
Labrador – Island Transmission Link

Timber Resources Component Study

Prepared for:

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EXECUTIVE SUMMARY

Nalcor Energy is proposing to develop the *Labrador-Island Transmission Link* (the Project), a High Voltage Direct Current (HVdc) transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula.

In preparation for and support of the environmental assessment (EA) of the Project, this *Timber Resources Component Study* was completed to assess and describe the existing timber resource in the area of, and which may interact with, the proposed Project. In the context of this study, "timber resources" refers to those natural resources collected from forests / woodlands of the province – including natural ecosystems, managed plantations (cutblocks), and/or wood lots – and which are used as a source for wood (e.g., industrial round wood (pulpwood), sawn timber, wood chips / pellets, or home-heating fuel).

The study provides an analysis of the existing timber resource within the currently proposed transmission corridor (2 km wide), as well as an estimate of likely quantities of timber that will be required to be harvested as a result of clearing of the eventual transmission line itself - which will comprise an approximately 60 m wide cleared right-of-way selected from within this larger corridor. This information will be used in the EA, as well as in on-going Project design and planning.

The study utilized existing forest inventory data incorporated into the Project's Ecological Land Classification (ELC), in order to describe the existing forest landbase. This information was subsequently used to quantify the type and volume of timber resources within the 2 km wide transmission corridor, as well as, for analysis purposes, within a hypothetical 60 m wide cleared right-of-way extending along the centerline of this corridor. Existing forest inventory data obtained from the Forest Resources Branch of the Newfoundland and Labrador Department of Natural Resources (NLDNR) provided the required base data to enable the large area mapping of timber resources, by stand type, over these two spatial scales. The most relevant and current forest inventory data available were obtained and used in the analyses.

For the Island of Newfoundland, stock and stand tables were used to estimate the merchantable volume of timber for all softwood and hardwood stand types occurring within the proposed 2 km wide transmission corridor and hypothetical 60 m right-of-way. In Labrador, inventory databases are considered incomplete or non-existent for the majority of Forest Management Districts (FMDs). As a result, estimates of merchantable volume rely primarily on the analysis of volume tables and / or yield curves (Government of Newfoundland and Labrador 2005) developed by the Province for FMD 19A. For ease of analysis, gross merchantable volume (GMV) was calculated for the transmission corridor and potential cleared right-of-way for: 1) each of the various subregions that comprise the Study Area (i.e., Southeastern Labrador, Northern Peninsula, Central and Eastern Newfoundland, Avalon Peninsula); 2) each relevant FMD crossed by the transmission corridor; and 3) for the Transmission Link Project as a whole.

On the Island of Newfoundland, the GMV of productive forest (softwood and hardwood) within the 2 km wide proposed transmission corridor and hypothetical 60 m right-of-way is estimated at 3,872,123.9 m³ and 121,200.4 m³, respectively. In Labrador, the GMV of productive forest is calculated for softwoods only, with the available timber volumes in the 2 km wide transmission corridor and 60 m wide right-of-way estimated at 1,186,841.9 m³ and 29,582.6 m³, respectively. Total volumes (Newfoundland and Labrador) of the timber

resource are estimated at 5,058,965.8 m³ and 150,783.1 m³ for the transmission corridor (2 km) and right-of-way (60 m), respectively.

The type and level of information provided on timber resources in this study is considered appropriate and adequate for the Project's EA and ongoing planning and design.

In addition to the inventory of timber resources provided through this study and report, forests within a larger 15 km wide study area that encompasses the proposed and various alternative transmission corridor segments are generally described in the Project's Ecological Land Classification (ELC) report (Stantec 2010).

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1.0 INTRODUCTION

Nalcor Energy is proposing to develop the *Labrador – Island Transmission Link* (the Project), a High Voltage Direct Current (HVdc) transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula. The Environmental Assessment (EA) of the Project is ongoing, with an Environmental Impact Statement (EIS) being prepared by Nalcor Energy. The EIS will be submitted for review by governments, Aboriginal and stakeholder groups and the public.

In preparation for and support of the EA, this *Timber Resources Component Study* has been undertaken in order to assess and describe the timber resources in the area of, and/or which may interact with, the proposed Project.

Specifically, the study provides an estimate of likely quantities (or volume) of timber resources within the currently defined 2 km wide proposed transmission corridor, as well as that which will be required to be harvested as a result of the clearing of the approximately 60 m wide transmission line right-of-way that will eventually be selected from within this larger corridor. This information will be used in the EA, as well as in on-going Project design and planning.

1.1 Project Overview

The Project involves the construction and operation of transmission infrastructure within and between Labrador and the Island of Newfoundland.

The proposed Project, as defined at the time at which this study was initiated, included the following key components:

- an ac-dc converter station at Gull Island in Central Labrador, on the north side of the Churchill River adjacent to the switchyard for the Lower Churchill Hydroelectric Generation Project;
- an HVdc transmission line extending from Gull Island across southeastern Labrador to the Strait of Belle Isle. This overhead transmission line will be approximately 400 km in length with a cleared right-of-way averaging approximately 60 m wide, and will consist of single galvanized steel lattice towers;
- cable crossings of the Strait of Belle Isle with associated infrastructure, including cables placed under the seafloor through various means to provide the required cable protection;
- an HVdc transmission line (similar to that described above) extending from the Strait of Belle Isle across the Island of Newfoundland to the Avalon Peninsula, for a distance of approximately 700 km;
- a dc-ac converter station at Soldiers Pond on the Island of Newfoundland's Avalon Peninsula; and
- electrodes in Labrador and on the Island, with overhead lines connecting them to their respective converter stations.

Project planning and design are currently at a stage of having identified a 2 km wide corridor for the on-land portions of the proposed HVdc transmission line (Figure 1.1) and 500 m wide corridors for the proposed Strait of

Belle Isle cable crossings, as well as various alternative corridor segments in particular areas. These “corridors” are essentially study areas for the on-going transmission line planning and design work, from within which a specific transmission line routing will eventually be identified and selected.

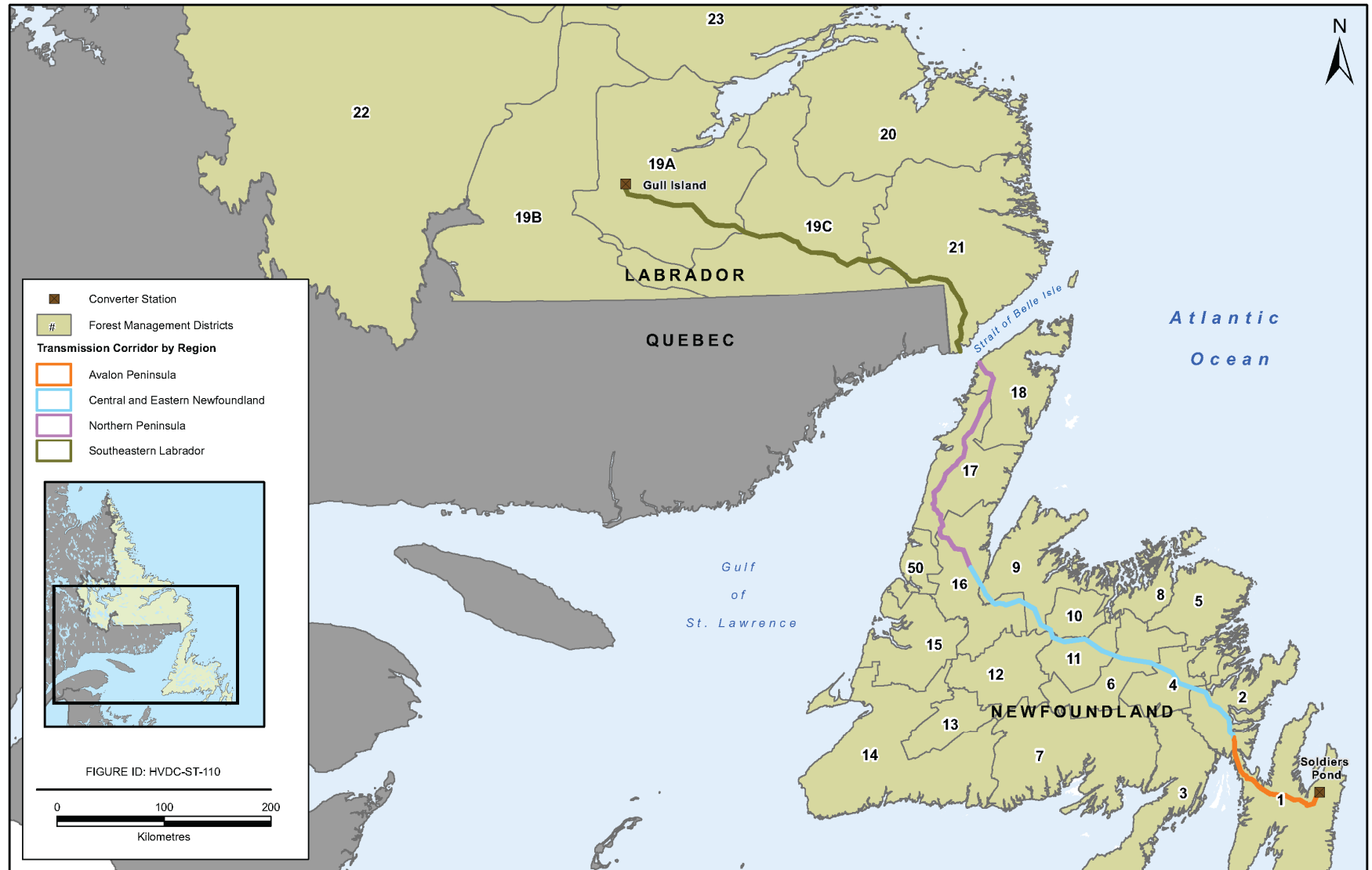
It is these proposed transmission corridors and components that were the subject of Nalcor Energy’s environmental baseline study program. Project planning is in progress, and it is anticipated that the Project description will continue to evolve as engineering and design work continue. The EA of the Project will also identify and evaluate alternative means of carrying out the Project that are technically and economically feasible.

In conjunction and concurrent with the EA process, Nalcor Energy will be continuing with its technical and environmental analyses of the corridors, in order to identify the specific routing for the on-land transmission line (for a cleared right-of-way that will average approximately 60 m in width). The eventual transmission route and locations will be selected with consideration of technical, environmental and socioeconomic factors.

1.2 Study Purpose and Objectives

The purpose of this *Timber Resources Component Study* is to analyze and describe the existing timber resource within the proposed transmission corridor (2 km wide), as well as to estimate the likely quantities of timber resources that will be required to be removed or otherwise affected as a result of clearing of the eventual transmission line itself – which, as described above, will comprise an approximately 60 m wide cleared right-of-way eventually selected from within this larger corridor. This environmental baseline information will be used in the EA of the Project, as well as ongoing Project planning and design work, including the eventual (post-EA) transmission line routing process.

Figure 1.1 Labrador – Island Transmission Link and Associated Geographic Regions Indicating Newfoundland and Labrador Forest Management Districts



2.0 APPROACH AND METHODS

This *Timber Resources Component Study* was conducted in conjunction with a larger study, the *Labrador – Island Transmission Link Ecological Land Classification (ELC)* (Stantec 2010), completed for the Project and its EA. Information on vegetation composition within the ELC Study Area, specifically with respect to forest resources, was supplemented by available provincial forest inventory data, in order to evaluate and describe the existing forest landbase within the proposed transmission corridor, including the volume of merchantable timber along the corridor. Merchantable timber volume (i.e., that which can be economically harvested) was determined using the projected volume per hectare multiplied by the total number of forested hectares. Timber resource estimates were derived and presented for the proposed transmission corridor (2 km wide), as well as, for analysis purposes, within a hypothetical 60 m wide cleared right-of-way extending along the centerline of this corridor.

2.1 Timber Resources

In Newfoundland and Labrador, the management of forest ecosystems, and therefore timber resources, is guided by the Newfoundland and Labrador *Forestry Act 1990*, which is within the mandate of the Newfoundland and Labrador Department of Natural Resources (NLDNR) who manage the forest resource on behalf of the province. Forest management occurs on both a province-wide and a district level, with 18 Forest Management Districts (FMDs) located on the Island of Newfoundland and eight in Labrador. The provincial *Sustainable Forest Management Strategy* outlines a vision for the forest ecosystems of the province. It states:

“The forests of Newfoundland and Labrador will maintain a sustainable balance of environmental, economic and cultural values desired by society. They will provide for viable population of native species, sustainable yields of forest products and the creation of wealth and employment to support local, regional and provincial economics” (Government of Newfoundland and Labrador 2003).

Nalcor Energy recognizes that there are a range of environmental and socioeconomic considerations associated with the harvesting of timber resources as a result of the Project, and which must be considered through the EA process. This report is intended to provide environmental baseline information in support of the EA, by generally evaluating and quantifying the existing timber resource in the general Project area (proposed transmission corridor), as well as that which may be directly affected by the eventual clearing of the transmission line right-of-way itself. In the context of this study, “timber resources” refers to those natural resources collected from forests / woodlands of the province – including natural ecosystems, managed plantations (cutblocks), and/or wood lots – and which are used as a source for wood (e.g., industrial round wood (pulpwood), sawn timber, wood chips / pellets, or home-heating fuel).

2.2 Timber Resources Inventory

Several approaches and data sources were used in the analysis of timber resources for this study. Specifically, the analyses utilized existing NLDNR Forest Resources Branch forest inventory data incorporated into the Project’s ELC, to describe the existing forest landbase and to quantify the type and volume of timber resources within the overall proposed transmission corridor and in the hypothetical cleared transmission line right-of-way.

To provide a reliable estimate of timber resources, the most relevant and current available forest inventory data were used. Forest inventory data, including stand tables, stock tables, and yield curves, provide the required base data to enable the large area mapping of timber resources, by stand type, and over a range of scales (i.e., 2 km transmission corridor, 60 m right-of-way).

In Newfoundland and Labrador, an array of distinct forest units (stands) exists for which separate yield curves have been developed by stand type, and within most FMDs (except for FMD 19C and FMD 21). Inventory data for each stand consist of the following: species composition (to the nearest 10 percent), age class, stocking, average height of dominant and co-dominant trees, and site class. Curves are assigned to forest units based on species composition (e.g., bS (black spruce), bF (balsam fir), wB (white birch)), site class (Good, Medium or Poor) and crown density class (1 - over 75 percent crown closure; 2 - 51 to 75 percent crown closure; 3 - 26 to 50 percent crown closure). Yield volume tables provide an estimate of the amount of wood that may be harvested from a particular type of forest stand by species, site, stocking, and management regime at various ages. The stock table combines stand and volume table information to estimate total volume per hectare. Stock tables endorsed by the NLDNR were categorized into one of two categories based on species composition for each forest unit / stand type encountered: 1) softwood (coniferous forest); and 2) hardwood (deciduous forest). Forest inventory data vary between FMDs depending on the site productivity, historic disturbances and past management. Therefore, the inventory data used to perform the analysis of timber resources varied with the FMD in which it was applied.

Delineation of the timber harvesting landbase represented the first step in the analysis of timber resources for the study. Using spatially-delineated forest inventory polygons (Government of Newfoundland and Labrador 2005), volume calculations were produced in all areas of “productive forest” contained within the proposed transmission corridor and associated transmission line right-of-way. Productive forest, in the context of this report, refers primarily to those areas of forest land producing or capable of producing, at rotation age and under natural conditions, a forest stand containing a minimum merchantable timber volume of 30 m³ (solid) per hectare (Government of Newfoundland and Labrador 1990).

Gross merchantable volume (GMV) that would potentially be cleared from the transmission line right-of-way was then calculated for: each of the various subregions that comprise the Study Area (i.e., Southeastern Labrador, Northern Peninsula, Central and Eastern Newfoundland, Avalon Peninsula); each relevant FMD crossed by the transmission corridor; and for the Project as a whole. The GMV is the estimated volume of a merchantable tree without deduction for defects (i.e., the diameter at breast height (DBH) and merchantable heights of all of the trees including defects). A merchantable tree has an outside bark diameter of 9.0 cm or greater at a point 1.3 m above mean ground level (Government of Newfoundland and Labrador 1990).

The GMV was available from provincial forest inventories and/or was extrapolated based on the scale of the available data (i.e., in the case of FMD 19A in Labrador) to meet the study objectives. Therefore, a volume analysis was completed to estimate stand-level volumes, which, in turn, were aggregated to provide estimates of the GMV for the transmission corridor and hypothetical right-of-way. The approach used to estimate GMV was dependent on the kind of stand (or forest polygon) under consideration. Three types (scenarios) of stands / polygons are defined:

- *Productive forests* - Treed stands (tree crown closure equal to or greater than 10 percent) or polygons that contain merchantable volume (gross merchantable volume greater than 30 m³/ha);

- *Non-productive forests* - Treed stands/polygons with merchantable volume but no available estimate of this volume or treed stands / polygons (stands with tree crown closure less than 10 percent) where gross merchantable volume is less than 30 m³/ha; and
- *Non-forested areas* - Vegetated, non-treed areas with no volume. Excluded are: cleared areas, cultivated lands, and vegetated urban areas.

For the Island of Newfoundland, existing provincial forest inventory data were used to estimate the merchantable volume of timber for all softwood and hardwood stand types occurring within the 2 km wide proposed transmission corridor and potential (hypothetical) 60 m wide transmission line right-of-way. The estimated merchantable volume for each identified “productive” and “non-productive” forest stand/unit was then expanded to provide volume estimates by combining average plot values (m³/ha) within designated strata with forested areas (hectares) from the forest inventory data.

In Labrador, comprehensive inventory databases are considered incomplete or non-existent for the majority of FMDs. Estimates of merchantable volume within the proposed corridor and hypothetical right-of-way in FMD 19A rely primarily on the analysis of volume tables and / or yield curves (Government of Newfoundland and Labrador 2005) to provide conservative estimates of volume per hectare (based on stocking). Similarly, the estimated GMV was determined by multiplying the volume per hectare by the total hectares of each forested area. Non-forested areas (e.g., fens, bogs) and disturbed areas were not used in the determination of timber volumes.

Two additional FMDs within Labrador, 19C and 21, were not able to be included within this analysis for various reasons. FMD 19C, located within the String Bog (Eagle River Plateau) Ecoregion consists of less than 8 percent Conifer Forest habitat type within the transmission corridor (Stantec 2010). This district currently has no FMD harvesting plan (i.e., there is no annual allowable cut (AAC) allocated to this district) (AMEC 2010). Discussions with Department of Natural Resources personnel confirmed that yield curves similar to that available for FMD 19A are not available for 19C (Jennings 2010; Payne 2010) and therefore GMV for this FMD were not able to be calculated for this study.

Similar to the String Bog Ecoregion (i.e., FMD 19C), the transmission corridor within the Forteau Barren Ecoregion (i.e., FMD 21) is comprised of less than 8 percent Conifer Forest habitat type (Stantec 2010). However, FMD 21 does have an AAC, although it is less than 50,000 m³ (AMEC 2010) and the identified timber wood supply for this FMD does not overlap with the transmission corridor (Payne 2010). Department of Natural Resources personnel confirmed that yield curves similar to that available for FMD 19A are likewise currently not available for FMD 21 (Jennings 2010; Payne 2010), and GMV for this FMD were not able to be calculated for this study.

The analysis of timber resources is intended to represent the range of current and potential management intensities (i.e., natural stands vs. plantations) for standard forest polygons (NLDNR database) crossed by the Project. The analysis is compatible with existing provincial sustainable forest management objectives (Government of Newfoundland and Labrador 2003) and applicable to the respective FMDs in Newfoundland and Labrador.

Of note, the spatial arrangement of areas for timber harvesting in Newfoundland and Labrador is somewhat unique and especially challenging with respect to the quantification of timber resources due to the natural and

anthropogenic fragmentation of forests available for harvesting. The types of areas typically excluded from harvesting are:

- unmerchantable stand types;
- non-productive land;
- inoperable areas;
- environmentally sensitive areas;
- roads and landings;
- riparian buffers; and
- incompatible land use areas.

These areas cannot be harvested, but they are not deleted from the landbase used in the inventory database as they can contribute to non-timber values (which are not assessed in this document).

Spatially-explicit estimates of merchantable timber volume over large areas may be limited by the spatial extent of the forest inventory relative to the area of interest (i.e., inventories of Labrador are not spatially exhaustive), or by the omission of inventory attributes required for volume estimation. These spatial and data attribution gaps in the forest inventory may result in an underestimation of merchantable volume for portions of the transmission corridor and right-of-way, particularly in Southeastern Labrador.

2.3 Study Team

All team members (Table 2.1) have in-depth knowledge and experience in their fields of expertise and a broad knowledge of the work conducted by other experts in related fields. Brief biographical statements, highlighting roles and responsibilities and relevant education and employment experience of key personnel, are provided in Appendix A.

Table 2.1 Study Team Members and Roles

Role	Personnel
Component Lead	Stephen Rowe (2010)
Report Author	Sean Bennett (2010)
GIS and Remote Sensing	Stephen Rowe (2008-2010)
	Peter Miles (2008-2010)
	Zach Bartlett (2010)

3.0 RESULTS AND ANALYSIS

The following sections present the results of the timber resources inventory. The study's results are provided through a series of tables and summary text, with figures provided at the end of the chapter. Information is provided on the available forest landbase and calculated gross merchantable timber volumes for each of the geographic regions that comprise the Study Area (Southeastern Labrador, Northern Peninsula, Central and Eastern Newfoundland, and the Avalon Peninsula) and the various Ecoregions within, as well as by FMD and for the Project as a whole.

3.1 Southeastern Labrador

The proposed transmission corridor traverses four Ecoregions, however as previously noted and explained, forestry inventory data were only available for FMD 19A (i.e., the High Boreal Forest and Low Subarctic Forest Ecoregions). Productive forests form a large percentage of the High Boreal Forest and Low Subarctic Forest Ecoregions (Figure 3.1). The landbase summary for this region only covers the northwestern portion of the corridor in this region, with the remainder unavailable for landbase classification.

The GMV calculations for Southeastern Labrador are for softwoods only, the majority of which occurs within the Low Subarctic Forest Ecoregion (Table 3.1).

The total GMV within the transmission corridor for Southeastern Labrador is estimated at 1,186,841.9 m³. The volume that would be harvested or otherwise altered as a result of the clearing of a 60 m right-of-way is estimated to be 29,582.6 m³.

Table 3.1 Gross Merchantable Volume (Softwood/Hardwood) Summary – Southeastern Labrador

Ecoregion	Gross Merchantable Volume ¹		
	Volume of Softwood (m ³)	Volume of Hardwood (m ³)	Volume of Merchantable Timber (m ³)
Transmission Corridor (2 km wide)			
Forteau Barrens	ND	ND	ND
High Boreal Forest (Lake Melville)	198,566.5	0	198,566.5
Low Subarctic Forest (Mecatina River)	988,275.4	0	988,275.4
String Bog (Eagle River Plateau)	ND	ND	ND
Grand Total	1,186,841.9	0	1,186,841.9
Percent of Volume for Southeastern Labrador (Transmission Corridor)	100%	0%	100%
Right-Of-Way (60 m wide, Hypothetical)			
Forteau Barrens	ND	ND	ND
High Boreal Forest (Lake Melville)	4,494.8	0	4,494.8
Low Subarctic Forest (Mecatina River)	25,087.8	0	25,087.8
String Bog (Eagle River Plateau)	ND	ND	ND
Grand Total	29,582.6	0	29,582.6

Ecoregion	Gross Merchantable Volume ¹		
	Volume of Softwood (m ³)	Volume of Hardwood (m ³)	Volume of Merchantable Timber (m ³)
Percent of Volume for Southeastern Labrador (Right-Of-Way)	100%	0%	100%
¹ The GMV calculations for Labrador are for softwoods only and were calculated using NLDNR yield-based methodology, as stand and stock table data are not presently available for use in this analysis. The landbase deductions for Labrador were consistent with those applied in Newfoundland. ND (no data) – Provincial Forest Inventory data are presently unavailable for FMD 21 which encompasses the Forteau Barrens Ecoregion of Labrador. Similarly, inventory data for the String Bog (Eagle River Plateau) Ecoregion of Labrador, as contained within FMD 19C, are also not available (See Section 2.0 Approach and Methods for further information on application of GMV calculation procedures).			

Note: Rounding errors less than 1 percent may occur in final totals

3.2 Northern Peninsula

Productive forest in the Northern Peninsula region tends to occur in the areas of lower elevation such as in association with the Northern Peninsula Forest Ecoregion (Figure 3.2). Some productive forest does occur within the other two Ecoregions (i.e., Strait of Belle Isle Barrens and Long Range Barrens) but most of the vegetation here is either non-productive or non-forested.

There is both productive softwood and hardwood forest in the Northern Peninsula although the latter represents approximately 9 percent (Table 3.2). The total volume within the transmission corridor for Northern Peninsula is estimated at 1,689,210.4 m³. The amount that would be harvested or otherwise altered as a result of a 60 m right-of-way is estimated to be 54,375.3 m³.

Table 3.2 Gross Merchantable Volume (Softwood/Hardwood) Summary – Northern Peninsula

Ecoregion	Gross Merchantable Timber Volume		
	Volume of Softwood (m ³)	Volume of Hardwood (m ³)	Volume of Merchantable Timber (m ³)
Transmission Corridor (2 km wide)			
Northern Peninsula Forest	1,072,291.4	98,149.9	1,170,441.3
Long Range Barrens	384,816.6	41,991.1	426,807.6
Strait of Belle Isle Barrens	86,015.5	5,945.6	91,961.1
Grand Total	1,543,123.5	146,086.5	1,689,210.4
Percent of Volume for Northern Peninsula (Transmission Corridor)	91.3%	8.7%	100%
Right-Of-Way (60 m wide, Hypothetical)			
Northern Peninsula Forest	32,079.6	2,897.0	34,976.6
Long Range Barrens	14,104.8	1,501.9	15,606.7
Strait of Belle Isle Barrens	3,562.3	229.5	3,791.9
Grand Total	49,746.8	4,628.5	54,375.3
Percent of Volume for Northern Peninsula (Right-Of-Way)	91.5%	8.5%	100%

Note: Rounding errors less than 1 percent may occur in final totals

3.3 Central and Eastern Newfoundland

Productive forest in the Central and Eastern Newfoundland region is almost exclusively within the dominant Central Newfoundland Forest Ecoregion (Figure 3.3). Non-forested and non-productive forest types also occur within the transmission corridor for this Ecoregion.

Productive softwood again dominates in the Central and Eastern Newfoundland region with some (approximately 10 percent) productive hardwood present (Table 3.3). The total volume within the transmission corridor for this region is estimated at 1,910,107.5 m³. The amount that would be harvested or otherwise altered as a result of a 60 m right-of-way is estimated to be 59,750.7 m³.

Table 3.3 Gross Merchantable Volume (Softwood/Hardwood) Summary – Central and Eastern Newfoundland

Ecoregion	Gross Merchantable Timber Volume		
	Volume of Softwood (m ³)	Volume of Hardwood (m ³)	Volume of Merchantable Timber (m ³)
Transmission Corridor (2 km wide)			
Central Newfoundland Forest	1,711,075.2	185,360.6	1,896,435.8
Long Range Barrens	780.7	39.0	819.8
Maritime Barrens	11,737.8	1,114.1	12,852.0
Grand Total	1,723,593.8	186,513.7	1,910,107.5
Percent of Volume for Central and Eastern Newfoundland (Transmission Corridor)	90.2%	9.8%	100%
Right-Of-Way (60 m wide, Hypothetical)			
Central Newfoundland Forest	54,021.8	5,454.1	59,475.9
Long Range Barrens	0.0	0.0	0.0
Maritime Barrens	265.0	9.8	274.8
Grand Total	54,286.8	5,463.9	59,750.7
Percent of Volume for Central and Eastern Newfoundland (Right-Of-Way)	90.9%	9.1%	100%

Note: Rounding errors less than 1 percent may occur in final totals

3.4 Avalon Peninsula

Productive forests within the Avalon Peninsula region represent the lowest proportion of available merchantable timber volumes, by region, within the proposed transmission corridor. Areas available for timber harvest occur primarily within the Maritime Barrens Ecoregion, where some 85 percent of available softwood and hardwood timber volumes occur in a dispersed spatial arrangement and non-forested areas predominate (Figure 3.4). Remaining areas of available merchantable timber occupy the Avalon Forest Ecoregion, characterized by mature stands of balsam fir (*Abies balsamea*) forest with minor hardwood components of white (*Betula papyrifera*) and yellow birch (*Betula alleghaniensis*).

Productive softwood forests dominate the Avalon Peninsula region (95 percent), with the remaining 5 percent comprised of hardwood forests (Table 3.4). The total volume within the transmission corridor for this region is

estimated at 272,805.9 m³. The amount that would be harvested or otherwise altered as a result of a 60 m hypothetical right-of-way is estimated to be 7,074.5 m³.

Table 3.4 Gross Merchantable Volume (Softwood/Hardwood) Summary – Avalon Peninsula

Ecoregion	Gross Merchantable Timber Volume		
	Volume of Softwood (m ³)	Volume of Hardwood (m ³)	Volume of Merchantable Timber (m ³)
Transmission Corridor (2 km wide)			
Avalon Forest	39,694.3	1,777.6	41,471.9
Maritime Barrens	216,915.0	14,419.0	231,334.0
Grand Total	256,609.3	16,196.6	272,805.9
Percent of Volume for Avalon Peninsula (Transmission Corridor)	94.1%	5.9%	100%
Right-Of-Way (60 m wide, Hypothetical)			
Avalon Forest	1,387.4	67.6	1,454.6
Maritime Barrens	5,297.3	322.1	5,619.4
Grand Total	6,684.7	389.8	7,074.5
Percent of Volume for Avalon Peninsula (Right-Of-Way)	94.5%	5.5%	100%

Note: Rounding errors less than 1 percent may occur in final totals

3.5 Newfoundland and Labrador

A summary of available merchantable timber within the proposed transmission corridor and hypothetical right-of-way, by region, for Newfoundland and Labrador is provided in Table 3.5. Productive softwood forests dominate throughout each of the geographic regions (93 percent), with the remaining 7 percent comprised of hardwood forests (Table 3.5). The total volume within the transmission corridor for Newfoundland and Labrador is estimated at 5,058,965.7 m³. The amount that would be harvested or otherwise altered as a result of a 60 m right-of-way is estimated to be 150,783.1 m³.

Table 3.5 Gross Merchantable Volume (Softwood/Hardwood) Summary – Newfoundland and Labrador

Geographic Region	Gross Merchantable Timber Volume		
	Volume of Softwood (m ³)	Volume of Hardwood (m ³)	Volume of Merchantable Timber (m ³)
Transmission Corridor (2 km wide)			
Southeastern Labrador	1,186,841.9	0	1,186,841.9
Northern Peninsula	1,543,123.9	146,086.5	1,689,210.4
Central and Eastern Newfoundland	1,723,593.8	186,513.7	1,910,107.5
Avalon Peninsula	256,609.3	16,196.6	272,805.9
Grand Total	4,710,168.9	348,796.8	5,058,965.7
Percent of Volume for Newfoundland and Labrador (Transmission Corridor)	93.1%	6.9%	100%
Right-Of-Way (60 m wide, Hypothetical)			
Southeastern Labrador	29,582.6	0	29,582.6
Northern Peninsula	49,746.8	4,628.5	54,375.3
Central and Eastern Newfoundland	54,286.9	5,463.9	59,750.8
Avalon Peninsula	6,684.7	389.8	7,074.5
Grand Total	140,300.9	10,482.2	150,783.1
Percent of Volume for Newfoundland and Labrador (Right-Of-Way)	93.0%	7.0%	100%

Note: Rounding errors less than 1 percent may occur in final totals

3.6 Timber Resources: All Regions and by Forest Management District

In terms of overall (total) merchantable volumes (softwood/hardwood) within the proposed transmission corridor for Newfoundland and Labrador, 3,872,123.9 m³, or approximately 77 percent, of the 5,058,965.8 m³ of available merchantable timber that currently exists occurs within FMDs comprising the Island portion of the province (Table 3.6). The remaining 1,186,841.9 m³, or 23 percent, of merchantable timber occurring in Southeastern Labrador was identified solely within FMD 19A, and exclusively within the High Boreal Forest (Lake Melville) and the Low Subarctic Forest (Mecatina River) Ecoregions.

The total volume (GMV) of merchantable timber that would be harvested or otherwise altered within the 60 m right-of-way was estimated at 150,783.1 m³ (Table 3.7).

Table 3.6 Gross Merchantable Volume (Softwood/Hardwood) within the Transmission Corridor by Forest Management District for Newfoundland and Labrador

Forest Management District	Softwood Volume (m ³)	Percent of Softwood	Hardwood Volume (m ³)	Percent of Hardwood	Total Volume of Merchantable Timber ¹ (m ³)	Percent of Total Volume of Merchantable Timber
Newfoundland						
1	242,968.3	5.2	15,501.4	4.4	258,469.7	5.1
2	501,451.3	10.7	47,348.3	13.6	548,799.6	10.9
4	194,908.0	4.1	33,188.6	9.5	228,096.6	4.5
6	132,698.1	2.8	11,930.6	3.4	144,628.7	2.9
9	271,480.7	5.8	21,473.2	6.2	292,953.9	5.8
10	24,893.6	0.5	2,686.7	0.8	27,580.3	0.6
11	204,219.4	4.3	42,189.8	12.1	246,409.2	4.9
12	26,443.7	0.6	2,960.5	0.9	29,404.2	0.6
16	915,953.7	19.5	65,906.5	18.9	981,860.2	19.4
17	756,791.0	16.1	87,161.8	25.0	843,952.8	16.7
18	251,549.0	5.3	18,419.7	5.3	269,968.7	5.3
Subtotal (Newfoundland)	3,523,356.8	74.8	348,767.1	100.0	3,872,123.9	76.5
Labrador						
19A	1,186,841.9	25.2	0.0	0.0	1,186,841.9	23.5
Subtotal (Labrador)	1,186,841.9	25.2	0.0	0.0	1,186,841.9	23.5
Total (Newfoundland and Labrador)	4,710,198.7	100.0	348,767.1	100.0	5,058,965.8	100.0
¹ The GMV calculations for Labrador are for softwoods only and were calculated using NLDNR yield-based methodology, as stand and stock table data are not presently available for use in this analysis.						

Note: Rounding errors less than 1 percent may occur in final totals

Table 3.7 Gross Merchantable Volume (Softwood/Hardwood) within the Right-Of-Way by Forest Management District for Newfoundland and Labrador

Forest Management District	Softwood Volume (m ³)	Percent of Softwood	Hardwood Volume (m ³)	Percent of Hardwood	Total Volume of Merchantable Timber ¹ (m ³)	Percent of Total Volume of Merchantable Timber
Newfoundland						
1	6,400.7	4.6	365.2	3.5	6,765.9	4.5
2	14,382.2	10.3	1,273.3	12.1	15,655.5	10.4
4	7,388.7	5.3	990.0	9.4	8,378.7	5.6
6	5,257.3	3.7	263.3	2.5	5,520.6	3.7
9	8,231.8	5.9	868.2	8.3	9,100.0	6.0
10	716.3	0.5	25.1	0.2	741.4	0.5
11	6,281.9	4.5	1,276.9	12.2	7,558.8	5.0
12	789.0	0.6	82.3	0.8	871.3	0.6
16	27,794.7	19.8	1,814.1	17.3	29,608.8	19.6
17	24,884.5	17.7	2,897.1	27.6	27,781.6	18.4
18	8,591.5	6.1	626.7	6.0	9,218.2	6.1
Subtotal (Newfoundland)	110,718.6	78.9	10,482.2	100.0	121,200.8	80.4
Labrador						
19A	29,582.6	21.1	0.00	0.0	29,582.6	19.6
Subtotal (Labrador)	29,582.6	21.1	0.0	0.00	29,582.6	19.6
Total (Newfoundland and Labrador)	140,300.9	100.0	10,482.2	100.0	150,783.1	100.0
¹ The GMV calculations for Labrador are for softwoods only and were calculated using NLDNR yield-based methodology, as stand and stock table data are not presently available for use in this analysis.						

Note: Rounding errors less than 1 percent may occur in final totals

Figure 3.1 Available Forest Landbase Summary (Transmission Corridor) – Southeastern Labrador

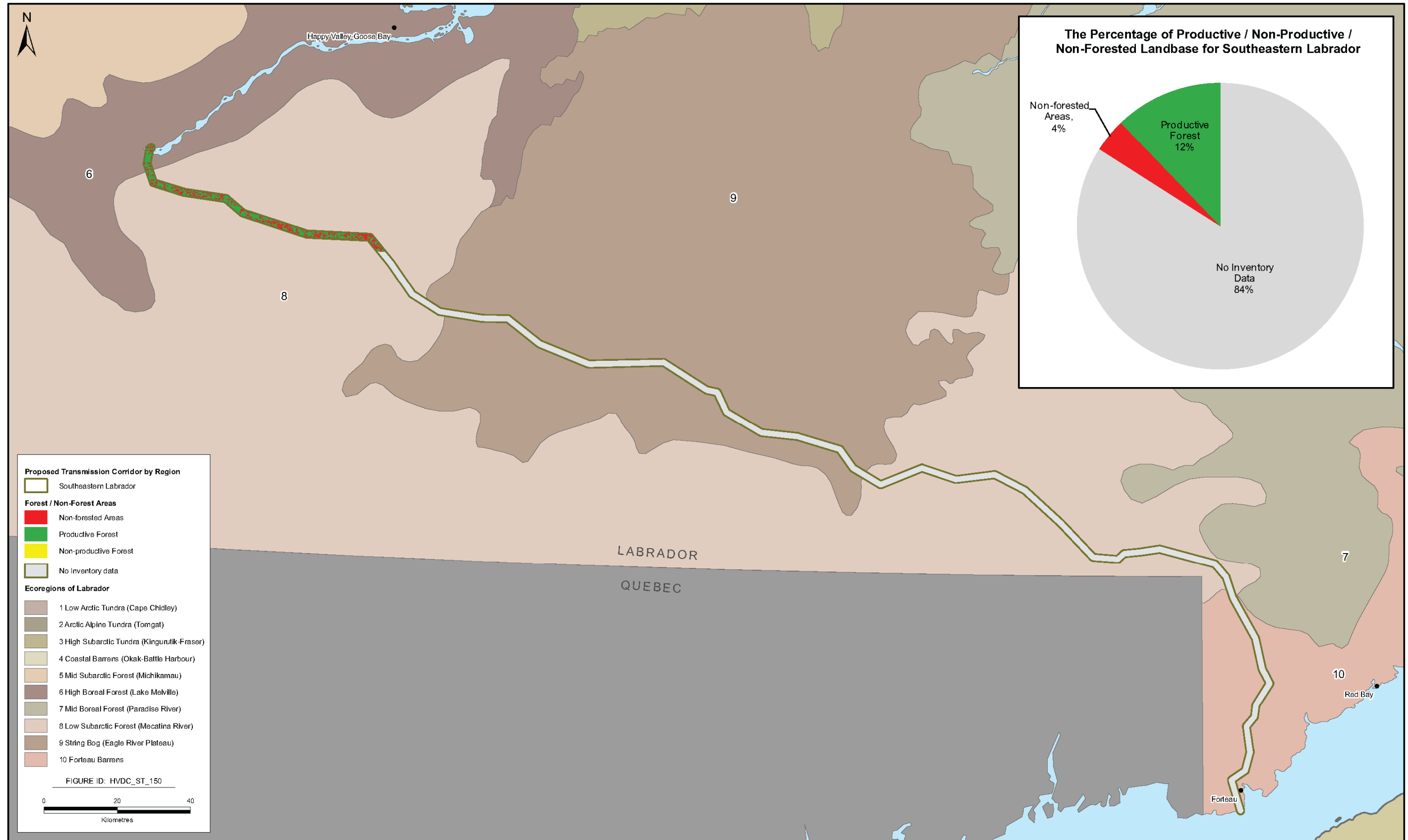


Figure 3.2 Available Forest Landbase Summary (Transmission Corridor) – Northern Peninsula

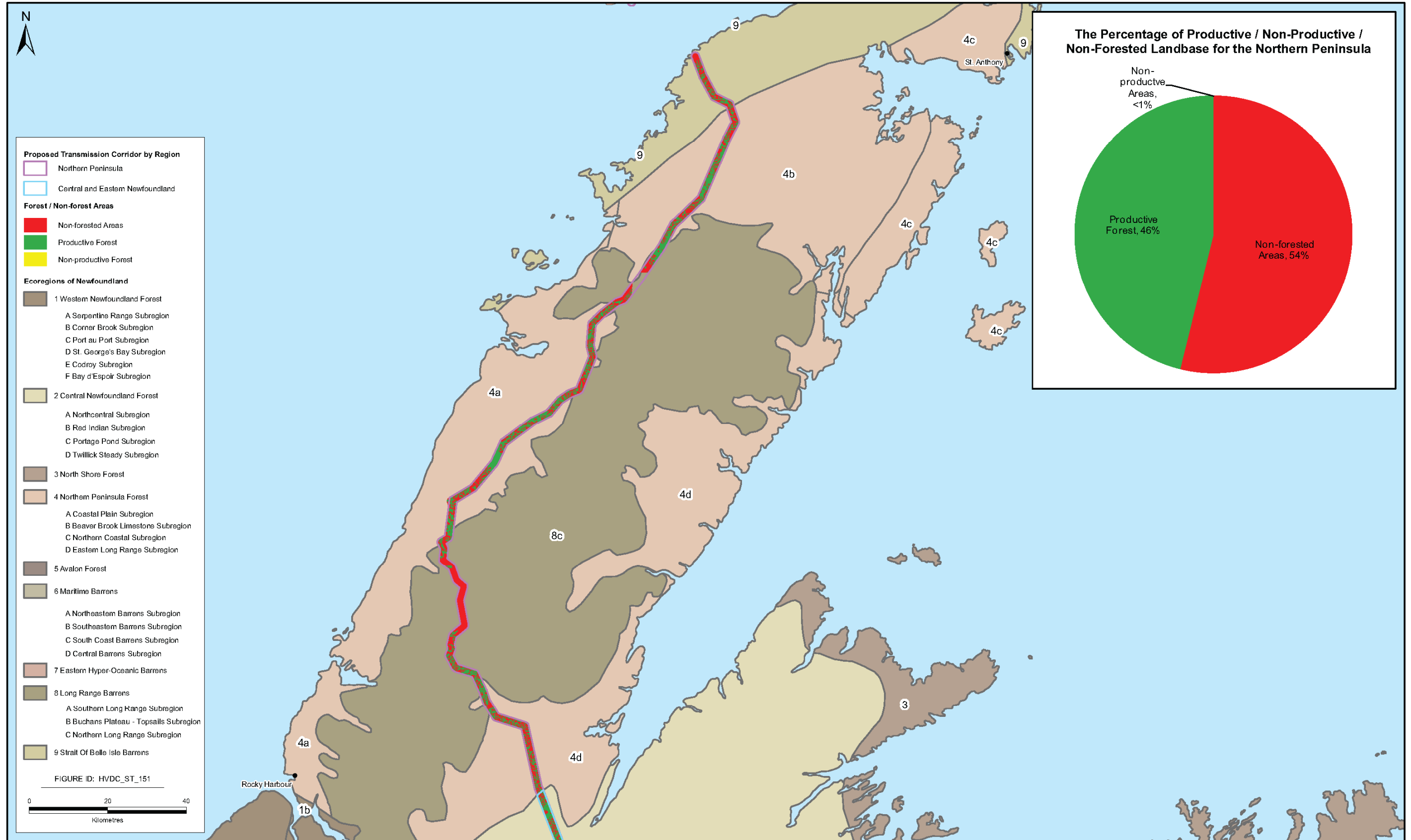


Figure 3.3 Available Forest Landbase Summary (Transmission Corridor) – Central and Eastern Newfoundland

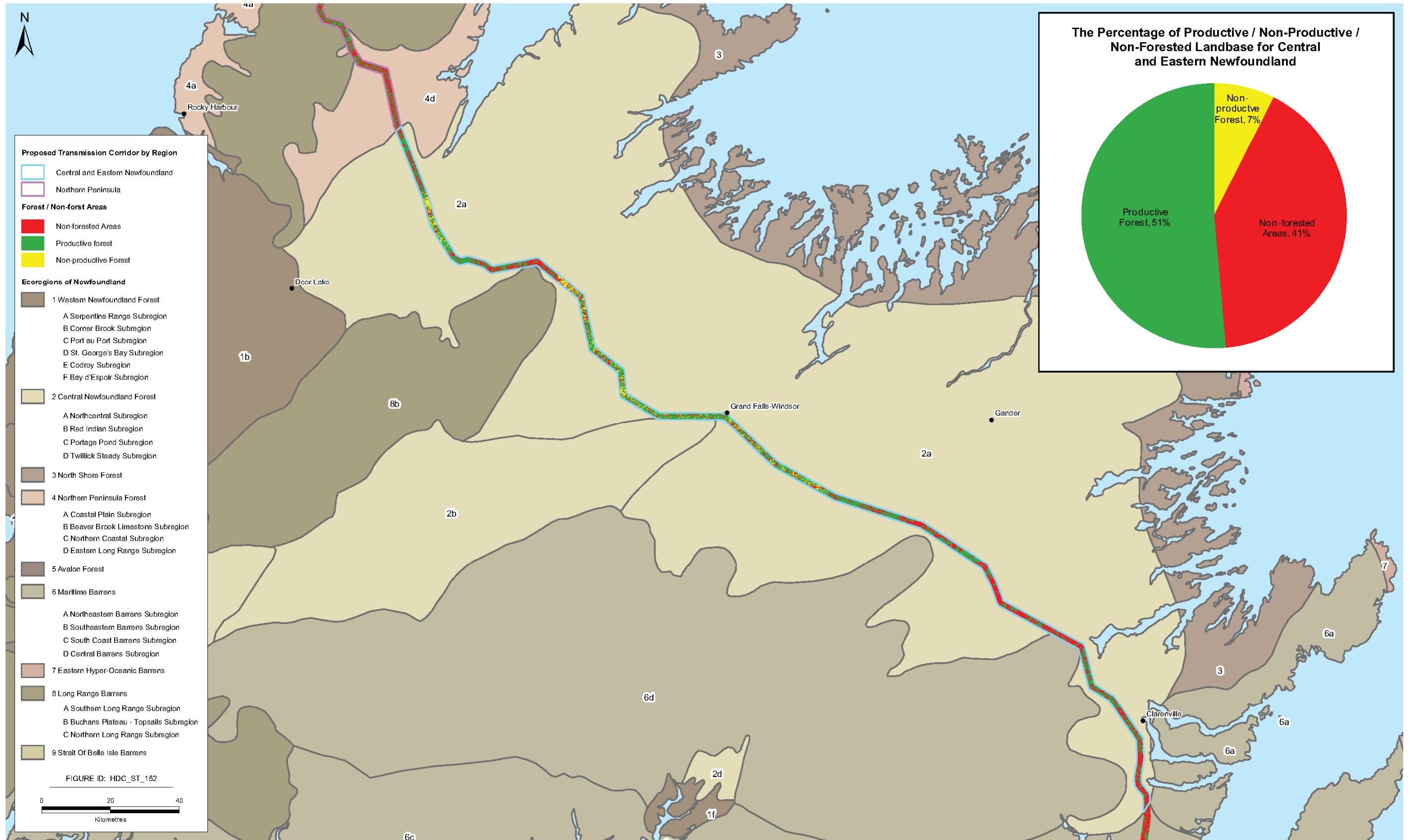
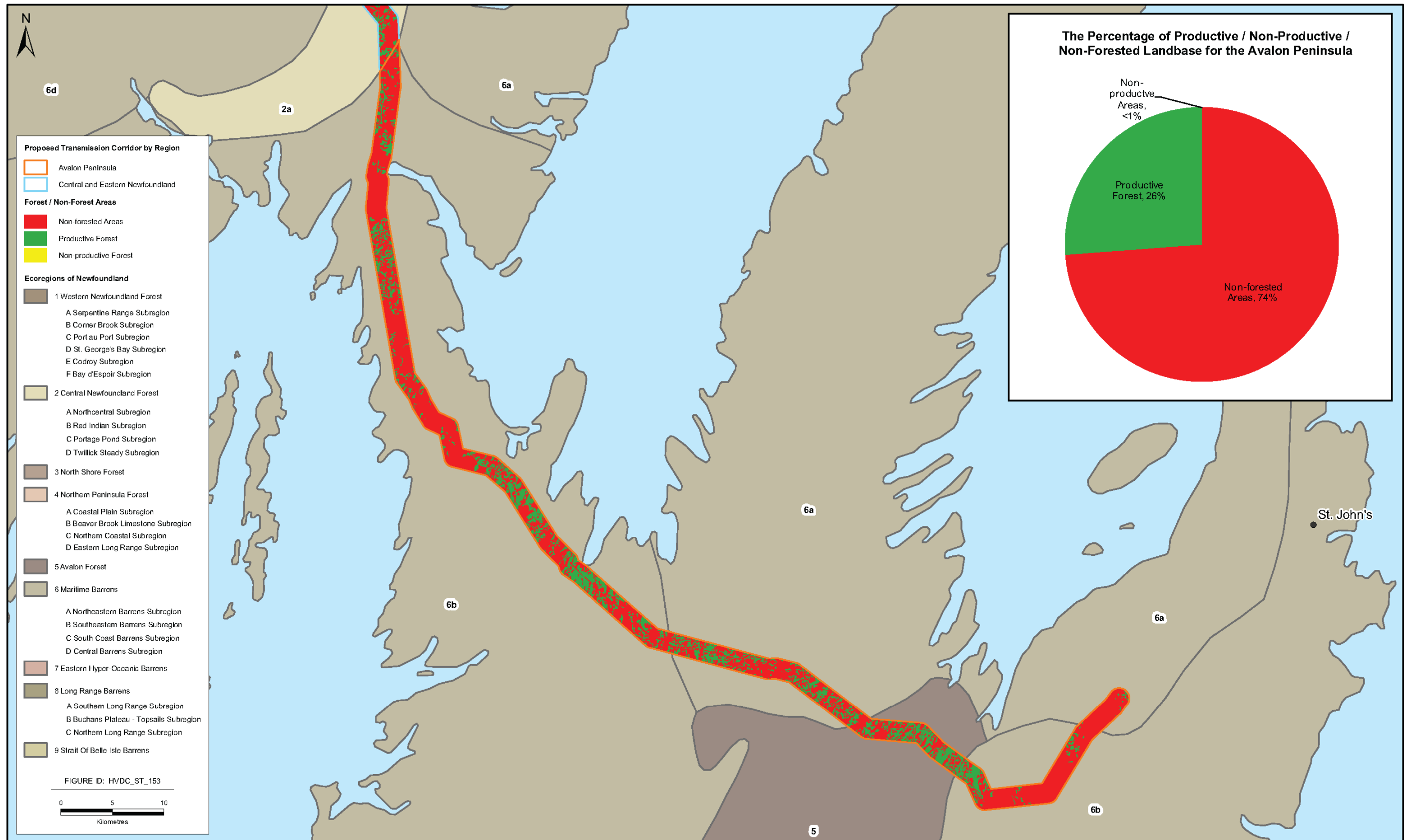


Figure 3.4 Available Forest Landbase Summary (Transmission Corridor) – Avalon Peninsula



4.0 SUMMARY AND CONCLUSIONS

Nalcor Energy is proposing to develop the *Labrador – Island Transmission Link*, an HVdc transmission system extending from Central Labrador to the Island of Newfoundland's Avalon Peninsula. The EA of the Project is ongoing, with an EIS being prepared by Nalcor Energy.

In preparation for and support of the EA of the Project, this *Timber Resources Component Study* has been undertaken in order to assess and describe the existing timber resources in the area of, and which may interact with, the proposed Project. This report presents the results of that timber resource analysis, which was completed for the proposed (2 km wide) transmission corridor and the eventual transmission line route itself (assuming, for analysis purposes, a 60 m wide cleared right-of-way down the centreline of the proposed transmission corridor). The study is based primarily on forest inventory data (i.e., stock / stand tables, yield curves) obtained from the NLDNR Forest Resources Branch and used to define and delineate available forest landbase and their associated GMV by stand type (softwood and hardwood).

The Project will cross 14 of the 26 FMDs in the province, including 11 FMDs (1, 2, 4, 6, 9, 10, 11, 12, 16, 17, and 18) on the Island of Newfoundland and three FMDs (19A, 19C and 21) in Labrador.

On the Island of Newfoundland, the GMV (m³) of productive forest (softwood / hardwood) within the transmission corridor and right-of-way is estimated at 3,872,123.9 m³ and 121,200.4 m³, respectively. In Labrador, the GMV of productive forest is calculated for softwoods only, with the available timber volumes in the transmission corridor and right-of-way estimated at 1,186,841.9 m³ and 29,582.6 m³, respectively.

Total volumes of timber resource for the entire Project's transmission corridor and right-of-way across Newfoundland and Labrador are estimated at 5,058,965.8 m³ and 150,783.1 m³, respectively.

As indicated above, the timber resource analysis conducted through this study has estimated that the clearing of an approximately 60 m wide right-of-way for the transmission link would result in approximately 150,783.1 m³ of timber resources being harvested or otherwise altered during the multi-year construction phase of the Project. By way of comparison, this amount of timber represents less than 6 percent of the current annual allowable cut (2,535,680 m³, softwood and hardwood) in Newfoundland and Labrador (DNR 2006), and less than 2 percent of the total volume of timber that is approved to be harvested in the most recent 5-year forestry operating plans in the 14 FMDs crossed by the Project in Newfoundland and Labrador (see AMEC 2010).

5.0 REFERENCES

- AMEC Earth and Environmental. 2010. Labrador - Island Transmission Link - Socioeconomic Environment: Communities, Land and Resource Use, Tourism and Recreation Component Study. Prepared for Nalcor Energy.
- DNR (NL Department of Natural Resources). 2006. Wood Supply Analysis 2006-2010 Annual Allowable Cut. Available online: http://www.nr.gov.nl.ca/forestry/management/woodsupply/pdf/Backgrounder_Final_AAC_2006.pdf
- Government of Newfoundland and Labrador. 1990. *The Forestry Act*. Queen's Printer, St. John's, NL. 17 pp.
- Government of Newfoundland and Labrador. 2003. *Provincial Sustainable Forest Management Strategy*. Department of Natural Resources, St. John's, NL.
- Government of Newfoundland and Labrador. 2005. Provincial Forest Inventory Data. Department of Natural Resources, St. John's, NL.
- Jennings, D. 2010. Regional Ecosystem Planner. Department of Natural Resources. Happy Valley - Goose Bay, NL. Personal conversation. April, 2010.
- Payne, S. 2010. Supervisor of Data Acquisition. Department of Natural Resources. Corner Brook, NL. Personal conversation. September, 2010.
- Stantec Consulting Ltd. 2010. Ecological Land Classification. *Labrador – Island Transmission Link*. Final Report. Prepared for Nalcor Energy, St. John's, NL.

APPENDIX A

Study Team

Study Team

Role	Personnel
Component Manager	Stephen Rowe
Lead Report Author	Sean Bennett
GIS and Remote Sensing	Stephen Rowe
	Peter Miles
	Zach Bartlett

Zach Bartlett, B.Sc., is a GIS Technician with the Information Management team at Stantec’s St. John’s office. His experience comes from a combination of public sector GIS positions and work related to his Masters of Science program. Through these various jobs and projects, he has considerable experience with spatial analysis, remote sensing, cartography, data management, and report writing, as well as some experience in object-oriented programming. Since starting with Stantec, Zachary has spent time working on Nalcor Energy’s proposed Lower Churchill Hydroelectric Generation and Transmission Link Projects, Aurora Waterfowl Surveys, IEMR Waterfowl Surveys and the Hebron Project. Prior to joining Stantec in 2010, Zachary was employed on a part-time basis with AMEC Earth and Environmental. Additionally, he worked on several projects ranging from deep-sea coral management, fisheries management and public health studies.

Sean Bennett, B.Sc., P.Biol., R.P.F., is a Professional Biologist (ASPB) & Professional Forester (CAPF) with over 14 years experience in the area of environmental consulting. A technical professional with focus on the assessment and characterization of terrestrial ecosystems, Mr. Bennett has provided expertise and coordinated projects throughout Canada in accordance with applicable federal and provincial (Sask., AB, BC, YK, N.W.T., Nunavut) regulatory requirements. Proficient in botanical/vegetation inventories (including taxonomy and species identification) and soil classification (Canadian System of Soil Classification), with demonstrated experience in the application of Ecological Land Classification (ELC) principles, he has conducted baseline environmental studies evaluating a variety of habitats to identify site-specific constraints (i.e., environmentally significant/sensitive areas) and develop appropriate mitigative measures for proposed developments.

Peter Miles, B.Sc., was a GIS Specialist with Stantec in St. John’s, Newfoundland. Mr. Miles has involved himself in various GIS and AutoCAD assignments including ecosystem mapping, linear corridor utility and pipeline projects, wetland and watershed studies, biophysical assessments, mapping of environmentally significant areas and species at risk, and a range of wildlife/resource management projects.

Stephen Rowe, B.Sc., is a GIS Specialist and was Lead of the Information Management department with Stantec in St. John’s, Newfoundland over the course of the project. Since graduating with a Bachelor of Science degree in Geography in 1998, he has gained over nine years experience as a GIS professional. Mr. Rowe has a diverse background as a GIS professional including working for Parks Canada, Provincial Parks and for a seismic surveying company. Mr. Rowe has involved himself in various GIS and AutoCAD assignments including ecosystem mapping, linear corridor utility and pipeline projects, wetland and watershed studies, biophysical assessments, mapping of environmentally significant areas and species at risk, and a range of wildlife/resource management projects.

