

1 **4.0 PROJECT DESCRIPTION, SCOPE & PURPOSE**

2 This Chapter provides a description of the ILM Project as proposed by BCTC. The
3 Project is a new 255 km 500 kV transmission line between NIC near Merritt and MDN in
4 Coquitlam, which would increase the transmission capability for serving customers in the
5 Lower Mainland and on Vancouver Island (Figure 1-1). The Project would also consist
6 of 500 kV circuit terminations and related equipment at NIC and MDN within the
7 existing substation boundaries and a new 500 kV series capacitor station located at Ruby
8 Creek near Node O. Descriptions of the existing NIC to MDN transmission system as
9 well as the proposed overhead transmission line, terminal modifications, and capacitor
10 station are provided below.

11 The alignment identified in this Section of the application is the “Preferred Alignment”
12 based on engineering and environmental considerations, as well as consultation with First
13 Nations, the public and regulatory agencies. A discussion of alternative routing
14 alignments considered during the environmental assessment process is included in
15 Section 3.2. Although the “Preferred Alignment” represents the preferred routing for the
16 Project, further refinements to the base concept such as minor alignment adjustments will
17 be considered during review of the environmental assessment, permit applications, and
18 development of a detailed design. These alignment adjustments may be required to avoid
19 site-specific features such as rare plant communities, archaeological sites, and localized
20 areas of unstable terrain.

21 A set of thirty-four 1:20,000 scale map sheets showing the proposed alignment of the
22 ILM Project overlaid on aerial orthophotos of the existing corridor are provided as
23 Figure 4-1.

24 **4.1 Existing Interior-to-Lower Mainland Transmission System**

25 **4.1.1 Overhead Transmission Lines**

26 The following 500 kV transmission lines comprise the existing ILM transmission system:

- 27 • Circuit 5L82 from Nicola Substation to Meridian Substation;
- 28 • Circuit 5L81 from Nicola Substation to Ingeldow Substation; and,
- 29 • Circuit 5L41 from Kelly Lake Substation to Clayburn Substation;

30 Circuit 5L82 comprises the existing overhead transmission system from NIC to MDN,
31 while Circuits 5L81 and 5L41 are both partially contained within the NIC to MDN
32 corridor. A brief description of the 500 kV overhead transmission lines located within
33 the ILM corridor is provided below.

1 Maps of the existing 500 kV ILM transmission system and 500 kV NIC to MDN
2 transmission system showing overhead transmission lines, substations and capacitor
3 stations are included as Figures 1-2 and 4-2, respectively. Photographs of the existing
4 500 kV overhead transmission line system between NIC and MDN are included in
5 Appendix W.

6 Circuit 5L82 from Nicola Substation to Meridian Substation

7 The first 500 kV AC transmission line constructed between NIC and MDN was circuit
8 5L82. Circuit 5L82 is approximately 245 km long and is comprised primarily of guyed
9 and rigid flat configuration SCSTs. Circuit 5L82 was completed in 1977 to transfer
10 power from the Mica Generating Station on the Columbia River to load centres in
11 southwestern BC. Following construction and commissioning of the Revelstoke
12 Generating Facility on the Columbia River in 1984, Circuit 5L82 has been used to
13 transfer power from both facilities to the Lower Mainland and Vancouver Island.

14 Circuit 5L81 from Nicola Substation to Ingledow Substation

15 5L81 is an approximately 265 km long 500 kV AC circuit comprised of flat configuration
16 SCSTs located between NIC and ING in Surrey. Circuit 5L81 was completed in 1976 to
17 transfer power from facilities on the Columbia River to the Lower Mainland. Circuit
18 5L81 parallels Circuit 5L82 between NIC and Agassiz, with both circuits tying into
19 AMC, located north of Hope. At Agassiz, Circuit 5L81 departs from the NIC to MDN
20 corridor, continuing south and then west through Chilliwack, Abbotsford and Langley
21 prior to its termination at ING in Surrey.

22 Circuit 5L41 from Kelly Lake Substation to Clayburn Substation

23 5L41 is an approximately 270 km long 500 kV AC circuit comprised of flat configuration
24 SCSTs located between KLY near Clinton and CBN in Abbotsford. Circuit 5L41 was
25 completed in 1969 to transfer power to the Lower Mainland from the Gordon M. Shrum
26 Generating Station on the Peace River. Circuit 5L41 parallels Circuit 5L81 and 5L82
27 between the headwaters of American Creek and Ruby Creek. At Ruby Creek, Circuit
28 5L41 departs from Circuits 5L82 and 5L81, continuing southwest into Agassiz along the
29 Fraser River prior to re-joining Circuit 5L81 as it travels south across the Fraser River.
30 Circuit 5L41 continues to parallel Circuit 5L81 until its termination at CBN in
31 Abbotsford. Circuit 5L41 ties into CHP, located on the west side of the Fraser River near
32 Spuzzum.

1 **4.1.2 Substations and Capacitor Stations**

2 The following substations and capacitor stations are located along the existing NIC to
3 MDN transmission line system:

- 4 • Meridian Substation (MDN);
- 5 • Nicola Substation (NIC);
- 6 • American Creek Capacitor Station (AMC); and,
- 7 • Chapmans Capacitor Station (CHP).

8 A brief description of each of the station facilities located along the NIC to MDN
9 transmission corridor is provided below. Photographs of the existing substations and
10 capacitor stations along the MDN to NIC corridor are included in Appendix W.

11 Meridian Substation (MDN)

12 MDN is a 500 kV/230 kV substation located at the northern end of Eagle Mountain Drive
13 in the Westwood Plateau area of Coquitlam. The 16 hectare (ha) property is owned by
14 BC Hydro. Access to the station is from Eagle Mountain Drive.

15 Built in 1975, the substation receives three 500 kV transmission circuits and transforms
16 them into five 230 kV circuits that are then routed to various substations in the Lower
17 Mainland. The three 500 kV circuits that enter the station are Circuit 5L82 connecting to
18 NIC near Merritt, Circuit 5L44 connecting to ING in Surrey and Circuit 5L45 connecting
19 to CKY north of Squamish. MDN is a key part of the ILM transmission system and is a
20 major component of the Lower Mainland transmission system.

21 The station consists of a 500 kV switchyard to the north and a 230 kV switchyard to the
22 south. A service building, compressor building, control building and trades building are
23 also located at the site, situated generally between the two switchyards. The grade of the
24 switchyards is very steep from north to south which causes surface runoff to flow into a
25 small creek which runs south along the east side of the substation and then west along the
26 bottom of the site into Scott Creek. Drainage from the site flows into subsurface drains
27 and is directed into oil separators prior to being discharged into ditches adjacent to the
28 site.

29 Nicola Substation (NIC)

30 NIC is a 500 kV/230 kV/138 kV substation located 20 km northeast of Merritt adjacent to
31 the Nicola River. The 17 ha property was purchased by BC Hydro from the Douglas
32 Lake Cattle Company in 1972. Access to the Station is from Douglas Lake Road.

1 The station has eight 500 kV circuits, one 230 kV circuit and three 138 kV circuits. The
2 eight 500 kV circuits that enter the station are connected to:

- 3 • MDN in Coquitlam (5L82);
- 4 • CBN in Abbotsford (5L81);
- 5 • KLY north of Lilloet (5L87);
- 6 • Mica generating station on the Columbia River (5L71 and 5L72);
- 7 • Ashton Creek Substation (ACK) near Enderby (5L76 and 5L79);and,
- 8 • Vaseux Lake Substation (VAS) north of Oliver (5L98).

9 NIC consists of a 500 kV switchyard to the north and a 230/138 kV switchyard to the
10 south. A control building and service center, 138 kV control building, barrel storage
11 building, and compressor building are also located at the site. The station is situated on a
12 flat bench approximately 100 m above the Nicola River and 50 m above its tributary,
13 Howse Creek. The site has no formal drainage except for a subsurface drain along the
14 main driveway and a shallow ditch with covered manholes located along the north side of
15 the 500 kV area. There are shallow perimeter ditches located on the west and south sides
16 of the site.

17 American Creek Capacitor Station (AMC)

18 AMC is located in the Fraser Canyon north of Yale along Trans-Canada Highway 1.
19 Specifically, the station is located close to American Creek adjacent to circuits 5L81 and
20 5L82. BC Hydro has a SRW (1.675 ha) for the AMC site. Access to AMC is from the
21 American Creek Forest Service Road (FSR) and the existing road use permit issued by
22 the Ministry of Forests and Range (MoFR). A distribution feeder (12F52) from the
23 existing 69 kV Hope Substation provides electrical service to the station.

24 The American Creek site currently has two in-service series capacitor banks on two
25 500 kV transmission lines (Circuits 5L81 and 5L82) from NIC to the Lower Mainland.
26 The existing American Creek series capacitor banks are constructed at roughly the
27 midpoint of the transmission lines with the source ends at NIC and the load ends
28 terminated at ING located in Surrey (5L81) and MDN located in Coquitlam (5L82). The
29 5L81/82 series capacitor banks are rated at 539 Mvars. The existing bank design does
30 not permit an increase in the bank rating.

31 Chapmans Capacitor Station (CHP)

32 CHP is located in the Fraser Canyon north of Spuzzum, along Trans-Canada Highway 1.
33 Specifically, the station is located close to Spuzzum IR No. 1 and Spuzzum Creek,
34 adjacent to Circuit 5L41. The CHP site is owned by BC Hydro and is 2.7 ha. Registered
35 access to the site is from the Trans-Canada Highway and the old Highway 1 over private
36 lands. A distribution feeder (12F51) from the existing 69 kV Spuzzum Substation
37 provides electrical service to the station.

1 The Chapmans site has one in-service series capacitor bank on a 500 kV transmission line
2 (Circuit 5L41) from KLY to the Lower Mainland. The existing Chapmans series
3 capacitor bank is constructed approximately two thirds of the distance south along the
4 circuit terminating at CBN. The capacitor bank is rated at 554 Mvars with an ultimate
5 rating of 1076 Mvars.

6 **4.1.3 Existing Land Tenure**

7 Table 4-1 provides details on existing agreements, tenures and rights for the existing NIC
8 to MDN transmission system, corresponding to existing station facilities and segments of
9 the ILM Project corridor where existing lines exist (see Section 3.0 for information on
10 segments of the ILM Project corridor that do not correspond to the Preferred Alignment).
11 Information is provided as to whether agreements were for Crown land, private land,
12 First Nation reserves or other land use types at the time the existing ROW was acquired.
13 The extent of existing ROW along the ILM Project corridor is shown on Figure 4-1.

TABLE 4-1: Existing Land Tenure along the NIC-MDN Transmission Corridor

Segment / Station Facility	Existing Line(s)	Existing # of Crown Parcels	Existing # of Private Parcels	Existing # of IR's	Registered Right-of-Way Agreements and Additional Information
1 Preferred Alignment					
2 NIC	5L81/82	---	---	---	– The NIC site is owned by BC Hydro and is 41.96 acres. It was purchased from the Douglas Lake Cattle Company in 1972.
3 A-B	5L81/82	12	31	0	– SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines within the ROW area. The ROW area over Crown lands in this segment is 600 feet (ft.) wide. – SRW agreements over private lands grant the right to construct, replace and maintain one or more overhead and underground lines within the ROW area. The ROW width over private land in this segment is between 600 and 500 ft.
4 B-C	5L81/82	2	0	0	– SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines within the ROW area. – The ROW width in this segment is 600 ft. wide at the east end and 400 ft. wide at the west end.
5 D-E	5L41	1	0	0	– SRW agreement over Crown lands grants the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 350 ft.
6 E-F	5L81/82	1	0	0	– SRW agreement over Crown lands grants the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 400 ft.
7 L-N	5L41	8	0	0	– SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 350 ft.
8 N-O	5L82/81 and 5L41	2	0	0	– SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 350 ft.

Segment / Station Facility	Existing Line(s)	Existing # of Crown Parcels	Existing # of Private Parcels	Existing # of IR's	Registered Right-of-Way Agreements and Additional Information	
9	O-O1	5L81/82	7	0	0	<ul style="list-style-type: none"> – SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead lines. The ROW width in this segment varies between 350 ft. and 400 ft. – Park Use Permit exists LMP9710095 for Sasquatch Provincial Park (surveys have since shown the ROW does not enter the Park). – BC Hydro owns Crown land within the segment for a future Ruby Creek Capacitor Station. The area is approximately 20 acres.
10	O1-P	5L81/82	7	11	0	<ul style="list-style-type: none"> – SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. – SRW agreements over Private lands grant the right to construct, replace and maintain one or more overhead or underground lines. – ROW width for this segment is 600 ft. – A registered access agreement exists for Parcel 112. Charge BJ126649 grants the right to install, construct, operate, use, upgrade, maintain or move roads over the parcel and to use the roads with all vehicles and machinery, as required. – BC Hydro has two agreements in place associated with Aboriginal properties issues: (1) Easement for transmission registration #9727, dated February 12, 1969, based on Order in Council PP.C. 1969-44, Registration #7684; and (2) Easement for transmission registration #X13201, dated January 14, 1954.
11	P-Q	5L82	29	16	0	<ul style="list-style-type: none"> – SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. – SRW agreements over private lands are not consistent; some grant both underground and overhead rights but all of the agreements grant the rights to one or more overhead lines. – ROW width for this segment is 400 ft. – ROW agreement for the Harrison Resort Ltd. Golf Course grants the rights to construct, replace and maintain one or more overhead lines with unobstructed access. The agreement was obtained by expropriation in 1976.
12	Q-R	5L82	5	0	0	<ul style="list-style-type: none"> – SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 400 ft.

	Segment / Station Facility	Existing Line(s)	Existing # of Crown Parcels	Existing # of Private Parcels	Existing # of IR's	Registered Right-of-Way Agreements and Additional Information
13	R-S	5L82	8	36	0	<ul style="list-style-type: none"> – SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. – SRW agreements over private lands grant the right to construct one or more overhead lines; however, not all of the agreements have underground rights. – ROW width is 400 ft. with the exception of the plans in and out of Stave Falls Generating Station. – BC Hydro owns Stave Falls properties around the south end of Stave Lake and for the Stave Falls Dam and Generating Station (parcels #286, 287, 290, 291 and 296). The ROW Plan (47509) on the west side of Stave Lake is 412 ft. wide and on the east side is 582 ft. wide.
14	S-T	5L82	16	36	0	<ul style="list-style-type: none"> – SRW agreements over Crown lands and private lands grant the right to construct, replace and maintain one or more overhead and underground lines, with the exception of the area through the UBC Research Forest. The ROW width is 520 ft. – The SRW agreement through the UBC Research Forest is strictly for overheard rights. ROW has been widened to a total width of 662 ft. through the area. – A Park Use Permit exists for use and maintenance of the existing line through Golden Ears Provincial Park.
15	T-U	5L82	10	9	0	<ul style="list-style-type: none"> – SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. – SRW agreements over private lands grant the right to construct one or more overhead lines; a few of the agreements include underground rights. – Rights over several private parcels along this segment were obtained by expropriation. – BC Hydro owns the ROW near Quarry Road. The width of the ROW owned by BC Hydro is 520 ft.

Segment / Station Facility	Existing Line(s)	Existing # of Crown Parcels	Existing # of Private Parcels	Existing # of IR's	Registered Right-of-Way Agreements and Additional Information
16 U-V	5L82	12	23	0	<ul style="list-style-type: none"> – SRW agreements over Crown lands (including through Pinecone-Burke Provincial Park) grant the right to construct, replace and maintain one or more overhead and underground lines. Pinecone-Burke Provincial Park was created in 1996 around the existing ROW. – SRW agreements over private lands grant the right to construct, replace and maintain one or more overhead and underground lines. – ROW for this segment is mainly 520 ft. with some areas widened.
17 MDN	5L82	---	---	---	– The MDN site is a 37.22 acre parcel owned by BC Hydro.
18	Alternative Segments (see Chapter 3.0)				
19 C-E	5L81/82	4	0	0	– SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines within the ROW area. The ROW width in this segment is 400 ft.
20 F-G	5L41	19	1	2	<ul style="list-style-type: none"> – Section 35 Easement registered under #R9248 issued by power of Order in Council #1969-596 for Spuzzum First Nation Papsilqua I.R. #2. – Section 35 Easement registered under #L272 issued by power of Order in Council #095822 for Spuzzum First Nation Papsilqua I.R. #2A. – Permit for Papsilqua I.R. #2 and #2A grants the right to construct, operate and maintain one or more overhead lines within the ROW area and to pass over existing reserve roads and trails to get to the ROW. The ROW width in this segment is 350 ft. – Unregistered crossing permit acquired from Canadian National (CN) Railway for construction and maintenance of the existing line.

Segment / Station Facility	Existing Line(s)	Existing # of Crown Parcels	Existing # of Private Parcels	Existing # of IR's	Registered Right-of-Way Agreements and Additional Information	
21	G-H	5L41	7	1	2	<ul style="list-style-type: none"> – Section 35 Easement registered under #R9248 issued by power of Order in Council #1969-596 for Spuzzum I.R. #1 and #1A. – Permit for Spuzzum I.R. #1 and #1A grants the right to construct, operate and maintain one or more overhead lines within the ROW area and to pass over existing reserve roads and trails to get to the ROW. The ROW width is 350 ft. (Plan CLSR 55185 for Spuzzum I.R. #1 and Plan CLSR 53677 for Spuzzum I.R. #1A). – SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 350 ft. – Existing permit with Canadian Pacific (CP) Railway grants the right to construct and maintain the existing line.
22	F-I	5L81/82	1	0	0	<ul style="list-style-type: none"> – SRW agreement over Crown lands grants the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 400 ft.
23	H-J	5L41	14	2	0	<ul style="list-style-type: none"> – SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 350 ft. – SRW agreements over private lands grant the right to construct, replace and maintain one or more overhead lines over some parcels, while other parcels include underground rights. The ROW width is 350 ft.
24	I-J	5L81/82	9	1	1	<ul style="list-style-type: none"> – Permit (registration #68102) issued through an Order in Council for Shx'ow'hamel First Nation's Kuthlalth I.R. #3. – Permit for Kuthlalth I.R. #3 grants the right to construct, operate and maintain one or more overhead lines within the ROW area and to pass over existing reserve roads and trails to get to the ROW. The ROW width is 400 ft. (Plan CLSR 59279). – SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 400 ft. – Existing permits with CP Railway and CN Railway grant the right to construct and maintain the existing lines.
25	J-K	5L82/81 and 5L41	1	0	0	<ul style="list-style-type: none"> – SRW agreement over Crown lands grants the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment varies but is mostly 350 ft.

Segment / Station Facility	Existing Line(s)	Existing # of Crown Parcels	Existing # of Private Parcels	Existing # of IR's	Registered Right-of-Way Agreements and Additional Information	
26	K-L	5L41	1	0	0	– SRW agreement over Crown lands grants the right to construct, replace and maintain one or more overhead and underground lines. The ROW width in this segment is 350 ft.
27	K-M	5L81/82	6	0	0	– SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. ROW for this segment starts as 400 ft. wide than splits to two 200 ft. wide ROWs, than joins together on an adjacent ROW which varies in width but is mainly 400 ft.
28	M-N	5L81/82	2	0	0	– SRW agreements over Crown lands grant the right to construct, replace and maintain one or more overhead and underground lines. The ROW in this segment is mainly 400 ft. wide, but it splits into two separate ROWs each 200 ft. wide prior to arriving at Node N.
29	CHP	5L41	---	---	---	– The CHP site is owned by BC Hydro and is 6.67 acres.
30	AMC	5L81/82	1	---	---	<ul style="list-style-type: none"> – The AMC site is owned by Crown lands. BC Hydro has a SRW with the Crown for the site. The site is 1.675 ha in size. The ROW plan for the station (KAP45460) accesses on to the American Creek Forest Service Road. – The AMC site agreement grants the right to construct, replace and maintain a capacitor site and all the works necessary for its undertaking for the adjacent 500 kV lines. – BC Hydro holds a Road Use Permit (No. 01-8123-00) for the American Creek Forest Service Road.

1 **4.1.4 System Limitations**

2 The ILM Project is being proposed to increase the transmission capability for serving
3 customers in the Lower Mainland and on Vancouver Island. Without an increase in
4 transfer capability, the existing ILM grid will not be adequate for the reliable transfer of
5 Interior generation resources to serve load in the Lower Mainland and on Vancouver
6 Island. According to most scenarios considered by BCTC and BC Hydro, the system will
7 not meet appropriate planning standards by 2014. Failure to increase the transfer
8 capability of the ILM grid when required will increase the unreliability of the system and
9 increase the risk of cascading outages and blackouts. As a result of the growing demand
10 for electricity, firm export commitments, and the need for a reliable and efficient
11 transmission system, the transfer capability of the ILM transmission system requires
12 reinforcement by 2014.

13 Further discussion of the Project purpose and rationale is included in Section 1.4 of the
14 EAC Application.

15 **4.2 Proposed ILM Transmission Line Project**

16 **4.2.1 Project Route**

17 The proposed ILM Project (Circuit 5L83) would be a new 500 kV AC SCST
18 transmission line between NIC and MDN, as shown on Figure 1-1. For most of its
19 approximately 255 km length, 5L83 would parallel Circuit 5L82. When Circuits 5L81
20 and 5L82 were planned, additional ROW width was acquired for portions of the NIC to
21 MDN route, anticipating one or two future additional lines. ROW sections with adequate
22 width to place an additional line include a 63 km section between NIC and the
23 headwaters of Uztlius Creek and a 93 km section between Hicks Creek and MDN. Some
24 new ROW and additional ROW width would need to be acquired for 5L83, particularly
25 within the Fraser Canyon.

26 During determination of the preferred route alignment, the ILM Project corridor was
27 divided into a number of potential segments between NIC and MDN. The 42 potential
28 segments can be identified between 30 nodes labeled A through V. The ILM Project
29 corridor, including all potential route alignment options and nodes considered during the
30 determination of the preferred alignment, is shown on Figure 3-3.

31 Based on the results of technical and environmental studies and consultation with
32 Aboriginal groups and agency and public stakeholders, BCTC identified the “Preferred
33 Alignment” designated in this EAC Application as the ILM Project. The 23 segments
34 which comprise the preferred alignment are outlined in Section 4.2.2 and shown on
35 Figure 1-1 and Figures 4-1. The process by which the “Preferred Alignment” was
36 determined is discussed in the review of alternatives in Section 3.2 of this Application.

1 Widening of Existing ROW

2 Based on the “Preferred Alignment”, several sections along the existing transmission
3 corridor would require widening to accommodate the addition of Circuit 5L83. ROW
4 widening would be necessary to ensure adequate separation between circuits. The total
5 length of sections requiring additional ROW width would be approximately 60 km. It is
6 possible that during detailed design, additional areas requiring ROW widening may be
7 identified. This widening would be required due to difficulties siting towers within the
8 existing ROW due to terrain conditions and the requirement to maintain adequate
9 separation between the new circuit and existing circuits.

10 New ROW

11 Based on the “Preferred Alignment”, there are also several locations where 5L83 would
12 need to be located on new ROW not adjacent to the existing corridor (i.e., the new line
13 would depart from existing ROW and then return). These departures from existing ROW
14 are required due to constraints associated with wildlife resources, geotechnical concerns
15 and natural hazards, and First Nations issues (Section 3.0), as well as a lack of existing
16 ROW in a number of locations between the headwaters of Uztlius Creek and Hicks Lake.
17 The amount of new ROW not adjacent to the existing corridor would be approximately
18 74 km.

19 **4.2.2 Route Segments**

20 The 23 route segments comprising the alignment of the ILM Project are outlined in
21 Table 4-2 and described in further detail below. The Project passes, from east to west,
22 through the Thompson-Nicola Regional District (TNRD), the FVRD, and Metro
23 Vancouver.

1

TABLE 4-2: ILM Project Route Segments

Segment	Name	Length (km)	Alignment	Terrain	
1	[A-B]	NIC Substation – Kingsvale	50.3	Parallel to 5L82	Easy/ Medium Terrain
2	[B-C]	Kingsvale – Uztlius Creek	20.2	Parallel to 5L82	Medium Terrain
3	[C-C1]	Uztlius Creek – 5L82 Structure 44/3	2.2	Parallel to 5L82	Medium Terrain
4	[C1-C2]	5L82 Structure 44/3 – Spius	8.1	New Alignment	Rough Terrain
5	[C2-C3]	Spius – Stoyoma	3.5	New Alignment	Medium Terrain
6	[C3-D]	Stoyoma – North Anderson	6.1	New Alignment	Medium/Rough Terrain
7	[D-E]	North Anderson – East Anderson	4.6	Parallel to 5L41	Medium Terrain
8	[E-F]	East Anderson – South Anderson	2.8	Parallel to 5L41	Medium Terrain
9	[F-F1]	South Anderson – 5L82 Structure 60/6	6.9	Parallel to 5L81/82	Medium/Rough Terrain
10	[F1-G1]	5L82 Structure 60/6 – Spuzzum Creek	5.6	New Alignment	Rough Terrain
11	[G1-H]	Spuzzum Creek – Sawmill Creek	5.6	New Alignment	Medium Terrain
12	[H-J1]	Sawmill Creek – All Hallows Creek	5.9	New Alignment	Medium Terrain
13	[J1 - L]	All Hallows Creek – Emory	13.8	New Alignment	Medium Terrain
14	[L-N]	Emory – Upper Emory	6.5	Parallel to 5L41	Medium Terrain
15	[N-O]	Upper Emory - Ruby Creek	7.4	Parallel to 5L82	Medium Terrain
16	[O-O1]	Ruby Creek - Hicks Lake	9.9	Parallel to 5L82	Medium Terrain
17	[O1-P]	Hicks Lake - Bear Mountain	5.0	Parallel to 5L82	Medium Terrain
18	[P-Q]	Bear Mountain - West Norrish	30.5	Parallel to 5L82	Medium Terrain
19	[Q-R]	West Norrish – Hatzic Prairie	9.8	Parallel to 5L82	Medium/Rough Terrain
20	[R-S]	Hatzic Prairie – Stave Lake	10.7	Parallel to 5L82	Medium Terrain
21	[S-T]	Stave Lake - Pitt Polder	22.6	Parallel to 5L82	Medium Terrain
22	[T-U]	Pitt Polder - Burke Mountain	8.7	Parallel to 5L82	Medium Terrain
23	[U-V]	Burke Mountain – Meridian Substation	8.3	Parallel to 5L82	Medium Terrain

1 Segment 1 A to B Nicola to Kingsvale

2 Segment 1 (Node A to Node B) is located between NIC and the Coldwater River at
3 Kingsvale. The segment is the eastern terminus of the ILM Project. It passes through
4 large ranches within the Agricultural Land Reserve (ALR) and adjacent to the Lower
5 Nicola Indian Band’s Hamilton Creek I.R. #7. The 50 km segment would require some
6 ROW widening to maintain separation from Circuit 5L82. Access to the segment would
7 be entirely from the existing 5L81/82 ROW.

8 Segment 2 B to C Kingsvale to Headwaters of Uztlius Creek

9 Segment 2 (Node B to Node C) is located between the Coldwater River at Kingsvale and
10 the headwaters of Uztlius Creek. The 20 km segment would require new and widened
11 ROW between the Coldwarer River and Maka Creek, as well as of widening along much
12 of the remaining segment. The majority of access to the segment would be from the
13 existing 5L81/82 ROW, with some new access required along the alignment.

14 Segment 3 C to C1 Headwaters of Uztlius Creek to 5L82 Structure 44/3

15 Segment 3 (Node C to Node C1) is located between the headwaters of Uztlius Creek and
16 Circuit 5L82 structure 44/3¹. The 2.2 km segment would require widening over its entire
17 length to maintain separation from Circuit 5L82. Access to the segment would be
18 entirely from the existing 5L81/82 ROW.

19 Segment 4 C1 to C2 5L82 Structure 44/3 to Spius

20 Segment 4 (Node C1 to Node C2) is located between Circuit 5L82 structure 44/3 and
21 Spius Creek. From C1 the alignment traverses west-northwest across the headwater
22 reach of a south-draining tributary of Spius Creek to reach Node C2 in the headwaters of
23 an unnamed stream about three kilometers southeast of Stoyoma Creek. This unnamed
24 stream drains southwest to the Anderson River. The 8.1 km segment is a new route
25 through Crown land and would require new ROW over its entire length. Access to the
26 segment is limited, with helicopter construction likely necessary for much of the route.

27 Segment 5 C2 to C3 Spius to Stoyoma

28 Segment 5 (Node C2 to Node C3) is located in upper reaches of the unnamed stream
29 three kilometers southeast of Stoyoma Creek that drains southwest to the Anderson
30 River. The 3.5 km segment is a new route through Crown land and would require new
31 ROW over its entire length. There is good logging road access to the segment.

¹ Structures or towers along an existing transmission line are numbered according to their location in miles or kilometres from its origin to its terminus (i.e. structure 44/3 indicates the tower is 44 miles west along the line from Nicola Substation). Within each mile or kilometer, structures or towers are numbered in sequential order. Existing Circuits 5L41, 5L81, 5L82 noted in this document are numbered in miles.

1 Segment 6 C3 to D Stoyoma to North Anderson

2 Segment 6 (Node C3 to Node D) is located between the mid reaches of the unnamed
3 stream southwest of Stoyoma Creek and the Anderson River, about 2 kilometers
4 downstream (north) of Uztlius Creek. The 6 km segment would mainly be located on
5 new ROW. Access to the segment would be from the existing 5L41 ROW and existing
6 logging roads, where possible. A portion of the segment may require helicopter
7 construction.

8 Segment 7 D to E North Anderson to East Anderson

9 Segment 7 (Node D to Node E) is located between the lower Anderson River and
10 East Anderson River. The 4.6 km segment would require both new and widened ROW.
11 There is reasonably good access to the segment from existing logging roads, but limited
12 helicopter construction may be necessary in some areas.

13 Segment 8 E to F East Anderson to South Anderson

14 Segment 8 (Node E to Node F) is located between the East Anderson River and the
15 Anderson River between the existing 5L41 and 5L81/82 ROWs. The 2.8 km segment
16 would require new and widened ROW. Access to the entire segment would be from
17 existing ROWs and logging roads.

18 Segment 9 F to F1 South Anderson to 5L82 Structure 60/6

19 Segment 9 (Node F to Node F1) is located between the Anderson River and Circuit 5L82
20 structure 60/6. The 6.9 km segment would require new and widened ROW over its entire
21 length due to separation and topographic requirements. This section also includes a long
22 span to cross the Anderson River near Node F. Access to this segment would be from the
23 existing 5L41 and 5L81/82 ROWs and existing logging roads.

24 Segment 10 F1 to G1 5L82 Structure 60/6 to Spuzzum Creek

25 Segment 10 (Node F1 to Node G) is located between Circuit 5L82 structure 60/6 and
26 Spuzzum Creek. The 5.6 km segment is a new route through Crown land and would
27 require new ROW over its entire length. Helicopter construction would likely be
28 required in most areas, with some new access road construction required from the
29 existing 5L81/82 ROW. This segment includes a long span crossing the Fraser River.

1 Segment 11 G1 to H Spuzzum Creek to Sawmill Creek

2 Segment 11 (Node G1 to Node H) is located between Spuzzum Creek and Sawmill
3 Creek. The 5.6 km segment is a new route through Crown land and would require new
4 ROW over its entire length. No access currently exists along the central part of the
5 segment. There is limited road access at the north and south ends of the segment.

6 Segment 12 H to J1 Sawmill Creek to All Hallows Creek

7 Segment 12 (Node H to Node J1) is located between Sawmill Creek and All Hollows
8 Creek. The 5.9 km segment is a new route through Crown land and would require new
9 ROW over its entire length. New access to the segment would be required from a nearby
10 logging road; otherwise helicopter construction could be used.

11 Segment 13 J1 to L All Hallows Creek to Emory

12 Segment 13 (Node J1 to Node L) is located between Yale Creek and Emory Creek. The
13 13.8 km segment is a new route through Crown land and would require new ROW over
14 its entire length. Much of the northern portion of the segment would be accessed and
15 constructed using helicopter, while existing roads allow access to the southern portion.

16 Segment 14 L to N Emory Creek to Upper Emory

17 Segment 14 (Node L to Node N), a component of the preferred alignment, is located
18 between the middle reaches of Emory Creek and the head of Emory Creek. The 6.5 km
19 segment would require new ROW and ROW widening to accommodate the new circuit.
20 Some access would be from logging roads, with helicopter construction likely necessary
21 in some areas.

22 Segment 15 N to O Upper Emory to Ruby Creek

23 Segment 15 (Node N to Node O) is located between the head of Emory Creek and the
24 confluence of Ruby Creek with Emory Creek. The 7.4 km segment would require ROW
25 widening on the north side of circuit 5L82 over its entire length to accommodate the new
26 circuit. Access to the entire segment would be from the adjacent 5L41 and 5L81/82
27 ROWs.

28 Segment 16 O to O1 Ruby Creek to Hicks Creek

29 Segment 16 (Node O to Node O1) is located between Ruby Creek and Hicks Creek.
30 This segment passes adjacent to, but not through, Sasquatch Provincial Park. The 9.9 km
31 segment would require widening on the north side of Circuit 5L82 over its entire length

1 to accommodate the new circuit. The majority of access to the segment would be from
2 the existing 5L82 ROW, with helicopter construction likely required in some areas. BC
3 Hydro owns a 20 ha parcel of land for a future capacitor Station within this segment near
4 Ruby Creek, located between the existing lines at the boundary of Sasquatch Provincial
5 Park.

6 Segment 17 O1 to P Hicks Creek to Bear Mountain

7 Segment 17 (Node O1 to Node P) is located between Hicks Creek and Bear Mountain.
8 Node P of this segment is in the vicinity of Seabird Island I.R., but does not go through it.
9 Sufficient ROW exists along the entire 5 km segment for construction of the new circuit,
10 except for a small portion of Crown land near Structure 96/5, which would require ROW
11 widening. The majority of access to the segment would be from the 5L82 ROW, with
12 helicopter construction required on Bear Mountain.

13 Segment 18 P to Q Bear Mountain to West Norrish

14 Segment 18 (Node P to Node Q) is located between Bear Mountain and West Norrish
15 Creek. The segment runs parallel to the boundary of Chehalis I.R. #5, but not in it.
16 Sufficient ROW exists along the majority of the 30.4 km segment; however, ROW
17 widening would be required at the Harrison River crossing. Access to this segment
18 would generally be from the existing 5L82 ROW, with some tower sites accessed by
19 helicopter.

20 Segment 19 Q to R West Norrish to Hatzic Prairie

21 Segment 19 (Node Q to Node R) is located between West Norrish Creek and
22 Hatzic Prairie. The 9.8 km segment would require new and widened ROW over its
23 length. The route generally parallels 5L82. A seven tower portion of 5L82, between
24 towers 119/2 and 120/4 would be relocated slightly to the south to allow 5L83 to take
25 advantage of the geotechnical advantages of the existing ROW. Access to the segment
26 would be from the existing 5L82 ROW, with helicopter construction required in some
27 areas.

28 Segment 20 R to S Hatzic Prairie to Stave

29 Segment 20 (Node R to Node S) is located between Hatzic Prairie and Stave Falls. No
30 additional ROW or ROW widening would be required, with sufficient ROW existing on
31 the north side of Circuit 5L82 over the entire 10.7 km length of the segment. Access to
32 the segment would be entirely from the 5L82 ROW.

1 Segment 21 S to T Stave to Pitt Polder

2 Segment 21 (Node S to Node T) is located between Stave Falls and Pitt Polder.
3 The segment passes through Crown land, private land, large farms, Golden Ears
4 Provincial Park, and the University of British Columbia (UBC) Research Forest, and also
5 lies adjacent to Rolley Lake Provincial Park. ROW widening may be required at some
6 sites; however, sufficient ROW generally exists on the north side of Circuit 5L82 over
7 the 22.6 km length of the segment. Access to the segment would be entirely from the
8 existing 5L82 ROW.

9 Segment 22 T to U Pitt Polder to Burke

10 Segment 22 (Node T to Node U) is located between Pitt Polder and the east side of
11 Burke Mountain. The segment passes through Crown land, private land, large farms, and
12 Burke Mountain Provincial Park. Sufficient ROW exists over the majority of the 8.7 km
13 segment; some widening may be required. Access to the segment would be entirely from
14 the existing 5L82 ROW

15 Segment 23 U to V Burke to Meridian

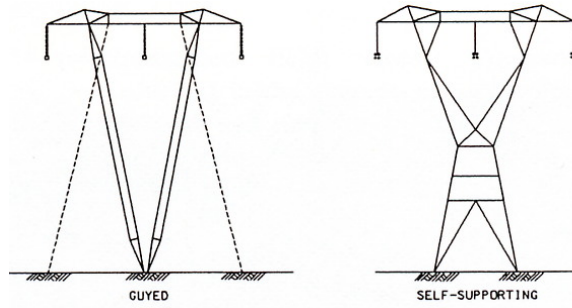
16 Segment 23 (Node U to Node V) is located between the East Side of Burke Mountain and
17 MDN. The segment is the western terminus of the ILM Project. It passes through Crown
18 land, private land, and Burke Mountain Provincial Park. No additional ROW or ROW
19 widening would be required, as sufficient ROW exists over the entire 8.3 km length of
20 the segment to accommodate the new circuit. Access to the segment would be entirely
21 from the existing 5L82 ROW.

22 **4.2.3 Structure Design and Layout**

23 All existing 500 kV circuits in BC use a flat conductor configuration. However,
24 preliminary tower designs for 5L83 include both flat and delta configurations. The flat
25 configuration is the same as the existing 5L81 and 5L82 circuits. The delta configuration
26 has a narrower profile and would reduce the amount of clearing and additional ROW
27 width required. It also has slightly better power transfer capability over the flat
28 configuration and lower EMF levels. Schematic figures of flat and delta configuration
29 towers are provided below.

1

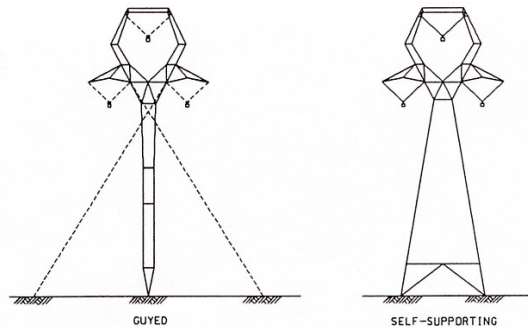
Flat Configuration for 500 kV Single Circuit Lattice Steel Tower



2

3

Delta Configuration for 500 kV Single Circuit Lattice Steel Tower



4

5 BCTC is proposing to use flat structures for Segments A through E1 and O through R.
6 Flat structures are proposed for Segments A through C1 to be consistent with existing
7 tower geometries in the range lands, where there is adequate existing ROW for the
8 majority of the segments and where clearing requirements are minimal. Flat structures
9 are proposed for Segments C1 to C3 and O through R to address potential heavy icing
10 conditions. Delta structures are proposed for the remaining segments to reduce ROW and
11 clearing requirements.

12 Suggested tower geometries for the ILM Project by route segment are shown in
13 Table 4-3.

1 **TABLE 4-3: Suggested Tower Geometries by Route Segment**

Segment	Predominant Tower Geometry ²	Rationale
1 A – B	Flat	Available ROW Consistent with existing tower geometries
2 B – C	Delta	Reduced clearing widths and smaller new ROW requirement
3 C – C1	Delta	Reduced clearing widths and smaller ROW widening requirement
4 C1 – C2	Flat	Proven mechanical performance in very heavy icing area
5 C2 – C3	Delta	Reduced clearing widths and smaller new ROW requirement
6 C3 – D	Delta	Reduced clearing width and smaller new ROW requirement
7 D – E	Delta	Reduced clearing widths and smaller new ROW requirement
8 E – F	Delta	Reduced clearing widths and smaller new ROW requirement
9 F – F1	Delta	Reduced clearing widths and smaller new ROW requirement
10 F1 – G1	Delta	Reduced clearing widths and smaller new ROW requirement
11 G1 – H	Delta	Reduced clearing widths and smaller new ROW requirement
12 H – J1	Delta	Reduced clearing widths and smaller new ROW requirement
13 J1 – L	Delta	Reduced clearing widths and smaller new ROW requirement
14 L – N	Delta	Reduced clearing widths and smaller new ROW requirement
15 N – O	Delta	Reduced clearing widths and smaller new ROW requirement
16 O – O1	Flat	Mechanical performance better suited for greater tower loads in this segment.
17 O1 – P	Flat	Mechanical performance better suited for greater tower loads in this segment.
18 P – Q	Flat	Mechanical performance better suited for greater tower loads in this segment.
19 Q – R	Flat	Proven mechanical performance in very heavy icing area
20 R – S	Delta	Reduced clearing width
21 S – T	Delta	Reduced clearing width
22 T – U	Delta	Reduced clearing width
23 U – V	Delta	Reduced clearing width

² The tower geometry indicated for each segment is the predominate type for that section. Engineering considerations at each tower location will dictate the type of structure used at that particular site. For example, where large spans exist, flat towers or special single mast towers may be used in a segment where delta towers are principally used.

1 Typical clearing width diagrams for both delta and flat configuration towers are provided
2 in Appendix X. Where delta configuration towers would be used adjacent to existing Flat
3 towers, approximately 35 m of permanent ROW clearing would be required, with a one
4 time clearing of an additional 0 to 39 m, or more, for the falling tree zone depending on
5 the heights of the trees adjacent to the lines as well as the slope of the terrain (total
6 clearing of 35 to 74 m). Where a flat tower would be used adjacent to an existing flat
7 tower, approximately 51 m of permanent ROW clearing would be required, with a one
8 time clearing of an additional 0 to 37 m, or more, for the falling tree zone (total clearing
9 of 51 to 88 m). New ROW areas with delta configuration towers would require
10 approximately 25 m of permanent clearing and a one time clearing of 0 to 39 m for the
11 falling tree zone on each side of the tower centerline (total clearing of 50 to 128 m). New
12 ROW areas with flat towers would require approximately 33 m of permanent clearing
13 and a one time clearing of 0 to 37 m for the falling tree zone on each side of the tower
14 centerline (total clearing of 66 to 140 m). The precise amount of forest removal for
15 ROW clearing at select locations would depend on several factors including: the nature
16 and amount of current vegetation on the landscape (*i.e.*, clearcuts, rocky outcrops and
17 other areas would not require high levels of tree removal), tree distribution (*i.e.*, densely
18 clumped second growth and older forests will require high amounts of tree removal),
19 slope, gradient, tower configuration and whether or not the ROW is adjacent to existing
20 maintained ROW.

21 Based on the preliminary layout, a total of approximately 684 transmission structures
22 would be required for the ILM Project: 372 delta structures and 312 flat structures.
23 Table 4-4 shows the approximate number of delta and flat structures within each segment
24 of the Project as well as the location of any long spans (those estimated at >800 m from
25 tower to tower). The final location of towers and span lengths would be determined
26 during the detailed design phase of the Project.

27 Tower heights are calculated to maintain a sufficient electrical clearance between the
28 conductors and the ground at the lowest sag point along the span length for the
29 undercrossing conditions. Towers height and span distances are adjusted to maintain
30 minimum ground clearances due to slope and terrain considerations. Span lengths vary
31 due to a number of local conditions. A typical span is in the range of 400 m to 600 m
32 long; however, towers can be located as little as 100 m apart, and in extreme cases, such
33 as long water crossings, can be situated as far apart as 1500 m or more. Specially
34 designed single phase towers would be required at certain locations, such as the Fraser
35 River crossing, Harrison River crossing, and Pitt River crossing to facilitate very long
36 spans. Conductors must also maintain sufficient height above navigable watercourses to
37 facilitate passage of boats and other vessels. Long spans required for the Project are
38 indicated in Table 4-4.

1 **TABLE 4-4: Tower and Span Information by Route Segment**

	Segment	No. of Delta Towers	No. of Flat Towers	Long Spans (if present)
1	A-B	-	128	Coldwater River
2	B-C	45	-	
3	C-C1	8	-	
4	C1-C2	-	29	
5	C2-C3	-	13	
6	C3-D	17	-	
7	D-E	14	-	
8	E-F	11	-	
9	F-F1	19	-	Anderson River
10	F1-G1	13	-	Fraser River
11	G1-H	16	-	
12	H-J1	15	-	
13	J1-L	44	-	
14	L-N	17	-	
15	N-O	16	-	
16	O-O1	-	27	
17	O1-P	-	13	
18	P-Q	-	75	Harrison River
19	Q-R	-	27	
20	R-S	30	-	
21	S-T	60	-	
22	T-U	20	-	
23	U-V	27	-	

2 **4.2.4 Property Requirements**

3 Tables 4-5 and 4-6, respectively, identify the Crown and private land property
 4 requirements for each segment of the ILM Project based on the preliminary design layout
 5 and the proposed tower structures in Table 4-3 which take into account terrain,
 6 geotechnical, environmental and First Nations considerations. Tables 4-5 and 4-6
 7 identify both the SRW and temporary land use requirements for the Project. Temporary
 8 clearing areas are based on a worst case scenario of 78 m from the alignment centreline.

1 **TABLE 4-5: ILM Project Crown Land Requirements by Segment**

	Segment	Segment Length (km)	New ROW over Crown Land		ROW Widening over Crown Land			Total Number of Crown Parcels	
			SRW Length (km)	Area (ha)		SRW Length (km)	Area (ha)		
				SRW	Temporary		SRW		Temporary
1	A – B	50.3	0.5	5.4	3	1.4	2.7	86.6	14
2	B – C	20.2	9.1	53.4	87	3.7	16.5	36.3	2
3	C – C1	2.2	0	0	0	2.2	14.9	10.9	1
4	C1 – C2	8.1	7.9	55.3	67.4	0	0	0	
5	C2 – C3	3.5	3.5	17.7	36.8	0	0	0	
6	C3 – D	6.1	6.1	35.7	58.8	0	0	0	1
7	D – E	4.6	4.6	25.6	37	0	0	0	1
8	E – F	2.8	1.9	10	18.2	0.9	4.4	4.1	3
9	F – F1	6.9	4.2	27.6	45.8	2.5	10.9	13.3	1
10	F1 – G1	5.6	4.7	49.7	32.1	0	0	0	12
11	G1-H	5.6	5.5	27.4	58.7	0	0	0	4
12	H – J1	5.9	5.4	36.9	47	0	0	0	4
13	J1 – L	13.8	13.7	92.2	126.2	0	0	0	3
14	L – N	6.5	5.3	33.6	46.3	0	0	0	3
15	N – O	7.4	0	0	0	7.4	36.3	29.1	5
16	O – O1	9.9	0	0	0	9.8	89.3	12	3
17	O1 – P	5.0	0	0	0	1.56	3.2	2.5	16
18	P – Q	30.5	0	0	0	13.3	52.6	90.1	52
19	Q – R	9.8	0	0	0	5.8	19.4	31.3	10
20	R – S	10.7	0	0	0	0	0	91.6	16
21	S – T	22.6	0	0	0	0	0	49.4	26
22	T – U	8.7	0	0	0	0	0	5.5	6
23	U – V	8.3	0	0	0	0	0	35.2	13
24	TOTAL	255.0	72.4	470.5	664.3	48.56	250.2	497.9	196

1 **TABLE 4-6: ILM Project Private Land Requirements by Segment**

Segment	Segment Length (km)	New ROW over Private Land				ROW Widening over Private Land					
		Length (km)	Area (ha)		Number of Parcels	Length (km)		Area (ha)		Number of Parcels	
			SRW	Temporary		SRW	Temporary	SRW	Temporary	SRW	Temporary
1 A – B	50.3	0.5	3.1	2.4	2	8.6	23.6	20.3	86.4	12	21
2 B – C	20.2	0	0	0	0	0	0	0	0	0	0
3 C – C1	2.2	0	0	0	0	0	0	0	0	0	0
4 C1 – C2	8.1	0	0	0	0	0	0	0	0	0	0
5 C2 – C3	3.5	0	0	0	0	0	0	0	0	0	0
6 C3 – D	6.1	0	0	0	0	0	0	0	0	0	0
7 D – E	4.6	0	0	0	0	0	0	0	0	0	0
8 E – F	2.8	0	0	0	0	0	0	0	0	0	0
9 F – F1	6.9	0	0	0	0	0	0	0	0	0	0
10 F1 – G1	5.6	0	0	0	0	0	0	0	0	0	0
11 G1-H	5.6	0	0	0	0	0	0	0	0	0	0
12 H – J1	5.9	0	0	0	0	0	0	0	0	0	0
13 J1 – L	13.8	0	0	0	0	0	0	0	0	0	0
14 L – N	6.5	0	0	0	0	0	0	0	0	0	0
15 N – O	7.4	0	0	0	0	0	0	0	0	0	0
16 O – O1	9.9	0	0	0	0	0	0	0	0	0	0
17 O1 – P	5.0	0	0	0	0	0.06	1	0.08	2.9	1	3
18 P – Q	30.5	0.8	6.9	4.3	1	2.3	2	21.5	7.7	5	8
19 Q – R	9.8	0	0	0	0	0	0.8	0	2.9	0	8
20 R – S	10.7	0	0	0	0	0	6.2	0	23	0	20
21 S – T	22.6	0	0	0	0	0	0	0	39.7	0	38
22 T – U	8.7	0	0	0	0	0	0	0	30.2	0	10
23 U – V	8.3	0	0	0	0	0	0	0	0	0	0
24 TOTAL	255.0	1.3	10	6.7	3	10.96	33.6	41.88	192.8	18	108

2

1 **4.2.5 Access Requirements**

2 Existing Forest service roads, public roads and private roads would be used to access the
 3 ROW along the Project corridor during the construction and operation/maintenance
 4 phases. Helicopter access would also be used within some segments due to access
 5 restrictions, terrain constraints and to minimize potential effects to environmental
 6 resources. Major roads used to access the Project corridor are provided in Table 4-7 and
 7 shown on Figure 4-1 and/or on Figures provided in Appendix M. Figure 4-1 shows the
 8 majority of new and existing roads that would be used to access segments along the
 9 Project corridor. However, additional spur roads may be required from these road
 10 locations to access individual tower locations within the ROW. General construction
 11 methodology and standards for road construction required for the Project are discussed in
 12 Section 4.3.1.

13 **TABLE 4-7: Major Access Roads Proposed for the ILM Project**

Map Label	Name	Comment	Speed Limit (km/h)	Segment(s)
1	Douglas Lake Road	Paved	50	A – B
2	Pennask Lake Road	Gravel	50	A – B
3	Lundbom Lake Road	Gravel	20	A – B
4	Iron Mountain Road	Gravel	30	A – B
5	Comstock Road	Gravel	25	A – B
6	Gwen Lake Logging Road	Gravel	20	A – B
7	Kane Valley Road	Gravel	30	A – B
8	Figlinski Road	Gravel	20	A – B
9	Salem Creek Logging Road	Gravel	30	A – B
10	Coldwater Road	Paved	80	A – B, B – C
11	Panchett – Spius FSR	Gravel	50 / 30	B – C
12	Maka – Murray FSR	Gravel	45	B – C
13	Dewdney FSR	Gravel	30	B – C, C – C1
14	Dean Fire Road	Gravel	25	B – C, C – C1
15	Uztlius FSR	Gravel	30	C – C1, C1 – C2, C3 – D, D – E
16	East Anderson FSR	Gravel	40 / 30	C2 – C3, C3 – D
17	Cattermole Timber, Anderson River Mainline	---	---	F – F1, F1 – G1
18	Gilt Creek Branch	Gravel	20	E – F, F – F1
19	Sawmill Creek Road	Gravel	20	H – J1

	Map Label	Name	Comment	Speed Limit (km/h)	Segment(s)
20	20	Albert Street	Gravel / Private	20	H – J1
21	21	North Emory FSR	Gravel	20	J1 – L
22	22	Nickel Mine Road	Gravel	20	J 1 – L, L – N
23	23	American FSR	Gravel	25	L – N, N – O
24	24	Garnet Creek FSR	Gravel	25	N – O
25	25	Ruby – Lougheed FSR	Gravel	25	O – 1
26	25a	Unnamed Track	Gravel	20	O – O1
27	26	Wahleach Road	Paved	50	O – O1, O1 – P
28	27	Kamp Road	Private	---	O – O1, O1 – P
29	28	Sea Bird Island Road	Paved	50	O – O1, O1 – P
30	29	Chaplin Road	Paved	50	P – Q
31	30	Unnamed Track	Gravel	---	P – Q
32	31	McPherson Road	Private	---	P – Q
33	32	Unnamed Track	Dirt	---	P – Q
34	33	Rockwell Drive	Paved	50	P – Q
35	34	Mount Woodside FSR	Gravel	20	P – Q
36	35	Morris Valley Road	Paved	60	P – Q
37	36	Chehalis Landing	Gravel	20	P – Q
38	37	Hemlock Valley Road	Gravel	40	P – Q
39	38	Unnamed Road	Gravel	20	P – Q
40	39	Chehalis FSR	Gravel	---	P – Q
41	40	Hawkins Pickle Road	Paved	50	P – Q
42	41	Norrish FSR	Gravel	30 / 20 / 10	P – Q, Q – R
43	42	Sylvester Road	Paved	60	Q – R, R – S
44	43	Ridgeview Road	Gravel	20	Q – R
45	44	Stave Lake Road	Paved	50	R – S
46	45	Robson Road	Private / Paved	50	R – S
47	46	Cardinal Street	Private / Paved	50	R – S
48	47	Sabo Road	Paved	50	R – S
49	48	Ainsworth Road	Paved	50	R – S
50	49	Smith Avenue	Gravel	30	R – S
51	51	Hoover Lake Road	Gravel	30	R – S
52	52	Lower Hoover Road	Gravel	30	R – S, S – T
53	53	Dewdney Trunk Road	Paved	60	S – T
54	54	Florence Lake FSR	Gravel	50	S – T

Map Label	Name	Comment	Speed Limit (km/h)	Segment(s)
55	Pilgrim Street	Paved	60	S – T
56	Bell Street	Paved	60	S – T
57	Cathy Crescent	Paved	50	S – T
58	BCIT WL0007	Gravel	30	S – T
59	McNutt Road	Paved	50	S – T
60	Blue Mountain FSR	Gravel	30	S – T
61	256 th Street	Paved	60	S – T
62	Alouette Road	Paved	50	S – T
63	Fern Crescent	Paved	60	S – T
64	Silver Valley Road	Paved	60	S – T
65	232 nd Street	Paved	60	S – T
66	Mark Road	Paved	60	S – T
67	Unnamed Road	Gravel / Dirt	30	T – U
68	Unnamed Road	Gravel	50	T – U
69	Neaves Road	Paved	50	T – U
70	Quarry Road	Paved	50	T – U
71	Victoria Drive	Paved	50	T – U
72	Coast Meridian Road	Paved	50	U – V
73	Harper Road	Paved	50	U – V
74	Pipeline Road	Gravel	50	U – V
75	Plateau Boulevard	Paved	50	U – V
76	Eagle Mountain Road	Paved	50	U – V
77	Johnson Street	Paved	---	U – V

1 Where bridges or culverts are required for access roads, they would be constructed in
 2 accordance with requirements and guidelines specified by DFO and Transport Canada
 3 including DFO’s Operational Statement for Clearspan Bridges. Typical drawings of
 4 bridges to be constructed for the Project are provided in Appendix U.

5 Helicopter construction would also be used in several locations along the Project
 6 corridor, particularly where existing access is non-existent or difficult to use or upgrade,
 7 or due to terrain or environmental constraints. Areas of the ILM Project corridor where
 8 helicopter construction is likely to be used include:

- 9 • Segment C1-C3 – at higher altitudes to the north of Uztlus Creek where terrain is
 10 very rugged;

- 1 • Segments F1-G1 – in previously unlogged areas where terrain is rugged and
2 geotechnical concerns prohibit land access;
- 3 • Segment L-N - at the higher elevations between Emory and American creeks
4 where only a small number of towers are located and the cost to extend existing
5 roads is comparatively high compared to helicopter construction;
- 6 • Segment N-O – at selected sites where terrain prevents easy access from the
7 ground;
- 8 • Segment O1-P – Parallel to existing circuits where no access exists along the
9 ROW;
- 10 • Segment P-Q – At some tower locations to the west of the Harrison River where
11 the new circuit would parallel the existing 5L82 circuit climbing the mountain
12 where no access along the ROW exists;
- 13 • Segment Q-R – At selected, difficult to access sites; and,
- 14 • Segment S-T – At the western edge of the segment, descending to Sturgeon
15 Slough where the steep hillside angles make road access impossible.

16 **4.2.6 Project Components**

17 Specific components of the ILM Project include:

- 18 1. Approximately 255 km of new single circuit 500 kV transmission line;
- 19 2. A new 500 kV series capacitor station located at Ruby Creek near Node O. This
20 station would be located about one-third of the line distance east from MDN. A
21 series capacitor station at the mid-point of the transmission circuit would improve
22 the voltage grading between each transmission terminal and the series capacitor
23 station. This would lead to a more uniform distribution of voltages along the
24 length of the transmission circuit. By deviating from the mid-point, the voltage
25 profile will not be as uniform. However, this is not expected to be a crucial issue
26 due to existing state of the art protection equipment. RYC is expected to maintain
27 a reasonable voltage profile across 5L83.
- 28 3. 500 kV single circuit terminations at NIC and MDN, including line termination
29 structures, circuit breakers, and associated equipment; all within the existing
30 substation fences.

1 Relocation of an approximately 3 km section of the existing 5L82 transmission line
2 (7 towers) would also be required between Nodes Q-R to accommodate the new line.
3 The relocation would occur within the existing ROW; the existing towers would be
4 relocated approximately 100 m to the south and minimal additional clearing would be
5 required (see Figure 4-1 [27 of 32]).

6 Components of the ILM Project are described in further detail below.

7 Transmission Line Components

8 The base conductors for the ILM Project would be steel reinforced aluminum conductors.
9 Final conductor specification would be made during the detailed design phase of the
10 Project.

11 Proposed transmission tower configurations are described in Section 4.2.3 above.

12 Ruby Creek Series Capacitor Station (RYC)

13 A new 2727 amp, 892 MVAR series capacitor bank would be required for circuit 5L83.
14 Based on reliability, technical feasibility, and environmental, property, stakeholder and
15 Aboriginal considerations, the preferred location for the capacitor station is at Ruby
16 Creek near Node O. Alternative capacitor station locations are discussed in Section 3.0
17 in conjunction with alternative route alignments.

18 The new RYC capacitor station would be constructed on BC Hydro owned property
19 located in the Harrison Lake area near Node O. The property is 42.67 ha of vacant land,
20 requiring road access, service supply and other features. A ROW approximately 0.5 km
21 long would be required from the 5L83 ROW to the site. It should be noted that only the
22 minimum area required for the series capacitor station and for circuit access would be
23 disturbed. The remaining property would be left in its present state.

24 Station service supply would need to be established via a distribution feeder from a local
25 area substation for the 5L83 series capacitor bank. Access is available to the site from
26 the Ruby-Lougheed FSR. However, extensive grading and some gravel would be
27 required to repair the surface for regular access for maintenance and operations. The site
28 would require a new digital microwave radio communication system, including a new
29 tower for a microwave antenna.

1 Nicola Substation (NIC) Termination

2 The new termination at NIC would require a new circuit breaker, shunt reactor and
3 associated equipment to create a new line position. Due to the physical configuration of
4 NIC, 5L83 would be connected to the existing 5L82 terminal and 5L82 would be
5 transferred to the new line position. This would match the termination position of the
6 lines at NIC to the arrangement of the transmission lines approaching the substation.

7 All line termination works at NIC would be undertaken within the existing substation
8 boundaries.

9 Meridian Substation (MDN) Termination

10 The Lower Mainland end of the ILM Project would be terminated at MDN. Circuit 5L82
11 would be re-terminated in a new line termination bay to remove a circuit crossing that
12 would reduce overall system security. To accomplish this, a new circuit bay would be
13 built to which existing circuit 5L82 will be relocated. Circuit 5L83 would be terminated
14 into the former 5L82 position.

15 All line termination works at MDN would be undertaken within the existing substation
16 boundaries.

17 **4.2.7 Other System Requirements**

18 Telecommunications requirements would be met by providing Supervisory Control and
19 Data Acquisition (SCADA) and data channels from the series capacitor station to Energy
20 Management Systems at the System Control Centre, as well as dial-up phone access for
21 the Sequence of Events Recorder, Digital Fault Recorder and protection relays.

22 Capacitor station communications equipment would include a communication tower,
23 antenna, a Class 1 digital microwave radio, Synchronous Optical Network, plus other
24 associated equipment. A separate repeater station would also be required to obtain line-
25 of-sight communications to an existing station.

26 **4.2.8 Potential Constraints**

27 The following section describes constraints or challenges along the existing lines within
28 the Project corridor (5L41, 5L81 and 5L82) which could potentially have implications for
29 the engineering, design, and/or implementation of the Project. Further discussion of
30 constraints or challenges along portions of existing lines that are located within the
31 Project corridor are discussed in Chapter 6.0, as well as in the corresponding discipline-
32 specific technical reports included as appendices to the Application. The Project has
33 been designed to avoid or mitigate for constrained areas or challenges present along the
34 existing lines.

1 Terrestrial Wildlife and Vegetation

2 The spread of invasive plants at tower locations and along linear features such as the
3 ROW and spur access roads has been well documented, especially within the grasslands
4 at the east end of 5L81 and 5L82 and in the Fraser Valley area at the west end of 5L82.
5 Knapweed is a problem species at the east end of the corridor, whereas scotch broom and
6 Himalayan blackberry are problem species at the west end of the corridor. Mitigation
7 measures proposed to minimize potential effects of the Project on the introduction and
8 proliferation of invasive plants are discussed in Section 6.2 (Terrestrial Wildlife and
9 Vegetation), Section 6.7 (Agricultural Land and Resource Use), and Section 6.1
10 (Fisheries and Aquatic Habitat). These measures would be incorporated into the
11 Environmental Management Program for the Project which is outlined in Chapter 11.0.

12 Limited information is available on wildlife encounters along the existing transmission
13 lines. BC Hydro records indicate that power outages have occurred along the lines due to
14 great blue herons, but it is unknown whether these were due to collisions, electrocutions
15 or excrement falling on the lines.

16 Geotechnical and Natural Hazard Conditions

17 There are a number of geological or geotechnical constraints along the existing
18 transmission lines that could affect the location and/or design of a new line³. These
19 constraints and their locations are outlined below (Table 4-8).

³ Constrained areas identified in Table 4-8 include those along the preferred alignment as well as those along route alignment options considered during the route alignment determination process (see Section 3.2).

TABLE 4-8: Geological and Geotechnical Constraints along the Existing NIC to MDN Transmission Lines

Constraint	Location	Description
1 2 3 4 5 6 Rock fall	Node B1	Rock fall hazard immediately west of Node B1 to about 5L82 structure 33/4 would necessitate a location upslope and north of the existing lines.
2	Node C	West of Node C, rock fall hazards exist above and between 5L82 structures 47/2 and 47/3.
3	Segment H-J	Locally there are rock fall hazards. One 5L41 structure along this segment suffered major structural damage in the past.
4	Segment I-J	Locally on the steep, rocky slopes near Siwash Creek there is potential for rock fall damage.
5	Segment K-L	Locally there may be rock fall hazard along Emory Creek near Node K.
6	Segment L-N	There is a history of rock fall concerns along this segment.
7 8 9 10 11 12 13 14 15 Shallow landslide hazards (debris flows/debris avalanches):	Node B2	East of Node B2, existing debris avalanche activity on escarpments along Maka Creek would require locating the new line a short distance downstream and north of the existing line.
8	Node C	West of Node C, along the south side of Uztlius Creek between 5L82 structures 48/1 and 52/3, there are a number of sites that may be vulnerable to shallow landslides and possibly larger rotational-translational landslides.
9	Node D	Between Node D and Uztlius Creek along 5L41, there are a number of sites that may be vulnerable to shallow landslides and possibly larger rotational-translational landslides.
10	Segment I-J	On the east side of the Fraser River between 5L82 structures 69/1 and 70/1, there is a history of frequent large debris flows, some associated with upslope rock avalanche activity.
11	Nodes G-J, K-M	Along 5L41, 5L81 and 5L82, there are a number of crossings of the gorges of deeply incised tributaries to the Fraser River. Past ROW clearing, logging and road construction has increased landslide activity along the steep sides of these gorges. Locally, these segments also cross steep gullies that have been subject to periodic debris flow activity.
12	Segment K-L	Debris flows and debris avalanches from natural sources and old, unstable logging roads exist above the alignment.
13	Segment N-O	Between Garnet Creek and Node O, the alignment crosses several gullies and the gorge of Ruby Creek that may be subject to periodic debris avalanches or debris flows.
14	Node O1	Between Node O1 to 5L82 structure 97/3, structures on colluvial fans adjacent to floodplain areas are vulnerable to natural debris flow activity.
15	Segments P-Q and Q-R	In the Norrish and Cascade Creek drainages, there are several areas where debris flows and debris avalanches from natural sources, forest harvesting activities and old, unstable, upslope logging roads have damaged and may continue to damage existing 5L82 transmission structures.

	Constraint	Location	Description
16	Snow avalanches	Segment K-L	Several 5L41 transmission structures along this segment are located at or near the base of gullies or on or near colluvial fans subject to periodic snow avalanches.
17		Segment M-N	The slope immediately above 5L82 structure 84/4 is subject to snow avalanches. 5L81 structure 82/2 is located immediately below the base of a wide snow avalanche track.
18		Segment P-Q	The logged slopes just east of 5L82 structure 113/3 may pose some snow avalanche hazard. This hazard should become less as the plantation matures.
19		Segment Q-R	5L82 structure 119/4 may be vulnerable to snow avalanches travelling on existing debris avalanche tracks.
20	Existing or potential large-scale, bedrock landslides or rock avalanches associated with regional faults or other distinct lineaments	Segment E-F	There is a dormant or relict bedrock landslide on the slopes above and east of 5L81 structures 56/4 to 57/2.
21		Node I	Immediately east of Node I, relocation upslope and to the west of the existing line would avoid an area of potential/existing deep bedrock instability.
22		Node I	West of Node I, between 5L82 structures 69/1 and 70/2, there may be potential for large rock avalanches.
23		Segments G-J	West of Yale and north of Gordon Creek, there is large, relict rock avalanche feature.
24		Node M	There may be some potential for the design seismic event to trigger rock fall or mass movement on the steep slope southwest of and above Node M. This slope is directly west of the Hope Fault and immediately north of the large rock avalanche that created Schkam Lake. It is possible that the same bedrock conditions associated with the Schkam Lake landslide extend onto this slope.
25	Segment N-O	One or two slopes along this segment south of Garnet Creek have been subject to rock avalanches in the past. There is also a dormant/relict bedrock landslide a short distance north of Node N.	
26	Weak and compressible soils	Node O1	Between Node O1 to 5L82 structure 97/3, a short section of floodplain soils constitutes an area of weak and compressible soils.
27		Segments P-Q and Q-R	Organic and floodplain soils exist near 5L82 structure 100/1, and between structures 100/4 and 101/4. Weak and/or compressible soils may be present.
28		Segment R-S	The lower slopes of the Cascade Creek fan may be vulnerable to liquefaction during a design seismic event.
29		Node T	Between Node T and 5L82 structure 146/5, the floodplain of the Pitt River constitutes an area of weak and compressible soils.
30	Space Constraints	Node I	West of Node I, near 5L82 structure 68/2, space constraints above/along steep bedrock slopes would require a location away from the existing line.

1 Contamination

2 Substation and capacitor station facilities contain a variety of oil-filled equipment
3 necessary for station operations, including reactors and transformers. The original
4 capacitors at CHP were known to contain Polychlorinated Biphenyls (PCBs) during the
5 1970s; however, these capacitors were switched out of service in the 1980s and removed
6 from the site in 1994. Station facilities are also equipped with battery banks for station
7 operations and Aboveground Storage Tanks (ASTs) for emergency power generation.
8 Small spills are known to occur regularly from this equipment, which are cleaned up in
9 accordance with site-specific BC Hydro spill response plans. Large spills occurred at
10 NIC in 1979 and approximately 15 years ago on the southern portion of MDN.
11 Following implementation of spill response and clean-up procedures, both spills were the
12 subject of detailed environmental investigations that indicated no exceedences of industry
13 standards in soil and/or groundwater. Further detail on these spills is provided in
14 Appendix L.

15 Hydrological or Drainage Conditions

16 The catchment area located immediately north of MDN along the west side of the
17 Coquitlam River includes urban development, the existing cleared 5L82 ROW, several
18 aggregate mining operations and some forest covered land. Under the existing
19 conditions, runoff from the upland portion of this catchment crosses the aggregate mining
20 properties prior to flowing into the Coquitlam River. This results in increased suspended
21 sediments and turbidity in the Coquitlam River. Various mitigative strategies have been
22 employed by the aggregate producers to minimize these impacts and these measures have
23 met with varying degrees of success.

24 **4.3 Construction Activities, Plan and Schedule**

25 **4.3.1 Project Activities**

26 Major components and activities during construction of the ILM Project, listed roughly in
27 the order they would occur, would include:

- 28 • Surveying and siting activities;
- 29 • Construction of or improvements to access roads along the ILM Project corridor;
- 30 • Construction of or improvements to watercourse crossings along the ILM Project
31 corridor;
- 32 • Right-of-way clearing and preparation;
- 33 • Foundation construction, including site preparation;
- 34 • Concrete production and placement;
- 35 • Assembly and placement of overhead structures;

- 1 • Stringing of conductors;
- 2 • NIC and MDN substation improvements;
- 3 • RYC capacitor station construction;
- 4 • Management of construction waste;
- 5 • Right-of-way restoration;
- 6 • Deactivation of temporary access routes;
- 7 • Construction equipment servicing; and,
- 8 • Testing and commissioning.

9 Activities anticipated during construction of the ILM Project are described below.
10 Vehicle traffic to move workers to and from construction sites would be associated with
11 the majority of the activities listed above and is also discussed below.

12 Surveying and Siting operations

13 Surveying and siting operations would involve three general activities: the determination
14 of control points along the Project alignment, the surveying and marking of the centre-
15 line along the Project alignment, and the surveying and staking of towers. The control
16 survey would be conducted by a crew of surveyors, pinpointing the Global Positioning
17 System (GPS) positions of control stations and/or points of intersection along the
18 alignment. The centre-line survey would generally be done using airborne Light
19 Detection and Ranging (LiDAR), wherever possible, and more conventional survey
20 methods in other areas. Finally, tower staking would be done by surveying crews, based
21 on the surveyed centre-line.

22 Access Road Improvements/Construction

23 Access road improvements are assumed to be required in those areas of the finalized
24 Project alignment where existing roads occur and where those roads are degraded in
25 quality. Conversely, access road construction would be required in areas of the finalized
26 alignment where there are no existing access roads. Two types of roads would be
27 required: main access roads and access tracks (i.e. spur roads). No access roads would be
28 required where helicopter construction and access is proposed.

29 Main access roads would be approximately 4 metres wide, with a minimum of 10 metres
30 (total width) of vegetation cleared for the road. The maximum clearing width is site-
31 specific, with up to 2 metres beyond the top of cut or toe of fills being cleared at some
32 sites. Access tracks are considered temporary and would not be maintained following
33 construction. They would be approximately 3 metres wide, with a minimum of 7 metres
34 of vegetation cleared for the road. The maximum clearing width is site specific, with up
35 to 2 metres beyond the top of cut or toe of fills being cleared at some sites.

1 Vegetation clearing along the road alignment may be either manual- or machine-cleared,
2 depending on slope and soil conditions (*i.e.* steep or unstable slopes and/or wet soils
3 would require manual clearing). Felling and yarding would be conducted in a manner to
4 minimize impacts to wetlands, waterbodies and watercourses (*e.g.* trees would be felled
5 in a direction away from these features, etc.). All topsoil and organic materials would be
6 removed from the cleared area during road construction. Any cuts and fills that are
7 required would be constructed in such a way as to avoid disrupting natural drainage
8 patterns or causing sedimentation in watercourses. Also, the BC *Occupational Health*
9 *and Safety (OHS) Regulation* requires that danger trees must be removed if they threaten
10 a work site, so individual trees beyond the 10 metres may need to be removed if they
11 pose a hazard to workers.

12 Watercourse Crossing Improvements/Construction

13 Watercourse crossings would consist of upgrading, replacing or installing culverts on
14 small non-fish bearing watercourses and replacing and installing clearspan bridges on
15 large and known fish-bearing watercourses. No new culverts or replacement culverts
16 would be installed on known or potentially fish-bearing watercourses. All clearspan
17 bridges would be constructed to promote bank stabilization and to avoid placement of
18 materials below the HWM.

19 It is assumed that where culvert installations occur, watercourses would be dammed or
20 diverted during watercourse crossing development activities. In addition, removal of
21 some riparian vegetation may be required where existing road ROWs are non-existent or
22 overgrown. These works would be executed as per an approved EMP to be approved and
23 managed by a professional biologist. The plan will detail an assessment of risks and
24 mitigation methods with clear reporting and monitoring protocols.

25 Right-of-Way Clearing and Preparation

26 Due to the importance of 500 kV lines in the bulk transmission system, the ILM Project
27 would be built to full falling tree security. This is one factor in determining the ROW
28 clearing width required. Clearing widths are also dependent on a number of other site-
29 specific factors, including which tower design is being used at a site (*i.e.*, flat or delta
30 towers), presence/absence of previously cleared ROW, and other topographic and
31 biophysical site-specific features (*e.g.*, slope, tree height at the site, etc.).

32 Maximum clearing widths can be estimated for each segment of the Project using the
33 intended tower design for that segment, estimates of the tallest trees potentially on the
34 site, and an assumed 0% slope (building the Project on slopes greater than 0% would
35 increase or lower the maximum clearing width in those areas). Expected clearing widths
36 for delta towers would be up to 64 metres per side (128 metres total, in areas with no

1 existing ROW), and for flat towers would be up to 70 metres per side (140 metres total,
2 in areas with no existing ROW). Please refer to Section 4.2.3 and the Figures provided in
3 Appendix X for additional detail on clearing widths required.

4 Vegetation clearing for the Project ROW would involve felling, clearing and disposing of
5 tall-growing vegetation within the clearing boundaries. Various methods (manual and
6 mechanical) are used to conduct these activities, with the choice of method depending on
7 the site conditions and the desired finished product. In general, issues that affect the
8 choice of method include: land use (*i.e.* private or Crown land), topography, soil/ground
9 conditions, forest/vegetation cover (*e.g.* size, species, density and extent of cover), MoFR
10 requirements, environmental protection, access, season of clearing, future maintenance,
11 equipment issues, and cost.

12 Foundation Construction and Anchor Installation

13 Foundation construction and anchor installation for the Project would generally involve a
14 small-scale excavation of the area where the foundation or anchor would be placed.
15 Excavations are typically conducted by rubber-tired backhoes or light-drilling equipment
16 for guyed tower foundation installations and by large-tracked backhoes or tracked tank
17 drills for self-supporting foundation installations; blasting may also be used in some
18 situations. A variety of foundation and anchor types would be used for the Project,
19 depending on terrain and soil drainage conditions. Depending on which foundation type
20 is used, and the local site conditions, concrete would be used in some cases as part of the
21 foundation. Approved corrosion protection would also be applied to metal parts of the
22 foundation and anchors to prevent corrosion.

23 Concrete Production and Placement

24 Concrete use during the Project would mostly be limited to footing pours, which require
25 concrete to be placed inside a wooden form. Depending on ease of access to specific
26 sites, concrete would either be transported by concrete truck or by helicopter. Concrete
27 works would be conducted according to specifications outlined in the Project EMP for
28 the protection of aquatic and terrestrial environments (Chapter 11.0). Washout locations
29 required at helicopter staging areas would be located or constructed more than 30 m from
30 any watercourse and in a fashion which does not provide an outlet for water.

31 Grouting of anchor dowels would also be required at rock footing sites. Grout would be
32 mixed and produced inside a truck and a hose would be used to transport the grout to the
33 footing locations. Grout works would also be conducted in a manner consistent with the
34 EMP and which protects aquatic and terrestrial habitats.

1 Overhead Structure Assembly and Placement

2 Overhead structure assembly and placement would be carried out by crane or helicopter.
3 Therefore, this activity would require the development of helicopter landing pads and/or
4 large, flat areas for tower steel assembly and crane operations.

5 NIC and MDN Substation Improvements

6 Both Nicola and Meridian substations would be upgraded as part of the Project. A
7 500 kV line termination structure would be required at both substations as part of the
8 Project, in order to accommodate all existing lines as well as those proposed for the
9 Project. These termination structures would require construction of foundations for the
10 equipment. In addition, MDN may require construction of other “civil” structures.
11 Works at NIC and MDN would be conducted entirely within the substation boundaries.

12 The following are the major components of the substation construction work in the order
13 they would occur:

- 14 • Mobilization;
- 15 • Material handling;
- 16 • Access & site preparation;
- 17 • Foundation and guy anchor installation;
- 18 • Tower assembly and erection;
- 19 • Conductor, bus and equipment installation;
- 20 • Clean-up;
- 21 • De-mobilization; and,
- 22 • Testing and commissioning.

23 In general, these activities would be similar to those required for transmission line
24 construction, albeit at a smaller-scale.

25 RYC Capacitor Station Construction

26 In general, activities required to construct the new RYC capacitor station would be
27 similar to those required for transmission line construction, albeit at a smaller-scale. The
28 site would be approximately 250 m by 150 m and would be located on mainly flat
29 ground. The station would require construction of a 5L83 capacitor bank, a ground grid,
30 a control centre building, and a terminal structure, as well as approximately 0.5 km of
31 ROW from the 5L83 ROW to the site. A new digital microwave radio communication
32 system would also be required, including construction of a tower for a microwave
33 antenna. A fence would be constructed around the facility to prevent public access.

1 Existing access to the site from the Ruby-Lougheed FSR would require extensive grading
2 and some gravel to repair the surface for regular use for maintenance and operations.
3 Upgrades to this road would be similar to those required for main roads used to access the
4 Project corridor. Connection of the station to the electrical distribution network would
5 also be required from a nearby distribution feeder. It is expected that the line would be
6 placed along the FSR that runs to the station site.

7 Stringing of 500kV Conductors

8 Stringing of conductors would be either ground-based or using a helicopter, depending on
9 the terrain. Pulling/tensioning sites would be required along the alignment. Installation
10 of the conductors is generally done using a winch (*i.e.* pulling the conductor from the
11 tensioner site towards the pulling site), when ground access is available, or using a
12 helicopter.

13 The stringing activity begins with upgrading roads to provide ready access to light traffic
14 to all sites and for heavy traffic (puller, tensioner and loaded reel trailers) to puller or
15 tensioner locations, if it has not been done already for the construction of the towers.
16 Material supply and delivery for stringing would be much the same as for towers.
17 Insulator strings with travelers (stringing sheaves) and threading lines are made up at
18 each structure. These are raised into place on each structure by a winch. The next
19 operation is the threading of preliminary lines between the puller and tensioner. If there
20 is reasonable access along the ROW, the preliminary line may be pulled by a medium-
21 sized tractor. When the preliminary line is in place, the main pulling line operation
22 would then proceed at previously determined locations. The next procedure is the
23 splicing and “let up” of the conductor prior to sagging. This procedure is performed
24 using hydraulic presses and winches mounted on a truck or small tractor. Splicing is also
25 carried out in the air by helicopter in rugged or swampy terrain for long pulls. Sagging of
26 the conductor is then undertaken, which requires the use of a heavy tractor to provide
27 tension to pull the conductor into the sag position. Following sagging, each conductor
28 must be marked and then “clipped-in” by line crews.

29 Construction Waste Management

30 Construction Waste Management guidelines concerning the proper storage and disposal
31 of hazardous and non-hazardous waste materials created during all phases of construction
32 will be outlined in the Project EMP and site or activity-specific EPPs prepared by
33 BCTC’s construction contractors (Section 11.0). These practices would be in accordance
34 with appropriate environmental waste management procedures and legislation such as the
35 *Waste Management Act* which are intended to minimize waste and potential for creating
36 health risks and problems for wildlife.

1 Right-of-Way Restoration

2 Restoration includes the identification and provision of drainage at site-specific areas,
3 seeding disturbed ground, scarifying and seeding compacted work sites, and stabilizing
4 access by removing culverts, ditching and installing waterbars or other water control
5 measures. Seeding is generally done using a helicopter or ground spreader for scattered
6 disturbed areas.

7 Deactivation of Temporary Access

8 Deactivation of temporary access would occur prior to restoration activities. This would
9 involve the closing and removal of temporary access and watercourse crossings. This
10 work generally requires only a small two worker crew with a backhoe and truck-mounted
11 crane.

12 Construction Equipment Servicing

13 Construction equipment servicing would be conducted according to the Project EMP and
14 site- or activity-specific EPPs prepared by BCTC's contractors in a manner which
15 minimizes potential disturbance and effects to terrestrial and aquatic environments
16 (Section 11.0). Servicing locations would be situated and appropriate spill prevention
17 and containment measures would be implemented to avoid potential spills into aquatic
18 systems.

19 Testing and Commissioning

20 Testing and commissioning activities involve: a) checking for continuity of the line,
21 b) checking for phasing, c) checking for the absence of grounds, and d) visual checking
22 for any fallen trees and as a final check of conductor ground clearances.

23 Vehicle Traffic

24 BCTC has identified a series of usable access roads for the proposed transmission line,
25 including those along the existing transmission lines. Although access roads for the
26 Project have not been finalized, these roads may be used during construction and on-
27 going maintenance activities. It is not expected that any construction camps would be
28 required during construction of the Project. If it is determined that a construction camp is
29 required, a site-specific environmental assessment would be undertaken at that location
30 prior to commencement of any construction activities.

1 Access roads to be potentially used during Project construction and maintenance include
2 public roads, FSRs, private roads and industrial logging roads. Since it is not anticipated
3 that construction camps would be required for the Project, it is assumed that the
4 construction workers, and any other individuals on site, would be based out of a nearby
5 town, from which they would commute to the construction site every day. Short-term
6 temporary delays or closures on existing roads may be required during stringing of
7 conductors, helicopter works and other activities. As required, appropriate traffic control
8 signage and control measures would be implemented according to Worksafe BC's *OHS*
9 *Regulation*.

10 **4.3.2 Project Schedule**

11 Figure 4-3 shows a preliminary draft schedule for the Implementation Phase (tender and
12 construction) of the ILM Project, with construction currently scheduled to occur between
13 2009 and 2014. The draft schedule assumes receipt of an EAC from the BCEAO on
14 June 20th, 2007, as well as receipt of all other required federal and provincial permits,
15 approval and authorizations prior to commencing construction.

16 The preliminary schedule provides the general sequence of construction activities and
17 timelines for completion of the Project. Final construction schedule details would not be
18 available until construction and procurement has been finalized. BCTC is currently
19 undergoing a P3 business case analysis to determine the procurement strategy for the
20 Project. Contracts would not be signed till 2009, with specific scheduling details
21 dependant on the contractor's approach and strategy.

22 **4.4 Operations and Maintenance Activities and Schedule**

23 Major components and activities during operation and maintenance of the ILM Project
24 would include:

- 25 • Operation of the 500 kV transmission system;
- 26 • ROW vegetation maintenance;
- 27 • Maintenance of overhead structures;
- 28 • Maintenance of access roads;
- 29 • Maintenance of substation and capacitor stations; and,
- 30 • Equipment and materials storage.

31 Activities anticipated during operations and maintenance of the ILM Project are
32 described below.

1 500kV Transmission System Operation

2 Operation of the transmission system would simply involve the movement of through the
3 conductors between NIC and MDN. The flow of electricity on the line would be
4 controlled by the System Control Centre.

5 Vegetation Maintenance

6 BCTC and BC Hydro’s vegetation maintenance activities are divided into three general
7 areas: transmission lines, distribution lines, and facilities. Each of these areas is managed
8 with different objectives, and thus vegetation maintenance for each of these areas has
9 been addressed independently in separate management documents: *Integrated Vegetation*
10 *Management Plan for Control of Vegetation in Transmission Rights-of-Way (IVMP)*
11 (BCTC 2005b), *Approved Work Practices for Managing Riparian Vegetation (AWPRV)*
12 (BC Hydro et al. 2003), *Integrated Vegetation Management Plan for Distribution Line*
13 *Corridors* (BC Hydro 2005), and *Pest Management Plan for Control of Weeds in BCTC*
14 *Facilities* (BCTC 2006a).

15 General vegetation maintenance is similar for all areas. Maintenance activities include
16 manual, mechanical, and chemical methods for maintaining vegetation at a low height to
17 protect electrical facilities, and each of these general methodologies has many options
18 (e.g., many types of herbicides and application techniques are available, depending on
19 site objectives; BC Hydro 2005; BCTC 2005b; BCTC 2006a). Determination of the
20 method(s) to be used at a site depends on a large list of criteria, including: site objectives,
21 time of year, weather, efficacy, site-specific features (e.g., vegetation species, terrain,
22 etc.), safety, aesthetics, cost, First Nations concerns, environmental constraints, etc.
23 (ibid). The aim of vegetation management is to ensure public and worker safety and
24 system reliability. Tall growing vegetation capable of encroaching within limits of
25 approach must be removed and hazard trees capable of falling into the lines from off-
26 ROW must be removed or pruned as necessary to meet the circuit security requirements.

27 Patrols of the corridor to identify any potential clearing requirements would occur on a
28 regular schedule as per existing standards to plan and conduct vegetation maintenance on
29 an as-needed basis. Some vegetation maintenance would likely occur every year
30 depending on growth cycles along different portions of the corridor. Work timing is
31 planned based on ensuring system security, treatment efficacy, and minimizing potential
32 effects to the environment.

33 Further detail on BCTC’s existing vegetation management documents is provided in
34 Section 11.2.

1 Overhead Structure Maintenance

2 BCTC has a program of overhead structure maintenance which is based on inspections to
3 ensure that transmission assets are maintained in a safe and cost effective manner.
4 Condition assessments made on these inspections are used to prioritize the maintenance
5 program in relation to safety and environmental considerations, business needs, and
6 maintenance cost constraints. Overview inspections are made annually and detailed
7 inspections occur every 5 years.

8 Overhead structure maintenance can be undertaken from the ground, or, in sensitive areas
9 or where access is difficult or impossible, by helicopter. Where required, a “touch-and-
10 go” exit from a helicopter on the tower bridge can be used to perform maintenance
11 activities without causing disturbance to the ground surrounding the tower.

12 Further detail on transmission infrastructure monitoring and inspection programs is
13 provided in Section 12.3.

14 Substation/Capacitor Station Maintenance

15 BCTC has maintenance standards in place which deal with the many components of
16 capacitor stations and substations. The standards specify the inspections, job site time
17 and frequency of maintenance.

18 Access Road Maintenance

19 Many of the roads used to access the ILM Project would be existing FSRs; a small
20 number of new roads would also be constructed. After the Project is in service, many of
21 the smaller spur roads to the new towers would be deactivated. The existing roads that
22 are active FSRs would be kept open by the MoFR and/or forest tenure holders. The
23 remaining main roads that provide access to the transmission lines, but which are not
24 actively maintained by other industries such as mining or forestry, would be maintained
25 to a temporarily deactivated state.

26 For a road to be maintained to a temporarily deactivated state, the bridges across major
27 creeks are left in place, but cross ditches and drains are installed along the road to reduce
28 erosion and prevent culverts from becoming blocked and washing out. Usually only
29 high-clearance 4-wheel drive vehicles can use such roads – for BCTC’s purposes these
30 roads are used only infrequently for inspections and access for vegetation maintenance.
31 The road can be re-activated if necessary for future projects, and the presence of this
32 infrastructure on the landscape is helpful for fire response in the event of forest fires.
33 Maintenance on these roads is usually limited to ensuring worker safety appropriate to
34 the level of use, as well as ensuring that the infrastructure (*i.e.*, bridges, culverts, etc.) left

1 on the landscape is not negatively affecting the environment. Typical works include
2 overview inspections, occasional culvert and bridge replacements, and the repairing of
3 eroded areas on the road surface. Overview inspections are completed annually, and the
4 condition assessments made on these inspections are used to prioritize the maintenance
5 program in relation to safety and environmental considerations, business needs, and
6 maintenance cost constraints.

7 Equipment and Materials Storage at Stations Facilities

8 BCTC currently makes use of the BC Hydro Material Management and Business Unit
9 (MMBU) for ensuring the efficient storage and management of equipment and materials
10 in the system. The storage of materials and equipment in stations facilities would be
11 coordinated by MMBU and the Stations groups as part of this existing system.

12 **4.5 Capital Costs**

13 The total estimated capital cost for the ILM Project is \$602 million. The \$602 million
14 estimate was developed in September 2007 based on analysis by BCTC's consultants
15 working on the Project team, with the majority of the costs estimated by BC Hydro
16 Engineering Services. This estimate is based on a reference alignment⁴ and an in-service
17 date of fall 2014 and considers all aspects of the ILM Project including all engineering,
18 procurement, and construction costs, regulatory and environmental costs, property
19 acquisition costs, BCTC corporate overheads, interest during construction, and inflation.
20 Aboriginal accommodation costs are not included.

21 The design, material procurement and construction portion of the estimate is based on the
22 preliminary scope notes (which define the facilities and in-service date required for the
23 Project) issued by BCTC in August 2006, and is considered a planning level estimate.
24 BC Hydro Engineering Services advises that this portion of the estimate has an accuracy
25 level of +30% to -10%, which is a subjective assessment based on the engineering design
26 that has been completed to date.

27 A breakdown of the estimate is outlined in Table 4-9.

⁴ The reference alignment on which this cost estimate was based was included in the CPCN Application submitted by BCTC to the BCUC and does coincide with the preferred alignment. The reference alignment was a route chosen between NIC and MDN prior to conducting environmental technical studies, undertaking the preliminary design layout and receiving input from First Nations, regulatory agencies and community stakeholders.

1

TABLE 4-9: ILM Project Total Project Costs

	Project Shortname	Description	2007 Estimated Cost (Millions)
1	ILMBCTC	Definition Phase: BCTC managed costs (Regulatory, Communications, Project Management, Environmental)	\$12.9
2	ILMENG	Definition Phase: BC Hydro managed costs (Engineering and Properties)	\$7.9
3	ILMFN	Definition Phase: BCTC managed costs (BC Hydro Aboriginal Relations and Negotiations)	\$8.6
4	5L83Y14	5L83 Transmission Line Implementation Phase: BC Hydro estimated costs (Engineering and Properties)	\$269.1
5	5L83Y14B	5L83 Transmission Line Implementation Phase: BCTC estimated costs (Regulatory, Communications, Project Management, Environmental, BC Hydro AR&N)	\$8.9
6	N4MDN183	MDN Substation Implementation Phase: BC Hydro estimated costs (Engineering and Properties)	\$4.7
7	N4NICL83	NIC Substation Implementation Phase: BC Hydro estimated costs (Engineering and Properties)	\$7.2
8	5L83RC	RYC Implementation Phase: BC Hydro estimated costs (Engineering and Properties)	\$26.4
9		TOTAL DIRECT COST ESTIMATE	\$345.7
10		Contingency	\$82.3
11		Inflation	\$80.5
12		Overhead	\$17.1
13		Interest During Construction	\$76.5
14		TOTAL ESTIMATE	\$602.1

2 Table 4-10 below provides a breakdown of the estimated transmission line costs
 3 associated with the Project.

1 **TABLE 4-10: ILM Project Transmission Line Costs**

	5L83 Transmission Line Implementation Phase	2007 Estimated Cost (\$'000s)
1	Engineering/Project Management	9,272
2	Survey/Forest Engineering	5,673
3	Properties	8,895
4	Material	
5	Foundations	10,887
6	Steel Structures/Guys	35,497
7	Conductor	23,506
8	Insulators/Hardware	11,424
9	Quality Assurance/Contract Management	5,009
10	Construction	
11	ROW/Access Roads/Restoration	26,453
12	Foundations	41,325
13	Tower Erections	62,499
14	Conductor/Hardware Installation	21,085
15	Construction Management/Other	7,616
16	Total	\$269,141

2 The current estimate is for the differential costs to operate and maintain the proposed
 3 ILM Transmission Line, based on costs to operate and maintain the existing 5L81/5L82
 4 lines, is a \$316,000⁵ annual average.

5 **4.6 Labour Force**

6 It is estimated that construction of the ILM Project would require approximately
 7 543 person-years of direct employment. The current estimate for the differential labour
 8 requirements to operate and maintain the proposed ILM 5L83 transmission line, based on
 9 estimates of the workforce required to operate and maintain the existing 5L81/5L82 lines,
 10 is 280-420 annual man hours.

11 Consulting services required during construction of the Project would include:

- 12 • Engineering photogrammetric and legal surveys;
- 13 • Environmental investigation and monitoring;
- 14 • Flagging and cruising and timber appraisal;
- 15 • Access design;

⁵ Based on 8 years of 5L081/5L082 data (F2000-F2007), and assuming maintenance costs and accessibility of the ILM Transmission line infrastructure are similar to those for 5L081/5L082.

- 1 • Quality assurance services;
- 2 • Geotechnical investigation and design; and,
- 3 • Civil, mechanical and electrical design.

4 Construction services required during construction of the Project would include:

- 5 • Right-of-way preparation and restoration;
- 6 • Civil and structural (including substations, series capacitor station, tower and
7 anchor foundations, tower assembly and erection);
- 8 • Electrical and mechanical, including substations, series capacitor stations and
9 installation of conductors; and,
- 10 • Other minor construction support contracts such as first aid facilities and
11 transportation, including helicopter services.

12 BC Hydro anticipates that 70% of the Project workforce would be from the lower
13 Mainland and the Southern Interior regions of the province, resulting in temporary
14 employment for local individuals and business opportunities for local suppliers of goods
15 and services. Specialized trades associated with foundation and anchor installation and
16 experienced power line technicians for conductor installation would likely be brought in
17 from other parts of BC and Canada.

18 BCTC's Aboriginal Business Development Policy outlines specific mechanisms to
19 support contracting, procurement and business development opportunities for First
20 Nations. Procurement to engage a materials and construction contractor(s) to construct
21 the Project would be publicly advertised and open to all qualified businesses including
22 First Nations. Work not included in the contractor(s)'s scope would be reviewed and
23 opportunities made available to qualified and competitive First Nations businesses.
24 BCTC would include requirements in the materials and construction contract(s) to
25 employ and subcontract to competitive, qualified First Nations businesses, if available, to
26 work on the Project.

27 The socioeconomic discipline has undertaken a baseline skills and capacity analysis (to
28 the extent possible) of First Nations communities located in proximity to the Project
29 corridor, and has compiled a business profile of First Nations businesses relevant for
30 Project construction and operation activities (Section 6.12). This information would be
31 used to guide proposed benefit enhancement measures to support First Nations
32 employment and work opportunities for construction and operations. The ongoing
33 consultation process will also explore opportunities for First Nation participation in the
34 Project workforce (Section 2.3).