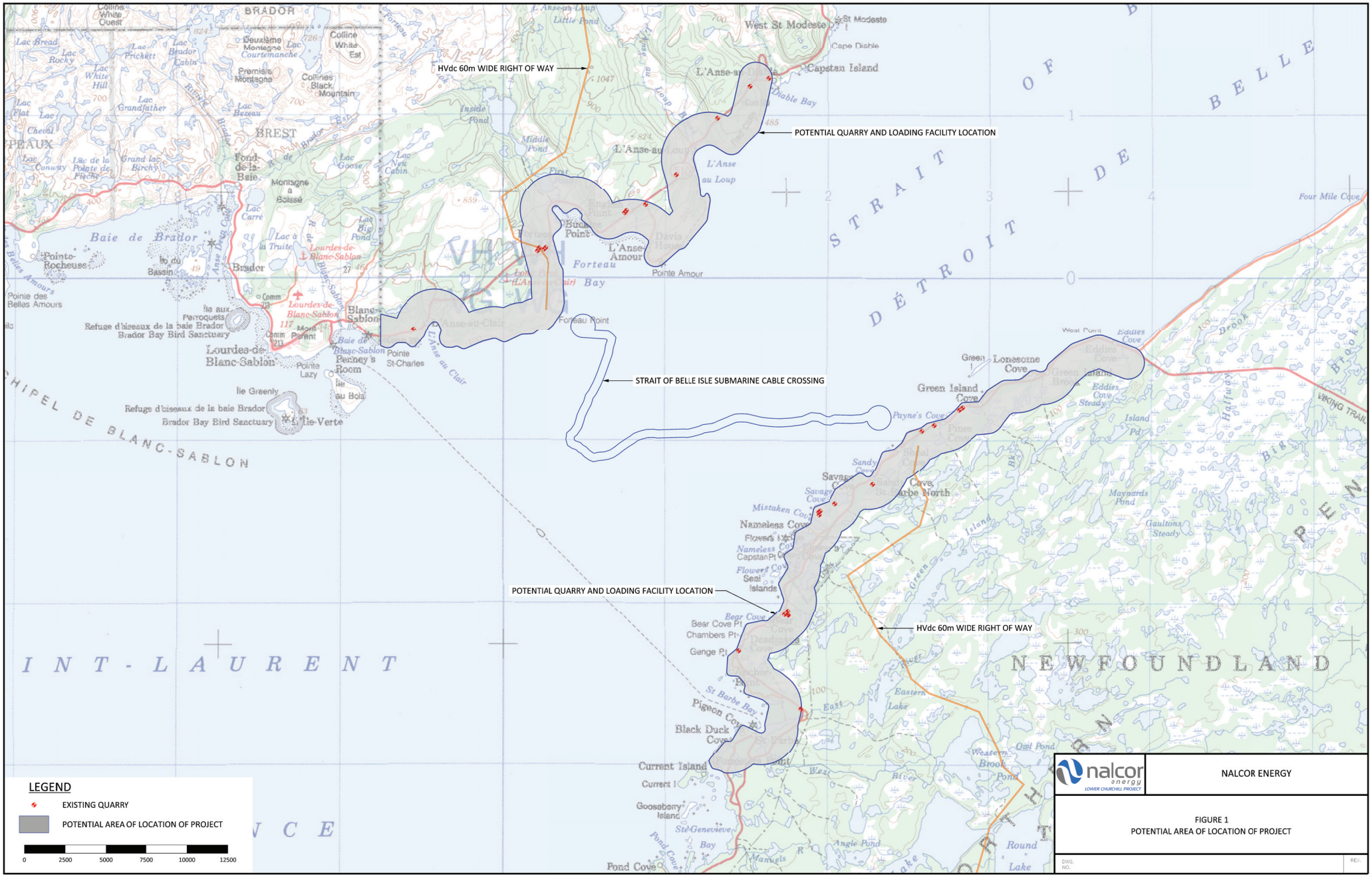

HVdc 60m WIDE RIGHT OF WAY
POTENTIAL QUARRY AND LOADING FACILITY LOCATION
STRAIT OF BELLE ISLE SUBMARINE CABLE CROSSING
POTENTIAL QUARRY AND LOADING FACILITY LOCATION
HVdc 60m WIDE RIGHT OF WAY
LEGEND
EXISTING QUARRY
POTENTIAL AREA OF LOCATION OF PROJECT
0
2500
5000
7500
10000
12500
NALCOR ENERGY
FIGURE 1
POTENTIAL AREA OF LOCATION OF PROJECT
DWG. NO.
REV.

- It is assumed that the diamond wire machine and the hydraulic jacks are powered by diesel generators, hence emissions are calculated for the use of the diesel generators.
- There are 10 dump trucks at the quarry at any given time. The remaining 20 trucks are either at the loading facility or in transit.
- The crusher processes 1,000,000 tonnes of rock over the life of the Project.
- Crushed rock may be stockpiled on-site before transport, or after transport near the loading facility. On windy days, fugitive dust may be generated by wind erosion of these stockpiles, depending on the size of the rock pieces, the presence of fine dust, if any, and the extent of mitigation such as dust suppressant in the form of water, if any. Since dust from this source is expected to be minimal, these emissions were not estimated. If dust is an issue, the stockpile may be wetted to reduce emissions.

The transportation of the crushed rock to the loading facility generates air contaminants and GHG emissions from the combustion of fuel (diesel), as well as sound emissions. The following assumptions were made regarding transportation:

- With respect to the estimated 500 trucks per day (approximately 21 trucks per hour), it is assumed that there are 500 round trips from the quarry to the loading facility.
- It is assumed that trucks travel a maximum of 10 km one way, and 5 km of the haul route is paved and 5 km of is unpaved.
- Days with precipitation do not generate road dust, and emissions were prorated to reflect this.
- A road dust control factor of 70% was applied in light of Nalcor's standard mitigation for the Project.
- Fugitive dust emissions from the crushed rock during transportation were not estimated, as there is no quantification methodology available. A control that could be used is to wet the material following loading if required.

The construction of the loading facility requires the use of heavy equipment (e.g., cranes). From this facility, loaders load crushed rock from stockpiles onto vessels for use in the placement of the rock berms for the submarine cable protection across the Strait of Belle Isle. The following assumptions were made:

- the loading facility area is 80,000 m^2 and site preparation in this area takes 2 to 3 months;
- the list of assumed mobile equipment operating at the loading facility, including number, horsepower, and operating hours, is provided in Table 2-3; and
- noise from the loading of crushed rock onto marine vessels was previously assessed in the EIS (Vol 2B, Chapter 11, Section 11.2.5.5), and is therefore not assessed in this document.

Crushed rock (with diameters of 5 to 25 cm) may be stockpiled at the loading facility. On windy days, there may be fugitive dust generated by wind erosion of these stockpiles. Since dust from this source is expected to be minimal, these emissions were not estimated. If dust is an issue, the stockpile may be wetted to reduce emissions.

The assessment presented herein is conducted for the activities associated with the Project, as follows:

- rock quarrying;
- transport of rock to the loading facility; and
- construction of a loading facility.

The rock quarry and loading facility are not currently anticipated to be used during the operation and maintenance of the Labrador-Island Transmission Link, or have substantive maintenance requirements. As a

result, releases to the atmosphere during operation and maintenance of the Labrador-Island Transmission Link are not considered further.

The potential environmental issues, indicators and interactions, analytical methods, and effects descriptors remain unchanged from those presented in the EIS (Volume 2B, Chapter 11).

2.1 Environmental Assessment Study Areas

2.1.1 Spatial Boundaries

The spatial boundaries for the assessment of potential environmental effects of the Project on the Atmospheric Environment were determined by considering the activities with the potential to cause effects and by the zone of influence associated with Project activities. The spatial boundaries include the Local Study Area (LSA) and the Regional Study Area (RSA) and are based on a combination of experience with similar projects (Stantec 2010a; Jacques Whitford 2009; Jacques Whitford 2006) and professional judgment.

- **LSA** - where the Project-related components and activities that may affect the Atmospheric Environment VEC will occur. The LSA therefore focuses on the rock quarry, transportation route and loading facility.
- **RSA** - an area extending 1 km out from the LSA. The RSA is considered sufficiently wide to capture any such effects (i.e., at this distance, atmospheric releases from Project-related activities are likely to be sufficiently dispersed to meet the regulatory objectives, guidelines and standards).

Regarding Climate (GHG emissions), in recognition of the global nature of the potential environmental effects of a change in GHG emissions on global climate, the spatial boundary for the assessment of the environmental effects of GHG emissions on the Atmospheric Environment is the global environment, with regional and provincial comparisons used to provide perspective.

2.1.2 Temporal Boundary

The temporal boundary for the assessment of potential effects of the Project on the Atmospheric Environment is the period of time over which the Project activities will occur, which is estimated to be from November 2015 to December 2016 (396 days).

2.2 Existing Conditions

Overall, the climate and GHG emissions of Newfoundland and Labrador (NL) are consistent across the province, with some variation across the region containing the Project due mainly to the presence of power stations or heavy industry at specific locations. The existing air quality is representative of a rural and clean environment, most of the time. The ambient sound pressure levels for much of NL are dominated by the sounds of nature, and range from 25 A-weighted decibels (dB_A) to approximately 40 dB_A. For more information on existing conditions, see Section 10.3 of the EIS (Vol 2A, Chapter 10).

Within the potential area for placement of the Project (Figure 1), there are 28 quarries along the coasts of the Strait of Belle Isle (see Section 1). Quarrying operations are sources of releases to the atmosphere, particularly air contaminants (i.e., dust), and noise (unwanted sound).

2.3 Methods

For Climate (GHG emissions) and Air Quality, the potential effects of the Project-related releases have been quantified and placed in context with the regulatory requirements, using a combined qualitative and quantitative approach (in the absence of dispersion modelling). For Sound, the same approach is used (i.e., qualitative and quantitative) with noise modelling to aid in estimating sound pressure levels anticipated from the Project.

Climate (GHG Emissions)

Following the guidance (CEA Agency 2003, internet site), the Project-related effects on Climate (GHG emissions) are assessed by conducting a preliminary scoping of GHG (i.e., CO_2, N_2O and CH_4) emissions, determining jurisdictional considerations (including GHG policies or plans) and by considering the magnitude, intensity and timing of Project emissions. Specifically, consideration is given to the quantities of GHG emissions resulting from the Project and the relative amounts compared to provincial, national and global GHG emissions. As recommended by the CEA Agency (2003, internet site), a GHG Management Plan is warranted only if GHG emissions are considered either medium or high.

Air Quality

As outlined in the EIS (Volume 2B, Chapter 11, Section 11.2.4), several different and key features of the Project-related activities were considered in the analysis of effects on Air Quality (e.g., nature of the Project-related activities, nature of the release to the atmosphere, types and quantities of substances released, duration and location of release, ambient air quality).

Following this methodology (i.e., screening and ranking of different Project activities and their potential for environmental effects on Air Quality), a combined quantitative and qualitative assessment was conducted. During the Project, the releases to the atmosphere would consist primarily of combustion gases and particulate matter from fuel consumption in heavy equipment and airborne dust from fugitive sources (e.g., dust from heavy equipment activities or trucks on unpaved roads). Further, given the nature of the Project activities and air contaminant emissions (i.e., minimal and temporary), both dispersion modelling and supplementary ambient air quality monitoring were not warranted for this assessment. Nevertheless, the Project-related environmental effects on air quality are considered quantitatively and qualitatively.

The emission estimates from Project equipment (e.g., heavy equipment) and Project activities (e.g., blasting) are considered in conjunction with the ambient air quality (EIS, Volume 2A, Chapter 10, Section 10.3.2). This is completed to establish the potential for the Project to cause the ambient objectives, guidelines or standards (EIS, Volume 2A, Chapter 10, Section 10.3.2) to be exceeded. The emissions inventory is based on the assumed type of equipment, number of equipment units, expected hours of operation of each unit, and assumed rated horsepower. These assumptions are based on the Study Team's experience with similar projects. Emissions are estimated using the US EPA NONROAD program (US EPA 2008, internet site).

As such, changes in Air Quality are assessed in the context of potential Project-related releases of air contaminants and the ground-level concentrations of these air contaminants in the LSA and RSA.

Sound

Sound emissions may result from Project activities through the operation of heavy equipment (i.e., cranes, excavators, blasting). Therefore, an evaluation of the potential effects resulting from the Project on ambient sound levels was undertaken as a part of this assessment.

The evaluation involved estimating ambient sound levels near a rock quarry and loading facility, identifying receptors at various distances from the rock quarry, haul route, and loading facility, predicting the sound emissions related to the Project, adding the predicted sound pressure levels to the current background levels, and comparing the results to available noise standards and guidelines.

Baseline sound level monitoring was not conducted for this environmental assessment. Instead, this assessment relied on the methodology and information published by the Alberta Energy Resources Conservation Board (ERCB) (2007) to characterize the existing ambient sound levels in rural and/or remote areas. In Alberta (and later adopted in British Columbia), the energy permitting agencies (i.e., ERCB) have adopted default levels for background sound that are the result of several sampling programs. Based on the similarity of the landscapes of variable boreal forests, and professional experience of the Atmospheric Environment Study Team at similar areas, it was concluded that no substantive difference exists between the

assumed ambient levels, such as those implemented in western Canada, and the majority of the LSA and RSA. As such, ambient sound levels in rural and remote areas were assumed to be 45 dB_A during the day (0700 to 2200 hrs) and 35 dB_A during the night (2200 to 0700 hrs).

As discussed in the EIS (Volume 2B, Chapter 11, Section 11.2.4.1), where the LSA and RSA are in close proximity or overlap with larger communities and cities, the ambient sound levels of these areas were assumed to be 5 dB_A higher, 50 dB_A during the day and 40 dB_A during the night. According to the ERCB (2007), these representative values of remote areas are appropriate for use in the absence of baseline monitoring. Further to this, the assumed values are similar to those measured by the Study Team from other baseline monitoring studies in remote areas such as Ridley Island (British Columbia), Fort McMurray (Alberta), Lameque (New Brunswick), Digby (Nova Scotia), and Voisey's Bay (Newfoundland and Labrador) (Stantec 2010b). For the purpose of this assessment, and to account for proximity to the ocean (i.e., source of sound from wind and waves) and ongoing rock quarrying activity in the area, the Study Team has selected the baseline values of 50 dB_A during the day and 40 dB_A during the night.

As the specific locations of the quarry and loading facility are not known at this time, sound pressure levels are estimated for five locations near the quarry, five locations near the loading facility, and five locations along the haul route. The locations and their distance from the quarry, loading facility, and road are presented in Table 2-1.

Table 2-1 Selected Receptors and Distances to Project Components

Receptor Number	Project Component	Approximate Distance to the Project Component (m)
1	Quarry	50
2	Quarry	100
3	Quarry	250
4	Quarry	500
5	Quarry	1,000
6	Haul Route	50
7	Haul Route	100
8	Haul Route	250
9	Haul Route	500
10	Haul Route	1,000
11	Loading facility	50
12	Loading facility	100
13	Loading facility	250
14	Loading facility	500
15	Loading facility	1,000

Estimates of sound emissions and corresponding sound power levels from equipment and activities associated with activities at the rock quarry, the haul route, and the construction of the loading facility were used to assess potential environmental effects from the Project. Predictions of representative sound pressure levels resulting from the Project were then made using the CadnaA model (Computer Aided Noise Abatement, version 4), based on the sound power levels. The CadnaA model is a recognized sound attenuation model and is in compliance with the predictive methods of ISO 9613-1 and ISO 9613-2 (International Organization for Standardization (ISO) 1993, 1996).

Natural factors typically influence ambient sound levels in the outdoor environment (e.g., wind, waves, birds, animals) and human activities (e.g., construction equipment, vehicle traffic, sporting events) also have an influence. Weather conditions such as temperature, humidity, wind direction and wind speed affect the distance that sound travels through the atmosphere. In addition, changes in the physical properties of the environment (e.g., such as a change in land cover, or the removal or construction of physical structures such as buildings) can result in changes to the sound propagation characteristics of the environment. Sound pressure levels naturally decrease with increasing distance from the sound emission source and local topographical features, such as hills or heavily wooded areas, reduce the transmission of sound. The CadnaA noise model accounts for the following:

- distance attenuation (i.e., geometrical dispersion of sound with distance);
- atmospheric attenuation (i.e*.,* the rate of sound absorption by atmospheric gases in the air between sound sources and receptors);
- ground attenuation (i.e., effect of sound absorption by the ground as sound passes over various terrain and vegetation types between source and receptor);
- screening effects of surrounding terrain; and
- meteorological conditions and effects.

Since the specific locations of the quarry, haul route, and loading facility are not known at this time, the analysis does not consider the screening effects of surrounding terrain. As a result, the predicted sound pressure levels are conservatively over-estimated.

Regulated limits for noise emissions are not imposed in NL unless by operating permit or as a requirement of an environmental assessment. As there are no noise guidelines or standards in the province, Health Canada's approach to noise assessments was adopted for this Project. Health Canada provides advice through a review process that sets out specific requirements for their information needs based on concern over noise and its ability to cause effects on community health (Health Canada 2009). Their concern is directly related to the proximity of humans to a project's activity. Health Canada environmental assessment guidance (Health Canada 2009) recommend a separate assessment of potential environmental effects on Sound for daytime and nighttime. Noise during the nighttime hours is perceived as more intrusive and of concern with regard to the potential for sleep disturbance. The WHO established a guideline of 30 dB_A inside a dwelling to avoid sleep disturbance (WHO 1999, internet site). Health Canada uses the percent of the nearby population that would be highly annoyed (% HA) metric as an assessment measure for human health effects, and this is based on long-term composite averages of day and night sound pressure levels (Health Canada 2009).

Health Canada's draft guidance document on noise assessments for CEA Agency projects (Health Canada 2009) also addresses projects lasting more than one year. The method for assessing effects of long-term construction is based on calculating the % HA using the procedure published in ISO 1996-1:2003 (ISO 2003). The procedure includes adding a 10 dB_A penalty to nighttime sound pressure levels before calculating % HA. If the % HA increases by 6.5% or more following mitigation, compared to the baseline condition, then the potential environmental effect may be of concern. In terms of schools and pre-schools during Project activity, the predictions for the Project are compared with the values in the Health Canada (2009) guidance. A summary of Health Canada's (2009) relevant guidance to noise assessments is provided in Table 2-2.

Table 2-2 Summary of Health Canada's Guidance to Assessing Noise

Phase	Criterion	Limit	Period	Rationale	Reference
Project (>1 year)	% HA	Change in % HA <6.5%	Day-Night	Annoyance is deemed to be a community health impact	Health Canada (2009)
Project (>1 year)	Sound pressure level indoor at schools	Leq <40 dBA	Class Time	Maintenance of 100% speech intelligibility indoors	Health Canada (2009)
Project (>1 year)	Leq and maximum sound pressure level (Lmax) indoors at schools, hospitals, senior residences, any sites where socially significant First Nations cultural or religious ceremonies take place	Leq <30 dBA; Fewer than 10 to 15 exceedances of 45 dBA	Night	Sleep interruption	WHO as adopted by Health Canada (2009)

Additional adjustments to sound levels for "quite rural areas" were not applied to the sound level data presented above. The % HA predictions were calculated using the equation provided in Annex D of ISO 1996-1 (2003) and are based on the day-night average sound level which includes a 10 dB adjustment to night time sound levels. This Annex does state "Research has shown that there is a greater expectation for and value placed on "peace and quiet" in quiet rural settings. In quiet rural areas, this greater expectation for "peace and quiet" may be equivalent to up to 10 dB"; however, the ISO document is unclear as to how this potential adjustment should be applied. According to the document "National Guidelines for Environmental Assessment: Health Impacts on Noise" (Health Canada 2005), "a 10 dB adjustment should be used if the baseline is a quiet rural setting". This guidance is provided for projects where the noise generating activity will represent a permanent change to existing sound levels, and the same guidance is not provided for projects with construction phases lasting less than one year or greater than one year.

2.3.1 Environmental Effects Descriptors

The likely effects of the Project were assessed for climate (GHG emissions), Air Quality and Sound. The likely effects on Climate (GHG), Air Quality and Sound from the relevant Project activities were characterized using a combination of environmental effects descriptors, as described in the EIS (EIS Vol 2B, Chapter 11, Table 11.2.4-3).

2.4 Overview of Project and Associated Effects Management

Nalcor has Environmental Policy and Guiding Principles that are designed to maintain a high standard of environmental responsibility and performance through the implementation of a comprehensive environmental management system. Following the guiding principles of 'Preventing Pollution', 'Improve Continually', and 'Comply with Legislation', Nalcor is committed to reducing adverse environmental effects to the extent practical.

During the Project, the activities that are relevant to Atmospheric Environment are:

- use of heavy equipment that includes loaders, excavators, dump trucks, and cranes;

- blasting of rock at the quarry;
- transport of crushed rock from the quarry to the loading facility; and
- storage of raw material (e.g., aggregate storage piles of rock) at the loading facility site.

These activities may result in the release of GHGs, air contaminants (including dust), and sound to the atmosphere.

Following the federal guidance (CEA Agency 2003, internet site), the Project will be completed in a manner that will be sensitive to the minimization of air contaminant and GHG emissions, where feasible. While the overall GHG emissions from the Project are anticipated to be "low" as per the classification in CEA Agency (2003, internet site), management measures will nevertheless be incorporated to mitigate the emissions from the Project. The following measures will be implemented wherever technically and economically feasible:

- vehicles and equipment must comply with the relevant federal vehicle emissions and energy efficiency standards that are applicable at that time;
- engine idling will be minimized and environmental awareness training with key contract personnel will be conducted on this topic;
- dust suppressants (e.g., water or crushed gravel) will be applied where required;
- well maintained equipment with quality mufflers will be used, and equipment maintenance schedules will be followed;
- during windy conditions, dust complaints will be addressed on a case by case basis and mitigation (e.g., dust control) will be considered locally as appropriate; and
- haul distances for Project material will be limited to the extent practical.

Short-term Project-related increases in noise will occur. These noises would likely result from, but are not limited to, the operation of heavy equipment needed to collect and transport rock, dig footings and foundations for the loading facility, and erect structures. Noise increases will be localized and transient, exposing adjacent areas for a limited time as the Project proceeds. The Project will be completed in a manner such that work is conducted as expeditiously as safety allows with applicable mitigation in place to minimize noise exposure at sensitive receptors. Locations for Project components will consider receptor locations to minimize exposure to noise.

A combination of mitigation measures will be employed for the Project, especially those activities undertaken within 150 m of residences, schools, medical facilities, retirement homes and places of spiritual importance, so that the Health Canada (2009) noise limits are met inside these facilities. These measures will be incorporated into Project contractual documents, as appropriate for the location, and will include:

- high noise-producing Project equipment will be strategically placed as far away as practical from receptors;
- all equipment will have appropriate mufflers and will be well maintained;
- blasting activities will be designed and undertaken in compliance with provincial and federal regulations;
- blasting mats will be used in environmentally sensitive areas;
- the size of explosive charges will be limited during blasting activities;
- sound barriers or berms may be used to minimize sound pressure levels, if warranted;
- during the Project, several measures will be in place to reduce noise including limiting the drop height; and
- frequent and open communication will be conducted with nearby residents to identify and address any noise complaints. Complaints will be addressed on a case by case basis and mitigation options

investigated; this could include temporary relocation during high sound generating Project activities (i.e., blasting).

2.4.1 Project-related Effects: Climate (GHG Emissions)

GHG Emissions from Project Equipment

Project activities will occur over a period of 396 days (i.e., November 2015 to December 2016). The majority of the GHG emissions will be generated by operation of heavy equipment. The Project equipment list is as follows:

- pneumatic drillers;
- diamond wire machines;
- chain saws;
- hydraulic jacks;
- derrick cranes;
- front end loaders;
- excavators;
- dump trucks; and
- generators.

Using this equipment list, and assumed equipment parameters (Table 2-3), the Project-related GHG emissions are estimated.

Table 2-3 Assumptions Regarding Project Equipment

Equipment[(a)]	Number	Location (#)	Horsepower (hp)	Operating Hours per Day (hr/d)
Pneumatic Drillers	5	Loading facility	500	12
Chain Saws	2	Loading facility and quarry	3.5	6
Derrick Cranes	2	Loading facility	300	12
Front End Loaders	6	Loading facility (3) quarry (3)	300	12
Excavators	6	Quarry	300	24
Dump Trucks	30	Loading facility, haul route, quarry	300	2[(b)]
Generators	4	Loading facility (2) quarry (2)	175	24

(a) Diamond wire machines and hydraulic jacks are assumed to be powered by the diesel generators.

(b) Dump trucks are assumed to be idling for a maximum of 2 hours at the quarry and loading facility, in accordance with Nalcor's idling mitigation. Emissions while transporting material are estimated separately from idling emissions.

Emissions of GHG from equipment at the quarry and loading facility were estimated based on the assumed horsepower, operating hours, and number of equipment units. The US EPA NONROAD program does not have emission factors for CH_4 or N_2O, and other emission factor sources use fuel consumption as the activity indicator. Given the preliminary nature of the Project activities, the volume of fuel consumed by the equipment is not available for estimation; however, CH_4 and N_2O emissions are often small in comparison to CO_2 emissions. For dump trucks, it was assumed that with the implementation of an anti-idling policy, dump

trucks at the quarry and loading facility would idle for a maximum of 2 hours per day. The total GHG emissions from mobile equipment operation at the quarry and loading facility is 22,499 tonnes CO_2e over the Project period.

In addition to mobile equipment, a crusher will be on-site to crush blasted rock to the desired size. The crusher was assumed to crush 1,000,000 tonnes of rock and operate 12 hours per day. Using the US EPA NONROAD emission factors for diesel-powered crushing equipment (US EPA 2008), and an assumed horsepower of 400 hp, the total GHG emissions from the crusher are 1,009 tonnes CO_2e over the Project period.

The detonation of explosives in the quarry may release a small quantity of methane. It was assumed that 2 tonnes of ammonia dynamite will be used in each blast, and that there were 50 blasts over the Project period. Emission factors from US EPA AP 42 were used to estimate emissions (US EPA 1980). The total GHG emissions from explosive detonation are 1.5 tonnes CO_2e over the Project period.

Emissions of GHG from the transportation of crushed rock were estimated based on the assumed distance travelled and default emission factors and fuel efficiency from the Transport Canada Urban Transport Calculator (Transport Canada 2012). For the purpose of estimation, the dump trucks were assumed to be heavy duty diesel vehicles, travelling 20 km per roundtrip and making a total of 500 roundtrips per day. The total GHG emissions from transportation of crushed rock is 4,125 tonnes CO_2e over the Project period.

Total GHG Emissions

For context, the total GHG emissions from the Project (approximately 27,636 tonnes CO_2e total) are small in comparison to the total effect on GHG emissions resulting from the Labrador-Island Transmission Link (660,953 tonnes CO_2e). It is important to note that between 2017 and 2067, the Labrador-Island Transmission Link is predicted to result in a net reduction of 100 Mt of GHG emissions due to the displacement of thermal generation at the Holyrood Thermal Generating Station.

There is a high degree of confidence in the prediction of GHG emissions associated with the Project. This is due to the conservative assumptions made for equipment horsepower and operating hours, and the use of default emission factors from the US EPA NONROAD program and the Transport Canada Urban Transport Emissions Calculator. The mitigation measures to reduce environmental effects of the Project on the Climate (GHG emissions), which include proper equipment maintenance and reduction in idling are proven and accepted methods.

2.4.2 Project-related Effects: Air Quality

Emissions from Combustion and Blasting

Activities associated with heavy equipment operation will be the largest sources of air contaminants (PM, PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO, total VOCs) for this aspect of the Project. There is also the potential for fugitive emissions of PM (dust) from several of the Project-related activities including clearing, truck loading and unloading, and blasting. Nalcor Energy will not burn slash or other debris during Project activities that would emit particles (e.g., smoke and ash) to the atmosphere and have an adverse effect on air quality. The estimates of air contaminants from Project activities include emissions from heavy equipment and the emissions of fugitive dust.

Estimates of vehicle traffic for the transportation of crushed material result in 500 roundtrips per day. The emissions of air contaminants from transportation from the quarry to the loading facility were estimated assuming a roundtrip distance of 20 km. Dump trucks are considered to be heavy duty diesel vehicles and default Transport Canada emission factors were applied.

The Project will require heavy equipment for the excavation and movement of earth materials, as well as the clearing of vegetation. The amounts and types of equipment used will vary depending on the Project

contractors, the terrain and vegetation types encountered and the type of Project activity. The mobile equipment assumed for the assessment is provided in Table 2-3 (above).

The estimated emissions for the Project, including blasting, heavy equipment, loading/unloading, crusher operation, and transportation, are presented in Table 2-4.

Table 2-4 Estimated Project Air Contaminant Emissions

Air Contaminant	Total (tonnes)
Sulphur dioxide	0.3
Nitrogen oxides	135
Carbon monoxide	60.7
Volatile organic compounds	10.8
Particulate matter	1,886
PM_{10}	587
$PM_{2.5}$	60.9

Fugitive Dust

Fugitive dust is particulate matter that originates primarily from the movement of mobile equipment on unpaved surfaces, especially during dry and windy periods. In addition to combustion gases, there is potential for fugitive dust to be generated during several Project activities.

Fugitive dust emissions can be controlled by use of best practices that include limiting the extent of clearing (i.e., limited disturbance of soil and vegetation roots) and applying dust suppressants (such as water or crushed rock) at specific locations during periods of heavy activity or dry periods to minimize airborne dust concentrations, if required. These measures were described above and will be reflected in the Environmental Protection Plan (EPP) developed for the Labrador – Island Transmission Link.

Project activities include site preparation (e.g., clearing, grubbing, blasting), excavation, and earth-moving activities. The activities are transient in nature (both in time and space), and resulting dust levels are dependent on several factors such as moisture in the soil, the location and terrain, the level of activity at a particular location and meteorological conditions at the time. Any potential for dust generation would likely occur during periods of high winds or extreme dry periods, on areas with exposed soil and / or gravel (e.g., gravel roads). The site preparation emissions associated with the quarry and loading facility were estimated using US EPA emission factors (US EPA 1998). The area disturbed by the Project is estimated to be approximately 180,000 m^2.

Emission factors from US EPA (2006) and conservative assumptions are used to estimate emissions of road dust (TPM, PM_{10}, and $PM_{2.5}$). It was also assumed that 10 km of the 20 km roundtrip haul route is unpaved. As stated above, haul trucks make 500 roundtrips per day. With respect to mitigation, a 70% reduction was applied to emissions to account for watering of the road as required to meet regulatory requirements.

The fugitive emissions from the screening and crushing of rock were estimated using US EPA emission factors (US EPA 2004) based on the quantity of rock processed (1,000,000 tonnes). Emissions of TPM were approximately 15.4 tonnes over the Project period. No mitigation was considered for this estimate; however, water sprays or baghouse dust collectors could be employed to reduce dust emissions by up to 99.9% (De Nevers 2000).

Fugitive emissions from loading and unloading of material as well as dust from blasting events were estimated to be approximately 1 tonne (TPM) over the Project period. No mitigation was considered in this estimate.

Considering the use of proven construction methods and effective mitigation, episodes of high dust concentrations are expected to be site-specific, of low frequency and short duration.

The effects of the Project on Air Quality are as follows:

- adverse, because Project activities will result in air contaminant emissions (PM, PM_{10}, $PM_{2.5}$, SO_2, NO_X, CO, and total VOCs);
- of low magnitude, because ambient concentrations of air contaminants are expected to increase in the vicinity of Project activities, but are expected to be below ambient objectives, guidelines or standards;
- Regional, because the effects will be limited to the RSA;
- low frequency; and
- of short-term duration, because air contaminants will quickly disperse once released from equipment and activities associated with the Project.

The mitigation measures to reduce environmental effects of the Project on Air Quality will be implemented wherever technically and economically feasible. Given the expected low magnitude of these releases to the atmosphere, the low frequency of occurrence, limited duration of activity at any one location, and the mitigation that will be applied, the releases of air contaminants from the Project are not expected to cause the regulatory standards to be frequently exceeded.

There is a high degree of confidence that the level of effect will not be greater than that predicted due to the conservative assumptions made for fuel estimates, duration of equipment of operation and the inherent conservativeness in the emission factors used (US EPA 2008, 2006, 2004, 1998, 1980; Transport Canada 2012).

2.4.3 Project-related Effects: Sound

The Project activities will contribute to ambient sound levels through the noise generated by the activities outlined in Section 1.1.4. Following the methodology described above for decision-making on detailed analyses, there are a number of Project activities that are considered of sufficient concern to warrant modelling and assessment. These are as follows:

- operation of heavy equipment in the quarry and loading facility;
- movements of dump trucks on the haul road; and
- blasting events.

As a conservative and precautionary approach, it is assumed, in the construction equipment noise model, that Project activities are conducted 24 hours per day throughout the Project period. A second scenario is also considered, where it was assumed that the Project activities, including transportation of crushed rock, are conducted 15 hours during the daytime throughout the Project period.

Sound power levels of equipment in the noise model were set based on values available from the US Federal Highway Administration (2006).

For the purpose of assessing compliance with the Heath Canada guidance, a 10 dB_A penalty was added to the predicted Project nighttime sound pressure levels. The baseline % HA, considering the existing background sound pressure levels of 50 dB_A (day) and 40 dB_A (night), was estimated to be 2%.

The background sound pressure levels, the maximum predicted sound pressure levels and the background plus predicted sound pressure levels during the day and night near the Project resulting from the use of heavy equipment are presented in Table 2-5.

Table 2-5 Estimated Sound Pressure Levels Near the Project – Day and Night (24 h Operation)

Distance from Project Component (m)	Project Component	Predicted 1-hour L_{eq} (dB_A)		Background + Predicted 1-hour L_{eq} (dB_A)		L_{dn} (dB_A)	Project + Background % HA[(a)]	Change in % HA
		Day[(b)]	Night[(b)]	Day[(b)]	Night[(b)]			
50	Quarry	85	85	85	95	91	83	81
100	Quarry	78	78	78	88	84	68	66
250	Quarry	70	70	70	80	76	41	39
500	Quarry	64	64	64	74	70	24	22
1000	Quarry	57	57	58	67	64	12	10
50	Haul Road	55	55	56	65	61	9	7
100	Haul Road	50	50	53	61	58	6	3
250	Haul Road	44	44	51	55	53	3	1
500	Haul Road	38	38	50	52	51	2	0
1000	Haul Road	32	32	50	51	50	2	0
50	Loading Facility	82	82	82	92	88	77	75
100	Loading Facility	76	76	76	86	82	61	59
250	Loading Facility	68	68	68	78	74	35	33
500	Loading Facility	62	62	62	72	69	21	18
1,000	Loading Facility	56	56	57	66	62	10	8

(a) % HA = percent of the nearby population that would be highly annoyed.

(b) Local terrain data were not incorporated into the modelling.

As presented in Table 2-5, the change in % HA for the predicted construction noise plus background exceeds 6.5% (i.e., the Health Canada 2009 noise limit guideline) up to approximately 1,100 m distance from the quarry and loading facility. With respect to the haul road, the change in % HA exceeds 6.5% up to a distance of 100 m from the haul road.

As stated previously, the screening effect of terrain was not considered and the predicted sound pressure levels are therefore conservatively over-estimated.

If Project activities were conducted between 0700 and 2200 (daytime), and not between 2200 and 0700 (nighttime), the Project contribution to nighttime sound pressure levels would be zero. This reduces the equivalent day-night sound pressure level and % HA. In this case, the change in % HA for the predicted Project-generated noise plus background would exceed 6.5% up to approximately 600 m from the quarry and loading facility. With respect to the haul road, the change in % HA would exceed 6.5% up to a distance of 50 m from the haul road.

For a blasting event, a sound pressure level of 94 dB_A at 15 m (US FHWA 2006) was used in the analysis, as information on the specific quantity of explosive to be detonated was not available. This estimated sound pressure level corresponds to construction blasting activities. Blasting may take place during the daytime or nighttime, subject to safety needs and whether the blast will cause disturbances in nearby receptors. It is anticipated that a maximum of 50 blasts are required for the Project, which is approximately 1 blast per week. The estimated sound pressure level following a blasting event is presented in Table 2-6.

Table 2-6 Estimated Sound Pressure Levels Resulting from the Blast

Distance from Blast	Predicted Project Contribution (dBA)	Project + Background Daytime (dBA)	Project + Background Nighttime (dBA)[(a)]
500	61	62	62
1,000	55	56	56
1,500	50	53	53
2,000	47	52	52
2,500	44	51	51
3,000	42	51	51
3,500	39	50	50

(a) Includes nighttime adjustment of +10 dB_A.

After approximately 3,500 m, the sound pressure level return to the daytime background value of 50 dB_A.

The above assessment does not consider a +12 dB adjustment for blasting noise. However, if a +12 dB adjustment is made to the predicted sound pressure level, the daytime and nighttime sound pressure levels are estimated to be 54 dB_A at 3,500 m.

Residents (within 1 km) near the blast site will be notified in advance of blasting to minimize annoyance and disturbance. Pre-blast surveys of buildings and structures for pre-existing damage may be completed if required.

The nighttime disturbance guidance of 30 dB_A (indoors) is equivalent to 45 dB_A outdoors, based on information in ISO 1996:1 (Canadian Standards Association 2005) for partially open windows. The outdoor sound pressure level may be higher before sleep disturbance occurs when windows are not open. As the screening effects of terrain were not considered in the model, including the effect that quarry walls would have on blasting (i.e., attenuation), the predicted sound pressure levels in Table 2-6 (blasting) are anticipated to be less than 45 dB_A at 3,500 m from the blast.

Because of the potential for components of the Project to be near human settlements, Nalcor will evaluate and apply the appropriate mitigation with respect to noise control (see Section 1.1.3 above or Volume 2B, Chapter 11, Section 11.2.5.1), such that Health Canada noise guidelines will not be exceeded. It is currently not expected that blasting would occur at nighttime, however, if it were required, Nalcor would implement the required mitigation such that Health Canada noise guidelines will not be exceeded.

After the incorporation of mitigation measures, and locating the quarry, haul road and loading facility at appropriate distances from receptors, the sound pressure levels during the Project activities near the quarry and loading facility are unlikely to cause more than brief annoyance during periods of particularly intensive activity. Further, considering Nalcor's proposed mitigation, events where the Health Canada criteria are frequently exceeded are not anticipated.

The effects of Project on Sound are predicted to be as follows:

- adverse, because there will be an increase in sound pressure levels that is undesirable;

- moderate in magnitude because the increase in sound pressure levels may exceed noise guideline levels;
- Beyond Regional because the effects will extend beyond the RSA; (i.e., beyond 1 km the sound will be audible, but not likely objectionable)
- low frequency; and
- of medium-term duration (intermittent over 396 days).

Given the expected moderate magnitude of the noise emissions, the low frequency of occurrence, limited duration of occurrence and the proposed mitigation, noise from the Project activities is not expected to cause the regulatory standards to be frequently exceeded.

With respect to the Sound assessment, there is a high degree of confidence for the prediction of sound pressure levels by mathematical modelling. Since the modelling did not take into account the attenuation effect of terrain, the predicted sound pressure levels are conservatively high. Background sound levels in the vicinity of human settlements are variable throughout the day due to human activities, offering a greater degree of masking of the Project-related sounds. Overall, these uncertainties are small and do not affect the overall level of confidence.

2.5 Environmental Effects Summary and Evaluation of Significance

2.5.1 Summary of Environmental Effects

The environmental effects on Atmospheric Environment during the Project activities are summarized for Climate (GHG emissions), Air Quality and Sound.

Climate (GHG emissions)

The GHG emissions from the Project activities are considered low in the context of CEA Agency guidelines (Section 1.1.3).

Air Quality

The Project has the potential to temporarily increase the ambient concentrations of air contaminants in the RSA during Project activities; however, in light of planned mitigation, it is not expected that the regulatory ambient standards will be frequently exceeded during the Project activities. The effects of the Project-related activities on Air Quality during the Project activities are predicted to be adverse, of low magnitude, limited to the RSA; and of short-term duration.

The releases of air contaminants from the Project activities are not expected to noticeably influence ambient Air Quality outside the RSA.

Sound

If the Project is going to operate for 24 hours a day, the nearest receptors must be at least 1,100 m from quarry and loading facility and 100 m from haul road to meet the % HA criterion. Alternatively, if the Project is going to operate for 15 hours a day (0700 to 2200), the nearest receptors must be at least 600 m from quarry and loading facility and 50 m from haul road. Considering this, and planned mitigation, it is anticipated that the effects on Sound during Project activities may be characterized as an occasional nuisance.

The effects of the Project-related activities on Sound are predicted to be adverse, of moderate magnitude, Beyond Regional and of short-term duration (as defined in EIS Vol 2B, Chapter 11, Table 11.2.4-3).

A summary of Project effects on the Atmospheric Environment is presented in Table 2-7.

Table 2-7 Environmental Effects Analysis Summary: Atmospheric Environment

Project Phase / Key Indicator	Residual Environmental Effects Summary Descriptors				
	Direction	**Magnitude**	**Geographic Extent**	**Duration**	**Frequency**
Climate (GHG)	**Adverse** – Activities will result in GHG emissions	**Low** – The quantities of GHG releases are low	**Beyond Regional** – Climate (GHG) effects are global in nature	**Long-term to Far Future** – GHG emissions can persist in the atmosphere for several hundred years	Emissions of GHGs will occur throughout the Project
Air Quality	**Adverse** – Activities will result in air contaminant emissions	**Low** – Ambient concentrations of air contaminants are expected to be below ambient objectives, guidelines or standards	**Regional** – Concentrations of air contaminants are likely to be back to ambient levels within 1 km of the Project sites on either side of the LSA	**Short-term** – Air contaminants will quickly disperse from the Project sites	Concentrations of air contaminants are not expected to frequently exceed ambient standards at any one location throughout the Project
Sound	**Adverse** – Activities will increase sound pressure levels	**Moderate** – The increase in sound pressure levels may be above guidelines applied to the Project	**Beyond Regional** – Sound pressure levels are likely to extend beyond the RSA; Project-related sound will be audible beyond 1 km, but not likely objectionable	**Short-term to Medium-term** – Sound will only be generated during the Project (396 days)	Sound emissions are expected periodically at any one location throughout the Project

Note: Summary of Potential Project-related Effects on Atmospheric Environment: Project effects on the Atmospheric Environment are predicted to be limited to contaminant emissions and noise primarily resulting from the operation of equipment and isolated blasting. These effects are expected to dissipate quickly and extend only a limited distance (i.e., less than 1 km) from the work area.

2.5.2 Definition and Determination of Significance

Significant environmental effects are those that are considered to be of sufficient magnitude, duration and geographic extent to cause a change in the VEC that will alter its status or integrity beyond an acceptable level. A significant effect on the Atmospheric Environment VEC, by way of definition, could result from a significant effect on Climate (global), or Air Quality or Sound within the RSA, as discussed below.

A significant adverse residual environmental effect of the Project on Climate is one where the release of GHGs is of a quantity that is either medium or high, where those terms are used in the guidance provided by CEA Agency (2003, internet site). Since there is no clear quantitative threshold defined in the provincial or federal regulations, this qualitative definition is used to make the determination of significance.

The CEA Agency (2003, internet site) recommends that net changes in GHG emissions as a result of a project be evaluated and detailed mitigation be considered if they are found to be medium or high. As the Project is considered to be a low emitter of GHG in the CEA Agency (2003, internet site) context, detailed mitigation (beyond that of applicable regulations) is not required.

The residual Project-related quantities of GHGs released to the atmosphere are a small fraction of the provincial, national and global emissions, and are considered low, in the context of the CEA Agency guidance (2003, internet site). Therefore, the likely environmental effects of the Project on Climate are rated not significant.

A significant residual effect on Air Quality is one that degrades the quality of the ambient air such that the Project-related ground-level concentrations of the air contaminant being assessed are likely to frequently exceed the regulatory ambient objective, guideline or standard. “Frequently” is defined as once per week for 1-hour objectives and once per month for 24-hour objectives. In light of the planned mitigation measures and based on the consideration of magnitude, geographic extent and duration, the residual environmental effects of a change in Air Quality on the Atmospheric Environment in the RSA during the Project are predicted to be not significant.

With respect to a change in Sound, a significant residual adverse environmental effect is one that causes a change in Sound such that a frequent exceedance of the Health Canada (2009) guidance (as presented in Table 2-7) is experienced at a noise sensitive area (NSA) due to Project activities. “Frequent” is defined as an aggregate period of 12 days per year. In light of the setbacks being applied for required sound attenuation (Section 1.1.5.1), planned mitigation measures and consideration of the magnitude, geographic extent and duration, the residual environmental effects of a change in Sound on Atmospheric Environment in the RSA during the Project are predicted to be not significant.

The changes to the Atmospheric Environment resulting from the Project are unlikely to noticeably influence ambient conditions within the RSA. Therefore, the Project is not likely to result in significant adverse effects on the Atmospheric Environment.

2.6 Cumulative Environmental Effects

Cumulative effects are the overall effect on the VEC as a result of the Project’s residual environmental effects in combination with those of other projects and activities. A summary of the cumulative environmental effects associated with the Atmospheric Environment and other projects is provided in Table 2-8.

Table 2-8 Cumulative Environmental Effects Summary: Atmospheric Environment

Cumulative Effects Analysis	Climate	Air Quality	Sound
Current (Baseline) VEC Condition (Reflecting the Effects of Past and Ongoing Projects and Activities)	– Overall, the climate / GHG emissions of Newfoundland and Labrador are consistent across the province.	– Ambient air quality in the regions is generally good, most of the time. On occasion, ambient ozone concentrations exceed the desirable National Ambient Air Quality Objectives (NAAQO); however, exceedances of the acceptable NAAQO are infrequent. Some industrial facilities are located in the regions near the Project. Emissions of air contaminants from these facilities range from 0.04 to 0.49% of Canada's total emissions.	– The ambient sound pressure levels in the vicinity of the Project are representative of a rural environment with minimal contributing existing sound sources.
Likely Residual Environmental Effects of the Project (Reflecting Current VEC Condition, As Above)	– The Project will generate approximately 27,640 tonnes CO_2e over the 396 day Project period. Project emissions are thus a small fraction of provincial and global emissions. – The Project's contribution to the residual change in GHG Emissions is low (CEA Agency 2003, internet site), and because the environmental effect of the Project on climate change is not measurable, this contribution is considered to be not substantive.	– The Project will release emissions of air contaminants during Project-related activities, which will increase ambient concentrations of the air contaminants in the RSA when such activities are being undertaken. Upon cessation of those activities, the ambient air contaminant concentrations are expected to quickly return to background levels.	– The ambient sound pressure levels will increase at locations where Project-related activities are being undertaken. There are a few industrial facilities located near the RSA; however, the distance between the facilities and the LSA is sufficient that effects are not expected to noticeably influence ambient conditions.

Table 2-8 Cumulative Environmental Effects Summary: Atmospheric Environment (continued)

Cumulative Effects Analysis	Climate	Air Quality	Sound
Potential "Overlapping" Environmental Effects (within RSA) of Other Future Projects and Activities	– Project-related GHG emissions are rated as not significant. The Project's contribution to the residual change in GHG emissions is very small relative to provincial and global emissions, and the cumulative environmental effect on climate change is not substantive.	– The future projects within 100 km of the Project have the potential to release emissions of air contaminants and result in an cumulative environmental effect on Air Quality – The contributions of air contaminants from the potential future projects will not add to the emissions from the Project such that ambient conditions would change noticeably, because each of the potential future projects will be located outside the RSA. Emissions of air contaminants from the Project will disperse quickly from the LSA, and when combined with emissions from potential future projects, are unlikely to noticeably influence ambient air quality and thus are unlikely to overlap.	– Based on the previous assessment regarding drilling noise, it is anticipated that sound pressure levels will reach 42 dBA within 1,000 m of the drilling site (EIS Volume 2B, Chapter 11, Section 11.2.5.5). Therefore, the potential for a change in sound quality due to quarry and loading facility activities to overlap with a change in sound quality from drilling activities will be minimized at distances greater than 1 km. – The contribution of sound from the future projects will not add substantively to the sound pressure levels from the Project, as they will be located outside the RSA. Sound pressure levels from the Project will disperse quickly from the LSA, and when combined with emissions from potential future projects, these are unlikely to cause the Health Canada (2009) criteria to be exceeded.
Cumulative Environmental Effects Summary	**Not Significant** – As noted above, because of the low magnitude of the Project-related GHG emissions, the Project is not expected to bring about a substantive change in the environment. As a result, the cumulative environmental effects are rated not significant.	**Not Significant** – The cumulative environmental effects of the Project on Air Quality in combination with other projects and activities that have been or will be carried out are predicted to be not significant as they are unlikely to spatially overlap or noticeably influence ambient air quality.	**Not Significant** – The cumulative environmental effects of the Project in combination with other projects and activities that have been or will be carried out are predicted to be not significant as they are unlikely to spatially overlap or noticeably influence ambient sound pressure levels.

2.7 Monitoring and Follow-up

The Project activities are not different than other activities (e.g., forest harvesting, transportation, shipping, rock quarrying) that currently occur within the LSA and RSA on a daily basis. Measurable effects to the Atmospheric Environment from the release of air contaminants from the combustion of fossil fuel and fugitive dust are expected to be localized to specific areas of activity during the Project. A follow-up program to measure ambient air contaminant concentrations for the purpose of verifying the environmental effects predictions or the effectiveness of mitigation is not warranted.

Nalcor will employ a complaint driven process to address the generation of excessive airborne dust and/or noise during any phase of the Project. The validity of the complaint will be ascertained by Nalcor Energy and corrective actions implemented as warranted and appropriate. In the event of complaints, ambient measurements of dust or noise may be conducted if required to identify the source and/or extent of the issue.

2.8 References

CEA Agency (Canadian Environmental Assessment Agency). 2003. Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners. The Federal-Provincial-Territorial Committee on Climate Change and Environmental Assessment, November 2003. Available at: http://www.ceaa-acee.gc.ca/default.asp?lang=En&n=A41F45C5-1. Accessed: June 2010.

De Nevers, Noel. 2000. Air Pollution Control Engineering. 2nd edition. McGraw-Hill, Boston, Massachusetts.

ERCB (Alberta Energy Resources Conservation Board). 2007. Directive 038 – Noise Control. Calgary, AB.

FHWA (Federal Highway Administration). 2006. US Department of Transportation FHWA Roadway Construction Noise Model User's Guide. Final Report, January 2006. Report no. FHWA-HEP-05-054. Prepared by the US DOT, Research and Innovative Technology Administration.

Health Canada. 2005. National Guidelines for Environmental Assessment: Health Impacts of Noise. Draft Version. Prepared by the Acoustic Unit, Consumer and Clinical Radiation Protection Division Product Safety Programme, Healthy Environments and Consumer Safety Branch. Ottawa, ON, May.

Health Canada. 2009. Draft Health Canada Guidance on Noise Assessment for CEAA Projects.

ISO (International Organization for Standardization). 1993. Acoustics – Attenuation of sound during propagation outdoors: Part 1: Calculation of the absorption of sound by the atmosphere. ISO 9613-1:1993.

ISO (International Organization for Standardization). 1996. Acoustics – Attenuation of sound during propagation outdoors: Part 1: General method of calculation. ISO 9613-2:1996.

Jacques Whitford (Jacques Whitford Consulting Limited). 2006. Environmental and Socio-economic Assessment, Brunswick Pipeline Project. Prepared for Brunswick Pipeline. Fredericton, NB.

Jacques Whitford. 2009. Environmental Assessment Report, Route 1, Route 127 Area to St. George/Letang River. Prepared for New Brunswick Department of Transportation. Fredericton, NB.

Stantec (Stantec Consulting Ltd.). 2010a. Environmental Assessment, Route 11 Upgrading Shediac to Richibuc River. Prepared for New Brunswick Department of Transportation. Fredericton, NB.

Stantec. 2010b. Unpublished notes from field observations during Environmental Assessments for: LNG Terminal, Ridley Island, BC; Conoco Philips, Fort McMuray, AB; Lameque Wind Farm, Lameque, NB; Digby Wind Farm, Digby, NS; Voisey's Bay Mine, Voisey's Bay, NL (1994-2010). Halifax, NS.

Transport Canada. 2012. Urban Transportation Emissions Calculator (UTEC). Available online at: http://wwwapps.tc.gc.ca/Prog/2/UTEC-CETU/Menu.aspx?lang=eng. Last accessed on October 29, 2012.

US EPA (United States Environmental Protection Agency). 1998. AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 11.9 Western Surface Coal Mining, Office of Air Quality Planning and Standards, United States Environmental Protection Agency. Available at: http://www.epa.gov/ttn/chief/ap42/ch11/final/c11s09.pdf. Accessed: October 5, 2012.

US EPA (United States Environmental Protection Agency). 2004. AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing, Office of Air Quality Planning and Standards, United States Environmental Protection Agency. Available at: http://www.epa.gov/ttn/chief/ap42/ch11/final/c11s1902.pdf. Accessed: October 5, 2012.

US EPA (United States Environmental Protection Agency). 2006. AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, Chapter 13.2.2 Unpaved Roads, Office of Air Quality Planning and Standards, United States Environmental Protection Agency. Available at: http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s0202.pdf. Accessed: October 5, 2012.

US EPA (United States Environmental Protection Agency). 2008. NONROAD Model (nonroad engines, equipment, and vehicles). Available at: http://www.epa.gov/oms/nonrdmdl.htm. Accessed: November 30, 2012.

US EPA (United States Environmental Protection Agency). 1980. AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Explosives Detonation. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. Available at: http://www.epa.gov/ttn/chief/ap42/ch13/final/c13s03.pdf. Accessed: March 2011.

WHO (World Health Organization). 1999. Guidelines for Community Noise, edited by: Berglund, B, Lindvall, T., and D.H. Schwela, World Health Organization, Geneva, April, 1999. Available at: http://whqlibdoc.who.int/hq/1999/a68672.pdf. Accessed: May 2010.

3 VEGETATION

Throughout the environmental assessment process, and committed to in the EIS, Nalcor Energy (Nalcor) has continued to consult with the Newfoundland and Labrador Department of Environment and Conservation Wildlife Division (NLDEC Wildlife Division) with respect to a more precise identification of areas with high potential habitat to support regionally uncommon plants within the final approximately 1,100 kilometres (km) long, 60 metres (m) wide transmission line right-of-way (ROW).

On November 7, 2012, Stantec Consulting Ltd. (Stantec) on behalf of Nalcor participated in a meeting with the NLDEC Wildlife Division to discuss aspects of the environmental assessment for Nalcor's Labrador – Island Transmission Link (the "Project"). In particular, the intent of the meeting was to discuss and clarify outstanding issues related to evaluation of potential direct adverse effects (i.e., alteration/loss) of the Project on regionally uncommon plants occurring within or in proximity to the Project ROW. In attendance were:

- Kirsten Miller - Senior Wildlife Biologist, Habitat Management (NLDEC Wildlife Division);
- Claudia Hanel - Botanist, Habitat Management (NLDEC Wildlife Division);
- Sean Bennett - Terrestrial Ecologist (Stantec); and
- Mike Crowell - Botanist (Stantec).

This memo provides a summary of the objectives expressed by the NLDEC Wildlife Division and Stantec's analysis of the habitat along the length of the ROW, methodology used in the selection of specific listed and/or regionally uncommon plant sampling locations (including brief rationale for selection), and an overview of recommendations/mitigation measures proposed by Nalcor to address the potential for adverse effects of the Project on regionally uncommon plants.

The objective of the meeting was to identify areas that have high potential to support regionally uncommon plant species that could be adversely affected by construction of the Project ROW. Given the scale of the Project, it was necessary to undertake an iterative approach to the development of a thorough, defensible and feasible regionally uncommon plant survey program.

With confirmation of Project design (i.e., the proposed final ROW alignment) occurring in late 2012; it became possible to examine habitats along the proposed alignment in more detail. The initial phase in the process involved the development and implementation of a regional-scale habitat model used to predict, based on coarse-scale Geographical Information System (GIS) data (Ecological Land Classification [ELC]), the spatial distribution of habitat types with a high potential to support regionally uncommon plant species.

Recognizing the size, scale and geographic distribution of the Project, it was not possible to develop a precise model focusing on microhabitats. Analysis of high-resolution aerial imagery for the ROW, combined with local knowledge (existing Atlantic Canada Conservation Data Centre [ACCDC] data and anecdotal information provided by Ms. Hanel, of the distribution and habitat preferences of regionally uncommon plants occurring along the route were used to identify areas within the ROW with high potential to support regionally uncommon species. The 35 locations along the ROW for pre-construction surveys (Table 3-1) were determined by consensus between NLDEC Wildlife Division personnel and Stantec. Using these tools, the process of delineating segments of the ROW for pre-construction field surveys in spring/summer 2013 was completed (see Section 3 – Appendix A). Field surveys will be conducted to determine whether or not regionally uncommon plant species are present within these areas. This pre-construction field survey approach was committed to by Nalcor in the EIS (see page 12-91). Assuming the entire RoW was to be surveyed, the total area to be surveyed is estimated at approximately 432 hectares (ha). In areas where the entire RoW (such as unforested areas) will not be disturbed, Nalcor proposes to survey areas where disturbance will occur (access trail construction, foundation construction, borrow pits, etc.) rather than the entire RoW.

Table 3-1 Proposed Regionally Uncommon Plant Survey Locations within the Labrador-Island Transmission Link 60 m Wide Right-of-Way

Survey ID	Geographic Region	Reference Location	Original Stantec Code presented in the Component Study	Wildlife Division Habitat Designation	Regionally Uncommon Plant Species Likely to be Encountered	Area (ha)
1	Central and Southeastern Labrador		River crossing	Riparian Habitat	Too varied to list	4.1
2	Central and Southeastern Labrador		River crossing	Riparian Habitat	Too varied to list	3.4
3	Central and Southeastern Labrador		River crossing	Riparian Habitat	Too varied to list	3.2
4	Central and Southeastern Labrador		River crossing	Riparian Habitat	Too varied to list	2.6
5	Central and Southeastern Labrador		River crossing	Riparian Habitat	Too varied to list	3.5
6	Central and Southeastern Labrador		River crossing	Riparian Habitat	Too varied to list	4.0
7	Central and Southeastern Labrador		River crossing	Riparian Habitat	Too varied to list	3.7
8	Central and Southeastern Labrador		River crossing	Riparian Habitat	Too varied to list	3.1
9	Central and Southeastern Labrador	Plateau between Forteau and L'Anse au Loup, Labrador	Survey of exposed barrens and linear wetlands / meadows	Calcareous meadow, heath, rock outcrop, etc.	*Botrychium species, Dryopteris filix-mas, Streptopus lanceolatus, Millium effusum, Schizachne purpurascens, Ranunculus macounii, Equisetum pratense, Urtica dioica ssp. gracilis, Asplenium viride, Minuartia dawsonensis*	44.7
10	Central and Southeastern Labrador	Forteau Brook Valley, Labrador	No survey suggested	Wet depressions in valley bottom	*Pedicularis palustris*	12.4

Table 3-1 Proposed Regionally Uncommon Plant Survey Locations within the Labrador-Island Transmission Link 60 m Wide Right-of-Way (continued)

Survey ID	Geographic Region	Reference Location	Original Stantec Code presented in the Component Study	Wildlife Division Habitat Designation	Regionally Uncommon Plant Species Likely to be Encountered	Area (ha)
11	Central and Southeastern Labrador	Plateau west of Forteau	Survey of limestone barren areas	Calcareous meadow, heath, rock outcrop, etc.	*Botrychium species, Dryopteris filix-mas, Streptopus lanceolatus, Millium effusum, Schizachne purpurascens, Ranunculus macounii, Equisetum pratense, Urtica dioica ssp. gracilis, Gnaphalium sylvaticum*	39.6
12	Northern Peninsula	Shoal Cove		Limestone barrens, disturbed area	*Braya spp.*	16.2
13	Northern Peninsula	Inland from Sandy Cove 1	Survey of limestone barren areas	Small pockets of limestone barrens	*Braya spp. Allium schoenoprasum var. sibiricum, Carex microglochin, Gymnocarpium robertianum, Botrychium virginianum, Cardamine pratensis var. angustifolia, Carex bicolor, Arnica angustifolia, Eriophorum callitrix, etc.*	1.0
14	Northern Peninsula	Inland from Sandy Cove 2	Survey of limestone barren areas	Small pockets of limestone barrens	*Braya spp. Allium schoenoprasum var. sibiricum, Carex microglochin, Gymnocarpium robertianum, Botrychium virginianum, Cardamine pratensis var. angustifolia, Carex bicolor, Arnica angustifolia, Eriophorum callitrix, etc.*	5.0
15	Northern Peninsula	Castor River upstream of Leg Pond	River crossing	Riparian habitat	Too varied to list	7.1
16	Northern Peninsula	Highlands of St. John; Big East River headwaters and Castors River	Survey of snowbeds, alpine meadows and rich fens	Alpine fen / meadow / snowbed	*Phyllodoce caerulea, Viola palustris, Veronica wormskjoldii, Viola selkirkii, Gnaphalium norvegicum, Salix herbacea, Milium effusum var. cisatlanticum, Athyrium alpestre, Diphasiastrum alpinum, Valhlodea atropurpurea*	72.3
17	Northern Peninsula		River crossing	Riparian habitat	Too varied to list	3.1
18	Northern Peninsula		River crossing	Riparian habitat	Too varied to list	5.3

Table 3-1 Proposed Regionally Uncommon Plant Survey Locations within the Labrador-Island Transmission Link 60 m Wide Right-of-Way (continued)

Survey ID	Geographic Region	Reference Location	Original Stantec Code presented in the Component Study	Wildlife Division Habitat Designation	Regionally Uncommon Plant Species Likely to be Encountered	Area (ha)
19	Northern Peninsula	NE of Gros Pate, unnamed stream	Survey of snowbeds, stream crossing, alpine meadows, barrens and rich fens	Riparian habitat	Too varied to list	10.4
20	Northern Peninsula	Long Range Mountains unnamed pond	Survey of snowbeds, stream crossing, alpine meadows, barrens and rich fens	Alpine fen / meadow / snowbed	*Phyllodoce caerulea, Viola palustris, Veronica wormskjoldii, Gnaphalium norvegicum, Salix herbacea, Athyrium alpestre, Diphasiastrum alpinum, Vahlodea atropurpurea, Sibbaldia procumbens, Poa laxa ssp. feraldii*	2.8
21	Northern Peninsula	Portland Creek headwaters	Survey of snowbeds, stream crossing, alpine meadows, barrens and rich fens	Alpine fen / meadow / snowbed	*Phyllodoce caerulea, Viola palustris, Veronica wormskjoldii, Gnaphalium norvegicum, Salix herbacea, Athyrium alpestre, Diphasiastrum alpinum, Vahlodea atropurpurea, Sibbaldia procumbens, Poa laxa ssp. feraldii*	100.0
22	Northern Peninsula	Main River headwaters 1	No survey required at this time	Alpine fen / meadow / snowbed	*Phyllodoce caerulea, Viola palustris, Veronica wormskjoldii, Gnaphalium norvegicum, Salix herbacea, Athyrium alpestre, Diphasiastrum alpinum, Vahlodea atropurpurea, Sibbaldia procumbens, Poa laxa ssp. feraldii*	5.6
23	Northern Peninsula	Main River headwaters 2	Survey	Alpine fen / meadow / snowbed	*Phyllodoce caerulea, Viola palustris, Veronica wormskjoldii, Gnaphalium norvegicum, Salix herbacea, Athyrium alpestre, Diphasiastrum alpinum, Vahlodea atropurpurea, Sibbaldia procumbens, Poa laxa ssp. feraldii*	3.7

Table 3-1 Proposed Regionally Uncommon Plant Survey Locations within the Labrador-Island Transmission Link 60 m Wide Right-of-Way (continued)

Survey ID	Geographic Region	Reference Location	Original Stantec Code presented in the Component Study	Wildlife Division Habitat Designation	Regionally Uncommon Plant Species Likely to be Encountered	Area (ha)
24	Northern Peninsula	Main River tributary headwaters	Survey	Alpine fen / meadow / snowbed	*Phyllodoce caerulea, Viola palustris, Veronica wormskjoldii, Gnaphalium norvegicum, Salix herbacea, Athyrium alpestre, Diphasiastrum alpinum, Vahlodea atropurpurea, Sibbaldia procumbens, Poa laxa ssp. feraldii*	6.0
25	Northern Peninsula	Main River and Pond River headwaters	Survey stream crossing and meadows	Riparian habitat	Too varied to list	4.1
26	Northern Peninsula		River crossing (secondary)	Riparian habitat (secondary)	Too varied to list	6.3
27	Central and Eastern Newfoundland	Barney's Brook	River crossing (secondary)	Riparian habitat - secondary	Too varied to list	7.8
28	Central and Eastern Newfoundland	South Brook	River crossing	Riparian habitat	Too varied to list	5.5
29	Central and Eastern Newfoundland	Exploits River	River crossing (secondary)	Riparian habitat (secondary)	Too varied to list	4.3
30	Central and Eastern Newfoundland	Great Rattling Brook	River crossing (east side of river only)	Riparian habitat (east side only)	Too varied to list	2.3
31	Central and Eastern Newfoundland	Northwest Gander River	River crossing	Riparian habitat	Too varied to list	6.2
32	Central and Eastern Newfoundland		River crossing (secondary)	Riparian habitat (secondary)	Too varied to list	5.9

Table 3-1 Proposed Regionally Uncommon Plant Survey Locations within the Labrador-Island Transmission Link 60 m Wide Right-of-Way (continued)

Survey ID	Geographic Region	Reference Location	Original Stantec Code presented in the Component Study	Wildlife Division Habitat Designation	Regionally Uncommon Plant Species Likely to be Encountered	Area (ha)
33	Central and Eastern Newfoundland	Terra Nova River	River crossing (plus riparian habitat between rivers)	Riparian habitat	*Carex adusta, Carex cryptolepis, Carex houghtoniana, Listera auriculata, Poa saltuensis, Carex umbellata, Viola lanceolata, Viola sororia*	8.9
34	Central and Eastern Newfoundland	Southwest River	River crossing	Riparian habitat	Too varied to list	2.9
35	Avalon Peninsula	Whitbourne to Oceans Pond	Lichen survey (Erioderma pedicellatum)	Moist conifer forest with minor birch component	*Erioderma pedicellatum*	15.1
Total Area (ha)						**431.8**

Nalcor will implement all mitigation measures related to regionally uncommon plants outlined in the Environmental Impact Statement (EIS) (see page 12-31 of the EIS). Adverse effects of the Project on regionally uncommon plant species are predicted to be minimal, as proven, standard, accepted mitigation practices, including avoidance to the extent practical or minimal disturbance of known locations of these plants have been proposed by Nalcor.

In addition, Nalcor has committed to completing and implementing an EPP for the construction, and operations and maintenance of all components of the Project located in proximity to known or identified regionally uncommon plant locations to ensure that adverse effects on regionally uncommon plants and their habitats are minimized or avoided. The EPP will include procedures for identifying and avoiding (where practical) regionally uncommon plants within the ROW, as well as a discussion of contingency plans in the event of failure of these mitigation measures leading to the unintentional loss of regionally uncommon plant species. As such, the level of confidence of the predicted effect on regionally uncommon plant species during construction and operation of the L-I Transmission Link will not be greater than predicted in the EIS.

As noted in Section 12.2.7.2 of the EIS (page 12-91) the Project is not likely to result in an effect on any of the key indicators (KIs) listed above (including regionally uncommon plants), such that their continued contribution to ecosystem function within the local study area (LSA) and the regional study area (RSA) cannot be sustainable. Therefore, the Project is not likely to result in significant adverse environmental effects on Vegetation.

Nalcor has worked closely with the NLDEC Wildlife Division staff throughout the environmental assessment process. Information and clarification between Nalcor and NLDEC Wildlife Division has been provided in an efficient and timely manner and this communication greatly assisted in the quality of this meeting. As a result, NLDECs participation in these technical discussions has been beneficial.

The information collected during the regionally uncommon plant survey will not change the mitigation that Nalcor has committed to in the EIS (i.e., the pre-construction survey was proposed in the EIS and considered in the environmental assessment), nor does this response affect the findings or conclusions of the EIS.

SECTION 3 – APPENDIX A

LABRADOR-ISLAND TRANSMISSION LINK TARGET RARE PLANT SURVEY LOCATIONS

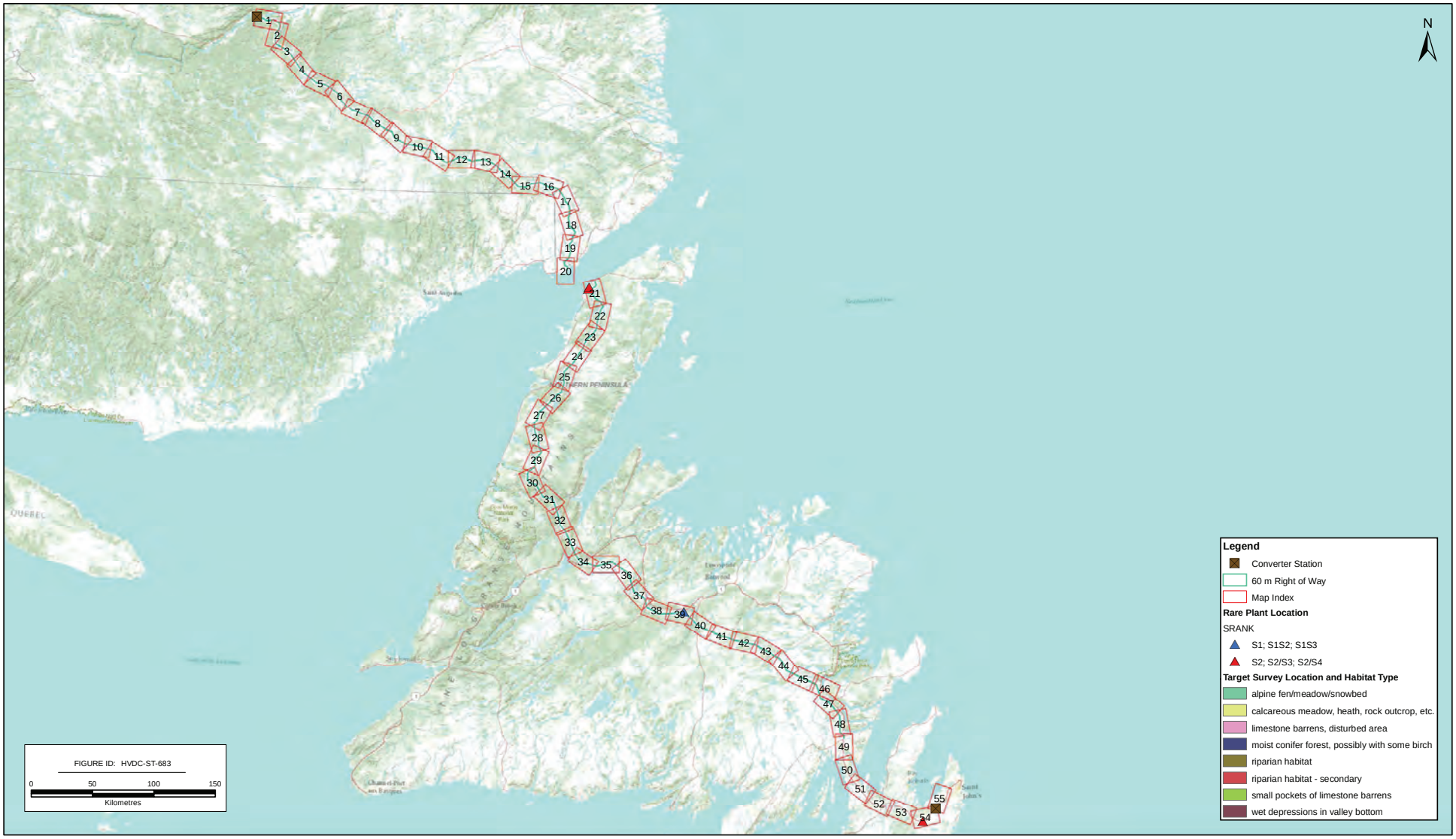


Figure: Overview Map Atlas

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

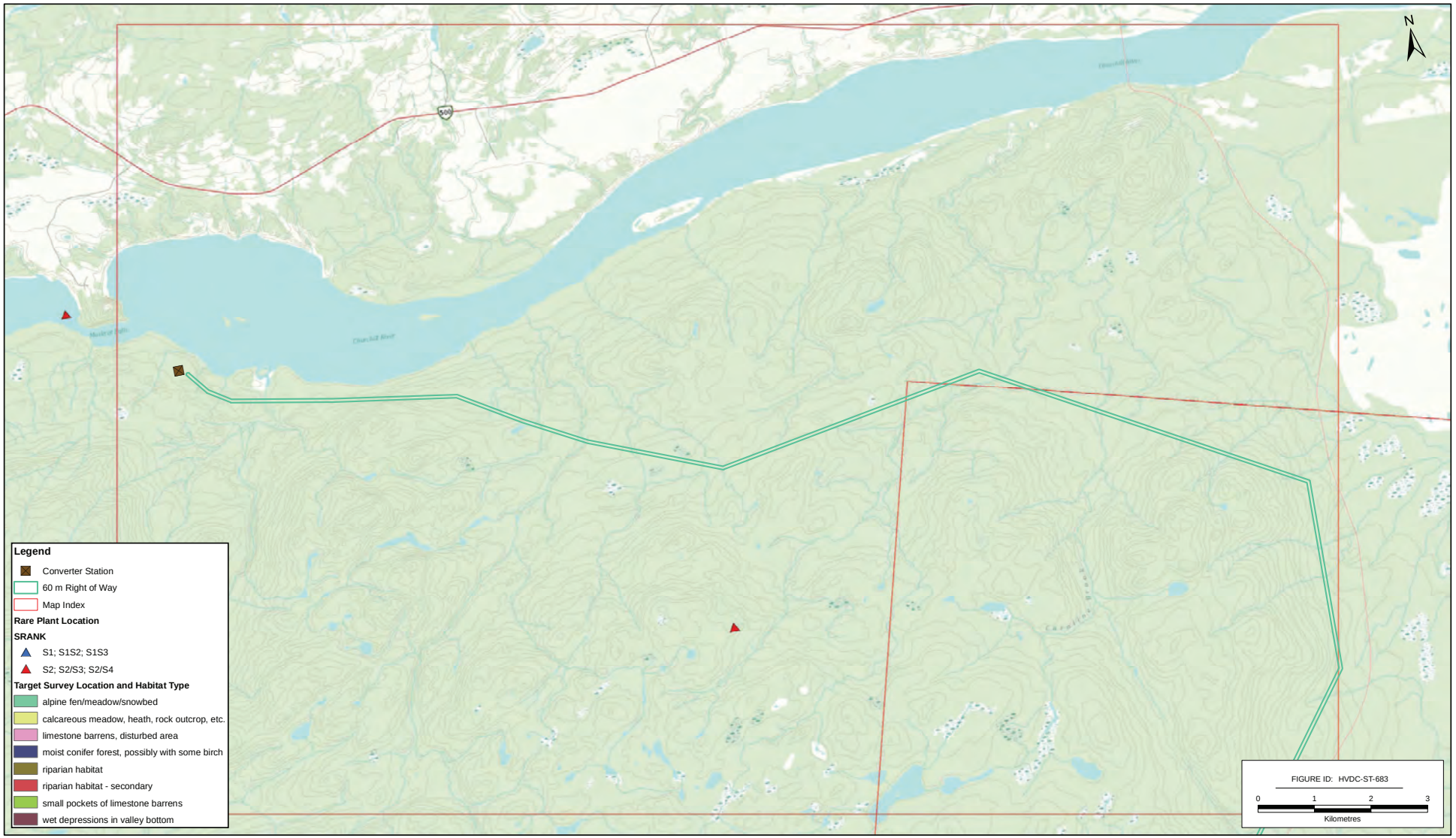
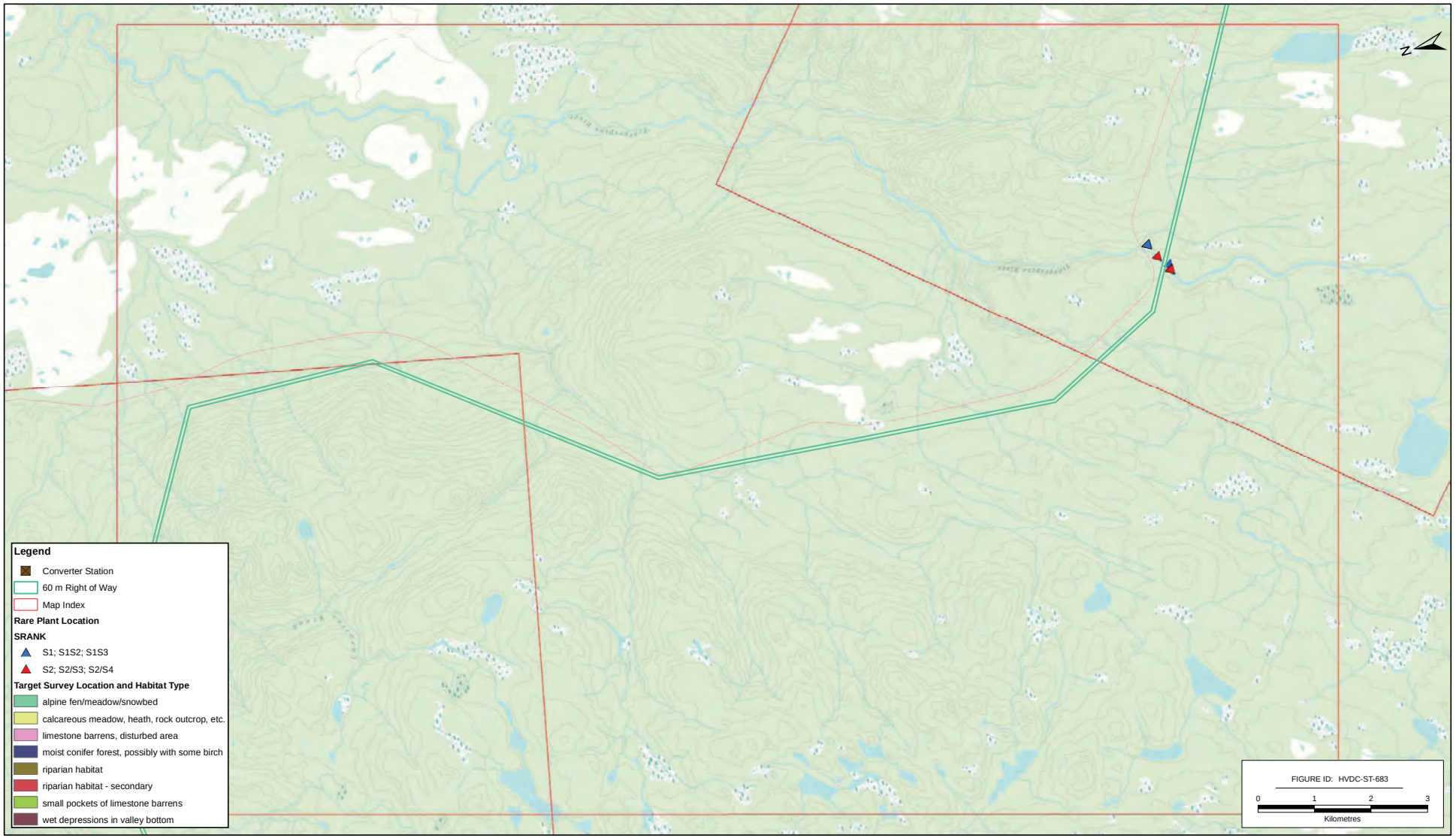


Figure: 1 of 55

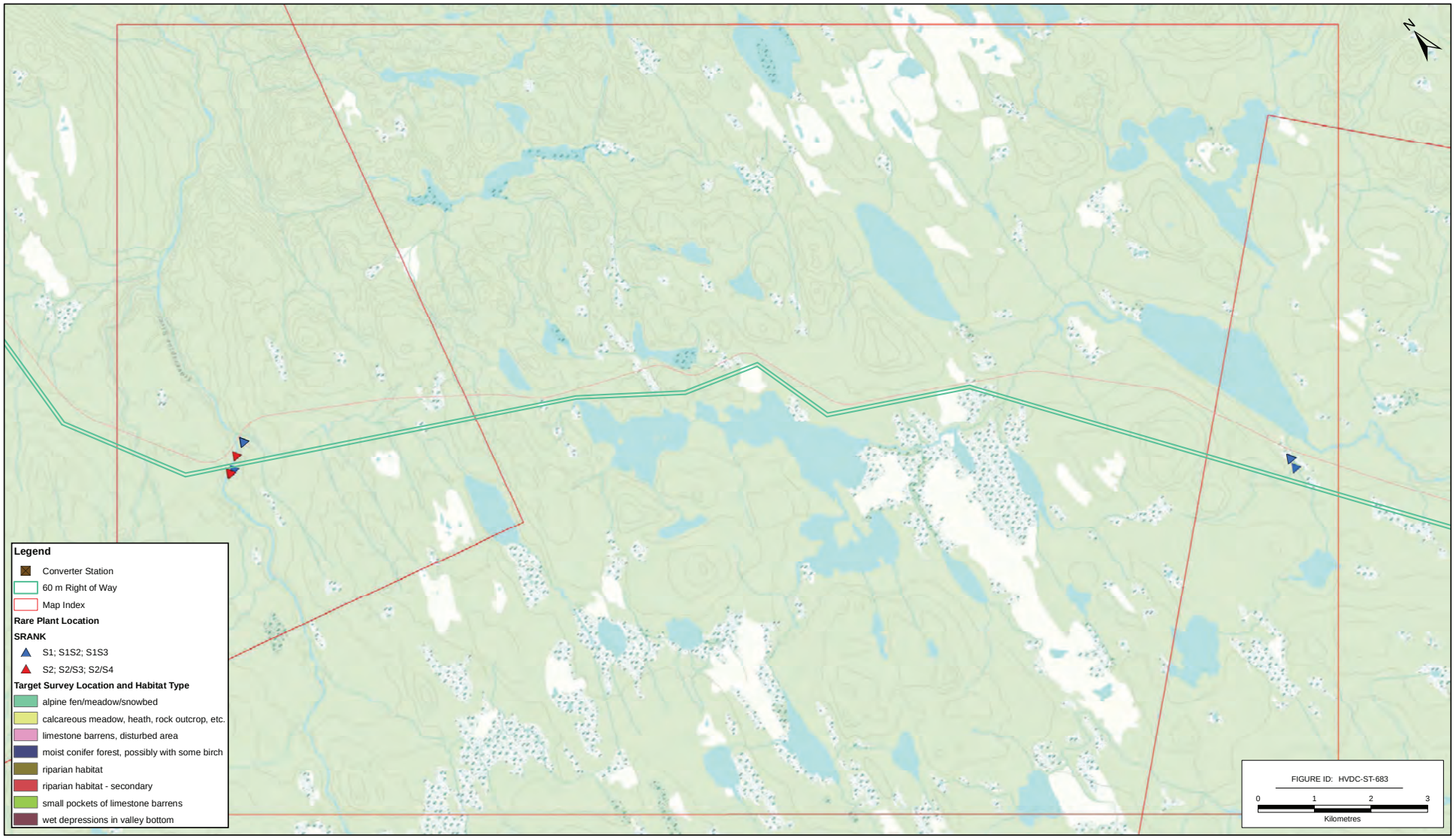
Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 2 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 3 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

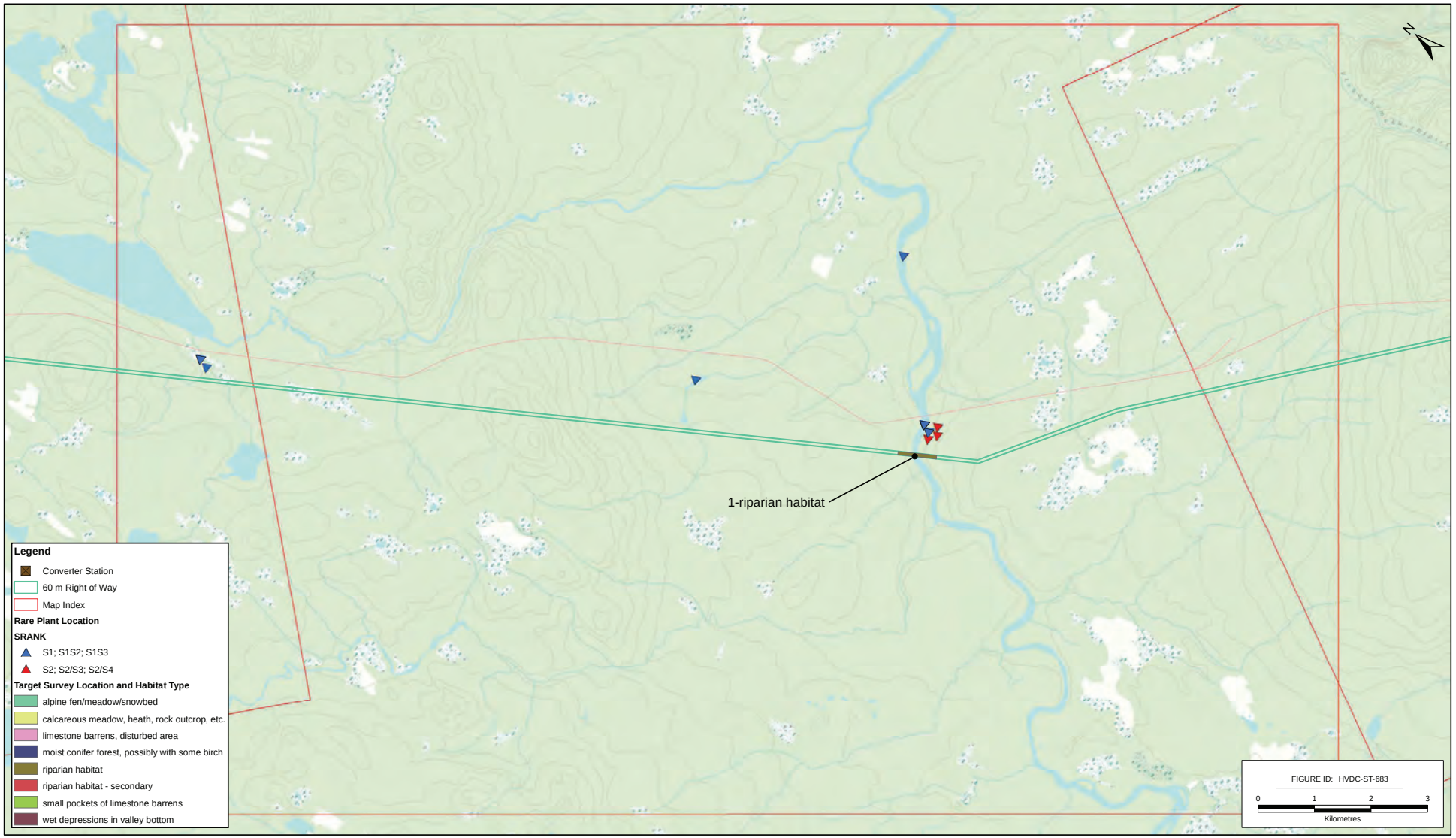
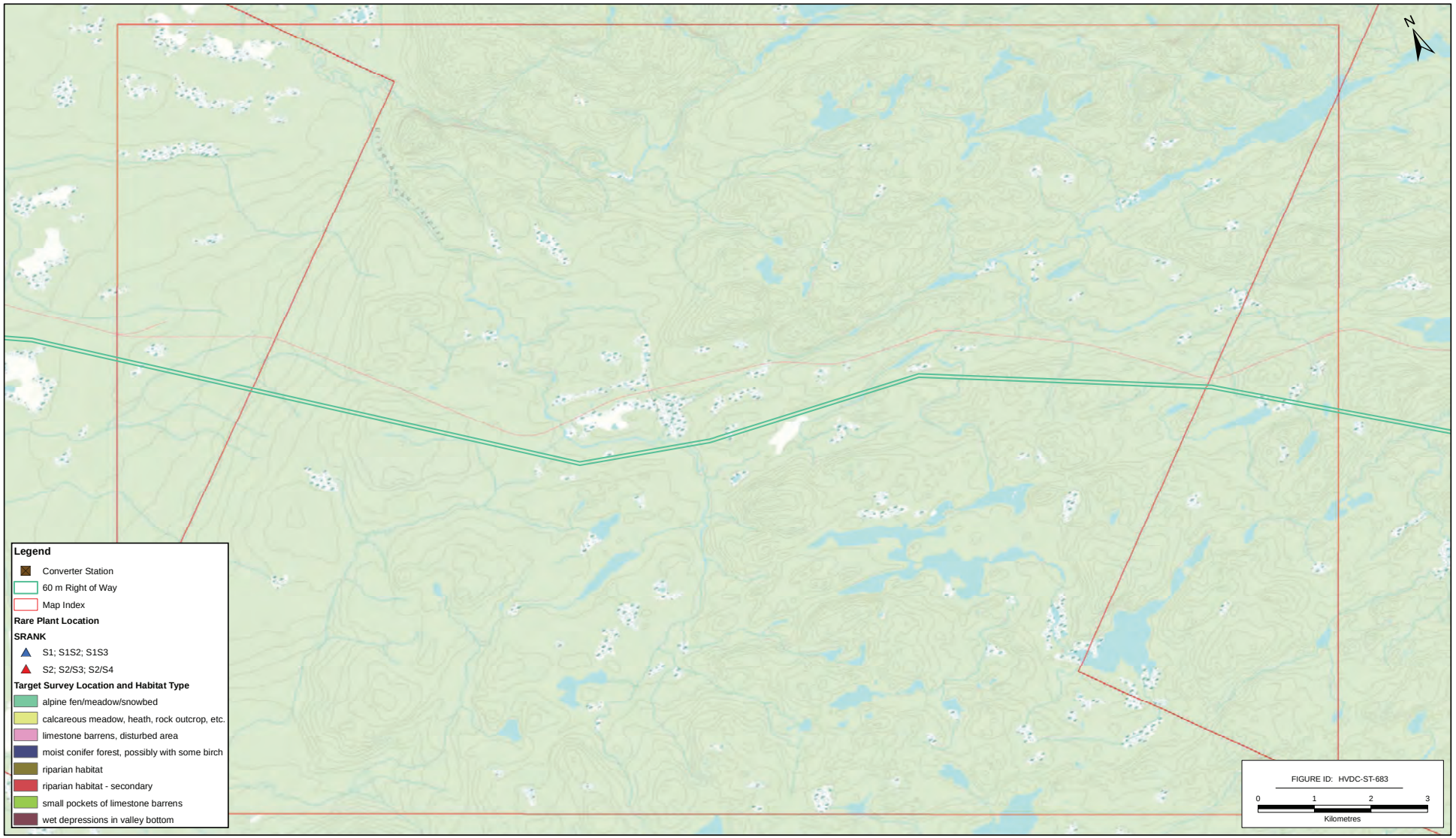


Figure: 4 of 55

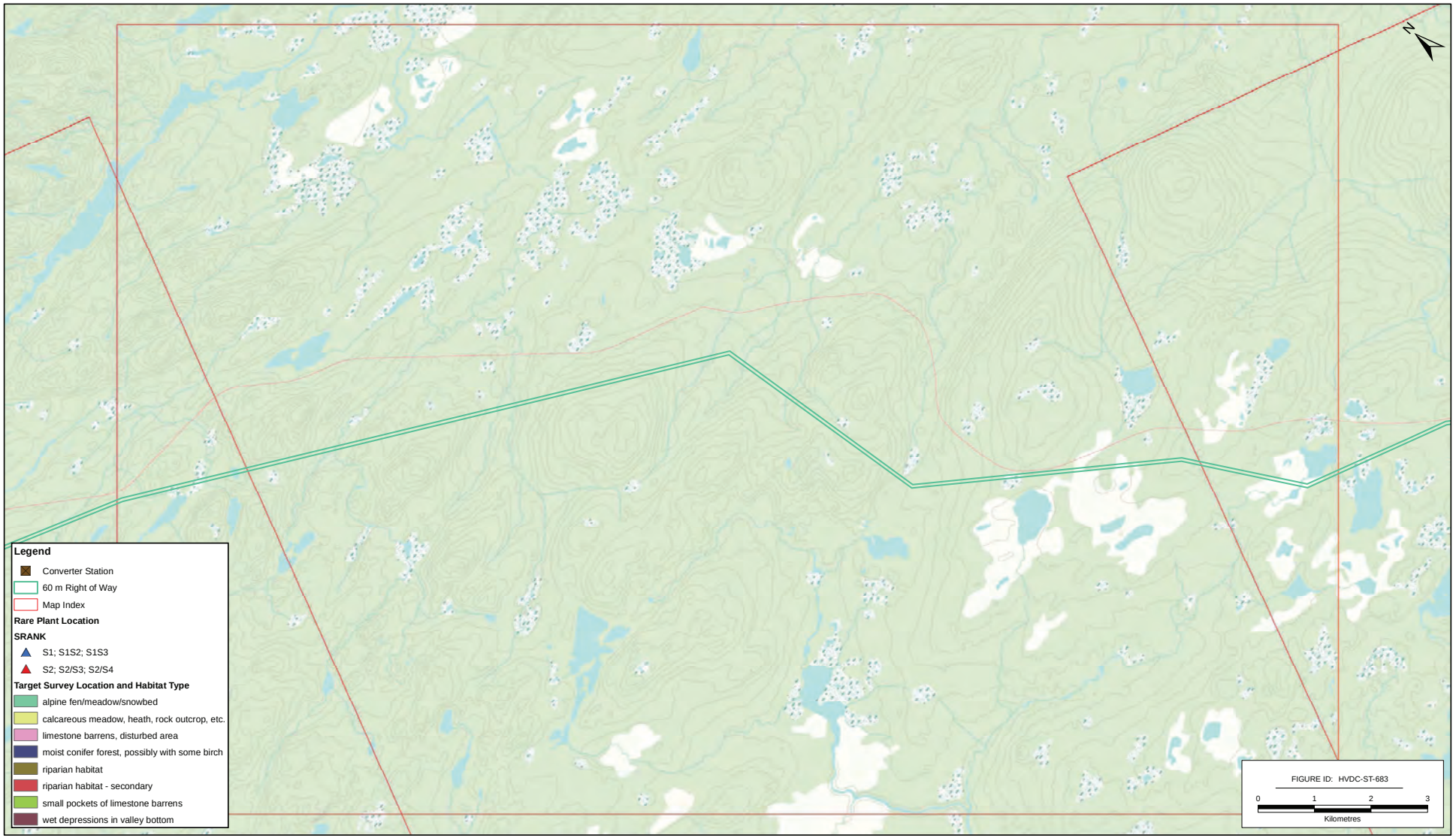
Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 5 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 6 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

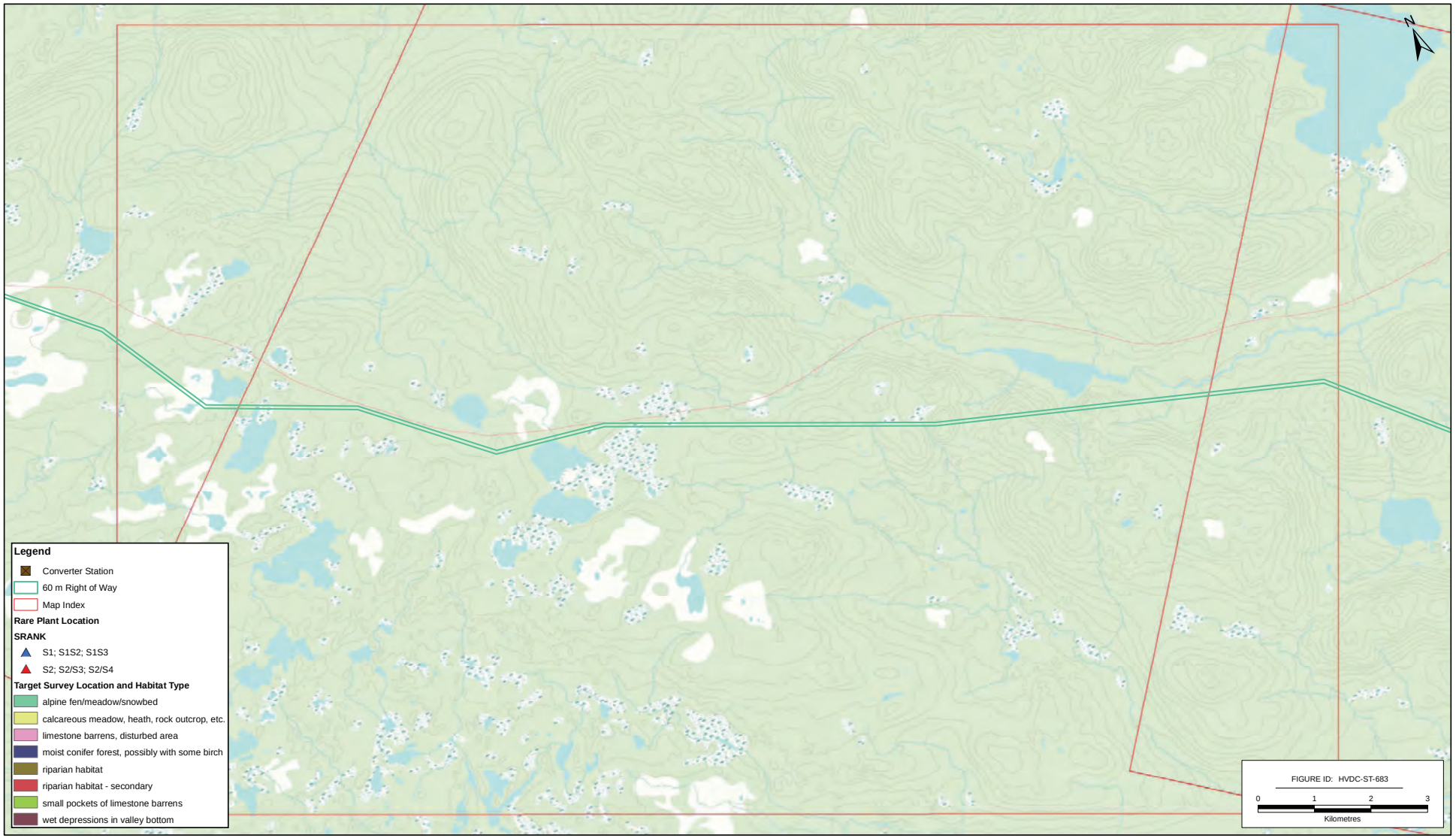


Figure: 7 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

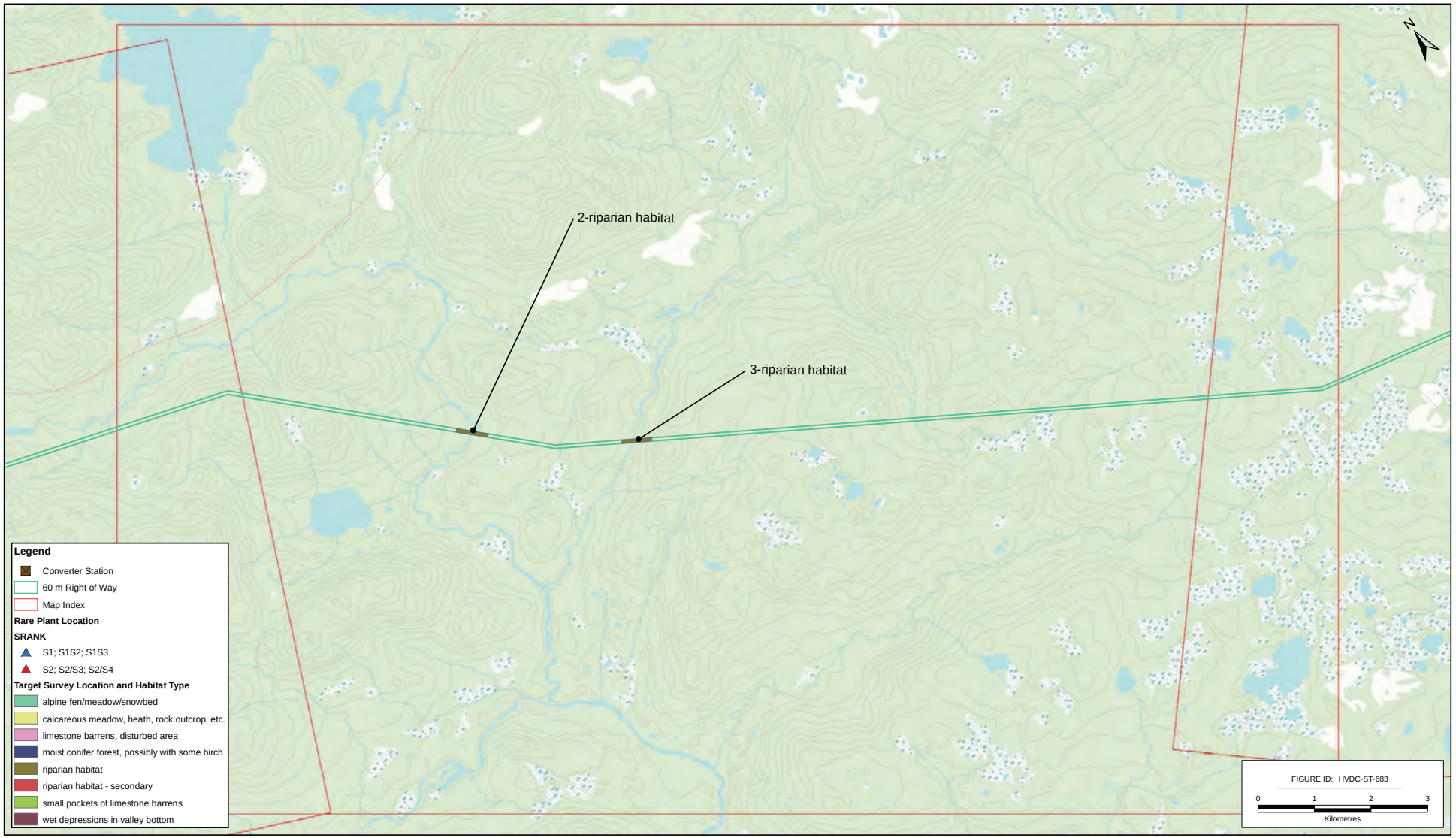
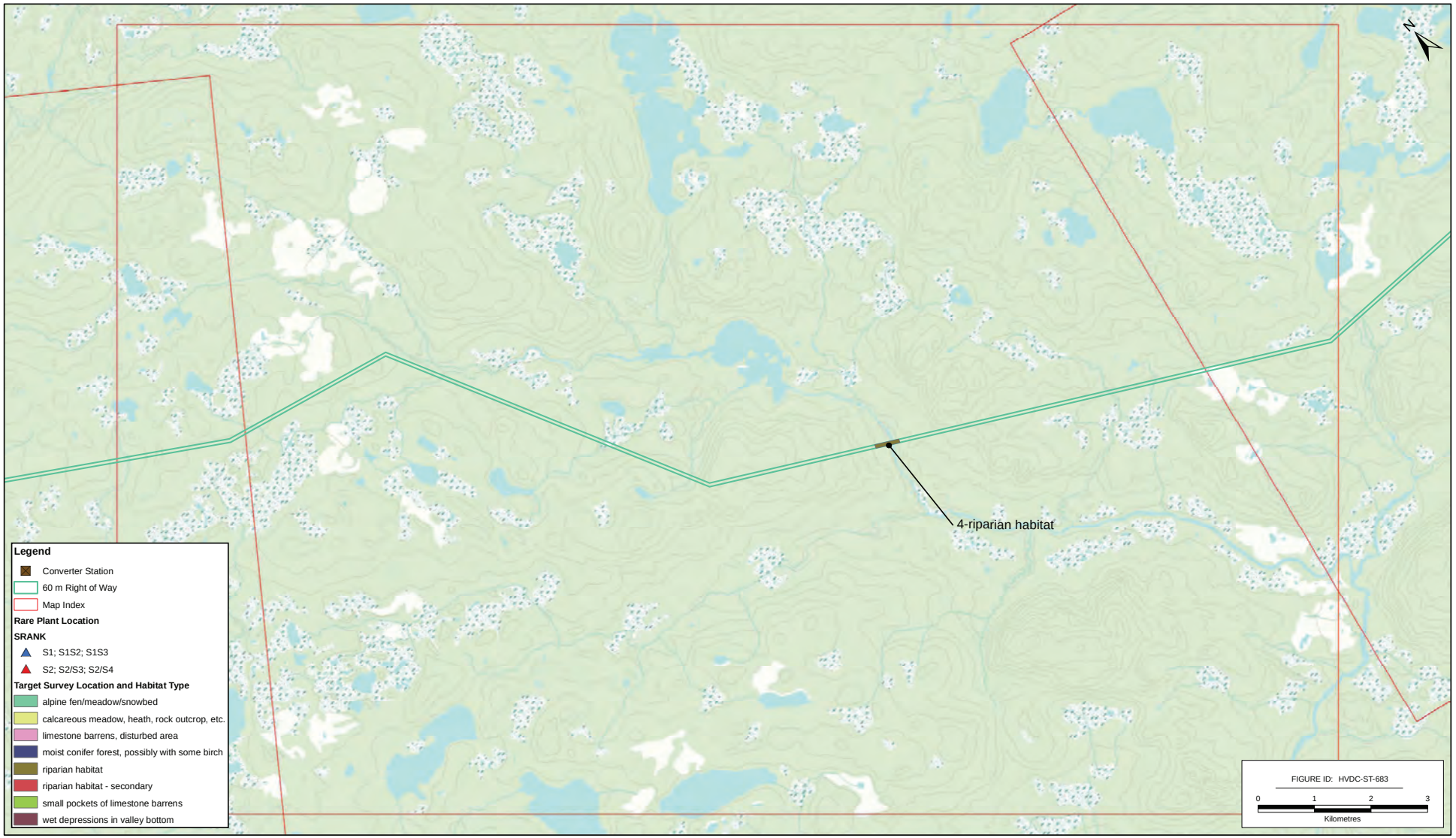


Figure: 8 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 9 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

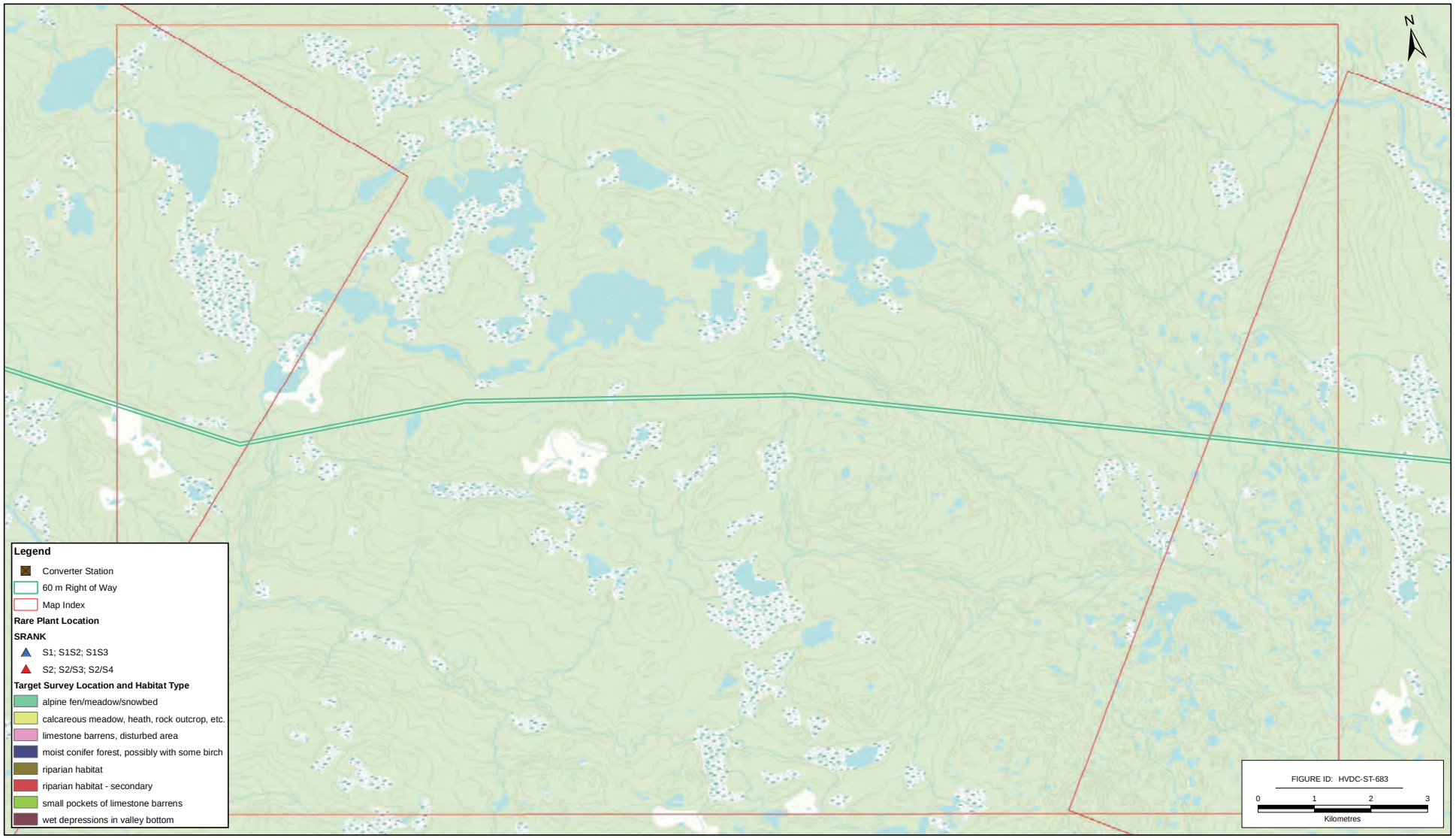
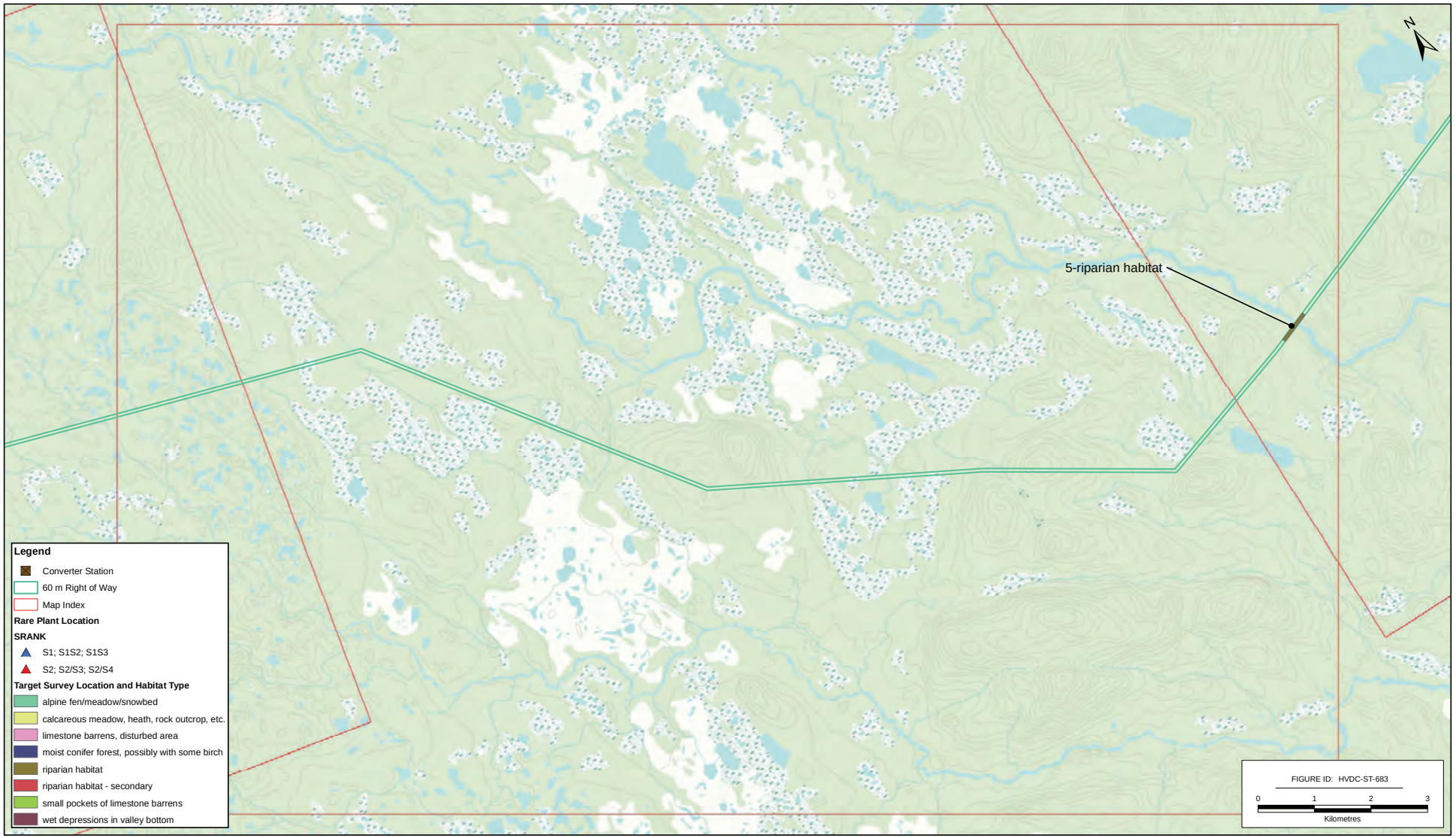


Figure: 10 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 11 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

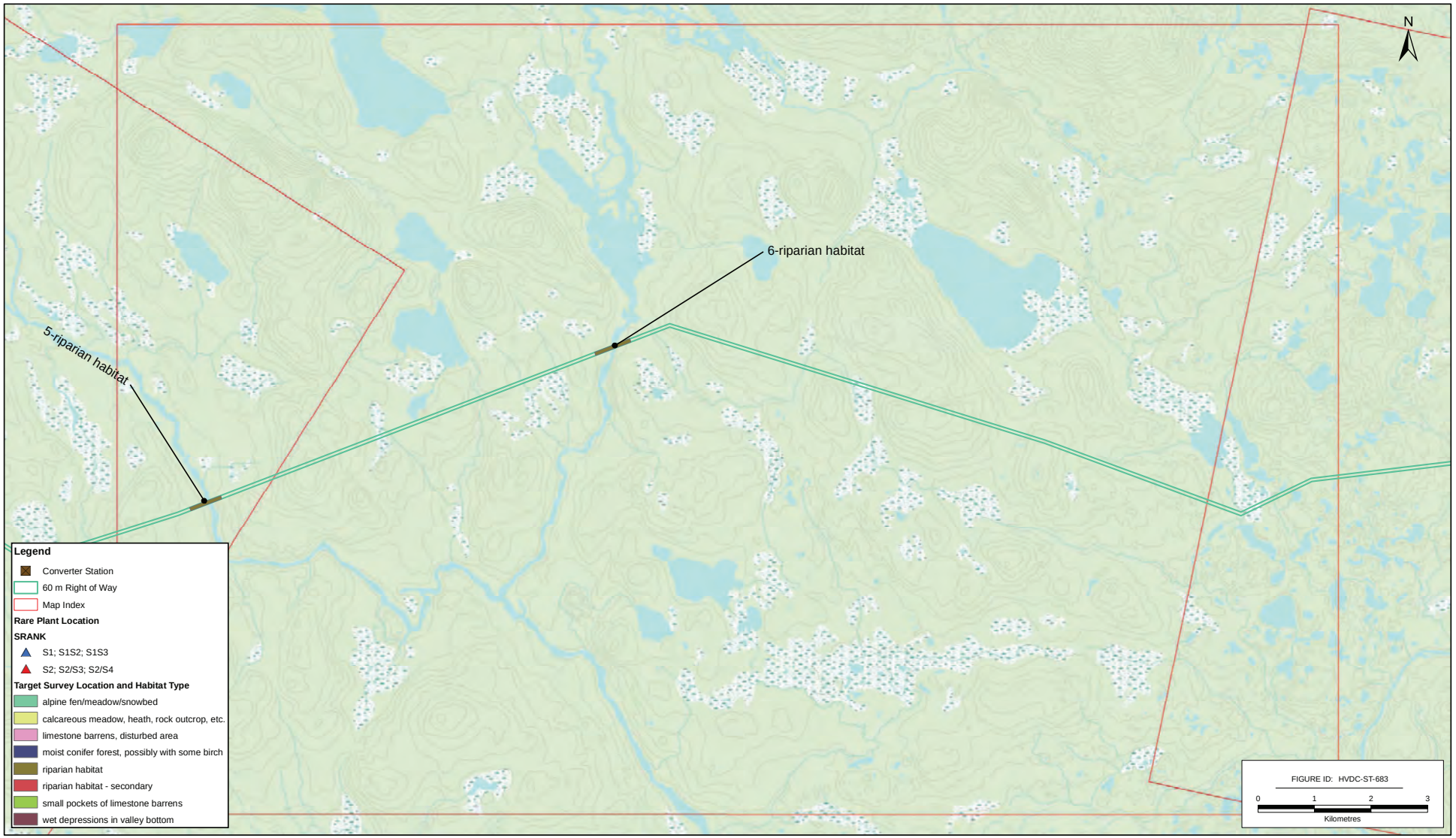
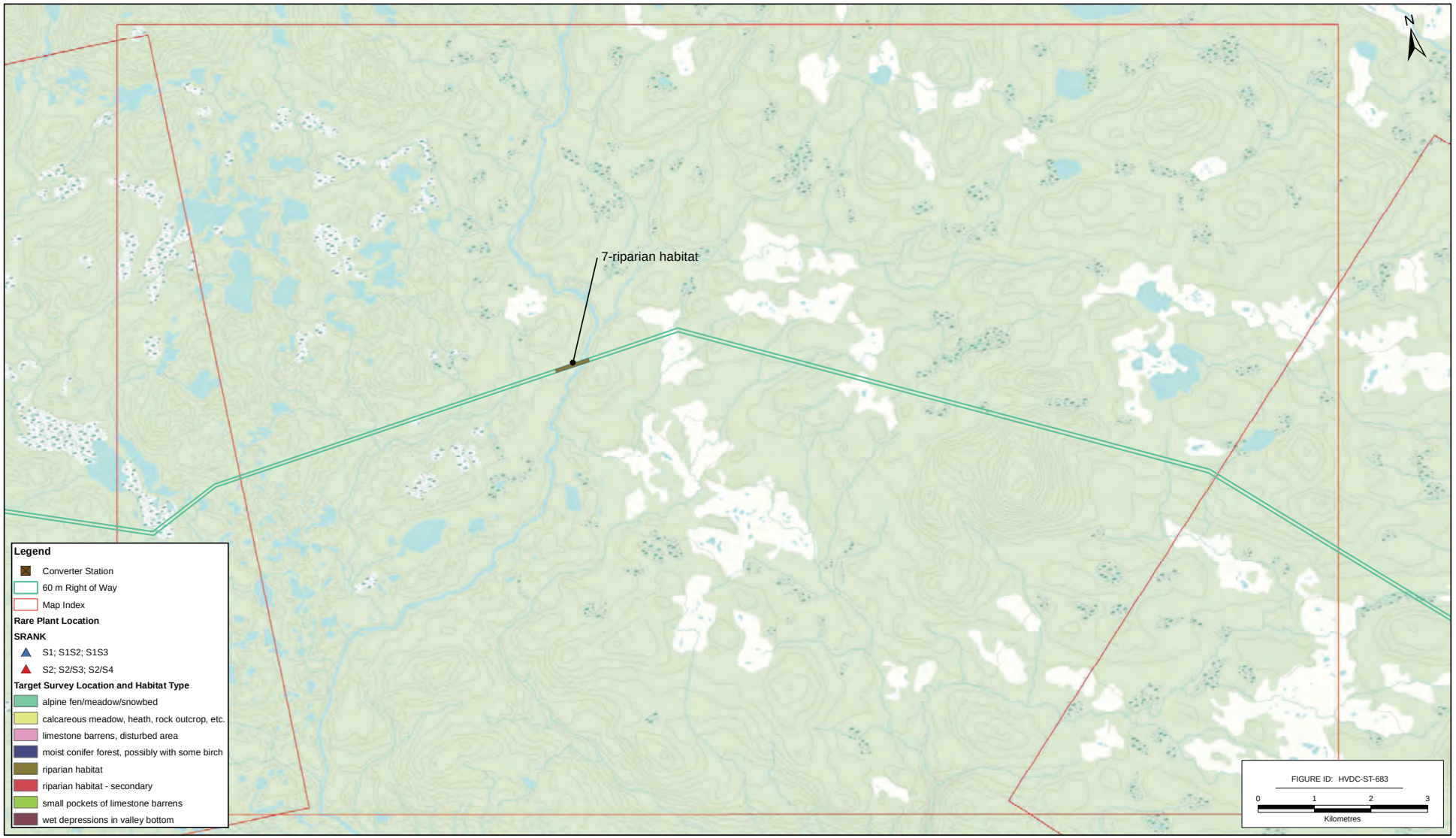


Figure: 12 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 13 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

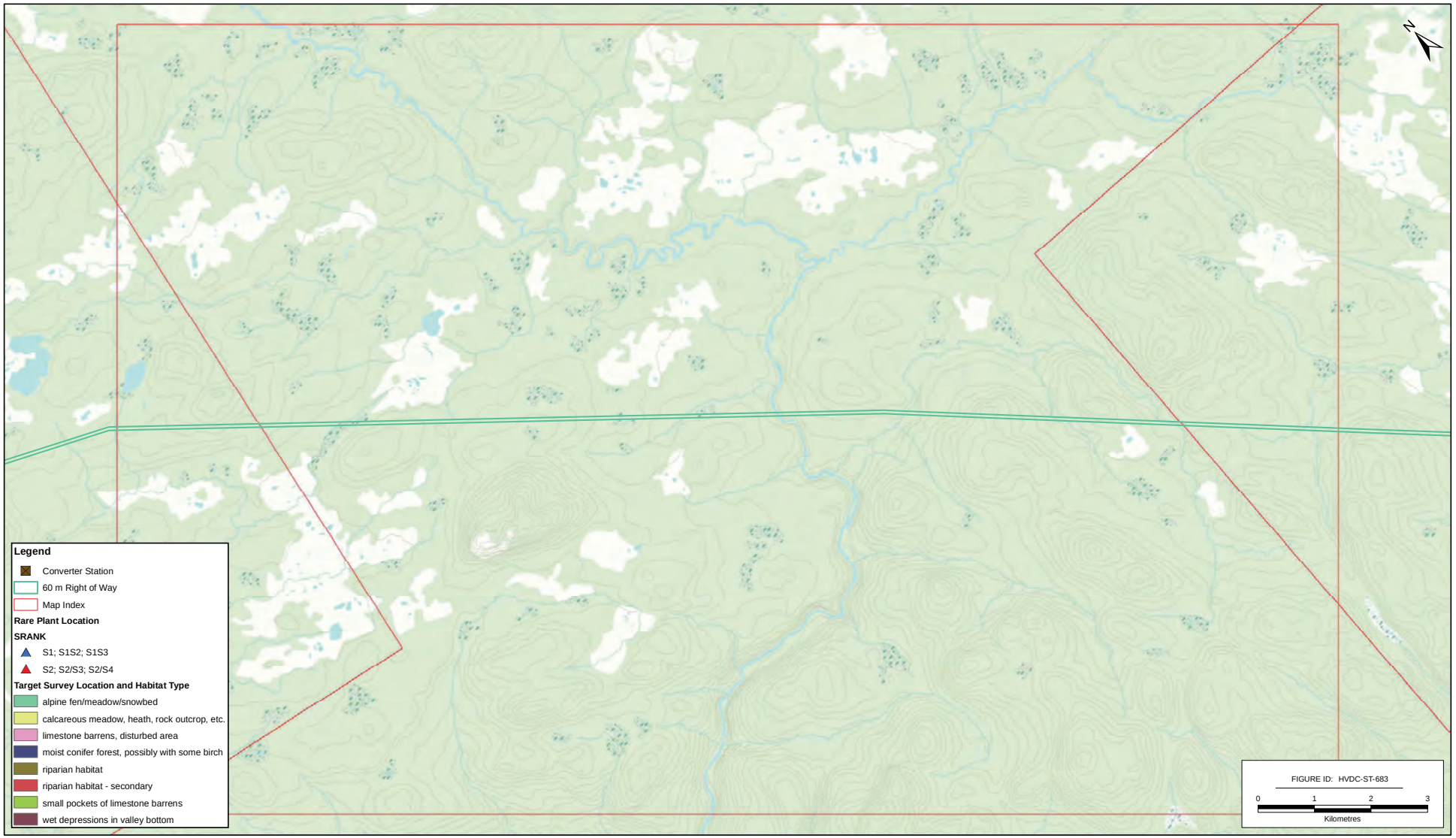
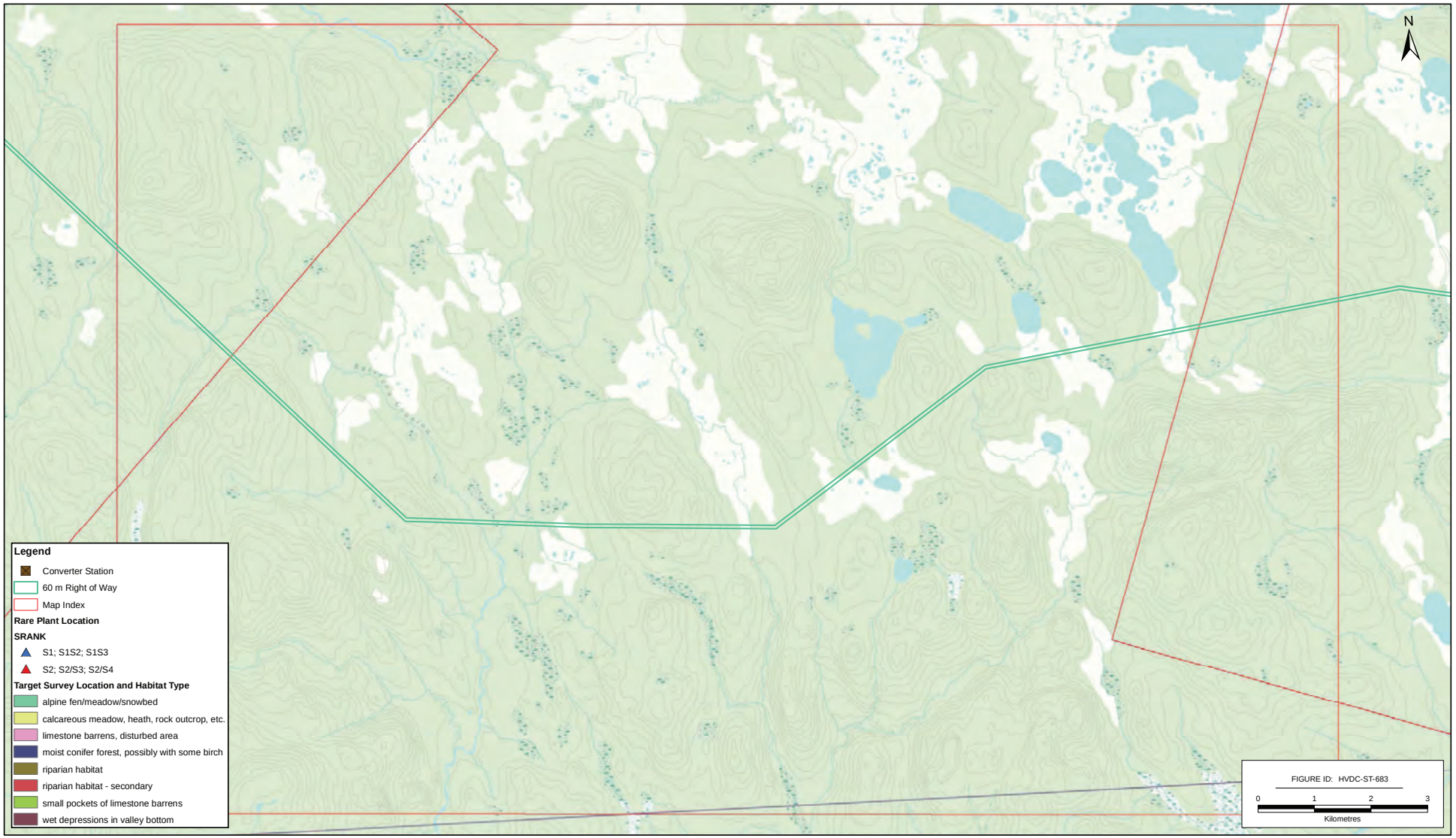


Figure: 14 of 55

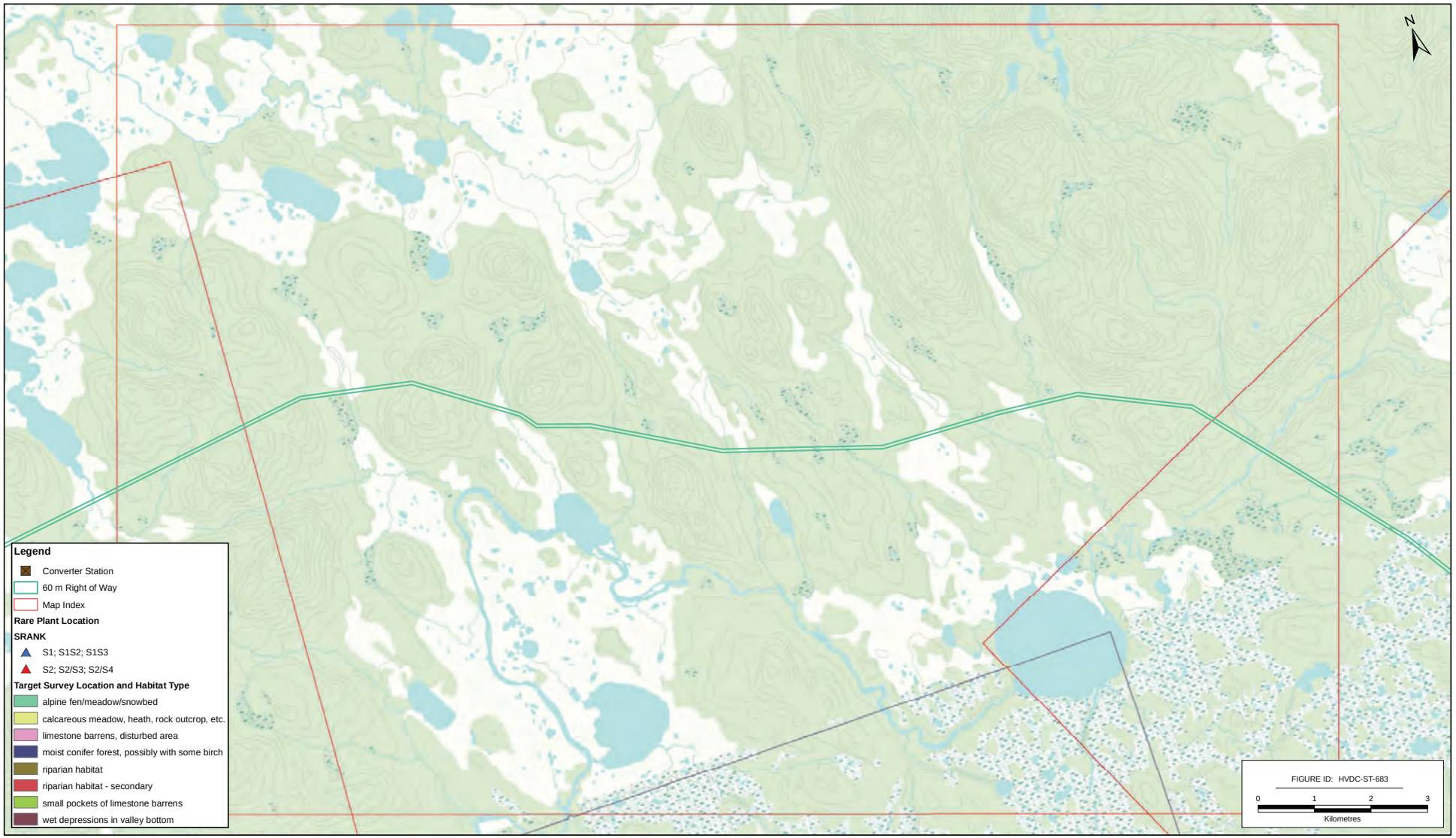
Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 15 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 16 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

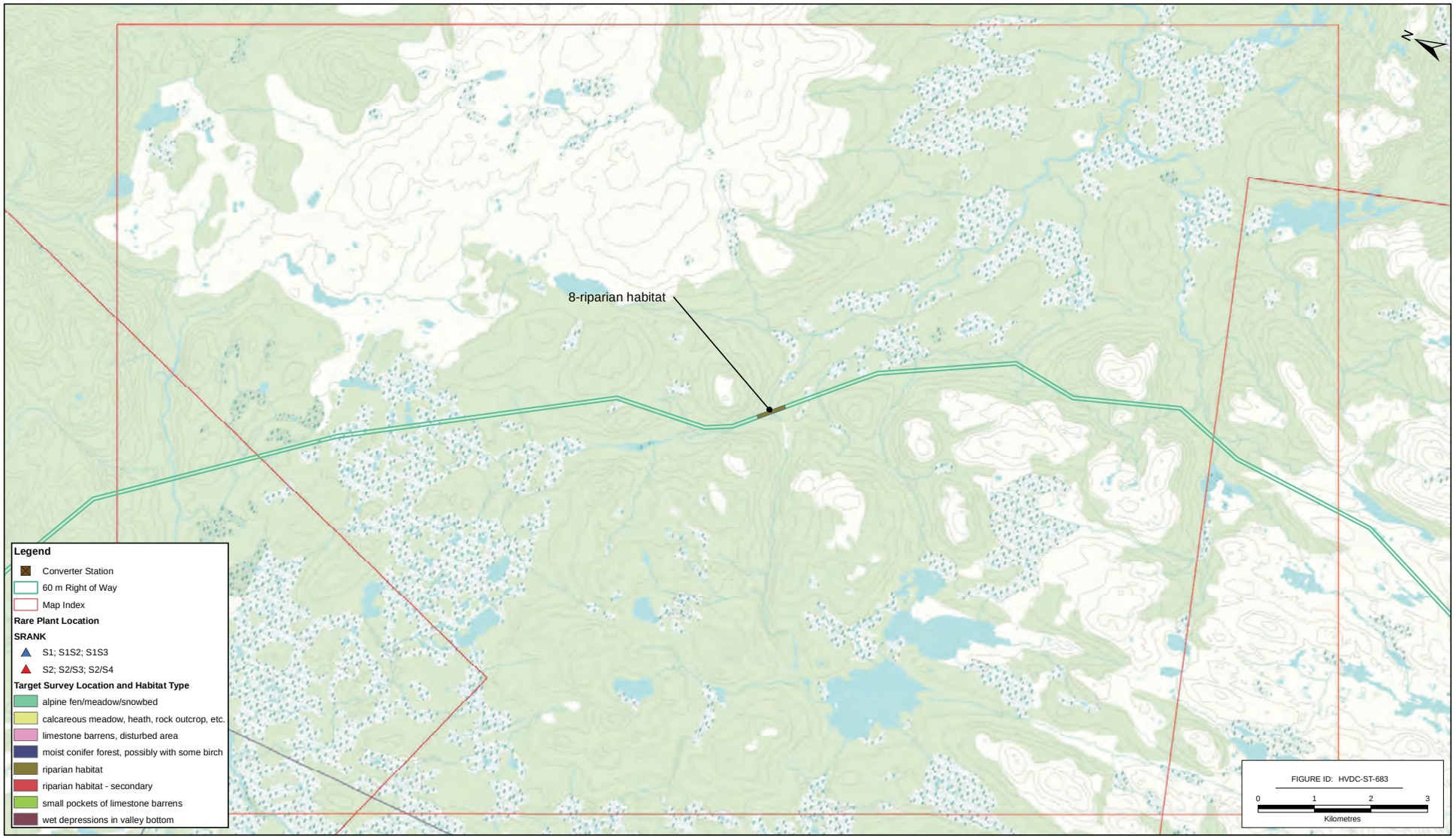


Figure: 17 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

nalcor energy

Figure: 18 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

Figure: 19 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

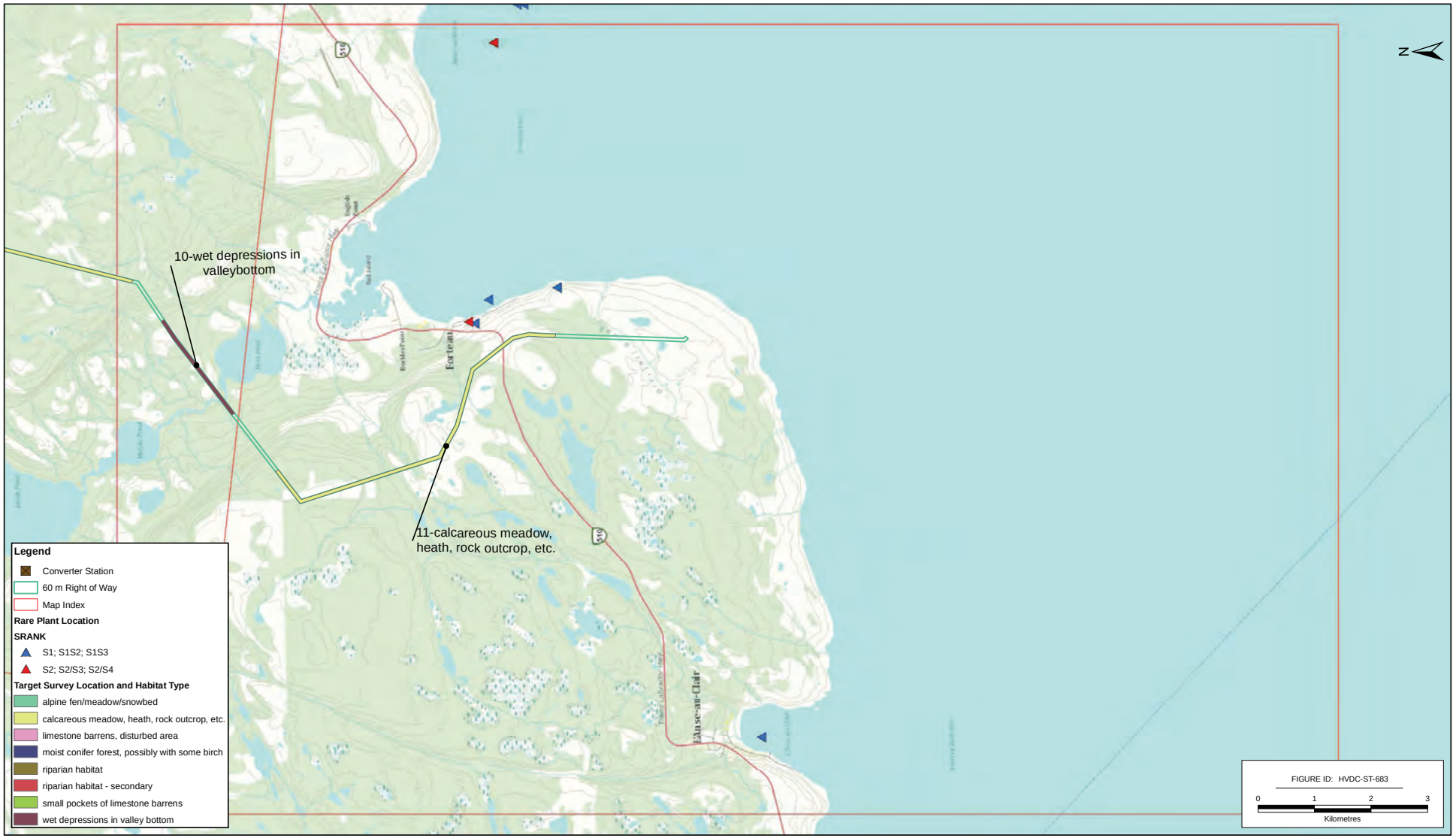


Figure: 20 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

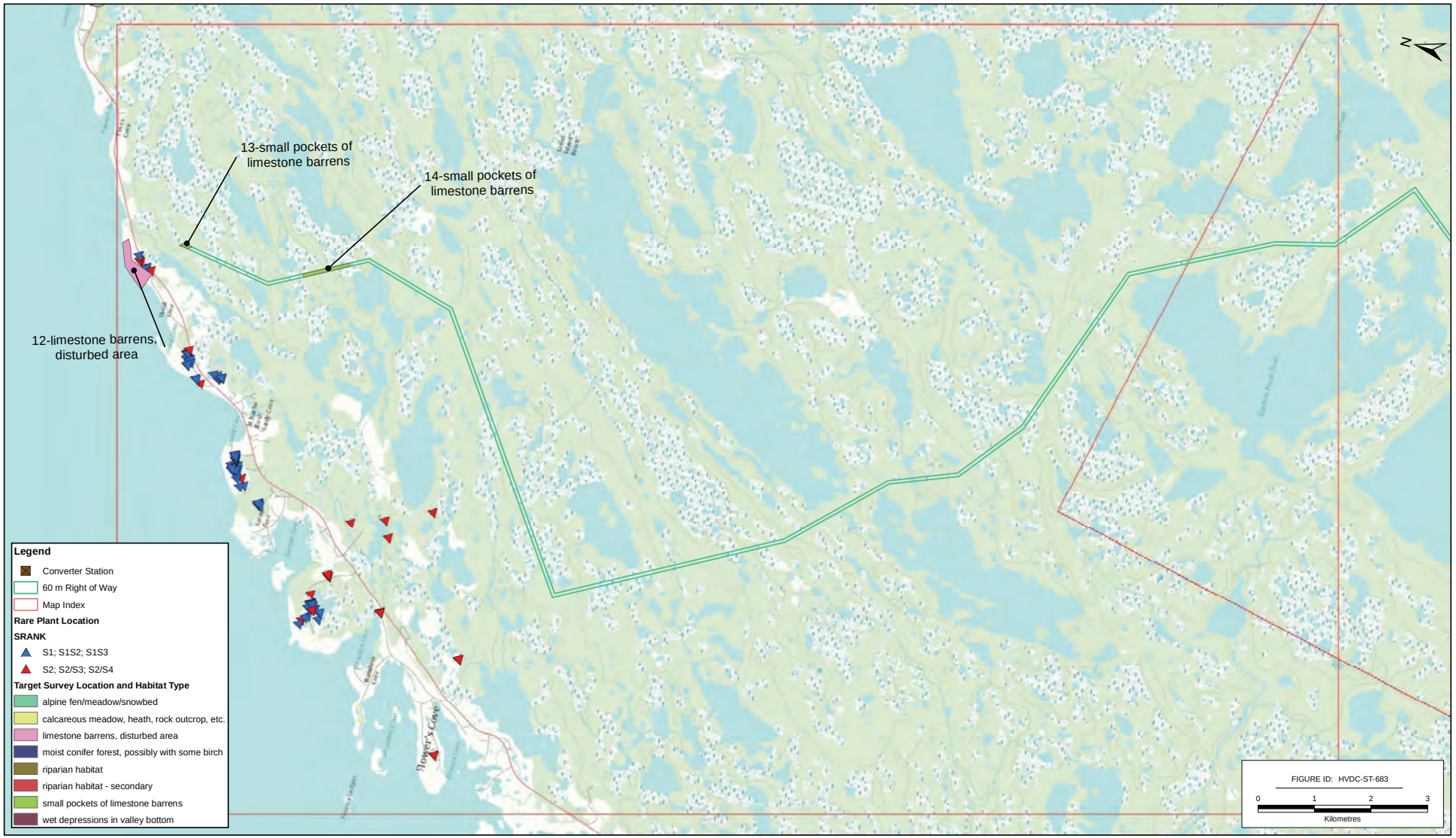
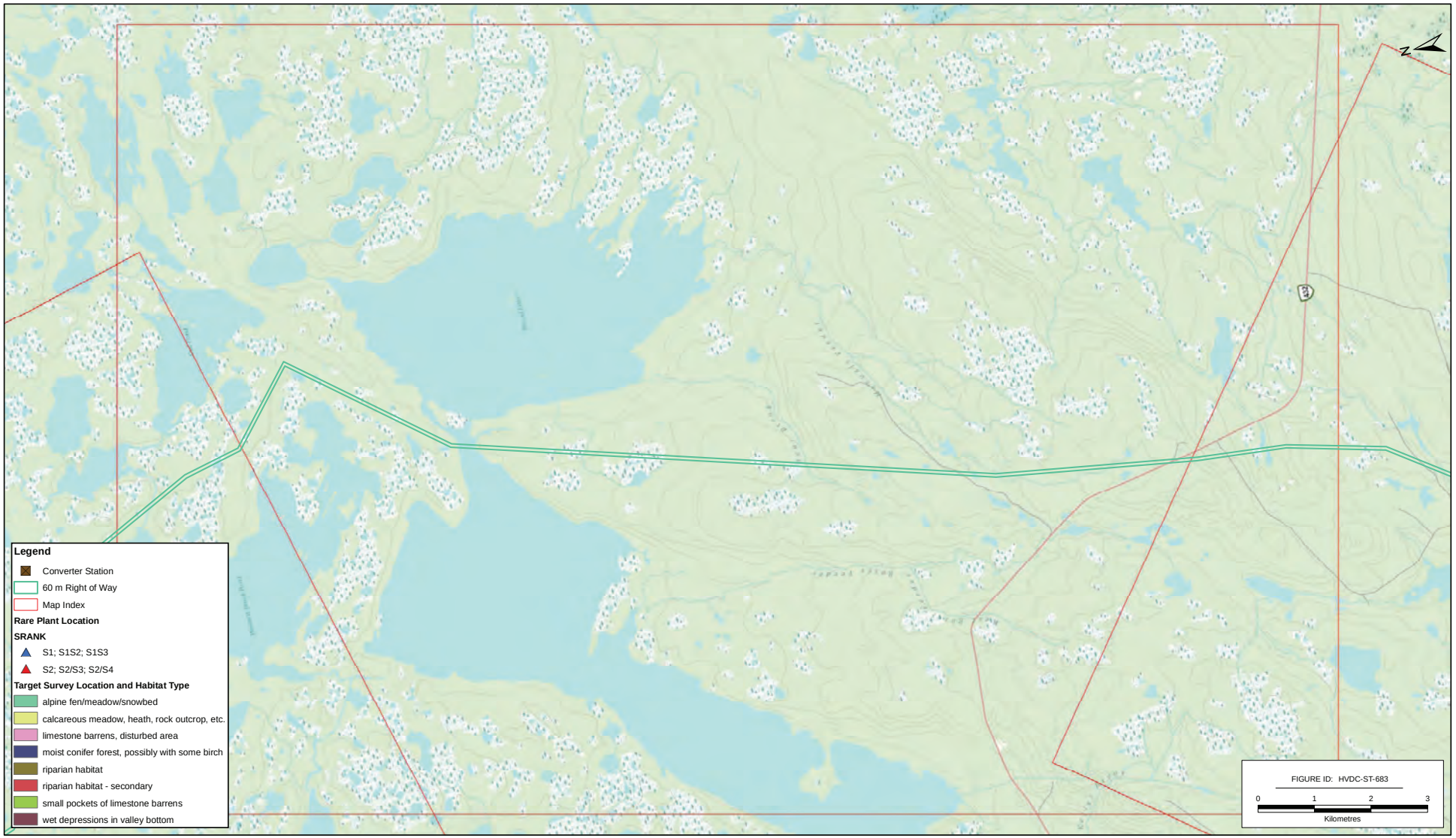


Figure: 21 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 22 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

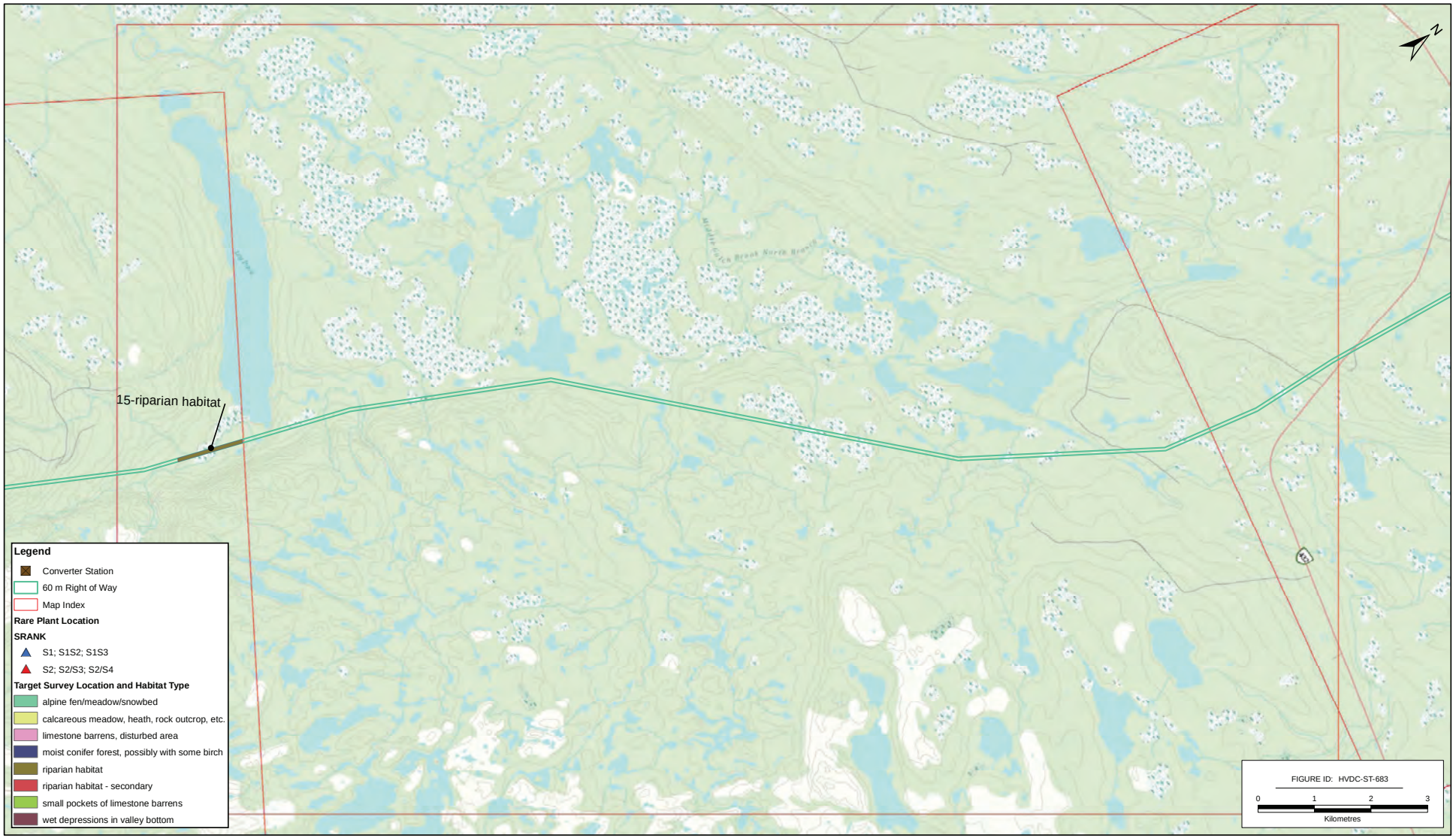


Figure: 23 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

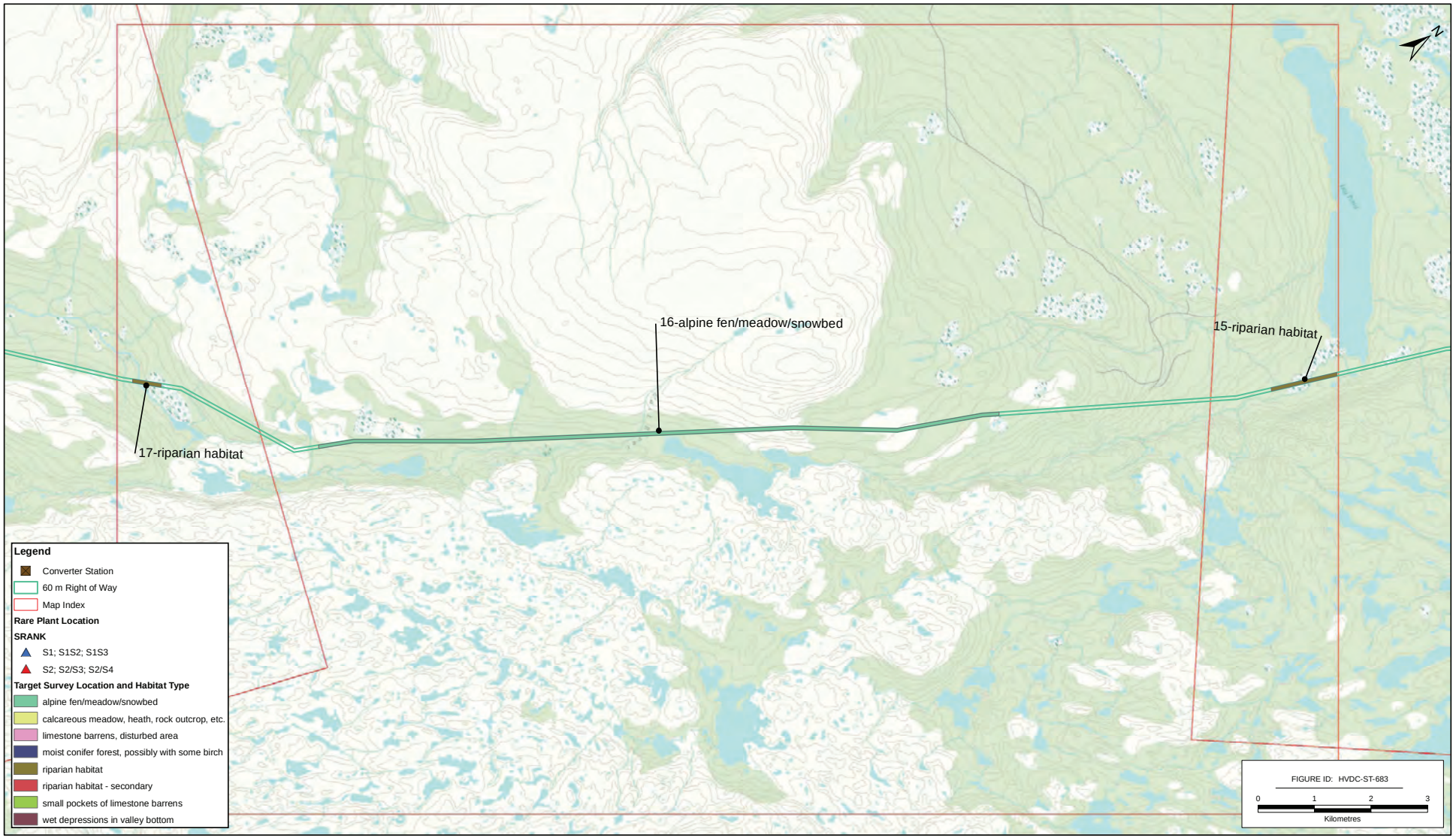


Figure: 24 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

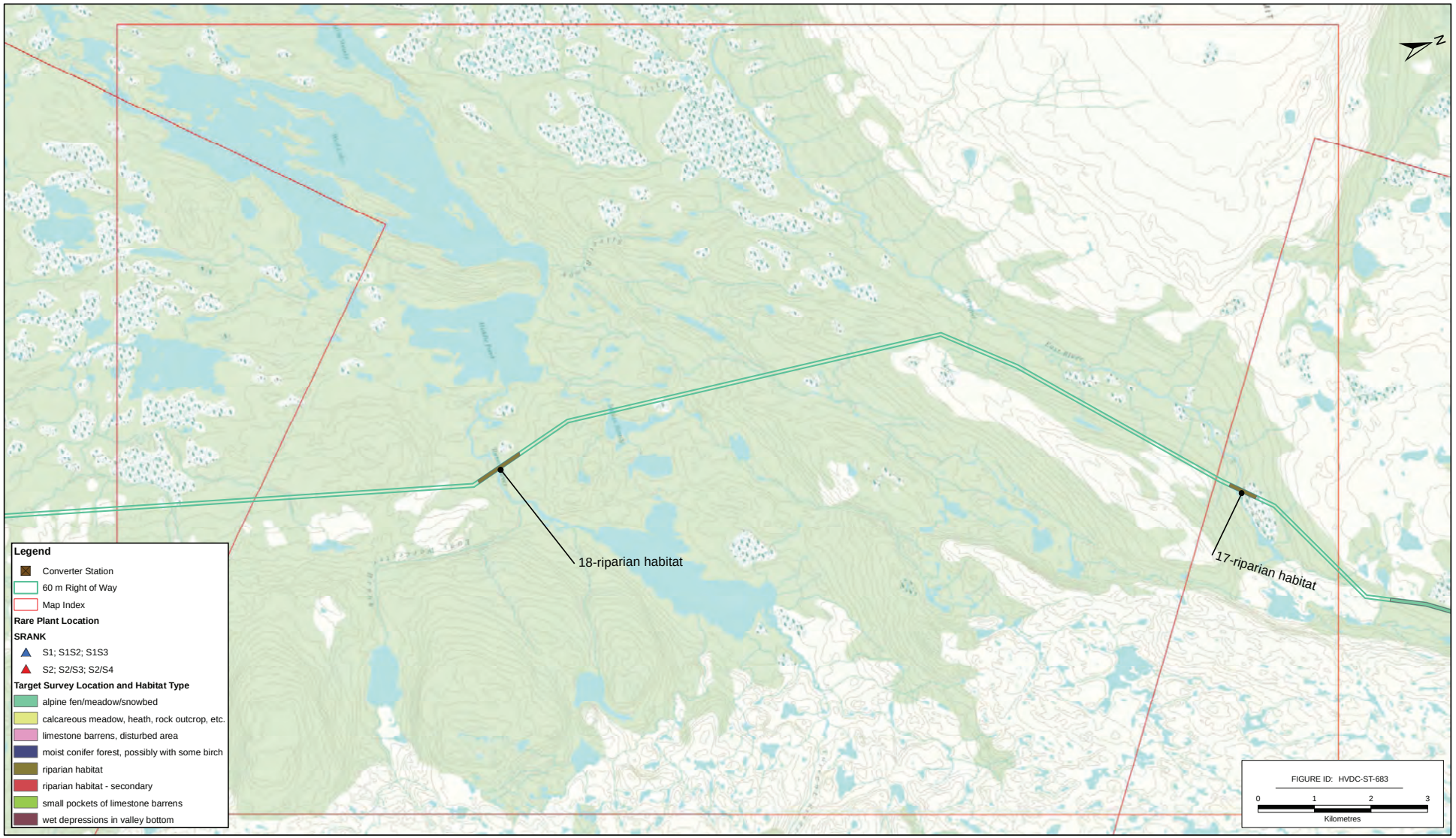
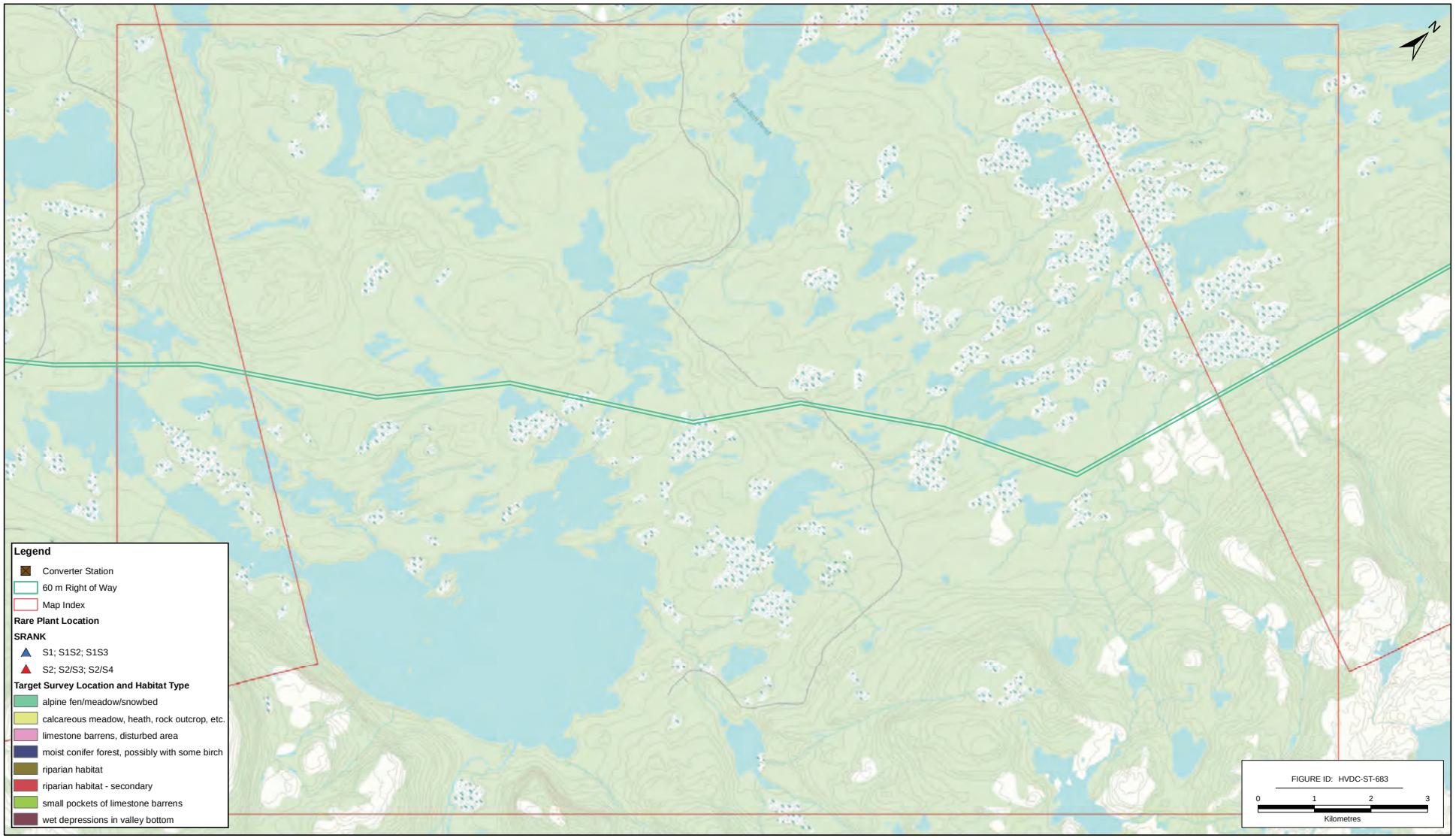


Figure: 25 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 26 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

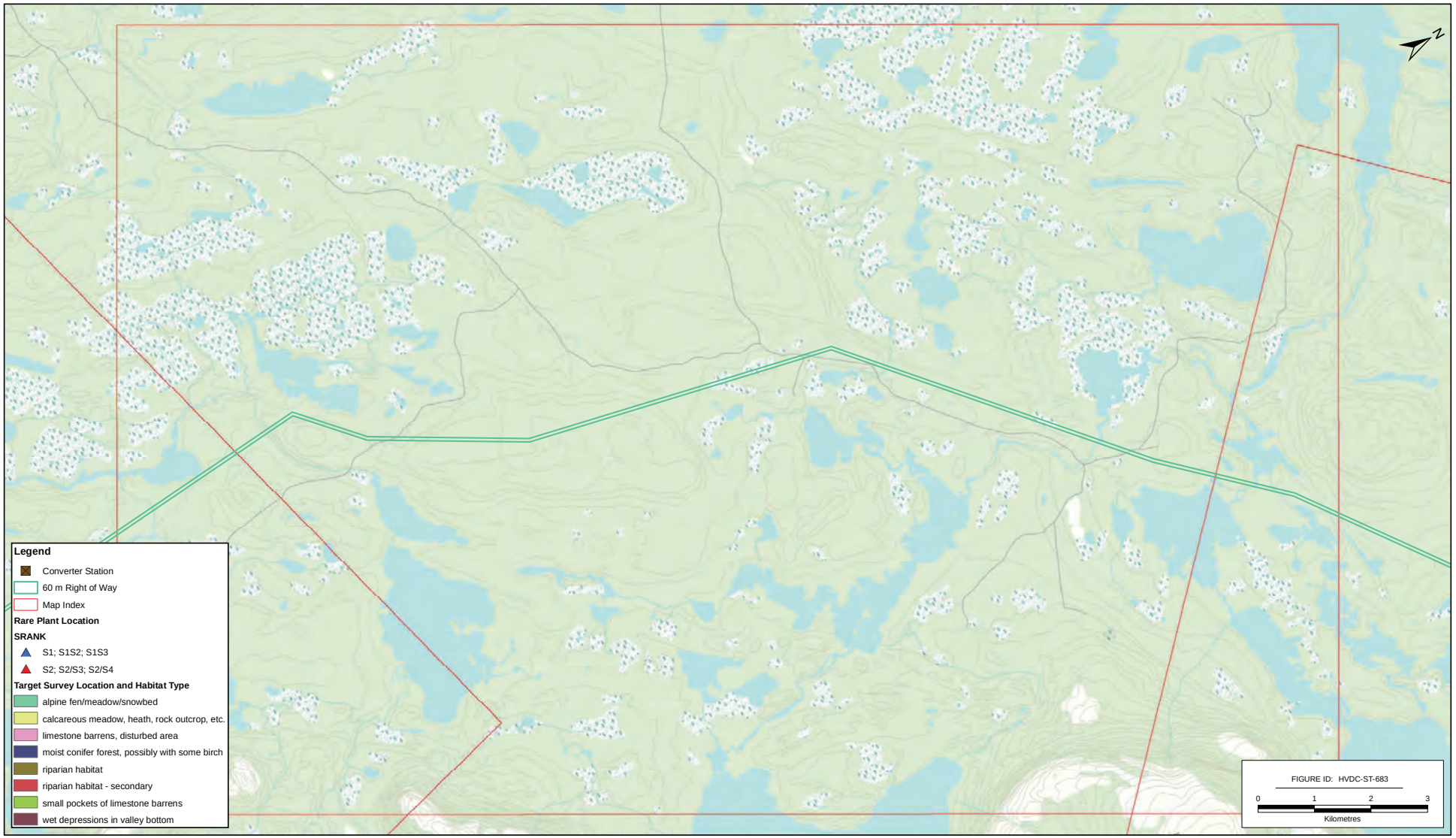


Figure: 27 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

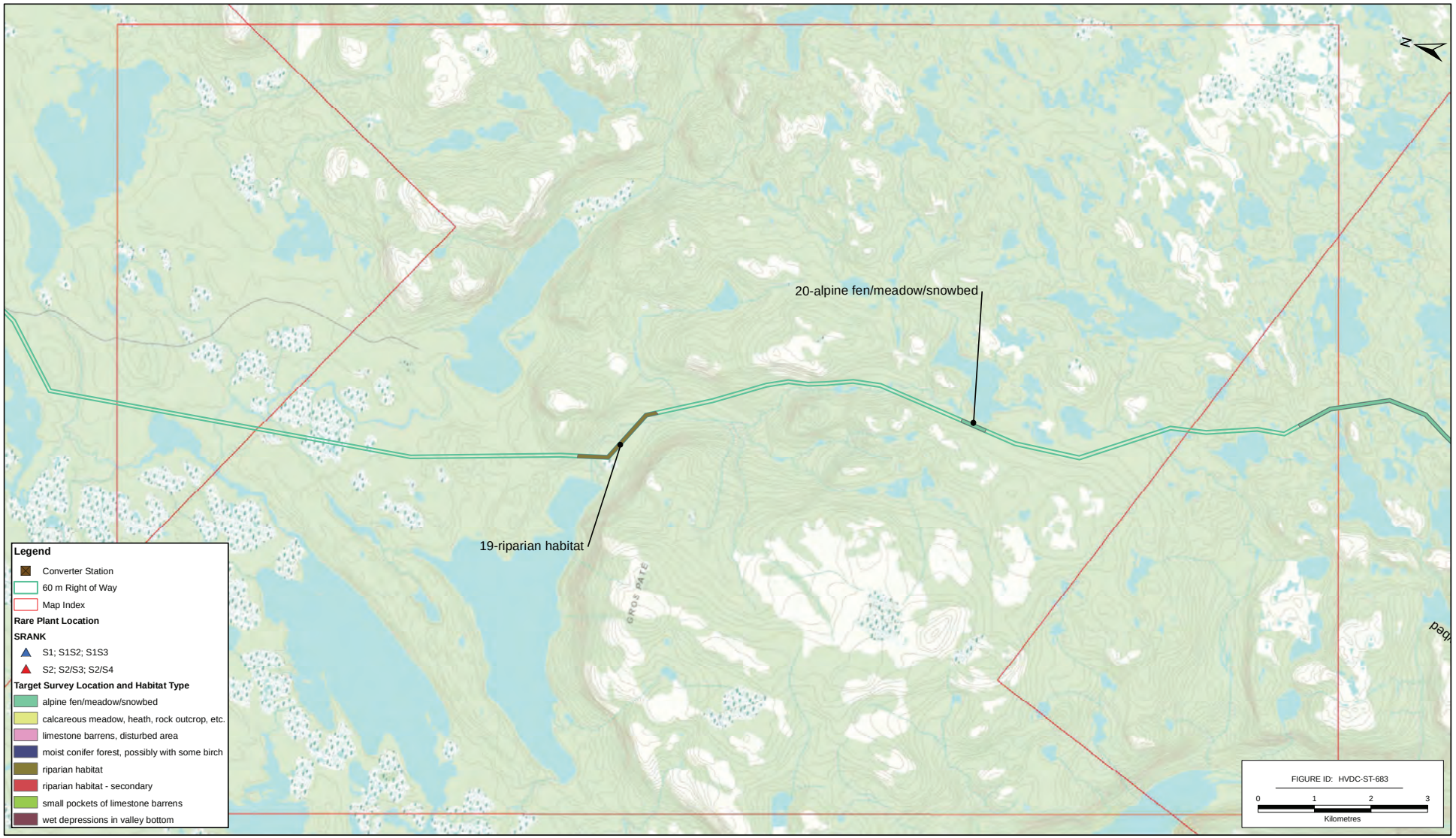


Figure: 28 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

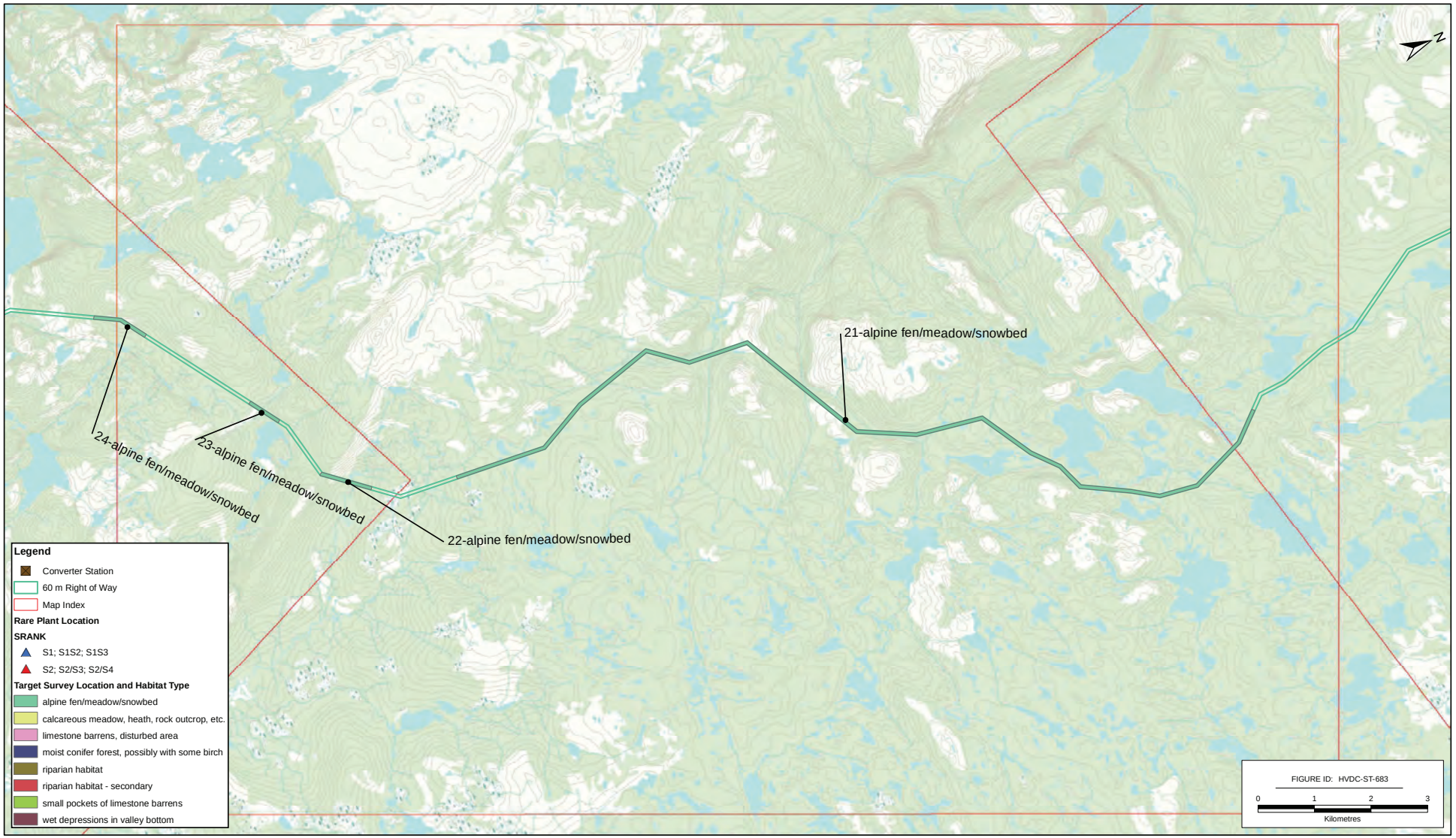


Figure: 29 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

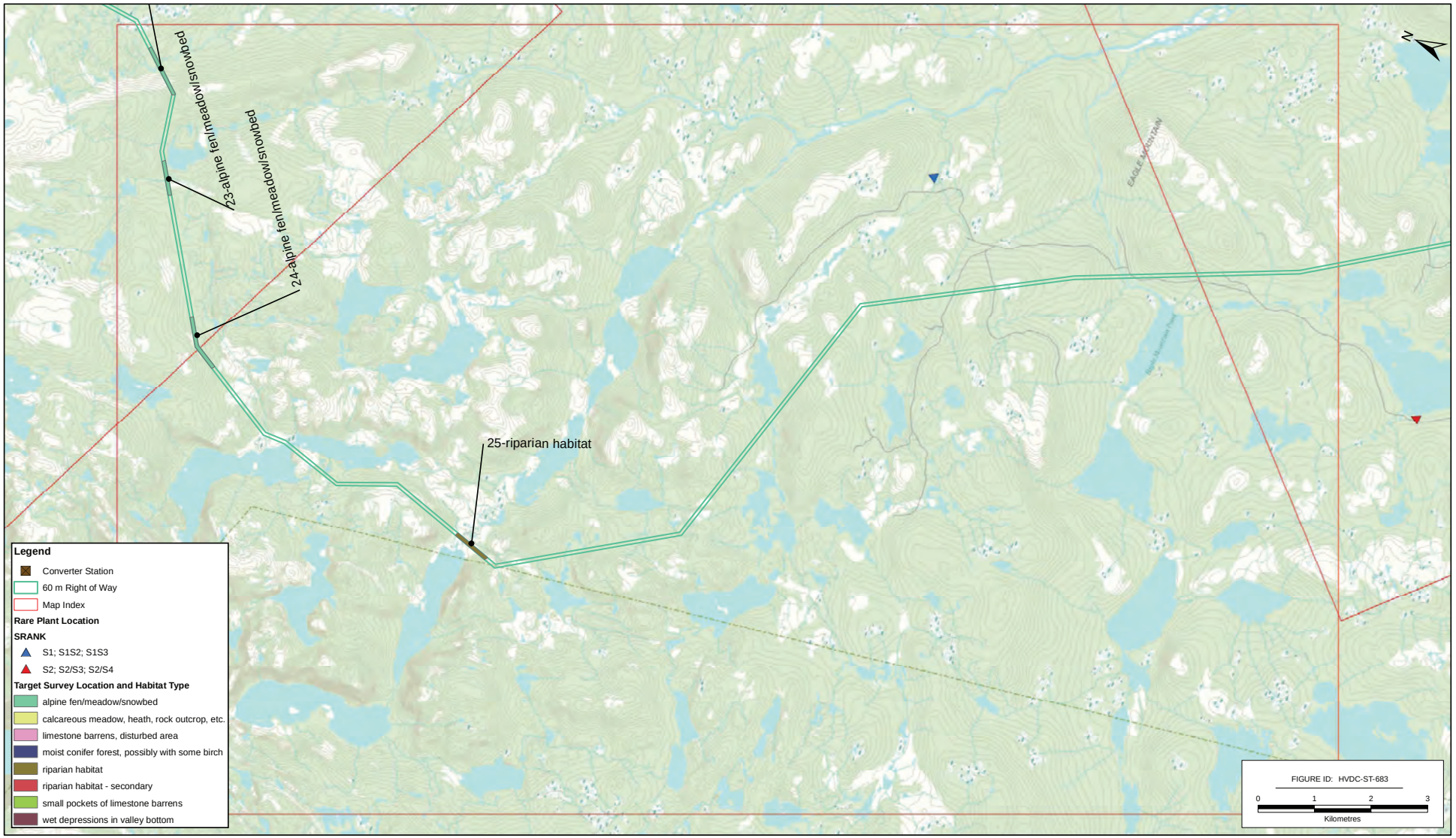
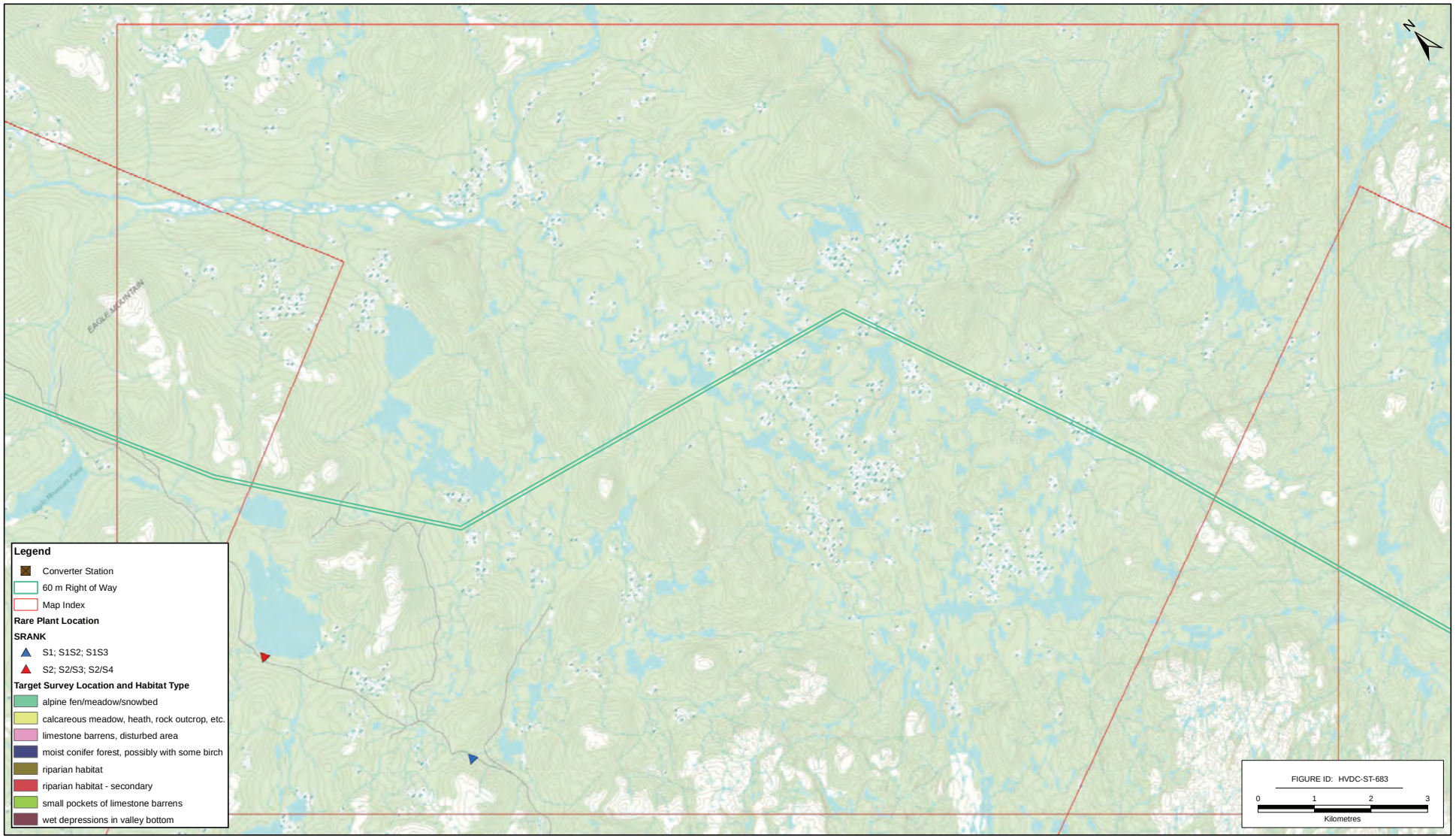


Figure: 30 of 55

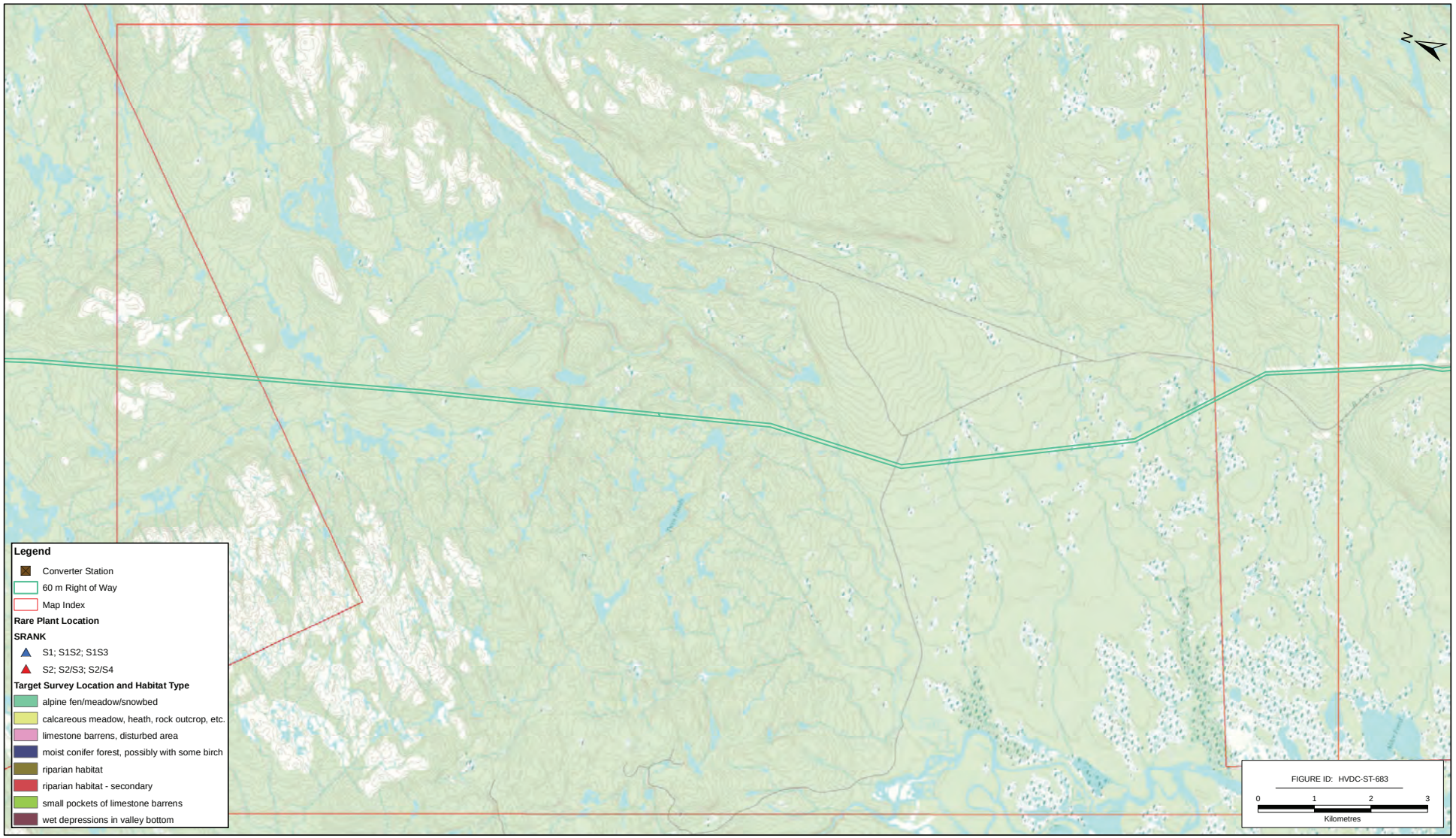
Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 31 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations



nalcor energy

Figure: 32 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

Figure: 33 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

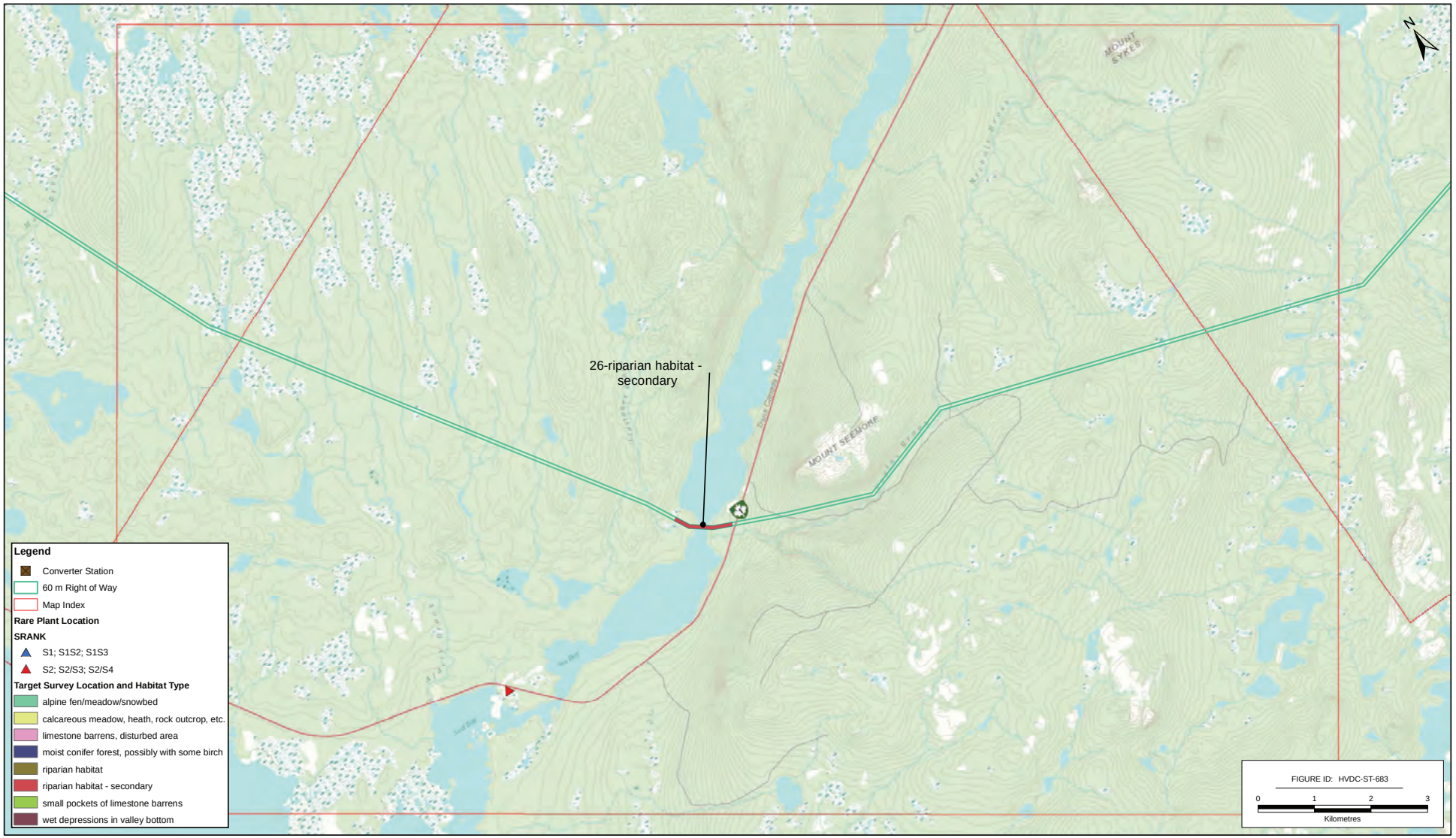


Figure: 34 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations

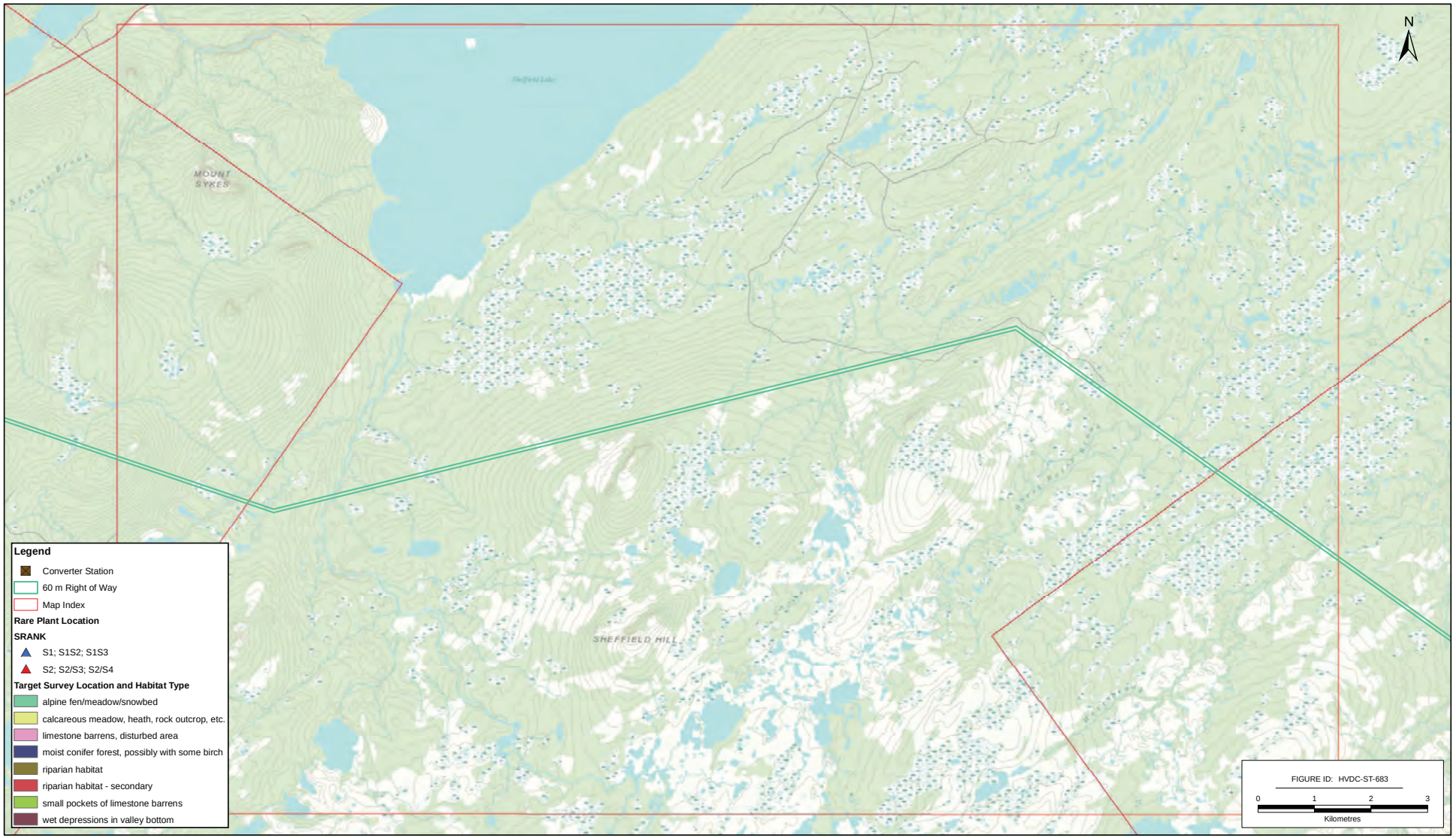


Figure: 35 of 55

Labrador - Island Transmission Link
Target Rare Plant Survey Locations