Nalcor Energy Lower Churchill Project, Environmental Effects Monitoring Program – 2014 Avifauna

Avifauna Field Surveys in the Lower Churchill River Valley

Prepared for:
Nalcor Energy
Hydro Place, 500 Columbus Drive
P.O. Box 12800
St. John's, NL A1B 0C9

Prepared by:
Stassinu Stantec Limited Partnership
141 Kelsey Drive
St. John's, NL A1B 0L2

File No: 121511260

Interim Report

September 26, 2014

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Executive Summary

The 2014 Avifauna Environmental Effects Monitoring Program (EEMP) was completed as part of a larger EEMP developed based on the requirements and commitments in the Lower Churchill Generation Project Environmental Impact Statement (EIS) (Nalcor 2009a and 2009b). The primary objectives of the avifauna EEMP were to: collect additional information on the distribution and habitat associations of avifauna Species At Risk (SAR); assess the effect of Project-related activities on the distribution and habitat associations of avifauna; and monitor Surf Scoter use of ashkui in the lower Churchill River valley.

Aerial surveys were conducted in May and June, 2014, to document ice conditions and presence of Surf Scoter along the Churchill River and at three control sites (Anne-Marie, Minipi and Wilson Lakes). Ground-based behavioural observations of scoters were made at two locations in the Churchill River. The percent of time that females and/or flocks spent diving (19.8% to 34.4%), feeding (21.7% to 28.1%), swimming and resting (12.6% to 19.8%), in comfort movements (4.2% to 10. 5%) and other activities (e.g., alert, courtship, flying; <1%) was recorded.

A total of 111 forest songbird point count surveys were conducted over a five day period between June 18 and June 25. Forty-two species were confirmed during surveys and an additional six species were identified outside of the point count period (considered incidental).

A combination of point count observations, call playback, and dedicated surveys were used to collect information on avifauna SAR. Call playback was used for two species [Olive-sided Flycatcher (*Contopus cooperi*) and Gray-cheeked Thrush (*Catharus minimus*)] following a point count when in suitable habitat, and evening surveys targeting Common Nighthawk (*Chordeiles minor*) were carried out over six evenings between June 16 and July 8. One Olive-sided Flycatcher was recorded during point count surveys; no other avifauna SAR was documented through these surveys. Common Nighthawk, Gray-cheeked Thrush and Rusty Blackbird (*Euphagus carolinus*) were recorded during other field EEMPs and incidentally in the town of Happy Valley-Goose Bay.

The results of the 2014 Avifauna EEMP provide additional baseline information on SAR and other species in the Project Study Area prior to inundation. Additional point count surveys will be carried out in 2015 and 2016, and an assessment of Project-related environmental effects on species richness will be completed when all data are available.

1.0 2014 AVIFAUNA PROGRAM

The 2014 Avifauna Environmental Effects Monitoring Program (EEMP) was completed by Stassinu Stantec Limited Partnership (Stassinu Stantec) and is part of the broader EEMP that Nalcor Energy is completing in conjunction with the Lower Churchill Generation Project (the Project). The work is based on the requirements and commitments in the Lower Churchill Generation Project Environmental Impact Statement (EIS) (Nalcor 2009a and 2009b). The specific objectives of the avifauna EEMP were to:

- Document ice conditions and monitor Surf Scoter (*Melanitta perspicillata*) use of *ashkui* (areas of early or permanent open water on rivers) in the lower Churchill River using a combination of aerial and ground-based (behavioural) surveys
- Assess the effect of Project-related activities on the distribution and habitat associations of avifauna using songbird species richness as an index of change over time; and
- Collect additional information on the distribution and habitat associations of select avifauna Species At Risk (SAR) in the lower Churchill River Valley, based on commitments made in the EISin regards to Olive-sided Flycatcher (*Contopus cooperi*), Rusty Blackbird (*Euphagus carolinus*), Gray-cheeked Thrush (*Catharus minimus*) and Common Nighthawk (*Chordeiles minor*).

This report provides a summary of the methods used and results from each field component in 2014, and represents findings from the first year of this multi-year EEMP.

1.1 Background

In 2006 and 2007, a series of avifauna and related surveys were carried out as part of baseline studies in support of the Project, including forest songbird (point count) surveys (Minaskuat Inc. 2008); waterfowl breeding pair, brood and spring staging surveys (LGL Limited 2008); and an ice dynamics study of the Lower Churchill River valley (Hatch 2007).

Between 72 (2006) and 82 (2007) avifauna species were recorded from point count stations in the lower Churchill River valley, along the Transmission Line right-of-way (Row), and in control locations in the Goose River valley (Minaskuat Inc. 2008). Sampling in 2007 was designed to replicate samples from 2006, with additional point count transects surveyed to fill geographic gaps across the landscape and/or to target under-surveyed habitats. The most widespread species identified during these surveys were Swainson's Thrush (*Catharus ustulatus*) and White-throated Sparrow (*Zonotrichia albicollis*).

A variety of waterfowl species were identified during surveys, including breeding Canada Goose (*Branta canadensis*), American Black Duck (*Anas rubripes*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*) and Red-breasted Merganser (*Mergus serrator*). Species likely to occur in the river valley during spring staging include goldeneyes, mergansers, Long-tailed Duck (*Clangula hyemalis*), Harlequin Duck (*Histrionicus histrionicus*),

scaup, and Ring-necked Duck (*Aythya collaris).* Relatively large aggregations of waterfowl can be found in the mainstem of the Churchill River during this period. High densities of Surf Scoter (and their broods) were also documented during staging. However, waterfowl use of the lower Churchill River in spring is variable and related to seasonal conditions (i.e., timing of spring thaw). In general, the lower Churchill River was considered relatively unproductive for waterfowl due to extent of sandy shoreline and sediments, although there are localized wetlands associated with tributary outflows, adjacent to the river, that are important to waterfowl.

Five species listed under the federal *Species at Risk Act* and/or the Newfoundland and Labrador *Endangered Species Act* were identified in the lower Churchill River valley through point count and waterfowl surveys including Harlequin Duck, Common Nighthawk, Olive-sided Flycatcher, Gray-cheeked Thrush and Rusty Blackbird.

Ice dynamics modeling indicated that, following Project development, there will be up to a two-week delay in the cool-down and warm-up periods in the reservoirs, as compared to the existing river. Within the reservoirs, a solid ice cover will persist throughout each winter, including areas that previously remained open throughout the year. However, *ashkui* in certain areas (such as that which occurs at the confluences of the Metchin River, Elizabeth River, Upper Brook and Lower Brook) will likely move upstream into the tributary at the interface with the new shoreline. It was believed that the topography at these locations would continue to enhance *ashkui* formation.

In the EIS (Nalcor 2009a, 2009b), Project-related environmental effects on avifauna was predicted to be not significant for the species of avifauna assessed, as these species will continue to persist as sustainable populations in the Study Area. Specific monitoring and follow-up programs identified for avifauna were forest avifauna surveys, aerial ashkui surveys, and maintenance of a log book to record any bird mortalities associated with the Project.

In August 2011, the "Report of the Joint Review Panel – Lower Churchill Hydroelectric Generation Project" was released, highlighting the Panel's recommendations (JRP 2011). Specifically, the Panel recommended that surveys be carried out to:

- Monitor *ashkui* formation in the Project area;
- Monitor direct and indirect impacts on waterfowl (e.g., waterfowl adjustment to changes in riparian habitat, and changes in the location and formation of *ashkui*); and
- Develop a detailed mitigation and monitoring plan for all listed species.

1.2 Study Team

The study team for the field components of the avifauna EEMP included personnel from Stassinu Stantec and Universal Helicopters Newfoundland and Labrador Limited Partnership (UHNL) (Table 1.1).

Table 1.1 2014 Avifauna Study Team

Name	Survey	Role	Organization
Diane Ingraham	all	Project Management	Stassinu Stantec
Perry Trimper	all	Senior Technical Advisor	Stassinu Stantec
Mike Crowell	all	Senior Review	Stassinu Stantec
Tina Newbury	Aerial Surf Scoter & Ice Point counts	Observer/navigator Team Lead/Ornithologist Reporting	Stassinu Stantec
Bruce Turner	Aerial Surf Scoter & Ice	Observer/navigator	Stassinu Stantec
Mary Ann Aylward	Aerial Surf Scoter & Ice	Observer	Stassinu Stantec
Ken Cashin	Aerial Surf Scoter &Ice	Pilot	Universal Helicopters
Jonathan Willans	Point counts	Team Lead/Ornithologist	Stassinu Stantec
Margie Clark	Point counts	Field technician	Stassinu Stantec
Daniel Windeler	Point counts Common Nighthawk	Field technician	Stassinu Stantec
Karen Rashleigh	Common Nighthawk	Team Lead Reporting	Stassinu Stantec
Trish Layden	Common Nighthawk	Field technician	Stassinu Stantec
Angela Dunphy	Common Nighthawk	Field technician	Stassinu Stantec
Alissa Tobin	Common Nighthawk	Field technician	Stassinu Stantec
Jacqueline Melindy	Common Nighthawk	Field technician	Stassinu Stantec
Matthew Boychuk	Common Nighthawk	Field technician	Stassinu Stantec

Prior to the start of the field component of the 2014 Avifauna EEMP, all personnel reviewed the Health, Safety, and Environment (HSEQ) Plan, and the Risk Management Strategy (RMS) 1 (Stassinu Stantec Limited Partnership 2014). A daily hazard assessment (RMS 2) was completed each morning. The required scientific research permit (permit #IW2013-66, Appendix A) was acquired from the Government of Newfoundland and Labrador, Department of Environment and Conservation prior to the initiation of the surveys.

2.0 METHODS

2.1 Study Area

Aerial Surf Scoter surveys encompassed the area within the lower Churchill River valley from Muskrat Falls to Churchill Falls, and the following lakes: Anne Marie Lake, Minipi Lake, and Wilson Lake (Figure 2-1). Areas were selected based on baseline study results and other earlier investigations (Goudie 1991, AGRA Earth & Environmental Ltd. and Harlequin Enterprises 1999, LGL Environmental Research Associates 2008).

Breeding forest songbird point counts were conducted in the area between Gull Island and the town of Happy Valley-Goose Bay (Figure 2-1). Point count locations were placed in a variety of habitats within and adjacent to the Project-related activities (e.g., reservoir and transmission lines), with effort to have a representative sample of points within and beyond 1 km of recent forest cutting. Potential habitat for SAR species (Olive-sided Flycatcher, Gray-cheeked Thrush, and Rusty Blackbird) was also targeted.

Common Nighthawk surveys were carried out within and adjacent to the Project Footprint between Muskrat Falls and Gull Island (Figure 2-1). Surveys targeted habitat believed to be ideal for this species, but other potentially less ideal habitats were also surveyed.

NALCOR ENERGY LOWER CHURCHILL PROJECT, ENVIRONMENTAL EFFECTS MONITORING PROGRAM – 2014 AVIFAUNA

METHODS
September 26, 2014

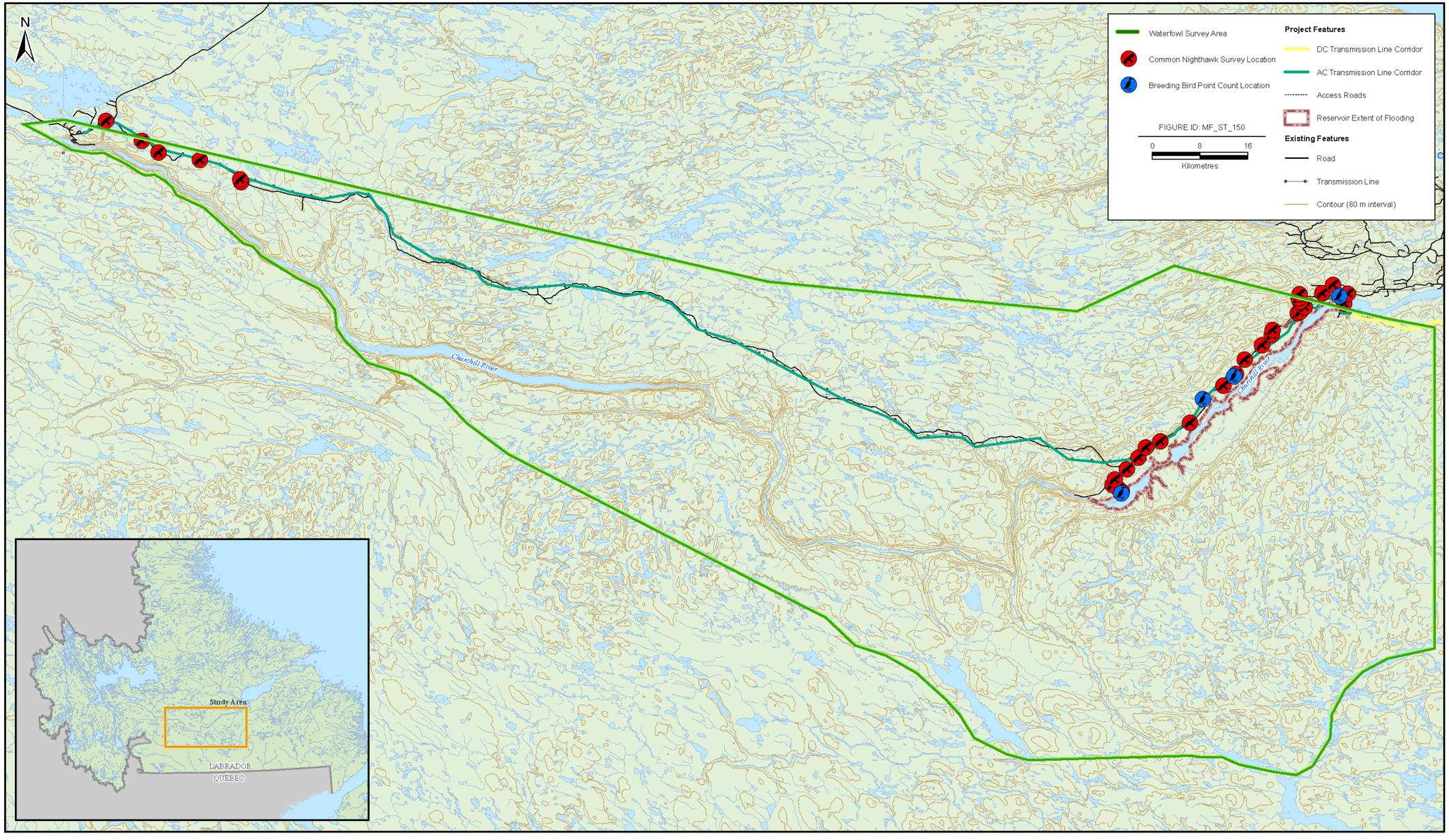

Figure 2-1 2014 Avifauna EEMP Study Area

2.2 *Ashkui* and Surf Scoter Surveys

2.2.1 Aerial Survey

Aerial surveys were conducted from a Bell 206L helicopter flown at 50-75 m above ground level (agl) and at speeds from 50-100 km/h. The helicopter was equipped with rear bubble windows which enhanced visibility. The survey crew consisted of a front seat observer and navigator, with two rear observers. The pilot also assisted with observations.

Survey routes typically followed along the center of the Churchill River, although in areas where Surf Scoter had been previously identified, the helicopter would make a second pass. Surveys of nearby lakes were similarly surveyed to assess whether Surf Scoter had dispersed to these areas for breeding.

Information on ice conditions and in particular locations of *ashkui* along the Churchill River and in the lakes was recorded, as well as all observations of waterfowl and other bird and wildlife species.

2.2.2 Behavioural Observations

Surf Scoters observed during the aerial survey were selected for behavioural observation, where a suitable helicopter landing area and observation location could be identified. Observations were made from an elevated position along the river bank, at distances ranging from 200-300 m (Churchill Falls site) to 500-1400 m (Muskrat Falls site). These distances were believed to be sufficient to not have an impact on Surf Scoter behaviour.

Observations primarily focused on individual females however where distance, wind, sun glare and/or other factors prevented observations of an individual, flocks were monitored. Flocked birds tended to act in unison and as such the Study Team was able to assess diving (i.e., foraging) behaviour, but had difficulty in quantifying other behaviours. Regardless of whether an individual or flock was monitored, the total number and sex ratios of Surf Scoter in the area was estimated.

Observations were categorized into recognized behaviours and fell into one of 10 categories (Bergen et al. 1989; Alexander and Hair 1979) (Table 2.1).

Table 2.1 Behaviour Observation Categories

Behaviour	Description
Courtship	Head extend frontward or upward, retract and pump; head nod and bill to breast, lateral to and fro of head. Parties of males may compete for female
Agonism	Aggression to neighboring bird
Alert	Head held upright; bird watching and listening for disturbance or threats
Comfort	Splash bathe, preen and wingflap
Dive	-
Pause	Interval between feeding dives
Surface feed or upend	-
Fly	-
Rest	Not moving; in one spot but not alert
Swim	-

2.3 Forest Songbird (Point Count) Surveys

Two 2-person field teams (consisting of a lead biologist experienced with point counts in boreal forest habitats and a technician) conducted point count surveys. Starting locations for all point count transects were accessed by vehicle (one transect per team per day).

Survey protocols were designed to follow the Newfoundland and Labrador Boreal Bird Monitoring Protocol Initiative SOP#3 (NLDOEC 2012). Surveys began no earlier than 30 minutes before sunrise and ended by 0930h, and only under suitable weather conditions (e.g., temperatures above freezing, winds <25 km/h, no precipitation (or intermittent precipitation), visibility >50m).

Point count stations were spaced 300 m apart, and consisted of a five-minute listening period followed by call playback. All birds heard or observed were recorded in the five minute period, and distance categories were assigned to each observation: 0-50 m, 50–100 m, and 100–200 m. After the survey, a Black-capped Chickadee (*Poecile atricapillus*) mobbing call was broadcast for two minutes (using a FoxPro game caller), and any new species were recorded in a one minute listening period. When suitable habitat for SAR of interest to this EEMP was encountered, call playback of the species was also played for two minutes (following the chickadee playback-listening period), followed by a one minute listening period.

At each point count location, the following information was recorded on prepared datasheets: date, GPS location, weather conditions, and habitat information. Survey start and end times were also documented. Any birds, mammals, and herptiles (or their sign) heard or observed in transit between point count locations, were recorded as incidentals.

2.4 Species at Risk Surveys

A combination of point count observations and call playback (described in Section 2.3), and targeted Common Nighthawk surveys were used to collection information on avifauna SAR.

Common Nighthawk surveys were carried out concurrently with evening amphibian acoustic surveys to enhance program efficiencies. The Study Team consisted of a team lead and technician, however on one evening a larger crew participated in surveys (five technicians) as a training activity for new field crew members.

Surveys followed Stantec's national protocols for Nocturnal Nightjar Surveys (Stantec 2013). Sample stations were spaced a minimum of 500 m apart, and commenced one half-hour prior to sunset and continued until the end of the dusk crepuscular period (nautical twilight). Survey locations targeted potential Common Nighthawk nesting (e.g., gravel pits, recent clear-cuts, disturbed areas) and feeding (e.g., lakes, ponds, rivers and wetlands) habitats in the Study Area that were accessible by road. Surveys were only conducted under suitable weather conditions (i.e., temperature >7°C, wind of Beaufort 3 or less, with nil to light precipitation).

Upon arrival at a survey location, all light and noise sources were turned off, and observers waited one minute to allow potential effects from such disturbances to subside. During this time, location, weather and habitat data were recorded. Any species detected during this period, but not during the actual count, were recorded as incidentals.

Surveys consisted of passive listening and watching for Common Nighthawk over a six minute period at each station. Each six minute sampling period was followed by a two minute call playback, and a final two minute listening period (i.e., ten minutes total). Common Nighthawk observations were recorded as occurring during one of the following time intervals: first 3-minutes, second 3-minutes, 2-minute playback, or last 2- minutes, where applicable. For any birds observed, the approximate distance and angle from the observation point was recorded, as well any information on behaviour (e.g., flight pattern, evidence of breeding).

3.0 RESULTS

3.1 *Ashkui* and Surf Scoters

Aerial surveys and behavioural observations were carried out under suitable weather conditions over a three day period between May 30 and June 1, 2014 (Appendix B).

Surf Scoters were observed at four locations along the lower Churchill River (Appendix C): immediately upstream of Muskrat Falls (~ 30 birds); the west end of Lake Winakopau near Wolfe Island (12 birds); upstream from the confluence of the Metchin River (8 birds); and approximately 10 km downstream of the Churchill Falls tail-race (estimated between 20 and 30 birds on

different survey days). All of these river sections were wide and slow-moving; there were no scoters observed on the faster moving stretches of the river.

Subsequent ground observations at the Churchill Falls site confirmed 35 birds on May 30, and at the Muskrat Falls site, 22 scoters on May 31 and 41 scoters on June 1. The difference in numbers between aerial and ground counts can be related to the behavioural tendency of Surf Scoters to dive upon the approach of a helicopter such that at any one time an unknown number of birds are not visible. Sex ratios were highly unbalanced and distorted heavily toward males. At their highest counts, females numbered four at Muskrat Falls and ranged between five and seven at Churchill Falls, translating into male:female sex ratios of 10.25:1 and 5:1 to 7:1, respectively.

As expected, Surf Scoters were relatively more abundant on some of the larger lakes sampled in the Study Area (Anne Marie and Minipi Lakes are known breeding areas). A total of 124 Surf Scoters were recorded on surveyed portions of Anne Marie and Minipi Lakes; no observations were made on Wilson Lake (Appendix C). Separate flocks of 20 and 40 birds comprised close to 50% of total observations (median flock size of four). Other observations included two lone males, five distinct pairs and several small mixed sex flocks ranging in size from three to six birds. The two large flocks observed at Anne Marie and Minipi Lakes indicates that these birds were in a pre-breeding stage, while the numerous small groups noted indicated that at least some birds were preparing for dispersal and breeding, and the presence of lone males in other areas indicated that nest initiation had likely already begun.

Areas within the lower Churchill River were ice-covered at the time of surveys. Gull Lake was ice-covered except for an area where the stronger currents had cut an open channel, as well as the western portion (half to two-thirds) of Lake Winakopau with the exception of isolated areas along the shoreline and the occasional channel extending into the lake. Ice coverage on the larger lakes and smaller waterbodies outside the Churchill River Valley was variable. Anne Marie Lake was completely ice-free, as well as the eastern portion of Minipi Lake. However, the southern portion of Minipi was still ice-covered, and most of Dominion Lake (except for a small area at its southern end and a ribbon of open waster along its western shore). Wilson Lake was also largely ice-covered, with areas of open water generally confined to the shoreline and areas of high energy (e.g., constrictions in the lake). Practically all small waterbodies were open and pairs of Surf Scoters were infrequently observed on them (Appendix C), indicating that some dispersion to breeding lakes had occurred.

Behavioural observations of females and flocks were conducted over a total of 6.95 hours, combined among the two sampling locations (Table 3.1).

Table 3.1 Summary of Behavioural Observations of Surf Scoter

Location	Date	Cohort	Observation Time (hrs)
Churchill Falls site	May 30	female	3.5
Muskrat Falls site (North Spur)	May 31	female	1.5
		flock	1.1
	June 1	flock	0.88

Time activity budgets were created based on observation location, date and cohort. While activity budgets of females were created based on all behaviour categories (listed in Table 3.1 above), only the time spent diving (i.e., feeding) was determined for flocks (due to a lack of precision in assessing other behaviour types with larger numbers of birds). The percent of the time that females spent diving (i.e., feeding) was 34.4% at Churchill Falls on May 30 and 19.8% at Muskrat Falls on May 31 (Figures 3.1 and 3.2). Flocks spent 21.7% of the time feeding at Muskrat Falls on May 31 and 28.1% on June 1 (Figures 3.3 and 3.4).

Swimming and resting were also frequent activities, and accounted for up to 49.2% of the time activity budgets for females (Figures 3.1 and 3.2). Comfort movements accounted for 4.2% and 10.5% of the activity budget of females at Churchill Falls and Muskrat Falls sites, respectively (Figures 3.1 and 3.2). All other activities (e.g., agonism, alert, courtship) consumed less than 1% of the time activity budgets of monitored females.

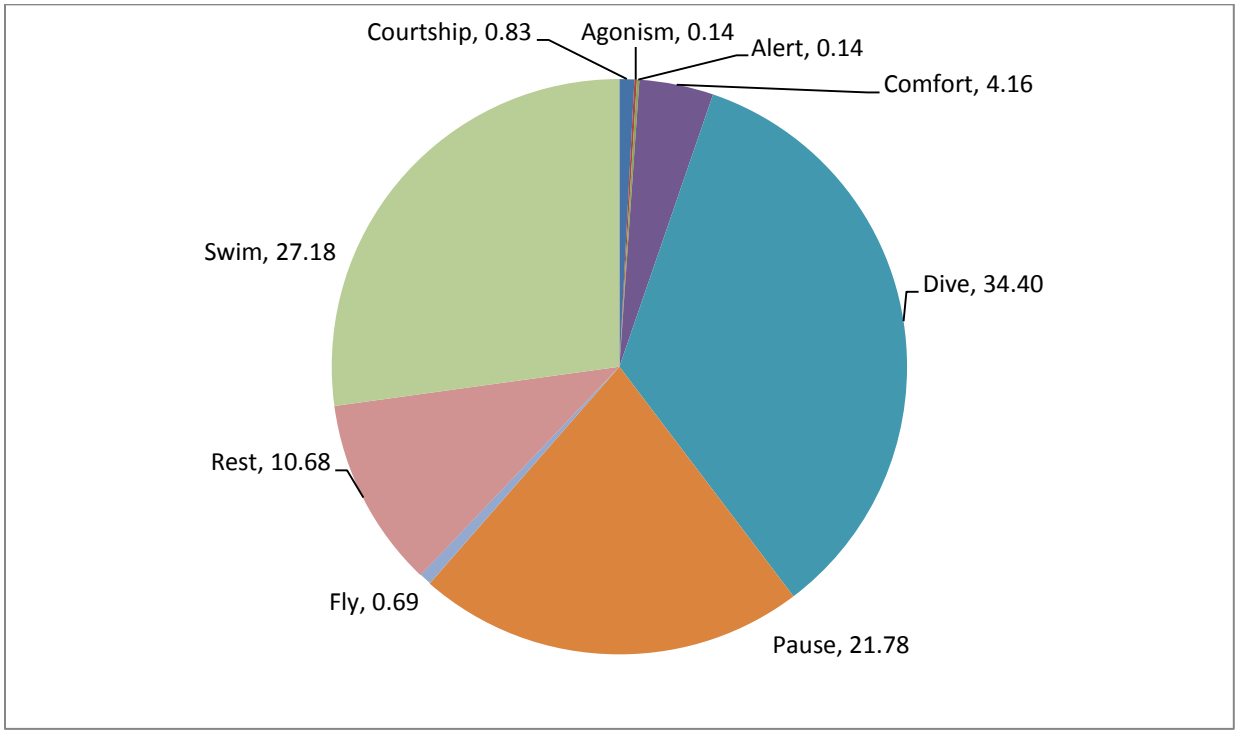

Figure 3-1 Activity budget (% of time observed) of female Surf Scoters at Churchill Falls site May 30, 2014

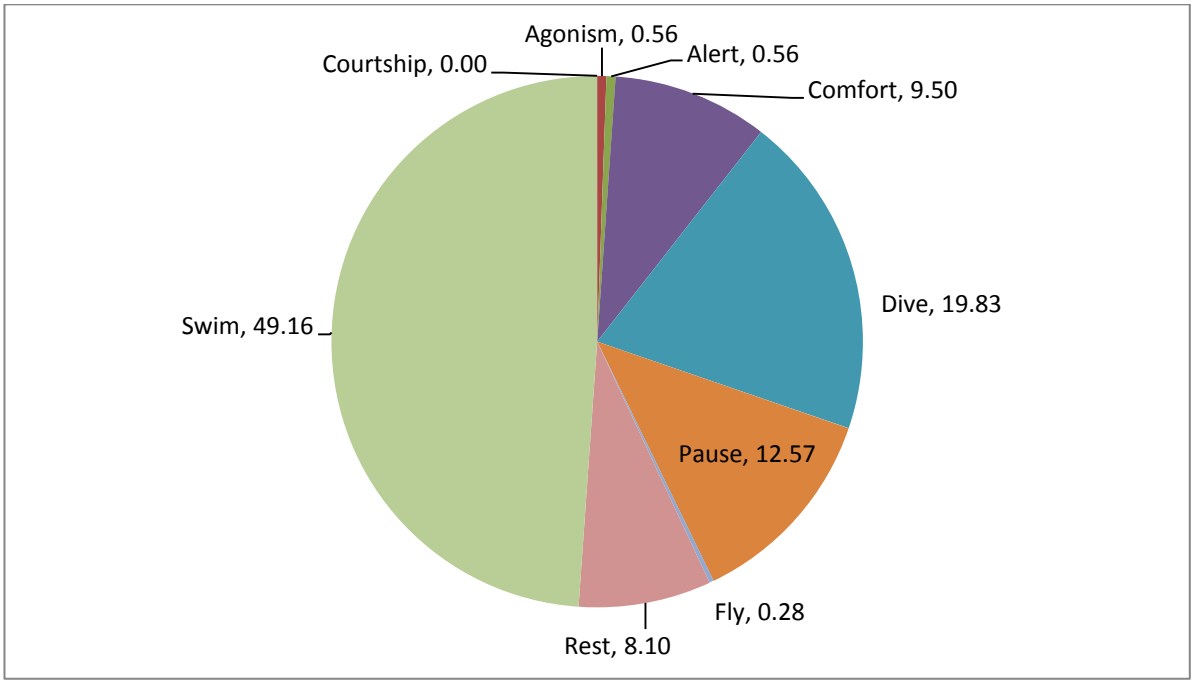

Figure 3-2 Activity budget (% of time observed) of female Surf Scoters at Muskrat Falls site May 31, 2014

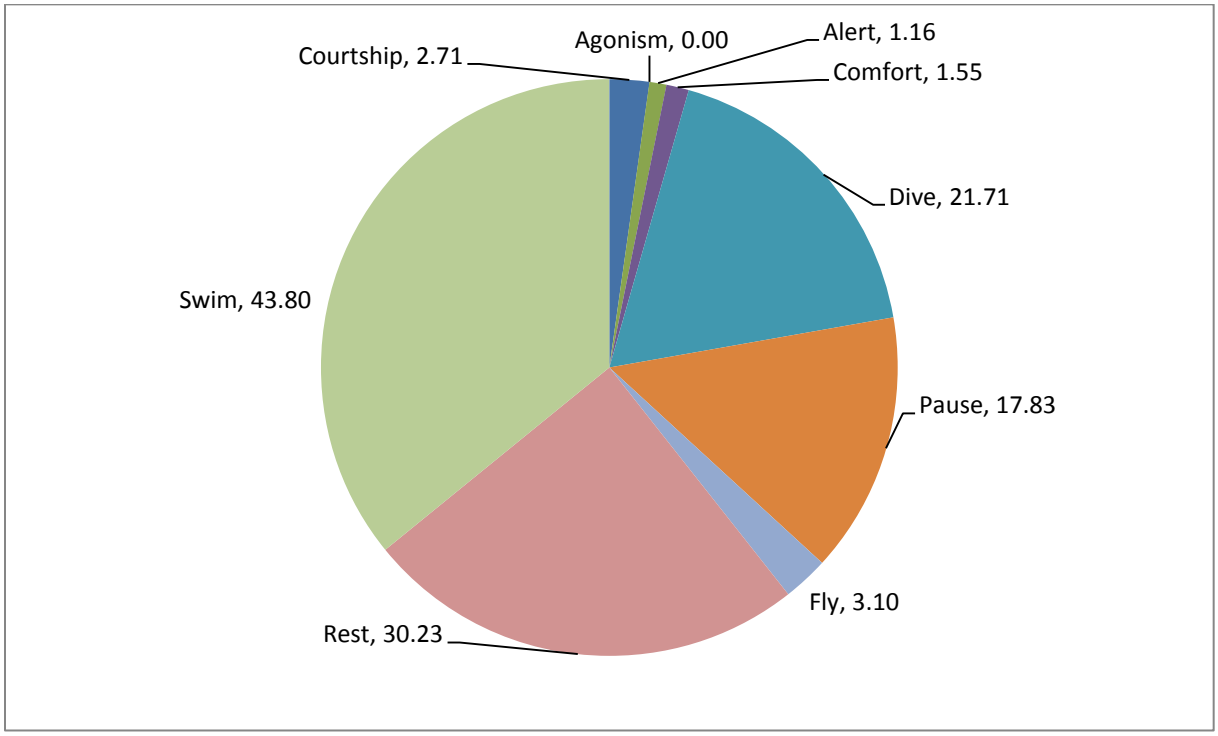

Figure 3-3 Activity budget (% of time observed) of flocked Surf Scoters at Muskrat Falls site May 31, 2014

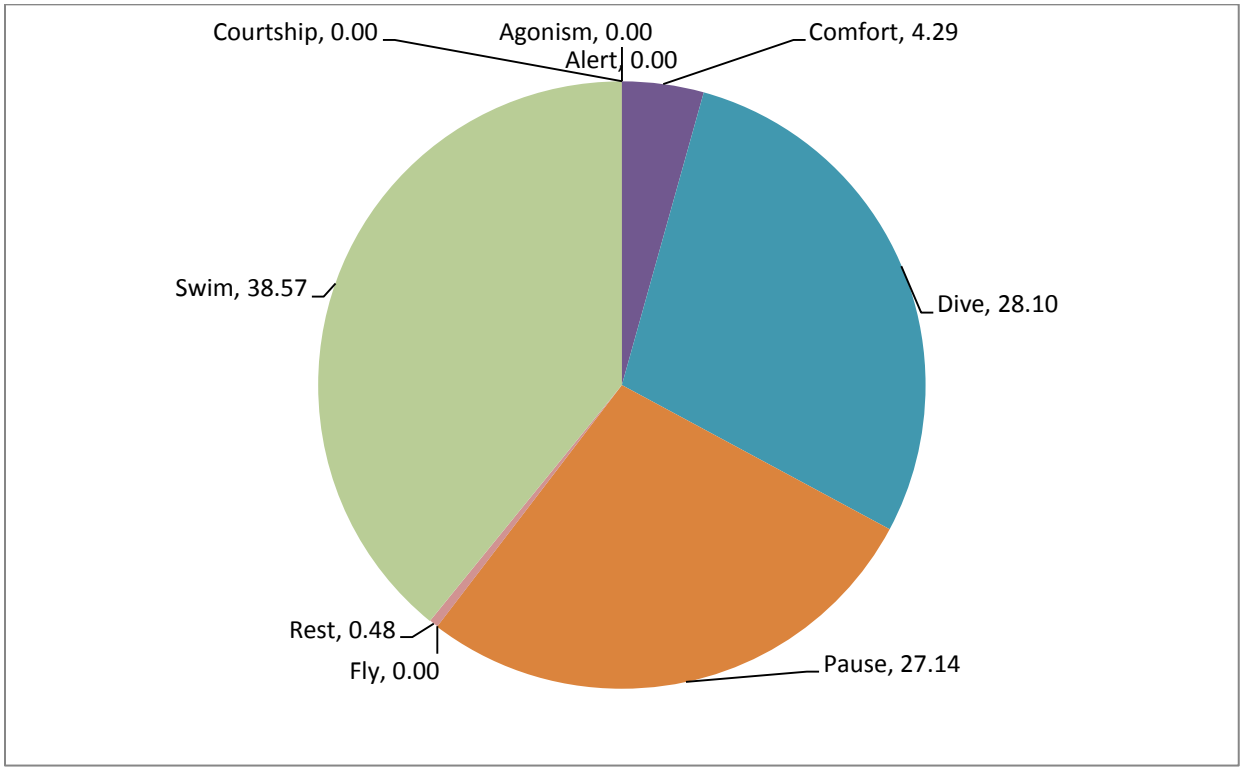

Figure 3-4 Activity budget (% of time observed) of flocked Surf Scoters at Muskrat Falls site June 1, 2014

3.2 Forest Songbirds

A total of 111 breeding bird point count surveys were conducted over a five day period between June 18 and June 25, 2014, under suitable weather conditions (Appendices B, C). Forty species plus an unconfirmed woodpecker species were identified during point counts (Appendix D). An additional six incidental species (i.e., recorded outside the point count period) were recorded including Greater Yellowlegs (*Tringa melanoleuca*), Merlin (*Falco columbarius*), ptarmigan sp.(*Lagopus* sp.), Purple Finch (*Haemorhous purpureus*), Red-eyed Vireo (*Vireo olivaceous*), and Red-tailed Hawk (*Buteo jamaicensis*)(Appendix E).

3.3 Species At Risk

One Olive-sided Flycatcher was recorded during point count surveys. Call playback was used following point counts for both Olive-sided Flycatcher and Gray-cheeked Thrush, but no additional birds were detected. There were no point counts established in suitable habitat for Rusty Blackbird and therefore no call playback was used for this species. Common Nighthawk, Gray-cheeked Thrush and Rusty Blackbird were all recorded during other field EEMPs and

incidentally in the town of Happy Valley-Goose Bay. A summary of information related to SAR considered in the 2014 Avifauna EEMP is provided Appendices C and F.

Thirty-three locations were surveyed for Common Nighthawk over six evenings between June 16 and July 8, 2014, under suitable weather conditions (Appendices B and F). Common Nighthawk were not recorded from any of the survey sites in the Study Area, despite records of this species within the Town of Happy Valley-Goose Bay and during other field EEMPs during the same period. These incidental observations confirm that this species was active at the crepuscular period during survey dates, and that weather conditions were suitable to allow for adequate observer detection.

Two observations of the same Common Nighthawk were made on different days, during the daytime, as part of the 2014 nest search program. The individual was observed on both days resting in the same location in a recent (2013) burn. On both occasions, the bird flushed when field crews were close (<10-15 m) from the location. The observation was on an access trail (yet to be cleared) associated with the Project.

4.0 SUMMARY

The 2014 Avifauna EEMP included a combination of aerial and ground-based surveys to document ice conditions and the presence of Surf Scoter and use of *ashkui* sites along the Churchill River and adjacent lakes; forest songbird point count surveys to collect information on species richness and additional information on SAR in the Study Area; and targeted evening surveys for Common Nighthawk.

Behavioural observation of Surf Scoters indicated that the birds were using specific areas of the Churchill River for feeding during spring staging. Observations of large flocks, numerous small groups, and lone males indicated that birds were in varying life history stages at the time of survey (i.e., pre-breeding / preparing for dispersal and breeding, and already breeding). A total of 48 species of breeding songbirds were documented in the Study Area during point count surveys, including one SAR (Olive-sided Flycatcher). Other SAR considered in the 2014 Avifauna EEMP (i.e., Common Nighthawk, Gray-cheeked Thrush and Rusty Blackbird) were recorded during other field EEMPs and incidentally in the town of Happy Valley-Goose Bay. Common Nighthawk was not detected during targeted surveys in 2014.

The results of the 2014 Avifauna EEMP provide additional baseline information on SAR and other species in the Project Study Area prior to inundation. Additional point count surveys will be carried out in 2015 and 2016, and an assessment of Project-related environmental effects on species richness will be completed when all data are available.

5.0 REFERENCES

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APPENDIX A

Research Permit

Newfoundland Labrador

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Dept of Environment & Conservation

Scientific Research Permit

(as under Section 86 of the Wildlife Regulations, Consolidated Newfoundland and Labrador Regulation 1156/96)

Permit #: IW2013-66

Project Title: *Wildlife Environmental Effects Monitoring During Construction of the Lower Churchill Hydroelectric Development*

Issued to:
Perry Trimper, Stassinu Stantec Limited Partnership
P.O. Box 482, Station C, Happy Valley-Goose Bay, NL A0P 1C0
Tel: (709) 896-5860

Permit to:
1) ***Winter Research***: Undertake winter aerial and ground track surveys for moose, otter, marten, porcupine and other wildlife;
2) ***Spring Summer Research***: Undertake spring/summer breeding bird point count surveys, otter and black bear hair snag trapping, and directed surveys for spring peeper and salamanders;
3) ***Fall Research***: Undertake fall aerial surveys for beaver colonies and deploy specialized traps to determine presence of water and pygmy shrews.

The objectives of these studies are to collect additional baseline information and to monitor potential environmental effects during construction of the Lower Churchill Hydroelectric Development.

Date of research: March 1 to October 1, 2014.

Date of Permit Expiration: November 1, 2014.

Location: All field investigations will occur primarily within the lower Churchill River watershed of Labrador. Of interest is a 20 km radius around the Project footprint in the lower Churchill River valley and the AC transmission line from Muskrat Falls to Churchill Falls (Figure 1). The intent is to establish a monitoring grid throughout the Study Area where cells become permanent monitoring stations. Where possible and appropriate, pre-existing transects and grids will be resurveyed and supplemented.

Conditions:
1) The permit holder may designate other individuals to perform these actions on his behalf, with suitable supervision. The permit holder is responsible for the training of any designated individuals and must ensure that designated individuals follow all conditions of this permit.

2) Names and contact information for all individuals participating in research activities shall be provided to the Wildlife Division, Department of Environment and Conservation prior to commencement of field work. Additional names or deletion of names can be provided to Wildlife Division on an ongoing basis.

3) Prior to initiation of the field program for effects monitoring and baseline investigations, a digital copy of the shape files of all survey routes must be provided to the Wildlife Division.

4) This permit is only valid for work within the indicated study area (Figure 1).

5) With the exception of activities covered under this permit, no wildlife species, including the study species, will be unduly harassed, injured or killed as a result of activities performed under this permit. The Wildlife Division advises applicants to operate under established regulations and guidelines with respect to wildlife and wildlife habitat to minimize adverse impacts (Section 106 of the Wild Life Regulations under the *Wild Life Act* (O.C. 96-809)).

6) Disturbance of all wildlife should be minimized during helicopter and ground transportation. Whenever possible, aircraft should not descend lower than 100 meters (above ground level) during surveys.

7) The field program will be conducted using accepted wildlife research techniques and targeted species will be disturbed as little as possible. The methods and survey dates described in the application will be followed as closely as possible. Any changes to the survey design or methodology outlined in the initial permit request will require prior approval before implementation.

8) A detailed protocol should be provided to the Wildlife Division for approval prior to any sampling of small mammals or amphibians. Any samples that are collected must be turned into the Wildlife Division following identification. A permit is required and must be obtained prior to transporting any samples or specimens out of the province.

9) To avoid the introduction of non-native species all research equipment should be new and unused, or equipment that has not been previously used outside of Labrador.

10) Final reports should be submitted for each of the components of the work proposed and permitted. Reports should provide a synopsis of the location of surveys, methods employed, number of samples/specimens taken, location of samples/specimens, additional relevant ecological information and a summary of next steps. The raw data and coordinates should be submitted in digital format along with the final reports for each component and for the following: small mammals, amphibian, otter, marten, moose, black bear, porcupine, beaver, breeding birds, mercury level analysis and all sightings of wildlife and sign. The permit holder is responsible to obtain any and all permissions which may be required to release this information to the Wildlife Division. Final reports are to be remitted by the following dates to the Wildlife Division:

Winter Research: May 1, 2014
Spring/Summer Research: October 1, 2014
Fall Research: December 1, 2014

11) Any unusual wildlife observations or any adverse effects observed during the Project are to be reported immediately to the Wildlife Division.

12) This permit does not absolve or relieve the permit holder from any other laws, permits, regulations or orders.

13) This permit does not relieve the permit holder from the requirement to acquire permission to access private property.

14) All conditions of this permit must be adhered to and data and results from this project submitted to the Wildlife Division prior to another permit being issued.

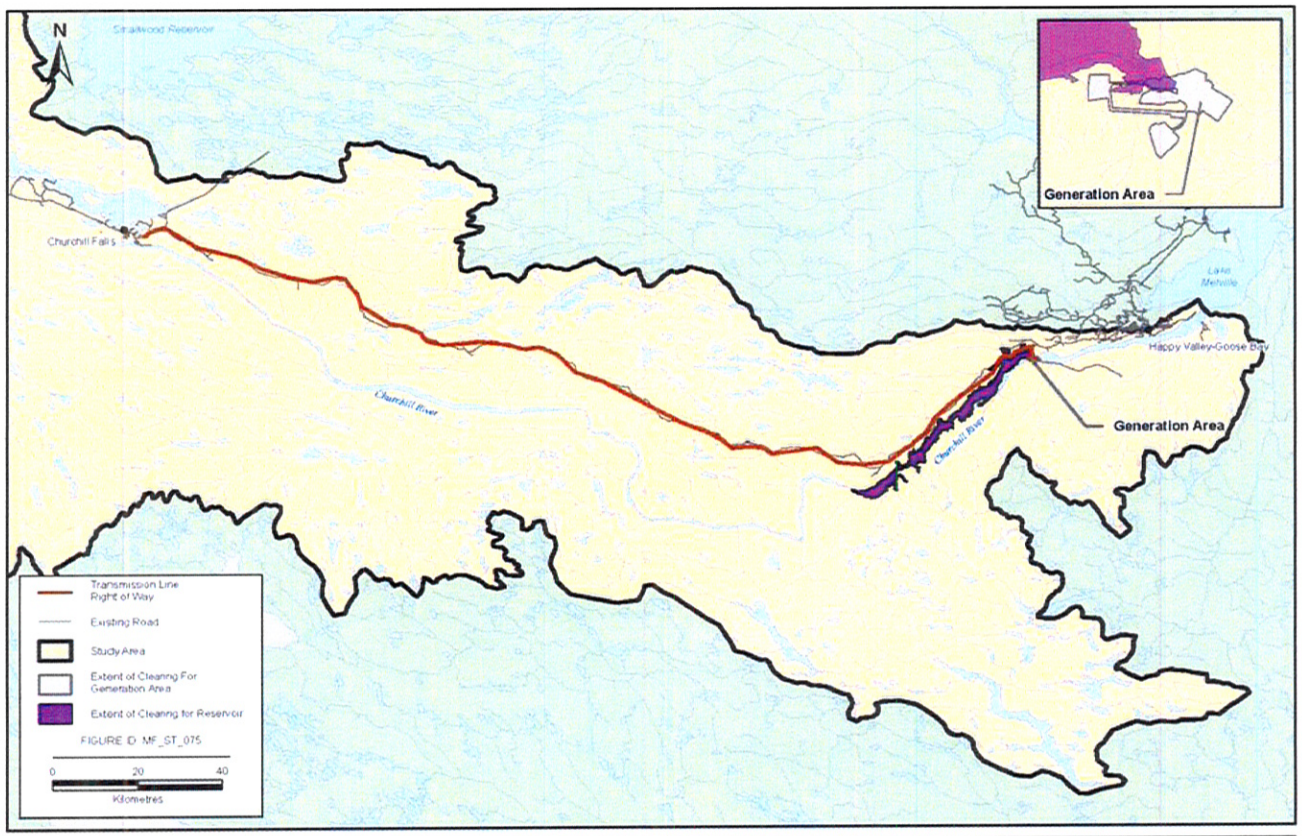
15) Under the discretion of the Director of Wildlife, this permit can be revoked without notice.

March 12, 2014
Date:

Director of Wildlife

PO Box 2007
Corner Brook, NL
A2H 2L7
Phone: (709) 637-2008
Fax: (709) 637-2004

Figure 1.1 **Study Area Overview: Happy Valley – Goose Bay to Churchill Falls**



nalcor energy	FIGURE 1.1
	Study Area Overview: Happy Valley-Goose Bay to Churchill Falls

APPENDIX B

Survey Effort and Weather Conditions

Table B.1 Survey Effort and Weather Conditions during *Ashkui* and Surf Scoter Surveys

Date	Total Survey Time (Hours)	Survey Type & Areas surveyed	Weather Conditions
May 30	3.6	Aerial Surveys (Churchill River from Muskrat Falls to Churchill Falls) Behavioural observations (Churchill Falls)	9°C, Winds ~ 5 km/h; 100% cloud cover; excellent visibility
May 31	0.7	Behavioural Observations (Muskrat Falls)	8°C, 10% cloud cover, excellent visibility
June 1	4.8	Aerial Surveys (Goose Bay to Churchill Falls, Anne Marie Lake, Minipi Lake, and Wilson Lake) Behavioural observations (Muskrat Falls)	20°C, winds ~5 km/h, 5% cloud cover, excellent visibility

Table B.2 Survey Effort and Weather Conditions during Point Count Surveys

Date	Number of point counts	Weather Conditions
June 18	20	14°C, winds <5 km/h, overcast with intermittent drizzle
June 20	23	6°C, winds <5 km/h, overcast with intermittent drizzle
June 23	24	5-12°C, calm, scattered clouds
June 24	22	17°C, calm, scattered clouds
June 25	22	7°C, calm, scattered clouds

Table B.3 Survey Effort and Weather Conditions during Common Nighthawk Surveys

Date	Number of points surveyed	Weather Conditions
June 16	7	Warm (>15°C), overcast with some clear areas, no rain
June 17	5	Warm (>18°C), overcast with light rain beginning ~2220h; ended survey at 2300 due to rain
June 18	6	Warm (>15°C), partial cloud, zero precipitation, light winds (~10-15 km/h)
July 2	5	Warm (>15°C), overcast, intermittent drizzle, low winds (<5-10 km/h)
July 7	6	Warm (>15°C), generally clear skies, calm
July 8	4	Warm (>15°C), cloudy, no rain, low winds (<5-10 km/h)

APPENDIX C

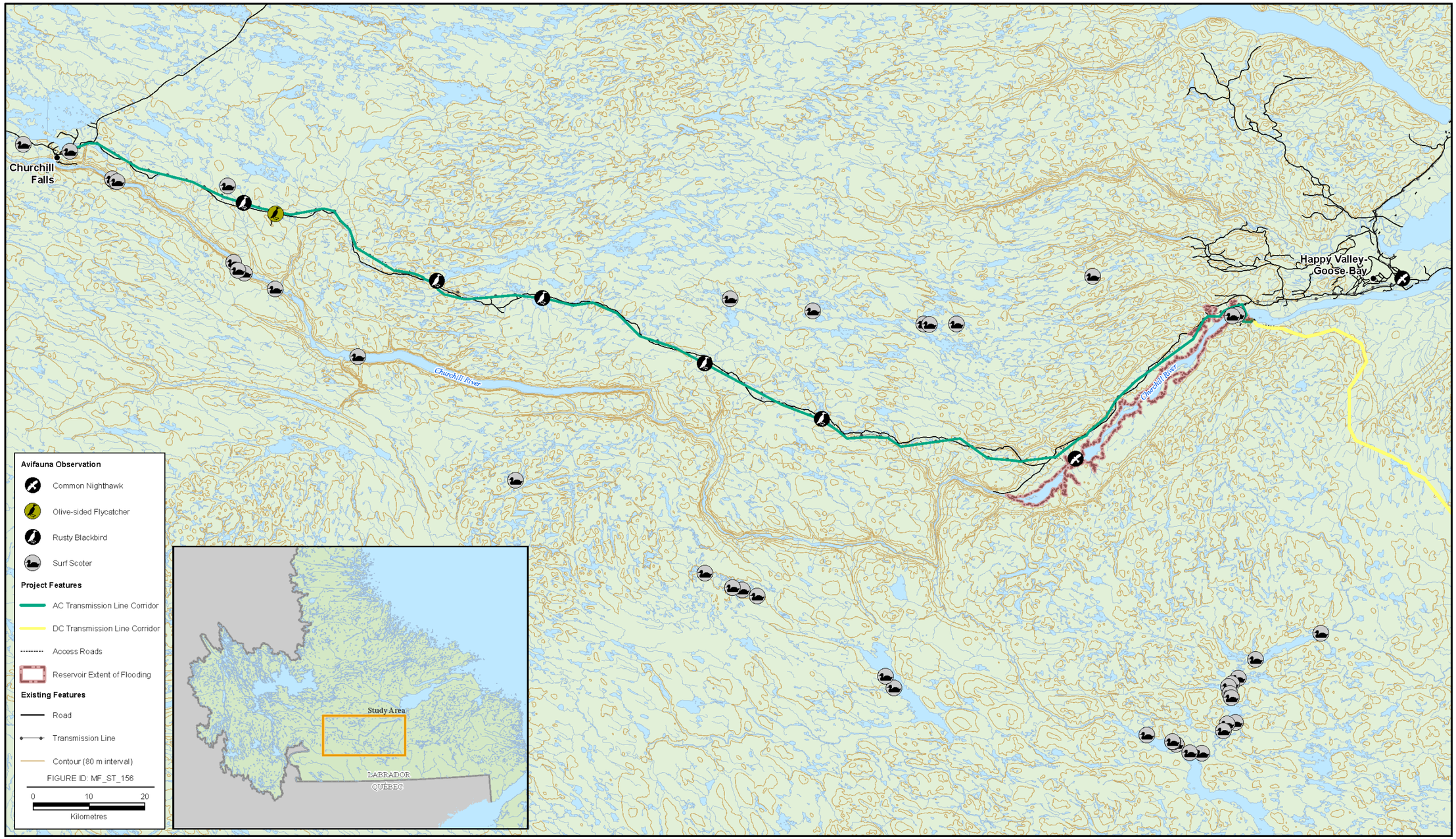


Figure C-1 Summary of 2014 Avifauna EEMP Observations

APPENDIX D

Forest Songbird Point Count Survey results

Table D.1 Species observed during 2014 point count surveys

English Name	Scientific Name	# Forest Songbird Point Count Records (2014)
Canada Goose	*Branta canadensis*	14
Spruce Grouse	*Falcipennis canadensis*	1
Spotted Sandpiper	*Actitis macularia*	2
Wilson's Snipe	*Gallinago delicata*	1
Black-backed Woodpecker	*Picoides arcticus*	2
Downy Woodpecker	*Picoides pubescens*	1
Yellow-bellied Sapsucker	*Sphyrapicus varius*	1
Least Flycatcher	*Empidonax minimus*	16
Alder Flycatcher	*Empidonas alnorum*	7
Yellow-bellied Flycatcher	*Empidonax flaviventris*	4
Olive-sided Flycatcher	*Contopus cooperi*	1
Philadelphia Vireo	*Vireo philadelphicus*	3
Gray Jay	*Perisoreus canadensis*	45
American Crow	*Corvus brachyrhyncos*	3
Common Raven	*Corvus corax*	1
Boreal Chickadee	*Poecile hudsonicus*	3
Red-breasted Nuthatch	*Sitta canadensis*	10
Ruby-crowned Kinglet	*Regulus calendula*	56
Golden-crowned Kinglet	*Regulus satrapa*	1
Swainson's Thrush	*Catharus ustulatus*	133
Hermit Thrush	*Catharus guttatus*	9
American Robin	*Turdus migratorius*	47
Tennessee Warbler	*Vermivora peregrina*	63
Orange-crowned Warbler	*Vermivora celata*	3
Yellow Warbler	*Dendroica petechia*	10
Mourning Warbler	*Oporonis philadellphia*	1
Palm Warbler	*Dendroica palmarum*	1
Magnolia Warbler	*Dendroica magnolia*	2
Yellow-rumped Warbler	*Dendroica coronata*	66
Blackpoll Warbler	*Dendroica striata*	4
Cape May Warbler	*Dendroica tigrina*	6
Black-throated Green Warbler	*Dendroica virens*	45
Wilson's Warbler	*Wilsonia pusilla*	7
Northern Waterthrush	*Seiurus noveboracensis*	26

English Name	Scientific Name	# Forest Songbird Point Count Records (2014)
Song Sparrow	*Melospiza melodia*	1
Lincoln's Sparrow	*Melospiza lincolnii*	4
White-throated Sparrow	*Zonotrichia albicollis*	49
Fox Sparrow	*Passerella iliaca*	30
Dark-eyed Junco	*Junco hyemalis*	61
Pine Siskin	*Carduels pinus*	12

APPENDIX E

Incidental observations during 2014 Avifauna Field Program

Table E-1: Incidental Observations of Avifauna and Other Wildlife

Observations	
Avifauna	**Mammals and Herpetiles**
Surf Scoter Component	
Common Loon (*Gavia immer*)	Moose (*Alces americanus* syn. *Alces alces*); female
Canada Goose (*Branta canadensis*)	Caribou (*Rangifer tarandus*); male and female
American Black Duck (*Anas rubripes*)	Porcupine (*Erethizon dorsatum*)
Common Merganser (*Mergus merganser*)	Black bear (*Ursus americanus*); adult and cub
Red-breasted Merganser (*Mergus serrator*)	
Ring-necked Duck (*Aythya collaris*)	
Black Scoter (*Melanitta americana*)	
Common Goldeneye (*Bucephala clangula*)	
Spotted Sandpiper (*Actitis macularius*)	
Golden Eagle (*Aquila chrysaetos*)	
Bald Eagle (*Haliaeetus leucocephalus*)	
Osprey (*Pandion haliaetus*); active nest	
Red-tailed Hawk (*Buteo jamaicensis*)	
Unidentified Scaup species (*Aythya sp.)*	
Unidentified Gull Species (*Larus sp.*)	
Forest Songbird Point Count Component (in addition to those detected during point count surveys)	
Ptarmigan species (*Bonasa/ Falcipennis/ Lagopus sp.)*	Moose (*Alces americanus* syn. *Alces alces*); tracks, scat and browse
Red-tailed Hawk (*Buteo jamaicensis*)	Fox (*Vulpes sp.*); tracks
Merlin (*Falco columbarius*)	American toad (*Anaxyrus americanus*)
Greater Yellowlegs (*Tringa melanoleuca*)	Porcupine (*Erethizon dorsatum*); browse
Red-eyed Vireo (*Vireo olivaceus*)	Small mammal (trails)
Purple Finch (*Haemorhous purpureus*)	Snowshoe hare (*Lepus americanus*); browse, and runs
Unidentified Woodpecker species (holes in trees)	Red squirrel (*Tamiasciurus hudsonicus*)
	American beaver (*Castor canadensis*)
Common Nighthawk Component	
Canada Goose (*Branta canadensis*)	American Toad (*Anaxyrus americanus*)
Bank Swallow (*Riparia riparia*)	
Wilson's Snipe (*Gallinago delicate*)	
Gray Jay (*Perisoreus canadensis*)	

Observations	
Common Raven (*Corvus corax*)	
Swainson's Thrush (*Catharus ustulatus*)	
Hermit thrush (*Catharus guttatus*)	
American Robin (*Turdus migratorius*)	
American Pipit (*Anthus rubescens*)	
Tennessee Warbler (*Oreothlypis peregrine*)	
Yellow-rumped warbler (*Setophaga coronate*)	
Black-throated Green Warbler (*Setophaga virens*)	
Northern Waterthrush (*Parkesia noveboracensis*)	
White-throated Sparrow (*Zonotrichia albicollis*)	
Fox Sparrow (*Passerella iliaca*)	
Dark-eyed Junco (*Junco hyemalis*)	
Unidentified Gull species (*Larus sp.*)	

APPENDIX F

Species at Risk

Table F.1 Avifauna Species and Risk and Habitat Associations Considered in the 2014 Avifauna EEMP

Scientific Name	Common Name	Status	Habitat	ELC Ecotype	Occurrence in Relation to Project[1]
Contopus cooperi	Olive-sided Flycatcher	Threatened under SARA	Open areas containing tall live trees or snags for perching. Open areas include forest clearings, forest edges located near natural openings (such as wetlands, rivers or streams), burned forest or openings within old-growth forest stands characterized by mature trees and large numbers of dead trees or human-made openings (such as logged areas).	Wetland	Documented during baseline point count surveys (n=1 in 2006; n=3 in 2007), and during 2014 point count surveys (n=1) Suitable primary habitat (14%) may be found in the lower Churchill River watershed (regional ELC)
Euphagus carolinus	Rusty Blackbird	Special Concern	Breeding habitat corresponds closely to with the boreal forest. Primarily occupies forest wetlands, such as slow-moving streams, peat bogs, sedge meadows, marshes, swamps, beaver ponds and pasture edges	Wetland	Documented during baseline point count surveys (n=1 in 2006; n=15 in 2007), and during the 2014 nest search field program (n=7) Suitable primary habitat (3.7%) may be found in the lower Churchill River watershed (Regional ELC)
Chordeiles minor	Common Nighthawk	Threatened	Burns and burn edges, anthropogenically disturbed sites for ground nesting; wetland areas for foraging on insects	Black Spruce Lichen Forest / Burn / Anthropogenic	Incidental observations during 2006 field season 2014 nest search field program and 2014 Common Nighthawk program Suitable primary habitat (42.3%) may be found in the lower Churchill River Watershed (Regional ELC)

Scientific Name	Common Name	Status	Habitat	ELC Ecotype	Occurrence in Relation to Project[1]
Catharus minimus	Gray-cheeked Thrush	Vulnerable under NLESA	A variety of mature forest types including white spruce, wet spruce and dry spruce adjacent to wetland or riparian habitat	Open Conifer Forest / Mixedwood Forest	Documented during baseline point count surveys (n=1 in 2006; n=8 in 2007) Suitable primary habitat (16.9%) may be found in the lower Churchill River watershed (Regional ELC)
[1] percentages of available primary habitat available in Regional ELC were taken from Tables 5-24 to 5-27 in Volume IIB of the EIS					

Table F.2 Results of 2014 Common Nighthawk Surveys

Date	UTM Coordinates (20 U)		Start Time	# CONI	Start Time		# CONI	Habitat	Comments
	Northing	Easting	6-minute Listening Period		2-minute Call Playback	2-Minute Listening Period			
16June	611005	5871409	21:45	0	21:51	21:53	0	At end of Gull Island road; sandy area bordered by mixed forest	
16June	610481	5871809	22:01	0	22:07	22:09	0	open sand pit on Gull Island road, bordered by Black Spruce forest	
16June	609481	5872499	22:20	0	22:26	22:28	0	Sand pit off Gull Island road, bordered by dry Black Spruce forest	
16June	609841	5873387	22:36	0	22:42	22:44	0	Gull Island road; 3 wetlands in area, open Black Spruce habitat along roadside	
16June	611890	5875093	22:51	0	22:57	22:59	0	Clearing / open Black Spruce; wetlands approximately 500 m to east and west of road	
16June	613862	5877047	23:06	0	23:12	23:14	0	open / mulched area of Transmission Line; Black Spruce surrounding cleared areas	overcast with some clear skies; not fully dark
16June	615068	5878732	23:19	0	23:25	23:27	0	burn habitat on south side of TLH; closed Black Spruce habitat on north side	very quiet
17June	622495	5882913	21:24	0	21:30	21:32	0	TLH near pond / cabins, with areas of open Black Spruce on north side and some areas of wet Black Spruce on south side	

Date	UTM Coordinates (20 U)		Start Time	# CONI	Start Time		# CONI	Habitat	Comments
	Northing	Easting	6-minute Listening Period		2-minute Call Playback	2-Minute Listening Period			
17June	628057	5889109	22:00	0	22:06	22:08	0	large wetland complex on north side of TLH; near access road AT13	
17 June	630186	5891052	22:14	0	22:20	22:22	0	on TLH between string bog and wetland habitats; with mixed forest (coniferous dominant) along edges of TLH	light rain started at end of survey; 18*C
17 June	631614	5893425	22:29	0	22:35	22:37	0	on TLH adjacent to a large sandpit with Black Spruce habitat on north side and surrounding the sand pit	
17 June	634528	5895873	22:46	0	22:52	22:54	0	in parking lot of old camp; large cleared area of sand, with several wetland areas nearby	
18 June	636131	5897564	21:18	0	21:24	21:26	0	gravel pit on north side of TLH	had attempted to survey on June 17 but conditions became unfavorable
18 June	636267	5898457	21:32	0	21:38	21:40	0	on side of road adjacent to TLH; several cabins in the area; open/sandy with sparse deciduous trees and bordered by coniferous forest	could hear river rushing
18 June	640467	5901194	21:54	0	22:00	22:02	0	recently cut Transmission Line intersecting TLH; bordered by Black Spruce-Lichen forest	

Date	UTM Coordinates (20 U)		Start Time	# CONI	Start Time		# CONI	Habitat	Comments
	Northing	Easting	6-minute Listening Period		2-minute Call Playback	2-Minute Listening Period			
18 June	640959	5901479	22:09	0	22:15	22:17	0	south side of road overlooks cut area and some wet areas; north side of road is dense, mixed forest	could hear waterfall/stream
18 June	641529	5902655	22:23	0	22:29	22:31	0	sand pit on south side of TLH; possible access road	Swainson's Thrush made unusual start to song
18 June	644612	5904535	22:45	0	22:51	22:53	0	cleared trail/road; generally sandy with wetlands in distance; Black Spruce forest along road edges	could hear machinery from the construction site; got dark very quickly on this night
2 July	463575	5923182	21:01	0	21:07	21:09	0	Gravel pit on south side of TLH	Swallow sp (undefined) came out during call playback
2 July	463418	5923601	21:17	0	21:23	21:25	0	Gravel pit on one side of TLH, small pond on opposite side	
2 July	456696	5926899	21:40	0	21:46	21:48	0	gravel access road leading to cleared Right-of-Way	recently disturbed with some gravel areas
2 July	449776	5928131	22:03	0	22:09	22:11	0	South of TLH is scrubby black spruce habitat with wetland; north side of TLH is rock ledge	
2 July	446971	5930030	22:24	0	22:30	22:32	0	Gravel pit on south side of TLH	
2 July	440928	5933400	22:44	0	22:50	22:52	0	Gated, cleared area/pit on north side of TLH	

Date	UTM Coordinates (20 U)		Start Time	# CONI	Start Time		# CONI	Habitat	Comments
	Northing	Easting	6-minute Listening Period		2-minute Call Playback	2-Minute Listening Period			
7 July	641698	5902272	21:20	0	21:26	21:28	0	cleared road/ turn around adjacent to cleared Right-of-Way; low shrub valley area with small river	
7 July	640880	5903155	21:41	0	21:47	21:49	0	sandy/cleared area off TLH with low shrub bordering; north side of TLH is coniferous dominated forest (closed canopy)	
7 July	640678	5903721	21:57	0	21:63	21:65	0	sandy/open area near cabin on road adjacent to TLH; some low shrub; overlooks valley	
7 July	640790	5904418	22:17	0	22:23	22:25	0	road off north side of TLH, low shrub trees and larger coniferous	
7 July	646405	5905934	22:47	0	22:53	22:55	0	gravel pit adjacent to road on north side of TLH	
7 July	+-	5908929	22:30	1	22:36	22:38	2	On bike trail in Goose Bay	
8 July	617520	5879736	22:07	0	22:13	22:15	0	recent burn	
8 July	648278	5902835	23:02	0	23:08	23:10	0	end of Muskrat Falls road (archaeology site); open area	
8 July	648868	5904475	23:20	0	23:26	23:28	0	on Muskrat Falls road	
8 July	666987	5905209	23:49	0	23:55	23:57	0	TLH: near bridge to Port Hope Simpson	

Note: TLH=Trans Labrador Highway