

Nalcor Energy – Lower Churchill Project



LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN

Nalcor Doc. No. LCP-PT-MD-0000-EV-PL-0016-01

Comments:	Total # of Pages: (Including Cover): 24
-----------	---

B3		Issue for Use	J. Wells	M. Organ	R. Power
Status / Revision	Date	Reason for Issue	Prepared by	Functional Manager Approval	Project Manager (Generation + Island Link) Approval

CONFIDENTIALITY NOTE:

This document contains intellectual property of the Nalcor Energy – Lower Churchill Project and shall not be copied, used or distributed in whole or in part without the prior written consent from the Nalcor Energy – Lower Churchill Project.

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	1

Inter-Departmental / Discipline Approval (where required)

Department	Department Manager Approval	Date
	Name	
	Name	
	Name	
	Name	

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	2

TABLE OF CONTENTS

	PAGE
1 PURPOSE.....	3
2 SCOPE	3
3 DEFINITIONS.....	3
4 ABBREVIATIONS & ACRONYMS	4
5 REFERENCE DOCUMENTS	4
6 PROJECT DESCRIPTION.....	5
6.1 Muskrat Falls Generation.....	5
6.2 Labrador Transmission Asset (LTA).....	6
7 EXISTING INFORMATION.....	7
7.1 Marten.....	7
7.2 River Otter.....	8
7.3 Beaver	9
7.4 Porcupine	9
8 REGULATORY COMPLIANCE	10
9 ENVIRONMENTAL EFFECTS MANAGEMENT.....	11
10 ENVIRONMENTAL EFFECTS MONITORING	13
10.1 Survey Protocols.....	13
10.1.1 Baseline Data Collection.....	14
10.1.2 Data Collection during Construction	14
10.1.3 Data Collection During Operations	16
10.1.4 Follow-up program.....	17
11 REFERENCES.....	21

TABLE	PAGE
Table 10-1 Summary of the Furbearers Protection and Environmental Effects Monitoring Plan	19

FIGURE	PAGE
Figure 6-1: Muskrat Falls Generating Facility	6
Figure 6-2 Labrador Transmission Asset	7

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	3

1 PURPOSE

The purpose of this Furbearers Protection and Environmental Effects Monitoring Plan (FPEEMP) is to demonstrate how any adverse environmental effects of the Lower Churchill River Hydroelectric Generation Project (the Project) will be mitigated, and to set out a program for monitoring the effectiveness of mitigation measures. To comply with regulatory requirements and commitments made in the Environmental Impact Statement (EIS), the Lower Churchill Project's (LCP) FPEEMP approach includes consideration of:

- Mitigation objectives – performance objectives in respect of each adverse environmental effect;
- Mitigation – measures planned to achieve the mitigation objectives;
- Metrics and targets – specific, quantifiable, relevant and time constrained;
- Follow-up or Monitoring Programs – how the Project will include follow-up or monitoring surveys to confirm that mitigation strategies are meeting the mitigation objectives; and
- Contingency – plan to be implemented should monitoring reveal that mitigation measures have not been successful.

The LCP's FPEEMP relates to furbearing mammals, represented in this plan by Marten (*Martes americana*), River Otter (*Lutra canadensis*) and Beaver (*Castor canadensis*), and includes Porcupine (*Erethizon dorsatum*). The FPEEMP builds on existing information and commitments made in the EIS (Nalcor 2009), and conditions of permits and licenses for the Project.

2 SCOPE

This plan addresses the required aspects of furbearers protection and effects monitoring for the design, construction, and operation phases of the Project including Muskrat Falls Generation and Labrador Transmission Assets (described in Section 6.0).

3 DEFINITIONS

Environmental Assessment: An evaluation of a project's potential environmental risks and effects before it is carried out and identification of ways to improve project design and implementation to prevent, minimize, mitigate, or compensate for adverse environmental effects and to enhance positive effects.

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	4

Environmental Management: The management of human interactions with the environment (air, water and land and all species that occupy these habitats including humans).

Environmental Protection Plan: Document outlining the specific mitigation measures, contingency plans and emergency response procedures to be implemented during the construction or operations of a facility.

Environmental Effects Monitoring: Monitoring of overall Project effects to confirm the predictions of EA and to fulfill EA commitments.

Environmental Compliance Monitoring: Monitoring of Project activities to confirm compliance with regulatory requirements and commitments made through the EA process.

Furbearer: For this plan, this refers to Marten, River Otter, Beaver and Porcupine.

4 ABBREVIATIONS & ACRONYMS

CEAA	Canadian Environmental Assessment Act
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
EA	Environmental Assessment
EEMP	Environmental Effects Monitoring Plan
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
ERC	Environment and Regulatory Compliance
Gen	Generation
HSE	Health Safety and Environment
IBA	Impacts and Benefits Agreement
IPD	Integrated Project Delivery
LTA	Labrador Transmission Asset
LCP	Lower Churchill Project
NE	Nalcor Energy
NL	Newfoundland and Labrador
NLDEC	Newfoundland and Labrador Department of Environment and Conservation
PEEMP	Protection and Environmental Effects Monitoring Plan
RCP	Regulatory Compliance Plan
SARA	Species at Risk Act

5 REFERENCE DOCUMENTS

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	5

LCP-PT-MD-0000-PM-PL-0001-01	LCP Project Execution Plan
LCP-PT-MD-0000-PM-CH-0001-01	LCP Project Charter
LCP-PT-MD-0000-EA-PL-0001-01	LCP Generation Environmental Assessment Commitment Management Plan
LCP-PT-ED-0000-EA-SY-0002-01	Environmental Impact Statement and Supporting Documentation for the Labrador-Island Transmission Link
LCP-PT-MD-0000-SM-ST-0001-01	Post Environmental Assessment Release
LCP-PT-MD-0000-RT-PL-0001-01	Regulatory Compliance Plan
LCP-PT-MD-0000-HS-PL-0001-01	Health and Safety Plan
LCP-PT-MD-0000-HS-PL-0004-01.	LCP Emergency Response Plan
LCP-PT-MD-0000-EV-PY-0001-01	LCP No Harvesting Policy

6 PROJECT DESCRIPTION

6.1 MUSKRAT FALLS GENERATION

The Muskrat Falls Generation Project will include the following sub-components which are broken down under the five principal areas of the development:

- 22 km of access roads, including upgrading and new construction, and temporary bridges;
- A 1,500 person accommodations complex (for the construction period); and
- A north roller compacted concrete overflow dam;
- A south rock fill dam;
- River diversion during construction via the spillway;
- 5 vertical gate spillway;
- Reservoir preparation and reservoir clearing;
- Replacement of fish and terrestrial habitat;
- North spur stabilization works, and:
- A close coupled intake and powerhouse, including:
 - 4 intakes with gates and trash racks;
 - 4 turbine/generator units at approximately 206 MW each with associated ancillary electrical/mechanical and protection/control equipment;

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	6

- 5 power transformers (includes 1 spare), located on the draft tube deck of the powerhouse; and
- 2 overhead cranes each rated at 450 Tonnes



Figure 6-1: Muskrat Falls Generating Facility

6.2 LABRADOR TRANSMISSION ASSET (LTA)

LTA consists of the AC transmission line system from Churchill Falls to Muskrat Falls, specifically:

- Churchill Falls switchyard extension;
- Muskrat Falls switchyard;
- Transmission lines from Muskrat Falls to Churchill Falls: double-circuit 315 kV ac, 3 phase lines, double bundle conductor, Single circuit galvanized lattice steel guyed suspension and rigid angle towers; 247 km long;
- 735 kV Transmission Line at Churchill Falls interconnecting the existing and the new Churchill Falls switchyards; and
- Labrador Fibre Project (Nalcor's participation in Aliant led initiative).

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	7

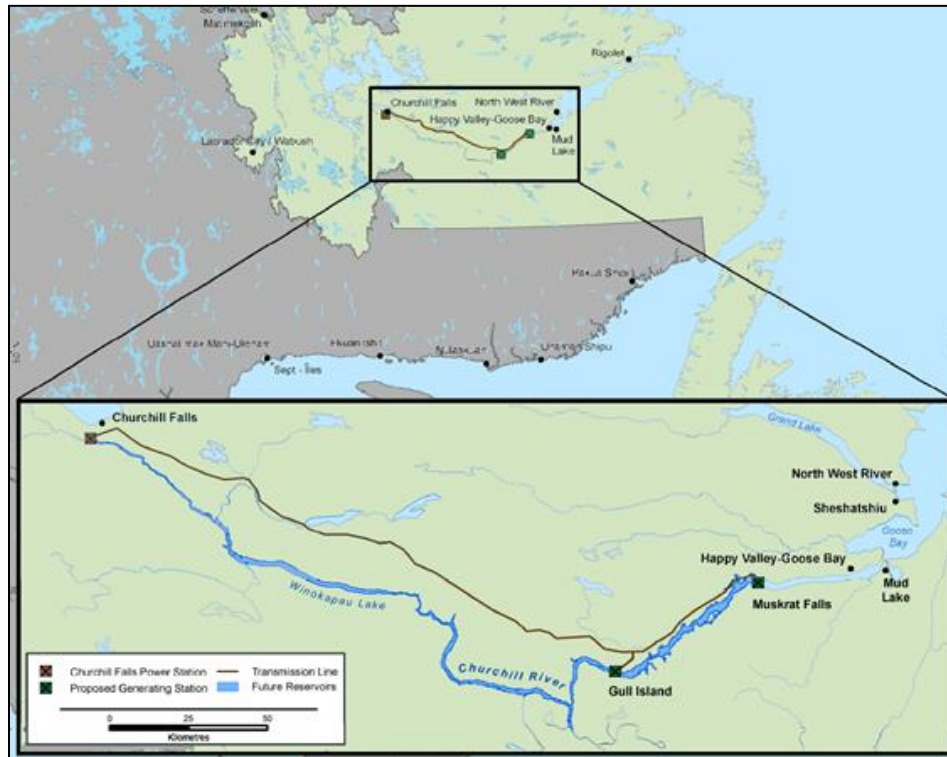


Figure 6-2 Labrador Transmission Asset

7 EXISTING INFORMATION

Existing information regarding furbearers, including Marten, River Otter, Beaver and Porcupine, is summarized from data compiled for the LCP's EIS for the Project (Nalcor 2009), which was based on a literature review, Project-specific baseline surveys, and other sources including traditional environmental knowledge (Innu Nation 2007) and current land and resource use in the lower Churchill River watershed (Minaskuat Inc. 2009).

7.1 MARTEN

Habitat selection by Marten depends on the availability of dense canopy forest patches within a matrix of bogs and scrub (Smith and Schaefer 2002). Marten favour and are most successful in continuous late-successional coniferous forests (Buskirk 1992; Buskirk and Ruggiero 1994; Poole et al. 2004). Mature coniferous habitat is important because it provides the vertical and

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	8

horizontal structure thought to be necessary for Marten (Bowman and Robitaille 1997). This structure provides access to subnivean (under-snow) areas in winter for hunting.

Marten diet varies considerably in different geographic areas; voles are typically the most common food in all seasons, although Marten is a generalist omnivore, preying on a variety of small mammals, birds, insects, fish, vegetation and carrion, and sometimes relying heavily on fruit in autumn (Martin 1994). Mech and Rogers (1977) suggest that the availability of food may be the most crucial factor affecting Marten distribution.

Marten is a common and widespread furbearing mammal in Labrador, where the lower Churchill River valley supports a diversity of mature and over-mature coniferous and mixed wood forests that provide the preferred structural and compositional elements for foraging and breeding habitat. Marten is considered to have a higher degree of resilience than a species with a more restricted distribution (Conover et al. 1985). Individual Marten have large home ranges in Labrador (males, 45.0 km²; females, 27.6 km²), perhaps because habitat was generally sub-optimal, rather than due to low prey abundance (Smith and Schaefer 2002). Marten has become the most important economic furbearer in Labrador.

The Project will affect Marten through the loss of forest cover during reservoir preparation, and construction related to other Project activities associated with the transmission line, as these activities will contribute to fragmentation of contiguous forest and may present obstacles to Marten movement.

Note that the Marten population in Labrador is genetically distinct from the Newfoundland Marten, which inhabits the Island of Newfoundland and is currently listed as “at risk” provincially and as “threatened” federally (NLDEC 2013, Internet site; SARA Public Registry 2013a, Internet site).

7.2 RIVER OTTER

The River Otter is native to both Newfoundland and Labrador (NL), and prefers shores of deep, clear water in lakes, rivers, marshes and ocean bays (NLDEC 2012, Internet site). The primary diet of River Otter consists of fish such as minnows and trout; however, they will also feed on dragonfly nymphs, water beetles, bugs, frogs, tadpoles, newts and even mammals such as muskrat, meadow voles, shrews and beavers. While the River Otter is aquatic, it may travel several miles over land to reach another stream or lake, and typically has a home range of 24 km² or more (Burt and Grossenheider 1952).

The River Otter’s diet of largely aquatic organisms, including fish, makes it a potential candidate to assess the effect of mercury accumulation following inundation of the reservoirs. River Otter

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	9

was evaluated, along with Osprey, in an Ecological Risk Assessment (Minaskuat Limited Partnership 2008) conducted by the LCP in anticipation of an environmental assessment for the Project. The assessment results suggest that River Otter are unlikely to experience adverse effects after eating fish containing predicted levels of methyl-mercury once the Project is constructed. In response, the separate EEMP to address methyl-mercury eco-risk focuses on Osprey (i.e., sampling feathers for methylmercury) as a non-destructive sampling procedure. As well, River Otter will be sampled using a non-destructive sampling method (i.e., using hair snag), to analyze for methylmercury in River Otter.

7.3 BEAVER

Beaver occupies rivers, streams, marshes, lakes and ponds and is most often found in association with riparian and wetland habitat; it is a keystone species as its watershed modification is important in creating and maintaining local ecological conditions. Beaver is common in wooded regions, with its range extending into the semi-barrens where trees are in adequate supply (Bangs 1898). Beaver has a widespread distribution, with a strong association with the presence of deciduous trees (Allen 1983), although Beaver can subsist on conifers (Van Gelder 1982). Beaver shows a distinct preference for the bark of trees, preferentially aspen and birch in Labrador, as food sources (Nalcor 2009).

The Beaver occupies water bodies within areas of deciduous vegetation throughout the lower Churchill River watershed, where willow and alder beds at the mouths of tributaries and small creeks are described as the best beaver habitat along the lower Churchill River (Northland Associates 1980). Aerial (helicopter) surveys conducted in the fall of 2006 (Minaskuat Inc. 2008) located 53 beaver colonies in 63 blocks (each 4 km² in size), of which only nine were considered to be active as reflected by the presence of fresh cuttings or a food cache (i.e., 'active' as defined by Bergerud and Miller (1977)). Based on these surveys (Minaskuat Inc. 2008) and compared to the North American average, Beaver occurs in relatively low densities along the Churchill River and its tributaries (Nalcor 2009), with a range of active colonies from 0.00 to 0.13/km², depending on the habitat type (Minaskuat Inc. 2008). Beaver is nonetheless an important species for trappers and as a food source for Innu (Nalcor 2009).

7.4 PORCUPINE

The Porcupine is adaptable and considered a generalist at the landscape level, using a wide range of seasonal habitat types, including conifer and mixed wood forests, throughout Canada (Roze 1989; Griesemer et al. 1998). Porcupine prefers coniferous cover, uses open water

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	10

habitat only rarely, as a travel corridor, and selects habitat to provide for foraging, predator avoidance, and resting (Stricklan et al. 1995; Sweitzer and Berger 1992).

Considered scarce only decades ago, Porcupine is now common and occurs throughout Labrador. Schmelzer (2001) suggests that Porcupine home ranges in Labrador are largest in winter at 7.01 km² (plus or minus 2.46 km²) and smaller in summer at 5.69 km² (plus or minus 2.28 km²). Porcupine is often pursued as a small game species during traditional and recreational hunting activities, and provides a food source for Innu and for others (Nalcor 2009).

8 REGULATORY COMPLIANCE

The Marten, Beaver, River Otter and Porcupine are not currently listed by provincial (NLDEC 2013, Internet site) or federal agencies (SARA Public Registry 2013b, Internet site), and Marten and River Otter are classified as “secure” in NL by the NLDEC (NLDEC 2013, Internet site). None of these species has been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2013, Internet site), and all are considered “secure” in NL by the General Status of Species in Canada initiative (General Status of Species in Canada 2012, Internet site).

Marten, River Otter and Beaver in NL are managed by the Wildlife Division of the NLDEC under Newfoundland and Labrador Regulation 68/12 Furbearing Animals Trapping and Shooting Order, 2012-2013 under the Wild Life Regulations (2012) and the *Wild Life Act* (2012). Porcupine in NL is managed by the Wildlife Division under Newfoundland and Labrador Regulation 74/12 Open Season Small Game Hunting and Snaring Order, 2012-2013 under the Wild Life Regulations (2012) and the *Wild Life Act* (2012).

To comply with federal and provincial legislation and regulations the LCP has, or will:

- identified furbearer habitat within the Project area, as presented in the EIS (Nalcor 2009);
- designed and employed appropriate best management mitigation to avoid disturbance and mortality of furbearers and porcupine;
- conduct monitoring or follow-up, as appropriate, to determine success of the mitigation; and
- if required, address contingency plans if the mitigation is found to be unsuccessful.

The intent of the FPEEMP is to allow the LCP to evaluate and to respond appropriately to the findings of the Project effects during construction and operations on:

- disturbance to Furbearers and Porcupine and their residences; and

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	11

- mortality of Furbearers and Porcupine.

NL Reg. 18/12, also referred to as the *Lower Churchill Hydroelectric Generation Project Undertaking Order* releases the Project from environmental assessment and sets conditions for this release that LCP must meet. The release of the Project from environmental assessment under section 3 is subject to the following conditions:

- (a) Nalcor Energy shall abide by all commitments made by it in the Environmental Impact Statement dated February 2009, and all the Environmental Impact Statement Additional Information Requests made by the Lower Churchill Hydroelectric Generation Project Environmental Assessment Panel and consequently submitted by Nalcor Energy, and the submissions made by Nalcor Energy during the panel hearings and, subsequent to the hearings, to the panel, unless one or more of the commitments, or a part of a commitment is specifically waived by the minister;
- (e) Nalcor Energy shall prepare and abide by the requirements of environmental effects monitoring plans for all phases of the project, and those plans shall be submitted to and approved by the Minister of Environment and Conservation or the appropriate minister of the Crown before the commencement of an activity which is associated with or may affect one or more of the following matters:

(xvii) beavers

Submission of this EEMP satisfies the condition/requirement in NL Reg. 18/12 that Nalcor Energy prepare and submit to the Minister of Environment and Conservation or the appropriate minister of the Crown, an environmental effects monitoring plan for all phases of the project, before the commencement of an activity which is associated with or may affect the following matters:

(xvii) beavers

9 ENVIRONMENTAL EFFECTS MANAGEMENT

The effects management plans (i.e., mitigation measures outlined in the EIS [Nalcor 2009] and the Generation and Labrador Transmission Assets Environmental Protection Plan (EPP) (LCP, 2013) and the commitments made by the LCP during the Information Request responses and the hearing to ensure regulatory compliance of the above discussed Acts and regulations include the following:

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	12

- Important habitats will be identified on site plans or plan profiles for roads and transmission lines for the Component-Specific Environmental Protection Plan (C-SEPP).
- Reservoir preparation will include removal of forest cover where safe and practical to do so such that the reservoir water surface (and littoral zone) will provide unimpeded access for wildlife.
- Active Beaver colonies will be identified and mapped one to two months before reservoir impoundment.
- The LCP will live-trap and relocate Beaver from active colonies within the proposed reservoir prior to flooding to alternative locations above the reservoir limit, under the direction of NLDEC-WD.
- Avoid disturbance and/or the clearing of sensitive wildlife areas (i.e., primary Furbearer habitat) during all clearing.
- To the extent practical, scheduling of activities will be limited and adaptable during sensitive periods in the winter; construction activities will be scheduled considering sensitivities related to areas of wildlife habitat and periods in wildlife cycles, and considering additional mitigation measures that may be required.
- The Generation and LTA EPP and best management practices will be followed, and Environmental Monitors will oversee the implementation of the Generation and LTA EPP.
- Personal pets will not be brought to the construction site.
- Buffer zones will be implemented to protect wildlife at the site (see Section 8.18 of the Generation and LTA EPP for the buffer zones for helicopter traffic at the site).
- Fishing, hunting and trapping are prohibited at or near the construction site. All Project participants will be prohibited from fishing, hunting and trapping at or near the construction site while working on the Project.
- Antifreeze will not be used as a method of pest control on site.
- Firearms will not be permitted on site, with exception of approved bear monitors.
- Personnel to operate under established regulations and guidelines with respect to wildlife and its habitat (e.g., nesting birds, caribou, waterfowl, wetlands, inland fish, rare plants, riparian species, prohibition of feeding wild animals, prohibition of harassing wildlife) to minimize additional impacts (Wild Life Regulations under the Wild Life Act (O.C. 96-809).
- All wildlife sightings and nuisance wildlife will be reported to the On-Site Environmental Monitor.
- The Forestry Branch will be contacted and updated with regards to nuisance wildlife and wildlife encounters.

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	13

- Equipment and vehicles will yield the right-of-way to wildlife and adhere to construction site speed limits.
- Environmental awareness training, with regular briefings, will be implemented for all Project personnel.
- When Project construction ends, all roads not essential to long-term maintenance will be decommissioned, habitat will be reclaimed, and access will be restricted.
- If used during operation, herbicide will be applied from the ground.

10 ENVIRONMENTAL EFFECTS MONITORING

This FPEEMP contains both:

Follow-up Programs – studies or surveys designed and implemented to evaluate the predictions of the environmental assessment and to determine the effectiveness of any measure taken to mitigate the adverse environmental effects of the Project; and

Monitoring Programs – studies or surveys designed and implemented to determine whether the Project is implemented as proposed, and that mitigation measures proposed by the LCP to minimize the Project's environmental effects are implemented.

A summary of the FPEEMP is presented in Table 10-1 at the end of this document.

10.1 SURVEY PROTOCOLS

The LCP has committed to conduct follow-up and monitoring programs to evaluate the effectiveness of the effects management plans, and to determine if expansion or reduction or deletion of the indicated programs is appropriate (with justification). This would apply to the following, as appropriate:

- data collection during construction;
- data collection during operations; and
- follow-up and monitoring report.

Protocols for the data collection are discussed in the following subsections. Data collection includes metrics that are species specific, quantifiable, repeatable, relevant and time constrained. The goal is to collect meaningful data in a focused, defensible, repeatable approach, within a reasonable timeline to ensure that the mitigation is appropriate. Where it is determined that the mitigation is not appropriate or can be improved, a contingency plan

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	14

would be presented that the LCP could incorporate as per their adaptive management approach.

Specific habitat enhancements for Marten, River Otter, Beaver and Porcupine are not proposed. Beavers in active colonies, however, will be live-trapped and relocated before the reservoir area is inundated. Consequently, as described below, the scope of the effects monitoring includes both surveys for active Beaver colonies and recording of sightings of and interactions with the four identified Furbearer species. Incidental observations of Furbearers during other Project-specific surveys will also be recorded.

River Otter was one of two species considered to study the potential for adverse effects from increased levels of methylmercury in the reservoirs. The LCP prepared the Methylmercury Environmental Effects Monitoring Plan to address methylmercury eco-risk for River Otter and Osprey. Refer to the Methylmercury Environmental Effects Monitoring Plan for details in relation to the study to assess mercury levels in Osprey, and River Otter.

10.1.1 Baseline Data Collection

Baseline data collection refers to the determination of the presence of Furbearers where Project activities are taking place. Baseline surveys have been conducted to document Furbearer presence in the Churchill River valley in the Project area. The survey results are presented in Nalcor Energy (2009) and are integral to data collection during construction and considered the initial part of that process.

10.1.2 Data Collection during Construction

10.1.2.1 Furbearer Sightings and Interactions

The LCP will compile the results of the On-Site Environmental Monitors' reports that reference sightings, interactions and consequences that relate to Furbearer encounters during construction, and will include regulatory compliance tracking. These data will be presented in Excel, or similar format, with the following information:

- date;
- time;
- location (UTM or lats/longs);
- interaction type – brief description of the type of interaction: sighting, human/animal conflict, vehicle/animal conflict;
- Furbearer species details – sex, age, behavior at the time of the interaction;
- interaction details - explanation of the nature of the interaction;

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	15

- issue resolution - explanation of the action(s) undertaken to resolve the interaction;
- interaction consequence – description of the outcome (animal was scared away; animal was killed); and
- additional actions undertaken – details of actions undertaken by the LCP (e.g., no additional actions required; report sent to Wildlife Division) and notes on regulatory compliance.

The coordinates of known active Beaver colonies will be included in the compiled log.

A compilation of daily reports will be submitted to the NLDEC-WD on a weekly basis which will document wildlife encounters. These data will be compiled by the LCP's EEM/EA Commitments Coordinators once each year (December) and the data evaluated to determine if the observed effects of the Project on Furbearers would require changes to the mitigation through the LCP's adaptive management approach. Any proposed changes would be communicated with the Wildlife Division prior to implementation. In addition, Furbearer sightings, interactions and consequences will be reported in a timely manner to the On-Site Environmental Monitor and the information distributed to crews to increase their level of awareness and caution when these species are in the Project vicinity.

10.1.2.1 Pre-impoundment Beaver Colony Survey

Two pre-impoundment surveys will be undertaken before reservoir inundation which is scheduled for the fall (during October to December). In the fall, one year prior to reservoir inundation, after deciduous leaf fall and prior to freeze-up (e.g., October), an aerial survey will be conducted in the area to be inundated, within the pre-established blocks surveyed in 2006 (Minaskuat Inc. 2008) to identify active Beaver colonies, reflected by the presence of fresh cuttings or a food cache. The pre-impoundment survey protocol will generally follow that used in 2006. In July of the year of inundation, a second aerial survey will be conducted to relocate previously identified Beaver lodges to confirm they are active and to identify and map any new colonies.

In August, immediately following the second pre-impoundment survey and prior to impoundment, individual animals in the active colonies will be live-trapped and relocated to suitable, alternative, unoccupied habitat identified outside the reservoir area. Relocation of Beaver via live-trapping is a common technique used throughout North America to deal with 'nuisance' situations. However, studies indicate that Beaver survival following relocation has limited success (McKinstry and Anderson 2002; Lands Council 2013, Internet Site).

Live-trapping techniques will attempt to capture all Beaver from a particular colony and introduce them to an area of suitable habitat, as close to the reservoir as practical. Relocating

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	16

Beaver during their principle dam-building and food-storage period will increase the chances that relocated Beaver will remain in the vicinity of the release site (Lands Council 2013, Internet Site). Live-trapping and relocating at this time will allow time for dam-building and cache-building, and the kits will be more robust.

The LCP will work with the NLDEC-WD to develop relocation protocols, including timing and habitat selection criteria for relocation to maximize the potential for success for these efforts, as reflected by Beaver survival and colony establishment. The location of any relocated colonies will be marked using a global positioning system (GPS) unit and mapped for reference during the post-impoundment survey described in the following section. The LCP will obtain a provincial permit from the NLDEC-WD to undertake Beaver live-trapping and relocation.

10.1.3 Data Collection During Operations

10.1.3.1 Furbearer Sightings and Interactions

The data collected during operations of the Project will be the same as collected during the construction period, but will be collected by the LCP's Inspection Crews, Maintenance Crews and other operations staff during the first five years of operation.

These data will be compiled once each year (December) and the data evaluated to determine if the observed effects of the Project on Furbearers would require changes to the mitigation through the LCP's adaptive management approach. Any proposed changes would be communicated with the Wildlife Division prior to implementation. As during construction, Furbearer sightings, interactions and consequences will be reported in a timely manner to the On-Site Environmental Monitor and the information distributed to crews to increase their level of awareness and caution when furbearer species are in the Project vicinity.

10.1.3.2 Post-Impoundment Beaver Colony Survey

In the event that active Beaver colonies are found below the full supply level prior to reservoir impoundment, and Beaver are relocated, a follow-up survey will be conducted to determine the success / effectiveness of the Beaver colony relocation effort. The survey protocol would be the same as for the pre-impoundment surveys, i.e., helicopter surveys scheduled after deciduous leaf fall and prior to freeze-up to enhance survey visibility, and be conducted in Year 1 and Year 5 post-impoundment. Results of these surveys would be expected to capture Beaver use of the newly formed reservoir. The findings will be used to determine if additional surveys are warranted. The need for additional Beaver surveys, and the requirement for

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	17

additional mitigation, would feed into the LCP's adaptive management approach, as appropriate.

The data would include observations of any Beaver and Beaver activity (e.g., dams, caches, lodges) in the general area of the release site. These data would be used to indicate the level of use of the area by the relocated Beaver.

10.1.4 Follow-up program

A final Follow-up and Monitoring Report will be generated that contains a section that compiles the information collected on Project interactions with Furbearers as outlined above to address Follow-up (i.e., verification of EIS predictions) and a section to address Monitoring (i.e., regulatory compliance), as discussed in the following subsections. A section in the Follow-up portion of the Follow-up and Monitoring Report will be included to describe the Beaver relocation effort and the results.

10.1.4.1 Follow-up

The Follow-up portion of the Follow-up and Monitoring Report, within the FPEEMP, will include the collation of all data related to Project interactions with Furbearers collected during the construction period and the first five years of operations. The Follow-up portion of the report will present the pre-construction Furbearers baseline information, consider the data as a description of the effects collected on interactions with Furbearers during the Project construction and operations time periods, and discuss the effects observed in relation to the effects predictions made in the EIS (i.e., no significant adverse residual effects on Furbearers).

10.1.4.2 Monitoring

The Monitoring portion of the Follow-up and Monitoring Report will summarize the On-Site Environmental Monitors' observations and efforts related to the interactions of the Project components and activities with Furbearers to show that the Project was implemented as proposed, and that mitigation measures to minimize the Project's adverse environmental effects on Furbearers were implemented appropriately. This will include a subsection to address Compliance Monitoring, also undertaken by the On-Site Environmental Monitors to ensure Project compliance with regulatory requirements and other environmental commitments made in the EIS, the responses the LCP provided to the information requests, and conditions of EA release.

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	18

10.1.4.3 Contingency Plan

At this time, contingency plans are not anticipated for Furbearers and any changes to the LCP's procedures or mitigation plans would be addressed through the adaptive management approach, if and as appropriate. Any changes proposed by the LCP would be based on the findings of the Follow-up and Monitoring Programs.

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	19

Table 10-1 Summary of the Furbearers Protection and Environmental Effects Monitoring Plan

Survey Type	Objective	Location	Timing	Frequency	Contingency (e.g., If Furbearers are present)
Data Collection During Construction					
Furbearer (Marten, River Otter, Beaver and Porcupine) Interaction Observation	To determine Furbearer (Marten, River Otter, Beaver and Porcupine) responses with Project components and activities during construction	All Project construction locations	Throughout the construction period	On-going	Communication with the Wildlife Division
Presence of Active Beaver Colonies (by aerial survey)	To determine if active Beaver colonies are present within the reservoir boundaries of the Project prior to impoundment	Within the reservoir boundaries	During construction	Twice; during fall (October) one year prior to reservoir inundation and in July immediately prior to the fall reservoir inundation	Communication with the Wildlife Division Live-trap and relocate Beavers to suitable, alternative, unoccupied habitat outside the reservoir area, during August and early September
Data Collection During Operations					
Furbearer (Marten, River Otter, Beaver and Porcupine) Interaction Observation	To determine Furbearer (Marten, River Otter, Beaver and Porcupine) responses with Project components and activities during operations	All Project components and activities during operations	Throughout the first five years of operations	On-going	Communication with the Wildlife Division

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN

Nalcor Doc. No.

Revision

Page

LCP-PT-MD-0000-EV-PL-0016-01

B3

20

Survey Type	Objective	Location	Timing	Frequency	Contingency (e.g., If Furbearers are present)
Presence of Active Beaver Colonies (by aerial survey)	To determine if relocated Beavers have survived and established active colonies	Locations mapped during pre-impoundment survey during construction	During fall, during operations from time of relocation to five years post-impoundment	Year One and Year Five following reservoir inundation, during fall (October)	Communication with the Wildlife Division
Follow-up					
	Verify EIS predictions on the Project effects on Furbearers (Marten, River Otter, Beaver and Porcupine)	Project area	Interim Report following construction; Final Report after first five years of operations	One report post-construction; one report following five years of operations	Communication with the Wildlife Division
Monitoring					
	Verify regulatory compliance during Project construction and operations	Project area	Environmental Monitor through construction and by Inspection crews through operations; Interim Report following construction; Final Report after first five years of operations; other reports as per incident, as required	On-going	Communication with the Wildlife Division

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	21

11 REFERENCES

- Allen, A.W. 1983. *Habitat Suitability Index Models: Beaver*. US Fish and Wildlife Service, FWS/OBS-82/10.30 Revised. 20 pp.
- Bangs, O. 1898. A list of the mammals of Labrador. *American Naturalist* 32: 489-507.
- Bergerud, A.T. and D.R. Miller. 1977. Population dynamics of Newfoundland beaver. *Canadian Journal of Zoology* 55: 1480-1492.
- Bowman, J.C. and J.-F. Robitaille. 1997. Winter Habitat use of American Martens *Martes americana* within Second-growth Forest in Ontario, Canada. *Wildlife Biology* 3: 97-105.
- Burt and Grossenheider. 1952. *A Field Guide to the Mammals. Field Marks of All North American Species Found North of Mexico*. Houghton Mifflin Company Boston.
- Buskirk, S.W. 1992. Conserving Circumboreal Forests for Martens and Fishers. *Conservation Biology* 6: 318-320.
- Buskirk, S.W. and L.F. Ruggiero. 1994. American Marten. Pp. 7-37. In: L.F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski (tech. eds.). *American Marten, Fisher, Lynx, and Wolverine*. General Technical Report RM-254. US Forest Service, Fort Collins, CO. Poole et al. 2004
- Conover, S.A.M., K.W. Strong, T.E. Hickey and F. Sander. 1985. An Evolving Framework for Environmental Impact Analysis. *Journal of Environmental Management* 21: 343-358.
- COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2013. Available at: http://www.cosewic.gc.ca/eng/sct1/index_e.cfm Accessed on: July 22, 2103.
- General Status of Species in Canada. 2012. Wild Species – the General Status of Species in Canada. Available at: <http://www.wildspecies.ca/searchtool.cfm?lang=e>. Accessed on: July 22, 2013
- Griesemer, S.J., T.K. Fuller and R.M. DeGraaf. 1998. Habitat Use by Porcupines (*Erethizon dorsatum*) in Central Massachusetts: Effects of topography and forest composition. *American Midland Naturalist* 140: 271-279.
- Innu Nation. 2007. Innu Kaishitshissenitak Mishta-shipu (Innu Environmental Knowledge of the Mishta-shipu (Churchill River) Area of Labrador in Relation to the Proposed Lower Churchill Project). Report of the work of the Innu Traditional knowledge Committee prepared by Wolverine & Associates, Inc. for Innu Nation.

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	22

Lands Council. 2013. Available at: <http://www.landscouncil.org/beaversolution/library.asp>

Martin, S.K.1994. Feeding ecology of American martens and fishers. Pp. 297-315. In: S.W. Buskirk, A.S. Harestad, M.G. Raphael and R.A. Powell (eds.). *Martens, Sables, and Fishers: Biology and Conservation*. Cornell University Press, Ithaca, NY.

Mech, L.D. and L.L. Rogers. 1977. Status, Distribution, and Movements of Martens in Northeastern Minnesota. *USDA Forest Service Research Paper NC-143*: 7 pp.

McKinstry, M.C. and S.H. Anderson. 2002. Survival, Fates and Success of Transplanted Beavers, *Castor canadensis*, in Wyoming. *Canadian Field Naturalist* 116(1): 60-68.

Minaskuat Inc. 2008. *Inventory of Beaver Colonies in the Lower Churchill River Valley*. Prepared for the Lower Churchill Hydroelectric Generation Project.

Minaskuat Inc. 2009. Current Land and Resource Use in the Lower Churchill River Area. Report prepared for the Lower Churchill Hydroelectric Generation Project.

Minaskuat Limited Partnership. 2008. *Existing Mercury Concentrations in Osprey and Ecological Risk Assessment. Prepared for the Lower Churchill Hydroelectric Generation Project*. 50 pp.

NLDEC (Newfoundland and Labrador Department of Environment and Conservation). 2013. Available at: http://www.env.gov.nl.ca/env/wildlife/all_species/mammals.html#a3

Northland Associates Ltd. 1980. Lower Churchill Hydroelectric Development Reservoir and Transmission Line - Wildlife Reconnaissance. Prepared for the Lower Churchill Development Corporation, St. John's, NL

Poole, K.G., A.D. Porter, A. de Vries, C. Maundrell, S.C. Grindal and C.C. St. Clair. 2004. Suitability of a Young Deciduous-dominated Forest for American Marten and the Effects of Forest Removal. *Canadian Journal of Zoology* 82: 423-435.

Roze, U. 1989. The North American Porcupine. Smithsonian Institution Press, Washington, DC.

SARA Public Registry (*Species at Risk Act Public Registry*). 2013a. Available at: http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=134

SARA Public Registry. 2013b. Available at: http://www.sararegistry.gc.ca/default_e.cfm

Schmelzer, I. 2001. Home range ecology and population structure of a wide-ranging rodent in the north: the North American porcupine in central Labrador, Canada. Wildlife Division, Department of Environment and Conservation, Corner Brook, NL.

Smith, A.C. and J.A. Schaefer. 2002. Home-range Size and Habitat Selection by American Marten (*Martes americana*) in Labrador. *Canadian Journal of Zoology* 80:1602-1609.

LCP FURBEARERS PROTECTION AND ENVIRONMENTAL EFFECTS MONITORING PLAN		
Nalcor Doc. No.	Revision	Page
LCP-PT-MD-0000-EV-PL-0016-01	B3	23

Stricklan, D., J.T. Flinders and R.G. Cates. 1995. Factors Affecting Selection of Winter Food and Roosting Resources by Porcupines in Utah. *Great Basin Naturalist* 55: 29-36.

Sweitzer, R.A. and J. Berger. 1992. Size-related Effects of Predation on Habitat Use and Behaviour of Porcupines. *Ecology* 73: 867-875.

Wild Life Act. 2012. Available at: <http://www.assembly.nl.ca/legislation/sr/statutes/w08.htm>

Wild Life Regulations. 2012. NEWFOUNDLAND AND LABRADOR REGULATION 68/12. Available at: <http://www.assembly.nl.ca/Legislation/sr/Regulations/rc120068.htm>.

Van Gelder, R.G. 1982. Mammals of the National Parks. Johns Hopkins University Press. Baltimore, MD. 310 pp.