3.0 REVIEW OF ALTERNATIVES

The following Chapter describes the evaluation of "alternatives to" the Project based on environmental, engineering, socioeconomic, cultural, and First Nations considerations. "Alternatives to" the Project (*i.e.,* functionally different ways to meet the project need and achieve the project purpose) were evaluated in accordance the CEA Agency's Operational Policy Statement OP2-EPO/2 (CEA Agency 1998) which provides guidance with respect to consideration of alternatives to a project.

In addition to "alternatives to" the Project, this Chapter also describes "alternative means of undertaking the project", including the analysis for selection of a "preferred alignment" and a preferred capacitor station site based on environmental, engineering, socioeconomic, cultural and First Nations considerations.

The results of the alternatives analysis explain why the proposed Project is the best means of meeting existing and future electricity demands within the Lower Mainland and on Vancouver Island.

3.1 Alternatives to the Project

The ILM Project is being proposed to increase the transmission capability for serving customers in the Lower Mainland and on Vancouver Island. Without an increase in transfer capability, the existing ILM grid will not be adequate for the reliable transfer of Interior generation resources to serve load in the Lower Mainland and on Vancouver Island. According to most scenarios considered by BCTC and BC Hydro, the system will not meet appropriate planning standards by 2014. Further discussion of forecast constraints on the ILM grid is included in Section 1.4 of the EAC Application.

The forecast constraints of the ILM grid could theoretically be fully or partially removed by one or a combination of the following categories of solutions:

- Building a new transmission line from the Interior to the Lower Mainland;
- Upgrading the existing ILM circuits; and,
- Adding more coastal generation or demand-side management.

This section presents and compares potential alternatives for meeting the need for increased transfer capability of the ILM grid. Although relying on the existing ILM grid would compound thermal and voltage stability stress of the network and not meet planning criteria, the Do-Nothing Alternative is also compared to the other alternatives.

3.1.1 Alternatives Considered

Do-Nothing

This alternative would attempt to rely on the existing ILM grid to replace existing supply and supply the growing load in the Lower Mainland and on Vancouver Island.

Coastal Generation and/or Additional Demand Side Management

This alternative would attempt to defer the need for increased transfer capability of the ILM grid by designating high levels of reliable generation in the Lower Mainland and on Vancouver Island and by limiting the dispatch of Interior generation during heavy load hours.

Designation of firm energy imports on existing facilities or future facilities such as the proposed Juan de Fuca project, or additional Demand Side Management (DSM) measures in the Lower Mainland and Vancouver Island over and above those levels identified in existing resource plans, could also act as potential alternatives similar to coastal generation (discussed below).

Upgrade-Existing-Circuits (UEC)

This alternative would increase the thermal rating of the existing ILM transmission grid through a combination of upgrading series capacitor banks, replacing circuit breakers, and upgrading transmission lines to increase conductor ratings.

The following group of projects is referred to as the UEC alternative (BCTC 2007a):

- Upgrade series capacitor banks at Chapmans Capacitor Station (CHP);
  - Upgrade series capacitor banks at Creekside Capacitor Station (CRK);
  - Upgrade series capacitor banks at American Creek Capacitor Station (AMC);
  - Upgrade series capacitor banks at Guichon Capacitor Station (GUI);
  - Upgrade summer rating of Circuit 5L41;
  - Upgrade summer rating of Circuit 5L42;
  - Upgrade summer rating of Circuit 5L44;
  - Upgrade summer rating of Circuit 2L1/2L5;
  - Replace circuit breakers at Ingeldow Substation (ING);
  - Replace circuit breakers at Nicola Substation (NIC); and,
  - Replace circuit breakers at Meridian Substation (MDN).

Circuit, substation and capacitor station components of the UEC Alternative are shown on Figure 1-2.

New Line – 5L83

This alternative consists of the construction of a new 500 kV series compensated transmission line between NIC and MDN. The new line would be approximately 255 km long and, for most of the route, it would be parallel to the existing 5L82 circuit using existing ROW for the majority of the route.

New Line – NIC to ING

This alternative would consist of the construction of a new 500 kV series compensated line between NIC and ING through the Abbotsford-Langley-Surrey corridor or by building and extending 5L83 from MDN to ING. This alternative would require acquisition of new ROW in parts of the Fraser Valley, if built directly between NIC and ING. A MDN to ING extension to 5L83 would use existing ROW.

The least expensive alignment between NIC and ING would be a line between NIC and MDN plus a new 500 kV line double-circuited with 5L44 from MDN to the Port Mann Bridge and another 500 kV line double-circuited with 230 kV circuits (2L22 and 2L27) to ING along existing ROW. These options would have similar thermal and voltage stability ratings as the 5L83 alternative discussed above.

New Line – 5L46

This potential alternative would consist of the construction of a new 500 kV series compensated transmission line (5L46) between Kelly Lake Substation (KLY) and Cheekye Substation (CKY) through the Pemberton Valley and Whistler corridor. This line would be approximately 200 km long and, for most of its route, would be parallel to the existing 5L42 circuit. Circuit 5L46 would require the acquisition of new ROW for most of its length.

3.1.2 Screening Analysis of Alternatives

The identified potential alternatives were screened at different levels of detail, as required, to identify a preferred alternative. Primary considerations at this stage include technical performance, reliability, Project cost, environmental effects, community effects, First Nation interests, implementation risks, regulatory risks, and other factors identified by the Project team or through stakeholder consultation. At this stage, a large deficiency in one particular area can be used to eliminate an alternative, without resorting to detailed studies and analysis in all areas of consideration.[1]

[1] Please note that a High Voltage Direct Current (HVDC) line between the Interior and the Lower Mainland was also considered in the assessment of alternatives and was ruled out because such a line and the required converter stations would have much higher capital and operating costs than an AC line between NIC and MDN. Given the distinction between alternatives to the project and alternative means of undertaking the project discussed above, this potential alternative is discussed below under "alternative means of undertaking the project."

Do-Nothing

The first level of screening ruled out the Do-Nothing alternative as it does not meet required planning or operating criteria and would require BCTC to curtail electricity deliveries to maintain the system within its continuous thermal operating limits.

Coastal Generation and/or Additional Demand Side Management

The Coastal Generation/DSM Alternative was also ruled out given that BC Hydro's approved resource scenarios already consider the forecast range of coastal generation and DSM, and do not indicate adequate amounts of new coastal resources to defer the need for increased transfer capability on the ILM grid beyond its earliest in-service date.

New Line – NIC to ING

A NIC to ING transmission line would provide similar benefits to 5L83 and would also allow higher deliveries of firm power to ING which could potentially be used for trade purposes. However, the least expensive routing for a NIC to ING transmission line is via MDN and BCTC can meet the load requirements of the coastal region with 5L83 (NIC to MDN) and subsequently extend the connection to ING if required in the future. Therefore, 5L83 could be considered the first stage of a NIC to ING circuit should the need for such a circuit arise.

New Line – 5L46

The 5L46 alternative would have higher line losses than 5L83 and a lower transfer capability than either the 5L83 or the UEC Alternative for resources forecast to be developed in the South Interior region of BC (BCTC 2007a). A cost comparison of 5L46 and 5L83 also showed 5L46 to be about 8 percent more expensive than 5L83 (BCTC 2005a). In addition, as noted previously, 5L46 would require the acquisition of new ROW for most of its route.

3.1.3 Analysis of UEC and 5L83

Based on their respective characteristics, the remaining alternatives, 5L83 and UEC, were analyzed in further detail. Comparison of these two alternatives indicated that (BCTC 2007a):

- For peak hour operating points, continuous thermal capabilities of the UEC and 5L83 alternatives vary between 6000 MW and 6570 MW for UEC and between 6220 MW and 6750 MW for 5L83;

- With the addition of 470 Megavolt Ampere Reactive (MVAr) reactive power support, the 5L83 and the UEC alternatives would increase the voltage stability of the ILM grid to 7120 MW and 6355 MW, respectively. Higher voltage stability levels for both alternatives would require excessive reactive power reinforcements and are not considered efficient;

- Compared to the UEC alternative, 5L83 would save approximately 307 Gigawatt Hours per Year (GWh/yr) in transmission losses;

- Building 5L83 in 2014 and following it by a limited number of UEC upgrades in 2020 would be less expensive than implementing the UEC in 2014 and delaying 5L83 to 2019. The difference between the two long-term planning sequences would be approximately $76 Million (M) and would be mainly attributed to the 5L83 transmission loss savings between 2014 and 2019; and,

- Both 5L83 and UEC reinforcement alternatives would make similar improvements in the reliability of the bulk transmission grid.

A summary of the comparison of technical attributes between the 5L83 and UEC Alternatives is shown in Table 3-1.

TABLE 3-1: Comparison of Technical Attributes of UEC and 5L83

Technical Index	5L83	UEC	Comments
Thermal Capacity (Overload)	Approx. 8400 MW	Approx. 8400 MW	Defined by the N-1 thermal overload nomograms
Thermal Capacity (Continuous)	6220 MW to 6750 MW	6000 MW to 6570 MW	Defined by the N-1 thermal continuous nomograms
Voltage Stability Limit	Approx. 7120 MW	Approx. 6355 MW	With 470 MVAr additional reactive power support
Transmission Loss Savings	Approx. 307 GWh/yr	None	Average ILM transmission loss savings in 2014/15
Present Value (PV) of Costs for Continuous TTC (note 1)	$-121.9 M	$251.5 M	For energy valued at $74.0/MWh
Double Outage Generation Shedding	393 MW to 681 MW	1080 MW to 1659 MW	Based on the N-2 shedding requirements
Double Outage Load Shedding	380 MW to 640 MW	938 MW to 1470 MW	Based on the N-2 shedding requirements
Reliability – Expected Energy Not Served (EENS)	121 MWh/yr to 172 MWh/yr	127 MWh/yr to 180 MWh/yr	Based on 500 kV outages

Note 1: This PV analysis assumes a 50 year time frame during which the ILM transfer is assumed not to exceed the capability of the UEC Alternative. The PV of the cash inflow for 5L83 exceeds the PV of costs for 5L83 under these assumptions because of the loss savings.

This analysis concluded that the 5L83 Alternative is the preferred alternative for increasing the transfer capability of the ILM grid. This conclusion was supported by a separate horizon year analysis which analyzed the reinforcements to the ILM grid over a 30 year horizon to assess whether 5L83 made sense in the longer term. The horizon year study confirmed that building 5L83 is an effective and adequate solution for improving thermal and voltage stability limits of the ILM system and is appropriate with respect to the long-term development sequence of the ILM transmission system (BCTC 2007b). The sequencing study also showed that Sequence 1 (5L83 followed by partial UEC) would cost approximately $150 M less than Sequence 2 (UEC followed by 5L83).

Following BCTC's initial comparison of alternatives, the Government amended certain regulations, which resulted in a change in the appropriate discount rate to use in the comparison of 5L83 and UEC. The appropriate real discount rate is now 6 percent, compared to the 2.5 percent used in BCTC's original analysis. Using a 6 percent real discount rate and maintaining the energy value of losses at $74/MWh, the long-term sequencing analysis shows that Sequence 1 (5L83 followed by partial UEC) would cost approximately $76 M less than Sequence 2 (UEC followed by 5L83).

BCTC was asked to provide analyses using a range of discount rates. Financial comparisons between 5L83 and UEC are sensitive to changes in discount rates, largely as a result of the benefit of loss savings over time for 5L83, relative to UEC. BCTC believes that comparisons using a 6% real discount rate are the most relevant, and that higher discount rates are unlikely to occur in the foreseeable future; however, even at a real discount rate of 8%, 5L83 still retains a considerable cost advantage over UEC.

The remaining point of comparison was with respect to factors which are not included in the current cost comparison of 5L83 and UEC. These are potential aboriginal accommodation costs, potential costs of environmental mitigation and compensation, and, for 5L83, the potential additional cost of the final route alignment in comparison to the reference alignment identified in the CPCN Application. While BCTC is not in a position to provide a quantitative comparison of these respective costs at this time, considering that UEC is not benign from either a First Nations or an environmental perspective, BCTC considers it highly unlikely that any differential in these costs between 5L83 and UEC would be such to make up the difference in the Present Value (PV) cost comparison. Regardless, based on the above, BCTC submits that, notwithstanding the change in BC Hydro's discount rate, 5L83 clearly is still the preferred alternative. 5L83 still provides 220 to 250 MW more in continuous thermal capacity limit than UEC, considerably higher voltage stability limits, lower double outage generation shedding, and lower double outage load shedding. Accordingly, the technical performance advantages of 5L83 over UEC are significant even if the two alternatives were equal from a cost perspective.

3.2 Alternative Means of Carrying out the Project

3.2.1 Alternatives Considered

Within the context of a 500 kV transmission line between NIC and MDN, there are various potential means of carrying out the ILM Project. This section describes the various tower configuration, route alignment and capacitor station site alternatives considered by BCTC within the context of the Project.

HVDC

This alternative would use High Voltage Direct Current (HVDC) technology to transfer power from NIC to MDN instead of AC technology.

Tower Configurations

This alternative considers use of delta and/or flat configuration towers during construction of the Project.

Route Alignment Options

Several route alignment options were considered during the determination of a "preferred alignment" for the Project. The "preferred alignment" selection process is summarized on Figure 3-1.

Within the initial scope of the Project described in the Project Description submitted to the EAO on December 18th, 2006 (revised versions were issued March 13, 2007 and September 17, 2007 but did not result in changes to the segment diagram), BCTC identified 31 segments between 25 nodes where the ILM Project route alignment could potentially be situated (BCTC 2007c). Route alignment options were identified in several areas, mostly in the Fraser Canyon where there is not sufficient existing SRW adjacent to an existing line to accommodate 5L83. These options were either located parallel to existing circuits or in other areas where construction was expected to be feasible based on a screening-level engineering analysis. Route alignment options were also identified for some areas with sufficient ROW. The new options, away from the existing ROW, were developed due to geotechnical and natural hazard concerns, wildlife issues, First Nations, and other considerations. Figure 3-2 shows all potential options and segments for the ILM Project as originally identified by BCTC.

Based on the results of the technical studies conducted for the EAC Application, layout work conducted by BC Hydro Engineering, and consultation with First Nations, the public and regulatory agencies, additional route segments and refinements to existing segments were identified to potentially avoid sensitive features and unstable terrain within the Project corridor. Five new Nodes (C1, C2, C3, E1 and F1) and several additional segments were added to the original segments under consideration to avoid the Uztlius Spotted Owl Wildlife Habitat Area (WHA) between Nodes C and D/E and to avoid additional spotted owl habitat and other sensitive features. Overall, a total of 42 segments between 30 nodes were identified (Figure 3-3). An analysis of the identified segments was conducted in Spring 2008 to identify the preferred alignment for the Project[2].

Additional alignment options were proposed to avoid the Uztlius Spotted Owl WHA, but were removed from consideration prior to undergoing more detailed evaluation for the following reasons:

- Segment C – C2 – This segment avoids the Spotted Owl WHA but bisects a Grizzly Bear WHA to the north. The route is also longer than the Option between C1 and C2 which avoids the Spotted Owl WHA and Grizzly Bear WHA;

- Segment C – E (South) – This segment is a variation on the originally proposed C-E segment, with the route remaining south of the Spotted Owl WHA. This option was not considered feasible due to its alignment through portions of the Anderson Spotted Owl Special Resource Management Zone (SRMZ) known to be occupied by Spotted Owls, access and terrain difficulties, and the costs associated with the length of new ROW required; and,

- Coquihalla Corridor Option – A preliminary route option was evaluated in order to situate the line within the Coquihalla Corridor at the east end of the alignment. This Option was considered infeasible for construction due to extensive areas of geotechnical and engineering concern such as avalanche hazards, steep slopes and unstable terrain.

[2] Minor modifications to select route segments that comprise the preferred alignment occurred during Summer 2008 (see Figure 1-1). These modifications are not reflected in mapping or other materials that were produced during the preferred route alignment determination process (the materials provided here are unchanged from those that were developed in Spring 2008 and used during this process). Some modifications were driven by First Nations and community input during this process (*i.e.,* to increase visual screening of the line and avoid unstable slopes near Yale).

Capacitor Station Sites

Associated with the proposed alignment options, the following potential capacitor station sites were also identified:

- Ruby Creek (RYC)– Greenfield site near Node O, on land currently owned by BC Hydro;
- American Creek (AMC) – Existing Series Capacitor station, near Node M, that would be expanded within the existing property line;
- Chapmans (CHP) – Existing Series Capacitor station, near Node G, that would be expanded within the existing property line;
- Sawmill Creek (SAW) – Greenfield site near Node H on Crown land; and,
- North Skeemis (NSK) – Greenfield site near Node G1 on Crown land.

3.2.2 Analysis of Alternatives

HVDC

BCTC engaged DC Interconnect Inc. (DCI) to assess the HVDC Alternative. DCI reviewed the HVDC converter station costs, reactive support requirements, and loss performance of the HVDC solutions and compared these to the expected performance of 5L83 (DCI 2007). The DCI report concluded that the cost of HVDC converter stations, not including overhead and interest during construction, would be as high as $378M ($2007) (ibid). A typical HVDC bi-pole transmission line requires less ROW, smaller towers, and fewer conductors than an AC transmission line. The savings in transmission line costs are estimated to be 20-30 percent (Bahrmann and Johnson 2007). The cost of the transmission line component of 5L83 was estimated in April 2007 at $253.5 M (direct with no contingency, inflation, overhead, or interest during construction) (BCTC 2007a). Therefore, an HVDC bi-pole circuit would cost between $177 M and $203 in transmission line costs. Combined with the HVDC converter station costs required at each end of the circuit, the transmission cost of an HVDC solution would be between $555 M and $581 M. The total cost of an HVDC line would be approximately $850 M compared to a cost of approximately $600 M for 5L83 (DCI 2007). In general, HVDC transmission becomes cost competitive with AC for transmission lines longer than 500 km (DCI 2007). Beyond this distance, the savings in transmission losses and line costs offset the additional HVDC converter station cost. In conclusion, the application of an HVDC circuit over a distance of 248 km would not be a cost effective method of reinforcing the ILM grid.

Tower Configurations

All existing 500 kV circuits in BC use a flat conductor configuration. However, both flat and delta configuration towers were considered for the ILM Project (see Section 4.2.3). Flat towers function well under extreme geotechnical and natural hazard conditions such as high ice, wind and snow loads. The delta configuration has a narrower profile and reduces the amount of clearing and additional ROW width required. It also has slightly better power transfer capability and lower EMF levels compared to the flat configuration.

BCTC examined constructing the ILM Project with all flat towers, all delta towers and with a combination of tower configurations. Constructing the line with all delta towers was not considered feasible since several areas along the potential alignments experience high ice loading, requiring flat configuration towers. Constructing the line with all flat configuration towers was feasible, but not considered preferable since using delta configuration towers in forested areas would reduce clearing requirements.

BCTC is proposing to use flat structures in the rangelands to be consistent with existing tower geometries, where there is adequate existing ROW for the majority of the segments and where clearing requirements are minimal. Flat structures are also proposed for segments in certain mountainous areas to address potential ice and snow loading. Delta structures are proposed for the remaining segments to reduce ROW and clearing requirements.

Route Alignment Options

Based on the results of technical studies and consultation with regulatory agencies and First Nations, certain segments were deemed infeasible due to environmental, engineering and First Nations considerations. Table 3-2 shows the segments identified as infeasible during the process, including a description of key engineering and environmental features that contributed to their removal from consideration for the "preferred alignment."

TABLE 3-2: Segments Removed from Consideration for the Preferred Alignment

	Segment	Key Features
1	Segment C1-D	– New right-of-way on Crown land required that does not parallel an existing line – Route passes through the Uztlius Spotted Owl WHA – Route passes in proximity to known spotted owl nest site(s)
2	Segment C1-E	– Route passes through the Uztlius Spotted Owl WHA – Route passes in proximity to known spotted owl nest site(s) – Extensive sections of unstable slopes are present within the route in the lower reaches of Uztlius Creek
3	Segment F-G	– Route passes through the Anderson Spotted Owl SRMZ – Transmission line and cleared right-of-way would be highly visible from Highway 1 near Node G as it crosses the Fraser River – Route passes through Papsilqua I.R. 2 and 2A – Route passes within 100 m of Papsilqua Indian Reserve (I.R.) 2B, within 100 m of Spuzzum I.R. 1 near Node G, and within 1 km of Skulet 1.R. 6
4	Segment F1-G	– New right-of-way required through Crown land that does not parallel an existing line – Entering Chapmans Capacitor Station at Node G as it crosses the Fraser River is infeasible from an engineering perspective – Transmission line and cleared right-of-way would be visible from Highway 1 near Node G – Route passes within 100 m of Spuzzum I.R. 1 north of the existing Chapmans Capacitor Station near Node G
5	Segment G-H	– Transmission line and cleared right-of-way would be highly visible from Highway 1 near Node G – Route passes through Spuzzum I.R. 1 and 1A
6	Segment H-J	– Mountainous terrain with very steep side slopes; high difficulty terrain for construction – Transmission line and cleared right-of-way would be highly visible from Yale, Highway 1 and the Fraser River – Route passes through Kuthlalth I.R. 2 – Route passes within 1 km of Yale I.R. 25 and Four and One Half Mile I.R. 2 – Presence of transmission line and cleared right-of-way may result in changes to existing and future rural residential land uses in Yale due to potential access requirements during construction and consideration of vegetated buffers and appropriate site designs during construction of future developments

Segment	Key Features
Segments F1-I-J	– Route passes through the Siwash Spotted Owl MAC and Anderson Spotted Owl SRMZ – Route passes adjacent to the Yale-Garry Oak Ecological Reserve – Route passes through a proposed Ungulate Winter Range (UWR) east of the Fraser River – Route crosses areas of steep, unstable terrain, between Nodes I-J creating potential line security concerns – Route passes within 1 km of Yale (opposite the Fraser River) – Transmission line and cleared right-of-way would be highly visible from Yale and the surrounding area (including Emory Creek Provincial Park) – Route passes through Kuthlalth I.R. 3 – Route passes within 200 m of Yale I.R. 19 and within 1 km of Yale I.R. 20 – Route passes through or adjacent to known archaeological sites and areas of high archaeological potential near Yale
Segments K-M-N	– Route passes through infeasible and undesirable areas of natural hazard potential and geotechnical instability – Transmission line would span several more major watercourses than other adjacent options including Stulkawhits Creek, Puckat Creek, and American Creek. New bridges would likely also be required at one or more of these locations to facilitate access to the new right-of-way – Route not desirable from a system reliability perspective due to three 500 kV lines entering American Creek Capacitor Station at Node M – Transmission line and cleared right-of-way would be visible from along the Fraser River, the Hope area and Emory Creek Provincial Park
Segment Q-R (South Route)	– New right-of-way on Crown land and on private parcels required that does not parallel an existing line – Route passes through areas infeasible or undesirable for construction due to natural hazard potential and unstable slopes

Route Alignment Option Areas

Based on the feasibility of route alignment options, the preferred route was identified between Nodes A – C3, Nodes N – Q, and Nodes R – V. Route alignment options remained in the following areas:

- Anderson River Drainage (Nodes C3-J1): 4 route alignment options;
- Yale to Emory Creek (Nodes J1-N): 2 route alignment options; and,
- Cascade Creek (Nodes Q-R): 2 route alignment options.

Route alignment options in these areas were chosen primarily as a result of the following considerations:

- Anderson River Drainage: Avoidance of critical spotted owl habitat, including the Uztlius Spotted Owl WHA;

- Yale to Emory Creek: Distance from Yale, presence/absence of existing ROW, and geotechnical concerns; and,

- Cascade Creek: Geotechnical concerns.

Figures 3-4 to 3-7 show the route alignment options in each of the three route alignment option areas. The four options in the Anderson River Drainage are shown on each of the four different maps, while options in the Yale to Emory Creek and Cascade Creek areas are repeated in inset on all four maps.

Ranking of Route Alignment Options

To determine the preferred option in each of the identified route alignment option areas, a set of criteria were developed in order to rank the options. Key attributes of each environmental technical discipline were identified that were deemed appropriate for evaluation during the route alignment selection process (*i.e.,* spotted owls, parks and protected areas, instream fish habitat, visual quality, etc.). Attributes were arranged according to the technical discipline chapters presented in Chapter 6.0 of the EAC Application. Criteria where developed to rank potential effects of each option on each attribute (Table 3-3). The ranking criteria were developed according to general guidelines for 5-categories from 1 (low impact) to 5 (high impact). Rankings for each attribute were assigned to each option based on the established criteria, and summarized in a color-coded matrix (Table 3-4).

Based on the results of the route option analysis conducted in Spring 2008, Tables 3-5, 3-6, and 3-7 present comparisons of the key environmental and engineering considerations associated with each of the alignment options. First Nations input on the route options is provided below.

TABLE 3-3: Environmental Effects Route Alignment Option Ranking Criteria

ATTRIBUTE	RANKING CRITERIA				
	1	2	3	4	5
GENERAL					
General	The option will likely not require any mitigation.	The option will result in few adverse environmental effects, and will require little mitigation.	The option will require moderate amounts of mitigation, but most or all adverse effects can likely be mitigated using standard measures.	The option would require compensation, high amounts of mitigation or costs to implement.	Alignment of the Project within this area is infeasible. **NOTE: Options that would have obtained a score of 5 were dropped from consideration during the preferred route alignment selection process, and, consequently are not included in this options analysis.**
TERRESTRIAL WILDLIFE AND VEGETATION					
Habitat Alteration Note: Species at Risk habitat excludes that of the spotted owl, which is covered independently below	Important habitats for Species at Risk that have the potential of being altered do not occur in the area.	Important habitats for Species at Risk that have the potential of being altered are limited within the area and are avoided by the Project.	Important habitats for Species at Risk occur in the area; however, the amount removed is not proportionally significant or can likely be avoided during the final design phase of the Project.	Proportionally significant or complete removal of highly important habitat already limited on the landscape that is used regularly by Species at Risk. Habitat compensation opportunities do exist but would require an extensive amount of work (*e.g.*, large wetland complex over several hectares [ha]).	Proportionally significant or complete removal of highly important habitat already limited on the landscape that is used regularly by Species or Ecosystems at Risk. Habitat compensation or mitigation opportunities do not exist (*e.g.*, no other old forest).
Road Access	Will use a current, well used road network.	Uses a currently well used road network with some additional road upgrades and new short spur roads (<500m).	Upgrading existing (but decommissioned) roads in watersheds that have had extensive historical use. Some minor new road construction over short lengths (<500m).	Upgrading of old road beds in sensitive watersheds that have had a history of limited industrial or recreational development, but which has not occurred for a number of years. Some new road construction is also required.	New road networks required in environmentally sensitive watersheds with currently no motorized access, which could lead to further development activities that would measurably affect Species at Risk (*e.g.*, grizzly bear). Helicopter construction would be used if construction were to occur in such an area.
Displacement/ Disturbance/ mortality Note: Species at Risk does not include the spotted owl, which is covered independently below	No Species at Risk occur in the area due to the amount of current activity. No recovery initiatives are anticipated.	Very few Species at Risk occur in the area and would not be affected by the Project.	A decline in the regional population is not anticipated provided standard mitigation practices are implemented.	A measurable decline in the local population of a Species at Risk is likely; however, science has proven that suitable alternative habitat can be created, or known mitigation measures are proven effective to greatly reduce or eliminate the threat. Project construction may have to shut down in the sensitive areas for several months per year.	Direct mortality or eventual local extirpation of critically imperilled Species at Risk.
Spotted Owl	No work within the range of the species and suitable habitat is not present.	Project development within the range of the species but suitable habitat is very limited or not present.	Project development within the range of the species and suitable habitat exists; however, the species has not been detected in the area.	Removal of suitable habitat in an occupied or previously occupied territory. Long-term monitoring would be required to measure possible effects - if species present. Compensation and/or post-construction monitoring would be required.	Removal of a known nest site or roost site in an occupied territory.

	ATTRIBUTE	RANKING CRITERIA				
		1	2	3	4	5
11	Rare or Sensitive habitats (includes the Garry Oak ecosystem)	Sensitive or rare habitats do not exist in the project area.	Sensitive or rare habitats are limited within the area and are avoided by the Project.	Sensitive or rare habitats could be altered, but not extensively. Site remediation has proven effective in past projects to ensure continued existence and some monitoring during construction or short-term monitoring following construction would likely be required.	Project development would be immediately adjacent to a very rare community, but not within. Post-construction monitoring would be required.	Very rare plant communities would be removed or significantly altered due to project development.
12	Ecological management areas (*e.g.*, WHAs, UWRs, SRMZs, parks, OGMA)	No management areas are present.	Management areas are present but would be avoided during Project development.	Little direct disturbance to management areas is expected (*e.g.*, small length of road construction) and the plan objectives are still met.	Removal of suitable habitats within the management areas is required; however a careful review with stakeholders does not show significant alteration from the management objectives. Long-term monitoring is likely required to ensure management goals are still being accomplished.	Removal of large portions of suitable habitat that would significantly alter management objectives to maintain the species' population or sub-population. The alterations would require a review and update of the management plan by the original stakeholders as objectives would now be unattainable.
13	**FISHERIES AND AQUATIC HABITAT**					
14	Instream Fish Habitat	No road crossings on watercourses.	Construction of new or replacement structures along access roads on watercourses with marginal-rated habitat. Construction would occur in accordance with Operational Statements (OPs) and BMPs.	Construction of new or replacement structures along access roads on fish bearing watercourses in accordance with OPs and Best Management Practices.	Construction of access roads would adversely affect critical or important habitat. Construction in accordance with OPs and BMPs may not be possible and compensation may be required.	Construction of overheadlines or access roads would result in substantial loss of instream habitat. This would include placement of a tower structure or bridge structure within the high water mark of a watercourse.
15	Riparian habitat	No clearing of riparian vegetation required for overhead line construction.	Clearing of riparian vegetation required for overhead line or access road construction will result in minimal adverse affects to fish habitat. The majority of riparian vegetation is retained along critical of important rated watercourses; some riparian habitat is retained along marginal rated watercourses. Clearing is completed in accordance with BMPs and existing approved practices.	Clearing of riparian vegetation required along critical or important rated watercourses for overhead line or access road construction, but it is completed and maintained in accordance with BMPs and existing approved practices. Understory vegetation is maintained or replanted.	Construction of overheadline or access roads would result in substantial removal of vegetation on marginal fish habitat, including substantial removal of riparian vegetation with no retained understory and limited replanting. Clearing adjacent to critical or important-rated watercourses would be completed in accordance with BMPs and existing approved practices. Compensation may be required.	Construction of overheadline or access roads would result in a substantial loss of habitat. This would include substantial removal of riparian vegetation with no retained understory and limited replanting on critical or important rated watercourses.
16	**GEOTECHNICAL AND NATURAL HAZARDS**					
17	Landslides	Right-of-way clearing will occur primarily on gently to moderately sloping terrain. There is a very low likelihood of post-clearing landslides.	Right-of-way clearing will occur primarily on moderately to moderately steeply sloping soil slopes or stable bedrock slopes. There is a low likelihood of post-clearing landslides.	Right-of-way clearing will occur across limited areas of unstable and/ or potentially unstable terrain. Site-specific relocation of towers to more stable terrain and other mitigative measures are feasible.	Right-of-way clearing will occur across several areas of naturally unstable and/or potentially unstable terrain. Sizeable post-clearing landslides could occur. Mitigation opportunities in the form of relocation of site-specific relocation of towers to more stable terrain are possible, but locally limited; consequently, mitigation may involve significant changes in route alignment.	Right-of-way clearing will occur across frequent areas of unstable terrain. Sizeable post-clearing landslides could occur. Mitigation through localized relocation of the alignment to more stable terrain is difficult or impossible.

	ATTRIBUTE	RANKING CRITERIA				
		1	2	3	4	5
18	**SURFACE WATER HYDROLOGY AND GROUNDWATER**					
19	Surface Water or Groundwater Quality	No significant impact to surface water or groundwater quality.	Potential impacts may temporarily threaten the water quality available for an agricultural irrigation water source or for wildlife, but appropriate mitigation measures are available and can be implemented. No impacts to human health are anticipated.	Potential impacts may threaten wildlife, but appropriate mitigation measures are available and can be implemented. No impacts to human health are anticipated.	Potential impacts may threaten wildlife, and mitigation measures are either costly or difficult to implement. No impacts to human health are anticipated, or mitigation measures are available and can be implemented to manage potential impacts.	Potential impacts may threaten human health, and mitigation measures are either costly or difficult to implement.
20	Surface Water or Groundwater Quantity	No significant impact to surface water or groundwater quantity.	Potential impacts may temporarily reduce the quantity of water available for an agricultural irrigation water source or for wildlife, but appropriate mitigation measures are available and can be implemented. No impacts to human water sources are anticipated.	Potential impacts may reduce the quantity of a drinking water source for a small group of users over the long-term, but appropriate mitigation measures are available and can be implemented.	Potential impact that results in the permanent loss of a drinking water source for a single user or small group of users, and where compensation or provision of alternative water sources is required and can be implemented.	Potential impact that results in the loss of a drinking water source for a community.
21	**URBAN LAND USE**					
22	Existing Urban Land Uses	There are no existing urban land uses.	There are no anticipated disruptions of, or changes to, existing urban land use activities; urban land use activities are not directly affected by the Project.	Use of land will cause a disruption of, or change in, existing urban land use activities. Effects can be minimized with implementation of standard mitigation measures resulting in few, if any, project-related effects.	Use of land will cause a great deal of disruption, or change to, existing urban land use activities. Project-environment interactions will require high levels of mitigation to manage potential effects.	Use of land will cause a great deal of disruption, or change to, existing urban land use activities. Implementation of mitigation measures is not possible or feasible.
23	Future Urban Land Uses	There is no potential future urban land use.	There are no anticipated disruptions of, or changes to, potential future urban land use activities; urban land use activities are not directly affected by the Project.	Use of land will cause a disruption of, or change in, potential future urban land use and/or may affect the local government's abilities to implement its future land use plans. Effects can be managed through implementation of standard mitigation measures.	Use of land will cause a great deal of disruption, or change to, potential future urban land use activities and/or may affect the local government's abilities to implement its future land use plans. Project-environment interactions will require high levels of mitigation to manage potential effects.	Use of land will cause a great deal of disruption, or change to, potential future urban land use activities and/or may affect the local government's abilities to implement its future land use plans. Implementation of mitigation measures is not possible or feasible.
24	Access to Urban Land Uses	There are no existing or potential future urban land uses.	There are no anticipated disruptions of, or changes to, existing or potential future urban land use activities; urban land use activities are not directly affected by any use of land for road construction and the Project will not require changed access to any urban land uses.	Changed access to land as a result of access road improvements or construction will affect existing or potential future urban land use activities. Effects can be managed through implementation of standard mitigation measures.	Changed access to land as a result of access road improvements or construction will affect existing or potential future urban land use activities. Project-environment interactions will require high levels of mitigation to manage potential effects.	Changed access to land as a result of improvements or construction to an existing access road will affect existing or potential future urban land use activities. Implementation of mitigation measures in not possible or feasible.

	ATTRIBUTE	RANKING CRITERIA				
		1	2	3	4	5
25	**AGRICULTURAL LAND AND RESOURCE USE**					
26	Agricultural Land Use and Activities	No effect on current or potential agricultural activities; potential effects occur on land with no potential for agricultural production or the effects result in a benefit to agricultural activities.	Potential effects to agricultural activities are limited and will require relatively little mitigation and/or compensation; mitigation will result in no residual effects.	Potential effects on agricultural activities require moderate amounts of mitigation and/or compensation; with mitigation, residual effects are limited.	Following implementation of standard mitigation measures, potential effects result in alteration of agricultural activities in such a way that quality or type of use may change, requiring low to moderate compensation.	Permanent disturbance to or alteration of regional agricultural land such that current uses cannot be maintained.
27	**FORESTRY LAND USE**					
28	Timber Harvesting Landbase (THLB)	No THLB area would be removed in this area.	Areas of THLB are limited within this area and the effects of removal can be mitigated.	Areas of THLB altered or removed in this area are relatively large, although those effects can be mitigated through other means.	Removal of relatively large area of THLB would impact local operators. Mitigative opportunities do exist but they are costly to implement. Compensation may also be possible.	Removal of highly important THLB would render the logging industry unviable in the local area. No mitigative options exist.
29	Area removed from designated Old Growth Management Areas (OGMA)	No OGMA impacted in this area.	Minor areas of OGMA are impacted that do not adversely impact the functionality of the OGMA. No new OGMA areas required.	Proportionally large removal of OGMA from the Landscape Unit (LU). Replacement OGMA areas are available and can be designated.	Proportionally large removal of OGMA would impact the Landscape Unit biodiversity plan. Replacement areas do exist but they would be very costly to designate or they are of much lesser quality.	Option would render OGMA within the LU completely ineffective. No replacement OGMA areas are available on the landscape.
30	Area-based forest tenures.	No impact on area based forest tenures.	Some effect on area based forest tenures where effects can be mitigated.	Construction would adversely impact existing area based forest tenures, although these impacts can be mitigated.	Construction would impact existing area based forest tenures and these impacts can not be mitigated or are very expensive to mitigate or compensate for.	Construction would render area based forest tenures as totally unviable and the value of the tenure surpasses the advantage provided by this Route Option.
31	Research Plots	No impact on any existing forest research activities.	Minor impact on existing research activities; any such impact can be mitigated.	Some effect on existing forest research plots; these effects can be mitigated or the research site can be moved.	Significant effect on ongoing forest research projects; these projects are difficult or costly to move or replace.	Construction would render high value ongoing and highly valuable forest research operations inoperative. Research can not be moved or replaced.
32	**LAND AND RESOURCE USE**					
33	Parks and Protected Areas	No project encroachment on park boundaries.	Very limited clearing, construction and temporary access road development within park boundary.	Minor (incremental) clearing, temporary access road development and construction activity within park boundary.	Extensive clearing, temporary access road development and construction activity within park boundary.	Long term, high extent/magnitude adverse effects within park boundaries when feasible alternatives exist.
34	Public Recreation	Limited or nil Project-related interaction; no adverse effects anticipated.	Short term, low extent/magnitude adverse effect on recreation feature, experience, or patterns of activity.	Moderate extent/magnitude adverse effect on recreation feature, experience, or patterns of activity.	Long term, high extent/magnitude adverse effect on recreation features, experiences, or patterns of activity.	N/A (Compensation would likely be possible)
35	Commercial Recreation	Limited or nil Project-related interaction; no adverse effects anticipated.	Short term, low extent/magnitude adverse effect on commercial operations.	Moderate extent/magnitude adverse effect on commercial operations.	Long term changes in land use or access, which preclude commercial operations.	N/A (Compensation would likely be possible)

	ATTRIBUTE	RANKING CRITERIA				
		1	2	3	4	5
36	Traplines	Limited or nil Project-related interaction; no adverse effects anticipated.	Short term, low extent/magnitude adverse effect on trapline.	Moderate extent/magnitude adverse effect on trapline (*e.g.*, improved access).	Long term, high extent/magnitude effects which preclude trapline operations.	N/A (Compensation would likely be possible)
37	Mineral Tenures	Limited or nil Project-related interaction; no adverse effects anticipated.	Short term changes in land use or access which may inconvenience mineral exploration and development.	Change in land use or access which constrains mineral exploration and development (*e.g.*, reduced access).	Long term changes in land use or access, which preclude mineral exploration/development.	N/A (Compensation would likely be possible)
38	Guide Outfitting	Limited or nil Project-related interaction; no adverse effects anticipated. Existing ROW through corner or edge of tenure area.	Short term and/or low magnitude effect on guided hunting operations *e.g.*, incremental widening of existing alignment or new alignment through corner or edge of tenure.	Moderate magnitude effect on guided hunting operations *e.g.*, new access through tenure area.	Long term, high magnitude effects which preclude guided hunting operations.	N/A (Compensation would likely be possible)
39	**VISUAL QUALITY**					
40	Visual Quality	The alignment passes through an area very rarely viewed by the public and/or has virtually no contrast with the existing landscape.	The alignment, although visible, has little contrast with the existing landscape. The users/viewers are either less sensitive to visual disturbance or the area is infrequently viewed.	The alignment has a moderate effect on a moderately sensitive visual landscape unit. The landscape is noticeably altered and the experience of area users will be adversely affected.	The alignment substantially alters the visual quality in a scenic area, where users are highly sensitive to visual alteration. The existing landscape has limited visual alteration.	Alignment passes through an irreplaceable scenic resource area.
41	**CONTAMINATED SITES**					
42	Contamination (Soil, groundwater, sediment, or surface water)	No historical contamination or source in the area, and no surface water bodies within the alignment area, and no Area of Potential Environmental Concern (APEC) within 500m of the alignment. BMPs and spill response plan required.	No historical contamination or source in the area, and no APEC within 500m of the alignment. Surface water located within the alignment area. BMPs and spill response plan required.	APEC located within 500m of alignment. No contamination identified within the alignment. Low to moderate potential for contamination to impact VECs and/or mitigation costs estimated to be low to moderate. BMPs and spill response plan required.	APEC located within 500m of alignment. Contamination exceeding the CSR standards identified within the alignment. Moderate to high potential for contamination to impact VECs and/or mitigation costs estimated to be moderate to high. BMPs and spill response plan required.	Contaminated materials identified within the alignment. Complex remediation required, mitigation costs estimated to be high or infeasible. High potential for contamination to significantly impact VECs.

	ATTRIBUTE	RANKING CRITERIA 1	2	3	4	5
43	**AIR QUALITY**					
44	Air Quality	o Following implementation of BMPs, magnitude of air emissions is at or nominally above baseline (existing) conditions. o The effect of air emissions remains "onsite" (within the Project corridor). o The effect of air emissions is evident only during the construction phase. o The effect of air emissions occurs very infrequently, or is effectively a one-time event. o The effect of air emissions is reversible; once the activity stops the effect is likely to stop.	o Following implementation of BMPs, magnitude of air emissions exceeds baseline emissions. o The effect of air emissions extends "locally" (within 500 meters of ROW). o The effect of air emissions is evident only during the construction phase. o The effect of air emissions occurs at regular though infrequent intervals. o The effect of air emissions is reversible; once the activity stops the effect is likely to stop.	o Following implementation of BMPs, magnitude of air emissions exceeds baseline emissions. o The effect of air emissions extends "locally" (within 500 meters of ROW). o The effect of air emissions is evident during the operational phase. o The effect of air emissions occurs at regular though infrequent intervals. o The effect of air emissions is reversible; once the activity stops the effect is likely to stop.	o Following implementation of BMPs, magnitude of air emissions exceeds baseline emissions. o The effect of air emissions extends "regionally" (beyond 500 meters). o The effect of air emissions is evident during the operational phase. o The effect of air emissions occurs at regular and frequent intervals. o The effect of air emissions is non-reversible - the effect is likely to continue after the activity has stopped.	o Following implementation of BMPs, the magnitude of air emissions will significantly exceed baseline (existing) conditions. o The effect of air emissions extends "regionally" (beyond 500 meters). o The effect of air emissions extends beyond the operational phase. o The effect of air emissions occurs at regular and frequent intervals. o The effect of air emissions is non-reversible - the effect is likely to continue after the activity has stopped.
45	**NOISE**					
46	Community Noise Levels	Following implementation of BMPs, noise from the Project is not audible at sensitive locations.	Following implementation of BMPs, noise from the Project could be audible from sensitive locations, but does not result in an increase in baseline noise levels >3 dba with an annoyance indicator of >6.5%, or an impulse noise indicator (HCII) >75 dba.	Following implementation of BMPs, continuous noise levels from the Project could increase baseline noise levels >3 dba with an annoyance indicator of >6.5%, or have an impulse noise indicator (HCII) >75 dba, but further mitigation or compensation would be possible.	Following implementation of BMPs and mitigation measures, continuous noise levels from the Project would increase baseline noise levels >3 dba with an annoyance indicator of >6.5%, or have an impulse noise indicator (HCII) >75 dba, but sleep in residential areas would not be affected.	Following implementation of BMPs and mitigation measures, continuous noise levels from the Project would increase baseline noise levels >3 dba with an annoyance indicator of >6.5%, or have an impulse noise indicator (HCII) >75 dba, potentially resulting in sleep disturbance.
47	**RADIO INTERFERENCE**					
48	Radio Interference (RI)	o Magnitude of Fair weather Radio Interference levels @ 15m from the outer conductor bundle is equal to or less then 60 dBuV/m. o There are no receptors sensitive to RI within 500ft of the ROW.	o Magnitude of Fair weather Radio Interference levels @ 15m from the outer conductor bundle is equal to or less then 60 dBuV/m. o There are receptors sensitive to RI within 500ft of the ROW.	o Magnitude of Fair weather Radio Interference levels @ 15m from the outer conductor bundle may exceed 60 dBuV/m by 6dB or less. o There are unlikely any receptors sensitive to RI within 500ft of the ROW. o The Segment will require moderate amounts of mitigation to minimize the RI levels.	o Magnitude of Fair weather Radio Interference levels @ 15m from the outer conductor bundle may exceed 60dBuV/m by 6dB or less. o There are receptors sensitive to RI within 500ft of the ROW. o The Segment will require moderate to costly mitigation measures to minimize the RI levels.	o Magnitude of Fair weather Radio Interference levels @ 15m from the outer conductor bundle will exceed 60 dBuV/m by greater than 6 dB. o There are receptors sensitive to RI within 500ft of the ROW. o The Segment will require costly mitigation measures to minimize the RI levels.

	ATTRIBUTE	RANKING CRITERIA 1	2	3	4	5
49	**ELECTROMAGNETIC FIELDS**					
50	Electromagnetic Fields (EMF)	o Magnetic Field levels are at or below standard limits (there are no regulatory standards, only guidelines). o Electric Field levels are at or below standard limits (there are no regulatory standards, only guidelines).	o Magnetic Field levels exceed the standard limits (there are no regulatory standards, only guidelines). o Electric Field levels are at or below standard limits (there are no regulatory standards, only guidelines). o The Option will require moderate amounts of mitigation to minimize the magnetic field levels.	o Magnetic Field levels are at or below the standard limits (there are no regulatory standards, only guidelines). o Electric Field levels exceed standard limits (there are no regulatory standards, only guidelines). o The Option will require moderate amounts of mitigation to minimize the Electric Field levels.	o Magnetic Field levels exceed the standard limits (there are no regulatory standards, only guidelines). o Electric Field levels exceed standard limits (there are no regulatory standards, only guidelines). o The Option will require moderate to high amounts of mitigation to minimize the Electric and Magnetic Field levels.	o Magnetic Field levels exceed the standard limits (there are no regulatory standards, only guidelines). o Electric Field levels exceed standard limits (there are no are regulatory standards, only guidelines). o The Option will require very costly mitigation to minimize the Electric and Magnetic Field levels, or mitigation is infeasible or impossible.
51	**SOCIOECONOMICS**					
52	First Nations and Non-First Nations Communities	Located over 5 km from a First Nation (FN) or non-FN community or populated area.	Located between 1 and 5 km away from a FN or non-FN community or populated area.	A 100 - 1000 m buffer exists between the line and a FN or non-FN community or populated area.	Option passes through a FN or non-FN community or populated area where there is an existing ROW; or adjacent to (1-100 m) a FN or non-FN community or populated area.	Option passes through a FN or non-FN community or populated area where there is no existing ROW.
53	Property Values	No discernible negative impact on general area property values expected.	No discernible negative impact on general area property values expected. An occasional property might experience a modest negative impact due to the infrastructure of the transmission line.	Nominal to modest negative impact on the value of property in the area, particularly those properties under the ROW. Some properties might experience no discernible impact.	Discernible modest negative impact on the value of properties under the ROW particularly related to visual impact. Class 4 impact arises when a new ROW affects a property.	Material negative value impacts for some area properties, particularly those beneath the ROW that were not previously subjected to a ROW encumbrance.
54	Transportation and Traffic	No traffic disturbance in residential or high traffic areas, on FN reserves or near/on areas of spiritual significance.	Minor, short-term traffic disturbance in residential or high traffic areas, on FN reserves or near/on areas of spiritual significance resulting in minor delays and inconvenience accessing certain features or areas.	Moderate, short-term traffic disturbance in residential or high traffic areas, on FN reserves or near/on areas of spiritual significance resulting in temporary delays and inconvenience accessing certain features or areas.	High, long-term traffic disturbance in residential or high traffic areas, on FN reserves or near/on areas of spiritual significance resulting in long-term inconvenience and delays accessing certain features or areas.	Very high, long-term traffic disturbance in residential or high traffic areas, on FN reserves or near/on areas of spiritual significance resulting in long-term inaccessibility of certain features or areas.
55	**ARCHAEOLOGICAL RESOURCES**					
56	Archaeological Resources	No Project-related interaction with known archaeological sites or areas of high archaeological potential is anticipated. BMPs will be implemented if unexpected sites are discovered.	No Project-related interaction to known archaeological sites. Project-related interaction to areas of high archaeological potential, but no adverse effects are anticipated. BMPs will be implemented to avoid disturbance to site-specific features.	Project-related interaction to known archaeological sites and/or areas of high archaeological potential; adverse effects are anticipated. Implementation of mitigation measures and BMPs will be required.	Project-related interaction to highly significant archaeological sites as determined by the archaeological impact assessment; adverse effects anticipated requiring significant costs for mitigation.	Project-related interaction to known spiritually significant archaeological sites (e.g., cemetery or rock art).

	ATTRIBUTE	RANKING CRITERIA 1	2	3	4	5
57	**NAVIGATION**					
58	Navigation	No bridge or transmission line crossings of potentially navigable watercourses (>3 m in width, gradient <10%).	Transmission line crossing of at least one navigable watercourse located at a height equal too or higher than existing crossings, or a bridge or transmission line crossing of a small, potentially navigable watercourse (3 to 10 m in width) that is constructed to have no effect on navigation.	Bridge crossing of at least one navigable watercourse that is constructed to have minimal or no effect on navigation or a transmission line crossing of at least one navigable watercourse below the height of all existing crossing structures, but that is constructed to have no effect on navigation.	Bridge or transmission line crossing of at least one watercourse used only by small vessels such as kayaks and canoes that may interfere with existing navigation.	Bridge or transmission line crossing of at least one major waterway used by commercial and recreational boats that may interfere with existing navigation.
59	**PUBLIC HEALTH**					
60	Human Health Note: Refer also to EMF, Contaminated Sites, Hydrology, Noise and Air Quality criteria for potential effects related to public health	o Chemical concentrations do not exceed appropriate regulatory criteria / guidelines. o Air quality, water quality, and noise do not exceed regulatory criteria. o No additional health risks to human receptors over the short term (acute) or long term (chronic) following implementation of standard BMPs.	o Chemical concentrations (in air or water) generated during the construction phase exceed appropriate regulatory criteria / guidelines. o The exceedance of regulatory criteria / guidelines is evident only during the construction phase. o The exceedance of regulatory criteria / guidelines is reversible; once the activity stops the exceedance is likely to stop. o Health risks to human receptors may increase over the short term (acute) following implementation of standard BMPs and mitigation measures.	o Chemical concentrations (in air or water) generated during the operational phase exceed appropriate regulatory criteria / guidelines. o The exceedance of regulatory criteria / guidelines is evident during the operational phase. o The exceedance of regulatory criteria / guidelines is reversible; once the activity stops the exceedance is likely to stop. o Health risks to human receptors may increase over the short term (acute) following implementation of standard BMPs and mitigation measures.	o Chemical concentrations (in air or water) generated during the operational phase exceed appropriate regulatory criteria / guidelines. o The exceedance of regulatory criteria / guidelines is evident during the operational phase. o The exceedance of regulatory criteria / guidelines is non reversible; the exceedance is likely to continue after the activity has stopped. o Health risks to human receptors anticipated to increase slightly over the short term (acute) or long term (chronic) following implementation of standard BMPs and mitigation measures.	Human health risks are anticipated to increase to an unacceptable level following implementation of BMPs and mitigation measures.

TABLE 3-4: Environmental Effects Route Alignment Option Ranking Matrix

OPTION	ENVIRONMENTAL EFFECTS																																				
	Terrestrial Wildlife and Vegetation					Fisheries and Aquatic Habitat		Geotechnical	Hydrology and Groundwater		Urban Land Use			Agriculture	Forestry Land Use				Land and Resource Use						Visual Quality	Contaminated Sites	Air Quality	Noise	Socioeconomics			RI	EMF	Archaeology	Navigation	Public Health
	Habitat Alteration	Road Access	Displacement/ Disturbance/ Mortality	Spotted Owl	Rare or Sensitive habitats	Instream Fish Habitat	Riparian Habitat	Landslides	Surface Water or Groundwater Quality	Surface Water or Groundwater Quantity	Existing Urban Land Uses	Future Urban Land Uses	Access to Urban Land Uses	Agricultural Land and Land Use	Timber Harvesting Land Base	Old Growth Management Areas	Area Based Forest Tenures	Research Plots Directly Affected by ROW	Parks and Protected Areas	Public Recreation	Commercial Recreation	Traplines	Mineral Tenures	Guide-Outfitting	Visual Quality	Contamination	Air Quality	Community Noise Levels	Proximity to Community of Interest	Property Values	Traffic and Transportation	Radio Interference (RI)	Electromagnetic Fields (EMF)	Archaeological Resources	Navigation	Human Health
ANDERSON RIVER DRAINAGE (Options C3-G1)																																					
Option 1 (C3-D-E-E1-G1)	3	3	3	4	3	3	3	2	2	2	1	1	1	1	2	2	1	1	1	3	2	2	2	2	4	3	2	1	4	2	2	4	3	3	2	1
Option 2 (C3-E1-F-F1-G1)	3	2	3	3	3	2	2	3	2	2	1	1	1	1	2	2	1	1	1	4	2	2	2	2	3	3	2	1	3	2	2	3	3	3	3	1
Option 3 (C3-D-E-F-F1-G1)	3	2	3	4	3	3	3	2	2	2	1	1	1	1	2	2	1	1	1	1	2	2	2	2	3	3	2	1	3	2	2	3	3	3	3	1
Option 4 (C3-E1-G1)	3	3	3	3	3	2	2	3	2	2	1	1	1	1	2	2	1	1	1	4	2	2	2	2	4	3	2	1	4	2	2	4	3	3	2	1
YALE TO EMORY CREEK (Options J1-N)																																					
Option 1 (J1-L-N)	3	3	3	3	3	2	2	3	2	2	1	1	1	1	2	2	2	1	1	2	1	2	2	2	3	2	2	1	3	1	2	3	3	2	3	1
Option 2 (J1-J-K-L-N)	3	3	3	3	3	3	3	4	2	2	4	4	3	1	2	2	2	1	1	2	1	2	2	2	3	2	2	1	3	2	2	3	3	2	3	1
CASCADE CREEK (Options Q-R)																																					
Option 1 (North)	2	3	2	2	3	3	3	2	2	2	4	2	3	2	2	1	1	1	1	2	1	1	2	1	2	2	2	1	2	2	1	3	3	3	3	1
Option 2 (Central)	2	3	2	2	3	2	2	2	2	2	4	2	3	2	2	1	1	1	1	2	1	1	2	1	2	2	2	1	2	2	1	3	3	3	3	1

TABLE 3-5: Anderson River Drainage Route Alignment Options Comparison (Options C3-G1)

	Environmental or Engineering Consideration	Option 1	Option 2	Option 3	Option 4
1	Right-of-Way Requirements	• New right-of-way on Crown land required that does not parallel an existing line over the majority of the route	• New right-of-way on Crown land required that does not parallel an existing line over the majority of the route • Route generally parallels the existing 5L81/5L82 right-of-way within Segment E1-F-F1	• Route generally parallel to existing rights-of-way within Segments D-E, E-F, and F-F1 • New right-of-way through Crown land required that does not parallel an existing line within Segments C3-D and F1-G1	• New right-of-way on Crown land required that does not parallel an existing line over the entire route
2	Terrain	• Medium difficulty terrain for construction with medium potential for ice loading over the entire route	• Medium difficulty terrain for construction with medium potential for ice loading over the majority of the route • Some rough, difficult terrain and high potential for ice loading within Segment C3-E1	• Medium difficulty terrain for construction with medium potential for ice loading over the entire route	• Medium difficulty terrain for construction with medium potential for ice loading over the majority of the route • Some rough difficult terrain and high potential for ice loading within Segment C3-E1
3	Access	• Existing access to the majority of the route from 5L41 and existing logging roads; extensions of roads will be required to new tower sites • Helicopter construction may be required east of the Fraser River within Segment E1-G1 to avoid undisturbed forest habitat	• New access required within Segments C3-E1 and F1-G1. Helicopter construction will likely be required in some areas. • Existing access to the route from 5L81/5L82 within Segment E1-F-F1	• Existing access to the majority of the route from 5L41/5L81/5l82 and logging roads; extensions of roads will be required to new tower sites • New access required within Segment F1-G1. Helicopter construction will likely be required in some areas.	• New access required to the majority of the route. Helicopter construction will likely be required in some areas. • Existing access from logging roads on the west side of the Fraser River within Segment E1-G1.
4	Wildlife	• Route passes through the Anderson Spotted Owl Special Resource Management Zone (SRMZ) between Node D and the east side of the Fraser River as well as in a small area surrounding Node G1 • Route passes through portions of the SRMZ currently occupied by spotted owls within Segment C3-D and D-E	• Route passes through the Anderson SRMZ between Node C3 and Node G1, but avoids areas known to be occupied by spotted owls	• Route passes through the Anderson Spotted Owl SRMZ between Node D and Node G1 • Route passes through portions of the SRMZ currently occupied by spotted owls within Segment C3-D and D-E	• Route passes through the Anderson SRMZ between Node C3 and the east side of the Fraser River as well as in a small area surrounding Node G1, but avoids areas known to be occupied by spotted owls
5	Fisheries	• Transmission line would span more tributaries of the Anderson River than Options 2 & 4	• Transmission line would span fewer tributaries of the Anderson River than Options 1 & 3	• Transmission line would span more tributaries of the Anderson River than Options 2 & 4	• Transmission line would span fewer tributaries of the Anderson River than Options 1 & 3
6	Public Recreation	• Transmission line would span the Gate Mountain Trail near Node E1	• Transmission line and cleared right-of-way would be highly visible from the Gate Mountain Trail near Node E1.	• The Gate Mountain Trail is not expected to be spanned by or within sight of the transmission line	• Transmission line and cleared right-of-way would be highly visible from the Gate Mountain Trail near Node E1.
7	Visual Quality	• Transmission line and cleared right-of-way would be highly visible from Highway 1 in the Alexandra Bridge area where new right-of-way would be required through previously undisturbed areas	• Transmission line and cleared right-of-way would be visible from Highway 1 Near Node G where the route crosses the Fraser River • Transmission line would be located in an area with existing visual disturbance from the 5L81 and 5L82 transmission lines and cleared rights-of-way within Segments E-F-F1	• Transmission line and cleared right-of-way would be visible from Highway 1 Near Node G as the route crosses the Fraser River • Transmission line would be located in an area with existing visual disturbance from the 5L81 and 5L82 transmission lines and cleared rights-of-way within Segments E-F and F-F1	• Transmission line and cleared right-of-way would be highly visible from Highway 1 in the Alexandra Bridge area where new right-of-way would be required through previously undisturbed areas
8	First Nations Reserves	• Route passes within 100 m of Teequaloose Indian Reserve (I.R.) 3 and 3A within Segment E1-G1 • Route passes within 1 km of Yelakin I.R. 4 and 4A and Long Tunnel I.R. 5A within Segment E1-G1	• Route passes within 1 km of Boston Bar I.R. No. 10 within Segment C3-E1 • Route passes within 1 km of Papsilqua I.R. 2A and Spuzzum I.R. 1 within Segment F1-G1	• Route passes within 1 km of Papsilqua I.R. 2A and Spuzzum I.R. 1 within Segment F1-G1	• Route passes within 1 km of Boston Bar I.R. No. 10 within Segment C3-E1 • Route passes within 100 m of Teequaloose I.R. 3 and 3A within Segment E1-G1 • Route passes within 1 km of Yelakin I.R. 4 and 4A and Long Tunnel I.R. 5A within Segment E1-G1

TABLE 3-6: Yale to Emory Creek Route Alignment Options Comparison (Options J1-N)

Environmental or Engineering Consideration	Option 1	Option 2
Right-of-Way Requirements	• New right-of-way on Crown land required that does not parallel an existing line over the majority of the route	• Route generally parallel to existing rights-of-way within Segments J-K, K-L and L-N • New right-of-way on Crown land that does not parallel an existing line required within Segment J1-J
Terrain	• Medium difficulty terrain for construction with medium potential for ice loading over the majority of the route • Some areas within Segment L-N with rough, difficult terrain for construction and high potential for ice loading	• Medium difficulty terrain for construction with medium potential for ice loading over the majority of the route • Some areas within Segments K-L and L-N with rough, high difficulty terrain for construction and high potential for ice loading
Access	• Existing access to the majority of the route from 5L41 and logging roads; new roads or helicopter construction would be required in some areas	• Existing access to the majority of the route from existing rights-of-way and logging roads; new roads or helicopter construction would be required in some areas • A high percentage of helicopter construction would likely be required within Segment K-L
Geotechnical	• Route crosses more stable terrain than Option 2	• Route crosses more unstable terrain than Option 1
Wildlife	• Route passes through the Emory Spotted Owl Matrix Activity Centre	• Route passes through the Emory Spotted Owl Matrix Activity Centre
Fisheries	• Transmission line would span fewer tributaries of Emory Creek than Option 2	• Transmission line would span more tributaries of Emory Creek than Option 1
Visual Quality	• Transmission line and cleared right-of-way would be visible from Highway 1 near Yale in a previously undisturbed area, but more distant from potential viewpoints than Option 2	• Transmission line and cleared right-of-way would be visible from viewpoints along Highway 1 near Yale in an area previously disturbed by the existing 5L81 and 5L82 rights-of-way
Urban Land Use	• Option 1 is not expected to result in changes to existing and future land uses in Yale	• Presence of transmission line and cleared right-of-way may result in changes to existing and future rural residential land uses in Yale due to potential access requirements during construction and consideration of vegetated buffers and appropriate site designs during construction of future developments

TABLE 3-7: Cascade Creek Route Alignment Options Comparison (Options Q-R)

	Environmental or Engineering Consideration	Option 1 (North Route)	Option 2 (Central Route)
1	Right-of-Way Requirements	• Route generally adjacent to the existing 5L82 right-of-way, but diverges to the north for a third of the alignment between Q-R due to terrain constraints in the Cascade River drainage	• Route generally adjacent to the existing 5L82 right-of-way, but diverges to the south for a third of the alignment between Q-R due to terrain constraints in the Cascade River drainage
2	Terrain	• Rough, high elevation, high difficulty terrain for construction with medium/high potential for ice loading	• Rough, high elevation, high difficulty terrain for construction with high potential for ice loading
3	Access	• Access to the route is limited; a large proportion of helicopter construction would be required	• Access to the route is limited; a large proportion of helicopter construction would be required
4	Urban Land Use	• Presence of the transmission line could potentially result in changes to existing rural residential land uses in the Hatzic Prairie area near Node R due to the potential requirement to access properties within the right-of-way during construction and to ensure buildings within the right-of-way are compatible with BC Hydro guidelines	• Presence of the transmission line could potentially result in changes to existing rural residential land uses in the Hatzic Prairie area near Node R due to the potential requirement to access properties within the right-of-way during construction and to ensure buildings within the right-of-way are compatible with BC Hydro guidelines
5	Fisheries	• Transmission line would span more tributaries of Cascade Creek than the Central Route	• Transmission line would span fewer tributaries of Cascade Creek than the North Route
6	Parks and Recreation	• Route passes within 1 km of Cascade Falls Regional Park	• Route passes within 1 km of Cascade Falls Regional Park

Figures 3-8 to 3-14 show each of the route alignment options in the three route alignment option areas with accompanying text providing a segment by segment outline of key environmental and engineering considerations.

First Nations and Community Input

Following identification of key environmental and engineering features associated with each of the route alignment options, input into the route alignment selection process was sought from First Nations at the following Open Houses and community meetings conducted in Spring and Summer, 2008:

- March 25 First Nations Open House in Merritt from 4 pm – 8 pm;
- March 26 First Nations Open House in Chilliwack from 4 pm – 8 pm;
- April 21 meeting with Union Bar First Nation;
- April 21 meeting with Yale First Nation;
- April 23 meeting with Stó:lō (collective);
- April 24 meeting with Boston Bar First Nation;
- April 28 meeting with Coldwater First Nation;
- April 28 meeting with Lower Nicola First Nation;
- May 28 meeting with Chehalis First Nation;
- June 5 meeting with Spuzzum First Nation; and,
- July 3 meeting with Stó:lō Nation Society (SNS) representing Aitchelitz First Nation, Leq'a:mel First Nation, Skawahlook First Nation, Skowkale First Nation, Tzeachten First Nation and Yakweakwioose First Nation.

At these meetings, First Nations groups were presented with route alignment option maps (Figures 3-4 to 3-7 and Figures 3-8 to 3-14), summaries of key environmental and engineering considerations (Tables 3-5, 3-6 and 3-7) and other materials. Some of the meetings included a Google Earth presentation of the route options. Input from First Nations at the route alignment meetings included:

- Identification of areas where berries are gathered and a discussion of vegetation management practices;
- Identification of an area where there are a number of CMTs;
- Identification of an area used historically as a trail to connect to a sister band;
- Interest in reducing the overall footprint of the Project by using previously cleared areas and paralleling existing ROW;

- Avoiding reserve land;
- Avoiding watercourses and fish bearing streams;
- Concerns about slope stability and potential for erosion; and,
- Limiting access to areas by ATVs and other recreational users.

A meeting was also held with the Yale Ratepayers Association on May 12, 2008 to identify potential concerns with respect to routing options in the Yale to Emory Creek area. The Yale Ratepayers Association expressed the following interests:

- Additional clearing adjacent to the existing line (5L41) may result in rockfall hazards and landslides onto private properties. Selecting an option that avoids a rocky outcrop and associated vegetative buffer adjacent to 5L41 would aid in protecting properties and the TransCanada Highway from ice and rockfall;
- Visual aesthetic concerns from the Fraser River, Yale and Highway 1 should be limited, wherever possible, by locating the lines where they are hidden behind ridgetops;
- Clearing practices should consider that many residents in the area get their water from local creeks;
- A small group of lakes north of Node J1 and east of the Frozen Lakes should be avoided, if possible;
- There is a potential for the J-K-L option to cross the Kassian property which is already constrained by one transmission line; and
- Yale is already constrained by the presence of existing transmission lines. Potential effects to the area from a new line should be minimized, wherever possible.

Rationale for Selection of the Preferred Alignment

Based on engineering and environmental technical studies, as well as input from First Nations and the Yale Ratepayers Association, the "Preferred Alignment" was identified for the ILM Project (Figure 1-1). The rationale behind selection of the route alignment within each of the option areas was as follows:

Anderson River Drainage

Option 3 (Nodes C3-D-E-F-F1-G1) was chosen as the component of the Preferred Alignment through the Anderson River Drainage area as a result of the following:

- The preferred alignment avoids disturbance to the Gate Mountain Trail near Node E1;
- The route at the northern end of the area (Nodes C3-E) was preferred by the Boston Bar First Nation as it avoids disturbance to the Gate Mountain Trail and other sensitive features;
- The route at the northern end of the area (Nodes C3-E) avoids steep slopes and exposed areas with high ice and wind loading along Segment C3-E1;
- Despite passing through portions of an occupied Long-Term Activity Centre (LTAC) within the Anderson SRMZ between Nodes C3-E, the alignment is well removed from known sightings, and travels mainly through previous cut-blocks. Clearing would also be avoided in many areas by spanning watercourses;
- The southern crossing of the Fraser River (Segment F1-G1) is less visually sensitive than the northern crossing (Segment E1-G1) due to the less prominent viewshed and the existing disturbance from Circuit 5L41;
- The route at the southern end of the area, between Nodes E-F1, parallels existing lines to the fullest extent possible and limits new disturbance to the landscape;
- The route at the southern end of the area avoids avalanche tracks along Segment E1-G1;
- The route at the southern end of the area avoids running adjacent to Teequaloose Indian Reserve (I.R.) 3 and 3A belonging to the Spuzzum First Nation along Segment E1-G1; and,
- A lengthy area of new ROW (approximately 10.5 km) is avoided between Node E1-G1.

Yale to Emory Creek

Option 1 (Nodes J1-L-N) was chosen as the component of the Preferred Alignment between Yale and Emory Creek as a result of the following[3]:

- The preferred option is further removed from Yale, where clearing of new ROW area (and associated concerns regarding debris flow and rockfall hazards) and visual quality were expressed as concerns;
- The preferred option is further removed from Yale, and, consequently, would likely have fewer effects on existing and future land uses and land use planning;
- The preferred option avoids private properties in the Yale area;
- The preferred option can be situated so it is mainly screened visually from Highway 1, the Fraser River and Yale by locating towers behind ridgetops;
- The preferred option avoids steep side slopes along Emory Creek near Node K where construction of a new line directly adjacent to the existing line would be extremely difficult and have line security concerns;
- The preferred option can be placed in a position which more effectively avoids unstable slopes and avalanche tracks near Node L; and,
- Although the preferred option results in new ROW between Node J1-L, it travels mainly through cut-blocks and other areas with existing disturbance.

Cascade Creek

The preferred option through the Cascade Creek drainage was chosen as the component of the Preferred Alignment as a result of the following[4]:

- The preferred option passes through terrain that is considerably more stable than more southerly or northerly options, which provides greater line security despite its proximity to the existing 5L82 circuit;

[3] Following further study in Summer 2008, the preferred alignment from Yale to Emory Creek (Option 1) was modified to avoid unstable slopes and to increase visual screening behind ridgetops west of Yale (see Figures 1-1 and 4-2).

[4] Following further study in Summer 2008, the preferred alignment for the Cascade Creek drainage was modified from the north alignment to follow Circuit 5L82 for the majority of its route (see Figures 1-1 and 4-2).

- By following Circuit 5L82, ROW clearing is minimized; and,

- The preferred option allows a greater proportion of the segment to be accessed from the ground via existing roads rather than by helicopter. This allows easier and more economical construction and maintenance.

Capacitor Station Sites

Based on the results of the route alignment analysis, the AMC and CHP capacitor station sites were removed from consideration because they did not fall along the preferred alignment. In addition, SAW was not considered desirable as a result of the requirement for new access across Spuzzum First Nation I.R. 1 and 1A. Table 3-8 provides a comparison of the engineering and environmental considerations associated with the remaining RYC and NSK sites.

TABLE 3-8: Ruby Creek (RYC) and North Skeemis (NSK) Capacitor Station Site Comparison

Environmental or Engineering Consideration	Ruby Creek (RYC)	North Skeemis (NSK)
Property	BC Hydro owned property	Crown land
Access	Available through an existing FSR. Upgrades would be required	New access would be required
Wildlife	Wetlands nearby that contain red-legged frogs. Altering the site hydrology could affect the wetlands. Located within the Sasquatch SRMZ	Located within the Anderson SRMZ
Geotechnical	No considerable natural hazard issues Very low to moderate seismic hazard Moderate climate hazard	Evidence of periodic rock fall Very low to low seismic hazard Low to moderate climate hazard
Fisheries	No identified issues	No identified issues
Forestry	Clearing of 1.2 ha of forested area within the Sasquatch SRMZ	Clearing of 9 ha within a visual landscape unit and the Anderson SRMZ
Visual Quality	No identified issues	Visible briefly along Highway 1
Socioeconomics	No identified issues	Located in proximity to Spuzzum First Nations community

Rationale for Selection of the Preferred Capacitor Station Site

RYC was chosen as the preferred location of the capacitor station as a result of the following:

- The site is located along the "Preferred Alignment" route;
- Access for construction and maintenance is easiest of all the sites under consideration;
- The land is already owned by BC Hydro;
- While a double crossing of 5L81 and 5L82 is required, this can be designed so that the risk to system reliability is considered low;
- The site requires less clearing of forested area than other greenfield sites;
- The site is visually screened from potential viewpoints; and,
- Although a portion of the site is swampy and contains red-legged frogs, it is expected that site design, placement and BMPs can be implemented to minimize or avoid potential effects to wetland habitats.

3.3 Preferred Alternative

Based on the analysis presented above, the preferred option for the ILM Project is an AC 500 kV transmission line from MDN to NIC along the route alignment from Nodes A to V presented in Section 4.0 (Figure 1-1). This alternative involves the construction of single-circuit steel delta and flat configuration towers from Coquitlam to Merritt, line terminations at MDN and NIC and construction of a new capacitor station at Ruby Creek. The 255 km long preferred alignment consists of 121 km within existing ROW, 60 km which require widening of existing ROW adjacent to existing lines and 74 km of entirely new ROW.