Long Harbour Commercial Nickel Processing Plant

Terrestrial Environment Component Study

Prepared For:

Voisey's Bay Nickel Company Limited
Suite 700, Baine Johnston Centre
10 Fort William Place
St. John's, NL A1C 1K4

Prepared By:

Jacques Whitford Limited
607 Torbay Road
St. John's, NL A1A 4Y6
Tel: 709-576-1458
Fax: 709-576-2126

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EXECUTIVE SUMMARY

Voisey's Bay Nickel Company (VBNC) is proposing to build a commercial nickel processing plant at Long Harbour, Newfoundland to process nickel concentrate from its mine/mill complex in Voisey's Bay, Labrador. VBNC has prepared component studies in support of an Environmental Impact Statement (EIS) for the commercial nickel processing plant at Long Harbour. This report presents the surveys completed, the results obtained and relevant background information for the Terrestrial Component Study.

The Project was registered with the provincial government on 21 March 2006 to initiate an environmental assessment under the *Environmental Protection Act*. Draft guidelines for the EIS were issued on 6 September 2006 and final guidelines were released on 31 October 2006. The scope of terrestrial field surveys was developed in January-February 2006 and most of the surveys were completed prior to the release of the assessment guidelines (Department of Environment and Conservation 2006). These surveys were reported in the 2006 Terrestrial Baseline Program (JWL 2007) and are largely reproduced in this component study report.

The Study Area for the Terrestrial Component Study is the area of potential physical disturbance (i.e., Project footprint) due to plant, road, pipeline, and residue storage construction. It also extends to include the potential zone of influence resulting from the construction, operation, and decommissioning of the plant. Within this area, surveys have been conducted to map vegetation, determine the presence of rare plants, and to characterize wetland areas. At the same time, four-seasonal surveys were conducted to determine wildlife presence and habitat use based on direct observation or indirect evidence. The Study Areas for these surveys were determined from the best available project description, and as such were modified over time. Maps of the survey Study Areas include the February 2007 Project footprint shown to indicate the proposed Project footprint. That footprint is a combination of the two process options (hydrometallurgical and matte processing).

Vegetation mapping and a rare plant survey were conducted to identify the vegetative communities (including wetlands) on and adjacent to the Project footprint and to identify the presence of rare plants. The survey characterized three small wetlands that may be affected by the Project. Summaries of the forest resources in the Study Area are based on Forest Resources Division covertype mapping as well as the vegetation surveys conducted for the component study.

A rare plant survey of the Study Area found no listed species, however a dedicated survey for the Boreal Felt Lichen (*Erioderma pedicellatum*) was conducted by members of the Newfoundland Lichen Education and Research Group (NLERG). *Erioderma pedicellatum* is listed as *Special Concern* under the federal *Species at Risk Act* (Schedule 1) and by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). It is listed as V*ulnerable* under the *Endangered Species Act* of Newfoundland and Labrador. Approximately 30,000 trees were surveyed during the 300 hours of survey time dedicated to the Long Harbour area. Of these, 60 trees were documented hosting 97 thalli of

E. pedicellatum, the first documentation of this rare lichen in the Long Harbour area. The vast majority of the thalli were found in areas that do not directly overlap with the Project.

Avifauna surveys were conducted to collect data on landbirds, waterfowl, gamebirds, and raptors.

The terrestrial surveys conducted in 2006 included seasonal reconnaissance-level surveys examining evidence of wildlife (usually indirectly by noting fresh sign).

A total of 37 bird species were detected during dedicated surveys in June 2006; 32 of these were censused by point count surveys. Common Loon, Osprey, Spotted Sandpiper, American Crow, Common Raven, Golden-crowned Kinglet, Common Yellowthroat and Tree Swallow were sighted incidental to the point counts. Several of these birds were also sighted during the wildlife and vegetation surveys conducted during late summer and fall. One Common Loon and one American Black Duck were sighted within the Study Area during an aerial survey conducted on 2 August 2007. That survey reported many other species observed outside of the Study Area. With the exception of the American Crow, Common Raven, Golden-crowned Kinglet, Common Yellowthroat, and Tree Swallow, all other bird species observed on the additional surveys were previously observed on the point count surveys, and are probably using the area as breeding habitat.

No listed rare and endangered species were observed in the Study Area. However, there was an observation of Red Crossbill near the Town of Long Harbour-Mount Arlington Heights. The Red Crossbill (*Loxia curvirostra percna*) is listed as *Endangered* for the Province and also *Endangered* on the *SARA* and COSEWIC lists. It is an irruptive migrant that relies on coniferous cone crops and its nomadic niche would make it unlikely that habitat in the Long Harbour area is critical for this species.

The results of the wildlife surveys revealed numerous signs of moose, which appears to be the only big game in the area. Small game in the area includes snowshoe hare and some gamebirds such as Ruffed Grouse. There are also signs and reports of furbearers that include red fox, red squirrel, mink, otter, and beaver.

The results of the various surveys will be used to help predict the potential effects of the proposed commercial nickel processing plant and to provide baseline data to facilitate follow-up monitoring.

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1.0 Introduction

Voisey's Bay Nickel Company (VBNC) is proposing to build a commercial nickel processing plant at Long Harbour, Newfoundland and registered the Project for environmental assessment in March 2006.

Following a review of the registration for environmental assessment under the *Environmental Protection Act* (VBNC 2006), the Minister of Environment and Conservation determined that an Environmental Impact Statement (EIS) was required. An environmental assessment committee was established and following public input, guidelines were issued, on 31 October 2006, identifying the issues to be addressed in the EIS and in the federal environmental assessment (Department of Environment and Conservation 2006).

The guidelines required that a Terrestrial Environment Component Study be prepared for submission to the Minister.

1.1 Rationale/Objectives

The objective of the Terrestrial Environment Component Study was to characterize relevant terrestrial baseline conditions. The guidelines state that the component study should consider wetlands, avifauna, and species at risk in particular.

Vegetation mapping and a rare plant survey were designed and conducted to identify the vegetative communities (including wetlands) on and adjacent to the Project footprint and to identify the presence of rare plants. Surveys were conducted to determine avifauna presence and use of the project area. Incidental observations are included to indicate the presence of wildlife and the use of habitat. To determine the presence of species at risk, a review of the survey data and other regional information was conducted and compared to the published lists of species at risk.

1.2 Study Area

The areas surveyed for these studies in 2006 were located near the Town of Long Harbour-Mount Arlington Heights and varied according to the various surveys (Section 2). Long Harbour is in the southwestern portion of the Avalon Peninsula, on the east side of Placentia Bay. The proposed commercial nickel processing plant site is 105 kilometres from St. John's. Long Harbour is in the Maritime Barrens Ecoregion, and the Southeastern Barrens Subregion. This ecoregion has a cold growing season with regular fog and strong winds. The habitat types consist primarily of near-pure stands of Balsam Fir (*Abies balsamea)*, alternated with open heaths, that were likely created by indiscriminate burning by European settlers. The *Clintonia*-Balsam Fir forest type is most common while the *Dryopteris*-Balsam Fir forest type dominates on the slopes (Meades and Moores 1994). The surficial geology of the area consists of boulder-strewn glacial till of varying thickness and composition, most commonly as a thin veneer over bedrock, with variable relief and topography.

1.3 Study Team

The study team and their roles are listed in Table 1-1.

Table 1-1 Terrestrial Component Study Team

Personnel	Position	Role
Bruce Bennett	Senior Scientist JWL	Project Manager
Perry Trimper	Senior Scientist JWL	Senior Report Review
Terrestrial Surveys/Reporting		
Perry Trimper	Senior Scientist JWL	Study Leader
Brent Keeping	Scientist JWL	Study team member
Steve Gullage	Scientist JWL	Study team member
Barry Wicks	Scientist JWL	Study team member
Matt Hynes	Technologist JWL	Study team member
Rare Plant Survey/Reporting		
Brent Keeping	Scientist JWL	Study Leader
Wetland Survey/Reporting		
Brent Keeping	Scientist JWL	Study Leader
Avifauna Surveys/Reporting		
Steve Gullage	Scientist JWL	Study Leader
Jytte Selno	Avian Specialist JWL	Study team member
Tina Newbury	Avian Specialist JWL	Study team member
Perry Trimper	Senior Scientist JWL	Study team member
Report Production		
Stephen Rowe	GIS Specialist	GIS and graphics
Carolyn Pelley	GIS Technician	GIS and graphics
Jackie Bowman	GIS Analyst	GIS and graphics

2.0 Methods

Vegetation surveys were designed to identify any potential occurrence of rare and/or endangered species and to develop a baseline of the dominant vegetation communities in the Study Area. Avifauna surveys were conducted to collect data on landbirds, waterfowl, gamebirds, and raptors. Incidental wildlife observations were obtained from reconnaissance level seasonal surveys conducted in concert with the vegetation and wildlife surveys.

2.1 Vegetation Mapping and Surveys for Rare Plants and Wetlands

The vegetation in the terrestrial baseline Study Area (Figure 2-1) was characterized using aerial photos, and a review of the federal *Species at Risk Act*, *Newfoundland and Labrador Endangered Species Act*, and the Atlantic Canada Conservation Data Centre (ACCDC) database to identify areas with the potential for rare or uncommon plants species. Following the completion of the terrestrial baseline research, additional aerial photo interpretation was completed to include an area that was identified as a potential matte residue storage area to the west of the field surveys. Wetlands in the Study Area were identified, classified and their areas determined.

A field survey of the Study Area was conducted in late summer (25-28 July 2006) (when fruiting bodies were present for most species) to determine the presence/absence of rare or uncommon plant species. Note that surveys were completed before the revised outline of the Project facilities for both hydrometallurgical and matte processing was available in February 2007 (Figure 2-1).

2.1.1 Vegetation Community Surveys and Mapping

The dominant vegetation communities within the Study Area were surveyed during the field program. Plots were established within a homogeneous area of the plant community type being surveyed. Cover values were estimated for the dominant vascular and non-vascular species within the plot area for each stratum (tree, shrub, herb, and bryophyte layers) based on 400 m^2. Plot locations were recorded using a handheld GPS receiver and representative photos taken at each plot. Plant species not readily identifiable during the field program were collected for subsequent identification. Site characteristics such as slope, aspect, position, and moisture regime were recorded.

2.1.2 Rare Plants Survey

A search of the ACCDC database of known rare plant species within 5 km of the Project footprint was conducted. Rare plant species are defined as those designated with sub-national (provincial) rank of S1 and S2 as determined by the provincial Wildlife Division of the Department of Environment and Conservation (Table 2-1).

Figure 2.1 Study Area for Terrestrial Baseline Surveys

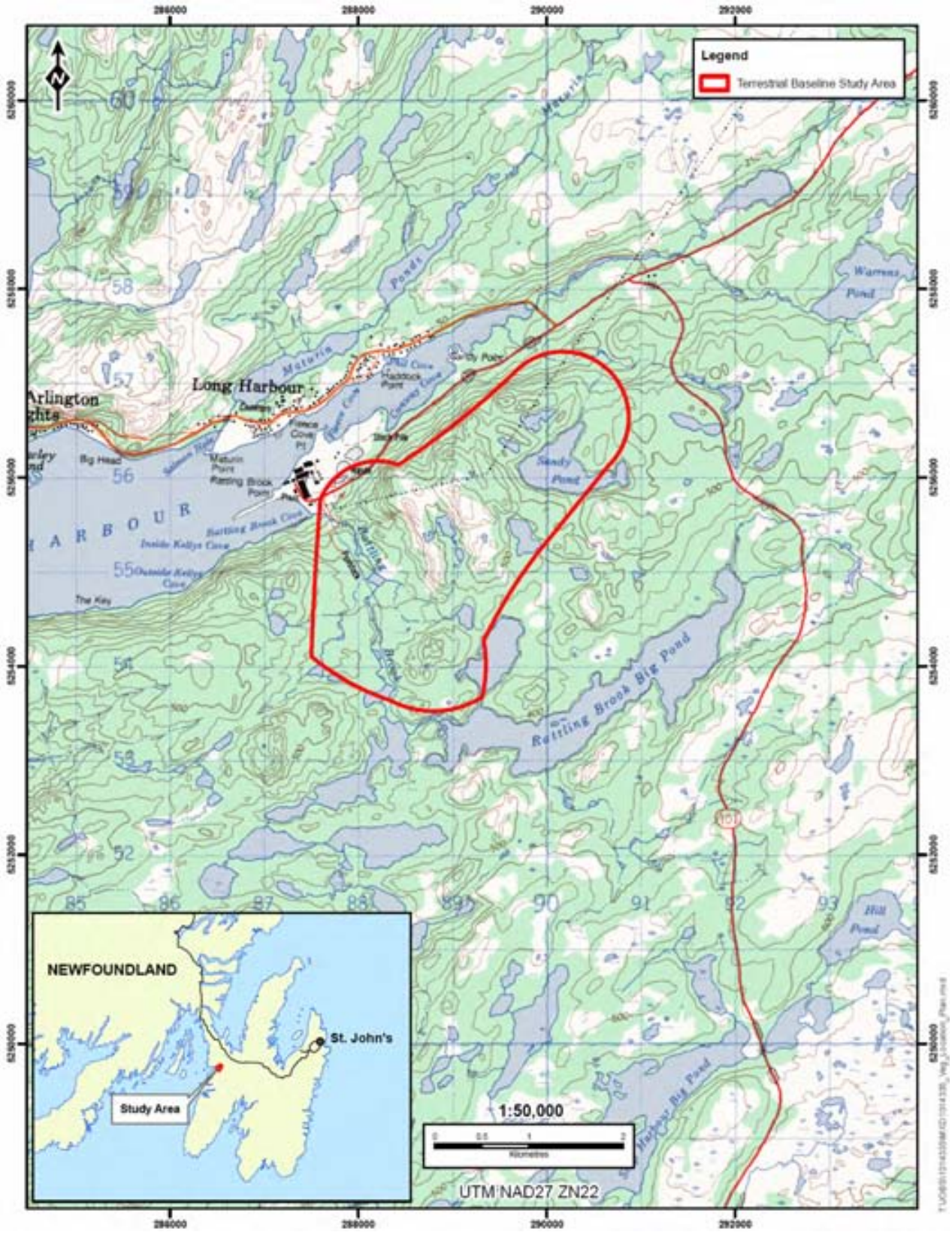


Table 2-1 Definitions of the Atlantic Canada Conservation Data Centre S Rankings

S Rank	Description
S1	Extremely rare throughout its range in the province (typically five or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2	Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3	Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in some locations (21 to 100 occurrences).
S4	Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the species is of long-term concern (e.g., watch list) (100+ occurrences).
S5	Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions.
S#S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes uncertainty about the exact rarity of the species (e.g., S1S2).
?	Inexact or uncertain: for numeric ranks, denotes inexactness (e.g., SE? denotes uncertainty of exotic status). (The '?' qualifies the character immediately preceding it in the S RANK).
SU	Unrankable: Possibly in peril, but status is uncertain - more information is needed.
SH	Historical: Previously occurred in the province but may have been overlooked during the past 20-70 years. Presence is suspected and will likely be rediscovered; depending on species/community.
SR	Reported but without persuasive documentation (e.g., misidentified specimen).

Field surveys (25-28 July; 26-27 September) were conducted at all sites identified during the aerial photo review and at previously unidentified sites encountered while on the ground. A complete list of vascular plant species at each site was generated and the habitat was described. Representative photos were taken at each site. Plants not readily identified in the field were photographed *in situ* and representative samples of the species were collected for subsequent identification.

The community types and prominent land features identified during the field investigations were mapped on air photos and incorporated into a Geographic Information System (GIS).

Aerial photos were used to identify and select any potential rare plant habitats within the Study Area. Potential rare plant habitats in Newfoundland typically include riparian zones, wetlands, groundwater seepage sites and unique geological landforms such as limestone rock outcrops.

A species of particular interest in the surveys was the Boreal Felt Lichen (*Erioderma pedicellatum).* *Erioderma pedicellatum* is listed as critically endangered on a global basis by the IUCN Red List of Threatened Species (IUCN 2006). The Newfoundland (Boreal population) is listed as *Special Concern* under the federal *Species at Risk Act* (Schedule 1) and by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). It is listed as V*ulnerable* under the *Endangered Species Act* of Newfoundland and Labrador.

In early 2006, VBNC approached the Newfoundland Lichen Education and Research Group (NLERG) to undertake reconnaissance of the general Long Harbour area in order to assess the presence of this rare lichen. Surveys and reporting were conducted by C. Scheidegger, Lichen Specialist Group of the

International Union for the Conservation of Nature (IUCN); I. Goudie, NLERG; and E. Conway, NLERG.

In June 2006, the NLERG initiated field surveys in the Long Harbour area to determine if *E. pedicellatum* was present in the forested areas of the general study area of Long Harbour, and to undertake surveys to determine the extent and abundance of the species. Approximately 300 hours were spent searching for *E. pedicellatum* over a 20-km^2 area in the Long Harbour vicinity during a three-month period from 1 June to 6 September 2006.

2.1.3 Wetland Assessments

Potential wetland sites were determined by reviewing air photos and conducting a ground reconnaissance. Any wetland larger than approximately 400 m^2 was assessed for wildlife habitat.

At each survey site, dominant plant species were recorded within the noted vegetation zone. Each wetland was assessed for potential habitat use for wildlife including waterfowl, furbearers, and moose. Wetlands were classified according to the Canadian Wetland Classification System (National Wetlands Working Group 1997). Estimates were made of shoreline substrate composition and water depth. For larger wetlands, post-fieldwork GIS analysis was used to determine wetland size and linear edge.

2.1.4 Domestic Wood Harvesting

The field team conducting the vegetative mapping noted areas where woodcutting has occurred. The vegetative mapping indicates only those areas of current domestic woodcutting. It is likely that domestic woodcutting has occurred in the area for generations.

2.2 Avifauna Surveys

Avifauna surveys were conducted to collect data on landbirds, waterfowl, gamebirds, and raptors (Figure 2-1). Wildlife (including avifauna) surveys were conducted to represent winter, early summer, late summer, and fall. The summer and fall surveys targeted use of the waterbodies and surrounding areas by passerine birds, waterfowl, gamebirds, and raptors.

Bird presence was recorded by 45 systematic (point count) surveys (15-17 June 2006) as well as incidental observations recorded during other surveys associated with this Component Study.

2.2.1 Point Count Surveys and Forest Avifauna

Point count surveys were completed in early summer, as this is the period when songbird species are most vocal and therefore easiest to detect. Note that these surveys occurred over two days and focused on areas of potential future site disturbance. These surveys were not comprehensive but rather were designed to characterize avifauna in those areas investigated. Additional surveys in late summer and fall were conducted to detect fledgling birds and birds using the area temporarily during dispersal and

migration. Terrestrial habitats (Table 2-2) were described at each point count station to infer habitat associations between birds and their environment. These habitat types are considered micro-habitats when compared to the types used to describe the vegetation zones in Section 2.0.

Table 2-2 Micro-Habitat Classification for the Wildlife and Bird Surveys (2006)

Habitat type	Description
Riparian (RI)	Shoreline vegetation, typically dominated by Mountain Alder (*Alnus crispa*), willows (*Salix* spp.), Sweetgale (*Myrica gale*), grasses (*Poaceae* spp.), and sedges (*Carex* spp.)
Forest	**Spruce Wet (SW)-**Canopy >90% spruce; ground moist and typically dominated by *Hylocomium splendens*, *Pleurozium schreberi*, and/or *Ptilium crista-castrensis* mosses. May also have areas of *Sphagnum* spp. mosses.
	Spruce Dry (SD) -Canopy >90% spruce; ground dry and typically dominated by *Cladonia* spp. lichens or Ericaceous heath
	Fir/Spruce (FS) - Canopy <10% deciduous, and >10% each Balsam Fir and Black Spruce (*Picea mariana*)
	Mixed Forest – Fir Dominated (MF) - Canopy 10-49% deciduous; fir dominant
Burn or cutover (BU)	Recent (< 20 years) burn or cutover, with or without regenerating vegetation

A total of 40 point counts were conducted in the Study Area, starting on the morning of 15 June and ending on morning of 17 June 2006 (Figure 2-2). Point counts were conducted from 0430h to 0900h each morning and 1630h to1900h each evening. On 16 June 2006, dawn surveys were cancelled due to high winds and heavy rain. Point count stations were spaced 300 m apart or more.

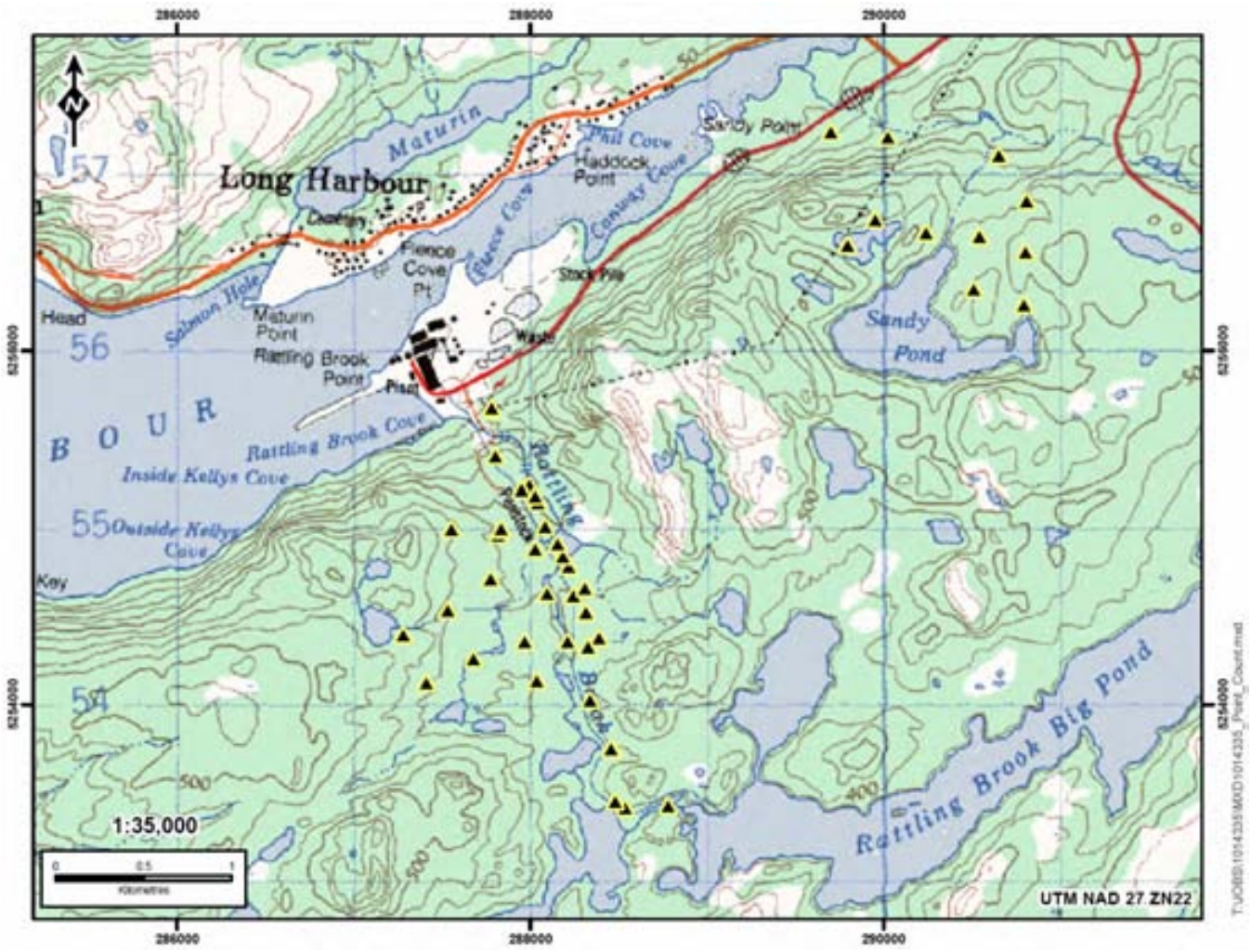
The surveys were focussed in areas south of the harbour, along the trail to Rattling Brook Big Pond, and in the Sandy Pond area. Species, direction and estimated distance (0-50 m, 51-100 m, and >100 m) of each bird were recorded during the 10-minute observation period. Habitat characteristics and vegetation species present were also recorded. Observations on other species (birds and mammals) were recorded when walking between sampling points. Bird observations were also recorded within the Study Area during the surveys in March, July, September, and October.

Additional surveys were conducted adjacent to the Study Area at six locations around Long Harbour on 23 August, 17 and 24 September, and 4 October 2006 (B. Mactavish, *pers. comm.*).

2.2.2 Waterfowl Surveys

The Study Area was censused on foot for waterfowl during the avian (Figure 2-2) and terrestrial surveys (Table 2-3). These surveys were conducted on 18-20 March, 15-17 June, 26 September, and 11 October. Each waterbody in the Study Area was surveyed at least once. Observers scanned (with binoculars) suitable areas, including grassy areas, and shorelines for waterfowl and other birds. Locations of all waterfowl (including birds in flight) were recorded.

Figure 2.2 June Avifauna Survey - Location of Point Counts



A waterfowl breeding survey was conducted on 2 August 2007 using aerial survey protocols (LGL 2007). The purpose was to assess breeding populations of waterfowl and record any incidental bird and animal observations.

Table 2-3 Dates, Routes, Distances, and Weather Conditions of the Terrestrial Ecosystem Surveys (2006)

Date(s)	Route Explored During Survey	Distance	Weather Conditions
18 March 2006	A network of trails leading south to Rattling Brook Big Pond and a transect from Route 101 west to Sandy Pond.	8.8 km	AM: clear sky, light wind,-3^{o} C PM: heavy snow, moderate northeast wind, 0^{o}C
19 March 2006	From Rattling Brook Cove, followed the main trail south then west, exploring the area of the proposed Processing Plant, then north and east to Rattling Brook. Then explored an area east and north-east of Sandy Pond.	11.1 km	AM: overcast, snow, 2^{o}C PM: snow/rain in the afternoon with fog, 0^{o}C
20 March 2006	From proposed Processing Plant site moving west towards the two Ponds south of 'Inside Kelly's Cove' then north east towards Rattling Brook Cove	3.5 km	AM: Clear, 0^{o}C PM: Clear, 0^{o}C
15 June 2006	From the ATV trail to Rattling Brook	4.0	AM: Clear, 9^{o}C PM: Clear, 15^{o}C
16 June 2006	From the Hydro access trail to Sandy Pond and then down to the Rattling Brook trail south and finally northwest	4.0	AM: Heavy wind and rain. Surveys cancelled, 9^{o}C PM: Cleared, 14^{o}C
17 June 2006	Sandy Pond area, From the Hydro access trail and along the transmission line and through the forest to Sandy Pond	4.0	AM: Clear, 8^{o}C PM: Clear, 14^{o}C
26 September 2006	West of Rattling Brook road, then north of Sandy Pond.	3 km	AM: Partly cloudy sky, 18 ^{o}C PM: Partly cloudy sky, 20 ^{o}C
11 October 2006	From Rattling Brook Cove to a small pond northeast of the road, and back around in a loop.	3.5 km	AM: Clear sky, light wind, 10^{o}C PM: Clear sky, light wind, 14^{o}C

2.2.3 Gamebird and Raptor Surveys

Gamebirds including Ruffed Grouse (*Bonasa umbellus)*, Spruce Grouse (*Dendragapus canadensis)*, and Willow Ptarmigan (*Lagopus lagopus*) were surveyed by recording evidence of individuals, such as, calls, drumming, snow burrows, tracks, and scats (in March surveys). These observations were made concurrently with other surveys in the Study Area (summer and fall surveys). Drumming (territorial wing-beating) by Ruffed Grouse was also recorded during point count surveys (June) and other surveys.

Raptor surveys were conducted in conjunction with other surveys. The presence of several species that occur in this region of Newfoundland, such as Bald Eagle (*Haliaeetus leucocephalus)*, Osprey (*Pandion haliaetus)*, and several species of owl was investigated. This included visual observations, auditory detections, nests, and owl pellets.

2.3 Wildlife Habitat Surveys

The terrestrial surveys conducted in 2006 included seasonal reconnaissance-level surveys examining evidence of wildlife (usually indirectly by noting fresh sign) as described below.

2.3.1 Wildlife Survey Methods

The Study Area (Figure 2-1) was surveyed on foot and over a variety of seasons and site conditions for wildlife use. All small ponds within the Project footprint of the proposed plant were also surveyed. Photographs were taken of wildlife sign and representative vegetation at these sites. Pre-determined survey routes were navigated and mapped with a handheld GPS, compass, 1:50,000 National Topographic Series Map Sheets, and aerial photographs (Table 2-3). The teams also collected digital photographs of various habitats/wildlife sign. Local residents provided anecdotal information that was also recorded by the study team on an opportunistic basis.

Since wildlife species use habitats in different ways at various times of the year, different survey techniques were employed. Field investigations were conducted seasonally to document terrestrial species presence/absence, abundance, and habitat associations. Surveys were conducted during 18-20 March, 15-17 June, 26 September, and on 11 October 2006. Field teams traveled on foot, documenting wildlife and wildlife sign (e.g., tracks, browse, and scat) by habitat type.

Surveying animal tracks and sign is one of the least intrusive ways to survey the activity of wildlife in an area. The Study Area was traversed along transects and all identifiable tracks and sign were noted. The degree of habitat utilization was based on the frequency upon which tracks or sign are found. This was a systematically-sampled, multi-season survey. The goal was to document wildlife species present in the Study Area and to determine important habitat components that would be affected by the proposed residue pond dam, the proposed pipeline/access road routes, and the commercial processing plant.

2.3.2 Wildlife Surveys

During the winter survey (17-19 March 2006), use of the Project footprint by furbearers such as mink and otter, moose, fox, other mammals, and resident birds was documented. The summer and fall surveys (mid-June and late-September) also targeted use of the waterbodies and surrounding areas by passerine birds, waterfowl, gulls, and other aquatic birds.

2.3.3 Snow Tracking

Winter track transects are commonly used to assess habitat use, particularly for furbearers and large mammals. Winter transects were conducted in the March 2006 surveys.

3.0 Results

3.1 Vegetation Communities and Mapping

Six general vegetation community types were designated during the field investigations: Empetrum Heathland (EH); Kalmia Heathland (KH); Sedge Fen (SF); Balsam Fir Forest (BF); Riparian (RP), and Scrub Forest/Rock Outcrop (SR). Recently logged or burned balsam forest (LF) areas were also observed within the Study Area. A GIS based map of the observed vegetation units and open water (OW) was produced (Figure 3-1). Information was mapped beyond the areas that were surveyed on the ground using aerial photographs.

3.1.1 Vegetation Community Descriptions

Balsam fir forests (BF) dominate the Study Area and are comprised mainly of balsam fir with lesser amounts of black spruce (*Picea mariana*) and birch (*Betula cordifolia*) within the tree layer. Sheep laurel or kalmia (*Kalmia angustifolia*), Labrador tea (*Rhododendron groenlandicum*) and young balsam fir and black spruce dominate the shrub layer when present. Typical herb species include creeping snowberry (*Gaultheria hispidula*) and bunchberry (*Cornus canadensis*). The moss layer is largely comprised of red-stemmed feather moss (*Pleurozium schreberi*), knight's plume (*Ptilium crista-castrensis*) and step moss (*Hylocomium splendens*). Underlying parent material, slope position and moisture regime vary throughout the range of the community that has resulted in a variable composition from near-scrub forest to open mature successional stands.

Empetrum Heathland (EH) is isolated to one site in the southern part of the Study Area. This open, low shrub community is dominated by black crowberry (*Empetrum nigrum*), kalmia, bakeapple (*Rubus chamaemorus*) and reindeer lichens (*Cladina* spp.). Although only one area of EH was noted within the mapped study area, EH is widespread in the South Eastern Barrens Subregion.

Kalmia Heathland (KH) is interspersed throughout the BF forming variable sized patches. This open low shrub community is drier than the EH community and is dominated in the shrub layer by kalmia, leather leaf (*Chamaedaphne calyculata*) and Labrador tea. The herb layer is often sparsely vegetated while the bryophyte layer is dominated by reindeer lichen and red-stemmed feather moss.

Sedge Fens (SF), the only wetlands found, are limited in size and distribution within the Study Area. Only two SF units were large enough to map at a scale of 1:12,500. One other SF unit was observed during the field surveys but was isolated and less than 200 m^2 rendering it too small to map.

The Riparian (RP) vegetation community is diverse and poorly developed within the Study Area. Rattling Brook Big Pond appears to have been channelized in various sections in the past; it was the water supply for the ERCO Plant. Species observed in the shrub layer include red-osier dogwood (*Cornus sericea*), spirea (*Spirea latifolia*), alder (*Alnus rugosa*), and willow (*Salix* spp.). Typical herbs include bluejoint, sedges, asters and willow herbs.

Figure 3.1 Vegetative Mapping of the Project Area

Scrub Forest/Rock Outcrop (SR) units are scattered throughout the area and situated on the crest and upper slopes of the rock outcrops. Soils, when present, are shallow and rapidly drained. The trees within this unit are stunted and limited in size to shrubs on the more exposed areas, including balsam fir and black spruce with lesser amounts of larch (*Larix laricina*). Vegetative cover ranges from moderate to non-existent. When present, plant species include common juniper (*Juniperus communis*), kalmia, crowberry, reindeer lichens and mosses.

As with the SR unit, Recently Logged/Burned/Cleared areas (LF) were typically comprised of a robust shrub layer of balsam fir, kalmia and blueberries (*Vaccinium* spp.). Observed herb and bryophytes include crowberry, bunchberry and reindeer lichens. It is expected that this unit will, over time, revert back to pre-disturbance conditions or to Kalmia Heath (Meades and Moore 1994). In the short-term, this succession can be influenced by moose or smaller herbivores.

Although not field checked, the BG mapped on the western edge of the study area is likely dominated by sphagnum peat moss. Vascular plants likely present in varying amounts include buckbean (*Menyanthes trifoliata*), bakeapple (*Rubus chamaemorus*) crowberry, leather leaf and bog aster. Minor amounts of sedges, rushes and grass species may also be present.

Table 3-1 presents the area of each habitat type mapped as well as the area of each type within the project footprint.

Table 3-1 Vegetation Community Areas for the Project Area

Vegetation Community Type	Map Label	Total Area (ha)	Area within Footprint (ha) *
Open Water	(OW)	64.03	2.46
Sphagnum Bog	(BG)	0.45	0.00
Sedge Fen (wetlands)	(SF)	3.17	0.78
Empetrum Heathland	(EH)	2.45	2.24
Kalmia Heathland	(KH)	20.07	7.14
Scrub Forest/Rock Outcrop	(SR)	118.49	0.30
Complex of Riparian and Balsam Fir Forest	(RP, BF)	15.03	3.92
Logged/Burned/Cleared	(LF)	13.62	1.01
Balsam Fir Forest	(BF)	762.13	80.88
Riparian	(RP)	3.30	0.14
Complex of Balsam Fir Forest and Logged/Burned/Cleared Forest	(BF, LF)	17.56	0.69
Total		**1020.31**	**99.55**

* Portions of the project footprint fall outside of the mapped vegetation community area.

3.1.2 Rare Plants Survey

The ACCDC data search revealed there are no known rare plant species occurrences within 5 km of the proposed project site with the exception of the Boreal Felt Lichen, which has been found in this area of the south western Avalon Peninsula.

A total of 11 sites were surveyed (Figure 3-2), including two transects. Of the 70 plant species identified, only the rare species (*Lycopus americanus*) (S2) was found in a small riparian habitat within a balsam fir forest. S1 ranked species were not observed within the Study Area. A list of the species, their coordinates, and habitat where they were found is presented in Appendix A.

3.1.3 Status of *Erioderma pedicellatum* in the Long Harbour Area

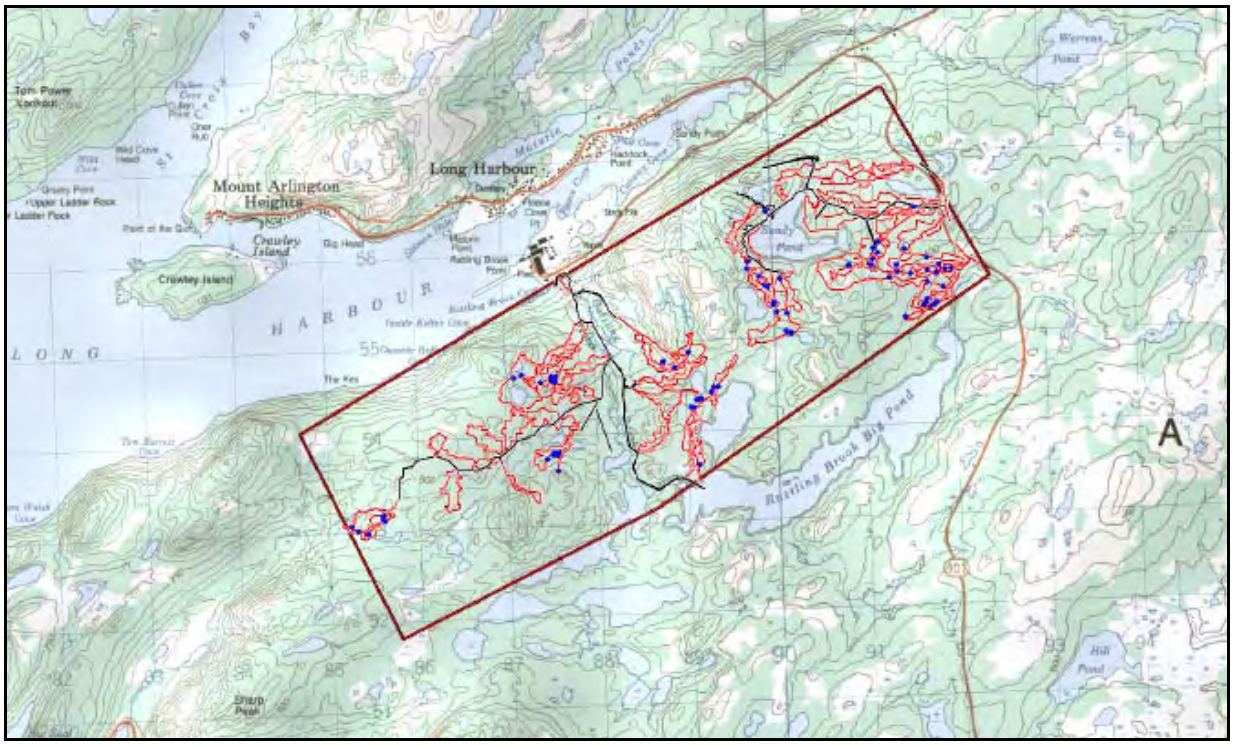
The Boreal Felt Lichen is a conspicuous lichen discovered in the early 19th century and presently may occur in two regions of the world, namely Scandinavia (Sweden and Norway), and Atlantic Canada (Newfoundland, Nova Scotia, and New Brunswick). All known populations from New Brunswick have disappeared and the Nova Scotia population has collapsed during the past twenty years, with the underlying cause of this decline being air pollution (Maass and Yetman 2002). However, additional search effort has resulted in a known Atlantic (NS and NB) population, in March 2006, of nine sites with 31 thalli (Environment Canada 2007). The North American distribution of this species is mainly restricted to several sites in Newfoundland. However, its populations at many locations have disappeared since the first reports in the 1970's (Ahti and Jørgensen 1971).

Approximately 30,000 trees were surveyed by the NLERG during the 300 hours of survey time dedicated to the Long Harbour area. Of these, 60 trees were documented hosting 97 thalli of *E. pedicellatum*, that is, phorophytes represented approximately 0.22% of Balsam Fir stems (Figures 3-3 and 3-4). This represents the first documentation of this rare lichen in the Long Harbour area. It had previously been documented in the area of Ship Harbour (Maass 1989, unpublished) also in the inner portion of Placentia Bay, Newfoundland, and there is a population in the area of southeast Placentia that is monitored with support from VBNC.

Erioderma, identified in this study, occurs in cool, moist habitat in areas of scrub and forest cover. Southwestern Barrens subregion locations have cool summers with frequent fog and strong winds with winters that are relatively mild with intermittent snow cover particularly near the coastline. Annual precipitation exceeds 1,250 mm (Protected Areas Association 2000).

Figure 3.2 Rare Plant Survey Plot Locations

Figure 3.3 Results of Ground-Based Surveys for *E. pedicellatum* in the Long Harbour Area in 2006



(Irregular red lines represent field searches, and blue dots indicate locations of host trees)

Figure 3.4 An Example of a Healthy Adult Thallus of *Erioderma pedicellatum* in the Long Harbour Study Area

3.1.4 Wetland Assessments

Following a review of the air photos, seven candidate sites within the Study Area were investigated on foot. Wetland assessments were conducted following the criteria defined by the Canadian Wetland Classification System. Three sites were identified as Floating (Sedge) Fens (SF), which are grass and sedge dominated wetlands that receive nutrient-rich surface water from mineral soils. The vegetation is not anchored to the bottom of the wetland but to a floating organic mat. The total area of the three fens is 3.17 ha. Two of these wetlands are represented on Figure 3-1 as SF; the third (W03) is too small to be presented on that figure. The locations of all three (W03, W04, and W06) are shown on Figure 3-2. Wetland characterization field sheets are included as Appendix B.

Typical species within the fens include bluejoint (*Calamagrostis canadensis*), sedges (*Carex* spp.), bulrushes (*Juncus* spp.) bog aster (*Oclemena nemoralis*) and violets (*Viola* spp.). Floating pondweed (*Potamogeton natans*) is a common aquatic submergent species.

Field surveys at the remaining four sites revealed little to no emergent vegetation along the abrupt predominantly boulder shorelines. As such, they were considered as Open Water (OW).

3.1.5 Forest Resources

The Study Area is used for domestic cutting, indicated by the presence of stumps and cutovers. Most of this activity was noted in forest and scrub areas that cover more than 80 percent of the 10-km^2 Study Area. The Department of Natural Resources – Forest Resources Division provided the summary of covertypes shown in Table 3-2.

Table 3-2 Summary of Covertype in Study Area

Covertype	Area (hectares)
Water	77
Forested	503
Scrub	334
Bog	3
Rock barren	49
Soil barren	10
Right-of-ways and cleared	10
Total	986
Source: Dept. of Natural Resources, Forest Resources Division	

Discrepancies between the fractional and total areas shown in Tables 3-1 and 3-2 can be attributed to classification differences of vegetation versus covertype and rounding errors in determining the areas of polygons by GIS.

The study team, in 2006, identified four areas within the mapped vegetation communities that showed evidence of logging or fire. Three of these are located along Rattling Brook and are identified as balsam

fir forest-logging/fire (BF, LF) or as Logging/fire (LF) on Figure 3-1. The fourth area is located to the east of Sandy Pond.

The remainder of the Study Area is scrub forest, heathland, and rock outcrop uplands. Although a portion of the forest is merchantable timber, accessibility is an issue due to the rough terrain and lack of access trails. A summary of the forest age classes is shown in Table 3-3.

Table 3-3 Summary of Age Classes in Forested Areas

Age classes of forested area	Area(ha)
0 – 20*	90
21-40	98
41-60	276
61-80	39
80 +	0
Total	503

* Includes 10 ha of burned area, 40 ha wind throw and 13 ha reverted to alders (after clearing near former industrial site and disturbance along riverbank

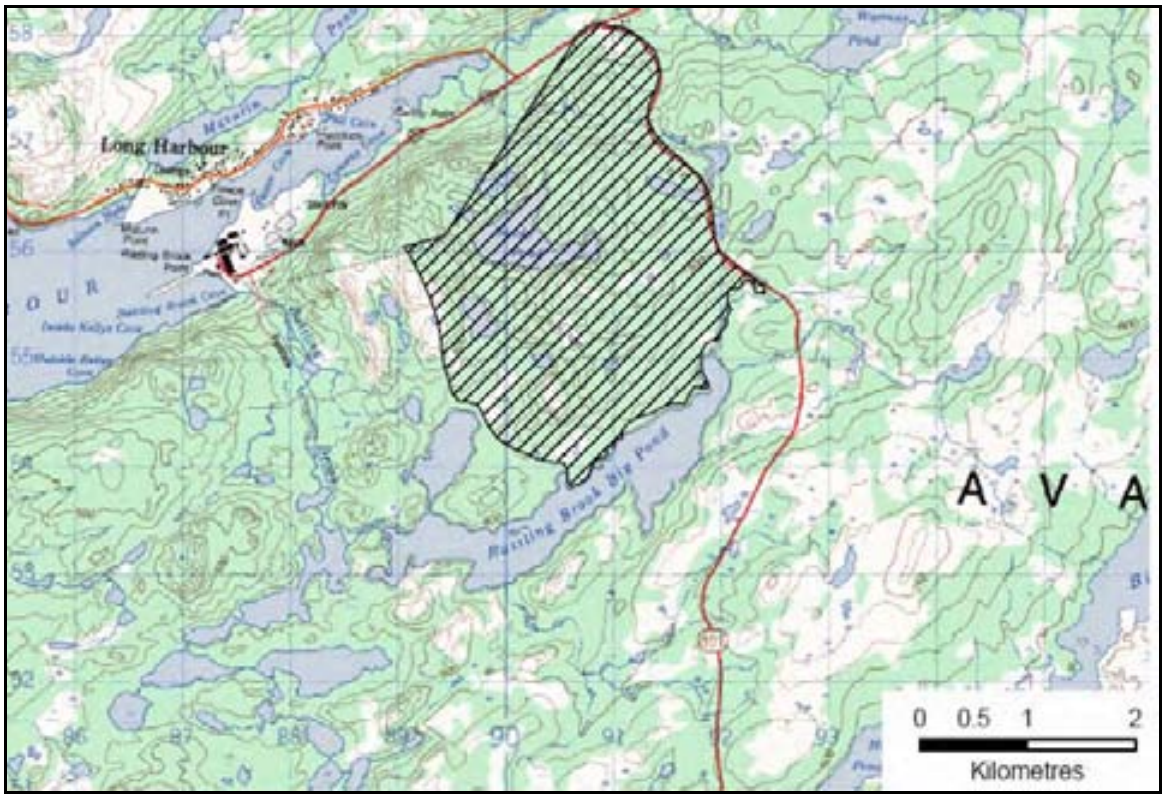
Source: Dept. of Natural Resources, Forest Resources Division

A portion of the Domestic Cutting Area H-5D (Rattling Brook) in Forest Management District 1 overlaps with the Study Area (Figure 3.5). The District forests are part of the larger boreal forest ecosystem of the Avalon Peninsula and are dominated by balsam fir, black spruce, white birch, yellow birch, and larch.

The balsam fir forest types of the Avalon are stable (i.e., regenerate to the previous stand type) following cutting, insect infestation and windthrow but after fire often go to spruce or hardwood forest types. Spruce types generally go to another spruce type following fire, but after cutting to a more open spruce type or heath in the absence of silvicultural treatment (Department of Natural Resources 2006). This site history is evident in large portions of heathland in the Study Area. There was also evidence of insect damage in some forested areas, and some wind throw and ice damage. These areas were small and isolated.

There are no commercial cutting areas found within the Study Area. The nearest is approximately one kilometre east of the Domestic Cutting Area H-5D and Route 101.

Figure 3.5 Location of Domestic Cutting Area H-5D (Rattling Brook) in Forest Management District 1



3.2 Avifauna Survey Results

3.2.1 Forest Avifauna

A total of 37 bird species were detected during dedicated surveys in June 2006; 32 of these were censused by point count surveys (Table 3-4). The point count station locations and vegetation are included as Appendix C. Common Loon (*Gavia immer*), Osprey, Spotted Sandpiper, American Crow, Common Raven, Golden-crowned Kinglet, Common Yellowthroat, and Tree Swallow were sighted incidental to the point counts. Several of these birds were also sighted during the wildlife and vegetation surveys conducted during late summer and fall.

Table 3-4 Species and Number of Birds Observed or Heard in Long Harbour Study Areas during Point Count Surveys 15-17 June 2006

Common Name	Scientific Name	Number Observed
Ruffed Grouse	*Bonasa umbellus*	4
Greater Yellowlegs	*Tringa melanoleuca*	2
Wilson's Snipe	*Gallinago delicata*	2
Herring Gull	*Larus argentatus*	4
Greater Black-backed Gull	*Larus marinus*	1
Downy Woodpecker	*Picoides pubescens*	2
Black-backed Woodpecker	*Picoides arcticus*	1
Northern Yellow-shafted Flicker	*Colaptes auratus*	2
Yellow-bellied Flycatcher	*Empidonax flaviventris*	15
Alder Flycatcher	*Empidonax alnorum*	32
Gray Jay	*Perisoreus canadensis*	4
Black-capped Chickadee	*Poecile atricapilla*	6
Boreal Chickadee	*Poecile hudsonica*	4
Ruby-Crowned Kinglet	*Regulus calendula*	20
Swainson's Thrush	*Catharus ustulatus*	12
Hermit Thrush	*Catharus guttatus*	20
American Robin	*Turdus migratorius*	46
Yellow Warbler	*Dendroica petechia*	1
Yellow-rumped Warbler	*Dendroica coronata*	22
Pine Warbler	*Dendroica pinus*	1
Blackpoll Warbler	*Dendrioca striata*	34
Black and white Warbler	*Mniotilta varia*	2
Northern Waterthrush	*Seiurus noveboracensis*	51
Mourning Warbler	*Oporornis philadelphia*	2
Wilson's Warbler	*Wilsonia pusilla*	1
Savannah Sparrow	*Passerculus sandwichensis*	1
Fox Sparrow	*Passerella iliaca*	20
White-throated Sparrow	*Zonotrichia albicollis*	54
Slate-coloured Junco	*Junco hyemalis*	5
Pine Grosbeak	*Pinicola enucleator*	11
White-winged Crossbill	*Loxia leucoptera*	10

With the exception of the American Crow, Common Raven, Golden-crowned Kinglet, Common Yellowthroat, and Tree Swallow, all other bird species observed on the additional surveys were previously observed on the point count surveys, and are assumed to be using the area as breeding habitat.

Of the bird species detected, many were migratory birds, present only in Newfoundland during the breeding season from approximately June to September. These birds come to Newfoundland to exploit abundant seasonal food resources (i.e., insects) and raise their young. Many species are Neotropical migrants that over-winter in Central and South America, the Caribbean, and Mexico. These species

include most of the warblers, the thrushes, and the flycatchers. Other species are temperate migrants, coming from the United States to breed and leaving in fall to avoid the harsher climes of Newfoundland in winter. These species include the Ruby-crowned Kinglet, the sparrows, and the Yellow-rumped Warbler.

Resident species occur year-round and are able to exploit seed resources or have adaptations to help them through winter (i.e., food caching, bark gleaning). These species include: the Gray Jay and Common Raven that employ food-caching and a varied diet to survive winter; the Black-capped and Boreal Chickadees that can switch from insects to seeds; Dark-eyed Juncos, White-winged Crossbills, Pine Grosbeaks, and Ruffed Grouse, that are all seed- or bud-specialists in winter; woodpeckers that can survive by exploiting feeders and bark-drilling; and some American Robins.

The greatest number of species was found on the mixed forest (fir dominant) sites (22), followed by the burns/cuts (19), fir/spruce (18), and riparian sites (17). The spruce (dry) sites had 11 species over two sites, and the spruce (wet) site had five species. Birds respond to habitat structure and composition. Because the mixed forest provides the greatest variety of structure and composition in terms of vegetation, it can support the greatest number of bird species.

The most abundant passerine birds are typical of a boreal forest. The migratory birds, including, Northern Waterthrush, White-throated Sparrow, Blackpoll Warbler, Alder Flycatcher, Fox Sparrow, Ruby-crowned Kinglet are all highly associated with boreal forest habitat (Birds of North America online 2006). These species would be expected to be in higher abundances than the remainder of the observed species. Some of the other abundant species are generalist like the American Robin, and Yellow-rumped Warbler that can all exploit several types of forested habitat.

The point-count surveys conducted around Long Harbour by B. Mactavish reported 26 species and a total count of 151 individual birds (Table 3-5) (B. Mactavish, *pers. comm.*). There were some differences in the assemblage of species detected at the locations around the town of Long Harbour from those found on the point count surveys in the Study Area. Since the town has a different diversity of habitats, it is not surprising that the bird species diversity would differ.

The American Crow and European Starling are both primarily urban birds, and were not expected from the point count surveys that were performed in forested habitats in the Study Area. The Common Raven was also not detected on the point count surveys, but this species has large territories so was likely just missed due to its tendency to roam long distances.

The Belted Kingfisher is a species that is usually detected close to water bodies, but was not noted during the point count surveys (perhaps due to insufficient preferred habitat in the Study Area). Swamp Sparrow and Common Yellowthroat are both typical of marshes and shrubby moist habitats, atypical of the Study Area. Other species detected around Long Harbour but not during point counts were the American Goldfinch, Golden-crowned Kinglet, Pine Siskin, Red-breasted Nuthatch, and Red Crossbill. The American Goldfinch is a field/edge species and would not be expected on the Study Area point counts. Golden-crowned Kinglet, Pine Siskin, and Red-breasted Nuthatch all prefer conifer habitats and

could be expected in the Study Area. These species may have been occupied with chick-rearing at the time of the point counts, and therefore may have been less vocal.

Table 3-5 Species and Number of Birds located at Six Locations around Long Harbour, August-October 2006

Common Name	Scientific Name	Number Observed
Belted Kingfisher	*Ceryle alcyon*	1
Northern Flicker	*Colaptes auratus*	2
American Crow	*Corvus brachyrhynchos*	29
Common Raven	*Corvus corax*	3
Red-breasted Nuthatch	*Sitta canadensis*	1
Golden-crowned Kinglet	*Regulus satrapa*	2
Ruby-crowned Kinglet	*Regulus calendula*	6
Swainson's Thrush	*Catharus ustulatus*	1
Hermit Thrush	*Catharus guttatus*	1
American Robin	*Turdus migratorius*	10
European Starling	*Sturnus vulgaris*	46
Yellow-rumped Warbler	*Dendroica coronata*	1
Blackpoll Warbler	*Dendroica striata*	2
Black-and-White Warbler	*Mniotilta varia*	1
Northern Waterthrush	*Seiurus noveboracensis*	3
Mourning Warbler	*Oporornis philadelphia*	1
Common Yellowthroat	*Geothylpis trichas*	1
Savannah Sparrow	*Passerculus sandwichensis*	10
Fox Sparrow	*Passerella iliaca*	5
Swamp Sparrow	*Melospiza georgiana*	6
White-throated Sparrow	*Zonotrichia albicollis*	1
Dark-eyed Junco	*Junco hyemalis*	3
Pine Grosbeak	*Pinicola enucleator*	4
Red Crossbill	*Loxia curvirostra*	1
Pine Siskin	*Carduelis pinus*	9
American Goldfinch	*Carduelis tristis*	1

3.2.2 Bird Species at Risk

No listed bird species at risk were observed or reported within the Study Area around the proposed processing facility. However, the surveys at Long Harbour conducted by Mactavish reported the presence of a Red Crossbill (*Loxia curvirosta*) indicating that the species is present in the region. Red Crossbill (*Loxia curvirostra percna*) is listed as *Endangered* for the Province, and also *Endangered* on the *SARA* and COSEWIC lists. This subspecies has been found across the province, particularly in the north central regions. Because it is a nomadic bird and is an irruptive[1] migrant that relies on coniferous

[1] Irruptive species: A species that is known to move in large numbers to an area where they are not found in abundance, often in response to food supply. Irruptive incursions of seed-eating birds like crossbills, finches and grosbeaks in an area usually correspond to poor seed production in more northerly forests.

cone crops and its nomadic niche population estimates are difficult to derive. Habitat associations are poorly understood for Red Crossbill in Newfoundland but it is unlikely that the project area possesses any critical habitat characteristics for Red Crossbill, as the habitat types present are common around most of the Island.

A Rusty Blackbird (*Euphagus carolinus*) was observed in early August 2006 near the junction of Route 202 and the TCH, approximately 13 km from the Study Area (I. Goudie, *pers. comm.*). The Rusty Blackbird is listed as *Special Concern* by COSEWIC (2007). More than 70% of the breeding range of the species is in Canada's boreal forest. The species has experienced a severe decline that appears to be ongoing, albeit at a slower rate. There is no evidence to suggest that this trend will be reversed. Known threats occur primarily on the winter range, and include habitat conversion and blackbird control programs in the United States.

3.2.3 Waterfowl

Only two species of waterfowl were detected during the combined field surveys (i.e. 18-20 March, 15-17 June, 26 September and 11 October 2006) (Figure 2-1). Twenty-six American Black Duck (*Anas rubripes*) were found in a small pond in the Rattling Brook Big Pond watershed on 18 March 2006. They were foraging and were still present approximately four hours later upon return to the pond. At least 23 were present the following day at the same location. It is uncertain whether this is a common occurrence due to the open water conditions during this late winter period. It is likely that this species breeds within the Study Area as it has a diverse range of breeding habitat, including most types and sizes of freshwater water bodies. Black Duck were observed intermittently at the estuary near Mount Arlington in fall 2006 (I. Goudie, *pers. comm.*).

A single Green-winged Teal (*Anas crecca*) was observed foraging on a small pond just north of Rattling Brook Big Pond on 11 October 2006. Green-winged Teal are migratory and it is possible that this bird was using the area as a stopover area to rest and feed prior to, or during, migration. Green-winged Teal also has a wide range of habitat types, so it would be expected to breed within the Study Area. Since most waterfowl species are migratory, it is not surprising that there was only two species detected within the Study Area.

The aerial survey completed on 2 August 2007 recorded two waterfowl in the Study Area that was surveyed on foot in 2006; one Common Loon and one American Black Duck (LGL 2007). Of the numerous incidental bird and animal observations reported from the aerial survey, one beaver and one pair of moose were observed in the Study Area for the Terrestrial Component Study. The complete aerial survey report is included as Appendix D)

3.2.4 Gamebirds and Raptors

Ruffed Grouse were observed in mixed-forest areas. This species is likely using the area year-round, and is breeding in the Study Area (drumming of males was noted on four occasions during point counts indicating breeding habitat). A snow burrow of either Ruffed Grouse or Spruce Grouse was also

observed on the winter survey. Although no observations of Spruce Grouse were recorded, it is possible that this species is using the Study Area, given the amount of suitable boreal habitat present. Willow Ptarmigan, although undetected on the surveys, may also use the area, specifically the barren upland areas where windswept spruce would provide adequate cover.

Three separate sightings of adult Bald Eagle occurred during the March surveys: near the former Long Harbour Phosphorous Plant; south of Inside Kellys Cove; and feeding along the highway (Route 202). This species is commonly noted by residents during winter and less frequently during summer (P. Brothers, *pers. comm.).* Osprey and other raptors were not observed during the surveys. Merlin (*Falco columbarius)*, Sharp-shinned Hawk (*Accipiter striutus)*, and Osprey likely use the area for foraging and breeding. It is likely that Bald Eagles overwinter in the area along the coast if adequate food could be obtained. Great-horned Owl (*Bubo virginianus)*, Northern Hawk Owl (*Surnia ulula)*, and Boreal Owl (*Aegolinus funereal)* are possible owl species for the area, based on available habitat types.

3.3 Wildlife Reconnaissance Survey Results

The results of the wildlife surveys have been organized by the following groups, big game, furbearers, and small mammals.

3.3.1 Big Game

During winter, moose (*Alces alces*) subsist primarily on twigs and shrubs such as balsam fir, aspen, dogwood, birch, willow, and maple. Moose decrease their food intake and limit their activity to save energy during these months of scarcity. Two wintering areas were identified during the late-winter surveys. Moose sign observed during the winter survey included bedding areas, browse, tracks, and scat.

Evidence of moose sign was also found during the summer survey, including browse, tracks, and scats. It is probable that this area is used frequently by moose during summer, given the number of waterbodies in and around the Study Area. In summer, moose often cool off in water for several hours each day, to forage on aquatic plants and to avoid the irritation of flies.

On 11 October 2006, evidence confirmed that moose were continuing to regularly use the Study Area, including fresh tracks, droppings, bedding areas, and browsed vegetation. Browsed species consisted primarily of balsam fir, willow, serviceberry, and white birch. Moose appeared to be using the forested side slopes to travel around the rocky hills rather than crossing over the exposed hilltops.

Woodland caribou (*Rangifer tarandus caribou*) are native to the island of Newfoundland and move about according to the time of year. In spring they prefer evergreen and deciduous shrubs and sedges; in summer they eat mainly deciduous shrubs and *Cladonia* spp. lichens, and fungi; in the autumn *Cladonia* spp. lichens; and in the winter arboreal lichens and evergreen shrubs (Bergerud 1972). The most southerly Canadian herd of Woodland caribou (currently numbering a few hundred animals) exists on the Avalon Peninsula, using the area from the Avalon Wilderness Area south to the Southern Shore of

the Avalon Peninsula. This would be the closest caribou range to Long Harbour, approximately 60 kilometres east of the community. Caribou are not reported from the Long Harbour area and since the habitat types they prefer are deficient, the area can be deemed insignificant for this species.

The black bear (*Ursus americanus hamiltoni*) island population is recognized as a subspecies of the mainland black bear. Black bears tend to exist in low densities by nature, and have large territories, making them difficult to monitor. The island population was estimated at 6,000-10,000 animals and was considered stable in the mid-nineties (Pelton *et al.* 1994). Black bear has rarely been reported on the Avalon Peninsula and currently does not have an established population there. For that reason, the season for hunting black bear has never been open on the Avalon. It is unlikely that there are black bears using the area around Long Harbour due to the poor bear habitat in that area and the lack of sightings (bears are usually easily observed in areas where their densities are high, given their generalist diet and propensity for seeking out food from human sources).

Coyotes (*Canis latrans*) were first confirmed on the island in 1987, and are now widely dispersed across Newfoundland, according to sighting and trapping records. Currently, little is known about the coyote in Newfoundland and Labrador (Blake 2006). Wildlife officials have documented the expansion of coyotes in Newfoundland and are investigating the morphology, diet, age structure and reproductive rates of coyotes. The coyote is adaptable and its continued population growth in Newfoundland has been a controversial topic. From trapping data, it is probable that the numbers of coyote around Long Harbour are very small (Mike McGrath, *pers. comm.*).

3.3.2 Furbearers

Snowshoe hare *(Lepus americanus)*, red fox (*Vulpes vulpes)*, and red squirrel (*Sciurus hudsonicus*) appear to use the Study Area year-round and there is ample habitat available for these generalist species. Snowshoe hare and squirrel evidence was found during all surveys. Tracks and other sign (droppings and recent browsing of shrubs) by snowshoe hare were common in the dense forest vegetation and riparian habitat throughout the Rattling Brook Big Pond watershed, and several rabbit trails were found in the heath areas during the fall surveys. Red squirrels were observed exclusively in forested areas and caches were consistently observed. A single red fox was noted in the burn area east of Sandy Pond and a scat was recorded on the Rattling Brook road. Fresh mink (*Mustela vison*) tracks were noted at two locations along the northeast outlet of Sandy Pond. Beaver (*Castor canadensis)* cuttings and a slide were observed inside the Study Area by a small pond, and were also observed at Rattling Brook Big Pond just outside the Study Area. A beaver lodge was observed west of Rattling Brook road. Local cabin owners (G. Brothers, *pers. comm.*) indicated that otter (*Lutra canadensis*) and beaver occur near the headwaters of Rattling Brook. Ermine (*Mustela erminea*) may also occur, based on available habitat.

Though not often seen in the wild, lynx (*Lynx canadensis subsolanus*) are considered abundant on the island of Newfoundland and are uncommon on the Avalon Peninsula.

3.3.3 Small Mammals

No dedicated surveys were conducted for small mammals, however, a sampling program that has been conducted for the past three years, included small mammal trapping (sampling) at locations near, and remote to, the proposed processing plant site. Baited snap traps set at various locations, caught numerous masked shrews (*Sorex cinereus*), meadow voles (*Microtus pennsylvanicus)*, and a single unidentified mouse.

4.0 Discussion and Conclusions

The terrestrial baseline surveys conducted during March to October 2006 indicate that the Study Area is typical of this Region of Newfoundland, reflecting climatic, geologic, and anthropomorphic influences. The vegetation patterns reflect various types of disturbance by local residents particularly engaged in various land-use practices (e.g., domestic wood harvesting, recreational cabins), and recent geotechnical investigations for the proposed Project and historical alteration of the Rattling Brook Creek for the former ERCO phosphorus processing plant. Natural factors that have also influenced the distribution and composition of the vegetation include insect damage, forest fires and wind throw. The proposed Project footprint including the processing facility, whether it is a hydrometallurgical facility or a matte plant, would occur within this context.

Most of the forest cover is in the form of various types of balsam fir stands with a few other vegetative communities such as wetlands, which are sparse in the area, or rock outcrops. The rare plant survey indicated that, with the exception of *Erioderma pedicellatum*, no other listed plants were found. An independent and extensive survey program for *Erioderma* documented the presence of 60 trees with 97 thalli on them. Most of these confirmed locations would not be physically disturbed by the proposed Project footprint.

A spring bird survey was conducted in the Study Area and the results were a compilation of sightings of typical avifauna for forest and heathland habitat. No species at risk were found in the bird surveys in the Study Area, but two listed species, Red Crossbill and Rusty Blackbird, were reported from ancillary surveys conducted around the Long Harbour area. It is unlikely that habitat that is critical or limited for these species is present in the Study Area. The Red Crossbill is nomadic and was likely just 'passing through' the area. Similarly, a single Rusty Blackbird observed in August could be migratory.

An aerial survey for breeding waterfowl, conducted on 2 August 2007, reported one Common Loon and one American Black Duck.

Wildlife surveys documented evidence of big game, i.e., moose, in the Study Area. Other big game such as woodland caribou do not frequent the area and black bear are rarely seen on the Avalon Peninsula. Small game such as snowshoe hare and game birds such as ruffed grouse were seen, or fresh signs were detected. Other animals using the Study Area include red fox, red squirrel, mink, otter, beaver, meadow vole, and masked shrew.

These findings will be carried forward for discussion and analysis in the Environmental Impact Statement.

5.0 References

5.1 Personal Communications

Brothers, G. Cabin Owner in Study Area, March 2006

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APPENDIX A

VEGETATION SPECIES LISTS

	Plot	LHRP01	LHRP2	LHRP3
	UTM Coordinates NAD 84	22 T 288528 5254757	22 T 288704 5253608	22 T 288937 5253678
	Date	25-Jul-06	25-Jul-06	25-Jul-06
		Habitat		
S Ranks	Species	small riparian 1-2 m wide in balsam forest stand	Spagnum bog previously disturbed - old utility pole stump in the site.	Bouldery riparian shoreline
S5	*Abies balsamea*			
S3S5	*Agrostis scabra*	√	√	
S4S5	*Alnus rugosa*			
S3S5	*Anaphalis margaritacea*			
S4S5	*Athyrium filix-femina*			
S3S5	*Bromus ciliatus*			
S3S5	*Calamagrostis canadensis*			√
S3S5	*Carex aquatilis*			
S3S5	*Carex canescens*			
S3S5	*Carex disperma*	√		
S3S5	*Carex echinata*			
S3S5	*Carex lasiocarpa*			
S3S5	*Carex pauciflora*			
S3S4	*Carex utriculata*			
S5	*Chamerion angustifolium*			
S4	*Chelone glabra*			
S3S5	*Cinna latifolia*			
S4S5	*Circaea alpina subsp. alpina*			
S5	*Clintonia borealis*	√		
S3S5	*Cornus canadensis*	√		
S3S5	*Cornus stolonifera*			
S5	*Drosera rotundifolia*		√	
S3S5	*Eleocharis palustris*	√		
S4	*Epilobium ciliatum*			
S4	*Epilobium palustre*	√		√
S4S5	*Equisetum fluviatile*			√
S3S5	*Eriophorum angustifolium*		√	
S3S5	*Eupatorium maculatum*			
	Galium sp.			
S3S5	*Glyceria canadensis*			
S4S5	*Gymnocarpium dryopteris*			
	Hieracium sp.			√
S5	*Iris versicolor*		√	
S3S4	*Juncus alpinoarticulatus*		√	
S5	*Juncus brevicaudatus*			
S4	*Juncus canadensis*	√		
S5	*Juncus effusus*	√	√	
S5	*Larix laricina*		√	
S3S5	*Linnea borealis*	√		
S2	*Lycopus americanus*			
S3S5	*Lycopus uniflorus*			
S5	*Maianthemum canadense subsp. canadense*	√	√	
S3S5	*Menyanthes trifoliata*		√	
S3S5	*Moneses uniflora*			
S3S5	*Monotropa uniflora*			
S4S5	*Myrica gale*		√	√
S4	*Nuphar variegata*			√
S3S5	*Oclemena nemoralis*			√
S3S5	*Orthilia secunda*			
S4S5	*Osmunda cinnamomea*			

	Plot	LHRP01	LHRP2	LHRP3
	UTM Coordinates NAD 84	22 T 288528 5254757	22 T 288704 5253608	22 T 288937 5253678
	Date	25-Jul-06	25-Jul-06	25-Jul-06
		Habitat		
S Ranks	Species	small riparian 1-2 m wide in balsam forest stand	Spagnum bog previously disturbed - old utility pole stump in the site.	Bouldery riparian shoreline
S5	*Picea mariana*			
S4	*Potamogeton natans*			
SE	*Ranunculus acris?*			
S3S5	*Rhododendron groenlandicum*		√	
S3S5	*Ribes glandulosum*			
S3S5	*Rosa nitida*			
S3S5	*Rubus idaeus*			
S3S5	*Rubus pubescens*			
S5	*Sarracenia purpurea*			
S3S5	*Scirpus microcarpus*			
SE	*Senecio vulgaris*			
S3S5	*Solidago rugosa*			
S5	*Sparganium angustifolium*			
S3S5	*Spriea latifolia*		√	√
S5	*Thalictrum pubescens*			
S3S4	*Thelypteris noveboracensis*			
S5	*Trientalis borealis*			
S5	*Utricularia vulgaris*			
S5	*Vaccinium angustifolium*		√	
S3S5	*Vaccinium macrocarpon*			
S3S5	*Vaccinium oxycoccos*		√	
	Viola sp	√		
S3S5	*Virburnum cassinoides*	√		

? - Identification unconfirmed

	Plot	LHRP4	LHRP5	LHRP6
	UTM Coordinates NAD 84	22 T 288413 5253913	22 T 288211 5254972	22 T 288266 5255060
	Date	25-Jul-06	25-Jul-06	25-Jul-06
		Habitat		
S Ranks	Species	Pond riparian zone - emergent vegetation	River riparian zone	Overgrown spirea thicket on rocky shoreline of pond.
S5	*Abies balsamea*			
S3S5	*Agrostis scabra*			√
S4S5	*Alnus rugosa*		√	
S3S5	*Anaphalis margaritacea*		√	
S4S5	*Athyrium filix-femina*			
S3S5	*Bromus ciliatus*			√
S3S5	*Calamagrostis canadensis*	√		√
S3S5	*Carex aquatilis*			
S3S5	*Carex canescens*			
S3S5	*Carex disperma*			
S3S5	*Carex echinata*			
S3S5	*Carex lasiocarpa*			
S3S5	*Carex pauciflora*			
S3S4	*Carex utriculata*			
S5	*Chamerion angustifolium*		√	√
S4	*Chelone glabra*			√
S3S5	*Cinna latifolia*			
S4S5	*Circaea alpina subsp. alpina*			
S5	*Clintonia borealis*			
S3S5	*Cornus canadensis*			
S3S5	*Cornus stolonifera*			
S5	*Drosera rotundifolia*			
S3S5	*Eleocharis palustris*	√		
S4	*Epilobium ciliatum*			
S4	*Epilobium palustre*	√	√	√
S4S5	*Equisetum fluviatile*			
S3S5	*Eriophorum angustifolium*			
S3S5	*Eupatorium maculatum*			√
	Galium sp.			
S3S5	*Glyceria canadensis*	√		
S4S5	*Gymnocarpium dryopteris*			
	Hieracium sp.		√	√
S5	*Iris versicolor*			√
S3S4	*Juncus alpinoarticulatus*			
S5	*Juncus brevicaudatus*			
S4	*Juncus canadensis*			√
S5	*Juncus effusus*		√	√
S5	*Larix laricina*			√
S3S5	*Linnea borealis*			
S2	*Lycopus americanus*			
S3S5	*Lycopus uniflorus*			
S5	*Maianthemum canadense subsp. canadense*			
S3S5	*Menyanthes trifoliata*			
S3S5	*Moneses uniflora*			
S3S5	*Monotropa uniflora*			
S4S5	*Myrica gale*			√
S4	*Nuphar variegata*	√		√
S3S5	*Oclemena nemoralis*			
S3S5	*Orthilia secunda*			
S4S5	*Osmunda cinnamomea*			

	Plot	LHRP4	LHRP5	LHRP6
	UTM Coordinates NAD 84	22 T 288413 5253913	22 T 288211 5254972	22 T 288266 5255060
	Date	25-Jul-06	25-Jul-06	25-Jul-06
		Habitat		
S Ranks	Species	Pond riparian zone - emergent vegetation	River riparian zone	Overgrown spirea thicket on rocky shoreline of pond.
S5	*Picea mariana*			
S4	*Potamogeton natans*			√
SE	*Ranunculus acris?*			√
S3S5	*Rhododendron groenlandicum*			
S3S5	*Ribes glandulosum*			
S3S5	*Rosa nitida*			√
S3S5	*Rubus idaeus*			√
S3S5	*Rubus pubescens*			
S5	*Sarracenia purpurea*			
S3S5	*Scirpus microcarpus*	√	√	√
SE	*Senecio vulgaris*			
S3S5	*Solidago rugosa*		√	√
S5	*Sparganium angustifolium*			
S3S5	*Spriea latifolia*	√	√	√
S5	*Thalictrum pubescens*			√
S3S4	*Thelypteris noveboracensis*			
S5	*Trientalis borealis*			
S5	*Utricularia vulgaris*	√		
S5	*Vaccinium angustifolium*			
S3S5	*Vaccinium macrocarpon*			
S3S5	*Vaccinium oxycoccos*			
	Viola sp	√	√	√
S3S5	*Virburnum cassinoides*			

? - Identification unconfirmed

	Plot	LHRP7	LHRP8	LHRP9
	UTM Coordinates NAD 84	22 T 288179 5255135	3224 5255231 to 22 T 288104	22 T 287806 5254722
	Date	26-Jul-06	26-Jul-06	27-Jul-06
		Habitat		
S Ranks	Species	Riparian zone along pond edge	Braided bouldery stream. Transect from this point down stream to way point LHRP8B	Moist seepage/riparian zone
S5	*Abies balsamea*			
S3S5	*Agrostis scabra*		√	
S4S5	*Alnus rugosa*			
S3S5	*Anaphalis margaritacea*			
S4S5	*Athyrium filix-femina*			√
S3S5	*Bromus ciliatus*		√	
S3S5	*Calamagrostis canadensis*	√		
S3S5	*Carex aquatilis*	√		
S3S5	*Carex canescens*	√		
S3S5	*Carex disperma*			
S3S5	*Carex echinata*	√		√
S3S5	*Carex lasiocarpa*			
S3S5	*Carex pauciflora*			
S3S4	*Carex utriculata*			
S5	*Chamerion angustifolium*	√		
S4	*Chelone glabra*		√	
S3S5	*Cinna latifolia*			√
S4S5	*Circaea alpina subsp. alpina*			√
S5	*Clintonia borealis*			√
S3S5	*Cornus canadensis*			
S3S5	*Cornus stolonifera*		√	
S5	*Drosera rotundifolia*			
S3S5	*Eleocharis palustris*			
S4	*Epilobium ciliatum*			√
S4	*Epilobium palustre*	√	√	√
S4S5	*Equisetum fluviatile*			
S3S5	*Eriophorum angustifolium*			
S3S5	*Eupatorium maculatum*		√	
	Galium sp.	√	√	√
S3S5	*Glyceria canadensis*			
S4S5	*Gymnocarpium dryopteris*			√
	Hieracium sp.		√	
S5	*Iris versicolor*		√	√
S3S4	*Juncus alpinoarticulatus*			√
S5	*Juncus brevicaudatus*			
S4	*Juncus canadensis*	√		
S5	*Juncus effusus*	√		
S5	*Larix laricina*			
S3S5	*Linnea borealis*			√
S2	*Lycopus americanus*			
S3S5	*Lycopus uniflorus*			√
S5	*Maianthemum canadense subsp. canadense*			
S3S5	*Menyanthes trifoliata*			
S3S5	*Moneses uniflora*			√
S3S5	*Monotropa uniflora*			√
S4S5	*Myrica gale*	√	√	
S4	*Nuphar variegata*	√		
S3S5	*Oclemena nemoralis*			
S3S5	*Orthilia secunda*			√
S4S5	*Osmunda cinnamomea*			

	Plot	LHRP7	LHRP8	LHRP9
	UTM Coordinates NAD 84	22 T 288179 5255135	3224 5255231 to 22 T 288104	22 T 287806 5254722
	Date	26-Jul-06	26-Jul-06	27-Jul-06
		Habitat		
S Ranks	Species	Riparian zone along pond edge	Braided bouldery stream. Transect from this point down stream to way point LHRP8B	Moist seepage/riparian zone
S5	*Picea mariana*			
S4	*Potamogeton natans*	√		
SE	*Ranunculus acris?*	√	√	√
S3S5	*Rhododendron groenlandicum*			
S3S5	*Ribes glandulosum*			
S3S5	*Rosa nitida*			
S3S5	*Rubus idaeus*			√
S3S5	*Rubus pubescens*			√
S5	*Sarracenia purpurea*			
S3S5	*Scirpus microcarpus*	√		
SE	*Senecio vulgaris*		√	
S3S5	*Solidago rugosa*	√	√	
S5	*Sparganium angustifolium*	√	√	
S3S5	*Spriea latifolia*	√	√	√
S5	*Thalictrum pubescens*		√	√
S3S4	*Thelypteris noveboracensis*			
S5	*Trientalis borealis*		√	√
S5	*Utricularia vulgaris*			
S5	*Vaccinium angustifolium*			
S3S5	*Vaccinium macrocarpon*			
S3S5	*Vaccinium oxycoccos*			
	Viola sp	√	√	√
S3S5	*Virburnum cassinoides*			

? - Identification unconfirmed

	Plot	LHRP10	LHRP11
	UTM Coordinates NAD 84	7637 5254220 to 22 T 287693	22 T 288118 5254997
	Date	27-Jul-06	27-Jul-06
		Habitat	
S Ranks	Species	Transect along shoreline - fen	Forested riparian
S5	*Abies balsamea*		√
S3S5	*Agrostis scabra*	√	
S4S5	*Alnus rugosa*		
S3S5	*Anaphalis margaritacea*		
S4S5	*Athyrium filix-femina*		√
S3S5	*Bromus ciliatus*		
S3S5	*Calamagrostis canadensis*	√	
S3S5	*Carex aquatilis*	√	
S3S5	*Carex canescens*		
S3S5	*Carex disperma*		
S3S5	*Carex echinata*		
S3S5	*Carex lasiocarpa*	√	
S3S5	*Carex pauciflora*	√	
S3S4	*Carex utriculata*	√	
S5	*Chamerion angustifolium*		
S4	*Chelone glabra*		
S3S5	*Cinna latifolia*		
S4S5	*Circaea alpina subsp. alpina*		√
S5	*Clintonia borealis*		√
S3S5	*Cornus canadensis*		√
S3S5	*Cornus stolonifera*		
S5	*Drosera rotundifolia*		
S3S5	*Eleocharis palustris*		
S4	*Epilobium ciliatum*		
S4	*Epilobium palustre*		
S4S5	*Equisetum fluviatile*		
S3S5	*Eriophorum angustifolium*	√	
S3S5	*Eupatorium maculatum*		
	Galium sp.	√	
S3S5	*Glyceria canadensis*	√	
S4S5	*Gymnocarpium dryopteris*		
	Hieracium sp.		
S5	*Iris versicolor*	√	
S3S4	*Juncus alpinoarticulatus*	√	
S5	*Juncus brevicaudatus*		
S4	*Juncus canadensis*		
S5	*Juncus effusus*		
S5	*Larix laricina*		√
S3S5	*Linnea borealis*		√
S2	*Lycopus americanus*		√
S3S5	*Lycopus uniflorus*		
S5	*Maianthemum canadense subsp. canadense*		
S3S5	*Menyanthes trifoliata*		
S3S5	*Moneses uniflora*		
S3S5	*Monotropa uniflora*		
S4S5	*Myrica gale*	√	
S4	*Nuphar variegata*	√	
S3S5	*Oclemena nemoralis*	√	
S3S5	*Orthilia secunda*		
S4S5	*Osmunda cinnamomea*		

	Plot	LHRP10	LHRP11
	UTM Coordinates NAD 84	7637 5254220 to 22 T 287693	22 T 288118 5254997
	Date	27-Jul-06	27-Jul-06
		Habitat	
S Ranks	Species	Transect along shoreline - fen	Forested riparian
S5	*Picea mariana*		√
S4	*Potamogeton natans*		
SE	*Ranunculus acris?*		√
S3S5	*Rhododendron groenlandicum*		
S3S5	*Ribes glandulosum*		√
S3S5	*Rosa nitida*		
S3S5	*Rubus idaeus*		√
S3S5	*Rubus pubescens*		√
S5	*Sarracenia purpurea*	√	
S3S5	*Scirpus microcarpus*	√	
SE	*Senecio vulgaris*		
S3S5	*Solidago rugosa*		√
S5	*Sparganium angustifolium*		
S3S5	*Spriea latifolia*	√	
S5	*Thalictrum pubescens*		√
S3S4	*Thelypteris noveboracensis*		√
S5	*Trientalis borealis*		
S5	*Utricularia vulgaris*		
S5	*Vaccinium angustifolium*		
S3S5	*Vaccinium macrocarpon*	√	
S3S5	*Vaccinium oxycoccos*		
	Viola sp		√
S3S5	*Virburnum cassinoides*		

? - Identification unconfirmed

Plot	LHV1	LHV2	LHV3	LHV04
	22 T 287984 5255197	22 T 287751 5254180	22 T 287971 5255393	22 T 287915 5255264
Date	26-Jul-06	27-Jul-06	28-Jul-06	28-Jul-06
Mapped unit	KH	EH	KH	BF
Photos	30		47	48
Habitat	Open heathland	Heathland Barrens	Open Kalmia / heath within forested area	north facing gentle slope, scrub forest
Slope	0-5	0-5	0-5	0-5%
Aspect	na	na	na	na
Slope Position	level	level	level	
Comments				
Tree Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Abies balsamea >= 4m				
Betula cordifolia >=4m				
Larix laricina >= 4m				
Picea mariana >= 4m				
Shrub Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Amelanchier spp.			trace	1
Alnus rugosa			1	
Abies balsamea <4m			2	30
Betula cordifolia <4m				
Chamaedaphne calyculata			15	1
Cornus stolonifera				
Larix laricina < 1 m		5	3	
Larix laricina < 2m	3			
Juniperus communis				
Kalmia angustifolia	40	30	55	30
Larix laricina < 4 m			7	10
Myrica gale			0.5	
Nemopanthus mucronatus				2
Picea mariana < 1 m		5		
Picea mariana < 4m			5	30
Prunus virginiana subsp. *virginiana*			trace	
Rhododendron groenlandicum	20	10	5	3
Ribes glandulosum				
Rubus idaeus				
Salix spp.	2	trace		

Plot	LHV1	LHV2	LHV3	LHV04
	22 T 287984 5255197	22 T 287751 5254180	22 T 287971 5255393	22 T 287915 5255264
Date	26-Jul-06	27-Jul-06	28-Jul-06	28-Jul-06
Mapped unit	KH	EH	KH	BF
Photos	30		47	48
Habitat	Open heathland	Heathland Barrens	Open Kalmia / heath within forested area	north facing gentle slope, scrub forest
Slope	0-5	0-5	0-5	0-5%
Aspect	na	na	na	na
Slope Position	level	level	level	
Comments				
Sorbus decora				
Virburnum cassinoides	0.5		1	2
Herb Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Agrostis scabra	trace		trace	
Aster puniceus				
Athyrium filix-femina				
Calamagrostis canadensis				
Carex disperma				
Carex spp.				
Clintonia borealis				1
Coptis trifolia			trace	
Cornus canadensis	0.5	0.5	trace	2
Empetrum nigrum	2	45	2	
Epilobium ciliatum				
Eupatorium maculatum				
Galium boreale				
Gaultheria hispidula				15
Gymnocarpium dryopteris				
Goodyera repens				
Hieracium sp.	trace			
Juncus canadensis				
Juncus spp.	trace			
Kalmia polifolia				1
Linnea borealis	trace			3
Listera cordata				
Maianthemum canadense				
Moneses uniflora				

Plot	LHV1	LHV2	LHV3	LHV04
	22 T 287984 5255197	22 T 287751 5254180	22 T 287971 5255393	22 T 287915 5255264
Date	26-Jul-06	27-Jul-06	28-Jul-06	28-Jul-06
Mapped unit	KH	EH	KH	BF
Photos	30		47	48
Habitat	Open heathland	Heathland Barrens	Open Kalmia / heath within forested area	north facing gentle slope, scrub forest
Slope	0-5	0-5	0-5	0-5%
Aspect	na	na	na	na
Slope Position	level	level	level	
Comments				
Monotropa uniflora				
Orthilia secunda				
Platanthera orbiculata				trace
Potamogeton natans				
Ranunculus acris				
Rubus chamaemorus		30		
Rubus pubescens				0.5
Herb Layer (cont.)	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Sarracenia purpurea		trace		
Scirpus microcarpus				
Solidago rugosa				
Thalictrum pubescens				
Trientalis borealis	trace			trace
Utricularia cornuta				
Vaccinium angustifolium	7	2	2	
Viola sp				
Vaccinium vitis-idaea			trace	2
Vaccinium cespitosum				15
Bryophyte Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Cladina spp.	70	30	15	
Dicranum spp.		2		
Hylocomium splendens				
Pleurozium schreberi	2		40	15
Ptilium crista-castrensis	0.5		10	
Racomitrium sp.	1	3	1	
Sphagnum spp.		5	2	

Plot	LHV05	LHV06	LV07	LHV8
	22 T 288134 5254927	22 T 288397 5254727	22 T 288364 5254512	22 T 288363 5254252
Date	28-Jul-06	28-Jul-06	28-Jul-06	28-Jul-06
Mapped unit	BF	BF	KH	BF
Photos	49	55	56	57
Habitat	Forested mesic site	Undulating terrain/ rolling topography. Scrub forest	Small open area of Kalmia heath. hummocky	Mesic forest. Rocky terrain. Shallow soil
Slope	na	15	na	30
Aspect	na	310	na	220
Slope Position	level	upper slope	level	mid slope
Comments		Plot in stand of small Abies with dbh<20 cm, height <6 m		
Tree Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Abies balsamea >= 4m	40	65		60
Betula cordifolia >=4m		2		
Larix laricina >= 4m	15			10
Picea mariana >= 4m	20			
Shrub Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Amelanchier spp.				
Alnus rugosa				
Abies balsamea <4m	30	5		20
Betula cordifolia <4m				
Chamaedaphne calyculata			10	
Cornus stolonifera				
Larix laricina < 1 m			5	
Larix laricina < 2m				
Juniperus communis			2	
Kalmia angustifolia	1	1	35	trace
Larix laricina < 4 m				
Myrica gale				
Nemopanthus mucronatus				
Picea mariana < 1 m				trace
Picea mariana < 4m				
Prunus virginiana subsp. *virginiana*				
Rhododendron groenlandicum				
Ribes glandulosum	0.5			
Rubus idaeus				
Salix spp.				

Plot	LHV05	LHV06	LV07	LHV8
	22 T 288134 5254927	22 T 288397 5254727	22 T 288364 5254512	22 T 288363 5254252
Date	28-Jul-06	28-Jul-06	28-Jul-06	28-Jul-06
Mapped unit	BF	BF	KH	BF
Photos	49	55	56	57
Habitat	Forested mesic site	Undulating terrain/ rolling topography. Scrub forest	Small open area of Kalmia heath. hummocky	Mesic forest. Rocky terrain. Shallow soil
Slope	na	15	na	30
Aspect	na	310	na	220
Slope Position	level	upper slope	level	mid slope
Comments		Plot in stand of small Abies with dbh<20 cm, height <6 m		
Sorbus decora				
Virburnum cassinoides			2	
Herb Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Agrostis scabra				
Aster puniceus				
Athyrium filix-femina				
Calamagrostis canadensis				
Carex disperma				
Carex spp.				
Clintonia borealis	1	trace		
Coptis trifolia				
Cornus canadensis	20	2		
Empetrum nigrum			15	
Epilobium ciliatum				
Eupatorium maculatum				
Galium boreale				
Gaultheria hispidula	7	1		trace
Gymnocarpium dryopteris	1			
Goodyera repens		trace		
Hieracium sp.				
Juncus canadensis				
Juncus spp.				
Kalmia polifolia				
Linnea borealis	5			
Listera cordata				
Maianthemum canadense			trace	
Moneses uniflora				

Plot	LHV05	LHV06	LV07	LHV8
	22 T 288134 5254927	22 T 288397 5254727	22 T 288364 5254512	22 T 288363 5254252
Date	28-Jul-06	28-Jul-06	28-Jul-06	28-Jul-06
Mapped unit	BF	BF	KH	BF
Photos	49	55	56	57
Habitat	Forested mesic site	Undulating terrain/ rolling topography. Scrub forest	Small open area of Kalmia heath. hummocky	Mesic forest. Rocky terrain. Shallow soil
Slope	na	15	na	30
Aspect	na	310	na	220
Slope Position	level	upper slope	level	mid slope
Comments		Plot in stand of small Abies with dbh<20 cm, height <6 m		
Monotropa uniflora		trace		trace
Orthilia secunda	trace			
Platanthera orbiculata				
Potamogeton natans				
Ranunculus acris				
Rubus chamaemorus				
Rubus pubescens				
Herb Layer (cont.)	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Sarracenia purpurea				
Scirpus microcarpus				
Solidago rugosa	0.5			
Thalictrum pubescens				
Trientalis borealis	trace	trace		
Utricularia cornuta				
Vaccinium angustifolium				
Viola sp				
Vaccinium vitis-idaea				
Vaccinium cespitosum			10	
Bryophyte Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Cladina spp.			60	
Dicranum spp.				
Hylocomium splendens	15	50		35
Pleurozium schreberi	50	15	15	30
Ptilium crista-castrensis	25	30		30
Racomitrium sp.				
Sphagnum spp.		2		

Plot	LHV09	LH10	LHV11	W04
	22 T 288271 5254492	22 T 288200 5254478	22 T 290445 5256938	22 T 288259 5253922
Date	28-Jul-06	28-Jul-06	October	W04
Mapped unit	RP	BF	BF	SF
Photos	60, 61	62	276, 277	258 - 264
Habitat	Wide riparian. Boulder substrate.	Multi-aged forest stand.	Mature balsam fir stand.	Sedge fen with open water centre
Slope	0	0-5	5-10%	na
Aspect	na	na		na
Slope Position	level	level		na
Comments	Die back of trees. Possibly disturbed in past 10 to 20 years. Open water between boulders 25%	Level area next to brook.		small fringe of spirea around pond.
Tree Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Abies balsamea >= 4m		25	40	
Betula cordifolia >=4m	3		2	
Larix laricina >= 4m		10		
Picea mariana >= 4m		35		
Shrub Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Amelanchier spp.				
Alnus rugosa				
Abies balsamea <4m	20	3		
Betula cordifolia <4m				
Chamaedaphne calyculata				
Cornus stolonifera	2			
Larix laricina < 1 m				
Larix laricina < 2m				
Juniperus communis				
Kalmia angustifolia		1		
Larix laricina < 4 m				
Myrica gale				2
Nemopanthus mucronatus				
Picea mariana < 1 m				
Picea mariana < 4m		3		
Prunus virginiana subsp. *virginiana*				
Rhododendron groenlandicum				
Ribes glandulosum				
Rubus idaeus	3			
Salix spp.				

Plot	LHV09	LH10	LHV11	W04
	22 T 288271 5254492	22 T 288200 5254478	22 T 290445 5256938	22 T 288259 5253922
Date	28-Jul-06	28-Jul-06	October	W04
Mapped unit	RP	BF	BF	SF
Photos	60, 61	62	276, 277	258 - 264
Habitat	Wide riparian. Boulder substrate.	Multi-aged forest stand.	Mature balsam fir stand.	Sedge fen with open water centre
Slope	0	0-5	5-10%	na
Aspect	na	na		na
Slope Position	level	level		na
Comments	Die back of trees. Possibly disturbed in past 10 to 20 years. Open water between boulders 25%	Level area next to brook.		small fringe of spirea around pond.
Sorbus decora		trace		
Virburnum cassinoides				
Herb Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Agrostis scabra				
Aster puniceus	10			trace
Athyrium filix-femina	2			
Calamagrostis canadensis	15			30
Carex disperma		trace	2	
Carex spp.				30
Clintonia borealis		1		
Coptis trifolia				
Cornus canadensis		3	1	
Empetrum nigrum				
Epilobium ciliatum	2			
Eupatorium maculatum	1			
Galium boreale	1			trace
Gaultheria hispidula		1	1	
Gymnocarpium dryopteris				
Goodyera repens				
Hieracium sp.				
Juncus canadensis	10			
Juncus spp.				
Kalmia polifolia				
Linnea borealis		15	0.5	
Listera cordata		trace		
Maianthemum canadense		1		
Moneses uniflora		trace		

Plot	LHV09	LH10	LHV11	W04
	22 T 288271 5254492	22 T 288200 5254478	22 T 290445 5256938	22 T 288259 5253922
Date	28-Jul-06	28-Jul-06	October	W04
Mapped unit	RP	BF	BF	SF
Photos	60, 61	62	276, 277	258 - 264
Habitat	Wide riparian. Boulder substrate.	Multi-aged forest stand.	Mature balsam fir stand.	Sedge fen with open water centre
Slope	0	0-5	5-10%	na
Aspect	na	na		na
Slope Position	level	level		na
Comments	Die back of trees. Possibly disturbed in past 10 to 20 years. Open water between boulders 25%	Level area next to brook.		small fringe of spirea around pond.
Monotropa uniflora				
Orthilia secunda		trace		
Platanthera orbiculata		trace		
Potamogeton natans				1
Ranunculus acris	7			
Rubus chamaemorus				
Rubus pubescens				
Herb Layer (cont.)	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Sarracenia purpurea				
Scirpus microcarpus				25
Solidago rugosa	40			
Thalictrum pubescens	2			
Trientalis borealis		trace		
Utricularia cornuta				trace
Vaccinium angustifolium				
Viola sp	5			trace
Vaccinium vitis-idaea				
Vaccinium cespitosum				
Bryophyte Layer	**Percent Cover**	**Percent Cover**	**Percent Cover**	**Percent Cover**
Cladina spp.				
Dicranum spp.				
Hylocomium splendens				
Pleurozium schreberi		40		
Ptilium crista-castrensis		40		
Racomitrium sp.				
Sphagnum spp.		15		

APPENDIX B

WETLAND CHARACTERIZATION

WETLAND HABITAT PROFILE

Site name: W03 **Date:** 26/ 09 /2006

Survey team: P. Trimper, B. Keeping

Class: Fen **Form:** Floating Fen

Size: 0.2 ha (open water: 0.3 ha) **Linear edge:** approximately 180 m

Substrate type	Boulder	Cobble	Gravel	Sand	Silt	Clay	Organic
%	50	30			15		5

Nearest wetland: (adjoining or approx. distance away): _____

Interspersion: _____ low **X moderate** _____ high

Water depth: <5 (m) **pH:** _____

Water flow: _____ fast **X moderate** _____ low _____ none

Seasonality: ____ ephemeral ____ seasonal ____ semi-permanent **X permanent**

Peat: _____ present **X absent**

Zone	**Dominant plant species**
Open water	*Potamogeton natans*, 60 percent
Emergents	*Calamagrostis canadensis*, *Carex* spp., 40 percent
Meadow	
Low shrub	*Spirea alba*
Tall shrub	
Forest	*Abies balsamea*

Number of snags: _____ **Comments:** _____

Notes (e.g. comments on wetland class, human activity, photos taken):

40 percent fen, 60 percent open water
Photo 257 taken from stream outflow

NAD 83
UTM 22T 288285, 5254322

Herptiles: (0 – none, 1 – low, 2 – moderate, 3 – high)

Species	Heard/seen	Potential habitat	Comments
Leopard frog			
Mink frog			
Wood frog			
American toad			

Mammals: (0 – none, 1 – low, 2 – moderate, 3 – high)

Species	Heard/seen	Droppings	Trail/tracks	Browse	Potential habitat
Moose		**2**	**3**	**3**	**3**
Beaver					**1**
River Otter					**3**
Muskrat					**1**

Waterfowl: (0 – none, 1 – low, 2 – moderate, 3 – high)

Species	Heard/seen	Potential nesting habitat	Potential moulting habitat	Comments
Canada Goose		**1**	**1**	
Cavity nesters		**1**	**1**	
Dabblers		**1**	**1**	
Divers		**1**	**1**	

Additional notes on wildlife: (e.g. UTM coordinates of significant observations or details regarding signs)

Abundant moose activity
Stream channelized up and down from this point – Historical.

WETLAND HABITAT PROFILE

Site name: W04 **Date:** 26 / 09/ 2006

Survey team: P. Trimper, B. Keeping

Class: Fen / Open Water **Form:** Floating Fen

Size: 2.47 ha (open water: 0.71 ha) **Linear edge:** 850 m

Substrate type	Boulder	Cobble	Gravel	Sand	Silt	Clay	Organic
%	60						40

Nearest wetland: (adjoining or approx. distance away): _____

Interspersion: X low _____ moderate _____ high

Water depth: 1 – 3 m **pH:** _____

Water flow: _____ fast **X moderate** _____ low _____ none

Seasonality: ____ ephemeral ____ seasonal ____ semi-permanent **X permanent**

Peat: _____ present **X absent**

Zone	**Dominant plant species**
Open water	*Potamogeton natans*, *Nuphar variegata*
Emergents	*Carex* spp., *Calamagrostis canadensis*, *Juncus* spp., *Scirpus microcarpus*
Meadow	
Low shrub	*Spirea alba*
Tall shrub	*Abies balsamea*, *Picea mariana*
Forest	*Picea mariana*, *Abies balsamea*

Number of snags: _____ **Comments:** _____

Notes (e.g. comments on wetland class, human activity, photos taken):

Photos: 258 – 264 of vegetation
265 - beaver lodge
266 – beaver trail

80 percent fen, 20 percent open water

UTM NAD 83 22t 288259, 5253922

Herptiles: (0 – none, 1 – low, 2 – moderate, 3 – high)

Species	Heard/seen	Potential habitat	Comments
Leopard frog			
Mink frog			
Wood frog			
American toad			

Mammals: (0 – none, 1 – low, 2 – moderate, 3 – high)

Species	Heard/seen	Droppings	Trail/tracks	Browse	Potential habitat
Moose					**2**
Beaver			**2**	**1**	**2**
River Otter					**2**
Muskrat					**2**

Waterfowl: (0 – none, 1 – low, 2 – moderate, 3 – high)

Species	Heard/seen	Potential nesting habitat	Potential moulting habitat	Comments
Canada Goose		**1**	**1**	
Cavity nesters		**1**	**1**	
Dabblers		**2**	**2**	
Divers		**1**	**1**	

Additional notes on wildlife: (e.g. UTM coordinates of significant observations or details regarding signs)

Beaver track/trail exiting pond on opposite side of pond from the lodge.
Well established lodge (March interviews with local residents)

WETLAND HABITAT PROFILE

Site name: W06 **Date:** 26 / 09 / 2006

Survey team: P. Trimper, B. Keeping

Class: Fen/Open Water **Form:** Floating Fen

Size: 0.5 ha (open water: 0.78 ha) **Linear edge:** 440 m

Substrate type	Boulder	Cobble	Gravel	Sand	Silt	Clay	Organic
%	40						60

Nearest wetland: (adjoining or approx. distance away): ____100m_____

Interspersion: X low _____ moderate _____ high

Water depth: __0 – 3 (m**)** **pH:** _____

Water flow: _____ fast _____ moderate **X low** _____ none

Seasonality: ____ ephemeral ____ seasonal ____ semi-permanent ____ permanent

Peat: X present _____ absent

Zone	**Dominant plant species**
Open water	*Nuphar variegata*
Emergents	*Carex* spp. *Juncus* spp. *Calamagrostis canadensis*, *Scirpus microcarpus*
Meadow	
Low shrub	
Tall shrub	
Forest	

Number of snags: _____ **Comments:** _____

Notes (e.g. comments on wetland class, human activity, photos taken):
60 percent open water. 40 percent emergent vegetation
Photo 269: outflow from pond
270: moose trail adjacent to pond
0042: Taken during vegetation surveys
See vegetation plot LHRP10 for more information.

NAD 83 22T 287706, 5254121

Herptiles: (0 – none, 1 – low, 2 – moderate, 3 – high)

Species	Heard/seen	Potential habitat	Comments
Leopard frog			
Mink frog			
Wood frog			
American toad			

Mammals: (0 – none, 1 – low, 2 – moderate, 3 – high)

Species	Heard/seen	Droppings	Trail/tracks	Browse	Potential habitat
Moose		**1**	**2**	**2**	**2**
Beaver					**2**
River Otter					**2**
Muskrat				**1**	**3**

Waterfowl: (0 – none, 1 – low, 2 – moderate, 3 – high)

Species	Heard/seen	Potential nesting habitat	Potential moulting habitat	Comments
Canada Goose		**0**	**0**	
Cavity nesters		**0**	**0**	
Dabblers		**2**	**1**	
Divers		**1**	**0**	

Additional notes on wildlife: (e.g. UTM coordinates of significant observations or details regarding signs)

APPENDIX C

AVIAN POINT COUNT LOCATIONS

&

VEGETATION DESCRIPTIONS

APPENDIX A – Avian Survey Point Count Locations and Vegetation Descriptions

Waypoint Position (N W)	Habitat Description
002 47° 25169 53° 48795	small, wet opening (running water) in predominantly coniferous forest – balsam fir and black spruce approx. 9m tall, some birch and larch. Ferns, cornlily, grasses, *Ranunculus*, sedges, dewberry, *Sphagnum* spp. White and blue *Viola*
003 47°24893 53°48601	larch, balsam fir and black spruce approx. 6m, *Sphagnum* spp.. *Kalmia polifolia*, twinflower, bunchberry, wild lily-of-the-valley, blueberry, reindeer lichen.
004 47°24797 53°48795	starflower, bunchberry, cornlily, feather moss, twinflower, creeping snowberry, *Kalmia polifolia*, balsam fir and black spruce approx. 8-9m, quite a few snags
005 47°24696 53°48983	immediate area open with a lot of snags. *Sphagnum* spp., cornlily, goldthread, twinflower, bunchberry, wild lily-of-the-valley, balsam fir and black spruce <1m to 9m
006 47°24616 53°49180	edge of lake-rocky, Labrador tea, *Sphagnum* spp., *Kalmia polifolia*, bunchberry, blueberry, crowberry, reindeer lichen, larch and balsam fir <1 m to 7m
007 47°24472 53°49069	adjacent to new, wide Geotech trail, *Sphagnum* spp., bunchberry, cornlily, wild lily-of-the-valley, *Kalmia angustifolia*, blueberry, Labrador tea, feather moss, creeping snowberry, black spruce and balsam fir <1m to 6 m, snags
008 47°24551 53°48860	Geotech trail edge/open forest, Labrador tea, *Kalmia angustifolia*, blueberry, wild lily-of-the-valley, feather moss, reindeer lichen, larch, balsam fir
011 47°24912 53°48500	Geotech trail edge/mature forest, grasses, alder, unknown herbaceous plants, balsam fir 1m – 10m and larch 10m
012 47°25054 53°48610	trail edge/mature forest with running water, grasses, golden rod, *Spirea* spp., alder, fern spp., star flower, bunchberry, *Sphagnum* spp., dogberry, balsam fir, larch and white birch approx. 10m.
015 47°24754 53°48420	open,hill top, reindeer lichen, blueberry, goldthread, *Kalmia angustifolia*, partridgeberry, crowberry, wild lily-of-the-valley, Labrador tea, larch 1.5m
016 47°24614 53°48439	balsam fir/black spruce forest approx. 9m, stairstep moss, wild lily-of-the-valley, cornlily, star flower
017 47°24491 53°48571	small opening on hill top, stairstep moss, bunchberry, starflower, twinflower, creeping snowberry, cornlily, black spruce up to 7 m, heavily moose browsed
019 47°24437 53°48329	edge of trail/forest, creeping snowberry, stairstep moss, *Ribes* spp., *Spirea* spp., golden rod, fern spp., grasses, twinflower, starflower, alder approx. 4m, balsam fir and birch approx. 10m
021 47°24130 53°48200	edge of trail/forest, pearly everlasting, golden rod, dewberry, *Spirea* spp., alder approx. 6m, balsam fir and larch approx. 9m
022 47°24124 53°47961	edge of trail/forest, grasses, *Spirea* spp., goldenrod, dewberry, wild lily-of-the-valley, alder 1-4m, larch approx 9m, balsam fir approx. 10m
024 47°24944 53°48980	hilltop, mature forest, stairstep moss, feather moss, creeping snowberry, twinflower, bunchberry, cornlily, starflower, unknown orchid spp., balsam fir and black spruce approx. 8m with very small dbh
025 47°26217 53°47318	large, wet opening in forest, *Sphagnum* spp., grasses, sedges, bunchberry., *Ranunculus* spp., bottlebrush, red osier dogwood, white violets, fern spp., balsam fir and white birch approx. 7m and widely spaced
026 47°25933 53°47123	hilltop on transmission line
027 47°25899 53°46893	hilltop, thick balsam fir/black spruce scrub approx. 2 m high, feather moss, creeping snowberry
028 47°25895 53°46651	stairstep moss, feather moss, creeping snowberry, cornlily, starflower, black spruce and balsam fir approx. 6m
029 47°25733 53°46620	hilltop, open –old burn, snags, a lot of coarse woody debris, Labrador tea, blueberry, bunchberry, creeping snowberry, balsam fir 0.5- 1.5 m
030 47°25689 53°46329	open – old burn, reindeer lichen, blueberry, *Kalmia polifolia*, bunchberry, fern spp., cornlily, a lot of coarse woody debris
031 47°25852 53°46433	old balsam fir and black spruce forest (0.5-8m) with lots of 'old man's beard' lichen, stairstep moss, feather moss, creeping snowberry, cornlily

Waypoint Position (N W)	Habitat Description
032 47°26008 53°46445	opening in forest with stream, grasses, fern spp., *Sphagnum* spp., stairstep moss, feather moss, creeping snowberry, bunchberry, starflower, balsam fir approx. 12 m and white birch approx. 8 m , snags
033 47°26145 53°46576	open/scrub forest, feather moss, stairstep moss, *Kalmia angustifolia*, leatherleaf, Labrador tea, bunchberry, cornlily, balsam fir and black spruce 1-3 m
146 47°42185 53°81356	A small gravelled parking area by start of the gravelled Geotech trail surrounded by alders <3m and up to 8m tall larch, white birch, balsam fir and white spruce; also a few dogberry trees, chuckley pears and cherries <6m. On ground, common hawkweed, fireweed, white and purple clover, eyebright, caraway, toad flax, black medick, wild raspberry and grasses.
Rattling Brook Waterfall	golden rod, black knapweed, wild daisy, English plantain, *Sphagnum* spp., meadowsweet, cow wedge, red-osier dogwood and a single ~6m tall mountain maple by an apple tree.
trail above waterfall	Trail edged by 2-3m tall alder, larch and balsam fir; twinflowers creep along the ground and at higher elevations the larch trees are up to 10m tall.
147 47°41786 53°81120	Adjacent to a newly cut Geotech trail; an open edged old "cut over" area with *Kalmia* heath, reindeer lichen, low scrub, alder~0.2m, willow spp. 0.2-0.5m, pin cherry~0.3m, blueberry and tundra bilberry. Circling at ~100m radius the *Kalmia* heath is edged by 70% black spruce<10m hung with "old man's beard" lichen, 15% balsam fir<10m, 15% larch 1-8m tall.On ground also juniper, leatherleaf, sheep laural, bog laurel, Sphagnum spp., labrador tea, *Rhodora*, hawkweed, a few wild "lily-of-the-valley". Red-osier dogwood plants are growing in the path as well as young birch, bunchberries, bakeapple and buttercup.
On path W at higher elevation	corn lily and *Dryopteris* spp.
148 47°41581 53°81260	Small opening at end of newly cut Geotech trail, with upturned sandy soil and gravel surrounded by a few larch 0.5-6m, black spruce 6-8m and balsam fir 0.5-8m tall; the latter two species hung with "old man's beard" lichen. Blooming bunchberries in sandy dark brown top soil, blooming white sheep laurel, bog laurel, *Sphagnum* spp., red-osier dogwood and pin cherry 0.1-0.2m tall, wild "lily-of-the-valley", willow sp., twinflower and shaggy moss. A moose foot print was found in moist soil on path ~100m east of waypoint.
149 47°41811 53°81060	By main Geotech trail adjacent to culvert, small stream running east into small pond; very lush larch trees <10m tall, alder 2-3m, balsam fir 0.5m, meadowsweet, golden rod, yellow hawkweed, buttercup, *Carex* spp., moss sp. and grasses. In pond also blue flag iris.
150 47°41727 53°80994	On main Geotech trail edged with alder <2-3m, balsam fir and larch <8m, grasses, dewberry, meadowsweet, golden rod and current sp.,
151 47°41605 53°80933	50m west of main Geotech trail with small bubbling stream to south; very lush larch trees 4-10m, balsam fir 1-8m, alder 1-4m, birch sp. 1-8m tall, currant sp., bunchberry, golden rod, golden thread, violet sp., buttercup, twinflower, starflower, meadowsweet, *Dryopteris* spp., *Sphagnum* sp., grasses and on bark a white lichen sp. Indian pipe in covering clusters on forest floor. Moose droppings on path through low vegetation.
152 47°41408 53°80746	Bridge over Rattling Brook; alders <2-3m, balsam fir <7m and very lush larch <6-8m tall grow along the brook edge; also grasses, sedges, buttercup, meadowsweet, golden rod; a cluster of aster sp. grows in middle of the brook to west.
153 47°41175 53°80602	South of Rattling Brook Bridge on Geotech trail edged with alder <3-4m, balsam fir 8-10m, current sp., meadowsweet, dewberry, twinflower, *Viola* sp., pearly everlasting and grasses.
154 47°41046 53°80499	Geotech trail edged with balsam fir 0.5-8m, larch <8m, alder 0.5-3m, current sp., bunch berry, meadowsweet, golden rod and grasses.
155 47°40483 53°80363	By eastern edge of Rattling Brook; lush larch <8m, balsam fir <9m, alder <4m, meadowsweet, golden rod, *Viola* sp., grasses and boulders.
155a 47°40187 53°80258	Shore of pond with Spotted Sandpiper; alder <2m and balsam fir <7-10m along edges; white lichen sp. and "old man's beard" on firs; on ground twinflower, meadowsweet, tall meadow-rue, knapweed, buttercup, eyebright, starflower, white clover, wild "lily-of-the-valley", caraway, currant sp., moss sp., *Dryopteris* spp., sedges and grasses.

Waypoint Position (N W)	Habitat Description
156 47°41554 53°81285	Forested semi-opened Kalmia-Black Spruce habitat with mostly black spruce and some balsam fire <8-10m hung with "old man's beard" lichen; on ground *Caldonia* spp., reindeer lichen, bunchberries in bloom, sheep laurel and *Sphagnum* spp.
157 47°43663 53°78895	Southern edge of main road, guard rail, wet area with small stream, balsam fir and larch 6-7m, alder 1-2.5m, yellow and white birch, cherry, shrub, fern, meadowsweet, hawkweed, white clover, pearly everlasting, fireweed, golden rod, grasses; on southern slopes 8-10m tall balsam fir and black spruce interspersed with white snags and birch.
hilltop on transmission line	edged with black spruce and balsam fir <10m; on open ground alder and birch and willow spp.>1m, red-osier dogwood, bunch berry, blueberry, sheep laurel, fireweed and fern sp.
158 47°43089 53°78740	North-western edge of small pond adjacent to and NW of Sandy Pond; black spruce and balsam fir <6m, dead tumbled trees and snags edging mountainous pond; on ground red-osier dogwood, blueberry, crowberry, sheep laurel, Labrador tea and moss sp.
158a 47°43091 53°78745	Balsam fir and white birch <6m, alder<3-4m, fern spp., *Viola* sp. and starflowers. Ruffed Grouse, female, with young.

APPENDIX D

Aerial Survey for Waterfowl Broods in the Long Harbour Area, Placentia Bay, Newfoundland and Labrador

(LGL 2007)

Aerial Survey for Waterfowl Broods in the Long Harbour Area, Placentia Bay, Newfoundland and Labrador

Prepared by

Ian Goudie, Ph.D.

LGL Limited
environmental research associates
P.O. Box 13248, Stn. A
St. John's, NL A1B 4A5
709 754-1992 (phone)
709 754-7718 (fax)
igoudie@lgl.com
www.lgl.com

Submitted to

VOISEY'S BAY NICKEL COMPANY LIMITED

A subsidiary of Inco Limited

Suite 700, Baine Johnston Centre
10 Fort William Place
St. John's, NL A1C 1K4

16 August 2007
SA889

Executive Summary

An aerial survey was completed on 2 August 2007 in the Long Harbour area of Placentia Bay, Newfoundland in order to assess breeding populations of waterfowl. Overall there was a low density of waterfowl detected at <10 pairs per 100 km^2 although waterfowl broods have a low rate of detection (<50 %) in north boreal habitats, and some hens fail nesting due to depredation. Ring-necked Duck (*Aythya collaris*) was the most abundant duck species, followed by Black Duck (*Anas rubripes*), Northern Pintail (*Anas acuta*), Green-winged Teal (*Anas crecca*), and Common Merganser (*Mergus merganser*). The Common Loon (*Gavia immer*) occurred throughout the survey area. Two broods of ducks were observed without adults in attendance (Black Duck and Northern Pintail) or in one case only one female Ring-necked Duck was present with two broods of downy young. A female Common Merganser with three young was noted, as were broody female Black Duck, Green-winged Teal, and Ring-necked Duck. A group of four Black Ducks were not ascertained to sex, and two groups of four male Ring-necked Ducks in eclipse plumage indicated that some individuals may undergo the annual feather moult on local wetlands. No rare or uncommon species of waterfowl were detected and densities recorded were typical for this section of the Maritime Barrens Ecoregion of Newfoundland.

Incidental wildlife recorded included several species of shorebirds, Belted Kingfisher and Osprey. Beaver and moose were ubiquitous in the area.

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Background

Aerial helicopter surveys were conducted by experienced LGL ornithologists, namely, Drs. I. Goudie and T. Lang. Standard protocols were used to census indicated breeding pairs of waterfowl were not initially surveyed as part of the terrestrial studies (JWL 2007) for the Long Harbour study area. This survey for broods of waterfowl in summer 2007 addressed the question of what waterfowl species are nesting in the Long Harbour study area, and whether unusual or significant concentrations occur there.

Introduction

The survey area lies within the Southeastern Barrens subregion of the Maritime Barrens Ecoregion (Meades 1990; Damman 1983). This ecoregion is characterized by extensive barren areas that consist of dwarf shrub heaths, acidic bogs and shallow fens, and is considered relatively unproductive for waterfowl (Goudie 1987). Balsam fir (*Abies balsamea*) and black spruce (*Picea mariana*) dominate the forested sections of the surrounding region with eastern larch (*Larix laricina*) scattered throughout. A scrub forest less than five metres in height, dominated by black spruce, covers many exposed coastal and upland areas along with ericaceous heath.

Waterfowl nesting in Newfoundland is characterized by early-breeding (dabbling ducks and geese) and late-breeding (diving ducks and sea ducks), and this survey was timed to provide meaningful data on productivity for both groups. By mid to late July 2007, clutches of all species of waterfowl likely to nest on the study area were hatched (notably Black Duck and Ring-necked Duck). A designated survey was flown on 2 August 2007 in an effort to assess waterfowl production and occurrences in the Long Harbour area of Placentia Bay. This report details survey methods and results.

Methods

Surveys were conducted from a Bell 206-L helicopter on 2 August 2007. The survey team comprised three observers and the pilot followed a Standard Operating Procedure (Canadian Wildlife Service 2007) for conducting helicopter indicated pair surveys for waterfowl. The front observer (I. Goudie) served as a navigator and recorded locations on topographic map sheets. A rear observer behind the Goudie (A. Munier) recorded observations as waypoints and tracked the aircraft flight path via a handheld GPS. An experienced LGL observer (T. Lang) was located behind the pilot.

An overall sample plot of 10 x 10 km ("survey area") was selected that encompassed the Project Area (including Plant footprint) and adjacent terrain (Figures 1 and 2). When inventorying the sample plot, all water-bodies within the plot were searched and all waterfowl and incidental wildlife observations were recorded on the NTS maps. Observations were also geo-referenced with the hand-held GPS unit as unique waypoints. Waterfowl were recorded by American Ornithologists Union (AOU) acronyms as single male, single female, or groups and broods were classified using age classes developed by Gollop and Marshall (1954). Aerial-generated waypoints were sometimes shared between localized observations and have an estimated error of ± 125 m.

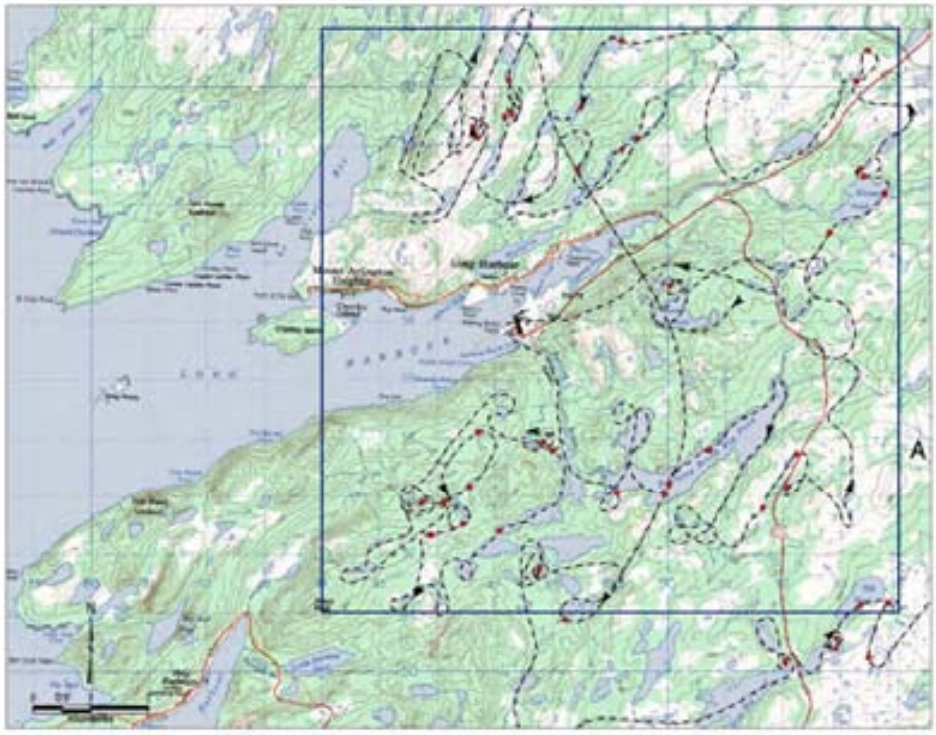

Figure 1 Aerial Survey Coverage of 10 x 10 km Plot for Waterfowl Broods in Long Harbour Area, August 2, 2007.

Note: Dashed line indicates coverage.

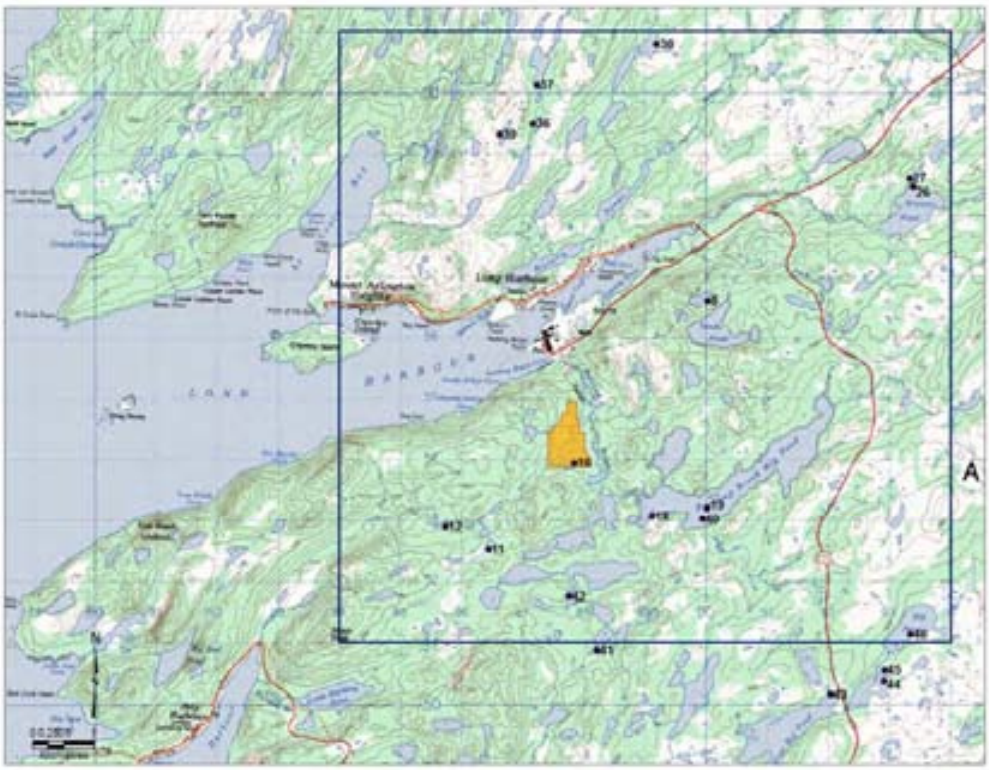

Figure 2 Locations by Waypoints of Waterfowl Observations During LGL Aerial Survey on 2 August 2007.

Note: Outside polygon represents the 10 x 10 km survey area.
Inside polygon (orange) represents the Plant footprint.

Weather conditions for surveys were ideal with light northerly winds (<3 m/sec) and partial cloud cover. Surveys were flown at 15 to 45 m AGL with ground speeds averaging 80 to 112 kph down to a hover in certain situations when broods were detected.

Results

Waterfowl

The Long Harbour area displays rugged terrain with a mixture of boreal forest cover and peatlands. Many lakes and ponds are impounded by beaver. The following species were confirmed as breeding in low densities in the survey area:

- Black Duck (*Anas rubripes*) – one brood and one broody female,
- Northern Pintail (*Anas acuta*) – one brood,
- Green-winged Teal (*Anas crecca*) (broody female),
- Ring-necked Duck (*Aythya collaris*) – two broods and one broody female,
- Common Merganser (*Mergus merganser*) – one brood, and
- Common Loon (*Gavia immer*) – three broods.

Two broods were observed without adults in attendance (Black Duck and Northern Pintail) or in one case only one female Ring-necked Duck was present with two broods of downy young. A female Common Merganser with three young was noted, as were broody female Black Duck and Green-winged Teal. (Figure 2, Table 1). No unusually large aggregations or uncommon species of waterfowl were located, and the area was typical of the general South-eastern Barrens Ecodistrict (Goudie 1987). All observations were recorded by GPS waypoints and National Topographical Coordinates (Appendix 1).

On 2 August 2007, broods of dabbling ducks were mostly feathered and almost full grown whereas diving ducks such as Ring-necked Duck were still in mid to late downy stages. At this time, young of Common Mergansers were partially feathered. These data support the hypotheses that Black Ducks were hatched in early June whereas Ring-necked Ducks probably hatched by mid July, and Common Mergansers by late June 2007. Overall, the Ring-necked Duck was the most abundant duck species. LGL biologists detected adult males of this species in eclipse plumage in early August 2007 on wetlands, indicating that some sites were used to complete the annual feather moult. The Common Loon was ubiquitous in the survey area indicating many lakes and ponds support fish populations (Table 1).

Incidental Wildlife

Shorebirds (Spotted Sandpiper, *Actitus macularia*, Common Snipe, *Gallinago gallinago*, Greater Yellowlegs, *Tringa melanoleuca*), Belted Kingfisher (*Ceryle alcyon*), and Osprey (*Pandion haliaetus*) comprised the incidental birds recorded during the aerial survey. Beaver and moose were common throughout the survey area (Figure 3, Table 1).

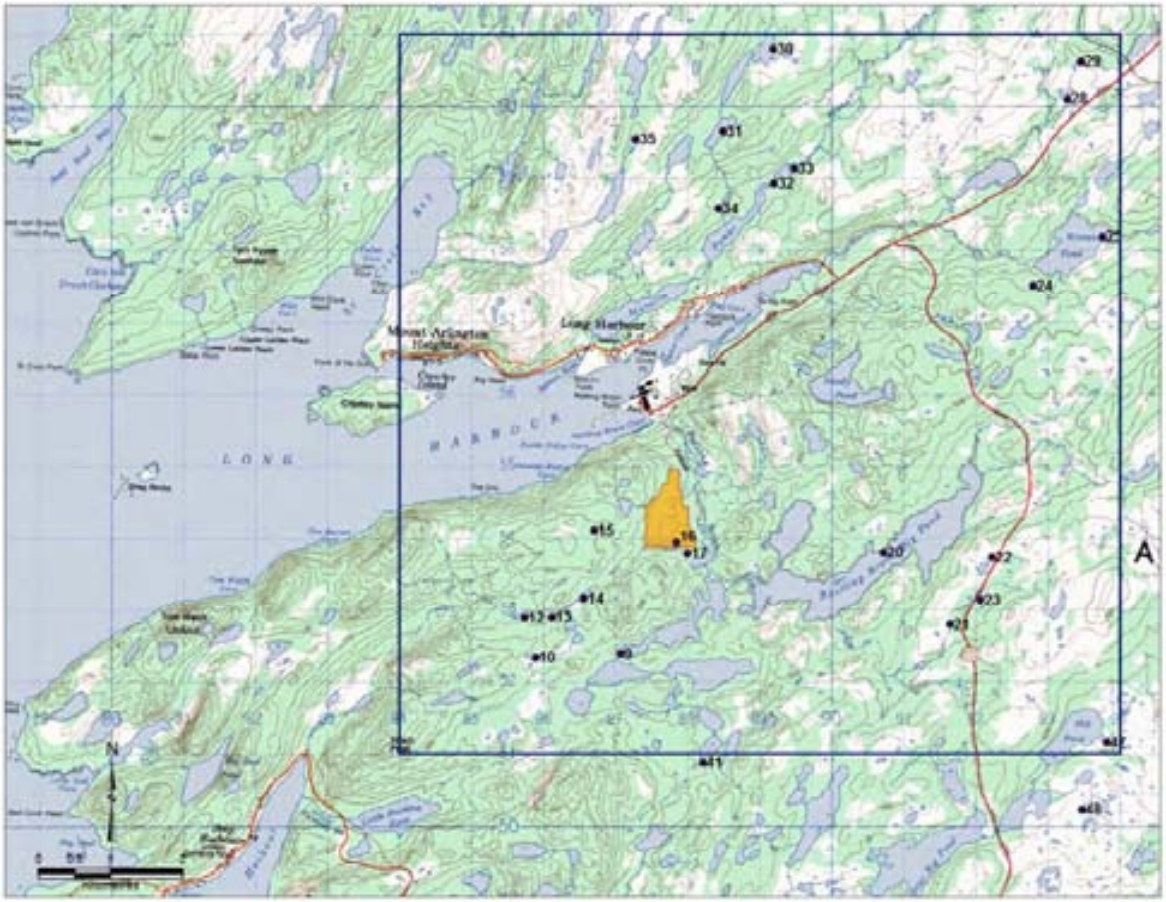

Figure 3 Locations by Waypoints of Incidental Wildlife Observations during LGL Aerial Survey on August 2, 2007.

Note: Outside polygon represents the 10 x 10 km survey area.
Inside polygon (orange) represents the Plant footprint.

Table 1 Waterfowl and Other Wildlife Observed by LGL Biologists on Aerial Surveys in Long Harbour Area on 2 August 2007.

Wpt	Observation	SP_Code	Brood	Age	Map	Pairs	Males	Females	Young	Unsexed	Total	Notes
8	Waterfowl	COLO			1					1	1	
9	Other - Bird	SPSA			3					3	3	
10	Other - Bird	COSN			1					1	1	
11	Waterfowl	AGWT			1f			1			1	
11	Waterfowl	RNDU			1f			1			1	
12	Waterfowl	NOPI	Yes	2C	(9y)				9		9	Adult female not observed
12	Sign	Beaver									0	Lodge/dam site (active); no animal observed
13	Sign	Beaver									0	Lodge/dam site (active); no animal observed
14	Sign	Beaver									0	Lodge/dam site (active); no animal observed
15	Other - Mammal	Moose			1m		1				1	
16	Waterfowl	ABDU			1					1	1	Possible brood present
16	Other - Mammal	Beaver			1					1	1	
17	Other - Mammal	Moose			1m+1f		1	1			2	
18	Waterfowl	COLO			1					1	1	
19	Waterfowl	COLO			5					5	5	
20	Other - Bird	SPSA			1					1	1	
21	Other - Mammal	Moose			1f			1			1	
22	Sign	Beaver									0	Lodge/dam site (active); no animal observed
23	Sign	Beaver									0	Lodge/dam site (active); no animal observed
24	Other - Bird	GRYE			1					1	1	
25	Other - Bird	BEKI			1					1	1	
26	Waterfowl	COLO			2					2	2	
27	Waterfowl	RNDU	Yes	1C	1f (5y)			1	5		6	Only 1 female present with 2 broods
27	Waterfowl	RNDU	Yes	1B	1f (6y)			1	6		7	Only 1 female present with 2 broods
28	Sign	Beaver									0	Lodge/dam site (active); no animal observed
29	Sign	Beaver									0	Lodge/dam site (active); no animal observed
30	Waterfowl	COLO			1					1	1	
. 30	Sign	Beaver									0	Lodge/dam site (active); no animal observed
31	Sign	Beaver									0	Lodge/dam site (active); no animal observed

Table 1 Continued.

Wpt	Observation	SP_Code	Brood	Age	Map	Pairs	Males	Females	Young	Unsexed	Total	Notes
32	Other - Bird	SPSA			1					1	1	
33	Other - Bird	COSN			1					1	1	
34	Sign	Beaver									0	Lodge/dam site (active); no animal observed
35	Sign	Beaver									0	Lodge/dam site (active); no animal observed
36	Waterfowl	RNDU			4m		4				4	Eclipse males
37	Waterfowl	COLO			1					1	1	
39	Waterfowl	COLO	Yes		1p (1y)	1			1		3	
40	Waterfowl	COLO	Yes		1p (1y)	1			1		3	
41	Waterfowl	COLO	Yes		1p (1y)	1			1		3	
41	Other - Bird	OSPR			1					1	1	
42	Waterfowl	RNDU			4m		4				4	Eclipse males
43	Waterfowl	COME	Yes	2B	1f (3y)			1	3		4	
44	Waterfowl	ABDU			4					4	4	Adults
45	Waterfowl	ABDU	Yes	2C	1f (6y)			1	6		7	
46	Waterfowl	COLO			2					2	2	
47	Sign	Beaver									0	Lodge/dam site (active); no animal observed
48	Other - Bird	HERG			4					4	4	
49	Other - Mammal	Moose			1f + c			1	1		2	

Notes: Brood classification is based on Gollop and Marshall (1954).

Species Codes

COLO – Common Loon
ABDU – American Black Duck
AGWT – American Green-winged Teal
NOPI – Northern Pintail
RNDU – Ring-necked Duck
COME – Common Merganser
SPSA – Spotted Sandpiper
GRYE – Greater Yellowlegs
COSN – Common Snipe
BEKI – Belted Kingfisher
OSPR – Osprey
HERG – Herring Gull

Discussion

The survey was conducted the day after unusually high rainfall and water levels in the ponds and brooks were high during the survey. The effect, if any, of the high water levels in detectability is unknown but may not have been great given the open nature of many of the wetlands in the survey area.

Impoundment and flooding associated with beaver activity enhances the productivity of wetlands often resulting in increased use by waterfowl, notably Black Duck (Longcore et al. 2000). The use of wetlands by breeding dabbling ducks in the area of Long Harbour appears to be associated with beaver activity. The Ring-necked Duck was expected to be nesting in the area because it has been noted for the northward expansion of its breeding range over the past four decades and its exploitation of acidic wetlands, especially peatlands (Goudie 1987).

LGL biologists recorded less than ten indicated pairs of ducks per 100 km^2 for the Long Harbour area based on detected broods. Low densities of nesting waterfowl are expected in north boreal zones. In addition, a low rate of detection can also be expected for aerial surveys for broods; for example, there was low detectability of duck broods based on one survey in northern Ontario (<40 percent in Gabor et al. 1995). Research in northern Quebec and Labrador have also demonstrated that less than half of waterfowl are detected in aerial surveys (Goudie and Whitman 1987; Savard and Lamothe 1991).

The survey was focused on broods of waterfowl and probably further underestimated true breeding effort because some pairs would be expected to have failed breeding due to factors such as depredation of nests and young. After failure, females may not re-nest and often abandon the area. Even when factoring in these possible biases, it appears that the Long Harbour area has relatively low quality habitat for nesting waterfowl. However, in some cases, the combination of beaver activity and fluvial habitat results in above-average wetlands (Appendix 2).

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Special thanks to Ron Whiffen of Universal Helicopters Limited for the skilful low-level flying, and for finding a flying window inside of the general state of emergency from the flooding events the previous day.

Study Team

Personnel (LGL)	**Role**
Ian Goudie, Ph.D.	Study Lead; Reporting
Tony Lang, Ph.D.	Observer
Anne Munier, M.Sc.	Observer
Colin Jones, M.Sc. (*in prep.*)	Mapping
Bob Buchanan, M.Sc.	Reviewer

Appendix 1.

Waypoints for Wildlife Observations Recorded in Long Harbour Area on 2 August 2007.

Case	Wpt	Date	Time	Lat_DD	Long_DD	Easting	Northing
1	8	2-Aug-07	10:52:35	47.4310	-53.7834	290108	5256813
2	9	2-Aug-07	11:03:10	47.3922	-53.8205	287153	5252604
3	10	2-Aug-07	11:07:42	47.3913	-53.8361	285968	5252552
4	11	2-Aug-07	11:08:13	47.3932	-53.8288	286526	5252736
4	11	2-Aug-07	11:08:13	47.3932	-53.8288	286526	5252736
5	12	2-Aug-07	11:10:23	47.3963	-53.8384	285814	5253109
5	12	2-Aug-07	11:10:23	47.3963	-53.8384	285814	5253109
6	13	2-Aug-07	11:13:29	47.3964	-53.8334	286198	5253113
7	14	2-Aug-07	11:14:13	47.3989	-53.8276	286642	5253376
8	15	2-Aug-07	11:15:29	47.4075	-53.8262	286784	5254319
9	16	2-Aug-07	11:25:06	47.4064	-53.8111	287919	5254159
9	16	2-Aug-07	11:25:06	47.4064	-53.8111	287919	5254159
10	17	2-Aug-07	11:25:21	47.4051	-53.8089	288079	5254004
11	18	2-Aug-07	11:26:06	47.3989	-53.7937	289201	5253279
12	19	2-Aug-07	11:29:12	47.4004	-53.7819	290097	5253418
13	20	2-Aug-07	11:29:44	47.4061	-53.7729	290798	5254021
14	21	2-Aug-07	11:35:27	47.3973	-53.7602	291723	5253012
15	22	2-Aug-07	11:36:26	47.4059	-53.7529	292304	5253946
16	23	2-Aug-07	11:37:18	47.4006	-53.7548	292145	5253358
17	24	2-Aug-07	11:43:13	47.4401	-53.7471	292877	5257727
18	25	2-Aug-07	11:43:49	47.4465	-53.7347	293838	5258409
19	26	2-Aug-07	11:44:14	47.4489	-53.7397	293467	5258691
20	27	2-Aug-07	11:44:30	47.4501	-53.7406	293406	5258827
20	27	2-Aug-07	11:44:30	47.4501	-53.7406	293406	5258827
21	28	2-Aug-07	11:47:55	47.4636	-53.7421	293349	5260324
22	29	2-Aug-07	11:48:35	47.4682	-53.7397	293545	5260838
23	30	2-Aug-07	11:53:37	47.4685	-53.7965	289269	5261016
23	30	2-Aug-07	11:53:37	47.4685	-53.7965	289269	5261016
24	31	2-Aug-07	11:54:27	47.4580	-53.8052	288567	5259873
25	32	2-Aug-07	11:58:08	47.4517	-53.7955	289279	5259150
26	33	2-Aug-07	11:58:39	47.4537	-53.7918	289559	5259357
27	34	2-Aug-07	12:00:44	47.4484	-53.8055	288508	5258806
28	35	2-Aug-07	12:03:16	47.4566	-53.8211	287366	5259760
29	36	2-Aug-07	12:04:12	47.4561	-53.8226	287251	5259717
30	37	2-Aug-07	12:06:22	47.4618	-53.8221	287310	5260345
31	39	2-Aug-07	12:10:18	47.4543	-53.8298	286700	5259537
32	40	2-Aug-07	12:21:05	47.3987	-53.7829	290015	5253231
33	41	2-Aug-07	12:22:10	47.3790	-53.8047	288291	5251096
33	41	2-Aug-07	12:22:10	47.3790	-53.8047	288291	5251096
34	42	2-Aug-07	12:24:48	47.3866	-53.8111	287835	5251964
35	43	2-Aug-07	12:34:56	47.3738	-53.7537	292116	5250384

Continued.

Case	Wpt	Date	Time	Lat_DD	Long_DD	Easting	Northing
36	44	2-Aug-07	12:36:25	47.3761	-53.7423	292988	5250608
37	45	2-Aug-07	12:37:12	47.3776	-53.7422	293001	5250778
38	46	2-Aug-07	12:39:28	47.3829	-53.7370	293416	5251346
39	47	2-Aug-07	12:39:50	47.3833	-53.7306	293897	5251375
40	48	2-Aug-07	12:40:44	47.3748	-53.7348	293554	5250447
41	49	2-Aug-07	12:52:10	47.3854	-53.7060	295765	5251541

Appendix 2.

Wetlands displaying emergent cover and potential high quality wetland habitat suitable for waterfowl in the Long Harbour Survey Area.

(a) Beaver Pond (1), the location of a brood of Northern Pintail (Waypoint 12)

(b) Beaver Pond (2)

Fluvial Marsh (1)

Fuvial Marsh (2)