may have the potential to affect soil quality, due to soil loss, erosion, degradation and contamination along the proposed Project route.

The Proponent anticipates that soil loss may occur as a result of burial or removal of soils where line structures are installed, and at sites where access roads and substations are constructed. However, the amount of soil loss would be low as the structures would generally occupy a small footprint.

The Application states that soil erosion is likely to occur where soils are exposed on steep and sloping topography, during construction activities such as installing structures, or the construction and upgrading of roads. Surface materials near watercourses may also be at risk of erosion. The proposed Project route crosses some areas where the soils may have a high potential for erosion, including steeper portions of the southern segments of the proposed route. The Application identified highly erodible soils in areas along the western and eastern route options near watercourses. These watercourses may be susceptible to increased sediment due to soil erosion, potentially effecting water quality and fish habitat.

The Proponent anticipates that soil degradation can occur where heavy equipment passes over an area multiple times, compacting soil at construction sites such as the

Bob Quinn substation. Soil degradation can also occur in areas of prolonged exposure to surface moisture on floodplain soils, or areas with poor drainage. The agricultural soils in the Terrace area occur primarily on floodplain soils which may be impacted by the proposed transmission line.

The Application states that there is the potential of soil contamination from fuel or lubricant spills from the operation of equipment or vehicles during construction which may affect soil quality.

The Proponent predicts that during operations and maintenance there is the potential for road surfaces to become degraded, resulting in erosion in steeper areas. Further degradation of soils could occur in adjacent areas in an effort to avoid portions of roads in poor condition. To maintain the vegetation in the ROW, herbicide may be used which may potentially affect the soil.

Summary of Mitigation Proposed in the Application

Mitigation strategies proposed by the Proponent to avoid or reduce potential adverse effects on soils from the proposed Project construction and maintenance are as follows:

- salvage and store topsoil used in the construction of temporary access roads or other temporary structures;
- deactivate temporary roads, including the removal of culverts to restore natural drainage, site preparation to reduce surface compaction, the reapplication of soils (after confirming it is uncontaminated), and re-vegetation with an erosion control seed mix, native seed and shrubs, as described in the Site Restoration Plan;
- loosening surface soil after structures have been installed, allowing vegetation to re-establish;
- control erosion by using cloth and tarps to cover soil for short term storage or if construction occurs during the winter;
- minimize the use of heavy equipment in areas used for agricultural purposes, and use a temporary gravel road over a liner removed after structures are installed;
- implement procedures to minimize spills and immediate clean-up of spills;
- conduct regular vehicle and maintenance to reduce potential leaks or spills;
- provide spill contamination kits at construction sites to respond any detected fuel or lubricant spills;
- excavate soil contaminated by spills from the site and disposed of an approved site;
- maintain access roads to MOFR standards; and,

- follow approved application procedures and application rates according to the permit conditions, when using herbicides.

Additional mitigation measures are identified in the Sediment and Erosion Control Plan, Site Restoration Plan, Agriculture Site and Reclamation Plan, Spill Prevention and Emergency Response Plan in Chapter 11 of the Application.

5.3.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Nisga'a Nation. These issues and the Proponent are detailed in Appendix 2. Key issues and responses include the following:

- NLG raised the concern about the lack of ground truthing of surficial materials in the lower Kiteen Valley. The Proponent's consultants had mentioned that they anticipate there will be erosion in the Kiteen Valley caused by the existing conditions from disturbances, such as old forestry roads. Also, that there is a clear disconnect between the information provided by the proponent's consultant reports and the conclusion of no significant impact in the Kiteen Valley.
    - *Response:* the Proponent has proposed mitigation measures to minimize erosion, some of which are outlined above.

5.3.4 Conclusion

Residual Adverse Effects and Significance Analysis for Soils

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation; EAO finds that there may be adverse residual effects on soils as a result of the proposed Project because the effects may not be fully mitigated. These effects include the following:

- soil loss from the construction of permanent access roads, structure foundation construction and installation, and the construction of Bob Quinn Substation.

With the implementation of relevant management plans and mitigation measures, soil erosion, soil degradation and soil contamination from construction and operation activities of the proposed Project, would be anticipated to be low.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on soils, as follows:

- soil loss from the construction of permanent infrastructure.

Cumulatively, soils could be lost from other existing mines, Eskay Mine or future mining, clean energy and other developments. However, there would be no overlap because of

geographic separation between these projects and the proposed Project. There are likely cumulative effects between the proposed Project and past, ongoing and future forestry developments, particularly related to road construction. Forest licensees must meet FRPA standards in relation to road building and maintenance in order to minimize soil disturbance and erosion. The Proponent estimates that the residual adverse effect of soil loss from the proposed Project in relation to the residual effects of soil loss from the forest construction activities is considered to be negligible.

EAO's analysis of the significance of potential residual effects on soils is as follows:

- **Magnitude:** the magnitude of the potential effect of soil loss from the proposed Project would be low because the amount of soil loss from the installation of structure foundations and the construction of permanent access roads is considered to be low. The magnitude of cumulative effects on soil from the proposed Project and industrial forest activities is considered to be low, as these activities are regulated to mitigate soil loss impacts.
- **Probability:** The likelihood of the effect on soils would be high because the soil loss would be from permanent access roads and structures.
- **Geographic Extent:** The extent of the effect from the proposed Project and cumulatively would be at the local and watershed level.
- **Duration and Frequency:** The duration of effect on soils from permanent roads and structures, both for the proposed Project and cumulatively, would be long-term and the frequency would be one time, during the construction phase.
- **Reversibility:** The effect on soils would be irreversible for permanent access roads and structures because the soil loss would be permanent and reversible for construction access that would be restored to previous condition post construction. Cumulative effects from road construction would be moderately reversible as industrial forest roads are deactivated and land returned to its original condition.
- **Context:** There is a provincial regulatory framework under FRPA that addresses the management of roads to minimize environmental impacts, including soil loss.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse effects on soils because the magnitude of the effect would be site specific and relatively low at a landscape level or at site specific locations.

5.4 Geotechnical Stability and Natural Hazards

5.4.1 Background Information

The Proponent's geotechnical stability assessment for the proposed Project was based on the results of the baseline study completed in 2007 on terrain stability and hazards, and additional fieldwork on the proposed Bell-Irving route and on Nisga'a Lands in the summer of 2010. The 2007 baseline study considered the proposed Project, including the western and eastern route options. From data collected from the fieldwork and the review of available terrain mapping information, such as terrain mapping, aerial photographs, terrain classification system and slope gradients, the Proponent prepared a set of terrain stability maps and a set of terrain hazard maps (Appendix 4 & 5 of the Geotechnical and Natural Hazards Baseline Report, appended to the Application as Appendix 7.5-1). The maps identify potentially unstable (terrain) areas, landslides and snow avalanche paths, and locations of hazard zones. Geohazards within the proposed Project transmission line corridor are listed in Table 7.5-1 of the Application.

The study area for the geotechnical stability and natural hazards assessment is a two km wide corridor along the length of the proposed transmission line.

Hazards and their potential effects on the proposed Project infrastructure are provided in the Effects of the Environment on the Project section (Section 23) of this Report.

The Application describes the proposed Project study area, situated on the western edge of the Central Plateau, as a mountainous area comprised of the Hazelton Mountains (igneous rock) in the south, the Nass Basin (volcanic rock) in the centre, and the Skeena Mountains (sedimentary rock) in the north. The southern region of the proposed Project consists of a series of plateaus and low mountain ranges at the base of the Coast Mountains. The northern region of the proposed Project is characterized by steep terrain and glacial-scoured steep-sided valleys. The proposed Project corridor follows to a large extent the valley bottoms and lower valley slopes at elevations between 50 m near the Skeena crossing and 1118 m at the Cedar Kiteen watersheds.

As the proposed Project is located within areas of steep topography, potentially unstable terrain and existing landslides have been identified in the Application. Areas of potentially marginally stable or unstable terrain were identified within the western and eastern route options and northern segments near avalanche paths along the proposed Project transmission line route. A summary of the potentially marginally stable or unstable terrain within the proposed Project corridor is provided in Table 7.5-2 of the Application.

Landslides have been identified (on the banks of several creek channels) near the proposed Project, particularly at tributaries to Snowbank Creek, Beaverpond Creek and

the Ningunsaw River; within the eastern route option at Stenstrom Creek and the Kiteen River; and along portions of the Bell-Irving route. Terrain stability classifications are provided for the Bell-Irving route in Figures 6.4-1 of 6.4-3 of the Bell-Irving Route Study (Appendix 6 attached to this Report), and for the western route through Nisga'a Lands in Figures 5.2-1 and 5.2-2 of the Nisga'a Lands Supplemental Study (Appendix 7 attached to this Report).

5.4.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The main concerns raised by First Nations, Nisga'a Nation and government agencies during consultations prior to the Proponent submitting its Application, included:

- the removal of timber and structure placement on unstable terrain;
- steep slopes and unstable soils immediately adjacent to the Kiteen River and its tributaries (eastern route);
- potential destabilization of the Kiteen Valley slopes by the construction of additional access roads; and,
- impacts to upslope hazards due to ROW clearing.

The Proponent predicts that there is a potential for landslide initiation caused by ROW clearing in areas where the transmission line route crosses terrain classified as marginally stable or unstable, predominantly along portions of the northern segments 12 (Skowell Creek), segments 13 and 14 (between Bell II and Snowbank Creek) and portions of segments 5 (southeast of New Aiyansh and between Seaskinnish Creek and Hoadley Creek) along the western route, and segment 7 (lower valley slope of Cedar River near Clarence Creek) and segment 8 (valley slope above the Kiteen River near Stenstrom Creek) along the eastern route of the proposed transmission line route. Landslides could compromise transmission line infrastructure, damage road and highway infrastructure, impact natural watercourses and fish habitat, and adversely affect water supplies and public safety. The Application indicates that there is also the potential for landslide initiation caused by access road construction in areas where the transmission line route crosses terrain classified as marginally stable or unstable. Areas of steep terrain were identified along northern segments 12, 13 and 14, and segments 5 and 7 of the western and eastern routes of the proposed transmission line as potentially susceptible to landslides (see Figures 5 or 7 for route segment numbers). The Application indicates that the potential for landslide initiation can be avoided or minimized through mitigation and predicts no residual effects related to geotechnical instability.

Summary of Mitigation Proposed in the Application

Mitigation strategies proposed to avoid or minimize potential geotechnical stability and natural hazards effects during construction and operation of the proposed Project include the following:

- during detailed design, make efforts to avoid construction of the transmission line structures on slopes classified as unstable;
- undertake a detailed assessment of slope stability by a qualified terrain specialist, where logging or road construction is planned on terrain that is classified as unstable;
- where potentially unstable slopes or existing terrain hazards cannot be avoided, locate tower structures to span the unstable areas and hazards, or implement slope stabilization measures, such as setup of monitoring measures during access and high risk periods, stabilization of unstable areas installation of structure protection;
- construct roads in accordance with approved design based on forestry road engineering standards and Road Maintenance Field Guide (BC Hydro);
- deactivate (i.e. scarification of the road bed, removal of culverts, re-establish the natural surface water drainage) temporary access roads after the construction of the transmission line has been completed;
- maintain or improve permanent access roads, by stabilizing road fill and cut slopes, reconstructing road surfaces, and replacing damaged or blocked culverts; and,
- inspect and maintain transmission line ROW and access roads to monitor known and identify new potential terrain stability concerns, and implement appropriate mitigation measures as necessary, during the operating life of the proposed Project.

The EAO considered the Proponent's commitment to complete further terrain stability studies and avalanche engineering assessments prior to, and as part of, the detailed design stage and further implement relevant management plans and mitigation measures, in consultation with the relevant agencies.

5.4.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- Members of the Working Group raised the concern about potential slope stability problems along the proposed Bell-Irving route.
    - *Response*: The Proponent undertook further fieldwork along the proposed Bell-Irving route in summer 2010 to assess terrain stability. Based on the fieldwork the Proponent concluded that with the implementation of mitigation measures to minimize or avoid areas which are unstable or marginally stable, including altering the alignment of the proposed route, the proposed Project would not result in significant adverse residual effects on terrain stability. The Proponent also committed to complete further terrain stability studies prior to the detailed design stage.
- MOTI raised concerns about avalanche risks at Ningunsaw Pass along the Highway and indicated that the Proponent should conduct additional detailed assessment by a Qualified Registered Professional.
    - *Response*: The Proponent conducted further avalanche engineering assessment along the proposed route in areas where there is avalanche risk. A fieldtrip along the proposed route was conducted in late September with MOTI staff to assess avalanche risk. The Proponent has also committed to developing an agreement with MOTI to coordinate activities and apply measures regarding MOTI avalanche control and response.
- DFO raised the concern about potential avalanches in the Kiteen Valley.
    - *Response:* The Proponent described the Kiteen area (eastern route) as an area of instability and class 3/4 avalanche. Roads in the area will require upgrade if used for access. However, the Proponent indicated that at the north end of the Kiteen there is no detailed stability mapping at present, and the area has gullies and no roads because of the terrain. The Proponent commits to undertake further work to delineate avalanche zones and determine if the avalanche zones can be avoided or spanned before the detailed design stage.
- Nisga'a raised the concern regarding an unforeseeable landslide, and questioned what protection measures or restoration plan are proposed to restore creeks or streams, should impacts be caused by a landslide.
    - *Response*: The Construction EMP, in section 4.4 – Environmental Incidents includes a reporting system for incidents such as landslides, erosion or floods with the potential to adversely affect environmental quality and provides requirements for notifying agencies, First Nations and Nisga'a Nation; mitigation and remedial measures. The Proponent advised that layout of transmission lines is completed with the input of geotechnical and natural hazard (avalanche technologist or other) professionals. As such, structure location and access is designed to minimize hazards to the line and to adjacent terrain and from initiation of

natural slope failures and similar events. However, where such events do occur, or there is a recognized potential for the occurrence of such events, protective measures are designed and installed and access procedures are put in place. In addition, periodic review of the overhead transmission system is completed to assess any changes in the environment which may result in increased hazard to the system.

Where an area is considered to be a concern or where a failure occurs, the assessment of natural hazards and protective measures must take into account public safety, worker access and safety, as well as system security.

Where a failure occurs, a geotechnical / natural hazard professional would be involved in the initial review to assess the above concerns, stability of the area and provide recommendations for monitoring, access, stabilization protection and safety prior to initiation of other response. The extent and scope of the assessment of such measures will be based on the professional judgement of that expert within normally accepted engineering practice. Prevention measures may include, where practical, but would not be limited to:

- setup of monitoring measures during access and high risk periods;
- stabilization of unstable areas;
- installation of structure protection;
- notification of, and cooperation with, local authorities, particularly where there is a perceived hazard to the public, public convenience systems or the environment; and
- development of an access plan for work within a hazard zone.

Where there is a recognized continuing hazard, access plans and limitations will be included in the transmission access requirements for the area.

5.4.4 Conclusion

Residual Adverse Effects and Significance Analysis for Geotechnical Stability

In consideration of the EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation; EAO finds that there may be adverse residual effects on geotechnical stability as a result of the proposed Project because the effects may not be fully mitigated. These effects include the following:

- potential destabilizing effect of construction on unstable or marginally stable terrain and natural hazard with the potential to cause landslides; and,
- potential to increase avalanche risk in high avalanche areas.

The EAO has considered BC Hydro's commitment to complete further terrain stability studies and avalanche engineering assessments prior to the detailed design stage and further implementation of relevant management plans and mitigation measures, in consultation with the relevant agencies.

As the Proponent did not predict, after mitigation, any residual project environmental effects on geotechnical stability, no cumulative effects assessment was included in the Application.

The EAO finds that effects on geotechnical stability from previous, ongoing and future proposed major industrial developments as identified in Table 4 would not overlap with the potential geotechnical effects from the proposed Project. However, previous, ongoing and future forest development in watersheds shared with the proposed Project may cause cumulative effects on slope stability and avalanches. However, forest development is regulated under FRPA in a manner that takes into account effects of forest activities on slope stability, ensuring that appropriate mitigation measures are in place where development occurs, and prohibiting forest development in highly unstable terrain.

EAO's analysis of the significance of potential residual effects on geotechnical stability is as follows:

- **Magnitude:** the magnitude of the potential effect on geotechnical stability would be low to moderate because the proponent is not intending to construct infrastructure on highly unstable slopes to preserve the integrity of the transmission line. Cumulative effects on slope stability from the proposed Project in combination with forest development would be low to moderate given avoidance and mitigation measures regulated under FRPA.
- **Probability:** The likelihood of the effect from the proposed Project and cumulatively on geotechnical stability would be low for the same reason as above.
- **Geographic Extent:** The extent of the effect would be at the local level for the proposed Project and, cumulatively, at a watershed level.
- **Duration and Frequency:** The duration of effect on geotechnical stability from the proposed Project would be medium term (during construction) to long term over the life of the proposed Project, and the frequency would be intermittent and infrequent along the ROW during the construction phase, and infrequent on a site specific basis once an event had occurred. The cumulative effects would be long term, as previous forest developments sites are rehabilitated and new forest

developments are implemented and infrequent on a site specific basis once an event had occurred.

- **Reversibility:** The effect on geotechnical stability would be partially reversible over the medium term, based on site specific conditions, given the relatively fast regrowth in the region. The degree of reversibility would also depend on the severity of the event, stabilization post construction and any remedial measures that would be applied, both by the Proponent and by forest licensees, after any instability event.
- **Context:** Landslides and avalanches in the area of the proposed Project are naturally occurring.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse effects on geotechnical stability because the magnitude of the effect would be low to moderate, and site specific, the probability would be low, the frequency would be intermittent and infrequent and would be partially reversible in the long term.

5.5 Fish and Aquatic Habitat

5.5.1 Background Information

The proposed Project would cross watercourses within the Skeena, Kitsumkalum, Nass, Cranberry, Meziadin, Bell-Irving, and Iskut river watersheds. There is considerable variation in aquatic habitat type along the proposed alignments, including small (including intermittent and ephemeral) streams, rivers varying in size from small tributaries to major rivers such as the Skeena and Nass Rivers, lakes and wetlands. Within each of these aquatic habitat types there are a range of fisheries habitat values and species present.

The Local Study Area (LSA) for the effects assessment included the proposed transmission line route and all route options, with a buffer zone of 100 m on either side of the proposed ROW. The Regional Study Area (RSA) for the proposed Project included all watersheds traversed by the proposed transmission line. Fish communities were sampled using backpack electrofishers and minnow traps[3]. Streams were classified as either confirmed or default fish-bearing or non-fish-bearing according to the

[3] according to *RISC Fish Collection Methods and Standards* (RISC 1997a), *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Standards and Procedures* (RISC 2001), and the *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory: Fish Collection Field Guide* (RISC 1999a).

classification system outlined in the *Fish Forest Practices Code Fish-stream Identification Guidebook* (BC MOFR 1998).

The Proponent evaluated a total of 1152 mapped watercourses, lakes, and wetlands along the proposed route. Of these, 288 did not exist or were identified as non-classified drainages (NCD) and were not considered streams or fish habitat that could be classified as confirmed fish-bearing; and 3 consisted of flooding beside the highway, and could not be classified as either fish bearing or non-fish bearing streams, wetlands, or NCD's. A total of 861 waterbodies (streams, lakes, or wetlands) crossed by the proposed Project were identified along the proposed transmission line route. Table 5 provides an overview of the fish bearing status of streams, lakes, and wetlands crossed by the proposed Project (including permanent and temporary access roads) in terms of their fish bearing status.

Table 5: Fish Bearing Status of Watercourses Crossed by the Proposed Transmission Line and Access Roads

Transmission Line Route	Fish Bearing Status	Number of Crossings
Primary Route	fish bearing	271
	non fish bearing	159
Cedar – Kiteen Route Option	fish bearing	40
	non fish bearing	71
Nisga'a Lands Route Option	fish bearing	34
	non fish bearing	24
Access Roads	fish bearing	192
	non fish bearing	70

Of the fish-bearing streams, lakes, and wetlands identified along the proposed route, proposed access roads, and two route options, a wide diversity of salmonid and non salmonid populations are present representing 17 individual fish species. These include all five species of pacific salmon (Pink, Chum, Coho, Sockeye, and Chinook), steelhead, rainbow trout, Dolly Varden, Bull trout, Coastal cutthroat trout, and Sturgeon. These species are of a heightened conservation interest for First Nations, the Nisga'a Nation, the federal and provincial governments, and the public. Bull trout, Dolly Varden, and Coastal cutthroat trout are blue-listed (a species of special concern) by the BC Conservation Data Centre.

Fish habitat along the proposed 344 km ROW is diverse. Habitat types include

- small headwater streams that provide spawning and rearing habitat for resident salmonids, particularly bull trout and Dolly Varden;
- moderate sized rivers such as the Kitsumkalum and Cranberry Rivers and their low-elevation tributaries that provide spawning, rearing, foraging, and overwintering habitat for resident and anadromous salmonids;
- large rivers such as the Skeena, Iskut, and Bell Irving that act as key migratory corridors used for pacific salmon, and provide rearing, overwintering, and foraging habitat for all salmonid species present in the study area; and,
- lake and wetland habitat providing critical overwintering, foraging, and rearing habitat to most species present within the study area, and are of particularly important in the life cycle of Sockeye and Coho salmon.

Three specific groups of salmonid species, as well as fish habitat in general, were identified by the proponent as VCs for the effects assessment presented in the Application, with the following rationale:

Dolly Varden and Bull trout: These species are blue listed species in BC and represent an important part of stream ecosystems, particularly in higher gradient streams such as those encountered by the proposed Project along much of the proposed alignment and route options. The Application reports that these species have been identified as culturally significant or otherwise important by First Nations and the Nisga'a Nation.

Rainbow trout, Steelhead and Coastal cutthroat trout: These fish species have been selected as a VC because they are an important part of stream ecosystems, particularly in lower gradient streams. Steelhead is valuable for recreational fisheries. Coastal cutthroat trout is a blue-listed species in BC. The Application reports that these species have been identified as culturally significant or otherwise important by First Nations and the Nisga'a Nation.

Anadromous Pacific Salmon: These species use all major watersheds along the route of the proposed Project as spawning, rearing, and overwintering habitat. Pacific salmon are valuable to the culture and subsistence fisheries of First Nations. Under the NFA, the Nisga'a Nation has an entitlement to harvest salmon for sale. These species are also valuable for both commercial and recreational fisheries.

Fish Habitat: Fish habitat includes all those parts of the environment on which fish depend, directly or indirectly, to carry out their life processes. Fish habitat includes riparian habitat and physical in stream features (e.g. large woody debris, boulders, pools, and gravel substrate) that support spawning, rearing, overwintering and migration life history stages. Fish habitat also includes water quality, sediment quality, and primary and secondary producers. Potential effects to in stream habitat, riparian habitat, water and sediment quality, and primary and secondary producers are addressed through this VC.

5.5.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Application identifies the following potential issues and corresponding proposed mitigation associated with the proposed Project that could adversely affect the fish and aquatic habitat VCs identified above:

Riparian Habitat Loss

Riparian vegetation is an integral component of fish habitat and provides numerous functions including shading, stabilizing stream banks, controlling sediment input to watercourses, contributing large woody debris and organic litter to the stream channel, and regulating composition of nutrients. The removal or reduction of riparian habitat typically has potential to have an adverse effect on fish habitat quality.

Mitigation measures proposed in the Application to address potential adverse effects associated with riparian habitat loss include:

- adherence to BC Hydro's AWPRV[4] for the operational phase of the proposed Project;
- selective vegetation removal with the goal of maximum retention wherever possible;
- maintenance of a minimum of 2-3 m high trees and all shrubs;
- avoidance of grubbing the riparian along the proposed transmission line corridor;
- selecting an alignment that, minimizes the number of watercourse crossings required;
- avoidance, where technically feasible, of parallel alignment of the ROW to directly adjacent watercourses, in consideration of the value of fish habitat;
- selection of lay-down areas outside of riparian zones;
- selection of structure placements and design to minimize loss or disturbance to riparian vegetation where technically feasible, (e.g. higher structures allow for wider span lengths);
- selection of structure placements to maximize riparian retention;
- design and construction of road approaches so that they are perpendicular to the watercourse where technically feasible, to minimize loss or disturbance to riparian vegetation;
- avoidance, where technically feasible, of structures or access roads on meander bends, braided streams, alluvial fans, active floodplains, unstable slopes, or any other area that is inherently unstable and may result in erosion and scouring of the stream bed (DFO noted that in order for road crossings on fish bearing

[4] Approved Working Practices for Riparian Vegetation is a specific module that forms part of a larger Protocol Agreement between BC Hydro, DFO, and the MOE. Both the protocol and ancillary documents (e.g. the AWPRV) are periodically reviewed. The agreement is reviewed every five years and was recently renewed a couple of years ago. The technical modules can be revised at any time based on joint agreement. It is not a voluntary agreement but any party can cancel the agreement, given enough notice.

watercourses to meet the conditions of DFO Operational Statements, road crossings must not be located on meander bends, braided streams, alluvial fans, active flood plains, or any other area that is inherently unstable and may result in the alteration of natural steam functions or erosion and scouring of the bridge structure);

- conducting work activities (equipment access, construction of transmission structures and conductor stringing) in a manner that minimizes riparian vegetation impacts and maintains fish habitat and stream bank integrity;
- minimizing the removal and disturbance of low-growing shrubs or grass species in riparian zones;
- maintaining riparian vegetation on non-fish bearing watercourses and non-classified drainages;
- modifying, where practicable, riparian cover by hand. If machinery must be used, it should be operated on land (above the high water mark) and in a manner that avoids disturbance to the banks of the water body;
- preservation of the root structure and stability of topped trees located on the bank of a water body;
- development of a detailed Fish Habitat Protection and Mitigation Plan providing mitigation measures prior to commencing work on the proposed Hells Gate Slough crossing; and,
- development of a Fish Habitat Compensation Plan, acceptable to DFO, prior to authorizations for riparian harmful alteration, disruption or destruction (HADD)s.

Blunt Trauma

Potential causes of lethal tissue damage to fish associated with the proposed Project include construction equipment crossing streams for ROW clearing (where crossing structures are not used), accidents during bridge and culvert construction, and rock blasting at quarry sites close to watercourses and more intense fishing pressure from increased road access. The potential effects to fish associated with blunt trauma are expected to occur primarily during the construction phase of the proposed Project, with a reduced potential during the operations phase of the project where maintenance access would be required.

Mitigation measures proposed in the Application to address potential adverse effects from blunt trauma include:

- adherence to DFO's operational statements for clear-span bridges and temporary ford stream crossings (DFO 2009) for streams determined as fish-bearing;
- avoidance of fording by vehicles during the construction and operations phases of the proposed Project. If fording is required the Application proposes it be limited to a one-time event, and should occur only if an existing crossing at another location is not available;

- adherence to the appropriate fisheries operating window for fish-bearing streams, as determined by MOE and DFO;
- mitigation of increased fishing access by the public along the proposed Project corridor by the following measures will be incorporated into the access plan:
    - basing roads used for inspection and maintenance on existing roads wherever practical;
    - avoiding circle routes from and to the highway or main road;
    - deactivating and allowing roads used only for construction to regenerate naturally;
    - avoiding or limiting access roads to the margins of wetlands where practical; and,
    - minimizing the number of fish-bearing watercourse crossings.
- cooperation between BC Hydro, MNRO and interested First Nations and Nisga'a Nation in the development and implementation of feasible and site-specific access control and management strategies in accordance with applicable legislation, permits, approvals, and ROW agreements. Practical access and management strategies could include measures such as:
    - limiting the total number of access points to high value habitat; and
    - developing and implementing effective and practical methods of controlling access for vehicle traffic, to balance a variety of access interests and requirements.

Noise

The Application reports that sound waves created by blasting near water can potentially cause physical damage to fish eggs, larvae, juveniles, and adults. The most common tissue damage occurs to the swim bladder of juveniles and adults. Adverse effects associated with blasting noise would be expected during the construction phase of the proposed Project.

Mitigation measures proposed in the Application to address potential adverse effects associated with noise include:

- the "Guideline for the Use of Explosives In or Near Canadian Fisheries Waters" (Wright and Hopky 1998) must be consulted for guidance on how to avoid detonation of explosives that will produce an instantaneous pressure change greater than 100kPa in the swim bladder of fish; and,
- if any quarries or pits are developed for the proposed Project, the recommended minimum setback distances for the safe use of explosives in all soil types adjacent to fish-bearing habitat would be followed (Wright and Hopky 1998).

Sedimentation

Smothering of fish life stages such as eggs or juveniles could potentially occur in the event of sediment releases. There is increased potential for generation and release of sediments during clearing activities for the proposed ROW, access roads and quarry sites. Sedimentation events can be lethal to incubating fish eggs in streambeds and

larvae present in the substrate because of fine sediment. High suspended sediment levels can lead to behavioural changes in fish such as alterations in migration routes and spawning behaviour, and can cause physical damages, such as the abrasion of gill surfaces leading to reduced respiratory efficiency.

Mitigation measures proposed in the Application to address potential adverse effects associated with sedimentation include:

- development and implementation of an Erosion and Sediment Control Plan;
- retention of riparian vegetation where practical in accordance with site-specific clearing specifications;
- adherence to the BC Hydro AWPRV during maintenance activities to avoid sedimentation;
- an Environmental Monitor for on-site monitoring water quality for all in-stream work;
- adherence to appropriate fisheries operating windows, determined by MOE and DFO, for fish-bearing streams for in stream work, if in stream work should be necessary; and,
- adherence to mitigation measures in the construction EMP as follows:
    - installation, inspection, and maintenance of appropriate erosion and sediment control measures;
    - directing road runoff away from watercourses through ditching and road grading; and,
    - restoration of disturbed areas by re-vegetating as quickly as possible to avoid erosion.

Hydrocarbon Spills

Most petroleum products from potential spills of commonly used materials such as hydraulic fluid, diesel, and fuel oil are toxic to fish and can cause mortality. The potential for fish exposure to spilled toxins is possible during both the construction and operations phases of the proposed Project.

Mitigation measures proposed in the Application to address potential adverse effects associated with hydrocarbon spills include:

- adherence to BC Hydro's Environmental Management System Standard Operating Procedures for working with petroleum and chemical products including maintaining onsite spill response equipment, spill response training, inspection of tools, equipment, vehicles, and storage containers and tanks for leaks, spills, or deterioration daily and making the necessary repairs;
- ensuring dispensing, mixing, or storage of fuels or chemicals does not occur within 15 m of any watercourse; and,
- a Spill Prevention and Emergency Response Plan to be developed and implemented by the design/build contractor to detail site specific measures that

will ensure that water quality is maintained at or near background levels during construction of the proposed Project.

Toxic Residues

Explosives used for blasting rock in quarries and along proposed access roads would typically contain compounds such as ammonia, ammonium nitrate, or nitrite. These compounds are toxic to all life history stages of fish when present in lower concentrations as well as acute toxic effects when present in high concentrations. The potential for fish exposure to these residues may exist during the construction phase of the proposed Project.

Mitigation measures proposed in the Application to address potential adverse effects associated with toxic residues include:

- development and implementation of an EMP by the design/build contractor to outline site specific water quality monitoring parameters to document that water quality is maintained at or near background levels during construction of the proposed Project. The EMP will also outline the thresholds beyond which additional measures need to be undertaken to ensure water quality is maintained; and,
- development and implementation of a Spill Prevention and Emergency Response Plan.

Metals Leaching and Acid Rock Drainage

The Application reports that newly exposed rock along proposed access roads and locations where blasting is required for other proposed Project infrastructure, for rocks with high sulphide content and low neutralizing potential, could be potentially acid generating (PAG) rock. Leachates from PAG rock have been shown to cause adverse behavioural and physiological effects to fish. The Application reports that the expected duration of these effects could be for the lifetime of the Project.

The following mitigation measure is proposed in the Application to address potential adverse effects to fish and fish habitat associated with Metals Leaching and Acid Rock Drainage (ML/ARD):

- assessing the potential for the exposure of acid producing rock during the work, minimizing rock disturbance in areas of potential acid producing rock, and conduct confirmatory monitoring in areas where newly exposed bedrock in those areas is anticipated;
- in areas of acid producing rock, diversion of surface water away from watercourses and cover the exposed rock surface to control sulphide oxidation and reduce potential leaching, as required; and,

- development and implementation of a Metals Leaching and Acid Rock Drainage Prediction and Prevention Management Plan by the design/build contractor to outline the site specific measures to be taken to document and monitor ML/ARD.

5.5.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, Nisga'a Nation and First Nations. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- DFO raised concern about the need for greater clarity on riparian vegetation removal practices and mitigation measures to be employed to protect riparian, fish and aquatic values at stream crossings.
    - *Response:* BC Hydro's goal is to minimize the removal of vegetation while meeting the minimum design clearance requirements. At some stream crossings, it will not be necessary to remove any vegetation. In preparing and implementing vegetation clearing prescriptions for each crossing, BC Hydro will make use of any of a number of riparian vegetation management area (RVMA) practices, including but not limited to:
        - locating structures at crossing sites to maximize conductor ground clearance, thereby allowing for higher retained vegetation;
        - selective vegetation removal in RVMAs to maximize retention;
        - hand felling, hand piling debris, aerial extraction;
        - directional felling away from a watercourse;
        - not disturbing stumps and ground surface; and,
        - alternative forms of vegetation management such as slashing, girdling, crown modification and creation of wildlife trees.
- DFO raised the concern that the alteration of riparian habitat for the construction of the transmission line would constitute a harmful alteration, disruption or destruction (HADD) of fish habitat.
    - *Response*: The proposed Project footprint will involve crossing over approximately 861 waterbodies (streams, lakes or wetlands). About 70% of the streams crossed are fish bearing. Using stream width as a guide to determine the functioning riparian width, the Proponent has calculated the total potential loss of riparian area associated with proposed transmission line construction. Using this 'worst case scenario', a conceptual fish habitat compensation plan was developed that outlines 15 potential projects that could be used as compensatory habitat to offset the residual loss of fish habitat associated with construction of the proposed transmission line. As the conceptual fish habitat compensation plan is

preliminary in nature, a final compensation plan will be developed that is both technically and economically feasible prior to permitting. DFO raised concern about the lack of sampling data provided to support the conclusion that leachates from potentially acid generating rock are not expected.

- MOE raised concern regarding Bull trout, a blue listed species that require special management with respect to access.
    - *Response:* Bull trout, a provincial blue-listed species, is sensitive to angling pressure. In respect to increased access to fish and aquatic habitat, the primary concern is increased angling. Bull trout are known to congregate during spawning season, thus increasing its susceptibility to angler harvest during this period. However, on a regional scale, increased access resulting from the Project will not result in an increase in angling mortality/harvest. While local Bull trout population may decline due to the redistribution of fishing effort, the change is not likely to affect the overall Bull trout populations.

- The Gitxsan Hereditary Chiefs raised the concern about the effects of the proposed Project on spawning grounds and wetland sites because they are integral to their traditional fishing practices. Gitxsan Hereditary Chiefs have indicated that altering their sites is not an option, because such sites cannot be replaced. Therefore, Gitxsan believe that compensation is not an option.
    - *Response:* The Proponent has committed to constructing the proposed Project without conducting in stream work and therefore spawning grounds or wetland fishing sites on Gitxsan asserted territory will not be altered. Combined with the use of best management practices during construction including the use of clear span bridges on fish bearing stream crossings, aquatic habitat along the proposed corridor will not be disturbed. Other habitat effects will be minimized or avoided through mitigation

- The Tahltan raised the concern that the Application information is inadequate regarding fish presence, fish distribution, and fish habitat. The Nisga'a Nation also raised similar comments with respect to Nisga'a contemporary treaty interests in fish and aquatic habitat. Nisga'a Nation shares the same concern as the Tahltan above.
    - *Response:* Regarding the interest in obtaining more specific information on fish species present for each stream crossed by the proposed Project, the information collected and presented in the Application and used for the

effects assessment is in accordance with the terms of the AIR approved by EAO. The proposed Project fisheries baseline identified that the proposed Project study area is home to 17 fish species including three blue-listed species and all five species of salmon. The request to conclusively assess each of the 686 stream crossings for the presence or absence of all fish species which could potentially be present is beyond the AIR requirements.

- Further, Nisga'a Nation raise the concern that in the Application the description of Nisga'a interests in fishing within the Nass watershed is crude and very limited in its scope. It seriously understates the species specific interests that the Nisga'a Nation has in specific salmon bearing watersheds whose protection is required to ensure that the Treaty protected entitlements to salmon are assured for future generations. These interests include, but are not limited to, the importance of Chinook salmon from the Tseax, Seaskinnish, Kiteen, Cranberry, and Bell Irving watersheds; sockeye salmon from the Meziadin and Bowser watersheds and coho from innumerable watersheds. The Nisga'a Nation indicate, the desk based review by consultants was very limited and disregarded multiple available reports that describe in copious detail Nisga'a interests in fish.
    - *Response:* BC Hydro and its consultants have undertaken a comprehensive fish literature review as well as a field program as a basis for preparation of the Application. Several Nisga'a fishery reports were obtained from the Provincial fisheries database. On page 7-149 of the Application, 13 studies are listed that are not traditional use studies. During baseline pre-fieldwork, baseline reporting, and EAO Technical Working Group meetings, BC Hydro made a number of requests for additional information sources to assist in preparing the Application. BC Hydro conducted further field studies in summer 2010 on Nisga'a lands and additional other areas of the Project (e.g., the Bell-Irving route). After receiving this comment a request for fisheries studies was made in person to the Nisga'a fishery office on August 25, 2010. Eleven Nisga'a reports were provided. These reports were reviewed and taken into account along with the above field studies in the preparation of a supplementary report on Nisga'a Lands.

5.5.4 Conclusion

Residual Adverse Effects and Significance Analysis for Fish and Fish Habitat

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that

there may be adverse residual effects to Fish and Fish Habitat as a result of the proposed Project. These effects are due to:

- watercourse sedimentation; and,
- riparian vegetation removal.

Based on the existing and similar future development within the proposed Project Area as outlined in Table 4 of this report, EAO has considered the potential for adverse cumulative impacts on fish and fish habitat associated with the residual effects listed above.

Since there is little hydrological connection between the existing and proposed major developments outlined in Table 4, cumulative effects on sedimentation or other contaminants on fish bearing streams is likely not significant. However, there are potential cumulative effects from past, ongoing and future proposed forest development on stream sedimentation, in combination with the proposed Project. Forestry-related sedimentation is minimized through regulation under FRPA, and there is no information as part of this EA, regarding sedimentation for forest development causing serious impacts to fish and fish habitat.

The EAO recognizes that the issue of access management in minimizing effects of excessive harvesting - fishing, hunting or gathering – is an important issue in the region, particularly from a cumulative effects perspective. First Nations, Nisga'a Nation and MOE have expressed concerns regarding overharvesting and poaching facilitated by current access from past and ongoing forest development, and fear that this may only increase as a result of the establishment of additional access related to future industrial activities. In response to these concerns, provincial agencies have proposed constraints around permanent access for the proposed Project that would maintain a separation of a distance of 500 m between any permanent access for the proposed Project and important wildlife habitat, including fish, with the objective of creating no new net access in the region.

EAO's analysis of the significance of potential adverse residual effects and potential cumulative impacts on fish and fish habitat is as follows:

- **Magnitude:** Potential effects to fish and fish habitat, as a result of the proposed Project, are anticipated to be negligible post habitat compensation and with sedimentation prevention measures in place. Potential cumulative effects incorporating forestry-related sediment effects are considered low in magnitude.
- **Probability:** There is a low to moderate likelihood of surface water quality degradation from sediment during construction of the proposed Project and the loss or disturbance of selective riparian habitat at specific stream crossings is

certain. There is a low to moderate probability of cumulative effects.

- **Geographic Extent:** Potential watercourse sedimentation is considered to be local for both direct and cumulative effects. Effects to riparian habitat are limited to the proposed Project footprint at particular stream crossings.
- **Duration and Frequency:** Effects to riparian habitat at specific locations along the proposed ROW are anticipated to be continuous and would endure for the life of the proposed Project. Sedimentation effects are anticipated to be of short duration and primarily limited to construction, with some potential for low frequency, short term sedimentation events associated with maintenance activities during the operations phase of the proposed Project. Cumulative effects regarding potential sedimentation in combination with forest activities are also predicted to be of short duration and intermittent.
- **Reversibility:** All potential effects either from direct or cumulative impacts to fish and fish habitat are considered reversible.
- **Context:** Disturbance to the aquatic environment and fisheries values exists within the proposed Project area as a result of forestry, road construction, and an existing transmission line. Application of DFO compensation policy, if adequately monitored for the life of the proposed Project, would result in no net loss of fish habitat.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse effects on fish and fish habitat. The effects of this proposed project are not significant primarily based on the nature of the effects (riparian loss vs. aquatic habitat loss) and the effectiveness of the mitigation measures to address the habitat loss (i.e. many functions of riparian are maintained through mitigation).

5.6 Wetlands

5.6.1 Background Information

The term "wetlands" defines land that is saturated with water sufficiently long enough to promote specific physical and biological processes to develop, as indicated by poorly drained soils, hydrophytic ("water loving") vegetation and various kinds of biological activity which are adapted to a wet environment.

Wetlands are an integral part of the water drainage system, storing water and helping to regulate the flow of water in streams, thereby reducing flood potential during wet

weather events and increasing stream flows during drier periods. Physical and biological processes in wetlands help to breakdown, sequester, and metabolize nutrients, metals, and toxins in the aquatic environment, and facilitate the energy transfer of nutrients from aquatic species to terrestrial ecosystems. Finally, wetlands provide key habitat for aquatic and terrestrial wildlife, including fish (e.g. wetlands provide critical coho rearing habitat, and Dolly Varden and Coastal cutthroat trout are found in wetlands along the proposed Project ROW), waterfowl, amphibians and moose.

The Application indicates that the spatial boundary for the wetlands effects assessment was limited to 40 m on either side of the centreline of the proposed Project transmission line route. This 80 m wide zone was selected as the spatial boundary for the wetland assessment because potential impacts on wetlands may result from either the permanent or temporary clearing of the ROW. Within those spatial survey limits approximately 800 ha of wetland habitat was identified as either crossed or adjacent to the route of the proposed Project. However, the Application indicates that, given the limited disturbance proposed within that habitat, the disturbance to wetlands from the proposed Project would be limited to approximately 55 ha. Temporal boundaries included in the assessment of wetland habitat included the construction and restoration phase assumed to take place over a 3-year period, and a minimum 50-year operations and maintenance phase.

VCs assessed in the Application were wetland extent (i.e. the size of wetlands encountered by the proposed project) and wetland function, which includes hydrologic, biogeochemical, habitat, and ecological components.

5.6.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Application identifies that the proposed Project could adversely affect wetland extent and function through the clearing of wetland vegetation along the proposed ROW. The following measures are proposed to mitigate potential adverse effects to wetland extent and function:

- avoidance of wetlands where technically feasible, particularly those wetlands with tall trees or shrubs that would require removal or trimming for conductor clearance;
- planning construction activities along wetland margins where technically feasible;
- completion of pre-construction environmental surveys to delineate wetland boundaries during detailed design, and maintenance of a buffer around Riparian Management Areas as defined in the Riparian Management Area Guidebook (BC MOE 1995);
- identification of wetland boundaries on orthophoto alignment maps as part of the construction EMP;

- development of site-specific environmental mitigation prescriptions for affected wetlands along the route of the proposed Project; and,
- development of a Wetland Compensation Plan.

5.6.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public. These issues, the Proponent responses and EAO's assessment of the adequacy of responses are detailed in Appendix 2. Key issues and responses include the following:

- EC raised the concern that there are approximately 811 ha of wetlands that fall completely or partially within the proposed ROW for the proposed Project and, it is unknown whether the transmission towers and access roads would impact the 811 ha of wetlands,
    - *Response:* The Proponent would avoid crossing wetlands with roads wherever possible; however, it cannot be ruled out that permanent roads could be built through wetlands until forest engineering is completed. If there are extensive wetlands in an area, BC Hydro may use winter roads for logging rather than permanent roads and to use helicopters for the line construction. Wetlands near the central and northern portions of Segment 10 would be avoided since the Proponent has selected the Bell-Irving route. Wetland hydrological function may be altered beyond the proposed ROW and associated infrastructure because of water crossings, however, these crossings have been assessed in the Application and mitigation measures identified. BC Hydro has committed to developing a wetlands compensation plan if wetland extent and function is lost.

- The Tahltan raised a concern regarding the potential for one or more transmission towers to be placed below the high water mark in wetlands at Snowbank Creek, which are considered important fish rearing habitat.
    - *Response:* BC Hydro provided additional information in a report outlining routing options through the Snowbank Creek area, demonstrating that the potential tower placement would be at the margins of the wetland, minimizing impacts to the wetland complex. The Proponent has committed that should the final design of the proposed Project result in a transmission tower being placed in a manner that causes a disruption to fish habitat, the Proponent will be required to provide habitat compensation under DFO's no net loss policy.

Potential impacts on wetlands from previous, ongoing and foreseeable future projects and activities are not seen to overlap with potential wetland impacts from the proposed Project. It is not known how cumulative effects may impact wetlands on a regional scale.

5.6.4 Conclusion

Potential for Residual Effects and Significance Analysis on Wetlands

Based on the information presented in, and the Working Group's consideration of the Application, EAO finds that there may be adverse residual effects to wetlands as a result of the proposed Project, due to a reduction in wetland extent and function.

Based on the existing and similar future development within the proposed Project Area as outlined in Table 4 of this report, EAO has considered the potential for adverse cumulative impacts on Wetlands associated with the residual effect listed above. These potential effects are considered in the following significance analysis.

EAO's analysis of the significance of potential adverse residual effects and potential cumulative impacts on Fish and Fish Habitat is as follows:

- **Magnitude:** Potential effects to wetlands would generally be of low magnitude, since wetlands typically do not require clearing, and most of the vegetation and function of the wetland is predicted to be maintained. The maximum area of wetland disturbance is predicted to be 19 ha. The magnitude of the cumulative effects are estimated to be low on a local or landscape level as no overlap with other activities have been identified, and uncertain on a regional scale.
- **Probability:** Probability of residual effects on wetlands is high; probability of cumulative effects on wetlands is low to moderate.
- **Geographic Extent:** Effects would be primarily limited to the proposed Project footprint, specifically to the placement of towers and access roads. Hydrologic effects associated with the loss of wetland extent are considered to be local. Cumulative effects from forestry, mining and hydroelectric development would be on a regional scale.
- **Duration and Frequency:** Residual effects to wetlands are anticipated permanent, once infrastructure is in place. Duration and frequency of cumulative effects on wetland are uncertain.
- **Reversibility:** Potential residual effects to wetlands are considered fully reversible as implementation of a wetland compensation plan would negate any

net effect of the proposed Project on wetlands. Cumulative effects on wetlands from m other industrial activities may also be reversible if similar compensation measures are applied.

- **Context:** There are approximately 800 ha crossed or adjacent to the proposed Project.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a certificate), EAO is satisfied that the proposed Project is not likely to have a significant adverse effect on wetlands, largely because of the small number of wetland sites that would be impacted and because the implementation of a wetland compensation plan would eliminate or minimize any net adverse effect.

5.7 Terrestrial Ecosystems and Vegetation

5.7.1 Background Information

The area between Terrace and Bob Quinn traversed by the proposed Project is ecologically diverse, with both coastal and interior climatic influences. Geographically the area is mountainous and includes a variety of ecosystem types based on the slope, elevation, and distance from the ocean. The proposed Project route passes primarily through the valley bottoms, lower slopes, and mid-slopes of the Skeena, Kitsumkalum, Nass, Cranberry, Meziadin, Bell-Irving, and Iskut river watersheds.

The proposed Project route crosses a variety of ecosystem types that can be described using the Biogeoclimatic Ecological Classification (BEC) System developed by the BC MOFR. Four BEC zones are crossed by the proposed Project, including the Interior Cedar Hemlock (ICH), Coastal Western Hemlock (CWH), Engelmann Spruce - Sub Alpine Fir (ESSF), and Mountain Hemlock (MH).

Along the proposed Project alignment the ICH and CWH zones cover low to middle elevations in the interior and coastal regions, respectively. The ICH is generally located farther inland than the CWH with the result that the ICH is generally cooler in the winter (with heavier snowpack) and warmer in the summer. The ESSF and MH BEC units crossed by the proposed Project cover high elevation, subalpine areas in the interior and coastal regions, respectively. Cold and snow conditions predominate for much of the year, particularly in the MH, which is one of Canada's wettest ecological zones (BC MOF 1995). High elevations in both the ESSF and MH BEC units typically comprise subalpine parkland, heath, meadow, and grassland vegetation with sparse tree cover. Lower elevations are continuously forested. In the high snowfall, mountainous areas,

frequent avalanches result in avalanche tracks with a unique vegetative layer dominated by shrubs and herbaceous species. These avalanche tracks are important habitat for several wildlife species, including bears.

To assess potential effects of the proposed Project on ecosystems and vegetation, studies were conducted to identify existing terrestrial and wetland vegetation communities and their condition. Ecosystem and vegetation community information was assembled from a combination of existing information sources and field sampling. The study area for the assessment of ecosystems and vegetation includes a 2 km wide buffered area centred along the proposed Project route, including the two proposed route options (the western, or Nisga'a route and the eastern Cedar – Kiteen route). Temporal boundaries included in the assessment considered a construction and restoration phase of approximately three years, and an operations and maintenance phase assumed to last indefinitely (>50 years).

Ecosystems in the proposed Project area are characterized by a mosaic of disturbed areas and intact forest varying from young to mature structural stages. Approximately 40% of the proposed Project footprint is in a disturbed ecological condition, primarily as a result of forestry activity. Baseline studies identified 11 ecosystems listed by the BC CDC in the 2 km-wide study area, including five forested ecosystems, four forested floodplain ecosystems, and two wet shrub ecosystems. Two additional ecosystems, noted as important to the Tahltan Nation, Gitxsan Nation, and Gitanyow Nation, are found in the area. Willow-thicket/riparian ecosystems were identified by these First Nations as sensitive to development and as important habitat for moose and other wildlife. The old forests ecosystem was also identified by First Nations as ecologically important and sensitive to disturbance. Old forests are structurally diverse, supporting a wide variety of plant and animal species, and are sensitive to timber harvesting and other land uses.

VCs were identified by the Proponent based on a series of criteria, including importance to First Nations and the Nisga'a Nation, as well as their biological and economic importance. VCs presented in the Application are representative rare ecosystems, pine mushrooms, country foods, cedar trees, Old Growth Management Areas (OGMAs), riparian areas, floodplain forests, old forests, and unlisted terrestrial ecosystems. VCs were selected according to the following description:

Rare Ecosystems: Plant communities (ecosystems) listed by the BC CDC are those that have particular threats, declining population trends, or restricted distributions that indicate that they require special management. BC CDC listing include all SARA-listed species. Baseline studies identified eight listed ecosystems in the area.

Pine Mushroom: Pine mushroom is a valuable economic species, and was identified as a concern by Nisga'a Nation, First Nations and local residents. Pine mushroom habitat may be affected by the proposed Project.

Country Foods: Country foods are defined as traditional foods from the land, such as wild animals, birds, fish and berries. Country foods were identified as a concern by Nisga'a Nation and First Nations. Country foods may be affected by altering and managing vegetation along the ROW.

Cedar Trees: Cedar trees were identified by Nisga'a Nation, First Nations, and land use and resource management plans as a protection concern as cedar is culturally significant. The Application reports that cedar will be removed during clearing of the proposed ROW, however the actual estimated volume and distribution will not be known with certainty until the forestry engineering work is completed.

OGMAs: OGMAs were identified by First Nations and land use and resource management plans as an important forest component in the proposed Project area. OGMAs are established to protect current or future old growth forests, but may be affected by clearing of the proposed ROW. OGMAs are legal objectives under the *Forest and Range Practices Act* and are protected from clearing, harvesting and degradation as part of industrial forest development. OGMA biodiversity and conservation values often overlap with cultural values

Riparian Areas: Riparian areas are identified by Nisga'a Nation, First Nations, land use and resource management plans and provincial legislation as sensitive and important ecosystems with mandated setbacks and management practices.

Floodplain Forests: Floodplain forests are identified as sensitive in land use and resource management plans and in research reports (de Groot 2005; de Groot and Pojar 2009) because of their relatively limited extent within the proposed Project area and the development pressures faced by this forest type.

Old Growth Forests: Old growth forests were identified by First Nations and land use and resource management plans as an important issue, and are included in many of the province's Sensitive Ecosystem Inventories. The Application reports that not all old forests present in the area are contained within OGMAs, and consequently they are included as a separate VC in the Application.

Unlisted Terrestrial Ecosystems: This type of ecosystem composes the remaining vegetative land cover not encompassed by the other VCs included in the effects assessment presented in the Application. This group of ecosystems is important for wildlife, forestry, and a variety of local extractive and recreation uses.

5.7.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Application identifies the following potential issues and corresponding proposed mitigation associated with the proposed Project that could adversely affect the ecosystems and vegetation VCs:

Permanently Altering Ecosystems

Areas of each of the four Biogeoclimatic Ecological Classification (BEC) zones traversed by the proposed Project would be altered during both access road and ROW construction. Areas in new ROW would effectively be altered permanently, because vegetation would be maintained in an early seral state within a statutory ROW under the transmission line. Areas within the one-time hazard tree removal zone would regenerate to wind-firmness conditions wherein alteration to ecosystems could be partially reversible. The Application also addresses cumulative impacts of increased permanent vegetation removal as a result of ongoing and future industrial projects. The Application compares the proposed Project's estimated 1490 ha of permanently altered vegetation to the estimated 155,011 ha of harvesting due to forest operations, and 59,754 ha of predicted permanent vegetation removal from a hydroelectric, two mining developments and other activities. When combined, the cumulative permanent vegetation alteration represents approximately 1.14% of available forest in the study area, with the proposed Project representing a very small portion of that percentage.

The permanent alteration of ecosystems from the removal of native vegetation for access road and transmission line ROW construction would affect all of the VCs listed in section 21.1.2. Key mitigation measures proposed in the Application to address this effect to all terrestrial ecosystems and vegetation VCs include:

- development of an Ecosystems and Vegetation Management Plan prior to commencing ROW clearing (all VCs);
- minimizing disturbance to native vegetation (all VCs);
- preconstruction surveys to identify rare ecosystems and pine mushroom habitat, and identify sensitive area boundaries that would allow the partial or complete avoidance of these features on a site-by-site basis;
- employing specialised vegetation removal and management techniques in rare ecosystems, floodplain forests, and riparian areas such as site specific felling methods, hand clearing, and topping.
- identification and avoidance of OGMAs, where possible; and
- development and implementation of a program to offset the amount of cedar removed during the construction of the proposed Project, including specific cedar management plans.

Temporarily Altering Ecosystems

In the hazard tree clearing area outside the maintained ROW, hazard trees and other vegetation would be removed as required during construction to maintain safe distances away from conductors and structures. Trees, however, would be allowed to regenerate into a wind-stabilized belt along the edge of the forest.

The temporary alteration of ecosystems along the proposed ROW has the potential to effect all of the terrestrial ecosystems and vegetation VCs listed in section 21.1.2. Key mitigation measures proposed in the Application to address this effect to terrestrial ecosystems and vegetation VCs include:

- development of an Ecosystems and Vegetation Management Plan prior to commencing ROW clearing (all VCs);
- preconstruction surveys to identify rare ecosystems and pine mushroom habitat, and identify sensitive area boundaries around these features (all VCs); and,
- adherence to the BC Hydro BMP document *Vegetation Maintenance Standards for Hazard Trees* (all VCs).

Pine Mushroom

Pine mushroom habitat occurs in predominantly old forest communities (80 to 160 years. The Application explains how pine mushroom habitat was estimated for the proposed general project area and how much pine mushroom habitat would be impacted as a result of vegetation alteration. The Application predicts that approximately 360 ha of pine mushroom habitat would be expected to be removed as a result of clearing of the proposed ROW out of about 14,640 ha of mapped pine mushroom habitat for the area, representing a habitat loss of 2.4%. The Proponent did not propose any measures to mitigate the potential effects on pine mushroom as old forest host trees would be permanently cleared and replaced by low growing shrub communities in the ROW. The effects assessment did not include the potential impacts resulting from the construction of access roads as the location of access roads has not been finalized.

The amount of pine mushroom habitat removed by other projects and activities is not known. Forestry activities that have been and will continue to target mature and old forests because of their economic value will likely disproportionally affect pine mushroom habitat. The cumulative effects are considered long term, given the amount of time forests would need to regrow to provide suitable pine mushroom habitat, however, the Application states that it is expected that the cumulative loss of pine mushroom habitat is only a small portion of the total available habitat in the region.

Riparian Areas

Riparian areas occupy a small component of forested ecosystems but serve a number of ecological functions including: important seasonal habitat and corridors for a wide variety of wildlife species; stabilization of alluvial fans, floodplains and streams, and fish habitat. Riparian areas are protected under various SRMPs and LRMPs in the study area and are managed under the FRPA which include BMP for activities in and around riparian habitats.

The Application predicts that, based on the provincial FRPA definition of riparian reserves and management zones, a one-time clearing of riparian vegetation that would be allowed to regrow is estimated as 628 ha, representing 3.8% of the available riparian habitat in the study area, and a permanent alteration of riparian habitat would be 302 ha, which the Proponent estimates to be 1.8% of the total available riparian habitat. The area of riparian habitat that may be altered due to road construction was not assessed as road locations were not available at the time to the assessment.

Key mitigation measures proposed in the Application to address potential adverse effects associated with the clearing of riparian areas include:

- avoiding, where possible, disruption of riparian habitat through placement of transmission line structures;
- specialized tree felling to minimize amount of riparian vegetation cleared; and ,
- compensation for riparian fish habitat features as part of the fish habitat compensation plan.

Rare Ecosystems

Rare ecosystems are considered of particular importance in preserving biodiversity in the province and are characterized by unusual physiographic setting (climate, geology), unusual or exceptionally diverse biota and complex disturbance history, and attractive to humans. These plant communities, consisting of moist and wet forests, floodplain forests, wet shrub and dry forest, are listed by the BC CDC as those that have particular threats, declining populations trends or restricted distribution that require special attention. Rare ecosystems also include habitats that would support SARA-listed plant species, including Cryptic Paw lichen.

The Application states that no rare plants were observed during baseline studies; however, several rare ecosystems were identified by BC CDC during baseline ecosystem mapping, which formed the basis of the assessment. The Application predicts that, potentially, a maximum of 254 ha BC CDC identified rare ecosystem would be altered, representing approximately 4.25% of the total rare ecosystem in the

2 km wide study area. Such a disturbance is considered a considerable difference from baseline conditions that may be beyond the range of natural variation.
The Application states that the majority of rare ecosystems are comprised of moist forests and floodplain communities, and the amount of already altered rare ecosystems are unknown. A considerable amount of most forests have already commercially harvested, however, the Application estimates that these communities are relatively common in the study area. The Proponent suggests that the contribution of the proposed Project to alteration of rare ecosystems is very small when compared to forestry operations. However, future forestry activities will be managed in accordance with LRMPs and SRMPs which contain management objectives for rare ecosystems, and are designed to ensure the sustainability of these ecosystems.

Key mitigation measures proposed in the Application to address potential adverse effects associated with the clearing of rare ecosystems include:

- avoiding construction in floodplain ecosystems wherever possible, and apply management practices to reduce disturbance of soils and vegetation;
- During the boundary marking exercise for the final alignment of the proposed Project, BC Hydro must ensure that surveys are conducted to red and blue listed plant and plant communities;
- survey crews will include professionals such as foresters, forestry technicians, or biologists that have received training from a rare plant biologist with significant regional experience;
- the site-specific details resulting from these surveys must be included on the maps in the construction EMP and considered in the development of the EPPs and clearing prescriptions.

Country Foods
The Application describes country food plants in the study area as consisting of shrubs, such as blueberry, raspberry, soapberry, thimbleberry, salmonberry, and devil's club. Removal of mature trees is anticipated to promote the growth of berry-producing shrubs, which would also be encouraged during vegetation management during the operation of the proposed Project. Conversely, clearing of old growth forest would remove devil's club's understory habitat. The Application predicts that a total of 1507 ha of old forest that may constitute devil's club habitat would be removed, representing 3.6% of total devil's club habitat within the 2 km wide study area.

The Application estimates that cumulative effects from other human activities and projects that would require temporary forest clearing would further enhance the abundance of berry plants.

The Proponent does not propose any mitigation for the effect on devil's club habitat as it is abundant in the area.

Cedar

Western red cedar grows throughout the maritime-influenced area of north-western BC and is an important commercial commodity. While a survey of cedar in the proposed ROW has not been completed, the Proponent estimated the amount of cedar that may be harvested based on current Timber Supply Review documents developed by the Province. Volumes of cedar that may be cleared due to road construction was not calculated as road locations were not known at the time of the Application. The Proponent estimates that 750 m3 or 3% of available cedar could be harvested in the Kalum TSA, 2500 m3 or 3-4% in the Kalum TFL 1, 250 m3 or 1% in the Cranberry TSA, and 1300 m3 or 2% in Nisga'a Lands. However, the Application notes that not all cedar either potentially cleared in the proposed ROW or existing in the TSAs or TFL of Nisga'a lands are necessarily of cultural or commercial value, depending on height, diameter, number of branches and stems.

The Application states that past and current cedar harvesting has been, and continues to be widespread given the high market value of cedar and that the cumulative effects of cedar lost through industrial harvesting is considerable and may exceed sustainability objectives for cedar. Cedar management plans are being developed throughout the region to ensure long term sustainability, including preferential planting of cedar in some areas. The Ministry of Forest, Lands and Mines and MNRO are responsible for sustainable management of these resources. While the cumulative effects of cedar removal is high because the total cumulative loss of cedar in the study area is already beyond the range of natural variation, the Application estimates that the residual effects from the proposed Project are small in comparison.

Key mitigation measures proposed in the Application to address potential adverse effects associated with the removal of cedar include:

- detailed design plans that will incorporate the avoidance of high quality cedar, reducing the amount of cedar removed;
- assessment of the amount (m3), age, and condition of cedar within the ROW during timbre-cruising and surveying assessments prior to construction;
- collaboration with forest licensees, relevant provincial agencies, First Nations and Nisga'a Nation to find reasonable opportunities to develop and implement, where feasible, a program to offset the amount of cedar removed during the construction of the proposed Project within the asserted traditional territories of First Nations and within Nisga'a Lands, Nass Wildlife Area,
  Nass Area, including specific cedar management plans that First Nations or Nisga'a Nation may undertake.

Old Growth Forests and OGMAs

The Application estimates that up to 411 ha of old forest would be removed during ROW clearing and up to 452 ha would be removed in the adjacent one-time clearing area for a total of 863 ha. Because of the amount of time it takes for old forests to re-establish themselves, the effects are considered permanent. The Proponent has not proposed any measures to mitigate those effects.

The Application states that the proposed Project will overlap 12 different OGMAs along the proposed route, ranging from a 1 ha overlap to approximately a 20 ha overlap, representing less than 0.55% to 36% of the area of individual OGMAs.

The Proponent advises that OGMAs that it is expecting will be affected peripherally may not be affected once the final alignment has been determined after detailed design of the proposed Project. BC Hydro has it must consult with First Nations and the Nisga'a Nation (where the areas are located within the asserted traditional territories of First Nations and Nisga'a Lands, respectively), and the appropriate MNRO manager to discuss an approach and process to address the impact, including developing suitable replacement OGMA areas if appropriate, of removing trees with an OGMA.

Introduction of Invasive Species

ROW construction and maintenance could create opportunities for invasive species to establish themselves, particularly along disturbed road verges and along the maintained ROW. Invasive species could negatively affect each of the VCs.

Key mitigation measures proposed in the Application to address potential adverse effects associated with the introduction of invasive species include:

- development of an Ecosystems and Vegetation Management Plan prior to commencing ROW clearing;
- minimizing disturbance to native vegetation;
- promptly re-vegetating disturbed sites; and,
- establishing vehicle wash stations at locations where invasive plant seeds or whole plants that are washed off would not become established elsewhere.

Increased Fire Risk

Cutting the ROW and hazard tree buffer during construction and maintaining the ROW could, if unmanaged, result in increased fuel loads along the ROW, which could result in a higher fire risk to all VCs and to communities near the line. Key mitigation measures

proposed in the Application to address potential adverse effects associated with increased fire risk include:

- controlling fuel loads in the ROW and other cleared areas. During construction, merchantable timber would be stacked and removed from the site. Non merchantable trees and other debris would be disposed of as per FRPA.
- Manage vegetation during operations in such a manner as to minimize any risk of increased fires as detailed in BCTC's *Vegetation Management Standards: Requirements and Guidelines for Burning on and near Rights-of-Way and Debris Management*.

Edge Effects

Edge effects, including wind throw, could have effects on the VCs presented in the Application during both construction and operation phases of the proposed Project. Cumulative wind throw effects in the region are also predicted, particularly where two sources of wind throw are combined, for example where fragments are formed from two linear cleared paths. Key mitigation measures proposed in the Application to address potential adverse effects associated with edge effects include:

- adherence to the BC Hydro best management practices document Vegetation Maintenance Standards for Hazard Trees; and,
- minimization of wind throw via the adoption of field assessment tools and guidelines for tree removal in the "edge tree program" currently being developed by the University of British Columbia Department of Forest Sciences.

Additional mitigation measures proposed by the Proponent for all potential impacts noted above can be found in section 7.8.5 of the Application.

5.7.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public. These issues, the Proponent responses and EAO's assessment of the adequacy of responses are detailed in Appendix 2. Key issues and responses include the following:

- NRCan and Nisga'a Nation raised concerns regarding effective mitigation of removal of cedar resources along the ROW and tree hazard clearing areas resulting from the proposed Project.
    - *Response:* As part of the timber cruise that will be conducted prior to clearing, the number, size and location of cedar trees that will require

removal as part of the proposed Project will be recorded. The results of these surveys will be used to determine the locations where site-specific mitigation, such as cedar replacement, would be required. Identified locations will be marked or flagged and updated in the construction EMP. These locations will be used to inform detailed design and planning. In addition, BC Hydro is committing to working with First Nations, Nisga'a Nation and provincial agencies in the development and implementation of a program to offset the amount of cedar removed during construction within the asserted traditional territories of First Nations and within Nisga'a Lands, Nass Wildlife Area, and Nass Area.

- Gitanyow First Nation and Kitsumkalum First Nation requested that no herbicide be used on their traditional territories.
    - *Response:* All methods of vegetation management had to be considered given the site conditions. Most (80% or more) of the vegetation along the ROW would be cleared mainly by slashing and mowing, and any herbicides used would be applied directly to individual rapidly growing deciduous trees where they occur in high densities, under proper conditions (no wind spray, and not during rain events) and using standard application procedures to protect surroundings soils and vegetation. As set out in the BC Integrated Pest Management Act and guidelines, provincially mandated pesticide free zones and additional no treatment zone buffers in riparian areas will apply to ensure no watercourses or riparian areas are affected by pesticides, thus protecting water quality, fisheries, and aquatic resources. The value of moose browse will be considered in vegetation clearing and maintenance practices. BC Hydro will consider areas of concern or of interest to First Nations'.

- Nisga'a Nation raised the concern about pine mushrooms because of their economic importance in the region.
    - *Response:* BC Hydro responded that up to 360 ha of potential pine mushroom habitat may be affected by the proposed Project, and that this potentially affected area is very small relative to the available pine mushroom habitat within the regional study area. Consequently, the removal of up to 360 ha of pine mushroom habitat is unlikely to adversely affect the contribution of pine mushroom regional to the economy as the potentially disturbed pine mushroom habitat represent only approximately 2% of total pine mushroom habitat in the study area.

- EC raised concern regarding impacts on Cryptic Paw lichen, a rare plant species.

- *Response:* Pre-construction surveys will include surveys for rare plant species with the potential to occur in the area, including Cryptic Paw lichen. Rare plant communities will be flagged and avoided during construction.

- INFC raised an issue regarding ROW clearing and the potential to use harvested wood as a biomass source for energy production or chipping on-site.
  - *Response:* BC Hydro has not considered the use of harvested wood as a biomass source for energy production or chipping on-site. Contractors will be hired to carry out tree removal. The decision to salvage or chip wood will depend on several factors including its commercial value, land tenure considerations, and the economic and environmental costs of moving or chipping it.

- MOE raised a concern that there appears to be no mitigation for red and blue-listed plants.
  - *Response:* Site-specific, pre-construction surveys will be conducted for listed ecosystems and species. The results of this survey will be used to determine locations where specific mitigation will be required, including identifying locations of rare plant communities, marking or flagging locations and updating the construction EMP to avoid or minimize disruption of the plant communities. These locations will be used to inform detailed design and planning. Where feasible, appropriate setback buffers will be identified so that construction can avoid those areas.

The inclusion of any additional effects from previous, ongoing and future proposed projects and activities, in particular forest development activities in proximity to the proposed Project, for the purpose of assessing cumulative effects on ecosystems and vegetation will likely result in an increase in temporary and permanent vegetation alteration, as well as an increase in the extent of area experiencing edge effects such as wind throw. Although there may be overall impacts to the condition of the ecosystems and vegetation VCs, these potential impacts are predicted to be distributed in time and space, and the sustainability of those VCs is expected to be maintained. Therefore, the cumulative effects assessment concludes that all cumulative effects, except one, are not significant.

There is expected to be a significant cumulative effect on cedar as a resource due to the previous harvesting of cedar beyond a sustainable level. However, the volume of harvest required for the proposed Project will not add a material impact to this pre-existing effect. Further, with the planned mitigation measures, such as the Proponent's

commitment to a cedar offset program, the proposed Project is not considered to be a significant addition to this pre-existing effect,

5.7.4 Conclusion

Potential for Residual Effects and Significance Analysis on Ecosystems and Vegetation

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects to Ecosystems and Vegetation as a result of the proposed Project due to permanent alteration of ecosystems, including rare plants and plant communities, pine mushroom habitat, cedar, old forests, floodplain forests, and country foods.

Based on the existing and future development within the proposed Project Area as outlined in Table 4 of this report, EAO has considered the potential for adverse cumulative impacts on ecosystems and vegetation associated with the residual effects identified above. These potential effects are considered in the following significance analysis.

Significance Analysis

EAO's analysis of the significance of potential residual effects on ecosystems and vegetation is as follows:

- **Magnitude:** Potential effects on ecosystems and vegetation would generally be of low (high spans – no clearing) to medium magnitude (selective to total clearing) depending on site-specific vegetation removal required by the proposed Project. The magnitude of cumulative effects will range from low to moderate, depending on management strategies governing future major project and forest development, and the rehabilitation and recovery of previously impacted vegetation and ecosystems.
- **Probability:** Effects to ecosystems and vegetation associated with vegetation removal are certain, both for the proposed Project and from previous, ongoing and foreseeable future activities.
- **Geographic Extent:** Potential effects to ecosystems and vegetation would be limited to the proposed Project footprint, and therefore at a regional level. Cumulative effects are predicted to be at a regional level, depending on the timing and spatial overlap of other activities.
- **Duration and Frequency:** Construction related effects to vegetation such as the

clearance, of trees along the proposed ROW are considered to be short term and frequent during the anticipated 3 year construction period of the proposed Project, and the effects to vegetation such as the removal of mature trees would be for as long as the proposed Project is in operation. Operations related effects through ongoing vegetation management to ecosystems and vegetation are anticipated to be continuous and would last for the life of the proposed Project. Cumulative effects from previous, ongoing and future proposed projects, particularly forest development activities, would be intermittent and of medium to long term in duration.

- **Reversibility:** Effects on ecosystems and vegetation are considered to be partially reversible as restoration activities undertaken and vegetation management prescriptions are developed to minimize effects on vegetation and ecosystems from the proposed projects and previous, ongoing and future proposed projects and activities.
- **Context:** Certain areas of the proposed Project are relatively undisturbed, however, a large portion of the proposed Project will be constructed in areas already cleared by previous logging activities, therefore the incremental impacts from the proposed project would be relatively moderate. Forest development is regulated under FRPA and considers avoidance and mitigation measures to minimize potential impacts on ecosystems.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse effects on ecosystems and vegetation, as potential effects will be moderate in magnitude, continuous at a landscape level, but partially reversible.

5.8 Wildlife and Wildlife Habitat

5.8.1 Background Information

The region traversed by the proposed Project is ecologically diverse, transitioning from moist coastal ecosystems in the south to drier northern interior ecosystems near the proposed Bob Quinn substation. The region supports a wide range of wildlife species and plant communities.

Grizzly bears, black bears, and moose inhabit the ICH zone, while higher elevations and meadows (ESSF and MH zones) support ungulates (e.g. moose and mountain goat) and large mammal grazing. Furbearing animals such as marten, fisher, and wolverine

use conifer forests of the ESSF zone, and the MH zone supports a variety of bird species in old and mature forests. The Proponent notes wolverine select a range of habitat types including low elevation habitats. One amphibian species, the Coastal-Tailed Frog, breeds in steep, cold mountain streams in old forests within the CWH zone, and Western Toad is found in the lower elevation wetland and riparian habitats along the proposed Project route.

The wildlife study area assessed for the proposed Project includes a 2 km wide area along the proposed 344 km long transmission line between Terrace and the proposed Bob Quinn substation and incorporates both the western (Nisga'a Lands) and eastern (Cedar - Kiteen) route options. Temporal boundaries included in the assessment considered two Project phases: (1) construction and restoration, and (2) operations and maintenance. The Application assumes that the construction and restoration phase would last three years and the operations and maintenance phase would last indefinitely (>50 years).

VCs were identified by the Proponent based on a series of criteria, including importance to First Nations and the Nisga'a Nation, as well as their biological and economic importance. VCs presented in the Application included representative ungulate, bear, bird and amphibian.

The wildlife cumulative effects assessment considered all projects within 75 km on either side of the proposed transmission line corridor. This spatial boundary included all wildlife VCs and their associated habitat, and allowed for the assessment of a worst-case scenario in which a VC interacts with the maximum amount of additional human activity.

Main issues relevant to past, present and future human activities and their cumulative effects in the study area are:

- direct and indirect changes to wildlife habitat, such as habitat loss, alteration, and fragmentation, and habitat avoidance due to sensory disturbance; and,
- increased access to wildlife habitat and higher rates of mortality through mismanagement as a cumulative result of hunting, poaching, and defence of person and/or property.

It is likely that the combined effects of human actions could adversely affect some individual wildlife species. The significance of the residual effects on wildlife VC populations depends on a number of factors including numbers, sex, and age-class of individuals affected, and the influence of these variables on the demographics of the local populations. These factors are unknown and difficult to predict without quantitative data and suitable population models.

Valued Component Considered in the Assessment

Moose: Moose were identified in the Application as a culturally important and hunted species by the Nisga'a Nation, and First Nations; as economically important species to local hunters and guide outfitters; as an important species requiring increased management consideration by numerous land management plans; and as a biologically important species, which is a species that contributes significantly to the functioning of the ecosystem. High and moderately high quality moose winter habitat was identified throughout the study area, and several Ungulate Winter Range polygons (UWRs) were identified in the study area. Moose populations are known to have decreased substantially in a portion of the proposed Project area which has been surveyed by Provincial authorities (DeMarchi 2007). These reductions are thought to have resulted from over-harvest of cow moose, and the extremely harsh winter of 2007 (Gitanyow communication). Consequently, there have already been substantial reductions in licensed moose harvest in some of the wildlife management units that overlap the proposed Project area, and a reduction in harvest levels in the 2007 Nass Wildlife Management Plan. For the reasons stated above, moose populations in some portions of the Project area should be considered more sensitive to habitat disturbance and over-harvest.

Mountain Goat: Mountain Goat was identified as a culturally important and hunted species by the Nisga'a Nation and by four First Nations, and as an important species requiring increased management consideration by numerous land management plans. The Application notes that mountain goat use of the wildlife study area is limited; however, the species is known to be sensitive to disturbance from human activity and is potentially sensitive to activities associated with the development of the proposed Project such as helicopter noise.

There is a lack of publicly available information on environmental baseline reports on ungulates for any of the five proposed mine projects (i.e. Mount Klappan Coal Mine, Shaft Creek Mine, KSM Mine, Kutcho Creek Mine and Kitsault Mine). It is likely that each mine project will have some degree of interaction with ungulates and ungulate habitat values. However, the scope of the interaction is uncertain, both in time and space. With respect to forest development, ungulates are managed as a VC under FRPA and mitigation measures are applied, including the establishment of UWRs.

Furbearers: Furbearers are important economic and cultural resources within the Project corridor. The Proponent's evaluation of BC Fur Harvest Database identified 16 furbearer species that were harvested in areas within and surrounding the study area, including the provincially blue-listed fisher and the federally listed wolverine (special concern). Fisher were identified as a VC in the Application because they are provincially blue-listed; identified as a culturally important and trapped species by the

Nisga'a Nation and First Nations in the proposed Project area; and identified as an important species requiring increased management consideration by land management plans. American marten were identified as a culturally important species and trapped by the Nisga'a Nation and First Nations; as the most important species to local trappers; an important species requiring increased management consideration by land management plans; and as biologically important as an indicator species used to indicate the health of an ecosystem.

BC MoE harvest data collected between 1985 and 2003 show that marten represented 58% of the furbearers harvested in the Skeena Region. In particular, the area north of Bell II (Segments 13 and 14) likely contains highly suitable marten winter habitat.

Grizzly Bear: Grizzly Bear are provincially blue-listed, and a federally listed species of Special Concern; a species of cultural importance as identified by the Nisga'a Nation and five First Nations for subsistence hunting and traditional reasons; biologically important as an umbrella species; economically important to local hunters and guide outfitters; and identified as an important species requiring increased management consideration by land management plans. High value grizzly bear foraging habitat is present in the proposed Project area.

Kermode Bear: Kermode bears are a subpopulation of black bears that carry a "white phase" recessive gene. When this gene is expressed, the result is a “white” black bear. Kermode bears were identified as a VC because they are recognized as a culturally important species for coastal First Nations and are considered a Special Element of Biodiversity in BC (Holt 2007). Given that Kermode bears are a subpopulation of black bears that carry a "white phase", all black bears in the area were considered to be potentially of the Kermode subspecies, and were considered in the effects assessment presented in the Application.

When the potential effects of the proposed Project are considered cumulatively with those of the proposed mine projects, the most pronounced effect is assessed to be sensory disturbance during the construction phases of the projects, when the largest workforce and amount of machinery and initial land alteration commences. For those projects where the construction phase has the potential to overlap with that of the proposed Project, there is increased potential of cumulative effects. However, the distances of the additional projects from the proposed Project suggest that the potential cumulative effect would be low.

The potential cumulative effect of indirect mortality for grizzly bear and Kermode bear, as well as for black bear, from facilitating access is likely because of the difficulty of preventing access, and detecting and monitoring unpermitted and unreported kills of the game species either from poaching or the mortality of nuisance/problem bears.

Waterfowl: Waterfowl were selected as a VC in the Application because individuals, eggs, and active nests are protected under the *Migratory Birds Convention Act* and the BC *Wildlife Act*; and are identified as culturally important by the Nisga'a Nation (geese, ducks) and five First Nations, including Tahltan Nation (gulls, geese, ducks), Gitxsan Hereditary Chiefs (geese, ducks, swans), Gitanyow Hereditary Chiefs (waterfowl), Kitselas First Nation (geese and ducks), and Kitsumkalum Band (swans, geese, ducks, other waterfowl).

Forest Birds: Forest birds were selected as a VC because individuals, eggs, and active nests are protected under *Migratory Birds Convention Act* and BC *Wildlife Act* and were identified as culturally important by the Nisga'a Nation and First Nations groups.

Direct habitat alteration for forest birds could occur in association with other projects and activities, particularly forestry. The potential cumulative effect of habitat loss on forest birds is likely to be low as none of the songbird species of conservation concern found within the proposed Project area is restricted to nesting within mature forest interiors. With respect to forest birds, raptors and waterfowl, the Proponent predicts that potential indirect habitat loss due to cumulative noise disturbance is negligible.

Raptors: Raptors were selected as a VC because nests and certain raptors are protected under the BC *Wildlife Act*; were identified as culturally important by First Nations groups; and were identified as an important species requiring increased management consideration by land management plans.

Western Toad: Western toad was identified as a VC in the Application given that it is listed as a Species of Special Concern under Schedule 1 of SARA, and is considered biologically important.

Coastal Tailed Frog: During the EA, members of the Working Group requested that more work be completed to identify Coastal Tailed Frog habitat along the proposed Project transmission line route. The Proponent conducted a field survey in September 2010 and Coastal Tailed Frog habitat was identified near Kitsumkalum Lake (segment 2 of the proposed transmission line route). The Coastal Tailed Frog is a provincially blue-listed species, and a species of Special Concern under Schedule 1 of SARA.

5.8.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Application identifies the following potential issues and corresponding proposed mitigation associated with the proposed Project that could adversely affect wildlife and wildlife habitat VCs.

Ungulates (moose, mountain goats)

The Application predicts that, during construction, ungulates may be adversely affected by direct habitat alteration, direct mortality and noise disturbance. The Application reports that habitat loss will occur as a result of alteration of land cover in association with the clearing of the proposed transmission ROW, although some habitat loss would be mitigated by an increase in forage for moose along the ROW. In addition, sensory disturbance to moose and ungulates could occur from sources such as noise from construction and maintenance equipment, visual disturbance from the presence of equipment, personnel, or aircraft along the proposed ROW, and vibrations associated with equipment operations or blasting. Disturbance generated by these sources have the potential to adversely affect ungulates through behavioural responses such as dispersal and habitat avoidance, or physiological responses such as acute or chronic stress reactions. Specific adverse effects to wildlife associated with sensory disturbance identified in the Application include the avoidance of the immediate vicinity of construction activities by moose and the disturbance of mountain goats by helicopter flights.

The Application reports that access into areas that were previously inaccessible or difficult to access could have adverse effects to moose and mountain goats in the area of the proposed Project. Local population declines could occur in certain circumstances where new access is created, including:

- in high quality habitat which functions as a spatial refugia for wildlife, particularly mountain goats;
- in high quality habitat areas where environmental conditions force animals into a confined space during the winter, such as the congregation of moose in overwintering habitats; and,
- where the proposed Project would result in new access for unregulated hunters to high quality moose habitat resulting in an increase of the total numbers of moose removed – including the removal of an increased number of females.

Key mitigation measures proposed in the Application to address potential adverse effects on moose and mountain goats include:

Alteration of land cover:

- prior to construction, the mapping of environmentally important features such as those identified in the pre-construction surveys as well as the locations of any additional sensitive and important moose habitat or features, such as high quality moose wintering habitat, to minimize alteration;
- specific vegetation clearing prescriptions, such as high mowing and selective vegetation removal to maintain quality of moose habitat;

- the consideration of aboriginal traditional knowledge in the development of the detailed design of the proposed Project, and the review and comment by First Nations and Nisga'a Nation of clearing prescriptions and vegetation management plans to maximize opportunities for retention or creation of moose habitat features;
- the retention of environmental professionals, including an Independent Environmental Officer by BC Hydro and Environmental Monitors by contractors to guide, inspect, and evaluate the work of construction contractor(s); and,
- the completion of a detailed, site specific construction EMP prior to commencing construction.

Sensory disturbance:

- the implementation of a Noise Management Plan which would outline mitigation measures to minimize construction related noise; and,
- maintaining a 1.5 km buffer between helicopters and goat winter ranges.

Direct mortality:

- the mitigation of adverse effects associated vehicle collisions through measures such as signage in high-value wildlife areas and at known wildlife crossings; and,
- speed limits, and trimming vegetation at road crossings of the ROW to ensure visibility of animals at these locations.

Indirect mortality due to increased access:

- in consultation with MOE and MOFR, and interested and potentially affected First Nations and Nisga'a Nation, the development and implementation of feasible and site-specific access control and management strategies to minimize increased access in important moose habitat in accordance with applicable legislation, permits, approvals, and ROW agreements;
- the development of an Access Plan prior to construction of the proposed Project;
- the utilization of existing roads for inspection and maintenance wherever necessary;
- avoidance of circle routes from and to the highway or main road to prevent easier access to hunters, deactivating and allowing roads used only for construction to regenerate naturally;
- deactivating temporary access roads post construction and returning the area to its original state;
- restricting the total number of access points to high value habitat; and,

- retaining vegetation between the ROW and the road (where concerns over windfall can be mitigated) to minimize a direct line of sight to wildlife moving along the ROW.

Further mitigation measures are found in section 7.9.6.2 of the Application.

5.8.3 Project Issues and Effects on Ungulates and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations and Nisga'a Nation. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- Working group members raised concerns regarding potential impacts to moose caused by increased access to moose habitat during the construction and operation of the proposed Project. In particular, Nisga'a Nation representatives considered that, given the depressed state of moose in the Nass Wildlife Area (2007 survey) that resulted in a reduction in moose allocation in the area, an increase in hunting access may result in a significant adverse effect (see Moose Conservation and the NTL Project Prepared by Mike Demarchi, on behalf of the Nisga'a Lisims Government, in Schedule A).
    - *EAO Response:* The EAO recognizes that access management's role in minimizing effects of excessive hunting is an important issue in the region, particularly from a cumulative effects perspective. First Nations, Nisga'a Nation and MOE have expressed concerns around overharvesting and poaching that is occurring, facilitated by current access from past and ongoing forest development, and fear that this may only increase as a result of the establishment of additional access related to future industrial activities.

  While the direct residual effects from increased access from the proposed Project would be minimal in relation to existing access in the proposed Project area, in response to the above concerns, the Proponent and provincial agencies have developed a framework and set of guiding principles with the objective of avoiding, minimizing or mitigating the incremental disturbance or fragmentation of high value wildlife habitat caused by the development or reactivation of roads required to develop the proposed Project while considering the needs of legitimate commercial and industrial users including the need for BC Hydro to economically maintain and sustain transmission line operations. This objective would be achieved by identifying all new or reactivated roads that potentially

conflict with known high value habitats for moose, mountain goat, fish and grizzly bear, and prioritizing full decommissioning for new road construction and deactivation for reactivated roads as the preferred mitigation measures. The adherence to the access management plan framework is included as a commitment in the Table of Commitments.

In addition, the proponent has committed to participating in a moose and mountain survey in 2011, in partnership with MNRO. The proponent has also committed to participate in, and contribute to a ground-based monitoring initiative developed collaboratively between MOE (MNRO) and UNBC to gauge the effects on moose in UWRs that have been subjected to various treatments (such as ROW clearing, roads construction and deactivation), particularly in relation to the proposed NTL project.

- First Nations, Nisga'a Nation and other members of the Working Group raised the issue of cumulative impacts to ungulates as a result of the proposed Project. Many predict that the proposed Project will potentially enable large scale industrial development in north-western British Columbia. At this time, it is very difficult to predict exactly what projects may occur as a result of the proposed Project, and therefore difficult to predict the potential cumulative impacts of the various projects. However, it is estimated that increased industrial activity will result in additional habitat loss for wildlife, an increase in the number of people living and working in the region, increased access into wildlife habitat, more industrial traffic on the highways and logging roads and therefore more wildlife-vehicle collisions. There are potentially other cumulative impacts that have not been assessed. As a result, First Nations, Nisga'a Nation, and other members of the Working Group consider that an area-based regional or sub-regional cumulative effects assessment needs to be undertaken to develop mitigations and adaptive management strategies to address cumulative effects in the mid to long term.
    - *EAO Response:* EAO acknowledges concerns regarding cumulative effects from future industrial projects in the northwest of the province and the high level of uncertainty associated with these potential effects. While information on potential impacts from previously approved, though not constructed, projects has been incorporated in the cumulative impacts assessment in the Application, there is little tangible information on future proposed projects that have not yet been assessed, and therefore a comprehensive cumulative effects assessment on those future projects cannot be undertaken at present. The EAO will continue to require cumulative effects assessments for EAs of proposed projects that will

include the effects from prior and ongoing industrial activities, including the proposed Northwest Transmission Line.

5.8.4 Conclusion

Potential for Residual Effects and Significance Analysis on Ungulates

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation; EAO finds that there may be adverse residual effects to ungulates (moose and mountain goats) as a result of the proposed Project due to:

- alteration of terrestrial habitat through vegetation removal;
- direct and indirect mortality effects;
- sensory disturbance effects during construction; and,
- cumulative impacts.

Based on the existing and similar future development within the proposed Project Area as outlined in Table 4 of this report, EAO has considered the potential for adverse cumulative impacts on ungulates associated with the residual effects listed above. With respect to cumulative effects, the proposed Project could contribute to an increase in development along and adjacent to the Highway 37 corridor. Cumulative effects associated with this potential future development are primarily from mining and hydroelectric projects that are outside the 150 km study corridor, and it is assumed that there would be no overlap with respect to sensory disturbance. There are likely cumulative effects from ongoing and future forest development within the vicinity of the study area; however, the timing and distance from forestry activities are unknown, so the overlap with the residual sensory disturbance effects from the proposed Project cannot be predicted with any degree of certainty. Similarly, there are potential cumulative effects from vegetation removal; however, these effects from mining and hydroelectric projects are not predicted to overlap. There are likely to be cumulative effects on ungulates from forest development, however, the location and timing of timber harvesting and regeneration is not known. There are potential cumulative effects with regard to direct mortality resulting from increased access from the Project and existing and future access. Provincial agencies are considering landscape and sub-regional strategies to address these effects. These potential effects are considered in the significance analysis below.

EAO's analysis of the significance of potential residual effects on ungulates is as follows:

- **Magnitude:**

  Sensory disturbance: The magnitude of potential effects on ungulates from

sensory disturbance would generally be low given the mitigation measures to minimize residual impacts, such as construction buffers during critical periods and helicopter avoidance of mountain goats. The magnitude of cumulative effects from sensory disturbance is predicted to be also low, given lack of (for mining and hydroelectric projects) or minimal overlap of industrial noise with the proposed Project.

Vegetation removal: The magnitude of residual potential effects on ungulate habitat is considered to be low for mountain goat as minimal goat habitat may be impacted due its high elevation, and low for moose as sensitive moose habitat will be identified and special clearing prescriptions will be implemented to maintain as much as possible quality moose habitat. It should also be noted that the proposed Project may increase moose habitat, such as foraging areas. The magnitude of cumulative effects on ungulates is also predicted to be low, considering the distance between the proposed Project and the location of other industrial projects, and the amount of available ungulate habitat, but may be moderate depending on the timing and intensity of future forest development and subsequent forest regeneration.

Direct and indirect mortality: The magnitude for residual potential effects from the proposed Project on ungulates due to direct and indirect mortality resulting from collisions and increased access is low as a result of traffic management and access constraints to high value habitat for the proposed Project. The magnitude of cumulative effects on ungulate direct and indirect mortality for ungulates due to existing and future highway use and potential increased access resulting from future industrial projects is largely unknown, but may be low to moderate.

- **Probability:**

Vegetation removal: Effects to ungulate habitat associated with vegetation removal are high for moose and low for mountain goat. There is a moderate probability of sensory disturbance effects associated with the construction of the proposed Project, depending on the location and timing of construction activities. The probability of both direct and indirect mortality effects are considered to be low given traffic management, access constraints and other mitigation measures.

The probability of cumulative effects to moose habitat associated with vegetation removal is certain.

Sensory disturbance: The probability of cumulative sensory disturbance effects associated with the construction of the proposed Project in combination with other developments is considered low, primarily because of the distance and timing of other potential industrial projects.

Direct and indirect mortality: The probability of both cumulative direct and indirect mortality effects are considered to be moderate for moose and mountain goat given current and future highway use and access development .

- **Geographic Extent:** Potential effects from the proposed Project for ungulates are predicted to be at a local and site specific level for sensory disturbance, landscape level for vegetation removal, and sub-regional level for access. Habitat loss effects would be limited to the proposed Project footprint. Cumulative effects from the proposed Project in combination with other previous, ongoing and future activities would be minimal with respect to sensory disturbance, and sub-regional to regional regarding vegetation removal and direct mortality from existing and new access to ungulate habitat.
- **Duration and Frequency:** Sensory disturbance from construction effects on moose and mountain goats is considered to be short term and infrequent in nature. Effects on moose habitat from vegetation removal and increased access would be continuous and long term. Duration and frequency of cumulative effects relating to sensory disturbance are considered short term and intermittent for forestry operations and the construction of hydroelectric projects, and medium term for construction and operation of mining projects. The cumulative effects on ungulates from vegetation removal and access are considered to be continuous and long term.
- **Reversibility:**

  Effects on ungulates and ungulate habitat from the proposed Project are anticipated to be partially reversible as clearing and vegetation management prescriptions will incorporate wildlife and wildlife habitat values while meeting operational needs, particularly for ungulates that occupy low to mid height vegetation communities. Potential mortality effects for moose and mountain goat would not be reversible. Sensory disturbance effects are considered to be reversible for ungulates.

  Cumulative effects on ungulates from sensory disturbance from other previous, ongoing and future activities are also considered to be reversible for forest harvesting operations and hydroelectric projects, and partially reversible for mining projects. Cumulative effects on loss of ungulate habitat due to vegetation removal will be reversible for forest-related impacts through reforestation, and partially reversible for other developments, as some part of future projects will be subject to reclamation post construction and/or operation. For example, proposed mining projects will incorporate wildlife habitat objectives in mine reclamation plans. Direct mortality resulting from cumulative effects of increased industrial traffic on highways is not reversible. Indirect mortality resulting from cumulative

effects of increased access from previous, existing and future projects are considered partially reversible as a portion of access roads required for industrial construction and operation will be decommissioned, or, in the case of forestry operations, deactivated post harvesting.

- **Context:** Some areas of the proposed Project are relatively undisturbed while other portions of the proposed ROW are disturbed and habitat altered. UWRs are specifically managed under FRPA to maintain high quality ungulate habitat. Affected wildlife may be displaced to other high quality habitat. MOE and MNRO have a mandate to manage ungulate populations to maintain their viability and sustainability through habitat management and hunting limits.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse effects on Ungulate and Ungulate Habitat. Sensory disturbance will be short term, vegetation removal will be partially reversible and may create additional habitat of a different nature. There exists alternate high value habitat for wildlife at a landscape, sub-regional and regional level and direct and indirect mortality due to access has been minimized by access constraints committed to by the Proponent.

Bears

The Application reports that the alteration of land cover would occur in association with the clearing of the proposed transmission ROW, construction of the proposed substation and a potential construction camp, and the construction of permanent and temporary access roads. Potential impacts from land clearing may include impacts to black bear dens, however, bears have a large home range and the amount of habitat alteration potentially impacting bear dens is estimated to be small. Grizzly bears tend to den in high elevation areas not overlapped by the proposed Project. Furthermore, the Application predicts that good quality bear habitat would likely be increased by providing earlier snowmelt berry producing feeding areas in the ROW.

The Application also reports that sensory disturbance to bears could occur from sources such as noise from construction and maintenance equipment, visual disturbance from the presence of equipment or personnel along the proposed ROW, and vibrations associated with equipment operations or blasting. Disturbance generated by these sources have the potential to adversely affect bears through behavioural responses such as dispersal and habitat avoidance. Specific adverse effects to bears associated with sensory disturbance identified in the Application include the avoidance of the

immediate vicinity of construction activities by bears, however, bears have a large home range and the effect of displacement may be minimal.

Sensory disturbance to bears may be attributed to olfactory sources such as vehicle exhaust, human scent, or waste materials. Odours associated with food, incinerators, garbage, or sewage may act as bear attractants. The Application reports that the presence of these attractants poses indirect risks to bears as animals can incur harm by becoming habituated to the presence of people. Habituated bears can pose a threat to the safety of both humans and bears (i.e. attacks) and often necessitates bear relocation or destruction.

The Application reports that indirect mortality may occur as a result of new linear access into areas that were previously inaccessible or difficult to access. Local population declines could occur in certain circumstances where new access is created in high quality habitat which functions as spatial refugia for grizzly bears or generally where the proposed Project would result in new access for unregulated hunters.

Key mitigation measures proposed in the Application to address potential adverse effects on bears include:

Alteration of land cover:

- prior to construction, conducting surveys to identify and mark black bear dens to stake out a clearing buffer;
- the retention of environmental professionals, including an Independent Environmental Officer by BC Hydro and Environmental Monitors by contractors to guide, inspect, and evaluate the work of construction contractor(s); and,
- the completion of a detailed, site specific construction EMP prior to commencing construction.

Sensory disturbance:

- the implementation of a Noise Management Plan which would outline mitigation measures to minimize construction related noise; and,
- management of construction waste in consideration of wildlife concerns as outlined in the Wildlife and Wildlife Habitat Protection Plan and Construction Waste Management Plan. These plans would provide protocols for proper storage and removal of bear attractants, wastes, and sewage to prevent wildlife attraction.

Direct mortality:

- the mitigation of adverse effects associated vehicle collisions through measures such as signage in high-value wildlife areas and at known wildlife crossings;
- speed limits, and trimming vegetation at road crossings of the ROW to ensure visibility of animals at these locations; and,
- bear awareness training and protocols to deal with nuisance bears.

Indirect mortality due to increased access:

- In consultation with MOE and MOFR, and interested and potentially affected First Nations and Nisga'a Nation, the development and implementation of feasible and site-specific access control and management strategies, including the development of an Access Management Plan, to minimize increased access in important bear habitat in accordance with applicable legislation, permits, approvals, and ROW agreements;
- the development of an Access Plan prior to construction of the proposed Project;
- the utilization of existing roads for inspection and maintenance wherever necessary;
- avoidance of circle routes from and to the highway or main road to prevent easier access to hunters, and deactivating roads used only for construction and allowing them to revegetate naturally;
- deactivating temporary access roads post construction and returning area to its original state;
- restricting the total number of access points to high value bear habitat; and,
- retaining vegetation between the ROW and the road (where concerns over windfall can be mitigated) to minimize a direct line of sight to bears moving along the ROW.

Further mitigation measures are found in section 7.9.6.3 of the Application.

5.8.5 Project Issues and Effects on Bears and Proposed Mitigation Identified During Application Review

- MOE raised the concern regarding potential direct bear mortality in situations where construction activities near salmon spawning rivers during bear feeding may result in human-bear conflict that results in the destruction of bears for self protection reasons.
    - *Response*: the Proponent will avoid construction activities in areas where and when bears are feeding in salmon spawning reaches of rivers.

As for ungulates, First Nations, Nisga'a Nation and other members of the Working Group also raised the issue of cumulative impacts to bears, including cumulative effects from increased industrial traffic and increased hunting access as a result of the proposed Project which will potentially enable large scale industrial development in north-western BC. Responses and further mitigation measures outlined in the previous section for ungulates also apply to this section. No additional issues regarding bears were raised by the Working group during the Application review.

5.8.6 Conclusion

Potential for Residual Effects and Significance Analysis on Bears

In consideration of the EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects to bears as a result of the proposed Project due to:

- alteration of terrestrial habitat through vegetation removal;
- both direct and indirect mortality effects;
- sensory disturbance effects during construction; and,
- cumulative impacts.

Based on the existing and similar future development within the proposed Project Area as outlined in Table 4 of this report, EAO has considered the potential for adverse cumulative impacts on bears associated with the residual effects listed above. With respect to cumulative effects, the proposed Project could contribute to an increase in development along and adjacent to the Highway 37 corridor. Cumulative effects associated with this potential future development are primarily from mining and hydroelectric projects that are outside the 150 km study corridor, and it is assumed that there would be no overlap with respect to sensory disturbance. There are likely cumulative effects from ongoing and future forest development within the vicinity of the study area; however, the timing and distance from forestry activities are unknown, so the overlap with the residual sensory disturbance effects from the proposed Project cannot be predicted with any degree of certainty.

Similarly, there are potential cumulative effects from vegetation removal, particularly regarding impacts to black bear dens. Given the large home range of bears, there may be spatial overlaps, however the degree of spatial overlap is not known. There are likely to be cumulative effects on bears from forest development, both negative with respect to denning displacement, and positive with respect to higher quality forage habitat, however, the location and timing of timber harvesting and regeneration is not known.

There are potential cumulative effects with regard to direct mortality resulting from increased access from the proposed Project and existing and future access. These potential effects are considered in the significance analysis below.

EAO's analysis of the significance of potential residual effects on bears is as follows:

- **Magnitude:**

  Sensory disturbance: The magnitude of potential effects on bears from sensory disturbance would be low given the mitigation measures to minimize residual impacts, such as waste management to avoid bear attractants. The magnitude of cumulative effects from sensory disturbance is predicted to be also low, given lack of (for mining and hydroelectric projects) or minimal overlap in space and time of industrial noise with the proposed Project.

  Vegetation removal: The magnitude of residual potential effects on bear habitat is considered to be low as minimal Kermode and grizzly bear habitat is predicted to be impacted, bears dens will be flagged and avoided. It should also be noted that the proposed Project may increase bear habitat, such as berry foraging areas, resulting in a positive effect. The magnitude of cumulative effects on bear habitat is also predicted to be low, given the distance between the proposed Project and other known or future industrial projects.

  Direct and indirect mortality: The magnitude of direct bear mortality due to human-bear conflict is low, given commitments made by the Proponent to avoid construction activity near salmon spawning areas in grizzly bear feeding areas and bear awareness training for workers. The magnitude for residual potential effects from the proposed Project on bears due to direct and indirect mortality resulting from collisions and increased access is low as a result of traffic management and access constraints to high value habitat for the proposed Project. The magnitude of cumulative effects on direct and indirect mortality for bears due to existing and future highway use and potential increased access resulting from future industrial projects is largely unknown, but may be low to moderate.

- **Probability:** The probability of effects to bear habitat associated with vegetation removal is low as bear dens will be surveyed and avoided where possible. The probability of sensory disturbance effects associated with the construction of the proposed Project is considered low, depending on the location and timing of construction activities. The probability of both direct and indirect mortality effects are considered to be low given traffic management, human-bear management plans, access constraints and other mitigation measures.

  The probability of cumulative effects to bear habitat associated with vegetation

removal is low to moderate, mostly due to the uncertainty regarding effects from other industrial developments. The probability of cumulative sensory disturbance effects associated with the construction of the proposed Project in combination with other developments is considered low, primarily because of the distance and timing of other potential industrial projects. The probability of both cumulative direct and indirect mortality effects are considered to be moderate for bear given current and future highway use and access development .

- **Geographic Extent:** Potential effects from the proposed Project for bears are predicted to be at a local and site specific level for sensory disturbance, landscape level for vegetation removal, and sub-regional level for access. Habitat loss effects would be limited to the proposed Project footprint. Cumulative effects on bears from the proposed Project in combination with other previous, ongoing and future activities would be minimal with respect to sensory disturbance, and sub-regional regarding vegetation removal and regional with respect to direct mortality from existing and new access to bear habitat.
- **Duration and Frequency:** Sensory disturbance from construction effects on bears is considered to be short term and infrequent in nature. Duration and frequency of cumulative effects relating to sensory disturbance are considered short term and intermittent for forestry operations and the construction of hydroelectric projects, and medium term and continuous for construction and operation of mining projects. The cumulative effects on bears from vegetation removal and access are considered to be continuous and long term.
- **Reversibility:** Effects on bears and bear habitat from the proposed Project are anticipated to be partially reversible as clearing and vegetation management prescriptions will incorporate bear and bear habitat values while meeting operational needs. Potential mortality effects for bears would not be reversible. Sensory disturbance effects are considered to be reversible.

  Cumulative effects on bears from sensory disturbance from other previous, ongoing and future activities are also considered to be reversible for forest harvesting operations and hydroelectric projects, and partially reversible for mining projects. Cumulative effects on loss of bear habitat due to vegetation removal will be reversible for forest-related impacts through reforestation, and partially reversible for other developments, as some part of future projects will be subject to reclamation post construction and/or operation. Direct mortality resulting from cumulative effects of increased industrial traffic on highways is not reversible. Indirect mortality resulting from cumulative effects of increased access from previous, existing and future projects is considered partially reversible as a portion of access roads required for industrial construction and operation will be

decommissioned, or, in the case of forestry operations, deactivated post harvesting.

- **Context:** Some areas of the proposed Project are relatively undisturbed while other portions of the proposed ROW have already been disturbed, and habitat altered. Affected bears may be displaced to other high quality habitat as bears have a large home range that can accommodate displacement to a certain point. Bear populations in the northwest are considered healthy. MOE and MNRO have a mandate to manage bear populations to maintain their viability and sustainability through habitat management and hunting limits. Cumulative effects on wildlife mortality due to existing and new access may need to be monitored by relevant provincial agencies.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a Certificate), EAO is satisfied that the proposed Project is not likely to have significant adverse effects on Bears and Bear Habitat. Sensory disturbance will be short term and intermittent, vegetation removal will be partially reversible and may create additional feeding habitat. There exists alternate high value habitat for bears at a landscape, sub-regional and regional level and direct and indirect mortality due to access has been minimized by access constraints committed to by the Proponent.

Furbearers

The Application predicts that, during construction, furbearers may be adversely affected by direct habitat alteration, direct mortality and noise disturbance. The EA focussed primarily on martens and fishers, as both species are trapped in the region. Fishers are a provincially blue-listed species. The Application reports that habitat loss, such as marten denning and summer foraging habitat and closed canopy winter habitat, and fisher denning habitat, all found in mature forests, will occur as a result of alteration of land cover in association with the clearing of the proposed transmission ROW. The Application also states that large tracts of early seral stage habitat can act as a barrier to movement of marten and decrease fisher use of some areas. However, the Application states that while the amount of habitat potentially lost is relatively large for an individual marten whose current range overlaps the proposed ROW, the overall reduction in habitat is small across the study area. The potential loss of highly rated fisher habitat is estimated to be between up to 7.4%.

The Application indicates that the NTL Project is unlikely to have an effect on wolverine for two reasons. First, wolverine are habitat generalists and the clearing of the ROW will not adversely affect the ability of wolverine to survive. Second, wolverine are

unlikely to be impacted by increased hunting pressure due to access because they have a relatively low population density and large home-range, making them less sensitive to incremental increase in access to, and increased poaching within, any particular area. Furthermore, trapping is regulated, making it even less likely that there would be a significantly increase in trapping.

The Application indicates that potential direct mortality may occur as a result of tree felling and vehicle interaction. Clearing large cottonwood or spruce trees during marten and fisher birthing periods could cause incidental mortality of females and their offspring.

In addition, sensory disturbance to furbearers could occur from sources such as noise from construction and maintenance equipment, visual disturbance from the presence of equipment or personnel along the proposed ROW, and vibrations associated with equipment operations or blasting. Disturbance generated by these sources has the potential to adversely affect furbearers through behavioural responses such as dispersal and habitat avoidance, or physiological responses such as acute or chronic stress reactions. Carrion from vehicle incidents also act as an attractant to marten along access roads, which might also increase its mortality risk from vehicles and predators.

The Application reports that access into areas that were previously inaccessible or difficult to access could have adverse effects to furbearers as a result of increased trapping. However, the Proponent also indicates that areas of increased trapping mortality could be recolonized by dispersing juvenile furbearers.

Key mitigation measures proposed in the Application to address potential adverse effects on bears include:

Alteration of land cover:

- prior to construction, conducting surveys to identify and mark marten and fisher dens to stake out a clearing buffer;
- prior to construction, the survey, mapping and flagging of environmentally important features such as those identified in the pre-construction surveys listed above as well as the locations of any additional sensitive and important wildlife habitats or features, such as marten and fisher dens, and including the presence of regionally or locally identified sensitive species and species at risk;
- the retention of environmental professionals, including an Independent Environmental Officer by BC Hydro and Environmental Monitors by contractors to guide, inspect, and evaluate the work of construction contractor(s); and,
- the completion of a detailed, site specific construction EMP prior to commencing construction.

Sensory disturbance:

- the implementation of a Noise Management Plan which would outline mitigation measures to minimize construction related noise.

Direct mortality:

- the mitigation of adverse effects from vehicle collisions through measures such as signage in high-value wildlife areas and at known wildlife crossings; and,
- speed limits and trimming vegetation at road crossings of the ROW to ensure visibility of animals at these locations.

Indirect mortality due to increased access:

- in consultation with MOE and MOFR, and interested and potentially affected First Nations and Nisga'a Nation, the development and implementation of feasible and site-specific access control and management strategies to minimize increased marten and fisher trapping in accordance with applicable legislation, permits, approvals, and ROW agreements;
- the development of an Access Plan prior to construction of the proposed Project;
- the utilization of existing roads for inspection and maintenance wherever necessary;
- avoidance of circle routes from and to the highway or main road to prevent easier access to trappers; deactivating roads used only for construction and allowing them to revegetate naturally;
- deactivating temporary access roads post construction and returning area to its original state;
- restricting the total number of access points to furbearer habitat; and,
- retaining vegetation between the ROW and the road (where concerns over windfall can be mitigated) to provide cover for furbearers moving along the ROW.

No additional issues concerning furbearers were raised by the Working Group during the Application review.

5.8.7 Conclusion

Potential for Residual Effects and Significance Analysis on Furbearers

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation; EAO finds that there may be adverse residual effects to bears as a result of the proposed Project due to:

- alteration of terrestrial habitat through vegetation removal;
- direct and indirect mortality effects;
- sensory disturbance effects during construction; and,
- cumulative impacts.

Based on the existing and similar future development within the proposed Project Area as outlined in Table 4 of this report, EAO has considered the potential for adverse cumulative impacts on furbearers associated with the residual effects listed above. Cumulative effects associated with potential future development are primarily from mining and hydroelectric projects that are outside the 150 km study corridor, and it is assumed that there would be no overlap with respect to sensory disturbance. There are likely cumulative effects from ongoing and future forest development within the vicinity of the study area; however, the timing and distance of the forestry activities are unknown, therefore the overlap with the residual sensory disturbance effects from the proposed Project cannot be predicted with any degree of certainty.

Similarly, there are potential cumulative effects from vegetation removal, particularly regarding impacts to marten and fisher dens. The potential for spatial overlap between the proposed Project and ongoing and future hydroelectric and mining developments development is unlikely. There are potential cumulative effects on furbearer habitat from forest development, however, the location and timing of timber harvesting and regeneration is not known.

There are potential cumulative effects with regard to direct mortality from trapping resulting from increased access from the Project and existing and future access.

EAO's analysis of the significance of potential residual effects on furbearers is as follows:

- **Magnitude:**

  Sensory disturbance: The magnitude of potential effects on furbearers from sensory disturbance would generally be low given the mitigation measures to minimize noise impacts and manage wildlife attractants. The magnitude of cumulative effects from sensory disturbance is predicted to be also low, given lack of (for mining and hydroelectric projects) or minimal (forestry activities) overlap in space and time of industrial noise with the proposed Project.

  Vegetation removal: The magnitude of residual potential effects on furbearer habitat is considered to be low to moderate while an important portion of habitat loss may impact an individual furbearer, the overall loss of available furbearer habitat is predicted to be low. Further, the Proponent has committed to surveying and flagging marten and fisher dens to minimize vegetation removal at those sites. The

magnitude of cumulative effects on furbearer habitat is also predicted to be low for future hydroelectric and mining projects, given the distance between the proposed Project and other known or future industrial projects, and low to moderate for the forest industry, depending on the timing and location of harvesting.

Direct and indirect mortality: The magnitude of direct mortality to furbearers is low to moderate, given the Proponent's commitments to minimize any increase in new access to likely trapping areas, and to identify denning nests prior to tree felling. The magnitude for residual potential effects from the proposed Project on furbearers due to direct and indirect mortality resulting from collisions and increased access is low as a result of traffic management and access constraints, and the general avoidance of furbearers of areas lacking tree cover. The magnitude of cumulative effects on direct and indirect mortality of furbearers due to potential increased access resulting from future industrial projects is largely unknown, but are estimated to be low to moderate.

- **Probability:** The probability of effects to furbearer habitat associated with vegetation removal is high as mature and old growth forests, the preferred habitat of martens and fishers, will be impacted. The probability of sensory disturbance effects associated with the construction of the proposed Project is considered low, depending on the location and timing of construction activities. The probability of both direct and indirect mortality effects are considered to be low given traffic management, flagging of dens, access constraints and other mitigation measures.

  The probability of cumulative effects to furbearer habitat associated with vegetation removal is low to moderate, depending on the intensity of industrial and forestry activities. The probability of cumulative sensory disturbance effects associated with the construction of the proposed Project in combination with other developments is considered low, primarily because of the distance and timing of other potential industrial projects. The probability of both cumulative direct and indirect mortality effects are considered to be low for furbearers given current and future trapping growth.

- **Geographic Extent:** Potential effects from the proposed Project for furbearers are predicted to be at a local and site specific level for sensory disturbance, landscape level for vegetation removal, and sub-regional level for access. Habitat loss effects would be limited to the proposed Project footprint. Cumulative effects on furbearers from the proposed Project in combination with other previous, ongoing and future activities would be minimal with respect to sensory disturbance, and sub-regional regarding vegetation removal and direct mortality from trapping.

- **Duration and Frequency:** Sensory disturbance from construction effects on furbearers is considered to be short term and infrequent in nature. Duration and frequency of cumulative effects relating to sensory disturbance are considered short term and intermittent for forestry operations and the construction of hydroelectric projects, and medium term and continuous for construction and operation of mining projects. The cumulative effects on furbearers and furbearer habitat from vegetation removal and access are considered to be continuous and long term.
- **Reversibility:** Potential effects on furbearer habitat from the proposed Project are anticipated to be irreversible as clearing and vegetation management prescriptions will prevent mature forests on the proposed ROW, and partially reversible over the long term in areas where access will be returned to previous condition. Potential mortality effects for furbearers would not be reversible. Sensory disturbance effects are considered to be reversible.

  Cumulative effects on furbearers from sensory disturbance from other previous, ongoing and future activities are also considered to be reversible for forest harvesting operations and hydroelectric projects, and partially reversible for mining projects. Cumulative effects on loss of furbearing habitat due to vegetation removal will be reversible over the long term for forest-related impacts through reforestation, and partially reversible for other developments, as some part of future projects will be subject to reclamation post construction and/or operation. Direct mortality resulting from cumulative effects of increased trapping would not be reversible at an individual level, however, areas of increased trapping are expected to be repopulated by furbearers. Indirect mortality resulting from cumulative effects of increased access from previous, existing and future projects is considered partially reversible as a portion of access roads required for industrial construction and operation will be decommissioned, or, in the case of forestry operations, deactivated post harvesting.
- **Context:** Some areas of the proposed Project are relatively undisturbed while other portions of the proposed ROW are disturbed and habitat altered. Affected furbearers may be displaced to other high quality habitat. The marten population is considered relatively healthy in the region and is considered resilient to the above effects. Fishers are rarer and less resilient to population decline. MOE and MNRO havre mandates to manage trapping activities and furbearer populations to maintain their viability and sustainability through habitat management and trapline licenses.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a Certificate), EAO considers that there will be moderate adverse impacts to furbearers and furbearer habitat from the proposed Project as a result of habitat loss and potential direct mortality from increased trapping, especially for the blue-listed fisher, and potentially moderate cumulative effects from ongoing and future industrial projects. However EAO is satisfied that the proposed Project is not likely to have significant adverse effects on furbearers such that the viability of marten and fisher populations may be affected. There exists alternate high value habitat for furbearers at a landscape, sub-regional and regional level.

Sensory disturbance will be short term and intermittent, increased access to trapping areas will be minimized and furbearer habitat will be surveyed prior to construction.

Birds

The Application assesses the potential impacts from the proposed Project on three categories of birds: waterfowl, raptors and forest birds. There is a high diversity of birds from all three categories in the proposed Project area and it is expected that potential effects may result from habitat alteration, sensory disturbance and direct mortality.

The Application predicts that the effects of habitat alteration from clearing will affect different species in different ways. High value raptors nests are located in mature and old growth forests. The construction of the proposed Project is expected to remove a relatively low portion of raptor nesting habitat within vicinity of the proposed Project area. Furthermore, the Application states that raptors may also build nests on transmission structures, which can also provide perches. ROW clearing can also enhance hunting opportunities for raptors. Raptors have also been found to be tolerant of habitat alteration near their nests.

Waterfowl habitat consists mainly of staging areas during migration and breeding habitat. Waterfowl nests are typically found near waterbodies, such as wetlands, marshes and lakes, or for some species, in cavities of mature and old growth forest. The Application states that the proposed Project would generally avoid construction in open water and wetland areas for engineering purposes, and wetland vegetation is sufficiently low to avoid clearing. The Application states that there are 62 species of forest birds occupy a diverse array of habitats ion the proposed Project area. The effects of vegetation clearing would result in some reduction in habitat of forest-interior

species, but would increase habitat for other forest bird species that prefer more open areas and forest edges, such as the blue-listed barn swallow.

Key mitigation measures proposed in the Application to address potential adverse effects associated with alteration of land cover include:

- the retention of environmental professionals, including an Independent Environmental Officer by BC Hydro and Environmental Monitors by contractors to guide, inspect, and evaluate the work of construction contractor(s);
- the completion of a detailed, site specific construction EMP prior to commencing construction;
- the completion of environmental surveys prior to construction, focussing on the identification and marking of forest bird nests, waterfowl nests and raptor nests;
- conducting clearing outside of raptor and waterfowl breeding periods where active nests are found;
- adhering to buffer zones around identified active raptor, forest bird and waterfowl nests during sensitive periods; and,
- maintaining or relocating inactive raptor nests or nests found outside of breading season.

The Application reports that sensory disturbance to birds could occur from sources such as noise from construction and maintenance equipment, visual disturbance from the presence of equipment, personnel, or aircraft along the proposed ROW, and vibrations associated with equipment operations or blasting. Disturbance generated by these sources have the potential to adversely affect bird species through abandonment of certain habitats and behaviour alteration. Loud noise may also interfere with territorial or breeding vocalization. The Proponent notes that noise disturbance effects to birds would occur during an average 2 to 4 week construction period during the breeding season at any one location.

Key mitigation measures proposed in the Application to address potential adverse effects associated with sensory disturbance include:

- project construction would follow a Noise Management Plan which would outline mitigation measures to minimize construction related noise; and,
- construction would be avoided during sensitive periods, e.g. during the breeding season near identified active raptor, waterfowl and forest bird nests and a buffer zone, free of human activity and noise would be implemented, as outlined in the Wildlife and Wildlife Habitat Protection Plan.

The Application reports that direct mortality to birds may occur as a result of vehicle collision, collision with transmission lines and electrocution. However, the configuration and spacing between conductors is proposed to be greater than the 1.5 m distance recommended for eagles, one of the species with the greatest wingspans. Waterfowl are also sensitive to collisions with transmission lines because of their poor manoeuvrability. While the Application predicts that direct mortality from electrocutions and collisions to be rare, they are expected in high use areas such are near waterbodies.

Key mitigation measures proposed in the Application to address potential adverse effects associated with direct mortality include:

- the mitigation of adverse effects associated vehicle collisions through measures such as signage in high-value wildlife areas and at known wildlife crossings;
- speed limits, and trimming vegetation at road crossings of the ROW to ensure visibility of animals at these locations; and,
- the mitigation of direct mortality to birds associated with conductor strikes via the adoption of BMP proposed by the Avian Power Line Interaction Committee (APLIC 2006), including spacing conductors greater than 1.5 m apart.

Further mitigation proposed by the proponent can be found in section 7.9.6.5 of the Application.

5.8.8 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- EC raised concern regarding Olive-sided Flycatcher
- (OSFC) that is currently listed on Schedule 1 of the SARA as "threatened". EC also raised the concern about unavoidable incidental harm to migratory birds and their nests.
    - *Response:* Olive-sided Flycatcher was considered within the VC "Forest Birds". Forest edge created by the proposed ROW clearing will potentially enhance habitat. Effects of noise, mortality and disturbance are assumed to be similar to those for other VC Forest Birds. Mitigation measures, including pre-construction surveys to identify bird nests, will include OSFC and is part of the management plan. If active nests are identified, they will receive protection afforded by best practices. In order to mitigate any potential effects of herbicides on amphibians, herbicides will not be used

within the riparian areas of wetlands or watercourses in order to maintain proper buffers. Best management practices for conserving migratory birds will be adopted and potential effects on migratory birds addressed as part of the Wildlife and Wildlife Habitat Protection and Mitigation Plan. (see response below relating to Coastal Tailed Frog)

5.8.9 Conclusion

Potential for Residual Effects and Significance Analysis on Birds and Bird Habitat

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation; EAO finds that there may be adverse residual effects to Birds and Bird Habitat as a result of the proposed Project due to:

- alteration of terrestrial habitat through vegetation removal;
- direct mortality effects;
- sensory disturbance effects during construction; and,
- cumulative impacts.

Based on the existing and similar future development within the proposed Project Area as outlined in Table 4 of this report, EAO has considered the potential for adverse cumulative impacts on Bird and Bird Habitat associated with the residual effects listed above. Cumulative effects associated with this potential future development are primarily from mining and hydroelectric projects that are outside the 150 km study corridor, and it is assumed that there would be no overlap with residual project effects. There are likely cumulative effects from ongoing and future forest development within the vicinity of the study area; however, the timing and distance from forestry activities are unknown, so the overlap with the residual effects from the proposed Project cannot be predicted with certainty as the location and timing of timber harvesting and regeneration is not known.

EAO's analysis of the significance of potential residual effects on birds and bird habitat is as follows:

- **Magnitude:** The magnitude of potential effects on birds from sensory disturbance would generally be of low given the avoidance and mitigation measures to minimize residual impacts. The magnitude of cumulative effects from sensory disturbance is predicted to be also low, given lack of, or minimal overlap with, the proposed Project.

  The magnitude of potential effects on bird habitat is expected to be negligible for raptors and waterfowl, low for interior forest birds, and beneficial for edge-

dwelling forest birds given the avoidance and mitigation measures, such as maintenance or relocation of nests. The magnitude of cumulative effects on bird habitat is predicted to be low to moderate, depending on the timing and intensity of future forest development and subsequent forest regeneration.

The magnitude for residual potential effects from the proposed Project on birds due to direct mortality from collisions and electrocution is expected to be low for waterfowl, and negligible for forest bird and raptors. The magnitude of cumulative effects on bird mortality due to existing and future planned access for industrial projects is low given the lack of spatial and temporal overlap of causes of direct mortality.

- **Probability:** Probability of effects to bird habitat associated with vegetation removal is considered low for interior forest birds, and negligible for other bird species. The probability of sensory disturbance effects on birds associated with the construction of the proposed Project is considered low, given the mitigation measures proposed. The probability of direct mortality effects is considered to be high for waterfowl, and low for raptors and forest birds

  The probability of cumulative effects to bird habitat associated with vegetation removal is certain. The probability of cumulative sensory disturbance effects associated with the construction of the proposed Project in combination with other developments is considered low. The probability of cumulative direct mortality effects are considered to be low.

- **Geographic Extent:** Potential effects from the proposed Project for all bird species are predicted to be at a local and site specific level for sensory disturbance and direct mortality, and landscape level for vegetation removal. Habitat loss effects would be limited to the proposed Project footprint. Cumulative effects from the proposed Project in combination with other previous, ongoing and future activities would be at a landscape level with respect to sensory disturbance, and sub-regional regarding vegetation removal, mainly as a result of forestry activities.

- **Duration and Frequency:** Sensory disturbance from construction effects are considered to be short term and infrequent in nature. Effects on birds and bird habitat from vegetation removal would be on one occasion and short term for waterfowl and raptors, and continuous for interior forest birds. Beneficial effects of vegetation alteration on edge dwelling forest birds would be continuous and long term. Duration and frequency of direct mortality from electrocution and collision with transmission lines is expected to be sporadic and long term. Duration and frequency of cumulative effects relating to sensory disturbance and vegetation removal is considered similar to direct project effects.

- **Reversibility:** Effects on birds and bird habitat from the proposed Project are anticipated to be reversible for waterfowl, partially reversible for raptors, and irreversible for interior forest birds. Sensory disturbance effects are considered to be reversible for all bird species. Direct mortality from vehicle collisions are considered reversible once construction in the area is completed, and non reversible for electrocution and transmission line collisions.

  Cumulative effects regarding sensory disturbance from other previous, ongoing and future activities are also considered to be reversible for forest harvesting operations. Cumulative effects on loss of habitat due to vegetation removal will be reversible for forest related impacts through reforestation, and partially reversible for other developments, as some part of future projects will be subject to reclamation post construction and/or operation. Direct mortality resulting from cumulative effects is not considered reversible.

- **Context:** Bird populations in the region are considered stable. Most birds are expected to temporarily alter their use of areas near construction activities. There is a considerable amount of suitable bird habitat in the region.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a certificate), while EAO considers that there will be low impacts to bird and bird habitat from the proposed Project and as a result of cumulative effects respectively, EAO is satisfied that the proposed Project is not likely to have significant adverse effects on Bird and Bird Habitat. Sensory disturbance will be short term, vegetation removal will be partially reversible and may create additional habitat of a different nature, there exists alternate high value habitat for birds at a landscape, sub-regional and regional level and direct mortality has been minimized to the extent possible by Proponent commitments.

Amphibians

The Application focussed primarily on western toads as a representative amphibian species, and predicted that vegetation removal related to clearing of the proposed ROW could result in potential adverse effects to amphibians via habitat loss or alteration and direct morality.

Western toads were observed in the proposed Project area and occupy a variety of terrestrial and aquatic habitats over their life stages; spring breeding requires aquatic sites, such as ponds and wetlands, whereas summer foraging and winter hibernation requires terrestrial habitat. The Application states that while vegetation clearing would alter vegetation in the ROW, it is anticipated that western toads would still be able to use the altered terrestrial habitat, therefore the assessment focused on the western

toad aquatic habitat. Western toad breeding habitat, such as marshes and shallow open water, are not expected to be substantially altered by the proposed Project. There are also expected cumulative effects as a result of forestry-related; for example, the Application suggests that tadpole numbers are lower in areas where logging has removed riparian vegetation. This effect is thought to be a product of increased water temperature through removal of riparian vegetation, stream siltation and disturbance, and alteration of riparian conditions such as coarse woody debris

The Application also found that the proposed Project may result in direct mortality to amphibians as a result of heavy machinery operating during breeding and emergence periods and other vehicles moving through the area.

Key mitigation measures proposed in the Application to address potential adverse effects associated with alteration of land cover and direct mortality include:

- the retention of environmental professionals, including an Independent Environmental Officer by BC Hydro and Environmental Monitors by contractors to guide, inspect, and evaluate the work of construction contractor(s);
- the completion of a detailed, site specific construction EMP prior to commencing construction;
- the completion of environmental surveys prior to construction, focussing on the identification and marking of western toad breeding ponds;
- the avoidance of use of machinery and associated construction activities in identified breeding ponds during breeding and emergence periods; and,
- the avoidance of impacts to wetlands, and, if wetland extent and function is impaired as a result of the proposed Project, a wetland compensation plan.

5.8.10 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, and Nisga'a Nation. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- EC and Nisga'a Nation raised a concern that the Coastal Tailed Frog (Schedule 1 SARA) is not included as a VC in the Application.
    - *Response:* The Proponent stated that the Coastal Tailed Frog was excluded as a VC because it was addressed through the assessment of fish habitat and wetlands. Alteration to riparian areas was addressed in the fish habitat effects assessment and in the effects assessment of wetlands, and it was concluded that there would be no net loss of

wetlands and disturbance to riparian habitat would be minimal. Consequently, it is unlikely there would be adverse residual effects from the proposed Project on Coastal Tailed Frogs. BC Hydro recognizes the potential for existence of Coastal Tailed Frogs along southern portions of the proposed Project and the construction EMP will describe appropriate management and any required mitigation for this species. In addition, tailed frog habitat modeling was undertaken for the portion of the route between Terrace and
New Aiyansh, and habitat management guidelines for Coastal Tailed Frog will be applied to wetlands and stream that may support this species.

- On September 24, 2010 the Proponent submitted a memorandum describing their methodology for assessing Coastal Tailed Frog for environmental management plan implementation of vegetation clearing prescriptions.
- The Proponent conducted a supplementary Coastal Tailed Frog study and provided the study results to EAO and the Working Group as supplementary information in November 2010 (see Appendix 8, Coastal Tailed Frog Pre-Construction Field Survey Summary Report, attached to this Report).
- The Proponent has committed that if in-stream work is necessary that such work would be conducted outside the Coastal Tailed Frog reduced risk window (October 1st to May 1st) at stream crossings identified as potential Coastal Tailed Frog Habitat.
- The Proponent has committed to apply habitat management guidelines for coastal-tailed frog, as identified in the provincial identified Wildlife Management Strategy, to wetlands and streams that may support this species.
- The Proponent also committed to the following mitigation measures developed based on applicable measures from the General Wildlife Measures in the Kalum SRMP (2006), which proposes mitigation measures for forestry in identified Tailed Frog wildlife habitat areas, and Provincial BMP established for amphibians inhabiting fast-flowing streams (MWLAP 2004), specifically:

1. Maintain a 30 m management area around the streams where no heavy equipment would be driven and hand clearing practices would be used wherever machinery cannot reach. Trees will be felled and yarded away from the streams to the extent possible.
2. Develop clearing prescriptions for the 30 m management area to maximize vegetation retention while ensuring electrical safety. The clearing prescriptions will also include provisions for habitat augmentation

through retention of large woody debris where available and where it will not pose a wildfire risk.

3. Require clearing contractors to prepare and implement a Sediment and Erosion Control Plan (EAC Application, Section 11.2.2.6), which will include measures to avoid siltation of stream habitats.
4. Avoid constructing road crossings where practical. Should road crossings be required, temporary clear span structures will be used.

Vegetation management during operation and maintenance of the line will be conducted in accordance with the AWPRV (BCTC 2003) and, if warranted, BC Hydro will work with BC MOE to develop site specific BMPs that maintain Tailed Frog habitat values while maintaining electrical safety.

5.8.11 Conclusion

Potential for Residual Effects and Significance Analysis on Amphibians and Amphibian Habitat

In consideration of the EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects to Amphibian and Amphibian Habitat as a result of the proposed Project due to:

- alteration of terrestrial habitat through vegetation removal;
- direct mortality effects; and,
- cumulative impacts.

Based on the existing and similar future development within the proposed Project Area as outlined in Table 4 of this report, EAO has considered the potential for adverse cumulative impacts on Amphibians and Amphibian Habitat associated with the residual effects listed above. With respect to cumulative effects, the proposed Project could contribute to an increase in development along and adjacent to the Highway 37 corridor. Cumulative effects associated with this potential future development are primarily from mining and hydroelectric projects that are outside the 150 km study corridor, and it is assumed that there would be no overlap with respect to effects on amphibians. There are likely cumulative effects from ongoing and future forest development within the vicinity of the study area, however, the timing and distance from forestry activities are unknown, so the overlap with the effects from the proposed Project cannot be predicted with any certainty.

EAO's analysis of the significance of potential residual effects on amphibians and amphibian habitat is as follows:

- **Magnitude:** The magnitude of potential effects on amphibian habitat as a result of vegetation clearing is predicted to be low, given the mitigation measures that included avoidance and habitat replacement. The magnitude of cumulative effects from habitat alteration is predicted to be low, given lack of (for mining and hydroelectric projects) or minimal overlap with the propped Project, but may be low to moderate as a result of forestry operations, although the timing and location of future activities are not known.

  The magnitude for residual potential effects from the proposed Project on amphibians due to direct mortality resulting from heavy machinery operation near breeding and emergence areas, and as a result of other vehicular traffic is expected to be low, given the proposed mitigation measures. The magnitude of cumulative effects on amphibian is not known.

- **Probability:** The probability of effects to amphibian habitat associated with vegetation removal is low. The probability of direct mortality effects are considered to be low given timing constraints and avoidance.

  The probability of cumulative effects to amphibian habitat associated with vegetation removal is low to moderate, depending on the intensity and timing of forest development. The probability of cumulative direct mortality effects is unknown.

- **Geographic Extent:** Potential effects from the proposed Project for amphibians are predicted to be at a local and site specific level for vegetation removal and direct mortality. Habitat loss effects would be limited to the proposed Project footprint. Cumulative effects from vegetation removal and direct mortality would be at a sub-regional to regional level.

- **Duration and Frequency:** Construction effects on amphibian habitat are considered to be short term and infrequent in nature. Effects on amphibian mortality would be sporadic and short term. Duration and frequency of cumulative effects from vegetation removal and direct mortality is considered similar to direct project effects.

- **Reversibility:** Effects on amphibians and amphibian habitat from the proposed Project are anticipated to be reversible as clearing and vegetation management prescriptions will incorporate amphibian and amphibian habitat values while meeting operational needs. Any loss of wetland habitat will be restored through a wetland compensation plan. Potential mortality effects would be largely reversible once construction (i.e. heavy machinery and increased vehicle use) ends.

  Cumulative effects on loss of amphibian habitat due to vegetation removal are considered partially reversible for forest related impacts through reforestation,

and partially reversible for other developments, as some part of future projects will be subject to reclamation post construction and/or operation. Direct mortality resulting from cumulative effects are deemed to be partially reversible as a portion of access roads required for construction will be decommissioned, or, in the case of forestry operations, deactivated post harvesting, and use of roads diminish post construction.

- **Context:** The Coastal Tailed Frog is a SARA listed species. .

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of a certificate), while EAO considers that there will be low impacts to amphibians and amphibian habitat from the proposed Project, EAO is satisfied that the proposed Project is not likely to have significant adverse effects on Amphibians and Amphibian Habitat. Amphibian habitat is likely to be minimally impacted, if at all, given the commitment for wetland compensation, and given that mitigation measures will minimize direct mortality to amphibians.

6 Assessment of Potential Economic Effects

This section provides an assessment of potential economic effects related to the proposed Project. The assessment considered the following economic valued components:

- employment and business opportunities,
- education, training and skills development;
- income;
- government revenues;
- private property values and businesses; and,
- Nisga'a Nation and First Nations interests

6.1 Economic Effects

6.1.1 Background Information

The Proponent collected general socio-economic baseline information and reviewed publicly available statistics and information for the assessment. The Study Area for the assessment includes the Regional District of Kitimat-Stikine (RDKS), Terrace, Stewart, several rural settlements (Old Remo, Rosswood, Irene Meadows, Nass Camp, Bell 2, and Bob Quinn Lake), and the communities of First Nations and Nisga'a villages (listed in Table 7.12-1 in the Application). A high level economic overview was conducted for the Regional Area and the province.

Forestry and mining are the main sources of economic activity and employment in RDKS. Other sources of economic activity within the RDKS include manufacturing industry, construction, agriculture, fishing, hunting, commercial recreation and transportation.

In 2006, unemployment rates in Terrace (9%) and the RDKS (14%) were higher than the provincial average of 6%. Employment in forestry has decreased due to the closure of mills and processing facilities in the area. The majority of employment in Terrace is associated with sales and service, trades, transportation, equipment operation, and clerical positions in business, finance and public administration.

In Stewart, with the closing of the last operating mine in the 1980's, the economy has shifted from mining to forestry to one that is dominated by the public sector.

In rural communities, economic activities include heli-skiing and fishing, road-side services, accommodations and camp services for forestry and other industries, and developing eco-tourism opportunities.

The Application describes the sources of economic activity in the Nisga'a villages to include public sector employment, fishing and forestry. NLG has established, and presently operates, fishery, forestry and communication companies, and is actively developing tourism opportunities in the region, focusing on Nisga'a culture and the natural environment.

The Application states that all of the First Nations (listed in Table 7.12-1 of the Application) have established and/or operate an independent business in one of the following sectors: fisheries, forestry, mining, tourism, education and training, construction and other industrial or resource sectors, for example:

- the Kitselas Forest Products Ltd. operates two forest licences;
- the Metlakatla Development Corporation owns and operates the Metlakatla Forestry Corp., First Nations Training and Development Centre, and various tourism, and marine and ferry services;
- Lax Kw'alaams First Nation, through Coast Tsimshian Resources Ltd, has harvesting rights within Tree Farm Licence 1 which crosses the proposed project. Lax Kw'alaams First Nation is also involved in other economic ventures such as fishing and fish processing;
- Gitxsan Hereditary Chiefs are involved in various economic initiatives related to mining and infrastructure development, and Skii km Lax Ha's Tsetsaut Ventures, provides services to mining exploration camps;
- Gitanyow Hereditary Chiefs are involved in economic development related to forestry; and,
- Tahltan Nation Development Corporation provides services to local industry, including mining and mineral exploration, and Bear Dog Enterprises provides catering services to mining operations and other development projects within the Tahltan territory.

Although Nisga'a Nation and First Nations (listed in Table 7.12-1 of the Application) are involved in economic initiatives within the proposed Project Area, and employ some Nisga'a citizens, the unemployment levels in the Nisga'a villages and First Nations communities remain substantially higher than the provincial unemployment level.

During consultation with the Proponent, First Nations and Nisga'a Nation expressed an interest in employment opportunities expected to be generated by the proposed Project.

6.1.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

Construction Impacts

Economic Opportunities

The Application states that during construction and restoration, the proposed Project is expected to provide economic opportunities, including increased employment, business opportunities, increased household income, and government revenues to the northwest and the province. The total economic effects from the proposed Project Construction are summarized in Table 6 below.

The Proponent estimated the assessment of potential economic opportunities from the BC Stats input-output model (discussed in the Economic Modeling Results in Appendix 7.12-2 of the Application). The model provides estimates for anticipated provincial output and gross domestic product (GDP), employment, household income and government revenues.

The Proponent anticipates that the construction period, over three years, of the proposed Project would generate:

- 860 full time equivalents (FTE[5]) or person-years of direct employment, and approximately 550 direct "jobs" in supply industries,
- 925 indirect and induced jobs during construction (255 indirect jobs with suppliers and 670 induced jobs through a variety of industries);
- increased local and regional business opportunities created by the demand to supply goods and services related to construction activities;
- GDP contributions from construction of $234.9 million, including $126.2 million as a direct result of project construction, and direct ($43.8 million) indirect ($17.4 million) and induced ($47.6 million) from supply industry contributions;
- $173.4 million in household income through employment created by the proposed Project over the total construction period ($110 million to direct employees, $24.1 million to direct supplier employment, $11.3 million to indirect industry employment, and $28.2 million to induced employment); and,
- directly from the proposed Project, an estimated $31.6 million in government tax revenues ($19.8 million to federal government and $11.8 million to provincial

[5] *The total jobs estimate includes both Project employment ("FTE") and supply industry employment ("jobs"). This assumes that FTE and the number of jobs are interchangeable; however, as "jobs" may be full-time, part-time, temporary, or seasonal, it is possible that the number of jobs may be an overestimate of FTE (or FTE an underestimate of the number of jobs). Note: Employment estimates are based on annual average wages in 2007. Numbers may not add up due to rounding. Source: BC Stats (BC Stats 2009)*

government) and an estimated $23.6 million in government tax revenues from direct, indirect, and induced suppliers ($11.3 million to federal government, $10.4 million to provincial government and $1.9 million to municipal governments).

Table 6: Total Economic Effects from the Proposed Project Construction

	CDN$ (Millions)			
	Direct	**Indirect**	**Induced**	**Total**
Project construction expenditures	$299.6	-	-	-
Change in supply industry output	$84.3	$43.9	$79.1	$207.2
Project contribution to GDP	$126.2			$126.2
Supply industry contribution to GDP	$43.8	$17.4	$47.6	$108.7
Total contribution to GDP				$234.9
Project employment (# of person-years, or FTE)	860			860 (FTE)
Supply industry employment (# of jobs)	552	257	670	1,479 (“jobs”)
Total Employment (jobs)				2,339*
Project addition to household income	$109.7	-		$109.7
Supply industry addition to household income	$24.1	$11.3	$28.2	$63.6
Total addition to Household Income				$173.4
Project derived federal government net revenue	$19.8			$19.8
Project derived provincial government net revenue	$11.8			$11.8
Total Project Government Net Revenue	$31.6			$31.6
Supply industry derived federal government net revenue	$3.3	$1.4	$6.6	$11.3
Supply industry derived provincial government net revenue	$2.4	$1.1	$6.9	$10.4
Supply industry derived municipal government net revenue	$0.4	$0.3	$1.2	$1.9
Total Supply Industry Government Net Revenue	$6.1	$2.8	$14.7	$23.6
Total Government Net Revenue				$55.2

Private Properties

The Proponent identified 42 private properties along the proposed transmission line corridor, and six properties which may be potentially impacted by the proposed Project.

The presence of the proposed Project may affect the economic value of the property or business opportunities along the Project route. Through consultation, residents of Old Remo, Rosswood and Irene Meadows expressed concerns about the impact of project related construction activities to potentially impact residents’ quality of life related to environmental disturbances and changes to visual quality, loss of valued landscape

features, decreased water quality, and increased traffic, noise, dust associated with ROW clearing, structure assembly or conductor stringing.

Nisga'a Nation and First Nations

The Proponent anticipates that Nisga'a Nation and First Nations would benefit from potential employment and contracting, increased income and training opportunities generated by the construction of the proposed Project. The Proponent would support Nisga'a Nation and First Nations involvement in forestry activities associated with construction, including timber clearing and harvesting, and aboriginal forestry venture opportunities. Nisga'a Nation and First Nations individuals and businesses would have the opportunity to apply for jobs and bid on contracts associated with the construction.

Operation Impacts

The potential economic effects associated with the operation and maintenance of the proposed Project would be limited to the ROW maintenance and inspections. During operation and maintenance, the proposed Project is expected to increase, although minimally, employment, business opportunities, household income, and government revenues.

Economic Opportunities

The Proponent estimates that 0.334 FTE of employment would be required to maintain the entire length of the proposed transmission line, annually, for the first twenty years. During years 21 to 30, 0.688 FTE of employment, annually, is anticipated; 1.032 FTE for years 31 to 40; and 1.376 FTE of employment for years 41 to 50. New employment is not required for the operation and maintenance of the substations as the work is expected to be minimal and would be undertaken by existing staff.

The Proponent estimates that the total annual property taxes for the proposed Project would be $1.5 million. The proposed Project would support economic development for the communities in the northwest through the provision of electricity for potential mining and other industry developments, and the potential to interconnect with independent power producers. While estimates from reasonably foreseeable proposed future projects as identified in Table 4 are not known, the cumulative economic benefits though taxation of proposed projects dependent on the Northwest Transmission Line would be significant. For example, for the two projects that have received an EA Certificate, the Galore Creek Copper-Gold-Silver Project's estimated capital cost is $1.6 billion and would create up to 1,000 jobs during the construction phase and approximately 500 direct employees during the operations phase over the 20 year life of the mine; whereas the Red Chris Porphyry Copper-Gold Mine Project's estimated

capital cost is approximately $228 million and would employ a workforce of 250 employees during its 25 year operation.

Private Properties

Through the Proponent's consultation, the issue of the potential effect on property values from the operation of the proposed Project was raised by the landowners along the proposed transmission line route. The Proponent reports in the Application that the presence of the proposed Project infrastructure and ROW may result in decreased market and heritage values on the properties located along the proposed transmission line route. Property based businesses in close proximity to the proposed Project may also be potentially affected by the project-related operation activities.

The Proponent conducted a preliminary appraisal of 42 potentially affected properties along the proposed transmission line route, (identified in Figures 7.12-3a to 7.12-3 c and listed in Table 7.12-5 and in the Application) in September 2009, to determine the degree of expected change in the market value of each property. The preliminary appraisal concluded that the estimated change in the market value of six properties is expected to be low to moderate.

The proposed Project could impact property-based businesses including tourist accommodations, roadside services, heli-skiing, fishing tours, explosive storage, manufacturing aircraft landing gear and a private airstrip, hay farm, merchantable timber, and proposed economic developments. The potential effects may include:

- changes to visual quality and perceived heath concerns may discourage tourists and tourism development;
- loss of potentially merchantable timber prematurely removed from properties to accommodate the ROW clearing, and loss of future income;
- application of herbicides along ROW could be detrimental to hay farming in the area; and,
- physical presence of infrastructure could inhibit business activities or future developments.

Nisga'a Nation and First Nations

Nisga'a Nation and First Nations individuals and businesses would have the opportunity to apply for jobs associated with the proposed Project operation, such as vegetation management and other maintenance activities. The Application states that employment, training, business, and other opportunities could be enhanced through further discussion with the Proponent.

Summary of Mitigation Proposed in the Application

Mitigation strategies proposed to avoid or minimize potential economic effects include:

- minimize noise, dust, and disturbances, to reduce the potential impact on the environment and the aesthetic quality from construction activities, on the nearby properties;
- keep landowners and residents informed of project construction related activities and potential disturbances;
- negotiate appropriate compensation with landowners whose property values may decrease due to the operation of the proposed Project;
- develop additional mitigation measures, if required, and negotiate appropriate compensation, where necessary, with landowners whose business (i.e. tourism, timber, and small aircraft) property may be affected by the operation of the proposed Project;
- place marker balls on the transmission line to reduce potential aircraft hazards to not impede helicopter flights to and from heli-skiing operations; and,
- manage vegetation in accordance with the vegetation management plan to ensure ALR and hay farms are not affected by the application of herbicides.

6.1.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

Comments received from the public (individuals, business and municipalities) during the Application review were focused on the potential economic benefits of the Proposed Project.

Issues raised by the Working Group, First Nations, Nisga'a Nation, and members of the public, and the Proponent's responses, and EAO's assessment of the adequacy of responses are detailed in Appendix 2. Key issues and responses include the following:

- Members of the public indicated that consideration should be given by the Proponent to provide opportunities for local contractors and suppliers to bid on appropriate parts of the proposed Project.
    - *Response:* Under the Agreement on Internal Trade, BC Hydro is unable to specify that its contractors must hire other types of local contractors. However, as is the case with most major projects of this size and complexity, it is likely that short-listed contractors will be looking for services from local subcontractors. The Proponent believes that there are many qualified local firms in Northwest BC that could provide subcontractor services. The Proponent encourages local firms to make the shortlisted contractors aware of their expertise.

    - The Proponent indicates that a significant amount of ROW and access clearing work would be awarded locally by the Proponent
- First Nations, Nisga'a Nation, and local residents raised the issue of removing 360 Ha of pine mushroom habitat with no plans to compensate for the potential loss of revenue and country food.
    - *Response:* The pine mushroom is the most economically important wild mushroom harvested in BC (Wiensczyk and Berch 2001). Loss of pine mushroom habitat would be permanent along the ROW. There is no mitigation planned for the permanent and temporary alterations of pine mushroom habitats. This residual effect is rated low magnitude because a relatively small proportion (2%) of the available pine mushroom habitat in the area would be removed.

- Gitanyow raised the issue of the lack of assessment of culturally significant values in the Application.
    - *Response:* Culturally significant values are not expected to be effected by the proposed Project due to the short duration of the construction phase and the limited employment and business opportunities expected to result directly from the proposed Project after construction. The Application identifies culturally significant areas and activities related to land and resources for all potentially affected First Nations and Nisga'a Nation (7.11.1.10). The Proponent has committed to hiring First Nations cultural monitors during the construction of the proposed Project, thereby avoiding or minimizing potential effects on cultural values.

- First Nations, the Nisga'a Nation and the public raised the issue of data availability and appropriateness of the socio-economic profiles.
    - *Response:* The use of publically available information is standard practice in EA's. As gaps in these data were recognized, particularly with respect to First Nations census data, attempts were made to engage First Nations and Nisga'a Nation to ensure that representative baseline information is included in the EA process. However, this information was not always made available or was made available too late to be included in the baseline research process. In the absence of accurate and representative statistics, qualitative descriptions of socio-economic characteristics are used. The Application includes socio-economic profiles for affected First Nations in the Socio-Economic Baseline Report (Appendix 7.12, Sec 6.6).

- First Nations and Nisga'a Nation have expressed interest in accessing training opportunities through the proposed Project in order to access employment

opportunities. There is some concern that any training for this project will not lead to permanent job positions or careers.

- *Response:* BC Hydro is working in close partnership with the Nisga'a Nation and those First Nations who may be impacted by the proposed Project to develop employment and training programs. The purpose of these programs is to provide training and skills development to assist aboriginal people and companies with securing employment related to the construction of the proposed Project and pursuing longer term economic opportunities. BC Hydro is currently sponsoring skills training in six communities. BC Hydro is currently working with a number of First Nations and the Nisga'a Nation to discuss the potential impacts and benefits of the proposed Project, including education and training opportunities, employment and contracting opportunities, and economic development opportunities. BC Hydro is leading the development of a proposal to the Federal Government for funding for a long-term training initiative. The Proponent has clearly stated that most economic benefits from the project will come from the construction phase and that little employment will be generated in the operation of the project.

- First Nations enquired whether their community would be connected to grid and by electrified by the proposed Project.
  - *Response:* The proposed Project will enable the electrification of communities currently reliant on diesel or other non-grid energy such as the community of Iskut to the north. However, it is expected that a connection to smaller communities such as Bell II would currently be cost prohibitive. There is the potential to connect other communities to the line in the future.

- NRCan raised the issue that the visual impacts of the proposed transmission line are identified as potentially being one of the largest negative impacts to the forestry industry, and the visual alteration by the transmission line may reduce the opportunity for forest licensees to harvest timber in visually sensitive areas.
  - *Response:* BC Hydro will determine the magnitude of actual impacts of the Project on Visual Quality Objectives during the detailed design phase and will consult with relevant agencies to determine the appropriate level of mitigation for tenure holders.

6.1.4 Conclusion

Potential for Residual Adverse Effects and Significance Analysis for the Economy

In consideration of the EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects on the economy as a result of the proposed Project. These effects include the following:

- increased environmental and aesthetic disturbance (noise, dust, and industrial presence during construction) to private properties; and,
- decrease in property values and potential impacts to existing businesses and business opportunities if agreement on compensation between private land and business owners is not reached.

EAO's analysis of the significance of potential residual adverse effects on the economy is as follows:

Private Properties

- **Magnitude:** The magnitude of the potential effects on private properties as a result of the proposed Project would be low to moderate, depending on the individual or household's proximity to dust, noise and industrial presence. As there are no known projects in the immediate vicinity of the potentially affected private properties, there would be no cumulative effects. The decrease in property values potentially affected by the proposed Project was not ascertained. However, based on previous periods of industrial activity in the region, the cumulative effects of other approved or potential major projects in the region have the potential to cause a minor to moderate increase in market value of existing residences.
- **Probability:** The likelihood of an effect on private properties from noise, dust and industrial presence is low to moderate, depending on the location of the residences. The likelihood of a decrease in property value is low for properties further away from the proposed Project, and high for residences in proximity to the proposed Project. The probability of increases in property values from increased industrial activity in the region is low to moderate, depending on the distance of residences from industrial expansion activities.
- **Geographic Extent:** The extent of the effect would be on the potentially effected households along, and in near proximity to the proposed transmission line. The geographic extent on cumulative effects regarding property values would be local to sub regional.
- **Duration and Frequency:** The duration of noise, dust and aesthetic effect on

private properties would be short term changes or nuisances, and the frequency would be regular or sporadic, until construction activities have ended.

- **Reversibility:** The effect of noise, dust and aesthetics on private properties would be reversible as the effect would be short term nuisances during construction. Negative projects effects on property values could be partially to fully reversible, depending on compensation negotiated with the Proponent; cumulatively effects could cause any negative impact on property values to be partially to fully reversible depending on housing demand resulting from industrial expansion in the region.
- **Context:** Impacts would be dependent on the individual's sensitivity and tolerance levels to disturbances; and dependent on compensation from Proponent.

Potential for Residual Beneficial Effects

In consideration of the Working Group's assessment of the Application, EAO finds that there may be beneficial residual effects on the economy as a result of the proposed Project. These effects include the following:

- increased employment opportunities;
- increased local and regional business opportunities from construction activities that would require supplies and services;
- increased total income estimated to be $40 million from local and regional employment;
- increased total tax revenue from is expected to be $55 million, and total property taxes are estimated to be $1.5 million; and,
- benefits for First Nations and Nisga'a Nation generated by the proposed Project, including employment, training, business, and income and revenue opportunities.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for beneficial cumulative impacts on the economy, including increased employment, business and income opportunities. Economic opportunities created by future projects as well as forestry and tourism activities, which coincide with employment and business opportunities generated by the proposed Project would create additional government revenues predicted to benefit local communities. The impact is expected to be positive, ongoing and province-wide.

Conclusion

A relatively small number of residences would be potentially impacted from the proposed Project. These impacts may be partially or fully mitigated as a result of compensation negotiations with BC Hydro. Beneficial cumulative effects on the economy from industrial expansion enabled by the proposed projects are anticipated. Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant residual adverse economic effects.

7 Assessment of Potential Social Effects

This section provides an assessment of potential social effects related to the proposed Project. The key indicators or Valued Social Components used in the assessment are:

- population, infrastructure and services;
- visual quality;
- land and resource use;
- transportation; and,
- utilities

7.1 Population, Infrastructure and Services

7.1.1 Background Information

The Proponent collected baseline information and reviewed publicly available statistics and information for the assessment on population and demographics, local infrastructure and services, and local housing and accommodations. The Study Area for the assessment includes the RDKS, Terrace, Stewart, several rural settlements (Old Remo, Rosswood, Irene Meadows, Nass Camp, Bell 2, and Bob Quinn Lake), and the Nisga'a villages and First Nations communities.

The Proponent reports in the Application that municipal infrastructure and services are well established and presently under-used in Terrace with a current population of 13,372. Terrace has considerable health services, including the Mills Memorial Hospital and a concentration of medical professionals that supports the region. Also fire, police and ambulance services are available for the city of Terrace and the surrounding area. Stewart's present population is 500. Stewart's existing infrastructure and services could allow for growth and accommodate up to 2,500 residents.

7.1.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

Because of the construction and operation of the proposed Project, the Proponent anticipates there would be an influx of people to the proposed Project area including employees, contractors, job seekers, and their families. The Proponent estimates that a large number of the employees would be from outside of the region, and there would be a temporary in-migration to Terrace and/or Stewart of up to 330 workers to directly and indirectly to support project related construction activities. This increase may put pressure on local infrastructure and services.

Construction Impacts

The Proponent anticipates that the temporary employees and contractors would be housed at existing construction camps and new construction camps along the proposed Project route. Temporary infrastructure would be established to provide accommodations and services for the employees. These camps would be self-sustaining, and be disassembled and infrastructure removed when the camps close. Assuming most of the employees during construction would be housed at the camps, the potential effect on local housing and accommodations is likely to be negligible.

During consultation with the Proponent prior to the review of the Application, municipal and regional governments, and Nisga'a Nation expressed concern that project-related construction activities may increase demand for health and emergency services. Such demands may arise from potential job-related accidents or worker injuries which may require response from emergency, fire or police services. The Proponent expects the potential increased demand on health and emergency services to be negligible, as the in-migrating workers would represent less than 2% of the existing population within the Terrace local health area. Over three years of construction, approximately 31 to 37 project related injury claims are expected annually.

Other potential impacts from construction activities may include traffic related accidents between private vehicles and construction vehicles, or the risk of wildfires from ROW clearing and controlled slash burning.

Operation Impacts

The Proponent expects that because of the low workforce requirements during operation of the proposed Project, there would be negligible impacts on population, housing or accommodation, and health and emergency services in the region.

Summary of Mitigation Proposed in the Application

Mitigation strategies proposed by the Proponent to avoid or minimize potential construction related social impacts on population, infrastructure and services are:

- employees would be housed at the existing or new temporary construction camps to reduce the demand for local housing and accommodation; and,
- employees would use applicable health and safety standards and policies including WorkSafe BC, and apply standard traffic control and safety measures to reduce potential accidents and the demand for local health and emergency services.

7.1.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- First Nations, regional and municipal governments and the Nisga'a Nation raised concerns about safety of the project including:
    - access roads and road drainage facilities;
    - operating procedures at the Skeena substation;
    - additional pressures on limited emergency service resources, such as the Iskut Valley Health Services, from the increased population within the area, the potential for workplace accidents, and vehicular accidents.

    - *Response:* The Proponent commits to include a program for regular inspection road drainage facilities in the Construction EMP. Mitigation of the risk posed by poor drainage of the access roads would include proper construction of roads to ensure all necessary drainage structures are in place and functioning.

      The System Operating Order for the Skeena Substation was last updated in February 2009. System Operating Orders for substations are generally updated when a procedure changes or at a minimum every 4 years.

      The potential for increased pressure on local health/ emergency services arising from in-migrants is expected to be negligible since the potential for in-migration workers on the proposed project is also negligible. The estimated number of in-migrating workers (a maximum of 330 at any given time) would compose less than 2% of the existing population of the Terrace Local Health Area (BC Stats 2008). To minimize the risk of injury, BCTC will require its contractors to develop and implement health and safety plans. At a minimum, contractors will have to comply with WorkSafe

BC safety standards during all activities. An appropriate number of first aid personnel would be on-site as determined by regulated standards.

Potential traffic accidents could occur between private vehicles and Project vehicles and equipment. RCMP and emergency services would be required to respond to these situations. However, BC Hydro's contractors will be required to implement a Traffic Management Plan and a Communications Management Plan to help minimize the potential risk. Construction activities could increase the risk of wildfires, which may require emergency response. Much of the proposed route would be subject to long emergency response times so the Project crews will be supported by on-site firefighting equipment. During times of high fire hazard, water tankers would be positioned near activities. In the event of a major forest fire, the Provincial authorities would be contacted to arrange additional support and notify local communities if necessary. Based on the mitigation measures above, the Proponent indicates the proposed Project is not expected to result in significant increased demand on local and regional emergency services. The Proponent concludes no potential residual adverse effects were identified.

- The Tahltan raised the issue that the Application does not adequately identify social-cultural impacts to children, families, community, culture, and society.
    - *Response:* The EA Application considers the potential for socio-cultural impacts to occur as a result of the construction and operations of the proposed Project. As described in Section 7.12.5.3 (Potential Adverse Effects), the adverse socio-cultural impacts which may be associated with mines and other major projects do not similarly apply to the proposed Project. For example, high-paying jobs associated with mining and other resource industries may be linked with increased substance abuse, while fly in/ fly out operations can lead to various types of familial and community stress. The primary socio-economic effect of the proposed Project is the creation of employment and business opportunities. For the most part, this will occur during the construction period. The benefit of increased employment opportunities for local and regional residents is not expected to be significant in the broader context of local and regional employment.

- First Nations and Nisga'a Nation raised concerns regarding the potential adverse cumulative effects of the proposed Project and other development related to social-cultural issues, including impacts to communities.

- *Proponent response*: In response to concerns raised by First Nations and Nisga'a Nation, the Proponent's assessment included the potential for adverse cumulative effects related to social-cultural issues. The cumulative socio-economic and socio-cultural effects are complex in nature and may be positive or negative. Since the First Nations and Nisga'a villages tend to be small and remote, with higher incidences of unemployed or underemployed, rapid expansion of employment, if not managed properly, could lead to various social problems. Increased development could impact traditional ways of life both positively and negatively. Cumulative effects could be experienced by First Nations and Nisga'a Nation to varying degrees depending on their proximity, future involvement and community planning in relation to future projects and activities. These potential cumulative effects should be considered by communities, proponents and governments in assessing future potential developments. It is the responsibility of government to address the broader issue of cumulative effects in the region. However, future major industrial development should be planned and developed in such a way as to minimize socio-economic cumulative effects. For example, construction and mining camps can be located at a sufficient distance from First Nations communities and Nisga'a villages to minimize interaction between imported labour and local residents; financial and substance abuse counselling services may be provided by major development operators; and scheduling of work shifts and leave can allow for ongoing traditional activities by aboriginal members of the workforce. At the same time, increased industrial and economic activity in the region may provide the opportunity of reducing the economic gap between aboriginal and non-aboriginal members of society. Increased economic activity and tax base may support enhanced training and educational programs and provide sufficient impetus for an expansion of other social, health and infrastructure services.

7.1.4 Conclusion

Potential for Residual Effects and Significance Analysis for Population

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation; EAO finds that there may be adverse residual effects on population, infrastructure and services as a result of the proposed Project due to the temporary influx of 165 to 200 direct proposed Project employees and 130 direct supplier employees during construction.

Known projects or activities (existing or likely to occur in the foreseeable future) within the proposed Project area listed in Table 4 of this report has the potential to produce both positive and negative impacts on the population.

EAO's analysis of the significance of potential residual effects on population is as follows:

- **Magnitude:** Potential effects on population from the proposed Project would be of a low magnitude because the influx of employees is expected to be relatively small. The magnitude of cumulative effects from a number of approved and proposed major projects on population may be moderate to high, depending the timing and/or the location of projects being developed. These cumulative impacts may benefit the region and local communities and villages from an economic and employment standpoint, however there may be potential social impacts associated with an increase in regional development, of a low to high magnitude, depending on the location of the projects and the population.
- **Probability:** The probability of potential population effects from the proposed Project is moderate to high, depending on the proportion of local hiring. The probability of cumulative impacts, both positive and negative, is unknown as approved projects have not yet been developed and other major projects have not received the required authorizations. The probability of other developments proceeding is also dependent on a number of other factors, including the price of metals and available capital financing.
- **Geographic Extent**: The impact on population from the proposed Project would be limited due to labour mobility and the ability of workers to commute long distances to work camps. The extent of the cumulative effects of other major developments occurring concurrently or sequentially would be on a regional scale.
- **Duration and Frequency:** The duration of effect on population from the proposed Project would be from the construction phase, and the frequency would be regular, during the three year construction period. The impact is likely to be short term and occur once. The duration and frequency of cumulative effects from other major developments are difficult to determine. Estimated mine life is known for only some of the approved and proposed projects, and may vary, for example once mine development is underway and the ore resources better defined. The initiation of construction of these developments is also unknown, except for the Red Chris Mine project which is intended to commence in 2011.
- **Reversibility:** The impacts of the proposed Project on population are fully reversible after the end of the construction period. Cumulative effects on

population will be reversible over the moderate to long term, depending on the operational life of future developments.

- **Context:** The region's services and accommodations are adequate to respond to in-migration of employees from the proposed Project. Provincial agencies will need to monitor whether increase in services resulting from population shifts or in-migration of temporary workers form future development will require an expansion of various services.

Conclusion:

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant residual adverse effects on population and related infrastructure and support services. However, depending on the timing and scale of cumulative effects resulting from future development enabled by the proposed Project, government agencies will need to monitor and respond to any increase in required services required.

7.2 Visual Quality

7.2.1 Background Information

The Proponent collected baseline information on visual landscapes or visually sensitive areas in 2007 and 2010 to assess the visual quality surrounding the proposed Project area. To identify the potential effects on visual quality, the Proponent completed a viewshed analysis on a series of observation points, and rated the degree of visual effect (negligible, slight, moderate or substantial) on each observation point. The list of observation points, criteria, and the results of the viewshed analysis are summarized in Table 7.13-9 in the Application.

The study area included 10 km on either side of the proposed Project corridor. The landscape of the proposed Project area is primarily forested except for the southern portion which is a mix of agricultural and forested land. The assessment also considered the visual quality objectives outlined in the Nass South SRMP, the Kalum LRMP and the Cassiar-Iskut-Stikine LRMP, and the Nisga'a Land Use Plan. The proposed Project transmission line may intersect areas within the boundary of the plans.

7.2.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

A number of areas visually sensitive to residents and tourists were identified along the proposed transmission line route which may be potentially affected by the proposed Project, such as communities along or within close proximity to the proposed route;

travel corridors; camps and lodges; provincial parks, proposed protected areas and ecological reserves; recreational sites; and backcountry trails or recreational areas used by snowmobilers, skiers, fishers, hunters, wildlife viewers, and hikers.

A number of issues or concerns relating to potential impacts to visual quality from the proposed Project related activities were raised by First Nations, Nisga'a Nation, community members, government agencies, land users and special interest groups, including:

- reduced visual quality from private properties;
- potential adverse effects to visual quality; and,
- preservation of natural aesthetics for tourism.

The Proponent reports that the principal issue expected during construction would be visual disturbance during the clearing of vegetation for the ROW and access roads. During operation the main issues would be the presence of project transmission line and structures, which would decrease the visual quality of the landscape. The Proponent noted that the visual quality experience is highly dependent on the viewpoint, duration of views and aesthetic preference of the viewer.

Summary of Mitigation Proposed in the Application

Mitigation measures to minimize or avoid the potential social impact of visual quality from the operation of the proposed Project are as follows:

- select an alignment to make as much use of landforms as possible; align transmission line to be diagonal to the contour, where practical;
- design asymmetry of ROW clearing to account for slope and vegetation to minimize some visual effect by disrupting linear edge effect; regeneration of vegetation along ROW to soften visual effect; and,
- choose routes to make as much use of landform as possible and leave trees around the perimeter of substations and along access roads to create natural barriers, where practical.

7.2.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation and members of the public. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- A member of the public raised the concern that the Proponent consult thoroughly with all stakeholders involved to ensure the stunning aesthetics of the region that drives tourism is maintained along the transmission line route.
    - *Response:* Visual effects were assessed and summarized in the Application; and mitigation measures (see section above) have been proposed to minimize visual quality impacts from the proposed Project.

- The Working Group identified the potential visual impact of the transmission line on Skii km Lax Ha's Cabin and Bell 2, as an issue.
    - *Response:* The Proponent conducted visual quality modeling for Bell 2 and the transmission line would be largely screened. BC Hydro committed to further discussion on the possible relocation of Skii km Lax Ha's Cabin.

7.2.4 Conclusion

Potential for Residual Effects and Significance Analysis for Visual Quality

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects to the visual quality at four locations: Old Remo Road, Pine Lake, confluence of Little Cedar and Cedar Rivers, and Ningunsaw Pass, as a result of the proposed Project, these residual effects are due to:

- visual disturbance from the loss, alteration or disturbance of land cover;
- visual disturbance from the visibility of some sections of the ROW; and,
- visual disturbance from the presence of the transmission line and associated infrastructure.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on visual quality through the alteration of the land cover. Visual quality is likely to be disturbed by forestry activities, the infrastructure of the Forest Kerr project, and the proposed Project cleared ROW and infrastructure. The potential impacts on visual quality would diminish over time, as replanting occurs and the vegetation along the ROW becomes re-established. Therefore, it is expected that the cumulative impact that may occur with the ongoing forestry operations and the development of the proposed Project would be minimal and partially reversible over time.

In consideration of the Working Group's assessment of the Application, EAO's analysis of the significance of potential adverse residual effects on visual quality is as follows:

- **Magnitude:** Potential effects on visual quality are anticipated to be of low magnitude except at Old Remo, Pine Lake, and Ningunsaw Pass and at

confluence of Little Cedar and Cedar Rivers where potential effects are expected to be moderate.

- **Probability:** There is a high likelihood of increased visual disturbance at the four specific locations noted above.
- **Geographic Extent:** Potential effects on visual quality would be local within Old Remo, Pine Lake, and Ningunsaw Pass and at confluence of Little Cedar and Cedar Rivers, which are in close proximity to the proposed Project.
- **Duration and Frequency:** The duration of potential effects on visual quality would be short term for those people visiting the area and long term for those residing in the area, and the frequency would be one-time for those visiting the area and continuous for those people living in the local study area.
- **Reversibility:** The reversibility of the potential effect depends on the location of the observation site. At locations where the transmission line crosses a roadway or close to waterbodies, the potential effects are irreversible, and at locations close to the cleared ROW, the potential effect is partially reversible as over the long term with the growth of trees and vegetation.
- **Context:** The general viewscape is undisturbed in some areas of the proposed Project and highly disturbed in other areas due to forest activities.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant adverse effects on visual quality as residual effects would be site specific and limited to a relatively small number of sites in relation to the overall proposed Project.

7.3 Land and Resource Use

The assessment included land and resource uses within the proposed Project area and a one kilometre perimeter of the proposed transmission line corridor. The baseline for the assessment included land and resource uses within the proposed Project area including land management plans, First Nations asserted territories, Nisga'a Lands and areas defined by the NFA, forest tenures, guide outfitter territories, trapline territories, commercial recreation tenures, and portions of ALR. Other land and resource uses were also considered near the proposed transmission line corridor, including: mineral and coal subsurface tenures, pine mushroom harvesting and recreation and Crown land tenures for other uses including the existing electrical power transmission.

The Proponent's assessment of the potential effects on land and resource use considered the following valued components: access, the quality of land and resource use, and forestry.

7.3.1 Access

7.3.1.1 Background Information

Access includes the ease of access to land use activities such as parks, protected areas, recreation sites, mineral exploration activities, and other tenures.

7.3.1.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Proponent reports in the Application that the proposed Project construction and maintenance activities may inhibit access to land use areas, such as parks, protected areas, and recreation sites; areas under mineral exploration and other tenures. The construction of new roads and the ROW may also increase access to, and the use of, remote areas. Through consultation activities, members of the public, stakeholders, government agencies, First Nations and Nisga'a Nation all raised the concern that increased access may increase activities such as hunting and fishing which may adversely impact wildlife (moose and grizzly bear) and aquatic resource populations.

The construction or maintenance of the proposed Project may result in temporary closures to roads used to access parks and trails within the *Anhluut 'ukwsim Laxmihl Angwinga* '*asanskwhl Nisga'a, (*Nisga'a Memorial Lava Bed Provincial Park) (western route only) and the Pine Lake Recreation Site (located within the southern portion of the proposed transmission line route) which would temporarily impact recreation users visiting the park or site.

A network of public roads and Forest Service Road's (FSR) are used by local and regional residents for recreation, including snowmobiling, ATV riding, hiking, hunting, and fishing and mushroom harvesting. These roads would be used during construction of the proposed Project to facilitate the movement of equipment and supplies between Terrace and the proposed Project site. Construction activities may cause temporary delays or minor disruptions for recreation users in the area.

Heli-skiing operators based out of Bell II expressed concern that the transmission line and structures may cause hazards to helicopter landing and fuelling sites located along Highway 37. Before construction the Proponent would consult with heli-skiing operators to determine potential conflicts between the proposed Project and established helicopter flight paths and landing or fuelling sites. The Proponent and heli-skiing operators would discuss and negotiate appropriate solutions to address any issues, should they arise.

The Naskeena coal property, located north of Kitsumkalum Lake (southern portion of the proposed transmission line) would be bisected by the proposed transmission line. The coal property owner and other companies presently utilize the network of FSRs to transport personnel, vehicles and equipment to and from their properties during mineral

exploration. Project related construction activities on or around the FSRs may result in temporary disruptions to exploration if the timing of the construction work overlaps with mineral exploration in the area.

Summary of Mitigation Proposed in the Application

To minimize the potential impact of construction activities on access to land use activities, the Proponent proposes the following mitigation measures:

- communicate with relevant authorities (e.g., NLG, RDKS, BC MOFR, BC Parks, BC MOT) regarding any forthcoming road and/or trail closures, and implement traffic control procedures and post signage of potential delays or hazards;
- contractors would develop a Traffic Management Plan and adhere to government regulations with respect to traffic safety;
- before construction, BCTC would consult with the Naskeena coal property owner regarding their use of the Big Cedar FSR and other roads;
- maintain trails so that they are accessible by Nisga'a Nation and public users, when safe to do so;
- minimize closures and consider scheduling closures at times when recreation or land use is less frequent; and,
- where required, construction staff would facilitate safe passage past construction activities to enable users to access trails.

7.3.1.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, no additional issues with respect to effects on access to land use activities and resources were raised by the Working Group, First Nations, Nisga'a Nation, or members of the public.

7.3.1.4 Conclusion

Potential for Residual Effects and Significance Analysis on Access

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation; EAO finds that there may be adverse residual effects on access to land use activities as a result of the proposed Project due to the following:

- increased access to remote areas and increased use of the area for hiking, hunting, fishing and motorized recreation.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 3 of this report, within the proposed Project Area, EAO has

considered the potential for adverse cumulative impacts on land and resource use, as follows:

Residual adverse effects on access are anticipated during the operation and maintenance of the proposed Project in several remote areas concentrated along portions of the western and eastern route options and northern portions of the proposed transmission line. The potential residual effect of the proposed Project combined with new and improved access opportunities related to mining and forestry activities, increased demand for roads and infrastructure for growing communities, and increased recreation and tourism activities may result in both positive and negative cumulative impacts. The potential adverse cumulative impact may be providing access to previously inaccessible areas, which may result in overlaps with a variety of land users, and increased effects on wildlife through hunting and industrial activities with conflicting objectives. The potential positive cumulative impact of additional access may promote tourism and business opportunities, and the potential for subsistence harvesters to benefit from new access to country foods.

In consideration of the Working Group's assessment of the Application, EAO's analysis of the significance of potential adverse residual effects on access to land use areas is as follows:

Significance Analysis on Access to Land Use Activities and Resource Use

- **Magnitude:** Potential adverse effects on land and resource use from increased access are anticipated to be of low to moderate magnitude.
- **Probability:** Depending on the effectiveness of the final access management strategy for the proposed Project, there is a likelihood of an effect on land use activities and resource use from increased access.
- **Geographic Extent:** The extent of the effect would be on (local) areas which are relatively remote and presently inaccessible or accessible with considerable difficulty.
- **Duration and Frequency:** The duration of potential effects on land use activities and resource use from increased access would be long term, and the frequency would be continuous once the new access roads are constructed and used during the maintenance of the proposed Project.
- **Reversibility:** The potential effects from increased permanent access are irreversible as this access would exist indefinitely once the ROW was established.
- **Context:** A majority of the proposed Project corridor is already accessible via forestry services roads and the land use areas are already disturbed.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant residual adverse effects on land use activities and resource use from access.

7.3.2 Quality of Land Use

7.3.2.1 Background Information

The quality of land use is the ability of land users to appreciate or benefit from land use activities and resources, including pine mushroom harvesting.

7.3.2.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Proponent predicts that the construction of the proposed Project may potentially affect the aesthetic quality of the environment from increased noise or dust or industrial presence; and the quality or quantity of resources harvested.

Increased noise, dust and industrial presence could diminish land users' interest in the surrounding environment. Land users mostly likely to be affected are those who seek natural and undisturbed landscapes, including hikers, guide outfitters, tourists, commercial recreation operators, and snowmobilers. Land users pursuing subsistence activities (hunting, trapping, or commercial mushroom gathering) may also be affected.

Visual quality changes are expected to be the primary aesthetic effect during the operation and maintenance phase. The visibility of the transmission line and infrastructure may diminish the aesthetic quality of the natural landscape and the desire of land users to use the area for recreational activities.

The proposed Project construction activities may affect resources harvested for subsistence, specifically the quality of the resource harvested and the quantity of resources available for harvest. The potential impact of the proposed Project on the ability to harvest pine mushrooms was a key issue that was raised by First Nations and Nisga'a Nation because of the potential economic benefit from the harvest and sale of pine mushrooms.

Summary of Mitigation Proposed in the Application

Mitigation measures to be implemented by the Proponent to minimize the impact of construction activities on the aesthetic disturbance are addressed in the section on Visual Quality and on harvestable resources are addressed in the sections on Country Foods and Terrestrial Ecosystems and Vegetation.

7.3.2.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, issues were raised with respect to effects on the quality of the land and resource use by the Working Group, First Nations, Nisga'a Nation, or members of the public. Key issues and responses regarding aesthetic disturbances are addressed in section 7.2 (Visual Quality), and impacts to harvestable resources are addressed in section 9.5 (Country Foods) and section 5.7 (Terrestrial Ecosystems and Vegetation).

7.3.2.4 Conclusion

Potential for Residual Effects and Significance Analysis on the Quality of the Land Use

In consideration of the Working Group's assessment of the Application, EAO finds that there may be adverse residual effects on the quality of the land use activities or resource use as a result of the proposed Project due to the following:

- diminished aesthetic quality of land use activities disrupted by noise, dust and industrial presence associated with the proposed Project construction activity;
- loss of pine mushroom habitat and harvest due to ROW clearing;
- fewer recreationists experiencing parks and recreation sites due to diminished visual quality of the natural environmental because of the presence of the ROW and transmission line; and,
- a reduction in the number of moose and grizzly bear.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on the quality of land use activities and resources as follows:

Residual adverse effects to the quality of land use activities due to aesthetic and resources are anticipated for some user groups from the proposed Project construction and operation activities. This residual effect may also occur from some of the other projects and activities (listed in Table 4 of this Report) in combination with the residual effects to land use activities from the proposed Project, resulting in short and long term cumulative impacts because of potential noise, dust, traffic levels, visual quality disturbances, degradation of wildlife and fish habitats and removal of vegetation. Cumulative impacts may diminish land users' interest in experiencing land use activities, or harvesting resources within the proposed Project area.

EAO's analysis of the significance of potential adverse residual effects on quality of land use activities and resources is as follows:

Significant Analysis on the Quality of Land Use Activities

- **Magnitude:** Potential effects on land use activities from aesthetic disturbances during operations would depend on the location of the park or recreation site and its proximity to the proposed Project. The magnitude of effect is anticipated to be minor at the Pine Lake recreation site as the proposed Project would adjoin the ROW of the existing transmission line. The magnitude of effect is anticipated to be high at the Anhluut ‘ukwsim Laxmihl Angwinga ‘asanskwhl Nisga’a, (Nisga’a Memorial Lava Bed Provincial Park) (western route only) as the proposed transmission line would pass over one of the park’s principal trails.
- **Probability:** It is likely that aesthetic disturbances would impact the quality of some land use activities in some locations.
- **Geographic Extent:** The extent of the aesthetic disturbances on land use activities would be at the local scale.
- **Duration and Frequency:** The duration of potential effects on land and resource use from aesthetic disturbances would be short term and sporadic during construction; and the duration would be long term, and the frequency would be continuous, once the proposed Project is operational.
- **Reversibility:** The potential effects from aesthetic disturbances would be reversible in the short term when the construction phase ends and the proposed Project ROW has been re-established. The potential effect would be partially reversible in the long term, depending on the land user’s ability to adapt to the aesthetic change.
- **Context:** Land users would likely adapt to the aesthetic disturbances.

Significant Analysis on the Quality of Resources

- **Magnitude:** Potential effects on the quality of subsistence harvest resources are anticipated to be negligible. The impact on pine mushroom harvests is expected to be low, as the potential impact to pine mushroom habitat represents only a small percentage (approximately 2 %) of total pine mushroom habitat. Further, this reduction in habitat does not necessarily correlate with a reduction in income if harvesters find suitable alternate pine mushroom locations. The exact potential loss of specific pine mushroom harvests has not been identified, as these areas are kept confidential by harvesters.
- **Probability:** There is a likelihood of an effect on the quality of subsistence harvests.
- **Geographic Extent:** The extent of the potential effect on the subsistence harvests would be at the landscape scale.
- **Duration and Frequency:** The duration of potential effects on the pine mushroom harvest is predicted to be long term, and the frequency would be

continuous during construction activities, such as the clearing of the ROW. The duration of potential effects on subsistence harvests would be long term and the frequency would be continuous during the maintenance phase of the proposed Project.

- **Reversibility:** The potential effects on subsistence harvests would be irreversible in the long term.
- **Context:** The impact on subsistence harvests would vary depending on the ability of subsistence land users to harvest resources at alternate sites.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant residual adverse effects on the quality of land use activities or resources.

7.3.3 Forestry

7.3.3.1 Background Information

Impacts on forestry are defined as the potential limitations of forest sector activities and impacts on the timber supply within the local study area.

7.3.3.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The potential effects on forestry activities in northwest BC from the proposed Project construction activities include:

- alterations to the existing timber harvesting land base and future timber harvest volumes;
- impacts to Old Growth Management Areas;
- disruptions to forestry operations;
- overlap and interactions with harvesting operations and permits;
- impacts to the commitments of forest licensees and operational plans; and,
- competition for labour and equipment.

The Proponent anticipates that the existing Timber Harvesting Land Base (THLB) would be affected within portions of Tree Farm Licence #1 (TFL 1) and other Timber Supply Areas (TSAs) along the proposed ROW. The Proponent estimates that 0.25% of the THLB would be impacted for all TSAs and TFL 1. The potential loss of portions of, or a reduction in, THLB would result in the potential loss of merchantable timber volume in TFL 1 and all the TSAs. The Proponent estimates that the long term timber volume loss would be 389,700 m^3 (western route) and 452,700 m^3 (eastern route). A summary of the

estimated volume loss for both route options, by TSA and TFL is provided in Table 7.11-10 in the Application. The potential effects would be as follows:

- short term – overlaps between the proposed Project ROW and forest licensee cut blocks, and the ability to harvest timber within the cut block during construction; and,
- medium to long term – potential loss to Annual Allowable Cut (AAC) from the clearing of ROW estimated to be between 4,400 m3 and 5,200 m3; or the harvesting activity of 88 logging truck loads (50 m3 load) per year for all forest licenses (listed in Table 7.11-4 of the Application) or one logging truck load every three weeks per license.

The location of transmission line and structures may affect the placement of new forest resource roads to be constructed by forest licensees adjacent to or under transmission lines to access and harvest timber. The potential effects from the location of the transmission line and structures may result in:

- moving roads to avoid structures;
- inability to transport equipment under transmission lines because of height restrictions; and,
- isolation of timber when a FSR cannot be constructed or economically re-routed to avoid structures to access timber that could be harvested.

The proposed Project has the potential to impact OMGAs which have been identified by the Proponent, in consultation with First Nations, Nisga'a Nation, government agencies, members of the public, and forest licensees, within segments of the western and eastern proposed transmission line routes. The Proponent estimated that the proposed routes would overlap with 10.5 ha of OMGAs along the western route and 34.2 ha of OMGAs along the eastern route. Where the OMGAs would be potentially impacted by the proposed Project, amendments to the OMGAs would be required and appropriate replacement areas found. Forest licensees, MOFR and ILMB, in consultation with First Nations and Nisga'a Nation, are responsible for the OMGA amendment process.

Project related construction activities, such as the transportation of construction materials, supplies and equipment, crew, or forestry log hauling along FSRs, may affect the ability of forestry companies' use of these roads or cause temporary delays to allow oncoming vehicles to pass. The increased use of the roads may degrade the surface of the road, increasing road maintenance costs for the forest licensee. The areas of concern due to the increased use of the FSRs and the impact on hauling cycle times are around the Kalum FSR in the southern portion of the proposed transmission line route, and FSRs within the western and eastern routes. There may be some degree of overlap on FSRs use by the Proponent and forest licensees, depending on the amount of timber harvested and hauled. As a result, there may be the potential for increased

hauling costs incurred by forestry licensees due to hauling delays and increased maintenance resulting from additional traffic from the proposed Project.

The Proponent anticipates that clearing of the proposed Project ROW is expected to benefit economic activity in the northwest BC forestry sector, specifically increased employment. In the short term, the clearing activities would benefit logging, hauling, road building and maintenance contractors, and in the long term, operation and maintenance activities would benefit vegetation and maintenance contractors. Clearing of the ROW is estimated to generate five to eight person-years (based on a 12 month timeframe) of employment for forestry sector consultants.

Summary of Mitigation Proposed in the Application

The Proponent concludes the medium to long-term effects on forestry by the operation of the transmission line are negligible in the context of the larger forestry industry. AS such, no mitigation measures are proposed by the Proponent.

To minimize the potential short term effects on forestry resources and activities, the Proponent proposes to:

- consult with forest licensees once the location and final alignment of the proposed Project is finalized to determine which segments of the ROW are of interest to the licensees for harvesting timber instead of the licensees' planned cut block, at the time of the ROW clearing;
- adhere to the OMGA amendment process procedures required by the MOFR District Manager during the licence to cut approval process;
- consult with forestry licensees to coordinate the timing of road use in order to avoid or eliminate the increased hauling cost;
- obtain a road use permit and adhere to Traffic Management Plan and MOFR requirements for industrial users of FSRs;
- enter into road use agreements with forest licensees to address increased road maintenance costs;
- consult with forest licensees on the height of forestry equipment expected to be transported under transmission lines to ensure transmission line clearance is adequate on existing FSR;
- consult with forest licensees on the location and design of the transmission line and structures to avoid conflicts with the future forest roads to be constructed by forest licensees; and,
- consider forest licensees needs in the development of an access plan and access management plan.

7.3.3.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, issues were raised with respect to effects on forestry by the Working group, First Nations, Nisga'a Nation, or members of the public. Key issues and responses relating to forestry resources are in section 5.7 (Terrestrial Ecosystems and Vegetation) of this Report.

7.3.3.4 Conclusion

Potential for Residual Effects and Significance Analysis on Forestry

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects on forestry as a result of the proposed Project due to the following:

- loss of timber harvesting land base and average loss of 0.24-0.28% of AAC in all TSA and TFL 1; and,
- constraints on forest licensees' use of access roads that may result in loss of time and increased costs.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts forestry use, as follows:

The potential interaction of the proposed Project's residual forestry effects with past and future forestry activities are anticipated to result in cumulative impacts. The potential residual effect of the reduction or loss in THLB from the proposed Project combined with future forestry activity or future mining and/or hydroelectric projects involving the removal for timber, may result in a potential moderate cumulative impact. In addition, MoFR considers the aggregate removal of timber in determining the AAC, taking into consideration forestry environmental objectives.

EAO's analysis of the significance of potential residual effects on forestry use is as follows:

<u>Access</u>

- **Magnitude:** Potential effects on of the proposed Project on potential to constrain access are anticipated to be of low magnitude given the relatively low access needs for the construction of the proposed Project. There are no known cumulative impacts with regards to access constraints.
- **Probability:** There is a low to medium likelihood of access constraints from the

proposed Project depending on the level of forestry activity during the construction period of the proposed Project.

- **Geographic Extent:** The extent of the potential effect on access constraint would be site specific – at the location of the particular access road segment being used.
- **Duration and Frequency:** The duration of the potential access constraints would be intermittent and of short duration.
- **Reversibility:** Potential access constraints would be fully reversible once the construction of the proposed Project is complete.
- **Context:** The Proponent has committed to working with other industrial users to coordinate use and minimize conflicts relating to the use of access roads.

Timber harvesting

- **Magnitude:** Potential effects on the THLB and AAC from the proposed Project are anticipated to be of low magnitude (less than 0.3%) given the relatively low rate of cut in recent years and for the projected near future. The magnitude of cumulative effects from future forestry and industrial development is difficult to quantify as the extent of timber removal is not yet determined.
- **Probability:** There is a high likelihood of an effect on THLB and AAC. There is a medium to high probability of cumulative effects as it is reasonable to assume that some planned forestry activity will occur, based on approved Forest Development Plans and approved major projects, such as the Red Chris Mine.
- **Geographic Extent:** The extent of the potential direct and cumulative effects on THLB and AAC would be at a regional scale.
- **Duration and Frequency:** The duration of the potential direct effects from the proposed Project on THLB and AAC is long-term and the frequency would be continuous. The duration of cumulative effects will likely be medium from forest development until re-growth occurs to long term for permanent removal of timber by a project footprint.
- **Reversibility:** The potential effects on the THLB and AAC would be irreversible. The potential cumulative effects would be partially reversible as a result of reforestation of cut blocks by forest licensees.
- **Context:** Potential impacts will be mitigated as MOFR takes into consideration the permanent removal of timber by the proposed Project in its determination of the AAC. In addition, the Proponent has committed to negotiating compensation with impacted tenure holders.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that

the proposed Project would not have significant residual adverse effects on forestry as access constraints will be short term, limited and coordinated with other users, and loss of timber will be considered in the management of the provincial forest and impacts compensated for by the Proponent, if necessary.

7.3.4 Conclusion

Based on the above analysis on access, quality of land use and forestry, and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant residual adverse effects on land and resource use.

7.4 Transportation

7.4.1 Background Information

The Proponent considered the potential effects of the proposed Project on roads and highways and aviation in the assessment on transportation.

The study area for the effects assessment includes all existing roads and highways extending 2 km either side of the proposed transmission line corridor. A list of the roads and highways is provided in Table 7.15-1 of the Application.

The study area for the effects assessment on aviation includes a 1 km zone on either side of the proposed Project route.

7.4.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

Potential Impacts on Roads and Highways

During consultation with the public, the primary concern raised was the potential effect of the proposed Project construction and operation related activities on the public use of Highway 16, 37 and 113 (Nisga'a Highway). Concerns regarding potential increases in traffic and road closures during construction were also raised.

The Proponent reports that there would likely to be a temporary increase in road and highway traffic during the construction of the proposed Project from the transportation of materials and personnel to and from construction sites. Over the long term, the traffic volumes along Highway 37 and existing FSRs are predicted to remain at the same levels experienced over the past 20 years when active logging was taking place. Traffic volumes would vary along the proposed Project corridor, with heavier traffic during the construction phase around construction camps and laydown areas. Peak volumes of traffic are anticipated at the beginning of the work day and at the end of the work day during construction. Short term road closures and traffic delays are expected along

Highway 37 and 113 at localized areas (Ningunsaw Pass and *Anhluut 'ukwsim Laxmihl Angwinga* '*asanskwhl Nisga*'*a, (*Nisga'a Memorial Lava Bed Provincial Park) – western route only) where construction would take place adjacent to the highways. The Proponent found that potential effect of increased traffic volumes may result in an increased risk of traffic accidents and increased risk to public safety. Potential traffic accidents may occur between private vehicles and Project-related vehicles and equipment.

During operations and maintenance of the proposed Project, the Proponent expects that project related traffic would be minimal, with a slight short term increase in traffic volume when maintenance and repairs to the transmission line would be required.

Potential Impacts on Aviation

Through consultation a number of issues were raised by members of the public and stakeholders, including:

- transmission line structures may present hazards for helicopter landings (i.e. at Bell II Lodge) and fuelling sites;
- infrastructure may interfere with established flight paths; and,
- helicopters used to support the construction of the proposed Project in inaccessible areas may interfere with aircraft flight paths.

Helicopters would be used to support construction activities in inaccessible areas and for annual inspections of the transmission line or maintenance activities, as required.

The Proponent reports that the potential effects on aviation due to the proposed Project construction and maintenance activities may include an overlap of airspace/flight paths used by helicopters and aircrafts flying between established airports in the region and result in safety hazards. Portions of the proposed transmission line requiring long spans over rivers or other obstacles where normal spacing of support structures are not possible, may pose a hazard to aircrafts flying over these areas.

Summary of Mitigation Proposed in the Application

To mitigate the potential effects on roads and highways from Project related construction, operation and maintenance activities, the Proponent proposes to:

- implement traffic control measures and signage according to WorkSafe BC's Operational Health and Safety Regulations and BC Hydro's Safety Management System for the protection of workers and the public;
- prepare and implement a Traffic Management Plan detailing the number of traffic control personnel required and traffic control required during construction

activities involving the transportation of personnel, vehicles and equipment along public roads, i.e. Highways 16, 37 and 113; and,

- develop and implement a Public Communication Plan detailing how the Proponent would notify the public, First Nations, Nisga'a Nation, and key stakeholders, regarding major construction activities and scheduling of such activities.

To mitigate the potential effects on aviation from Project related construction, operation and maintenance activities, the Proponent proposes to:

- notify NAV Canada and TC of any construction activities that could affect flight operations;
- notify NAV Canada and TC of any temporary operations and maintenance activities that require helicopter use;
- contractors would obtain approved flight paths for all construction and activities where helicopters are required. BC Hydro would establish flight paths for specific operation and maintenance activities. Flight plans would be reported to TC as required by regulation;
- clearly mark transmission line and support structures in locations where the span of the transmission line and placement of structures are greater than the average span; and,
- select a route for the proposed Project that would avoid interference with the operations of Bell II Lodge.

7.4.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- MOE raised the concern regarding the cumulative effect of increased industrial traffic from proposed or foreseeable development projects, and impacts on wildlife.
    - *Response:* The cumulative effects assessment in the Application focuses on the residual effects of traffic use from the proposed Project along with other existing and reasonably foreseeable projects. To mitigate potential effects of wildlife mortality from high volumes of project related traffic, the Proponent proposes to consult with provincial wildlife management authorities about sign posting during the construction phase to notify

vehicle users when the volume of construction related traffic is expected to be high.

- The EAO met with MoTI to discuss a number of scenarios based on the implementation of reasonably foreseeable projects identified in Table 4. Advice from MoTI is that
  - highways 37 and 113 are designed to accommodate the type (size/weight) and number of potential industrial trucks related to foreseeable future projects;
  - increased signage and brushing for sight lines may be implemented to minimize impacts on wildlife;
  - safety rest areas and pull outs may be contemplated as trucking highway use increases; and,
  - there is an assessment protocol that will monitor road condition with increased use.

7.4.4 Conclusion

Potential for Residual Effects and Significance Analysis on Transportation

In consideration of the EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects to transportation (roads and highways) as a result of the proposed Project due to:

- increased traffic delays due to increased local traffic volume;
- short-term road and lane closures; and,
- cumulative effects on traffic as a result of industrial development enabled by the proposed Project

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on transportation, such as increased traffic volume on roads and highways during construction.

EAO's analysis of the significance of potential adverse residual effects on roads and highways is as follows:

- **Magnitude:** Potential effects on delays and road closure from the proposed Project are anticipated to be of low magnitude as these effects will be similar to those experienced during regular road maintenance along Highway 37. The magnitude of cumulative effects is moderate as a result of other industrial developments, their location, their project life and overlap between the developments – mostly as a result of mining.

- **Probability:** The probability of delays and road closures as a result of the construction of the proposed Project is high. It is likely there will be increased traffic volume due to the cumulative effects of industrial development in the region. Timing around the increase in traffic resulting from multiple industrial developments happening is uncertain.

- **Geographic Extent:** Potential effects from the proposed Project are local and site specific. The largest increase in traffic volume would be at access points from laydown areas, and delays would be at localized areas such as Ningunsaw Pass. The potential effects would be regional in the long term due to potential increases in traffic from other industrial development.

- **Duration and Frequency:** For the proposed Project, the effect would be short term, and sporadic during construction activities and long term and intermittent for the operation of the transmission line. Duration and frequency of cumulative impacts to traffic from industrial development in the region would depend on the lifespan of the projects the number of projects that will eventually proceed to development and the overlap in the operation of those projects.

- **Reversibility:** For the proposed Project, the effect would be fully reversible and short-term as traffic volumes would decline once the road closures ended and construction completed. Cumulative traffic impacts would be reversible over medium term as projects, such as mining developments, would end.

- **Context:** Roads and highways are resilient to the effects from the proposed Project, as they are designed to support a much higher capacity than current traffic volume and types. In addition, MOTI has a mandate to ensure that traffic and road use meets government standards and objectives, and can mitigate road use pressures and effects over time.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), and the mandate and jurisdiction of provincial agencies related to traffic management and road use, EAO is satisfied that the proposed Project would not have significant residual adverse effects on roads and highways as potential effects from the proposed Project are considered of low magnitude, local and site specific, intermittent and reversible.

EAO is also satisfied that cumulative effects would not be significant, as there is a low likelihood that all projects incorporated in the cumulative effects assessment would

operate within the same time frame the highways are designed to accommodate the increase level of traffic, and cumulative effects can be further mitigated by the province if necessary.

Based on the information presented in, and the Working Group's consideration of the Application, EAO finds that there would not be adverse residual effects on aviation, from the proposed Project. As such, EAO did not undertake a significance analysis on aviation.

7.5 Utilities

7.5.1 Background Information

The Proponent considered the potential effect on utilities that would cross, parallel, or pass near the proposed Project in the assessment, including:

- the Pacific Gas pipeline;
- existing 138 kV transmission line;
- existing telecommunications utilities; and,
- four telecommunications tenures (western route only).

The study area for the effects assessment on utilities includes an 80 m wide boundary, cleared during construction, along the proposed Project transmission line corridor.

7.5.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Application states that construction activities, such as excavation and blasting for foundation construction and structure installation, and clearing of the ROW have the potential to damage buried or surface utilities.

Project related operation and maintenance activities, such as the vegetation management within the ROW, structure and conductor maintenance, may also have the potential to damage buried or surface utilities.

Summary of Mitigation Proposed in the Application

To mitigate the potential effects on utilities from Project related construction, operation and maintenance activities, the Proponent proposes to:

- work with the utility providers, where required, to identify and mark any potentially affected utilities to ensure that they would not be disturbed.

7.5.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, no additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public.

7.5.4 Conclusion

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there would not be adverse residual effects to utilities from the proposed Project. As such, EAO did not undertake a significance analysis of effects on utilities.

8 Assessment of Potential Heritage Effects

This section provides an assessment of the impact of the proposed Project on archaeological and heritage resources. Potential effects relating to heritage values associated with First Nations, and Nisga'a Nation are discussed in the First nations and Nisga'a Nation Consultation Report.

8.1 Archaeology and Heritage Resources

8.1.1 Background Information

The Proponent conducted an assessment of heritage resources including archaeological sites protected by the *Heritage Conservation Act* (HCA) and designated sites, such as sites of historical, paleontological and architectural significance, which could potentially be affected by the proposed Project.

The study area for the heritage resource assessment included the area affected by the construction of the proposed Project, including the entire initial clearing of the proposed ROW for the transmission line.

The Proponent's baseline information included an AIA, data collected from the Provincial Heritage Register, the RDKS's Community Heritage Register, and other publically available literature on known archaeological and designated heritage sites within
two kilometres of the proposed Project area. The Proponent also reviewed publicly available traditional land use and knowledge studies, and consulted with First Nations, Nisga'a Nation, and the MCTA, Archaeology Branch. The baseline information collected did not consider private lands and the proposed Project ancillary (i.e. existing substations and construction camps) components.

During the Proponent's fieldwork, four archaeological sites protected under HCA and one designated heritage site (portions of the Yukon Telegraph Line including, three cabins, and a segment of a telegraph line) were identified within the study area. No significant architectural or paleontological sites were identified within or in close proximity to the proposed Project.

8.1.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Application states that the primary issue is the direct and indirect effects from ground disturbance during construction of the proposed Project. Construction activities could potentially impact three archaeological sites and a designated heritage site identified along northern segments of the proposed transmission line route, and one archaeological site along a southern segment within the proposed western route option (Nass Valley). The sites identified during the Proponent's fieldwork potentially impacted by the proposed Project are listed in Table 7.10-1 in the Application. As a result of the additional archaeological field investigations in 2010, Table 7.10-1 has been revised as follows:

Identified Archaeological and Heritage Concerns

Archaeological / Heritage Concern	Route Segment ID	Description
Site GcTd-45	1	Cultural depression site within the proposed ROW.
Site HeTk-2	13	Lithic scatter site within the proposed ROW.
Dominion Yukon Telegraph Line, including site HeTk-3	13, 14	Dominion Yukon Telegraph Line and associated cabin (HeTk-3) in close proximity to the proposed ROW.
HfTm-1 and HfTm-2	14	Lithic scatter sites within the proposed ROW. HfTm-1 is within one of two route options and could be avoided by selecting the alternate option.

During the fieldwork conducted in 2010 along the Bell Irving route and the western route option, the Proponent determined that no impacts were anticipated to archaeological sites adjacent to or in close proximity to the proposed Project.

Summary of Mitigation Proposed in the Application

Mitigation strategies proposed by the Proponent to avoid or minimize potential adverse heritage effects are:

- avoid known archaeological sites during construction;
- consult with RDKS to determine acceptable measures to mitigate Project related effects on the heritage site;

- where avoidance is not possible, determine if, in consultation with the Archaeology Branch, additional archaeological work, such as systematic data recovery in advance of construction, site capping, and/or construction monitoring by a qualified archaeologist and issuance of a HCA section 12 Site Alteration Permit, is required, and,
- in the event that additional sites are identified during construction activities, establish an Archaeological Chance Find Procedure and adhere to it during the construction phase of the proposed Project.

8.1.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- Tahltan requested that they be consulted before archaeological sites are disturbed due to construction, and if, where sites cannot be avoided, Tahltan be consulted on measures to mitigate impacts to sites.
    - *Response:* If it becomes necessary during construction to disturb archaeological/heritage sites protected under the Heritage Conservation Act, site alteration permits will be required. Archaeology Branch will forward proposed site alteration permits to those First Nations in whose traditional territory the site is located for their comments and suggestions. Further, the Proponent anticipates that the Archaeology Branch will review the technical information and proposed mitigation measures, regarding the line segments that pass through Tahltan territory.

- Gitanyow raised the issue that potential effects on VCs should be assessed at the Wilp scale and include Traditional Use data.
    - *Response:* VCs are defined in part based on First Nations interests and values. Potential effects on First Nations interests were assessed using available information. The Proponent concludes that there are no significant adverse effects, however, acknowledges that site-specific mitigation measures may be required.

- Gitanyow raised the issue that the Proponent's TU/TK study was not undertaken jointly or with significant input from the Gitanyow. There is concern that these data are incomplete or inadequate for the purposes of the EA.
    - *Response:* The Gitanyow Traditional Use and Knowledge Report, found in the Appendices of the Application, is a synthesis of three documents provided by the Gitanyow Hereditary Chiefs and publically available documents and ethnographic information. Gitanyow recently provided the

Proponent with a Traditional Use/Traditional Knowledge Report and the Proponent intends to consider the information in the report in the development of the Access Plan and construction EMP.

- The Tahltan are concerned that the technical approach and outcomes do not reflect Tahltan knowledge, putting the technical information in question and therefore the mitigation measures.
    - *Response:* Maps were created illustrating the areas that were assessed as having archaeological potential within the Project area, but were not included in the EA Application or baseline reports in view of the sensitivity of the information. All areas that were assessed as having archaeological potential have been surveyed. No areas within Tahltan traditional territory require additional work for the ROW as proposed. Should the finalized route alignment differ significantly from the proposed alignment, additional AIA work will be required.

      Members of the Tahltan Nation participated in archaeological fieldwork and efforts were made to include information from the draft Tahltan Traditional Knowledge (TK) report (received in September 2009) in the archaeological impact assessment. While no further archaeological work is recommended in Tahltan traditional territory, the final Tahltan TK report will be considered in the development of the construction EMP. Mitigation of potential effects for archaeological sites recommended in the Application is site avoidance or further archaeological work. In the case of designated heritage sites, sites will be avoided or acceptable mitigation measures will be determined in consultation with the RDKS. The additional AIA survey work was undertaken in 2010 and conducted in Tahltan territory in which Tahltan cultural monitors participated to investigate the proposed Bob Quinn substation site, geotechnical test pit locations, and minor re-alignments of the ROW. As a result two sites were documented, and their location is informing the alignment of the ROW.

      Provided that site avoidance and/or site mitigation recommendations (e.g., systematic data recovery in advance of Project construction, site capping, construction monitoring by a qualified archaeologist) are followed, the overall effects to archaeological sites and designated heritage sites would be not be significant.

- The Tahltan indicated that the Application did not provide the commitments and mitigation measures to support the restoration of the Tahltan trail network across the Ningunsaw and Bell-Irving valleys.
    - *Response:* During the ROW survey, trail features of historical value will be identified and their preservation will be incorporated into the construction EMP. The potential benefits of any trail revitalization will have to be weighed against the potential concern for increased access.

8.1.4 Conclusion

In consideration of the EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there would not be adverse residual effects to heritage resources as a result of the proposed Project.

9 Assessment of Potential Health Effects

This section provides an assessment of human health effects from project related noise, electromagnetic field (EMF) levels, drinking water, air quality, and country foods.

9.1 Audible Noise

9.1.1 Background Information

The Proponent collected baseline noise measurements from 10 monitoring stations throughout the study area (proposed transmission line route plus a 5 km buffer), under or along the existing transmission lines, the existing Skeena and New Aiyansh substations, and at various locations along or close to the proposed transmission line route. The locations of the monitoring stations are described in Table 7.14-2 in the Application.

The Application states that noise levels were measured every minute over a 24 hour period at each monitoring station. The range of noise levels measured at each station reflects noise levels along all 15 segments of the proposed transmission line route. The noise sources that influenced the noise levels included rain, transformers, vehicle noise (e.g. off road motorcycles, cars, helicopters). Baseline noise levels were presented as "A-weighted" decibels (dBA) which incorporates the noise frequencies that are audible to the human ear. The Application provided examples of typical noise levels:

- 0 dBA: the threshold of human hearing;
- 40 to 60 dBA: a normal conversation;
- 100 dBA: a jackhammer at distance of 1 m;
- 110 to 130 dBA: a jet taking off at 100m; and,
- 130 dBA: human pain threshold.

The average noise levels measured at the various locations along the proposed Project transmission line route varied from 36 to 60 dBA. Table 7.14-3 in the Application summarizes the baseline noise measurements for 10 monitoring stations along the proposed transmission line route.

Results of the recorded baseline line noise data recorded were used to develop estimated baseline noise levels for the human receptor locations. Baseline noise levels were estimated at permanent or semi-permanent human receptor locations, adjacent to roadways, such as private properties in New Aiyansh, Ellsworth Construction Camp and Bell 2 Lodge. The distance between the proposed transmission line route and the closest receptor feature (i.e. house, building or cabin) varied from 40 m to 5,000 m.

For each human receptor, the potential noise effect was assessed for construction using the “Day-Night Sound Level” (Ldn) (A-weighted equivalent sound level for a 24 hour period with an additional 10 dB imposed on the equivalent sound levels for night time hours of 10 p.m. to 7 a.m.*)* and the Equivalent Sound Level (Leq) (the noise environment as a single value of sound level for any desired duration. This descriptor correlates well with the effects of noise on people or ‘Average’ Sound Level) . The Proponent advises that construction activities are anticipated to occur 10 hours a day, 7 days a week, and each construction activity at any one location would last a week or less. Potential noise sources from construction activities include construction equipment, vehicles, and helicopters. The estimated baseline noise level for the majority of the human receptors was 45 dBA (Leq) and 50 dBA (Ldn) for receptors located near roadways. The estimated noise levels at the human receptor locations are summarized in Table 7.14-4 in the Application.

Further, the Proponent assessed potential health effects for construction based on a change in percent highly annoyed (%H/A_n) (the change in the percentage of the population (at a specific receptor location) who become highly annoyed) at each human receptor location. A change is based on the difference between the noise associated with the proposed Project and noise without the proposed Project. According to the Proponent, if there is a 6.5 %H/A_n increase creates a high potential for an impact on human health from project related activities.

No cumulative effects from other industrial development have been identified as there was no overlap between the proposed project and foreseeable future projects in relation to human receptors.

9.1.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Proponent evaluated the potential effects to human health from the exposure to Project-generated noise. The Proponent reported that construction activities would contribute to increase noise levels at the receptor locations.

Based on the noise measured for each human receptor location, the %H/A_n is predicted to be higher than 6.5% at two human receptor locations (Old Remo residences and a private property in the southern segments of the proposed route) due to potential noise impacts during construction activities such as:

- equipment and vehicles used during the clearing the ROW for the transmission line;
- equipment and vehicles used during structure foundation construction and erection; and,
- noise from the use of a helicopter to erect structures.

During operation, audible noise emitted from the transmission line is typically low. The Proponent confirmed this as baseline measurements from within existing transmission line ROWs are below 30 dBA. On occasion, conductor “corona” noise can be detected, generally highest during heavy rainfall. The Proponent estimates that at the edge of the proposed transmission line ROW maximum noise levels would be 55 dBA. The maximum noise level from conductor noise at the human receptor locations is estimated to be lower than the maximum noise levels measured during the noise baseline studies.

Summary of Mitigation Measures Proposed in the Application

The Proponent proposes the following measures to avoid or minimize effects related to noise:

- development of a noise management environmental protection plan for the construction phase that would include standard construction practices such as the use of silencers, mufflers, regular maintenance of equipment, and implement slower vehicle speeds;
- helicopters accessing the proposed Project site would follow similar flight paths and schedule; and,
- stakeholders would be informed in advance of construction activities that are predicted to cause increased noise levels.

9.1.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

No additional issues relating to noise were identified by the Working Group, First Nations, Nisga’a Nation, or members of the public during the review of the Application.

9.1.4 Conclusion

Potential for Residual Effects and Significance Analysis for Audible Noise

In consideration of the EAO’s assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga’a Nation, EAO finds that there may be adverse residual effects from audible noise as a result of the proposed Project at the Old Remo residences. These effects include the following:

- Increase in percent of residents annoyed by the increase in noise (%H/A > 6.5) from ROW clearing, tower foundation construction, and tower erection.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts from audible noise generated by the proposed Project during construction activities.

EAO's analysis of the significance of potential adverse residual health effects from noise is as follows:

- **Magnitude:** Potential effects of noise are anticipated to be of low magnitude as the annoyance would occur only during the daytime construction activities.

- **Probability:** There is a high likelihood of increased annoyance from the noise due to the construction of the proposed Project. If noise increases from other activities (forestry, traffic, recreation and tourism) coincide with construction activities at the proposed Project site, it is anticipated that there would be a high probability of a cumulative impact of audible noise.

- **Geographic Extent:** Individual/households in the settlement of Old Remo.

- **Duration and Frequency:** The duration of the effect would be short term during daytime construction only, and frequency would be sporadic, at localized residences.

- **Reversibility:** The effect would be reversible as noise would only occur during construction periods.

- **Context:** There are a relatively small number of persons who may be temporarily affected by construction-related noise.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that noise from the proposed Project would not have significant residual adverse health effects.

9.2 Electric and Magnetic Fields

9.2.1 Background Information

The Proponent's assessment considered a review of available scientific and public research data, conclusions and policy statements with respect to health effects from EMF. The baseline information recorded was based on the average and peak EMF levels calculated from the existing 138 kV transmission line. The calculated EMF levels for the proposed Project are summarized in Table 7.14.12 of the Application.

Potential health effects from human receptor exposure to EMF were assessed for the operation phase when the transmission line would be energized.

The study area for the EMF assessment includes a 20 m zone from the edge of the proposed transmission line ROW.

9.2.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Application states that people near the proposed Project may be exposed to EMF generated from the energized transmission line. During the pre-Application stage, First Nations, Nisga'a Nation and members of the public raised concerns about the potential impacts to human health from exposure to EMF.

The Proponent's assessment indicated that the calculated EMF for the proposed Project are well within the limits of the exposure (short term) guidelines developed by the International Commission on Non-Ionizing Radiation Protection (ICNRP). These guidelines were recently revised because in ICNRP's view, existing scientific evidence indicate that the causal relation of prolonged exposure to low frequency magnetic fields and increased risk of childhood leukemia is too weak to form the basis for exposure guidelines. As a result, the reference limits for exposure to EMF have changed. The guidelines now recommend a residential magnetic field exposure limit of 2,000 milligauss (mG), formerly 833 mG and an occupational exposure limit of 10,000 mG, formerly 4,200 mG. The calculated EMF levels for the proposed Project are well below the prescribed limit, with a maximum EMF level of 143 mG. At present there is no exposure standards established for long-term exposure to power frequency magnetic fields because the scientific evidence is not strong enough to conclude that typical exposures cause health problems.

In the Application, the Proponent states that no potential health effects are anticipated from the exposure to EMF from the operation of the proposed Project.

Summary of Mitigation Proposed in the Application

Although the Proponent states that no potential adverse health effects predicted from EMF generated by the proposed Project are predicted, and, therefore, no mitigation measures are required, the Proponent proposed to undertake the following actions:

- adjust the phasing to minimize EMF where the proposed transmission line would share the ROW with the existing transmission lines;
- continue ongoing review of scientific monitoring and developments on potential health effects of EMF;
- monitor research on EMF mitigation techniques and new technologies through participation in various organizations and forums;
- continue to fund independent research on EMF through the Canadian Electricity Association;
- continue to provide a variety of public materials on EMF (presently accessible online), including magnetic field measurements kits, as requested, and respond to queries; and,
- continue to inform the public in a timely manner relevant to new scientific information, as it becomes available.

9.2.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public. These issues, the Proponent responses and EAO's assessment of the adequacy of responses are detailed in Appendix 2. Key issues and responses include the following:

- Members of the public and Working Group members indicated that there is insufficient information to determine the level of EMF caused by the transmission line within the study area, and its potential impact on human health and wildlife.
    - *Response*: EMF levels for the proposed Project would be below the guidelines endorsed by the World Health Organization. There is no evidence to suggest that EMF affects wildlife.
- MoTI questioned whether EMF from transmission lines may interfere with radios and telecommunications during avalanche control and rescue.
    - *Response*: Transmission lines are regulated in Canada to mitigate potential adverse effects of electric and magnetic field interference on radio, mobile radio, televisions and aircraft instruments. The final design and selection of the placement of the towers and conductors would ensure no adverse effects from electric and magnetic field interference. BC Hydro

will work with MoTI to agree to a protocol during avalanche control and rescue.

9.2.4 Conclusion

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there would not be adverse residual effects to human health as a result of EMF exposure from the proposed Project. As a result, a significance analysis is not warranted.

9.3 Domestic Water Quality

9.3.1 Background Information

The Proponent evaluated domestic groundwater supply wells, springs, surface community water supplies within the study area (defined as one kilometre from the proposed transmission line centreline, construction camps, laydown areas and substations), for potential drinking water contamination and health human effects associated with the construction and operation of the proposed Project. In the Application the baseline information collected by the Proponent in 2007 included the location of 25 licensed points of diversion/water licences, the Gitzyon Creek, and Gingit Creek community watersheds (near the community of New Aiyansh), numerous stream crossings and 24 registered groundwater wells.

9.3.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Proponent reports that the key issue with respect to potential effects on drinking water quality is possible contamination from sedimentation, spills, ML/ARD and the use of herbicides during construction or operation of the proposed Project.

The Application states that construction activities, such as road construction and ROW clearing, may result in increased sedimentation and siltation in watercourses within or near the proposed Project area. During construction there is also the potential for accidental fuel, oil and lubricant spills from equipment, and the generation of ML/ARD if bedrock is exposed during site preparation or excavation for the transmission structure foundations. These contaminants could potentially affect downstream water quality used for domestic purposes which could result in human health effects.

The Proponent states in the Application that once construction and site restoration is complete, the potential impact on domestic water would be limited. During operation, there would be the potential for spills of hydrocarbons and oils stored onsite at substations which could affect both surface water and groundwater, in proximity to drinking water sources. Also, during operation the Proponent may apply herbicides to

manage the vegetation under the transmission lines and substations. The Proponent's management strategy includes only applying herbicide to vegetation away from watercourses and riparian areas, and not during rainy or windy conditions. If the Proponent follows the directions and application methods, and only applies herbicides in isolated locations, the Proponent predicts that it is unlikely that surface water or groundwater, and drinking water sources in close proximity, would be affected by the use of herbicides.

Summary of Mitigation Proposed in the Application

The Proponent proposed mitigation measures to mitigate or avoid drinking water contaminants and potential health effects, as follows:

- During construction:
    - implement a Sediment and Erosion Control Plan to maintain water quality at or near baseline levels;
    - implement a Spill Prevention and Emergency Response Plan that includes spill kits, equipment maintenance, and stream set back distances;
    - develop and implement a ML/ARD Prediction and Prevention Management Plan; and,
- During operation and maintenance:
    - use BC Hydro's standards and guidelines, including Vegetation Maintenance Standards[6]; Site Objectives and BC Hydro's Standard Operating Practice; Road Construction, Maintenance and Deactivation; BC Hydro's Road Maintenance Field Guide for Erosion and Sediment;
    - implement Spill Contingency Plans for all substations;
    - use BC Hydro's Spill Response Procedures; Protocol Agreement for Maintenance Work in and Around Water Associated with BC Hydro Transmission and Distribution Infrastructure; AWPRV; Integrated Vegetation Management Plan for Control of Vegetation in Transmission Rights of Way; and Pest Management Plan for Control of Weeds; and,
    - as required under the *BC Integrated Pest Management Act* and Regulations, the Proponent would notify the public, and consult with First Nations and Nisga'a Nation prior to applying herbicides.

[6] For vegetation management: http://www.bchydro.com/safety/vegetation_and_powerlines.html

9.3.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

No additional issues regarding drinking water were raised by the Working Group, First Nations, Nisga'a Nation, ord members of the public addition during the review of the Application.

9.3.4 Conclusion

Potential for Residual Effects and Significance Analysis for Drinking Water Quality

In consideration of EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects to the drinking water quality as a result of the proposed Project construction activities due to:

- the possibility of sedimentation during periods of high precipitation and equipment accidents during construction, reducing water quality in surface waterbodies used for drinking water; and,
- the possibility of spills from construction activities which may reduce water in surface waterbodies used for drinking water.

EAO finds that there will be no potential residual effect to drinking water from ML/ARD because ML/ARD is not likely to occur.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on drinking water quality.

EAO's analysis of the significance of potential adverse residual effects on drinking water quality from construction activities is as follows:

- **Magnitude:** Potential effects on drinking water quality from sedimentation or spills during construction are anticipated to be of low magnitude. It is unlikely that sedimentation and spills would occur at the same drinking water source from more than one activity.

- **Probability:** There is a low likelihood of effects on drinking water quality from sedimentation or spills from proposed Project construction and operation related activities in combination with other local activities. If construction activities of the proposed Project coincide with forestry activities and road construction, it is anticipated that there would be a low to moderate probability of cumulative impacts on drinking water quality from sedimentation or spills.

- **Geographic Extent:** The extent of the effect on drinking water would be localized.

- **Duration and Frequency:** The duration of the effect would be short term during the construction phase only, and frequency would be sporadic, if there is an isolated spill event.

- **Reversibility:** The effect would be reversible and short-term as the possibility of sedimentation and spill events would only occur during construction periods.

- **Context:** Should a spill occu, the effect on drinking water quality would be minimal. Overall, drinking water sources would be resilient to the effect, because it is likely that the impact would be isolated to one drinking water source.

Conclusion

Based on the above analysis and having regard to the Proponent commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant residual adverse health effects to drinking water quality as a result of potential ML/ARD, or sedimentation and spills that may occur during construction and operation related activities.

9.4 Country Foods

9.4.1 Background Information

The Proponent compiled a list of plants and fungi used for medicinal or nutritional purposes within the study area. The list was compiled from the review of a variety of information sources, including First Nations Traditional Use and Knowledge Reports. The list formed the baseline to assess the potential impact on the quality of country foods from the proposed Project construction and operation related activities within the study area. A complete list of country foods is in Table 7.14-21 in the Application.

9.4.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

To determine the potential effects of the proposed Project on the quality of country foods, the Proponent reviewed the predicted changes to the quality of drinking water, air quality, soils, and vegetation documented in the effects assessment section for each valued component in the Application. The changes to the quality of drinking water, air quality, soils, and vegetation may have the potential to reduce the quality of country foods consumed by harvesters.

In the Application, the Proponent reports that country foods could be affected by the potential contaminants absorbed from the surrounding water, air, soil and vegetation. Proposed Project related construction activities could result in minor fuel, oil or fluid spills that could potentially affect soil quality. Particulate matter from the burning of waste wood during the ROW clearing and dust from increased traffic on access roads could affect edible vegetation. The application of herbicides to maintain vegetation along the proposed transmission line corridor could affect the quality of country foods. The Application states that the potential effects on edible vegetations or country foods from the proposed Project construction and operation activities would be negligible.

Summary of Mitigation Proposed in the Application

The Proponent proposed mitigation measures to minimize or avoid impacts on the quality of country foods:

- shrubs, including berry crops will not be treated with herbicides (as they are compatible with the power line);
- herbicides would not be applied near dry streams, watercourses and wetlands;
- public notification will be carried out and signs will be posted to inform local people during the herbicide-treatment period;
- implement a Spill Prevention and Emergency Response Plan. In the event of a spill, the Proponent would apply response mechanisms to minimize potential effects on water quality;
- implement an Air Quality and Dust Control Plan;
- implement the Integrated Vegetation Management Plan for Control of Vegetation in Transmission ROW and Pest Management Plan for Control of Weeds; and,
- as required under the *BC Integrated Pest Management Act* and Regulations, the Proponent would notify the public, and consult with First Nations and Nisga'a Nation prior to applying herbicides.

9.4.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, Nisga'a Nation, and members of the public. These issues and the Proponent responses are detailed in Appendix 2. Key issues and responses include the following:

- First Nations raised concerns about:
    - the impact of the use of herbicides in their asserted territories, specifically on edible foods such as berry crops, and forage for moose, bear or other wildlife species;

    - the use of herbicides would be detrimental to wildlife, impacting human health if fish and game exposed to herbicide are consumed; and,
    - the Application states that herbicides will be applied to maintain vegetation on the proposed transmission line corridor, when First Nations were assured herbicides would not be used.
- *Response:* Vegetation would mainly be cleared and maintained by slashing and mowing, and herbicides would only be applied directly to individual growing trees. Concentrations of herbicides would be low and localized, and applied under proper conditions, and using standard application procedures. As required by the *BC Integrated Pest Management Act* and Regulations, pesticide free zones and no treatment buffers would be enforced to ensure waterbodies or riparian areas would not be affected, and water quality, fisheries and aquatic resources would be protected. Residual herbicides would not be used on the proposed Project ROW, only products registered for use in Canada by the Pest Management Regulatory Agency of Health Canada. These herbicides rapidly breakdown in the environment and have low toxicity, therefore, the risk of contaminating animals and plants is low. Lastly, notice will be posted during the short herbicide treatment period to avoid the collection of berries in the area, and First Nations will be notified about the nature and timing of the herbicide treatments proposed, prior to the application of herbicides in their territories. BC Hydro further responded that herbicides may be used in maintenance, but will not be used in the initial clearing of the ROW. Secondly, when used, herbicides will be generally applied to relatively mature, fast-growing deciduous trees like poplar, which reach relatively tall heights. Stands of taller trees treated with herbicides will die off and be replaced with younger, shorter poplar and alder, which is preferable as moose browse. In summary, the application of herbicides will be relatively limited, directed at taller stands of deciduous tree which may breach the acceptable limits of electrical clearance and pose an electrical hazard, and will likely result in a net increase in moose browse.

9.4.4 Conclusion

Potential for Residual Effects and Significance Analysis for Country Foods

In consideration of the EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects to country foods as a result of the proposed Project construction activities due to:

- a reduction in quality of country foods from particulate matter;
- the possibility of contamination of country foods from the application of herbicides; and,

- the possibility of spills from construction activities which may contaminate country foods.

EAO's analysis of the significance of potential adverse residual effects on country foods from construction activities is as follows:

- **Magnitude:** Potential effects on country foods from contaminant spills, herbicides or particulate matter during construction and operation are anticipated to be of low magnitude, given the low intensity of activities that may contribute to the potential effects.Cumulative effects from other activities on country foods are considered of low magnitude, given limited overlap in time and space.
- **Probability:** There is a low likelihood of effects country foods from proposed Project construction and operation related activities, given spill prevention measures, herbicide application restrictions and adherence to the *Open Burn Smoke Control Regulation* to minimize the dispersion of particulate matter. If construction activities of the proposed Project coincide with forestry activities and road construction, it is anticipated that there would be a low probability of cumulative impacts on country foods given the lack of significant overlap in time and space.
- **Geographic Extent:** The extent of the effects from residual effects from the proposed Project and from cumulative effects in conjunction with other activities on country foods water would be site specific and localized.
- **Duration and Frequency:** The duration of the effect on country foods would be short term during construction and operation phases, and frequency would be sporadic. Duration and frequency of cumulative effects would be similar.
- **Reversibility:** The potential effects on country foods from the proposed Project would be reversible and short-term as herbicide life is short (e.g. 24 hours), particulate matter would cease once burns are completed, and spill would be cleaned up. Reversibility of cumulative effects from other activities would be similar for the same reasons.
- **Context:** Country foods are plentiful in the proposed Project area.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant residual adverse on the quality of country foods and health related effects from the proposed Project construction or maintenance related activities.

9.5 Air Quality

9.5.1 Background Information

To evaluate air quality, the Proponent's assessment considered fugitive dust, fine PM, and gases in the atmosphere produced from the proposed Project related construction and operation activities, and their potential effects on human health.

The Proponent lists the sources of air pollutants including gases (e.g. carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2)) and fugitive dust and fine PM (PM_{10} and $PM_{2.5}$) and the associated potential health effects, in Table 7.14-3 of the Application.

The assessment considered short term, acute exposure to air pollutants at six human receptor locations. These are listed in Table 17.4-1 of the Application.

9.5.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

The Application states that the proposed Project construction phase would result in air emissions from fuel combustion, emissions of fugitive dust caused by the movement of construction and equipment along access roads and the transmission line ROW, and from blasting and slash burning. Although construction would take up to three years, construction activities would average one week per 300 m segment of road or ROW clearing, and installation of structures and exposure to emissions would be short term. Therefore, potential health effects from inhalation of PM emissions are anticipated to be low during the three year construction phase.

Summary of Mitigation Proposed in the Application

To minimize or avoid the potential health effects from fugitive dust and fuel combustion emissions, the Proponent proposes the following mitigation measures:

- conduct periodic maintenance of construction vehicles according to manufacturer's guidelines; avoid engine idling; and minimize helicopter flights where practical;
- apply water to surface of the access roads and materials handled during dry, windy conditions; and,
- use blast mats to reduce dust generation.

To mitigate emissions from open burning, and potential effects on air quality, the Proponent proposes the following measures:

- comply with local MOFR burning restrictions; and,
- comply with the Open Burning Smoke Control Regulation.

To further reduce the potential for adverse health effects from short term exposure to PM at the human receptor locations (see Table 7.14-25 in the Application), the Proponent proposes the following mitigation:

- set back fires 500 m from a permanent receptor location, where possible. If not possible, the set back would be no less than 200 m; and,
- use forced air at all fires near permanent receptors to minimize particulate matter.

9.5.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

No additional issues were raised by the Working group, First Nations, Nisga'a Nation, and members of the public addition during the review of the Application.

9.5.4 Conclusion

Potential for Residual Effects and Significance Analysis for Air Quality

In consideration of the EAO's assessment of the Application, supplementary reports, and comments from the Working Group, First Nations and Nisga'a Nation, EAO finds that there may be adverse residual effects on air quality as a result of the proposed Project construction activities due to increases in particulate matter in the air at receptor locations (listed in Table 7.14-1 in the Application) which may cause potential adverse health effects.

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on air quality. Human activities in neighbouring communities producing PM emissions from vehicular use and residential wood burning, forestry activities, combined with emissions produced from the proposed Project construction activities, such as the construction of access roads, ROW and substations, could result in a cumulative impact on air quality and health effects, depending on the timing, location and duration of these activities.

EAO's analysis of the significance of potential adverse residual health effects from the impact on air quality during construction activities is as follows:

- **Magnitude:** The magnitude of potential direct and cumulative effects on air quality and human health is anticipated to be low as the concentrations of PM from the proposed Project would be minimized and comply with provincial regulations. Cumulative effects on health of individuals would depend on the

level PM resulting from wood stoves and road dust and are expected to be low to moderate.

- **Probability:** There is a low likelihood of health effects on air quality from the proposed Project construction related activities and a low effect on human health from cumulative effects, in particular road dust and wood stove burning, as the quality of the airsheds is good to excellent.

- **Geographic Extent:** The extent of the health effect would be per individual or by household, both for direct and cumulative effects.

- **Duration and Frequency:** The duration of the health effect from air quality would be transient and the frequency would be one-time sporadic depending on the health sensitivity of the receptor to exposure to PM. The duration and frequency of cumulative effects on human health would be intermittent and seasonal as weather conditions dictate when burning can occur.

- **Reversibility:** Direct effects from the proposed Project and cumulative effects would be reversible.

- **Context:** The airsheds along the proposed project are of high quality and low pollution. Regulations are in place to minimize exposure to air pollutants, either from slash burning, to industrial air emissions.

Conclusion

Based on the above analysis and having regard to the Proponent's commitments (which would become legally binding as a condition of an EA Certificate), EAO is satisfied that the proposed Project would not have significant residual adverse health effects from increased PM in the air during the proposed Project construction related activities.

10 Summary of Environmental and Operational Management Plans

10.1 Environmental and Operational Management Plans

A number of the Proponent's Commitments discussed above relate to the development of a construction EMP and Environmental Management Component Plans. These plans are important parts of the Proponent's EMP and strategy for avoiding or mitigating adverse environmental, social, economic, health and heritage effects from the construction and operation of the proposed Project. The construction EMP is considered

preliminary at this time and would be completed in greater detail by the Proponent during the detailed design stage of the proposed Project.

10.1.1 Construction Environmental Management Plan

The construction EMP would be developed prior to construction of the proposed Project in consultation with relevant permitting agencies, Nisga'a Nation and First Nations. The construction EMP would describe how environmental risks, and health and safety would be managed during construction, and how emergency response procedures, mitigation measures and reporting protocols would be implemented.

The contractors hired by the Proponent would be required to prepare Environmental Protection Plans (EPPs) for specific project related activities in accordance with the construction EMP. The contractors would provide details of planned work procedures, environmental mitigation measures, and monitoring activities that would be implemented during construction and would comply with the construction EMP and regulatory approvals required for the proposed Project. Also prior to construction activities, the Proponent or qualified professionals would prepare Environmental Management Component Plans, including: Archaeological Impact Management Plan, Communication Plan, Access Plan and Clearing Prescriptions. Details of each plan are provided below.

The Proponent reports that the construction contractors would be responsible for hiring an environmental monitor(s) to evaluate and report on the compliance with work procedures and practices established by the EPPs. The environmental monitor(s) would be responsible for ensuring that the relevant portions of the construction EMP are successfully implemented and followed.

The Environmental Protection Plans (EPPs) if required from the contractor, for specific work, would include the following:

- **Air Quality and Dust Control Plan**
    - adheres to current legislation and BMP, and the Federal-Provincial-Territorial Committee on Climate Change and EA Guidelines;
    - outlines methods to be used to minimize air emissions and control dust associated with construction activities such as operation of heavy equipment, generators, power tools, and slash burning; and,
    - addresses mitigation requirements related to slash burning, control of fugitive dust, and management of greenhouse gas emissions.
- **Noise Management Plan**
    - provides guidelines and techniques to be implemented to minimize noise generation during construction of the proposed Project; and,

- adheres to noise level regulations and guidelines established by regulatory agencies and local governments.

- **Sediment and Erosion Control Plan**
  - develops and implements measures to minimize soil disturbance and sediment reaching watercourses in accordance with Land Development Guidelines for Protection of Aquatic Habitat (DFO 1993) and Standards and Best Practices for In stream Work; and,
  - describes erosion control protection measures to be applied to steep slopes, stockpiles and disturbed areas.

- **Spill Prevention and Emergency Response Plan**
  - describes procedures and guidelines for spill and emergency prevention, response, and follow-up, as well as emergency response for the proposed Project;
  - development of a plan that would be consistent with the Proponent's Spill Response Procedures (Appendix 11.2-1 in Application) and adhere to the Spill Reporting Regulation (BC Reg 263/90) and Contaminated Sites Regulation (BC Reg 375/96) of the *BC Environmental Management Act* (2003a); and,
  - adheres to BC Guidelines for Industry Emergency Response Plans and/or the CSA Z731-03-CAN/CSA Emergency Preparedness and Response standards.

- **Material Storage, Handling and Waste Management Plan**
  - describes procedures and guidelines for the handling, storage, transportation, and disposal of waste materials in a manner mindful of health, safety, and environmental concerns; and,
  - adheres to relevant provincial and federal legislation and regulations for waste management.

- **Fish Habitat Protection and Mitigation Plan**
  - describes areas and type of aquatic habitat which may be potentially impacted due to the construction of the proposed Project;
  - describes the measures and BMP proposed to minimize, avoid or offset potential effects;
  - develops a plan that ensures compliance with approved practices, guidelines and legislation in section for setting buffer zones, managing drainage water, and completing in-stream work; and,
  - describes measures and protocols to protect fish and fish bearing streams, avoid destruction of fish or HADD, and avoid or minimize deposit of substance harmful to fish or fish habitat.

- **Ecosystems and Vegetation Management Plan**
    - describes the areas and actions to be undertaken to minimize potential effects on ecosystems and vegetation; and
    - describes measures to minimize: the removal and disturbance to vegetation and ecosystems areas, riparian areas, and sensitive ecosystems; the risk of inducing and spreading invasive species; and the risk of fire along the ROW.
- **Wildlife and Wildlife Habitat Protection and Mitigation Plan**
    - describes mitigation measures and procedures relating to the protection of terrestrial habitats and wildlife during construction;
    - considers species-specific requirements for birds, bears, fisher, ungulates and amphibians;
    - develops wildlife enhancement strategies according to applicable standards and legislation such as BC *Wildlife Act, Migratory Birds Convention Act,* and *Species at Risk Act*; and,
    - recommends set back distances from sensitive environmental features, and a list of wildlife sensitive habitats, sensitive periods and safe work timing windows for sensitive specific species.

- **Traffic Management Plan**
    - develops a plan to assist in the management and safe use of roads that cross or are along the ROW, in accordance with applicable legislation, permits or approvals; and to assist in the management of flight traffic, during construction.
- **Site Restoration Plan**
    - describes protocols and procedures to re-vegetate and restore temporarily disturbed areas in a manner that is environmentally sound, reduces erosion and transport of sediment laden water;
    - describes procedures for the salvage and storage of surface soils to mitigate soil loss from temporary access roads; and,
    - describes site restoration that would follow BMPs outlined in relevant documents, including BC MOTI Environmental BMP for Highway Maintenances Activities (2009) and National Energy Board Pipeline Regulation in Canada, A Guide for Landowners and the Public (2003)
- **Agricultural Site Access and Reclamation Plan**
    - describes procedures and recommendations to minimize disturbances to agricultural properties potentially affected by the proposed Project;

- develops a plan in consultation with range or farm operators before finalized;
- meets the requirements of the Agricultural Land Commission and are acceptable to the farm/range operator; and,
- adheres to relevant legislation including the *BC Agricultural Land Commission Act.*

- **ML/ARD Prediction and Prevention Management Plan**
  - implements measures during construction in areas of higher risk of encountering acid producing rock;
  - provides results of the assessment of potential exposure to acid producing rock, and monitoring of ML/ARD and neutralizing potential in areas where bedrock is exposed;
  - implements appropriate Best Management Practices in areas of acid producing rock regarding the diversion of water and covering exposed rock surfaces; and,
  - adheres to the provincial guide for the prediction, prevention, and management of ML/ARD.

- **Forest Fire Emergency Response Plan**
  - adheres to Wildfire Act and Wildfire Regulation and Requirements and BC Hydro's Guidelines for Burning on and near ROW standards;
  - addresses fire prevention and suppression requirements, and techniques for debris management, cutting, piling, chipping, hauling, and other vegetation clearing activities; and,
  - includes a fire emergency response protocol and notification procedure.

The four Environmental Management Component Plans are described below.

- **Archaeological Impact Management Plan**
  - provides measures to mitigate potential effects of the proposed Project on archaeological sites protected by the *Heritage Conservation Act* as well as designated heritage sites;
  - describes guidelines and procedures for previously discovered archaeological sites, and undiscovered sites encountered during construction;
  - describes provisions for monitoring, during construction, if required; and,

- adheres to application legislation and guidelines such as *Heritage Conservation Act* and the Archaeology Branch (1998) Archaeological Impact Assessment Guidelines.

- **Communications Plan**

  - provides details of how the public, Nisga'a Nation, First Nations and stakeholders will be notified about major construction activities, such as scheduling, and environmental management of potential issues, associated with construction; and,
  - describes communication methods for the distribution of information.

- **Access Plan**

  - identifies access required for clearing the transmission line corridor based on the preliminary design, including existing access for clearing phase and new roads which will be constructed, and temporary roads and roads to be used for access during operations;
  - develops a plan by the design-build contractor for additional access based on the final line design; and,
  - describes additional requirements for access, including measures to minimize disturbances to vegetation, fish, water courses, wetlands, and wildlife.

- **Clearing Prescriptions**

  - developed by design-build contractor;
  - describes the procedures to minimize and avoid vegetation removal and disturbance in riparian areas, wetlands, and valued and listed ecosystems;
  - describes the guidelines for clearing and cutting of ground cover species; and,
  - describes procedures for minimizing disturbance or destruction of recreational features during clearing and construction.

10.1.2 Operation Management Plan

The environmental management of the proposed Project during operation would be in accordance with the Proponent's Environmental Responsibility Principles and relevant legislation, and be guided by the Proponent's existing procedures, standards and guidelines (operational procedure documents) specifically for the operation and maintenance of the transmission system (see BC Hydro's website: www.bchydro.com) . The following operational procedure documents considered in the Operation Management Plan are as follows:

- Spill Response Procedures and Spill Contingency Plans
- Emergency Response Procedures
- Integrated Vegetation Management Plan (IVMP) for Control of Vegetation within Transmission Rights-of-Way
- Pest Management Plan for Control of Weeds in BCTC Facilities
- Vegetation Maintenance & Transmission Maintenance Standards and Standard Operating Procedures

A brief explanation of these operational procedure documents are provided in Section 11.3.3 of the Application.

11 Compliance Reporting

Background Information

The Environmental Assessment Act (Part 5, Section 34) details the steps the Minister of Environment may take if a proponent fails to comply with the terms of their EA Certificate. The Minister of Environment has broad powers to order that construction or operation cease on the project, either partly or completely, at his or her discretion, until the proponent has complied with the EA Certificate's terms. The Minister of Environment may also suspend, cancel or amend a certificate for a variety of reasons. The Act (Section 41 and 43) defines offences and specifies maximum fines and imprisonment times for those offences.

The EA Certificate may be subject to cancellation, suspension in whole or in part, amendments, or the attachment of new Conditions, for any of the following reasons:

a) the Minister has reasonable and probable grounds to believe that the Proponent is in default of:
    i. an order of the Courts under section 35(2), 45 or 47 of the Act;
    ii. an order of the Minister made under section 34 or 36 of the Act; or,
    iii. one or more requirements or Conditions of the Certificate.

As part of the EA Certificate agreement, the Proponent must submit a report to the Executive Director on the status of compliance with the Conditions of the EA Certificate, and the commitments in Schedule B, at a specified time prior to significant surface disturbance during construction, and at a specified time prior to full scale operation of the Project.

<u>Compliance and the Proposed Project</u>

The construction EMP provides the Proponent's Contractor(s) with performance-based environmental specifications for the protection of important biophysical, cultural, archaeological and socioeconomic values within the Project area. The EMP will assist

Contractors in constructing the Project in accordance with Commitments and Assurances for the EA Certificate, BC Hydro's Environmental Responsibility Policy, other regulatory requirements, BMP and protocols. The construction EMP also describes how environmental risks are to be managed during construction and, in the event of an environmental incident, how emergency response procedures, mitigation measures, and reporting protocols are to be implemented.

The finalized construction EMP will be reviewed every 12 months during construction to verify that the environmental management system is conforming to Project commitments, regulatory approvals, and legislative requirements. In addition, corrective or preventative actions may be raised indicating that amendments are required to the construction EMP. The construction EMP review and amendment process will be used to revise and improve the construction EMP and the Environmental Management Component Plans in order to facilitate regulatory and permit compliance and continuous improvement.

The Proponent will contract Environmental Monitors to provide it with details of its Environmental Monitoring Program to achieve compliance with EAC Commitments and Assurances and with terms and conditions of regulatory permits and approvals.

The Proponent grants authority for the Environmental Monitor to suspend work if conditions, requirements, or terms and conditions of commitments and assurances, regulatory approvals, the construction EMP, applicable EPPs and/or applicable legislation are not being met. Should this be necessary, the Environmental Monitor shall immediately advise the Contractor and BC Hydro's Project Manager of the circumstances and reasons for this action.

The Proponent will design and implement an Environmental Monitoring Plan identifying the type and frequency of observations and data collection, methodologies to be employed, and protocols to be followed. Monitoring shall be focused on determining whether terms and conditions of permits, authorizations, and approvals are being met. The Environmental Monitoring Plan shall include, at a minimum:

- regular inspection of sediment and erosion control measures;
- regular inspection of construction equipment on site for leaks or spills;
- water quality monitoring upstream and downstream of construction areas, including measurement of common parameters (e.g. pH, temperature, turbidity, dissolved oxygen, conductivity, and total suspended solids), especially during works (e.g., concrete pours) in the vicinity of watercourses – see Section 5.4 of Application: Water Quality Management;
- monitoring of fuel deliveries and transfers;
- regular inspection of bulk fuel storage facilities;
- regular inspection of the adequacy of the emergency response and spill containment and recovery equipment, and spill response training programs;
- inspection of construction waste management programs;
- inspection of slash burning operations;

- inspection and reporting on mitigation measures for vegetation alteration including:
  - monitoring of access roads and construction sites to determine if there are any new areas of invasive species establishment; and,
  - inspection of vehicles and measures taken to prevent invasive species from establishing;
- inspection and reporting on mitigation measures for wildlife including:
  - recording observations of amphibian congregations and breeding sites; and,
  - regular inspection of fences or flagged no-disturbance buffers around identified important wildlife habitats or features.

The Environmental Monitor shall help identify and resolve potential problems through effective communication with BC Hydro's Project Manager, Construction Program Manager and Environmental Officer(s) and, where appropriate, regulatory agencies, Nisga'a Nation, First Nations, and key stakeholders. The Environmental Monitor will be obliged to follow protocol to advise both BC Hydro and applicable regulatory agencies (i.e. MNRO) when construction activities do not comply with regulatory requirements, and when corrective actions are required. The Environmental Monitor will provide weekly environmental monitoring reports.

Cultural Monitoring and Compliance

Archaeological Monitoring would be conducted on an as-needed and as-required basis by Cultural Monitors. For monitoring actions conducted within their traditional territories, activities will comply with the standard terms and conditions of the policies and procedures of Nisga'a Nation and First Nations. Work shall be suspended in the event that a suspected archaeological site is uncovered during any phase of the proposed Project, in accordance with the conditions of the *Heritage Conservation Act* Permit issued for construction, and the *Heritage Conservation Act* Permit holder (registered archaeologist), Archaeology Branch of MNRO, Nisga'a Nation or the relevant First Nation communities shall be contacted.

BC Hydro will provide an opportunity for First Nations and Nisga'a Nation to, provide the opportunity for one of their members to participate on the AIA crew for any additional AIA work conducted on their traditional territories or on Nisga'a Lands, respectively.

PART C – FEDERAL REQUIREMENTS

This section provides an overview of the additional information required as part of the federal EA delegated to EAO under subsection 17(1) of the CEAA for the proposed Project, as scoped by the federal RAs. A basic outline of the type of information that will be addressed as part of the federal EA report is provided below. Additional detail is included in the federal assessment, including:

- the environmental effects of the proposed Project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
- the significance of the environmental effects referred to above;
- comments from the public that are received in accordance with the CEAA and its regulations;
- measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the proposed Project;

As defined under the CEAA, "environmental effect" means, in respect of a project:

a) *any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the Species at Risk Act*

b) *any effect of any change referred to in paragraph (a) on*

   i) *health and socio-economic conditions*

   ii) *physical and cultural heritage*

   iii) *the current use of lands and resources for traditional purposes by aboriginal persons, or*

   iv) *any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or*

c) *any change to the project that may be caused by the environment, whether any such change or effect occurs within or outside Canada.*

The federal assessment includes an evaluation of the nature and extent of the residual adverse environmental effects after applying mitigation and whether the adverse environmental effects are significant. The prediction of significance is based on the following factors: magnitude, geographic extent, duration, permanence/reversibility, and ecological context.

Under section 79 of the *Species at Risk Act*, SC 2002, c.29, the RAs must identify adverse effects of the project on listed species and their critical habitat or residences. The RAs must also ensure that measures are taken to avoid or lessen adverse effects and that effects are monitored. Mitigation measures must be consistent with recovery strategies and action plans for the species.

12 Navigable Waters

Navigable waters in Canada are protected by the *Navigable Waters Protection Act*, RS 1985, c.N-22, (NWPA) and are the jurisdiction of TC. TC has determined that approvals are required under the NWPA for the works identified in the Application and in supplementary reports submitted during the EA, because there is likely to be a potential effect of the proposed Project on navigation.

Background Information

In Canada, “navigable waters” include any body of water capable of being navigated by any type of floating vessel for the purposes of transportation, recreation, or commerce (Transport Canada 2009b). The Navigable Waters Protection Act (1985) was adopted to protect the public right to navigate. The Act ensures that any interference created by a project does not alter the navigability of the waterway and that the rights of other waterway users are respected.

In accordance with TC requirements, watercourses along the Project corridor at access road or transmission line crossings are considered potentially navigable if their bankfull width is $\geq$3 m and their bankfull depth is $\geq$0.5 m. TC will make the final determination of navigability (considering additional criteria, such as access).

Scope

For the navigable waters section of the effects assessment, spatial boundary was used encompassing an area 50 m upstream and downstream of each crossing location. The assessment considered two Project phases: (1) construction and restoration, and (2) operations and maintenance. The Proponent’s analysis focused on whether public safety would be affected and whether existing navigational routes and uses would need to be diverted or restricted.

Watercourses that cross the proposed route may be used for recreational and commercial navigational purposes. Human use of surface water as a resource for recreational and commercial navigation occurs within the Project area. Aboriginal

groups also use local waterways for traditional hunting, fishing, and trapping. Additional details on watercourse use are provided in Section 7.11 of the Application.

Proposed Northwest Transmission Line Route

At the time the Application was submitted, a total of 426 stream crossings were identified along the proposed transmission line route. Details on each of these crossings are provided in the appendices of the Fisheries Baseline Report (Appendix 7.6-1). Subsequent to the Application submission, supplemental work along the Bell-Irving route, and confirmation of stream information at other locations where the route was re-aligned, resulted in a revised total of 861 waterbodies (streams, lakes, or wetlands) stream crossings.

Many of the waterbodies that would intersect the transmission line are narrow (<3 m wide), shallow, or ephemeral streams, thus, severely limiting their navigable value as recreational or commercial waterways. Using the present criteria, a list of 111 potentially navigable streams were identified in the Application (Appendix 7.11-1, Table 17.4-1). Of this total, 83 streams are located along the shared alignment, 26 along the eastern route option, and 2 along the western route option. The proposed transmission line would cross several major waterways (≥40 m width), including Bell-Irving River, Cranberry River, Nass River, and Skeena River near the Hell's Gate Slough.

Bell Irving Route:

Along the proposed Bell-Irving route, 83 stream crossings have been identified. Details on each of these crossings are provided in Appendix 6.2-2. Using the present criteria, seven potentially navigable streams were identified (Table 6.15-1). Many of the streams that would intersect the transmission line are narrow (<3 m wide), shallow, or ephemeral, thus severely limiting their navigable value as recreational or commercial waterways.

The proposed Bell-Irving route will cross the Bell-Irving River (≥120 m width) and the Nass River (≥70 m width), which are considered major waterways. The remaining five watercourses will likely not be considered navigable by TC due to their gradient or morphology, which includes numerous falls and cascades. The Nass, Cranberry, and Bell-Irving Rivers will not likely be affected because the Proponent does not intend to build bridges across these rivers, but conductors will be strung across these waterways.

Proposed Project Issues and Effects and Proposed Mitigation Identified in the Application

The main concern identified was the potential effect of the construction phase of the proposed transmission line and infrastructure on the navigability of streams. The

principal issues associated with this concern are access to the public and First Nations interests. Navigable waterways are important for traditional forms of travel.

The key issues identified for the Construction Phase of the proposed Project are:

- conductor stringing;
- bridge construction; and,
- heavy equipment activity.

Construction of the Project could potentially have adverse effect on watercourse navigation during conductor stringing and bridge construction activities over navigable watercourses by disrupting recreational and commercial vessel traffic and creating potential safety issues. If transmission lines and/or bridges are not constructed to minimize or avoid potential adverse effects to all navigable vessels potentially using each watercourse, navigation at these locations by certain vessels could be limited or prevented for the life of the Project.

Mitigation:

- where new access roads and spur roads are required, they will be oriented to avoid crossing streams wherever practicable.
- any new bridges constructed for Project roads would be designed with sufficient freeboard to ensure navigability is not impeded. The height of minimum freeboard would be set above 1:200 year flood levels for each watershed (BC MOTI 2007). Bridge construction is expected to affect navigation for approximately two to five days.
- when conductors are strung across major waterways such as the Nass and Bell-Irving Rivers, temporary closures of watercourses to navigable vessels will occur due to potential safety concerns associated with operation of heavy equipment and other construction activities over the waterway. During these periods, navigability of the waterway at the crossing location will be limited or prohibited, necessitating temporary avoidance of the area by the general public or use of exit/entry points before and after the crossing location to avoid passage through the area. Conductor stringing could be expected to affect navigation for approximately one to two days at each watercourse crossing location.
- for navigable watercourses where crossing information is not currently available, detailed design drawings, for specific aerial transmission lines and bridges, consistent with TC's requirements under the *Navigable Waters Protection Act*, would be included with submissions for formal approvals, following submission of the Application, but prior to construction. Drawings would include the watercourse name and number (if applicable), crossing width, height to the transmission line from bankfull width or height to the bridge measured from the high water mark, bankfull depth, longitude, and latitude.

- the Proponent commits to plan, design, construct and maintain transmission line access routes in accordance with accepted Transport Canada standards to prevent any on-going adverse effects to navigation.
- maintain minimum height clearance of transmission lines above waterways.
- warning signs for bridge and transmission line construction that are legible at 50 m to be placed 25-200m (depending on width of stream) upstream and downstream of the construction site.

The principal issue identified for the Operations phase is bridge maintenance

Potential effects of the Project on navigation during operation activities would likely be limited to temporary closures associated with bridge maintenance or replacement activities.

Mitigation:

- routine maintenance of bridges would ensure unimpeded navigation for a crossing. Transmission line and ROW management and maintenance would occur over the life of the Project.
- warning signs for bridge and transmission line maintenance that are legible at 50 m to be placed 25-200m(depending on width of stream)upstream and downstream of the maintenance site.
- short duration closures.

Nisga'a Lands Route

In 2010, an additional field study of the Nisga'a Lands stream crossings was conducted with field participation of Nisga'a citizens. The results of this fieldwork form the baseline information that identifies all potential navigable waters within Nisga'a Lands. Along the Nisga'a Lands route, 27 stream crossings have been identified. Using the present criteria, six potentially navigable streams were identified. Many of the streams that will intersect the proposed transmission line are narrow (<3 m wide), shallow, or ephemeral, thus severely limiting their navigable value as recreational or commercial waterways. The proposed NTL alignment through Nisga'a Lands will cross two minor waterways: South Seaskinnish and Gitzyon Creeks. The remaining four unnamed watercourses will likely not be considered navigable by TC due to their gradient or morphology, which includes numerous falls and cascades. Overall, no effects are predicted with respect to navigable waters that have not already been considered above. In addition, if the route passing through Nisga'a Lands is selected, the Proponent will conduct additional work will to determine whether existing, new, or replacement crossing structures will cross potentially navigable watercourses once the route and access roads are finalized. This information will be provided to TC during the detailed design phase, in accordance with applicable engineering standards.

If the Proponent provides the additional assessment described in this report, and taking the mitigation measures into account, the proposed Project is unlikely to result in a significant adverse effect on potentially navigable waters on Nisga'a Lands.

Proposed Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the Application Review, Government agencies and EC, requested more detail related to completed detailed engineering design work and availability of drawings to accompany construction, including information on specific tower locations and individual stream crossing designs;

- *Response:* Specific information such as conductor sizing, specific tower locations, surveys for new road requirements and ROW cross-sections based on centre-line surveys and clearing width definition, are to come with the next phase of the proposed Project once a design-build contractor is engaged.

The Lax Kw'alaams First Nation identified that fisheries resources and fishing sites in their territory could be affected by the crossing of the Skeena River, near the Hell's Gate Slough. They expressed concern that the construction of a transmission line across the river has the potential to introduce land disturbance and removal and alteration of riparian vegetation through construction and operational phases of the proposed Project. Further, temporary and permanent access to areas adjacent to the river could also introduce erosion and water quality issues. As part of the project EA, the Proponent conducted a crossing assessment and determined that if the Fisheries Act guidelines for riparian crossings were met, then a HADD could be avoided. Cultural and environmental monitoring will be critical to avoid potential impacts

- *Response:* The Proponent recognizes the importance of fish to the Lax Kw'alaams First Nation and the Skeena River and adjacent channels contain fish and riparian habitat which is sensitive to disturbance.

Any riparian clearing for the ROW would be subject to site-specific clearing prescriptions that would be part of the Clearing Prescription Component Plan. Lax Kw'alaams First Nation will have an opportunity to review and provide input on the Construction EMP, EPPs, and EMP Component Plans. As detailed in the Construction EMP, all contractors will be required to have an Environmental Monitor. Unless a First Nation has a contract which provides for an Environmental Monitor, BC Hydro will provide the First Nation with an opportunity to provide a cultural monitor and/or site specific cultural information for excavation areas (e.g., road building or tower construction) within its asserted traditional territory. BC Hydro will reasonably fund cultural monitors and provide construction schedules, as available.

Response: The Proponent recognizes the importance of fish to the Lax Kw'alaams First Nation and the Skeena River and adjacent channels contain fish and riparian habitat which is sensitive to disturbance. Any riparian clearing for the ROW would be subject to

site-specific clearing prescriptions that would be part of the Clearing Prescription Component Plan. Lax Kw'alaams First Nation will have an opportunity to review and provide input on the Construction EMP, EPPs, and EMP Component Plans. As detailed in the Construction Environmental Management Plan, all contractors will be required to have an Environmental Monitor. Unless a First Nation has a contract which provides for an Environmental Monitor, BC Hydro will provide the First Nation with an opportunity to provide a cultural monitor and/or site specific cultural information for excavation areas (e.g., road building or tower construction) within its asserted traditional territory. BC Hydro will reasonably fund cultural monitors and provide construction schedules, as available.

Conclusions

The majority of the streams that would be crossed by the transmission line and maintenance access roads are less than 3 m in width and 0.5 m depth. Proposed design considerations, other mitigation measures proposed by the Proponent, and the relatively short-term nature of the residual adverse effects, the EAO believes that the Proposed Project's effect on navigable waters along the proposed transmission line route is not likely to be significant.

13 Effects of the Environment on the Proposed Project

In addition to evaluating the effects of the proposed Project on the environment, changes to the proposed Project that may arise as a result of the environment have also been considered. The assessment of the effects of the environment on the proposed Project included identifying the environmental factors deemed to have possible consequences on the proposed Project, the likelihood and severity of their occurrence and mitigation measures planned to minimize their impact. The environmental conditions or events discussed in regard to their potential to affect the proposed Project include, but may not be limited to, consideration of natural hazards such as: extreme weather events (lightning, heavy precipitation, extreme temperatures, flooding, and wind); natural seismic events; fire; slope stability and mass wasting events (e.g., debris flows/torrents; rock fall; snow avalanche); and climate change. Proposed mitigation, including design strategies are considered in the evaluation of the effects of the environment on the proposed Project and the determination of their significance.

13.1 Background Information

Chapter 8 of the Proponent's Application provides an assessment of environmental factors that have the potential to affect the construction, infrastructure and operation of the proposed Project, and identifies measures to avoid, mitigate or manage potential effects of these environmental factors. The environmental factors considered in this

assessment include landslides, snow avalanches, channel debris flow, earthquakes, and volcanic activity, flooding, climate and meteorology effects, and wildfire hazards.

13.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

Landslides

There is the potential of landslides to occur on steep slopes associated with local mountain ranges, including the Hazelton Mountains near Terrace and the Skeena Mountains from Bell 1 crossing to Echo Lake north of Ningunsaw Pass.

In the Application, the Proponent states that there is evidence of landslide activity and potentially unstable terrain within the eastern route option on the banks of the Cedar River and Clarence Creek, and on the valley slopes of the Kiteen River including Stenstrom Creek and many of the tributary creeks (eastern route option) that would be crossed by the route. There is also evidence of landslide activity on steep gullied sections of other creeks near the proposed corridor, including Deltaic Creek and Skowill Creek, between Bell I and Bell II. Small landslides associated with forestry road construction have been identified along the east side of the Kiteen River.

The results from the 2010 Nisga'a Lands field study confirmed that the potential for natural landslides to affect the proposed ROW on Nisga'a Lands is low.

Snow Avalanches

The Application states that snow avalanche hazards are likely to occur at several locations on the northern slope of the Bell-Irving River near Bell II, two locations on the valley slope of Beaverpond Creek and the northern side of the Ningunsaw River near Bend Creek within the northern segments of the proposed transmission line route. Snow avalanche hazard is also likely to occur at one location along the Kiteen Valley within the eastern route option. Potential effects of snow avalanches may include damage to road and highway infrastructure, damage to transmission lines and disruption of power supply, and reduced public safety.

Channel Debris Flows

In the application, the Proponent reports that several rivers and creeks within the proposed Project area are subject to flooding and recurring debris flow events. Debris flows in many of the tributaries to Snowbank Creek, Beaverpond Creek, and Ningunsaw River within the northern segments of the proposed line have resulted in washouts and damage to bridges, culverts and highway embankments along Highway 37 between Bell II and Bob Quinn. The Application states that some debris flows may also be expected at some creeks within the western and eastern route options in the southern segments of the proposed line. At some locations, the proposed

transmission line route crosses deposition zones of active fluvial fans or cones. The distribution of debris flows and fans or cones within the study corridor are shown in Table 7.5-1 of the Application.

Large fluvial and colluvial fans have developed in the deposition zones of many tributary creeks feeding Snowbank Creek, Beaverpond Creek, and Ningunsaw River along the northern segments of the proposed route.

Earthquakes

The Proponent reports in the Application that the proposed Project is in an area of low to moderate seismic activity. Earthquake records since 1985 indicated that several magnitude 3 to 4 earthquakes have occurred within 100 km of the proposed Project area and an earthquake of magnitude of 5.3 was registered within 200 km of the proposed Project area. In the Application, the Proponent states that it is unlikely that seismic response from the recorded earthquakes within the proposed Project area or from remote earthquake events would be sufficient to cause damage to well-constructed structures, or initiate large-scale landslides or rockfalls that could affect the proposed transmission line or infrastructure.

Volcanic Activity

The proposed Project area is located within the southern portion of the Stikine Volcanic Belt that extends just north of Prince Rupert into the Yukon Territory. The Application reports that the area has been active in recent history with an eruption at the Tseax Cone, northeast of Lava Lake near New Aiyansh. The most recent eruption occurred in 1775 and produced a lava flow into the Nass River destroying a Nisga'a village.

The proposed western route option through the Nass River Valley crosses lava beds at Crater Creek. The proposed eastern route option through the Kiteen River Valley does not cross an area that has been directly affected by volcanic activity in recent history.

The Proponent reports that the potential of a future lava eruption is 1 in 220 and an annual probability is 1 in 3,333. Should a future eruption and a lava flow occur, the lava flow may cause forest fires, and the damming of local rivers.

Flooding Effects

In the Application it is anticipated that there is the potential for transmission structures to be affected by floodwaters with substantial flow velocity that could erode the fill around footings and result in destabilization of affected structures. Further, debris and ice within the flood flow may damage the inundated towers. If the structures require replacing, a short term outage of the line may be required to remove the old structure and foundation.

The Proponent surmises that flood events that exceed the capacity of drainage facilities at stream crossings and at other locations along access roads may result in a closure of the road and the potential for the excess water to erode the road surface, damage the stream crossings or block the road due to debris. Such road closures may have the potential to delay the construction schedule and the ongoing maintenance if several roads are affected.

The proposed transmission line would cross the Skeena River and the structures at the south side of the Skeena River crossing may be located within a floodplain. This crossing and Hells Gate Slough on the south side of the Skeena River, and some of the surrounding lands may be at risk of flooding during very high river flow conditions.

Flood events that could affect the proposed Project are considered to be high magnitude and low frequency.

Based on the current climate change projections such flood events are predicted to increase in frequency and magnitude in the foreseeable future (see sections 7.2.1 and 8.4 of the Application), however, it is unlikely that the effect would be substantial during the operation phase of the proposed Project.

Wildfire Hazards

The Application describes the proposed Project as being located in an area which has seen a few major and several minor wildfires in the past decade. The proposed Project area is particularly sensitive because of its location among mature and old-growth coniferous forest areas that have historically been susceptible to forest fires. Potential wildfires could pose a considerable hazard to transmission line infrastructure and substations and the deterioration of air quality. Heavy smoke, flames and heat from wildfires may create electrical paths between an energized conductor and the ground effecting transmission of electricity.

The Proponent predicts that the proposed Project itself could potentially affect wildfire hazards during the clearing and construction phase through:

- increasing potential for human caused ignition from increasing human activity in the region;
- increasing fuel sources by clearing vegetation; and,
- decreasing wildfire hazards by creating barriers such as the ROW.

The Proponent stated in the Application that the risk of wildfires in the proposed Project area and the potential effects on the proposed Project as a result of wildfires, would be effectively managed by mitigation, contingency and emergency planning, preparedness, fuel management, and with the presence of the BC Forest Services Protection Branch.

Climate and Meteorology Hazards

The application suggests that climate and meteorology hazards that may have the potential to impact the proposed Project transmission line and infrastructure include: lightning strikes; loading due to ice, wind, and snow; washout of footings and access roads due to heavy precipitation and snow creep. Each of these hazards has the potential to temporarily interrupt or cause failure to the transmission line infrastructure, in areas along the proposed route that are located on ridges tops or areas with high wind and weather exposure. Climate and meteorology hazard levels related to wind, ice loading, and snow loading, can medium to very high. Lightning hazard effects on the proposed Project are expected to be low to moderate.

Several areas of the proposed route described in the Application are at elevations higher than 700 m and are likely to be subject to a very high risk of ice and a high risk of wind. Therefore, the span length between the towers in these areas would be reduced to accommodate potential conductor sag due to the weight of ice and potential wind pressure on ice. Snow depth greater than 1 m (i.e. in the Snowbank Creek area snow depths are expected to be 2.5 to 3 m) would impact the structure height and/or span length. .

The Application states that lightning poses a major threat to the reliability of the transmission line causing power outages. Transmission lines may be directly affected by striking the transmission or substation infrastructure, or indirectly through the ignition of wildfire, which may threaten the operation of the transmission line system. Approximately, 0 to 0.2 lightning strikes per square kilometre, per year, are expected to occur in the proposed Project area.

The Proponent considered climate change in the assessment and reports in the Application that over the past 50 plus years there has been a slight warming, an increase in precipitation, and a decrease in snowpack.

Summary of Mitigation Proposed in the Application

The following mitigation and environmental management measures proposed in the Application would be implemented to minimize potential adverse effects caused by landslides or potential slope instability:

- locate final alignment, transmission structures, substations, and access roads in areas that avoid or minimize exposure to steep terrain, landslides, or slope stability hazards, where possible;
- locate final alignment, transmission structures, substations and access roads in areas that avoid or minimize exposure to steep terrain, landslides or slope stability hazards, where possible;

- increase spans between structures to avoid construction in areas prone to landslides, or potential instability;
- design and construct protective works for hazard mitigation or reduction, where required, in areas where terrain hazards such as debris flow, debris slide, rock slide, or rock fall cannot be avoided;
- design and construct access roads and culverts based on forest road engineering guidelines (BC MOFR 2002); and,
- schedule construction during summer months when landslide and slope instability risks are typically lower.

Additional mitigation measures are described in the Geotechnical Stability section of the Report.

The application contains the following mitigation and environmental management measures to minimize potential adverse effects to the proposed Project caused by snow avalanches:

- locate final alignment, transmission structures, substations, and access roads in areas that avoid or minimize exposure to snow avalanche hazards;
- increase spans between towers to avoid construction in areas prone to snow avalanches;
- design and construct reinforced transmission structures or protective works for hazard mitigation or reduction in areas where snow avalanche hazards cannot be avoided;
- develop a strategy for protection of transmission infrastructure from powder avalanches, such as dead-end structures and breakaway conductors to facilitate quick restoration of unforeseen extreme return period events;
- schedule construction during seasonal periods when snow avalanches risks are low in areas of high avalanche potential;
- discuss plans for Project construction with BC MOTI, including ROW clearing, access road construction, or any other modification to the terrain that could have an effect on avalanche paths in the area of Highway 37 between Bell II and Bob Quinn; and,
- transmission towers within identified avalanche areas would be designed and strategically located where practical so as to not interfere with the ability of BC MOTI to carry out avalanche control for highway safety.

The Application contains the following mitigation and environmental management measures to minimize potential adverse effects on the proposed Project caused by debris flows:

- locate final alignment, transmission structures, substations, and access roads in areas that avoid or minimize exposure to channel debris flows and active debris fans;
- increase spans between towers to avoid construction in areas susceptible to debris flow or active fan deposition, where technically feasible;

- design and construct appropriate protective works for hazard mitigation or reduction in areas where debris flows or active fan deposition cannot be avoided. Tower bases may require rip-rap protection to protect against potential erosion and scour where creek channel avulsion is predicted. In areas where debris flow and flood control is required, structures such as check dams or deflection berms could be considered; and,
- design and construct culverts, bridges, and road embankments for road access based on engineering designs that consider appropriate design flood flows to minimize the potential for washouts.

The following mitigation and environmental management measures would be followed to avoid or minimize potential adverse effects of earthquakes on the proposed Project:

- design and construct deep foundation support or undertake foundation treatment (soil replacement, preloading, dynamic compaction, vibro-compaction, vibro-replacement or deep soil mixing) where transmission structures would need to be placed on weak, compressible, or potentially liquefiable foundation soils; and,
- design transmission structure foundations and substation foundations in accordance with seismic standards required by the National Building Code of Canada 2005, where applicable.

Project design, construction, and maintenance considerations that would mitigate potential flood related effects on transmission structures and access roads include:

- place individual structures and other transmission facilities outside of wetland, riparian, fluvial fans, and active floodplain areas, wherever technically feasible;
- construct special foundations or protection structures (i.e., raised foundations, deeper foundations, debris deflection cages, armoured rock arms, rip-rap) within active floodplains or high risk areas;
- follow BC Hydro's design and construction standards for structure footing and guy placement and installation to minimize risk of erosion and destabilization around footings;
- perform visual geotechnical hazard inspections and undertaking required maintenance, in a timely manner, on any transmission line structures following flood events that may have damaged structure footings;
- minimize the construction of new access roads;
- assess the integrity and capacity of drainage structures of existing roads that would be used as Project access roads, to ensure that they meet current BC FRPA (2002) standards;
- design roads to minimize the number of stream crossings, when new access roads are required;
- locate roads on high ground and installing fail safes on the downside of susceptible culverts;
- install adequate access road drainage facilities in accordance with the BC FRPA (2002), which would include sizing facilities to the appropriate design flow (i.e. 1-in-100 year event);

- follow BC Hydro standard operating procedures for road construction and maintenance to reduce possible flooding effects during road and stream crossing construction and use;
- follow a regular inspection and maintenance schedule, that would include the identification and repair of drainage defects on the access roads;
- avoid potential for beaver-related problems by planning access to avoid placing roads through beaver-friendly sites (aspen and running water). If blocking of culverts becomes a problem, mitigate by placing extended trash-racks around the inlet of the culverts to allow free drainage and utilizing the MOE (2001) beaver management guidelines; and,
- schedule construction activities related to stream crossings outside periods when large runoff events can be expected, and follow BC Hydro standard operating procedure for construction shut-down during heavy runoff (i.e. rainfall and/or snowmelt) events.

To mitigate the risk of wildfires, the Proponent would undertake the following specific actions:

- undertake a wildfire risk and consequence analysis and specify the Wildfire Risk Management System treatments;
- reduce overall slash loading on the ROW;
- reduce spatial distribution of fuels, by having smaller treatment areas, where practical;
- create fuel free zones to limit potential for fire spread; and,
- use and enforce contract standards which limit fuel accumulations.

  In addition, MoFR monitors fire hazard conditions and determines the timing, location and level of any activity in the provincial forest to minimize the ignition of a potential forest fire.

To minimize environmental effects on the proposed Project from climate change and meteorological impacts, the Proponent would undertake the following:

- incorporate the International Electrotechnical Commission (IEC) standard 60826 (Design Criteria of Overhead Transmission Lines"), American Society of Civil Engineers' (ASCE) Minimum Design Loads for Buildings and Other Structures standard (ASCE 7-95 Section 10), and Canadian Standards Council (CSA) standard C22.3 No. 1 Overhead Systems, during design and construction of the proposed Project;
- avoid areas more susceptible to adverse meteorological conditions such (i.e. ridgelines, areas of high exposure, narrow and windy valleys, and steep slopes);
- where it is not practical to avoid such areas, implement precautionary measures in the detailed engineering design and construction to minimize potential adverse environmental effects;
- install surge arrestors and protective relaying to protect equipment, and to disconnect the line to extinguish a lightning induced flashover;

- monitor climate and hydrology changes and provide updated information on climate change risks and incorporate into the adaptive management framework for long term operation of the transmission system; and,
- increase maintenance to access various Project sites, ROW and related infrastructure because of greater potential for large accumulations of snow.

13.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group and First Nations pertaining to landslides, potential slope instability and avalanches. Key issues and Proponent responses are documented in section 5.4, Geotechnical Stability, of this Report. Detailed Proponent responses and EAO's assessment of the adequacy of responses are detailed in Appendix 2 attached to this Report.

13.4 Conclusion

Based on the information presented in, and the Working Group's consideration of, the Application, EAO finds that there would not be adverse residual effects on the proposed Project, caused by changes in the environment.

14 Environmental Effects of Accidents and Malfunctions

Pursuant to the CEAA, consideration of the environmental effects of any potential project-related accidents or malfunctions is required. The assessment includes consideration of the potential accidents, malfunctions and unplanned events that could occur in any phase of the proposed Project, the likelihood and circumstances under which these events could occur, and the environmental effects that may result from such events, assuming contingency plans are not fully effective.

14.1 Background Information

The Proponent conducted an assessment of the environmental effects of accidents and malfunctions that could potentially occur during construction or operation of the following proposed Project components: transmission line and ROW, substations and access roads.

14.2 Project Issues and Effects and Proposed Mitigation Identified in the Application

Potential accidents and malfunctions that may occur during construction, operation or maintenance of the proposed Project include: electrical hazards such as electrocutions, construction hazards on unstable terrain, or equipment related accidents during maintenance activities. Potential spills may occur during construction, with the transportation, storage, and handling of hazardous materials, or fuel spills or leaks from

construction and maintenance equipment. Potential accidents may occur with construction of facilities and access roads, and include vehicle collisions and or unsafe interactions between employees or members of the public and the proposed Project components.

Transmission Line and ROW - Electrical Hazards

Electrical hazards are most likely to occur during operation, from energized transmission lines and infrastructure. Workers in close proximity to power lines may be at risk of electrical injuries from direct human contact with high voltage electricity or from indirect contact with devices that have themselves contacted high-voltage electricity. Equipment that comes into contact with energized lines will energize an un-insulated object. The consequences of direct or indirect contact with the line may result in a serious injury or death. In addition, members of the public who are unaware of the dangers of high voltage line and interfere with the line and infrastructure may potentially be electrocuted. Other potential hazards may result from equipment failure, adverse weather conditions, or damaged power lines.

Transmission Line and ROW - Terrain Hazards

There is the potential for terrain hazards to occur along the ROW and along access roads during construction and maintenance, particularly during the initial clearing and site preparation work conducted on steep or unstable slopes or where helicopters are used for construction. Steep slopes are often associated with landslides, rockfall or avalanche hazards that can damage equipment during clearing, excavation, transmission structure assembly, and other construction activities. Steep slope hazards may result in serious injury or death to construction crews.

Potential accidents may also occur from falling trees or branches which may result in accidental death or injury, during construction and maintenance of the proposed Project.

Poor drainage around access roads or undercutting of streams and rivers during high periods of precipitation may increase the potential risk of slope movement.

Transmission Line and ROW & Substations - Hazardous Substances

Spills of hazardous substances could potentially occur during the construction and operation of the proposed Project, associated with the following:

- construction and clearing equipment and vehicles that contain fuel, oil, lubricants or other hazardous substances;
- herbicide use at select locations along ROW to control invasive species and for vegetation management, that may result in potential soil and groundwater contamination; and,

- potential accidents related to vehicle collisions, vehicles driving off paved and unpaved roads, rupture of storage containers or other accidents involving the transportation of goods resulting in spills of hazardous substances.

The proposed Project would require modification of existing substations or building of new substations. There is the potential for power transformers at each substation to spill transformer oil used as an insulator and coolant in the operation of the substation. This substance is potentially toxic and harmful to the surrounding environment.

Spills of these hazardous substances could occur as a result of human error, equipment malfunctions, seismic events, and terrain hazards such as landslides and rock falls.

Spills could result in adverse effects to human health, wildlife, terrestrial and aquatic ecosystems, First Nations' and Nisga'a Nation's interests, property values, and emergency services.

Substation and Equipment Malfunctions

Substations contain equipment housing hazardous materials such as transformer insulating oils and sulphur hexafluoride (SF6) within high-voltage switch gear and circuit breakers, as well as limited amounts of diesel fuel used for on-site emergency generators. In the event of equipment failure, hazardous materials from these facilities could be released onto the substation property and adjacent terrestrial and aquatic environments, if onsite preventative measures fail.

The release of hazardous substances from unpredicted equipment malfunction at the substations could result in detrimental effects to surrounding watercourses, specifically:

- Skeena Substation (existing): approximately 600 m from Alwyn Creek. Alwyn Creek flows into the Skeena River; or,
- Bob Quinn Substation (proposed): on top of a hill approximately 300 m from a small wetland. This wetland drains into the Ningunsaw River.

Access

Potential Effects from Air and Ground Traffic Hazards

With the construction of the proposed Project there is the potential risk of traffic accidents involving: vehicles and equipment traveling along access roads to and from construction sites with motorists, wildlife, pedestrians, and cyclists. Such potential traffic hazards may result in the following potential effects:

- loss or damage of personal or commercial property; and,
- injury or death to public, work place personnel or wildlife.

Helicopter support would be required during construction of the proposed Project in more remote areas where the terrain does not allow for the construction or maintenance of access roads. Although the frequency of helicopter accidents is fewer than with vehicles, the severity of the accident results in a more serious injury or death. Potential hazards associated with working nearby helicopters include:

- rotor blades – back and front;
- heat from engine;
- dust and debris from wash;
- loud noise;
- crashes/emergency landings;
- injury from improper slinging procedure;
- injury from improper hovering entries/exits; and,
- improper storage of dangerous goods.

Also, there is the potential for helicopters used during construction to interfere with established aircraft flight paths.

Public Access

With the development of the proposed Project, the Proponent would ensure public access to the proposed Project is minimized yet still provide adequate access to areas that require maintenance. Public interaction with the proposed Project may result in the increased risks to public safety because of the potential for electrocutions and interactions with traffic and heavy equipment.

The Proponent intends to construct permanent and temporary access roads. The temporary roads would be deactivated after construction which would reduce the ability for the public to access the ROW. However, the Application states that it is likely that the public would use the permanent access roads that would be maintained for the proposed Project related maintenance activities for hunting, back country, and other recreational or commercial activities.

Summary of Mitigation Proposed in the Application

The Proponent proposes the following mitigation measures to minimize the potential for risk of injury from electrical hazards from the proposed Project, as follows:

- maintain safe distance between personnel and energized conductors to comply with the BC OHS Regulations (Worksafe BC 2009);
- certified utility arborists doing line clearance work would follow standards and guidelines outlined in Safe Work Practices for Certified Utility Arborists (WCB 2005);

- train maintenance personnel working in proximity to energized high voltage transmission lines;
- ensure employees adhere to all applicable federal and provincial legislation to prevent and mitigate electrical-related accidents; and,
- fence substations so that the public and wildlife remain a safe distance from electrical hazards. Manage security and access through a combination of fencing, gates, signage, alarms, and security personnel.

To reduce the risk of injuries or accidents and malfunctions as a result of terrain hazards associated with the proposed Project, the Proponent proposes the following:

- incorporating preventative measures would be incorporated into the detailed design including site-specific engineered slope stabilization and structure protection features;
- where slope instabilities are shallow, increase the burial depth of the structure foundations or guy anchors and combine with drainage and erosion control measures;
- where potential for slope instability from upslope processes poses risk of injury, involve qualified terrain specialists in pre-construction surveys to inspect and identify work-safe zones for people and equipment;
- ensure contractors would adhere to an extensive health and safety management program, including relevant legislation and guidance documents to ensure the implementation of safe working procedures with respect to terrain hazards, as follows:
    - *BC OHS Regulation for Tree Pruning and Falling near Electrical Conductors*
    - *BC OHS Regulations for Excavations*
    - *BC OHS Regulations for Slope Limitations* (Worksafe BC 2009); and,
- *Properly construct access roads to ensure all necessary drainage structures are in place and functioning, and all end of construction drainage measures are considered to ensure roads are stable.*

Additional mitigation measures are described in the geotechnical stability section (5.4) of this Report.

To minimize the risk of, and reduce the potential for, the environmental effects from, a hazardous substance spill to the area surrounding the proposed Project site, the Proponent proposes the following measures:

- prepare and implement an EMP;
- prepare site or activity specific EPPs, including Spill Prevention and Emergency Response Plans, and Construction Waster Management Plans which would outline procedures for the proper storage, handling, management and clean-up of hazardous material spills;

- adhere to existing oil spill contingency and emergency response documents for operations and maintenance of the proposed Project (see list of documents in section 13.3.1.1 of the Application);
- Train personnel in spill prevention and emergency response procedures prior to commencing work; and,
- Make available spill kits and emergency response procedure document.

Further mitigation measures are addressed in the soils section (5.3) of this Report.

In the event of an unpredicted equipment malfunction and the potential effect from the release of hazardous substances to the surrounding environment, the Proponent proposes the following mitigation measures:

- stored hazardous materials would be housed within steel, aluminum, composite, and/or porcelain containers to prevent the release of the substances into the surrounding aquatic and terrestrial environment;
- implement a leak detection and inventory program to ensure compliant management and tracking of SF_6 gas; and,
- subject equipment at each substation a rigorous inspection and maintenance program to detect leaks or malfunctions in a timely manner in accordance with the Proponent's established protocols.

To mitigate the potential effects of traffic hazards throughout the construction and operation of the proposed Project, the Proponent proposes the following measures:

- address requirements for air and vehicular traffic safety through the development and implementation of the Traffic and Safety Management plan, and include traffic control measures, traffic safety management measures, and safe working procedures for personnel working along public and private roads, and near helicopters;
- provide appropriate training for workers on safety management practices; and,
- adhere to all provincial and federal regulatory requirements with respect to transportation.

Further discussion on these effects is found in the Transportation section (7.4) of this Report

To minimize the risk to public safety while ensuring public access to various land use activities, and Proponent access to the proposed Project site to maintain the transmission line and associated infrastructure, the Proponent proposes to

- consult with provincial agencies, First Nations and Nisga'a Nation, and members of the public and develop an access management plan to identify and implement mitigation measures;
- fence and sign post substations to prevent public access to these properties and to inform the public of potential hazards, and minimizing potential of risk of exposure to electrical hazards and hazardous substances; and,
- install security measures such as fences, signs, and gates, to minimize the potential of public access to construction and maintenance work sites.

Further discussion on access is found in the Land and Resource Use section (7.3) of this Report.

14.3 Project Issues and Effects and Proposed Mitigation Identified During Application Review

During the review of the Application, additional issues were raised by the Working Group, First Nations, and Nisga'a Nation. Issues and Proponent responses relating to, avalanche and terrain hazards are documented in the Geotechnical Stability section (5.4); traffic hazards are documented in the Transportation section (7.4); and risk of public safety while ensuring public access are documented in the Land and Resource Use section (7.3) of this Report. These issues, the Proponent responses and EAO's assessment of the adequacy of responses are detailed in Appendix 2.

No additional issues relating to electrical hazards were raised during the review of the Application, by the Working Group, First Nations, Nisga'a Nation, and members of the public.

14.4 Conclusion

Based on the information presented in, and the Working Group's consideration of, the Application, EAO finds that there would not be significant adverse residual environmental effects from accidents and malfunctions, as a result of proposed Project related construction or operation activities.

15 Cumulative Environmental Effects Assessment

Federal agencies require a separate chapter to present their analysis of cumulative effects, in order to qualify this Report as a joint report. As such, section 4.5 and this section are included in the Report for federal purposes.

Section 16(1) of the CEAA requires any screening or comprehensive study to include consideration of "any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried

out". Cumulative environmental effects are changes to the biophysical environment or socio-economic setting (only from a biophysical change) caused by an activity in association with other, past, present and future human activities. Cumulative effects assessment is done to ensure that the incremental effects resulting from the combined influences of various actions are considered. These combined effects may be significant even though the effects of each action, when individually assessed, are considered insignificant. Cumulative effects assessment includes effects that are likely to result from the proposed Project in combination with other projects or activities that have been or will likely be present in a reasonable temporal and spatial scale. In accordance with federal requirements, a cumulative effects assessment must be conducted if the project meets two conditions:

1. The Project could result in a demonstrable residual effect on a VC; and,
2. The Project-specific residual effect on that VC is likely to act in a cumulative fashion with the residual effects of other past, present, or reasonably foreseeable future projects and activities in the area.

On May 20, 2010, at the direction of the Agency, DFO, INFC, and EAO, the Proponent completed a Supplemental Cumulative Effects Assessment to consider five additional potential mine projects. These five potential projects are included in Table 4 of this Report which identifies all past, existing and reasonably foreseeable future projects and activities within the scope of a cumulative effects assessment of the proposed Project.

The cumulative effects assessment follows the identification of Project-specific residual effects (after mitigation) and a determination of significance for each VC as described in Section 5.8 of the Application.

15.1 Climate and Meteorology

Potential Residual Effects

The proposed Project may have a potential residual effect on the atmospheric environment through the increased emission of GHGs.

The primary GHGs emitted by the proposed Project would be carbon dioxide, methane and nitrous oxide. The release of these pollutants is associated with fuel consumption, slash burning and deforestation during primarily the construction phase of the proposed Project. Based on an estimated 3-year construction period, the annual total GHG emission is projected at 107 kt CO2-eq (kilotonnes of CO2 equivalence). The release of GHGs by the proposed Project is scientifically certain but the projected magnitude is considered low and minor in comparison to national and provincial GHG emission norms, as described in the Application. The estimated contributions of the proposed

Project during construction would represent 0.17% of BC's and 0.015% of Canada's annual GHG emissions. Emissions from the proposed Project are anticipated to decrease considerably after the construction phase of the Project.

Potential Cumulative Effects

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts from increases in GHG emissions and contribution to global GHGs, and potential to affect climate change by consuming fuel and through deforestation.

GHG emissions from the proposed Project would interact on a cumulative basis with emissions produced by other existing and reasonably foreseeable industrial projects identified in Table 4. The magnitude of the potential cumulative effect is uncertain and cannot be quantified. The GHG emissions from the proposed Project construction activities would interact on a cumulative basis with emissions produced by other human activities and projects, and potentially contribute to global climate change. However, cumulative GHG emissions are estimated to be insignificant when considered on a global scale.

15.2 Air Quality

Potential Residual Effects

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report, within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on the atmospheric environment from increases in particulate matter and related effects on airsheds along the ROW

Ambient emissions from human activities and other active or proposed projects within 40 km were considered in the cumulative impact assessment on atmospheric environment. Most activities and projects likely to emit air contaminants (SO2, NO2, CO, PM10 and PM2.5) are estimated to be more than 40 km from the proposed Project; those within the 40 km effects boundary would likely be sporadic and spatial and temporal overlaps uncertain and likely infrequent, therefore, no cumulative impacts on receptors in the local study area are anticipated.

Although periodic air emissions would occur during the operation phase of the proposed Project from maintenance vehicles and vegetation management along the ROW, the level of emission is predicted to be negligible.

15.3 Surface and Groundwater Resources

Potential Residual Effects

Findings from the Proponent's cumulative effects assessment conclude that the proposed Project has no predicted residual effects on the Skeena, Nass or Iskut River watersheds at the regional or sub-regional scale. The proposed Project does, however, cross several smaller watersheds and those crossings pose potential residual effects for the hydrology and quality of surface water in those smaller watersheds. Residual effects on surface hydrology are expected because greater than 4% of each watershed, the (upstream) streams crossing along the proposed route (western, eastern and Bell-Irving routes) and the (downstream) streams crossing Highway 37 and Nisga'a Highway (listed in Tables 7.3-8 and 7.3-9 in the Application) would be affected from clearing the area for the transmission line ROW, new access roads, or proposed substations, resulting in sustained alteration to the land cover of each watershed.

Potential Cumulative Effects

Based on the known projects or activities (existing or likely to occur in the foreseeable future) listed in Table 4 of this report within the proposed Project Area, EAO has considered the potential for adverse cumulative effects on surface water hydrology.

The alteration of the land cover, specifically changes to forested areas from the proposed Project construction activities, in combination with continued forestry operations within the Kalum, Nass and Kispiox TSA's, may have the potential to generate cumulative residual effects on surface water hydrology if the total harvested areas exceed the maximum allowable equivalent clear cut area (ECA) threshold set by MOFR District Managers. This may lead to cumulative residual effects on surface water hydrology in terms of changing annual run off, peak flows and low flows. However, because planning of allowable clear cut areas is part of the management plan for TSAs to preserve the hydrological function of the watersheds, and thresholds set for ECA within watersheds for each TSA would include the forested areas cleared by the proposed ROW, the cumulative impact would be included in regulatory forestry management decisions.

The magnitude of the potential effect on surface water hydrology from the proposed Project would be low as the affected area of the watersheds is greater than 4% but less than 20%. The magnitude of cumulative impacts would be low to moderate, as managed by the provincial forestry authority. With respect to groundwater, it is not anticipated that the proposed Project would result in any adverse residual effect provided that identified mitigation measures, as described in section 5.2.2 are

implemented. Hence, there is high confidence in the assessment that the proposed Project will not result in any cumulative effect on groundwater resources.

15.4 Soils

Potential Residual Effects

Potential loss of soils is predicted as a residual effect of the proposed Project due to the construction of structure bases, permanent access roads, and at the Bob Quinn Substation. However, the residual effect was predicted to be insignificant as the amount of soil predicted to be lost was considered negligible. With the implementation of relevant management plans and mitigation measures, soil erosion, soil degradation and soil contamination from construction and operation activities of the proposed Project, would be anticipated to be low.

Potential Cumulative Effects

Based on the known projects or activities (existing or likely to occur in the foreseeable future), listed in Table 4 of this report within the proposed Project Area, EAO has considered the potential for adverse cumulative impacts on soils as a result of soil loss from the construction of permanent infrastructure.

Cumulatively, soils could be lost from other exiting (Eskay Mine or future mining, clean energy and other developments. However, there would be no overlap because of geographic separation between these projects and the proposed NTL. In addition, mitigation measures such as comprehensive soil salvage, storage, protection and restoration (reclamation) are anticipated to be applied during the life of each of the proposed or authorized mines to minimize the potential residual loss of soils.

There are likely cumulative effects between the proposed Project and past, ongoing and future forestry developments, particularly related to road construction. Forest licensees must meet FRPA standards in relation to road building and maintenance in order to minimize soil disturbance and erosion. The Proponent estimates that the residual adverse effect of soil loss from the proposed Project in relation to the residual effects of soil loss from the forest construction activities is considered to be negligible.

Furthermore, the potential loss of soils is considered not significant because the soils in the region are primarily developed on glacial till, and there is an extensive amount of both glacial and colluvial soils in BC.

15.5 Geotechnical Stability

Potential Residual Effects

The EAO finds that there may be adverse residual effects on geotechnical stability as a result of the proposed Project because the effects may not be fully mitigated. These effects include the following:

- potential destabilizing effect of construction on unstable or marginally stable terrain and natural hazard with the potential to cause landslides; and
- potential to increase avalanche risk in high avalanche areas.

The EAO has considered BC Hydro's commitment to complete further terrain stability studies and avalanche engineering assessments prior to the detailed design stage and further implementation of relevant management plans and mitigation measures, in consultation with the relevant agencies.

Potential Cumulative Effects

After the Proponent conducted further studies on the proposed Project transmission line routes, potential cumulative effects on terrain stability was considered not warranted. A screening of the proposed Project's potential contribution to the cumulative effects of other projects and activities in the area, for geohazards and terrain stability, indicate that there is either no overlap between the footprint of the proposed Project and that of other projects, or any overlap identified (e.g. Highway 37); therefore, a cumulative effect analysis was not conducted by the Proponent.

The EAO has found that there may be spatial overlaps between potential impacts on geotechnical stability between the proposed Project and past and ongoing forest development activities, including harvesting and road construction. However, the cumulative effects on slope stability from the proposed Project in combination with forest development would be low to moderate given avoidance a mitigation measures regulated under FRPA. The extent of the cumulative effect would be at a watershed level and long term, as previous forest developments sites are rehabilitated and new forest developments are implemented. Cumulative effects in terrain stability would also be infrequent on a site specific basis once an event had occurred and partially reversible of the medium term, given stabilization post construction, depending on the severity of the event given the relatively fast re-growth in the region. It should be noted that landslides and avalanches in the area of the proposed Project are also naturally occurring.

15.6 Fish and Aquatic Habitat

Potential Residual Effects

The proposed Project may have residual effects on fish and aquatic habitat due to direct mortality, sub-lethal effects and habitat loss. However, the potential residual effects were assessed as not significant, for both the construction and operation/maintenance phases of the proposed Project, provided that mitigation described in section 5.5.2 is implemented. After mitigation by using standard construction practices, the magnitude of potential residual effects on fish and aquatic habitat is considered negligible or low, and all residual effects assessed as local in extent, their duration as short-term and the frequency of effects as sporadic.

Subsequent to the implementation of the habitat compensation plan in accordance with DFO's No Net Loss Policy, there will be not net impact to fish habitat and therefore not residual effects.

Potential Cumulative Effects

The probability of deleterious discharges from the proposed Project cumulatively adding to those from other existing and foreseeable projects is assessed to be very small to zero because there is virtually no hydrological connection between the proposed Project and projects identified in Table 4. Discharges from the Kitsault Mine would not drain into the corridor of the proposed Project. With regard to the Kutcho, Schaft Creek, Mount Klappan and Kerr-Sulphurets-Mitchell mine projects, the Proponent's analysis determined that there would be very low probabilities of cumulative interactions resulting from the release of effluents.

The only potential connection between the Kutcho Project and the proposed Project is at the first 25 km of the access road from Highway 37 to the Kutcho Mine site. As the Kutcho Mine lies within the Stikine watershed, some stream crossings along that stretch of road may release sediment of other contaminants that could flow downstream to the Stikine River and then across the international boundary into southeast Alaska and the Pacific Ocean after a distance of several hundred kilometres. Even then, the only possible interaction with the proposed Project would be if the latter released material into the Iskut River. The probability of any cumulative effect arising from that hydrological connection is considered to be very small because the Proponent of the proposed Project is committed to building the stream crossings along the access road to current environmental standards to avoid affecting fish habitat and, because both the Iskut and Stikine rivers are among the largest rivers in British Columbia and have very high dilution capacity.

Similarly, the likelihood of interaction between potential effluent released from the proposed Project and the Schaft Creek Project, Mount Klappan Project and Kerr-Sulphurets-Mitchell Project is very small because of the low probability of hydrological connection between the projects.

Furthermore, under existing provincial and federal regulatory regimes, any discharge from mine projects must be treated to a level that meets the Canadian Council of Ministers of the Environment (CCME) guidelines for the protection of freshwater aquatic life at a point approximately 100 m downstream of the end of the discharge pipe. This requirement means that any potential residual effects on water quality or fish habitat would be essentially localized within the project-specific watershed, with little probability for cumulative interactions. Hence, there is high confidence in the assessment that any potential cumulative effect on fish and aquatic habitat between the proposed Project and other existing and foreseeable future projects is not significant.

15.7 Wetlands

Potential Residual Effects

The proposed Project may have potential residual effects on wetlands at site-specific areas through the alteration of vegetation and hydrological function. However, the viability of wetlands within the region is not predicted to be significantly affected. In December 2010, the Proponent submitted additional information on the type of wetlands that may be impacted, the methodology and results of an analysis on the amount of wetlands that may be affected, mitigation proposed, residual effects, wetland compensation and monitoring. The Proponent has committed to a wetland compensation program should wetland function be impacted, therefore there would be little to no residual effect from the proposed Project.

Potential Cumulative Effects

With regard to the projects identified in Table 4 and based on publicly available information on those projects, the Proponent reports with high confidence that the proposed Project footprint would not contribute to any cumulative effects on wetland vegetation and hydrological function on a local or landscape level. The distance of the NTL assessment boundary from any known wetland where possible interaction could occur is considered too great. There is insufficient information to enable a conclusion on cumulative effects on a regional scale.

15.8 Terrestrial Ecosystems and Vegetation

Potential Residual Effects

The primary potential residual effect on ecosystems and vegetation that the proposed Project could pose would be on the temporary and permanent alteration of ecosystems through the clearing and maintenance of the ROW, and edge effects. Vegetation alteration would be a residual effect affecting rare ecosystems, pine mushroom habitat, cedar trees, riparian vegetation, floodplain forests, old forests, country food plants, and all other unlisted ecosystems in the Project area. Increased risk of fire, the invasion and spread of invasive plant species, and edge effects such as wind throw, are also considered to be potential effects resulting from the Project. Wind throw as a potential residual effect would primarily pertain to rare ecosystems, cedar and unlisted ecosystems.

Potential Cumulative Effects

Based on the existing and similar future development within the proposed Project Area as outlined in Table 4 of this report, EAO has considered the potential for adverse cumulative impacts on ecosystems and vegetation associated with the residual effect identified above. The inclusion of any additional project for the purpose of assessing cumulative effects on ecosystems and vegetation will likely result in an increase in temporary and permanent vegetation alteration, as well as an increase in the extent of area experiencing edge effects such as wind throw. Although there may be an overall decline in the condition of the ecosystems and vegetation VCs on a local or landscape level, the sustainability of those VCs are not expected to be significantly impacted. Therefore, the cumulative effects assessment concludes that all cumulative effects, except for cedar (see below) are not significant. The magnitude of cumulative effects will range from moderate, depending on management strategies governing future major project and forest development, and the rehabilitation and recovery of previously impacted vegetation and ecosystems. Cumulative effects are predicted to be at a landscape to sub-regional level, depending on the timing and spatial overlap of other activities. Effects on ecosystems and vegetation are considered to be partially reversible as restoration activities undertaken and vegetation management prescriptions are developed to minimize effects on vegetation and ecosystems from the proposed projects and previous, ongoing and future proposed projects and activities. Certain areas of the proposed Project are relatively undisturbed, however a large portion of the proposed Project will be constructed in areas already cleared by previous logging activities, therefore the incremental impacts from the proposed project would be relatively moderate Forest development is regulated under FRPA and considers avoidance and mitigation measures to minimize potential impacts on ecosystems.

There is expected to be a significant cumulative effect on cedar as a resource. Due to the suggestion that the existing harvesting of cedar is suggested to be already beyond a sustainable level. However, the addition of the proposed Project, with planned mitigation measures, is not considered to be a significant addition to this pre-existing effect, as the Proponent is committing to a cedar replacement program, in consultation with First Nations, Nisga'a Nation and MOFR.

15.9 Wildlife and Wildlife Habitat

Potential Residual Effects

The proposed Project is predicted to result in direct and indirect residual effects on moose, mountain goat, grizzly bear, Kermode bear, American marten, fisher, raptors, waterfowl, and forest birds, as well as their habitat. Direct effects on wildlife habitat, such as habitat loss, alteration, fragmentation and habitat avoidance may result from sensory disturbance. Increased access associated with development and activities into wilderness areas that were formerly remote would indirectly result in a higher rate of wildlife mortality due to hunting, poaching, roadkills through vehicle impact and defence of person and/or property. Project-specific residual effects on each VC are summarized as follows:

Ungulates

Direct habitat alteration to moose is a potential adverse residual effect resulting from the proposed Project but it is predicted to be insignificant.

Noise disturbance from helicopter activity and indirect mortality from increased access to both moose and mountain goat populations are potential adverse residual Project-related effects. However, the magnitude of these indirect effects is predicted to be low and not significant, at both the local and regional levels, and unlikely to affect the viability of the VCs.

Bears

The river valleys through which the proposed Project would pass are assessed as high and moderately high value habitat for bears. However, direct habitat alteration is not considered a potential Project-related residual effect for either grizzly bear or Kermode bear.

Indirect habitat loss due to sensory disturbance from helicopter activity and machinery, particularly near salmon spawning reaches and den sites, is assessed as a potential residual effect, particularly for Kermode bear, during the construction phase of the proposed Project.

Increased access created by Project-related activities poses a greater threat to bear populations. Increased hunting pressure would probably occur within the proposed Project ROW and associated access roads, and along ungated mining and forestry access roads. The effect of additional access could be increased for high value species with slow reproductive rates such as bears. As a result, provincial agencies have provided direction to the Proponent regarding the establishment of permanent access for the proposed Project that would avoid, minimize or mitigate the incremental disturbance or fragmentation of high value wildlife habitat caused by the development or reactivation of roads required to develop the proposed project while considering the interests of legitimate commercial and industrial users who may be affected by, or have an interest in, the construction, reactivation or use of roads required to develop the proposed Project.

Furbearers

Loss or alteration of American marten and fisher denning habitat is not considered a potential residual effect. A cumulative effect assessment was not warranted.

More trapping may occur within the proposed ROW as a result of increased access, thus contributing to indirect mortality of both American marten and fisher. This indirect effect is an adverse residual effect of the proposed Project.

Birds

Habitat loss for raptors and waterfowl is not considered a potential Project-related residual effect. Increased access is also not considered a potential residual effect for raptors, waterfowl and forest birds. Therefore, a cumulative effect assessment was not warranted for either potential effect.

Noise disturbance is a potential residual effect for raptors, waterfowl and forest birds, and habitat alteration is assessed as a potential residual effect for forest birds because of forest clearing, particularly with the loss of mature forest.

Potential Cumulative Effects

The wildlife cumulative effects assessment considered all projects within 75 km on either side of the proposed transmission line corridor. This spatial boundary included all wildlife VCs and their associated habitat, and allowed for the assessment of a worst-case scenario in which a VC interacts with the maximum amount of additional human activity.

Main issues relevant to past, present and future human activities and their cumulative effects in the study area are:

- direct and indirect changes to wildlife habitat, such as habitat loss, alteration, and fragmentation, and habitat avoidance due to sensory disturbance; and,
- increased access to wildlife habitat and higher rates of mortality through mismanagement as a cumulative result of hunting, poaching, and defence of person and/or property.

The probability that the combined effects of human actions could adversely affect some individual wildlife species is high. The significance of the residual effects on wildlife VC populations depends on a number of factors including numbers, sex, and age-class of individuals affected, and the influence of these variables on the demographics of the local populations. These factors are uncertain and difficult to predict without quantitative data and suitable population models, therefore, the likelihood of cumulative effects is considered unknown.

Ungulates

There is a lack of publicly available information on environmental baseline reports on ungulates for any of the five proposed mine projects (i.e. Mount Klappan Coal Mine, Shaft Creek Mine, KSM Mine, Kutcho Creek Mine and Kitsault Mine). It is highly likely that each mine project will have some degree of interaction with ungulates and ungulate habitat values. However, the scope of the interaction is uncertain. The Proponent predicts a low magnitude for both indirect habitat alteration to moose and mountain goat, due to noise disturbance during operation, and mortality related to increased access to mountain goat, and a moderate magnitude for indirect effects on the mortality of moose.

Bears

When the potential effects of the proposed Project are considered cumulatively with those of the proposed five mine projects, the most pronounced effect is assessed to be sensory disturbance during the construction phases of the projects, when the largest workforce and amount of machinery and initial land alteration commences. For those projects where the construction phase has the potential to overlap with that of the proposed Project, there is increased potential of cumulative effects. However, the distances of the additional projects from the proposed Project suggest that the potential cumulative effect would be of low magnitude, reversible and not significant.

The potential cumulative effect of indirect mortality for grizzly bear and Kermode bear, as well as for black bear, from facilitating access is likely to be of a moderate magnitude, regional scope, long term duration, sporadic, and potentially continuous frequency because of the difficulty of preventing access, and detecting and monitoring unpermitted and unreported kills of the game species either from poaching or the

mortality of nuisance/problem bears. The overall potential cumulative effect on local bear populations is likely to be insignificant.

Furbearers

Due to the abundance of American marten on the landscape and the assumption that fisher would be trapped only incidentally, the cumulative effect of increased access and associated trapping mortality is likely to be low and not significant.

Birds

Direct habitat alteration for forest birds could occur in association with other projects and activities, particularly forestry. The potential cumulative effect of habitat loss on forest birds is likely to have a low magnitude as none of the songbird species of conservation concern found within the proposed Project area is restricted to nesting within mature forest interiors. With respect to forest birds, raptors and waterfowl, indirect habitat loss due to cumulative noise disturbance is negligible.

The EAO recognizes that the issue of access management in minimizing effects of excessive hunting is an important issue in the region, particularly from a cumulative effects perspective. First Nations, Nisga'a Nation and MOE have expressed concerns around overharvesting and poaching that is occurring and facilitated by current access from past and ongoing forest development, and fear that this may only increase as a result of the establishment of additional access related to future industrial activities. In response to the above concerns, the Proponent and provincial agencies have developed a framework and set of guiding principles with the objective of avoiding, minimizing or mitigating the incremental disturbance or fragmentation of high value wildlife habitat caused by the development or reactivation of roads required to develop the proposed Project while considering the needs of legitimate commercial and industrial users including the need for BC Hydro to economically maintain and sustain transmission line operations. This objective would be achieved by identifying all new or reactivated roads that potentially conflict with known high value habitats for moose, mountain goat, fish and grizzly bear, and prioritizing full decommissioning for new road construction and deactivation for reactivated roads as the preferred mitigation measures. The adherence to the access management plan framework is included as a commitment in the Table of Commitments

15.10 Archaeology and Heritage Resources

The proposed Project is assessed to pose no potential adverse effects on archaeology and heritage resources that may interact with those of other past, present or probable future projects or activities. Hence, further assessment with respect to potential cumulative effects on archaeology and heritage resources is not warranted.

15.11 Land and Resource Use

Potential Residual Effects

The only residual effect identified for the Access VC is a potential for increased access to remote areas concentrated in Segments 4 (western route option), 5 (western route option), 8 (eastern route option), 9, 10, 12, 15 and along the proposed Bell-Irving route. This residual effect may combine with new and improved access opportunities related to mining and forestry activities, increased demand for road infrastructure from growing communities (Segment 5), and increased recreation and tourism activities and development.

Potential Cumulative Effects

The proposed Kutcho Creek, Mount Klappan and Shaft Creek mines are located far from the proposed Project and it is unlikely that the development of these mine projects would result in increased access to the same areas as the proposed Project. Increased access resulting from the proposed Kitsault and KSM mines may overlap with access created for the proposed Project.

The potential for increased access to remote areas could result in both positive and negative cumulative effects.

The potential positive cumulative effects associated with additional access include increased recreational, tourism and business opportunities associated with increased access to areas, the potential for subsistence users to benefit from new access to country foods and the potential improved expanded road infrastructure.

The probability of access-related cumulative effects are predicted to be high due to the certainty of constructing new access required to develop the proposed mine projects, and the likely effect of people being attracted to using new road access. The magnitude and extent are expected to be low and the overall effect is likely to be not significant.

Future mine construction will likely involve some removal of timber, although generally the supplemental mining projects appear to be outside of current THLB. Without specifics for each project and its location, it is not possible to determine the cumulative effects of timber removal with respect to the THLB. This cumulative effect may have a regional scope, but would be medium-term during the construction phase of the proposed Project, and occur specifically when other forest activities take place. Some of this effect is reversible over the long-term as other developments close and are rehabilitated, returning some lands to the productive land base.

PART D – CONCLUSIONS

16 Conclusions

Based on:

- information contained in the Application;
- information contained in supplemental studies and reports;
- the Proponent's efforts at consultation with First Nations, Nisga'a Nation, government agencies, including local governments, and the public, and its commitment to ongoing consultation;
- comments on the proposed Project made by participating First Nations, Nisga'a Nation, and government agencies, including local governments, as members of EAO's Working Group, and the Proponent's responses to these comments;
- comments on the proposed Project received during the public comment period, and the Proponent's responses to these comments;
- issues raised by Nisga'a Nation and participating First Nations, regarding potential impacts of the proposed Project on aboriginal and treaty rights, and the Proponent's responses and best efforts to address these issues; and,
- commitments and mitigation measures identified in Appendix 3 to be undertaken by the Proponent during the construction, operation, and decommissioning of the proposed Project,

EAO is satisfied that:

- the EA process has adequately identified and assessed the potential significant adverse environmental, economic, social, heritage and health effects of the proposed Project;
- consultation with First Nations, Nisga'a Nation, government agencies, and the public, and the distribution of information about the proposed Project have been adequately carried out by the Proponent and that efforts to consult with First Nations and Nisga'a Nation will continue on an ongoing basis;
- issues identified by First Nations, Nisga'a Nation government agencies and the public, which were within the scope of the EA, were adequately and reasonably addressed by the Proponent during the review of the Application; and,
- practical means have been identified to prevent or reduce any potential negative environmental, social, economic, heritage or health impacts of the proposed Project such that no direct or indirect significant adverse effect is predicted or expected.

The provincial Minister of Environment and the Minister of Forests, Mines and Lands will consider this Assessment Report and other accompanying materials in making their decision on the issuance of an EA Certificate to the Proponent under the Act.