December 2013

HAMMOND REEF GOLD PROJECT

Terrestrial Ecology Technical Support Document

VERSION 2

Submitted to:
Osisko Hammond Reef Gold Ltd.
155 University Avenue, Suite 1440
Toronto, Ontario M5H 3B7

Project Number: 13-1118-0010
Document Number: DOC023
Distribution:

Alexandra Drapack, Director Sustainable Development
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Golder Associates

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Part A: **Introduction**

Part B: **Supplemental Information Package**

Part C: **Terrestrial Ecology Technical Support Document, Version 1**

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PART A

Introduction

Version 1 of the Terrestrial Ecology Technical Support Document (TSD) was published on February 15, 2013 as part of Osisko Hammond Reef Gold's (OHRG) Draft Environmental Impact Statement/Environmental Assessment (EIS/EA) Report.

The Draft EIS/EA Report underwent a seven week public review comment period after which, on April 5, 2013, OHRG received comments from the public, Aboriginal groups and the Government Review Team (GRT) seeking clarification and requesting new information.

Approximately 80 comments regarding the Terrestrial Ecology TSD and component of the EIS/EA Report were received from the GRT. Written responses have been prepared for each comment and are provided in Appendix 1.IV of the EIS/EA Report.

Version 1 of the Terrestrial Ecology TSD has not been revised. The methods used to define baseline conditions and predict potential changes are technically defensible and based on standard industry practices. The conclusions and results presented in the Terrestrial Ecology TSD are sound and have remained the same after consideration of comments received.

The EIS/EA Report has been revised and updated based on comments received. Version 2 of the Terrestrial Ecology TSD is comprised of the following:

- Part A: Introduction
- Part B: Supplemental Information Package (attached) that provides additional detail on new work undertaken related to the Terrestrial Ecology component and the information presented in the Terrestrial Ecology TSD.
- Part C: Version 1 of the Terrestrial Ecology TSD. Part C was issued in February 2013, and is available online on OHRG's website; it has not been re-printed as part of this Version 2 of the Terrestrial Ecology TSD. The Version 1 document should be reviewed within the context of this Version 2 document, and associated updated information as presented in Part A or Part B should be considered as correct should it differ from the information presented in Version 1.

A summary of the information found in Part B is provided below. Throughout the EIS/EA Report, unless otherwise noted, all references made to the Terrestrial Ecology TSD are to Part C.

Bat Monitoring and Effects Assessment

In response to comments that the Terrestrial Ecology assessment did not consider the potential effects of the project on bat species listed under the *Species at Risk Act*, a bat monitoring program was undertaken define baseline conditions with respect to bat habitat and bat presence in the project study area. The monitoring program was undertaken during both the maternity roosting and hibernacula periods and utilized both acoustic and visual assessment approaches. Through this monitoring program, it was determined that maternity roosting and hibernacula habitat were both present in the study area and an effects assessment was completed. The detailed results of the monitoring program and effects assessment are provided in the attached Supplemental Information Package. The results of the monitoring program have been summarized in Chapter 3 of the Final EIS/EA Report and the results of the effects assessment have been summarized in Chapter 6.

Other Supplemental Information

Information requests from the GRT requested more detail and information on several aspects of the terrestrial assessment. In response to these information requests, additional information was prepared and has been provided in the Supplemental Information Package (Part B). The table below provides a summary of the additional information requested and the corresponding documents in the Supplemental Information Package in which the information is provided.

Additional Information Requested	Location of Information in the Supplemental Information Package
Provide the predicted number of individuals or pairs of upland breeding birds (Canada Warbler and 21 other BCR 12 priority species) displaced	Response to Information Request EC-49
Provide eco-site types within TMF, WRMF and Low Grade Ore Stockpile footprints prior to disturbance and the type of rehabilitation planned	Response to Information Request MNR-286
Provide results from wetland complex evaluations using the Northern Ontario Wetlands Data Evaluation and Scoring Record	DVD containing evaluation results
Revise Figure 1-3 to include the transmission line in the legend	Revised Figure 1-3
Revise name Seine River First Nation community on Figure 2-5	Revised Figure 2-5
Revise Figure 2-10 to highlight the moose aquatic feeding site at the north end of Lizard Lake	Revised Figure 2-10
Revise legend on Figure 3-2	Revised Figure 3-2

Minor Corrections and Clarifications

The following minor text corrections and clarifications should be noted:

Access to the Project Site is presently via two routes: the Premier Lake Road, a gravel *forest access road* that intersects Highway 623 near Sapawe and the Hardtack-Sawbill Road, a gravel *forest access road* that intersects Highway 622 northwest of the Town of Atikokan. The TSD does not specify that these routes are forest access roads (Section 1.3.1, page 7). In response to Information Request MNR-142, the reader is directed to consider these as forest access roads when reading the Version 1 Terrestrial Ecology TSD.

In response to MNR-16 and MNR-169 all references to "*Sapawe Forest*" in reference to the Sapawe Forest Management Unit within the Version 1 Terrestrial Ecology TSD should now be read as "Rainy Lake Tribunal Forest Management Unit". Similarly, all references to "Crossroute Forest Management Unit" within the TSD should now be read as "Resolute Forest Management Unit." This change has been made in the EIS/EA document. Figure 2-6 of the Version 1 Terrestrial Ecology TSD has been revised to reflect this change in names, and is attached in Part B.

In response to MNR-175, it is acknowledged that the construction of the accommodation camp may interact with the Forest Cover VEC of the Terrestrial Ecological environment. This was omitted from Table 3-4 in Section 3.2.1 of the Version 1 Terrestrial Ecology TSD. The reader is directed to consider a potential direct

interaction between the accommodation camp construction and the forest cover VEC when reviewing Table 3-4 of the Version 1 Terrestrial Ecology TSD.

Section 2.2.2.2.1.1 (page 43) of the Version 1 Terrestrial Ecology TSD contains an incorrect reference to Figure 2-10. The reader is directed to ignore this reference when reviewing the Version 1 Terrestrial Ecology TSD.

Supplemental Information Provided in Part B

- Terrestrial Ecology Technical Support Document Addendum – Effects Assessment for Bats (November 14, 2013)
- Response to Information Request EC-49
- Response to Information Request MNR-286
- DVD with wetland complex evaluation results
- Revised Figure 1-3 (from Response to Information Request MNR-150)
- Revised Figure 2-5 (from Response to Information Request MNR-171)
- Revised Figure 2-10 (from Response to Information Request MNR-187)
- Revised Figure 3-2 (from Response to Information Request MNR-186)

PART B

Supplemental Information Package

December 2013
Project No. 13-1118-0010
Hammond Reef Gold Project

November 14, 2013

HAMMOND REEF GOLD PROJECT

Terrestrial Ecology Technical Support Document Addendum-Effects Assessment for Bats

Submitted to:
Osisko Hammond Reef Gold Ltd.
155 University Avenue, Suite 1440
Toronto, Ontario M5H 3B7

REPORT

Project Number: 13-1118-0010

Document Number: 009 (Rev 0)

Distribution:

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Cathryn Moffett, Project Manager Sustainable Development

Golder Associates

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1.0 INTRODUCTION

1.1 Purpose and Scope

The purpose of this addendum is to consider effects of the proposed Hammond Reef Gold Project on bats. The draft Terrestrial Ecology Technical Support Document (TSD) identified the potential for bats and bat habitat in the Project study areas (Golder 2013). The TSD also identified the potential for Species At Risk bats in the study areas. Little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*) were designated as Endangered on the Species at Risk in Ontario (SARO) List on January 24, 2013 and thus receive species and habitat protection under the *Endangered Species Act, 2007* (ESA). Comments from the Ontario Ministry of Natural Resources on the Terrestrial Ecology TSD included several related to the need for an assessment of endangered bat species (IR-MNR-131, 139, 223). This addendum is submitted to address the field investigations for bats at the Hammond Reef site and provide an effect assessment of the project on bats.

2.0 METHODS

The approach to the assessment of bats on the Hammond Reef site was designed to determine species presence and to assist in the identification of bat maternity roosts and potential bat hibernacula in the mine study area (MSA) and local study area (LSA). The methods for the bat surveys were adapted from *Bat Habitats: Guidelines for Wind Power Projects* (MNR 2011). The field surveys conducted were:

- Maternity Season Stationary Acoustic Surveys;
- Maternity Season Mobile Transects;
- Swarming Season Visual Assessment; and
- Swarming Season Stationary Acoustics.

For the purposes of the bat surveys, efforts were focussed on the vegetation communities which have the potential to contain suitable maternity roosts and potential hibernation habitat as identified during baseline surveys for the Hammond Reef Gold Environmental Assessment (Golder 2013). The bat surveys were conducted in the LSA which encompasses the extent of the proposed physical disturbance related to the mine development footprint plus a buffer of 200 m or more which represents the potential extent of hibernacula as discussed in the Guidelines (OMNR 2011).

2.1 Maternity Season Surveys

2.1.1 Maternity Season Stationary Acoustic Surveys

All Vespertilionid bats of North America use echolocation for navigation and hunting of insect prey (Kunz and Racey 1998). For this reason, acoustic recording of echolocating bats is an effective method to determine the presence and relative abundance of bats at a particular location (Kunz and Parsons 2009). Acoustic survey of bats provides a measure of the passage rate of bats at a particular location which can then be used to determine relative abundance of each species recorded and determine species presence and potential use of the general landscape during each season. However, there are limitations to this type of survey method in that an acoustic detector cannot be used to determine the absolute abundance, sex, age or behavioural activity of the bats. Acoustic recordings aren't used to locate particular roosts unless accompanied by site specific visual observation

as bats may be passing by (commuting) on the way to feed several kilometres from their roost. However, acoustic recordings of bats at specific times of the year can give some indication of habitat usage.

In terms of habitat preferences during maternity roosting, the MNR Guidelines indicate that maternity roosts are typically situated in mixedwood forests and deciduous forests (OMNR 2011). Mixedwood forest habitat is common throughout the LSA, therefore acoustic survey stations were situated along the edges of forest communities with preference for those containing large trees (forests with the potential to have trees of >25 diameter at breast height, tree cavities and snags).

Ten stationary acoustic survey stations were established throughout the Hammond Reef LSA during the maternity season from June 24/25 – July 8/9, 2013. Each acoustic detector recorded from twelve to fourteen full nights of data during this period. The acoustic survey stations each consisted of a Binary Acoustics Technology (BAT) AR125 detector and a solar power panel. The locations of the acoustic survey stations (BAT 01-BAT09) during the maternity season are depicted on Figure 1: Map sheets 1-4.

Acoustic detectors were situated in areas with good solar exposure to allow the solar panel to recharge the detector battery during the day thereby reducing the risk of power failure. A description of the habitat of each station is provided in Table 1.

Table 1: Maternity Season Acoustic Monitoring Stations for the Hammond Reef Project

Station	UTM Location	Habitat Description
BAT01	15 U 611884 5421071	Within a cutover area between Mitta Lake and Marmion Reservoir. Residual stands of mixed forest beside re-circulation sump pond.
BAT02	15 U 611600 5421251	Disturbed site surrounded by mixed forest. Large black ash present. Near a re-circulation sump pond.
BAT03	15 U 613124 5421328	In a disturbance clearing within a mixed forest habitat type. Large aspen and red pine present.
BAT04	15 U 612466 5421780	On a rocky outcrop at the edge between dense mixed forest and a meadow marsh. Snags present.
BAT05	15 U 613869 5421269	Shoreline of Marmion Reservoir. Shoreline is surrounded by mixed forest containing large aspen.
BAT06	15 U 618242 5425391	At the edge of clearing for a weather station surrounded by dense mixed forest.
BAT07	15 U 617796 5428024	At the edge of a beaver pond surrounded by mixed forest. Snags present.
BAT08	15 U 618859 5428671	At the edge between a marsh and mixed forest habitat. Snags present.
BAT09	15 U 613968 5430674	Roadside meadow marsh surrounded by mixed forest.
BAT10	15 U 612809 5426730	At the edge of a sand pit surrounded by dense mixed forest.

611000 612000 613000 614000

5428000 5427000 5426000

N

Bat10

461 ES-F
414 ES-B
413 W2
107 ES-E
414 W4
437 W12
535 W32
243 W31
108 ES-H
246 W35
244 W14
440 W29
438 W18
418 W14
436 W12
441 W30
439 W27
316 ES-F
247 W13
128 ES-H
460 ES-H
444 W30
426 ES-B
445 W3
427 ES-D
442 W35
443 W16
267 W25
266 W30
131 ES-F
248 W22
481 W12
332 W35
260 W16
419 ES-E
132 ES-G
249
disturbed
109 ES-F
483 W30?
130 ES-H
259 W30
425 W30
447 W27
428 ES-D
263 W12
265 W30
262 W35
135 ES-F
269 W35
134 ES-G
133 ES-H
268 W11
482 W12
264 W12
261 W33
129 ES-E
446 W4
459 ES-F
273 W30
250 W32
110
426 W12
434 W29
420 ES-E
418 ES-F
420 W14
318 ES-H
274 W31
271 W13
111 ES-F
270 W35
421 ES-F
431 W30
331 W11
432 W28
427 W21
435 W31
537 W31
113 ES-H
112 ES-C
429 W29
428 W31
430 W30
433 W16
272 W30
422 ES-H
276 W14
423 ES-F
423 W14
334 W30
330 W32
538 W30
329 W4
314 ES-H

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Bat Survey Location (2013)
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4,
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
2013 BAT SURVEY LOCATIONS
MAP SHEET 1 of 4

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	REV. ION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	25 Sep. 2013		
CHECK	AVS	25 Sep. 2013		
REVIEW	KT	25 Sep. 2013		

FIGURE: 1

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611000 612000 613000 614000 615000

5423000 5422000 5421000 5420000

N

425 ES-F
311 ES-A
313 ES-A
312 ES-A
209 ES-H
204 ES-H
571 W5
210 ES-H
212 ES-H
216 ES-E
157 ES-H
171 W14
575 W29
211 ES-E
29 ES-F
28 ES-E
170 W31
213 ES-E
Heli Ref
Heli Ref2
174 W14
200 ES-J
Adit1
Adit2
155 ES-E
203 ES-E
208 ES-H
206 ES-F
193 W4
194 W35
192 W15
195 W28
238 W31
214 ES-H
202 ES-I
205 ES-H
Bat04
2 ES-D
201 ES-F
208 W31
199 ES-F
156 ES-H
16
0
Mitta Lake
17
Bat03
236 ES-H
209 W31
Bat05
210 W31
479 W13
183 W13
211 W30
572 W32
478 W13
179 W13
190 W34
Bat02
182 W13
533 W1
246 ES-I
322 W3
Bat01
94 ES-B
181 W14
178 W12
169 W14
176 W14
244 ES-B
198 ES-A
243 ES-C
191 W15
1 ES-E
180 W4
15 ES-E
207 ES-H
215 ES-F
Lynxhead Bay

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Bat Survey Location (2013)
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4,
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

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METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
2013 BAT SURVEY LOCATIONS
MAP SHEET 2 of 4

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	REV. ION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	25 Sep. 2013		
CHECK	AVS	25 Sep. 2013		
REVIEW	KT	25 Sep. 2013		

FIGURE: 2

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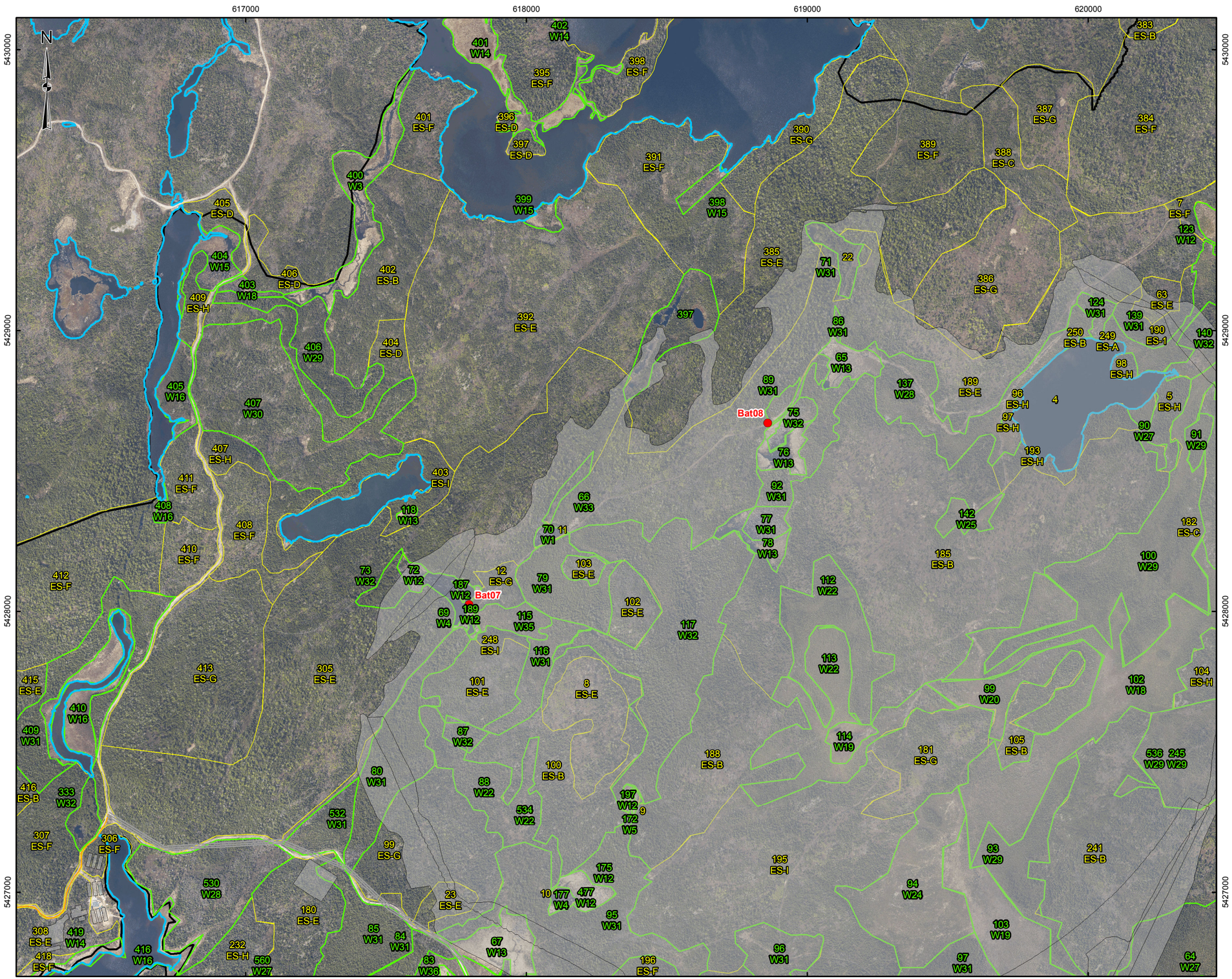

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Bat Survey Location (2013)
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4,
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
2013 BAT SURVEY LOCATIONS
MAP SHEET 3 of 4

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	REV. ION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	25 Sep. 2013		
CHECK	AVS	25 Sep. 2013		
REVIEW	KT	25 Sep. 2013		

FIGURE: 3

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617000 618000 619000 620000

5427000 5426000 5425000 5424000

Bat06

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Bat Survey Location (2013)
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4,
Produced by Golder Associates Ltd under licence from
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
2013 BAT SURVEY LOCATIONS
MAP SHEET 4 of 4

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	REV. ION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	25 Sep. 2013		
CHECK	AVS	25 Sep. 2013		
REVIEW	KT	25 Sep. 2013		

FIGURE: 4

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At the end of the survey period (12-14 recording events/nights during the maternity season), the bat detectors were collected and the data analyzed using the automated classifier software. BAT detectors are designed and programmed to collect full spectrum data files with a maximum 15 second recording length that can be filtered using Scan'R© and Scrubber©, followed by automated species classification using Sonobat©. A bat pass is considered one file with at least one recording of bat echolocation pulses, but may include multiple individuals or species. The total number of passes for each species or species group was tallied on a per-night basis. An average bat pass per night and a standard deviation associated with the average was calculated.

2.1.2 Maternity Season Mobile Transects

Two mobile transect surveys were conducted using a BAT AR125 detector fixed to the roof of a truck. Mobile transect surveys are used to maximize the spatial coverage for acoustic detector surveys to allow for a relative comparison of bat species presence in a variety of habitats along transects. Transect surveys are conducted in several regions including in Ontario by the MNR, although no formal methods are available. Methods for transect surveys generally followed Britzke and Herzog (2013).

The transect surveys in the Project study areas were conducted on the nights of June 24 and June 25, 2013. The truck mounted detector traversed a total of 50 km each transect with a constant speed of approximately 30 km/hr when possible, to reduce the chance of recording the same individual multiple times. Transect surveys started a half hour after sunset on nights with appropriate weather conditions. A map of the transect route is provide in Figure 2.

2.2 Swarming Season Surveys

2.2.1 Swarming Season Visual Assessment

Hibernation by bats is preceded by swarming or flights through or around the hibernacula, which occurs in August and September in Ontario (Gerson 1984; Caceres and Barclay 2000). Swarming can be identified by an increase in relative acoustic activity levels of bats from locally established baseline activity of the same species (Glover 2008).

The MNR Guidelines (OMNR 2011) indicate that habitat features that have the potential to be hibernacula (termed candidate hibernacula in the Guidelines) are surveyed for up to 10 nights in August to determine if they are used for swarming. If swarming activity is detected on any night, the visual assessment is complete and no further visual assessment is required.

Two mine adits on the Hammond Reef mine site, identified as potential bat hibernacula, were surveyed visually from August 12 –21, 2013 (Figure 1-Map sheet 2 of 5). Visual surveys entailed a surveyor watching for bat activity at the entrance of the potential hibernacula, supplemented with acoustic detection of bats using a hand-held device.

Surveys were initiated 30 minutes before sunset and continued until at least two hours after sunset. Both adits were monitored concurrently and each surveyor also had an Echo meter (EM3) handheld bat detector.

Surveyors observed the area for visual sightings of bats and monitored acoustically with the hand-held device. All bat observations were noted. Echo meter recordings were later analyzed using Kaleidoscope© and Sonobat© software and manual species identification was conducted by an experienced bat acoustic specialist.

600000
610000
620000
5430000
5420000
5410000

N

LEGEND

Bat Driving Transect Route

- June 24th
- June 25th
- Road
- Trail
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000
SCALE 1:100,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
BAT DRIVING TRANSECT ROUTES

Golder Associates
Mississauga, Ontario

PROJECT NO. 13-1118-0010			SCALE AS SHOWN	VERSION 2
DESIGN	CGE	14 Nov. 2008		
GIS	JO	11 Sep. 2013		
CHECK	REJ	11 Sep. 2013		
REVIEW	KJD	11 Sep. 2013		

FIGURE: 2

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Although this type of survey is used to indicate the location of hibernacula, it does not confirm the use of the hibernacula. Entry into the feature during hibernation would provide a better indication of the status of the potential hibernacula. Sherwin (2009) states that unaided external visual observations are not generally recommended because they are costly and usually provide data of limited value with no verifiable record to more accurately quantify and confirm use.

2.2.2 Swarming Season Stationary Acoustics

To supplement the visual surveys at potential hibernacula, stationary BAT detectors were deployed during the swarming season. The detectors were placed within 10 meters of the old mine adits/potential hibernacula and recorded up to 8 nights after deployment on August 12, 2013. BAT detector stations are illustrated on Figure 1. Note that although the detectors were set up to record for 10 nights, power failures limited the recordings to 6-8 nights each. Reference stations were also set up as illustrated on Figure 1. Initially, a reference station was sited adjacent to a helicopter pad located approximately 300 meters north of Adit 1 (Reference station 1). This reference location was selected due to its proximity to the mine adits and the similarity in landform, ground cover and adjacent vegetation structure and composition as the mine adits. Within the duration of the swarming survey (on August 19th) the reference station was relocated to a similar site approximately 185 meters to the east of the original reference station (Reference station 2). This reference station relocation was determined to be necessary as the helicopter pad was to be used and the down-draft from a helicopter may have damaged the acoustic equipment at Reference station 1.

BAT detectors are designed and programmed to collect full spectrum data files with a maximum 15 second recording length that can be filtered using Scan'R© and Scrubber©, followed by automated species classification using Sonobat©. A bat pass is considered one file with at least one recording of bat echolocation pulses, but may include multiple individuals or species.

3.0 RESULTS

Range maps indicate that six species of bats have known home ranges that encompass the LSA and MSA (Bat Conservation International, 2013). These include hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), little brown myotis and northern myotis. All of these species were recorded during the 2013 bat field surveys at Hammond Reef. An additional species, small-footed myotis (*Myotis leibii*) was also recorded during the 2013 field surveys. Although the known range for this species does not currently encompass the study areas, little data have been collected in this area. Based on consultation with bat researchers Craig Willis and Brock Fenton (Derek Morningstar personal communication, August 27, 2013), it is plausible that this species may use habitat in this region of northwestern Ontario. However, this record cannot be confirmed until a specimen is captured.

3.1 Maternity Season Surveys

During the summer, bats occupy a variety of day and night roosts (Caceres and Barclay 2000). Sexes roost separately, and reproductive females of colonial species form maternity colonies in tree cavities, buildings or a variety of other structures. Adult males and non-reproductive females roost singly or in small (<10) groups in buildings, caves or trees (Nagorsen and Brigham 1993; Nagorsen and Nash 1984; Turner 1974). Studies indicate that little brown myotis and northern myotis are not likely to travel far (1-2 kilometers maximum) from their maternity roosts for feeding when young are present (Broders 2008). The young are born in June and by

late July or August the nursery colonies are abandoned for other roosts (Fenton 1969; Banfield 1974; Gerson 1984).

3.1.1 Maternity Season Stationary Acoustic Survey Results

The ten stationary acoustic survey stations are depicted on Figure 1. Each acoustic detector recorded from twelve to fourteen full nights of data during the maternity roosting season. The mean number of passes for each species or species group is provided in Table 2 with a standard deviation from the mean in parenthesis to indicate variability in the calculations. The total passes for little brown myotis and northern myotis and the maximum passes within a single night for each of these species are provided in Table 3.

Seven species of bats were recorded in the LSA during the maternity season. Little brown myotis individuals were recorded at all 10 stations and northern myotis were recorded at three stations. The small-footed myotis (*Myotis leibii*) was recorded at five of the stationary acoustic stations. This record is outside of the known range of this species; however, the observation is not thought to be unusual or mistaken as little is known about this species (Derek Morningstar personal communication, August 27, 2013).

The highest level of total bat activity (all species combined) was at station BAT05 where an average of 108.85 bat passes per night was recorded. This is the location where the highest activity of little brown myotis was observed, with an average of 26.77 passes per night to a maximum 198 passes on July 7, 2013 and a total of 348 passes across 13 nights. Hoary bat was also common at Station BAT05, with an average of 23.92 passes per night. BAT05 was located at the edge of the water where bats from the local area likely commute and feed.

Little brown myotis activity ranged from 0.29 to 9.46 average passes per night at all stations other than BAT05. Relatively high bat activity was also observed at BAT07 and BAT03, with 39.31 and 32.23 passes of all bat species combined on average per night, respectively. Little brown myotis is the most common bat recorded by the detectors among all the stations, with hoary bat and silver-haired bat being the second and third most common. Northern myotis was uncommonly recorded with a maximum of two passes observed on July 2, 2013 at BAT06, although this may be due in part to its secretive behaviour and close association with interior forest habitat.

BAT09 is located outside of the LSA and was used as a reference station for these surveys. The results show that the level of activity at BAT 09 was similar to the other stations within the Project study areas.

Table 2: Mean nightly passes of individuals of each bat species or species group (with a standard deviation from the mean in parenthesis) during the maternity season stationary acoustic surveys

Station	Nights	Mean nightly passes of all species (standard deviation)	Hi Frequency recordings[(a)] (standard deviation)	Lo Frequency recordings [(b)] (standard deviation)	Mean nightly passes per species or species group (standard deviation)								
					Big brown bat or silver-haired bat	Unknown Myotis	Hoary bat	Silver-haired bat	Big brown bat	Red bat	Little brown myotis	Northern myotis	Small-footed myotis
BAT01	14	10.5(3.82)	5.64(2.47)	4.86(3.01)	0.21(0.58)	0.14(0.36)	0.57(0.65)	2.21(1.72)	0.14(0.36)	0.21(0.43)	1.36(1.15)	0(0)	0(0)
BAT02	14	19.29(9.72)	8.29(4.56)	11(6.93)	0.14(0.36)	0(0)	2.71(2.76)	0.29(0.47)	0.29(0.61)	0.21(0.43)	1.07(1.86)	0.07(0.27)	0.07(0.27)
BAT03	13	32.23(14.69)	21.15(11.68)	11.08(5.16)	0.85(0.8)	0.31(0.48)	1.54(1.39)	3.54(3.82)	1.85(1.57)	2.46(2.7)	4.15(2.76)	0(0)	0.08(0.28)
BAT04	14	10(6.08)	6.79(5.62)	3.21(2.19)	0.07(0.27)	0.07(0.27)	0.36(0.84)	0.71(0.91)	0.36(0.63)	0(0)	2.71(3.31)	0(0)	0(0)
BAT05	13	108.85(120)	45.08(79.82)	63.77(62.61)	6.46(8.36)	0.31(0.48)	23.92(25.95)	12(12.46)	6.18(5.67)	2.71(2.98)	26.77(52.59)	0(0)	0.08(0.28)
BAT06	14	12.14(6.74)	8(5.04)	4.14(2.54)	0.21(0.43)	0.86(1.41)	0.5(1.16)	1.43(1.6)	0.14(0.36)	0.07(0.27)	1.64(1.39)	0.36(0.63)	0.21(0.43)
BAT07	13	39.31(21.17)	19.08(20.08)	20.23(7.96)	0.85(1.68)	0.08(0.28)	5.15(2.34)	7(3.34)	0.62(0.87)	0.54(0.66)	9.46(10.19)	0(0)	0(0)
BAT08	12	7.75(3.98)	4.08(2.39)	3.67(3.03)	0.08(0.29)	0(0)	1.33(1.37)	0.58(0.79)	0.17(0.58)	0.33(0.49)	0.75(0.87)	0.08(0.29)	0.08(0.29)
BAT09	14	14.29(11.46)	12.07(11.1)	2.21(1.97)	0.07(0.27)	0.14(0.36)	0.86(1.1)	0.29(0.47)	0(0)	0.36(0.5)	6.57(7.04)	0(0)	0(0)
BAT10	14	6.36(3.3)	3.43(2.59)	2.93(2.13)	0.07(0.27)	0.07(0.27)	0.21(0.58)	0.5(0.76)	0.07(0.27)	0(0)	0.29(0.61)	0(0)	0(0)

Note:

(a) Hi frequency bats include little brown myotis, northern myotis and red bat
(b) Lo frequency bats include hoary bat, big brown bat and silver-haired bat

Table 3: Total passes among all nights and maximum passes within a single night of SAR little brown myotis and northern myotis during the maternity roosting stationary acoustic surveys

Station	Total Little Brown Myotis Passes	Max Little Brown Myotis Passes in Single Night	Total Northern Myotis Passes	Max Northern Myotis Passes in Single Night
BAT01	19	3	0	0
BAT02	15	6	1	1
BAT03	54	9	0	0
BAT04	38	13	0	0
BAT05	348	198	0	0
BAT06	23	4	5	2
BAT07	123	42	0	0
BAT08	9	2	1	1
BAT09	92	24	0	0
BAT10	4	2	0	0

3.1.2 Maternity Season Mobile Transects Results

Fifty kilometer mobile transect surveys through the LSA yielded recordings of bats at several locations. The location of the transect is depicted in Figure 2.

On June 24, 2013, 27 bat passes were heard through the bat detector of which 15 passes could be classified by species/species group. The detailed results are as follows: seven passes of the big brown or silver-haired bat group, one pass of an individual in the unknown myotis group, one hoary bat pass, two silver-haired bat passes, two big brown bat passes and two little brown myotis passes.

On June 25, 2013, 25 bat passes were heard through the bat detector of which 15 passes could be classified by species/species group. The detailed results are as follows: two passes of individuals in the big brown bat or silver-haired bat group, one pass of an individual in the unknown myotis group, two hoary bat passes, six silver-haired bat passes and four little brown myotis passes.

3.2 Swarming Season Surveys

Hibernation by bats is preceded by swarming or flights through or around the hibernacula, which occurs in August and September in Ontario (Gerson 1984; Caceres and Barclay 2000). Swarming can be identified by an increase in relative acoustic activity levels of bats from locally established baseline relative activity of the same species (Glover 2008). Glover (2008) also found that sites with high levels of acoustic activity during the swarming season also had a large abundance of bats hibernating in nearby hibernacula.

Bats spend the winter in their hibernacula, usually caves or abandoned mines (Caire et al. 1979; Griffin 1940; Hitchcock 1965; Whitaker and Rissler 1992a,b), but occasionally in buildings (Barbour and Davis 1969). Hibernation may begin in September to early November and last until March, April or May (Caire et al. 1979; Griffin 1940; Hitchcock 1949; Mills 1971).

The protection of little brown myotis and northern myotis under the ESA was in response to documented significant mortality of these species in northeastern North America. These species and others that hibernate in caves have been affected by a novel disease coined white-nose syndrome (WNS) which was first discovered in a cave in New York in 2006. The disease is characterized by a fungus recently reclassified as *Pseudogymnoascus destructans* (Minnis 2013) which erodes the dermis and epidermis of the bat's skin and grows best during the winter hibernation period of these bats (Meteyer 2012). Mortality levels of caves revisited after infection by the disease are as high as 90-100% (Buchen 2010). The current known distribution of WNS in eastern North America is shown in Figure 3. The study area is not within the current distribution of WNS.

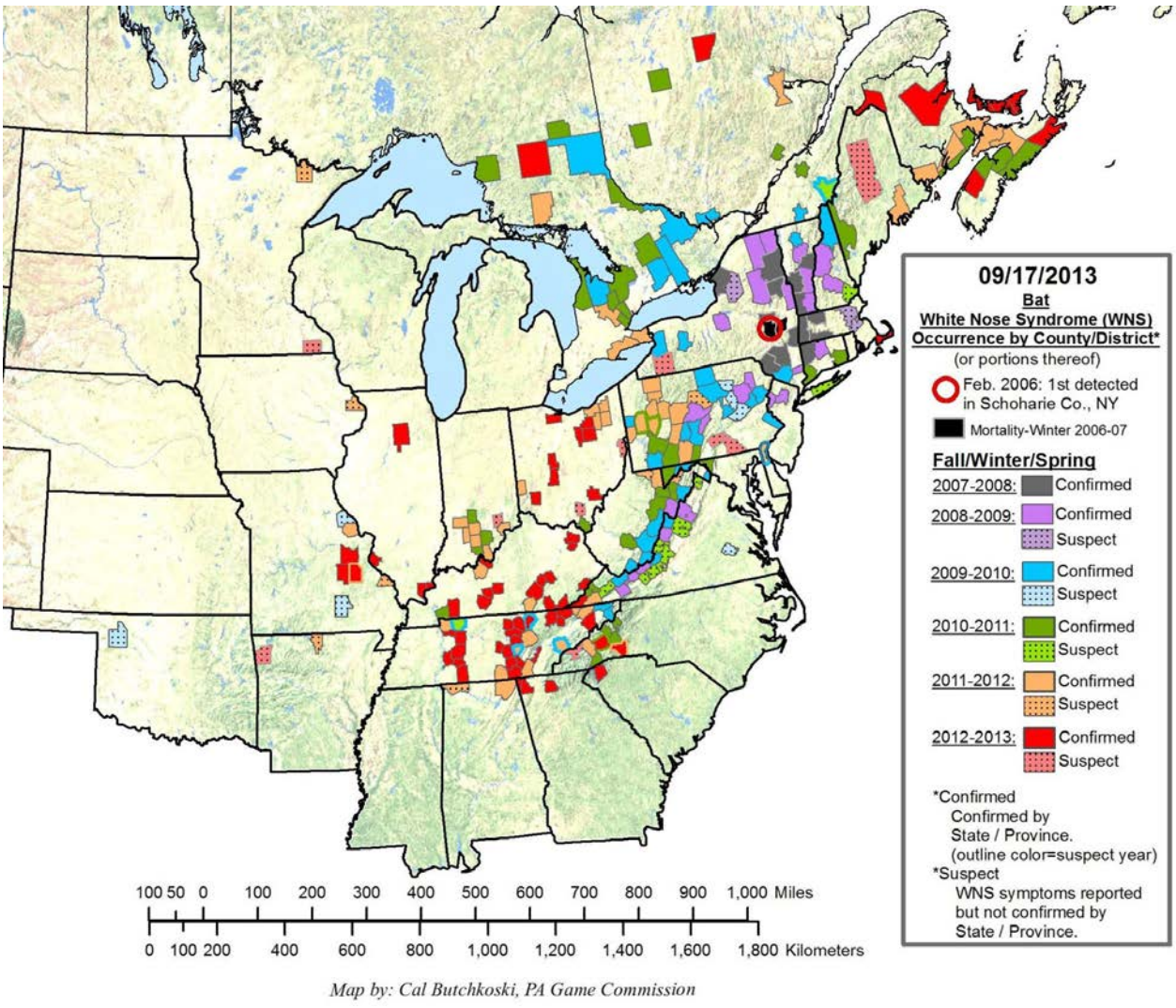

Figure 3: White nose syndrome occurrence by county/district as of September 17, 2013.

3.2.1 Swarming Season Visual Assessment Results

The visual surveys at the potential hibernacula (mine adits) between August 12 and 21, 2013 did not confirm swarming activity. Individual bats were observed and/or acoustically recorded each night at the adits, however they were not observed entering or exiting the adits or interacting with each other. Therefore, the results of the 10 nights of visual assessment do not indicate swarming behaviour.

The visual assessment did result in the observation of an individual bat landing on the rock at the entrance to Adit 2 on two consecutive night surveys. The individuals that landed were later classified using the acoustic sonograms recorded on the EM3, and were both silver-haired bats, a species that does not hibernate in caves or mines. The implications of this behaviour are unknown.

3.3 Swarming Season Stationary Acoustics

Stationary BAT detectors recorded bat activity for six nights at Adit 1 and 8 nights at Adit 2 (Figure 2). The mean numbers of passes for each species or species group are provided in Table 4 with a standard deviation from the mean in parenthesis to indicate variability in the calculations. The total passes of little brown myotis and northern myotis and maximum passes for each of these species within a single night are provided in Table 5.

Little brown myotis activity was 16.83 average passes per night at Adit 1 and 9.88 average passes per night at Adit 2. These activity levels are substantially higher than the reference station concurrently monitored, which had an average of 2.88 little brown myotis passes per night. It is also higher than the maternity season activity levels for this species at all stations except BAT05.

This level of activity of little brown myotis relative to a concurrently monitored reference station and the levels detected during the maternity season may suggest that swarming activity is taking place at both mine adits.

Table 4: Mean (standard deviation) nightly passes of bats individuals of each bat species or species group during the swarming season stationary acoustic surveys

Station	Nights	Mean nightly passes of all species (standard deviation)	Hi Frequency recordings[(a)] (standard deviation)	Lo Frequency recordings [(b)] (standard deviation)	Mean nightly passes per species or species group (standard deviation)								
					Big brown bat or silver-haired bat	Unknown Myotis	Hoary bat	Silver-haired bat	Big brown bat	Red bat	Little brown myotis	Northern myotis	Small-footed myotis
Adit 1	6	54.67(27.13)	46.67(23.19)	8(4.9)	0(0)	0.83(0.75)	0(0)	2.17(1.47)	1.17(1.33)	2.33(2.94)	16.83(11.91)	0(0)	0(0)
Adit 2	8	67.75(56.33)	25.63(16.01)	42.13(40.93)	1.38(1.85)	0.25(0.46)	0.88(1.13)	17.88(20.17)	6.5(6.82)	1(1.07)	9.88(6.81)	0(0)	0(0)
Reference station (combination of References station 1 and 2)	8	24.5(8.35)	19.38(5.9)	5.13(2.77)	0.5(0.73)	0.5(1.01)	0(0)	0.63(0.88)	0.25(0.44)	0.75(1.12)	2.88(1.51)	0.25(0.44)	0.25(0.5)

Note:

(a) Hi frequency bats include little brown myotis, northern myotis and red bat
(b) Lo frequency bats include hoary bat, big brown bat and silver-haired bat

Table 5: Total passes among all nights and maximum passes within a single night of little brown myotis and northern myotis during the swarming season

Station	Total Little Brown Myotis Passes	Max Little Brown Myotis Passes in Single Night	Total Northern Myotis Passes	Max Northern Myotis Passes in Single Night
Adit 1	120	33	1	1
Adit 2	110	29	0	0
Reference station	23	5	2	1

3.4 Summary of Results

During the maternity roosting season, seven species of bats were recorded in the LSA. These species include little brown myotis and northern myotis, the two species currently listed as endangered under Ontario's Endangered Species Act. These two species form maternity roosting colonies in the cavities of mature trees. This type of maternity roosting habitat is available throughout the MSA, and the LSA and further beyond in other forested communities. Therefore, although maternity roosting habitat for bat species including little brown myotis and northern myotis is available in the Project a study area, this type of habitat is not limited to the Project site.

The high levels of bat activity at the surveyed mine adits, relative to the reference station suggest that swarming activity may be occurring. In particular, mean passes by little brown myotis at these adits may indicate that they could be used as hibernacula.

4.0 EFFECTS ASSESSMENT

The potential pathways for the project activities to affect bats are summarized in Table 6. The Project Component column refers to the main Project activities (grouping of common activities) which are detailed in the Terrestrial Ecology TSD and the EIS report (Golder 2013). An effect pathway is composed of the physical effect of the Project (e.g., alteration of flows and drainage patterns) and the ecological consequence (e.g., changes in vegetation).

Table 6: Potential Pathways of Effects to Bats

Project Component	Potential Effect Pathway	Environmental Design Features and Mitigation
Mine Footprint (open pits, tailings management facility (TMF), Ore processing Facility, waster rock management facility (WRMF), etc.) Footprint of Project access road and transmission corridor	Habitat Loss and Alteration	The design and layout of the mine footprint limits the amount of habitat that is disturbed. Installation of bat condos and bat boxes for colonial maternity roosting to replace habitat lost.
	Alteration of flows and drainage patterns can cause changes to aquatic and wetland habitats	Development of a site drainage management plan. Installation of culverts to minimize the alteration of flows and drainage patterns along linear corridors. Creation of wetlands for fish habitat compensation will attenuate flows.
	Injury/mortality due to destruction of maternity roosts in trees	Clearing of vegetation will take place outside of the maternity roosting season (month of June), where possible.
	Injury/mortality due to destruction of potential hibernacula	Timing of the excavation of the pit near the mine adits. Habitat removal will take place outside of the bat hibernation period (approximately September to May).
Mine Operations	Changes to surface water and groundwater quality based on the discharge of treated effluent, runoff from WRMF and other mine facilities may affect vegetation, soils, sediments and wildlife habitat	Any potential for acid generating mine rock will be sequestered and treated on-site. Runoff from the processing facility will be captured and diverted to the Effluent Treatment Plant. The water management mine facilities will have enough capacity to store both operating flow and storm events. Sewage will be treated in the STP and the treated effluent will either be re-used during processing or discharged to Upper Marmion Reservoir.
	Changes to water levels. Water taking from Upper Marmion Reservoir for process and potable water supply can affect wetlands and wildlife habitat including bat foraging habitat	Water taking for the processing and make-up water will be minimized by reusing the on-site water supply for multiple undertakings (e.g., water from the tailings will be recycled for the processing plant operations). Excess water will be treated and discharged to the Upper Marmion Reservoir.
	Air emissions and dust deposition can cause changes to the chemical and physical properties of surface water, soils, and vegetation which in turn affect wildlife health	Dust suppression on site using watering techniques. Enforcing speed limits on access roads and mine roads. Emission controls on construction and operation equipment. Processing facility equipped to reduce emissions. Operating procedures developed to reduce dust generation and emissions.

Project Component	Potential Effect Pathway	Environmental Design Features and Mitigation
General Construction and Operation of the Mine, Ore Processing Facility and Support and Ancillary Infrastructure	Accidental spills on the mine site or along the access road can affect soils, vegetation, wetlands and other aquatic features which in turn affect bats	Emergency spill management program. Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and the workers. Demarked areas will be established for the storage and handling of hazardous wastes.
	Sensory disturbance. Noise, vibrations and proximity to humans can cause the disturbance and displacement of wildlife	Stationary equipment will be housed in buildings. Equipment will be regularly maintained to avoid excess emissions. Limit the use of all-terrain vehicles on trails. If required, potential noise reduction measures such as mufflers, rubber lining of haul truck boxes and physical barriers may be implemented.

4.1.1 Potential Pathways for Effects

Potential pathways through which the Project could affect bats are as follows:

- Habitat Loss or Alteration (construction)
- Alteration of flows and drainage patterns (construction)
- Changes in water level (operations)
- Changes in surface water quality and groundwater quality (construction and operations)
- Sensory Disturbances (construction and operations)
- Injury/Mortality(construction and operations)
- Air emissions and dust deposition (construction and operations)

4.1.1.1 Effect 1 – Habitat Loss or Alteration

The species of bats that were recorded on the site during the maternity roosting season are tree roosting bats. Big brown bat, Little brown myotis, silver-haired bat and Northern myotis are colonial maternity roosting species, in that they form colonies in which they give birth and nurse their young. Although individual roosts were not identified during the 2013 maternity season surveys, it is evident from the acoustic recordings that some mature trees are being used by maternity colonies in the LSA. The MNR Guidelines state that maternity colonies are typically located in mature deciduous or mixed forests with more than 10 large trees (greater than 25 cm DBH) per hectare. The habitats identified in the LSA that have high suitability for bat maternity roosting are dense mixedwood habitat types, in particular the upland ecosites ES-E (Hardwood-Fir-Spruce-Mixedwood), ES-F (Fir-Spruce Mixedwood), ES-G (Pine-Spruce Mixedwood) and ES-H (Spruce-Pine/Feathermoss). These ecosites occupy 3908.76 ha in the LSA, of which 465.10 ha will be removed for the mine site footprint. This represents 11.9% of the highly preferred habitat for bat maternity roosting in the LSA. This loss of habitat is advanced for further assessment.

The swarming surveys suggest that the abandoned mine adits located within the footprint of the open pit have a high potential to be bat hibernacula. The removal of the mine adits will result in a loss of the potential bat hibernacula. This loss of habitat is advanced for further assessment.

Mitigation and Compensation

The clearing of the forest communities, particularly those with the potential to be maternity roosts will take place outside of the maternity season (June-July) where possible. The old mine adits will be sealed to prevent entry of bats prior to the hibernation period (September) during site preparation activities so that the mine operations do not disturb hibernating bats.

Due to the presence and potential for habitat of listed bats, ESA compliance will be required for the mine project activities. Should the requirement for an ESA permit under 17 (c) be triggered an overall benefit permit package would be developed in consultation with the MNR.

Continued monitoring of the potential hibernation habitat will be undertaken in consultation with the MNR and as required for ESA compliance. This monitoring will seek to verify the use of the mine adits as hibernation sites and determine the species of bats utilizing these sites.

If a permit under Section 17 (c) of the ESA is required, a detailed overall benefit plan will be developed that is agreeable to regulators. At this stage a few concepts that have been introduced to regulators are:

- Construction and installation of two bat condos and numerous bat boxes to compensate for the loss of maternity roost sites (see Appendix A for design specifications);
- Rehabilitation of other old mine shafts in northwestern Ontario to create/enhance their capacity as hibernacula;
- Phase 1 safety inspections of mines in NW Ontario to allow bat researchers (academics, MNR biologists) to enter old mines that are known/suspected hibernacula to conduct their studies;
- Installation of gates on old mines to protect bats by preventing public access and degradation of the feature; and
- Partnership and support for research into white nose syndrome.

4.1.1.2 Effect 2 – Alteration of Flows and Drainage Patterns

The Project footprint will alter surface water flows and interrupt natural drainage patterns. An alteration in the hydrological conditions of aquatic features can led to changes in the extent of wetland and aquatic features beyond the footprint. Therefore, as bats rely on wetland and aquatic habitats as foraging area, the changes in flow can alter the spatial extent and characteristics of foraging habitat.

Changes to tributary drainage areas will occur due to the interception of runoff from areas within the Project footprint by the water collection system. Changes in flows are expected to be roughly proportional to changes in tributary drainage area. A summary of predicted changes to the site watersheds is discussed in detail in the Hydrology TSD (Golder 2013b). A summary of those conditions is as follows:

The greatest changes in flows as a result of Project activities during the operations phase are expected to occur in site scale watercourses as a result of changes to their tributary drainage areas. Of the 44 site watersheds evaluated, three will be reduced in size by less than 10%, six will be reduced in size by less than 50%, nine will be reduced in size by less than 90%, and six will be reduced in size by more than 90% (one by 100%).

The expected changes in flows in LSA watercourses are as follows:

- A reduction in flows in Lumby Creek (refer to Hydrology TSD, Figure 2-3) of approximately 7% to 8% as a result of the interception of runoff from the Project footprint by the water collection system; and
- An increase in flows in Sawbill Creek (refer to Hydrology TSD, Figure 2-3) of less than 1% due to the discharge of treated sewage effluent from the Exploration and Permanent Accommodation Camps.

The water levels and flows in the wetlands that are located outside of the footprint of the Project infrastructure but in the upper part of the watersheds are not expected to change.

The wetlands that are not being directly removed in the Project footprint but that are located in the lower portion of the catchment basin will have a reduction in flows and water levels. This change in flow is advanced for further assessment.

As outlined in the Hydrogeology TSD, the cone of depression, an area in which groundwater will be drawn down as a result of pit dewatering, extends about 700 m from the open pit perimeter and underlies a portion of the WRMF and overburden stockpiles. The result is a reduction or even elimination of flows in some local streams. Also within this area, seepage losses from the stockpiles results in flow increases in some local streams. These changes are expected to be of minor consequence to bats that forage above more permanent water bodies and watercourses like Upper Marmion Reservoir.

Environmental Design Features and Mitigation

A Project Site water balance has been calculated. This has contributed to site drainage plans to minimize the change to flows throughout the LSA. Thus the water flowing in to the Project footprint will continue to be conveyed through a drainage system around Project facilities so that water does not get backed up and flood new areas. While there will be changes to flows and drainage patterns, these changes have been minimized through a site drainage management plan.

The Project Site drainage system has been designed to convey drainage across the Project Site with minor disruption to the habitats surrounding the Project footprint. In this manner, the wetlands that are located outside of the footprint of the Project infrastructure but in the upper part of the watersheds are not expected to change. To the extent practicable, clean surface water runoff will be diverted around and away from the TMF to reduce water management volumes, thereby providing water to wetlands downstream of the TMF footprint.

The access road follows an existing road way, but the existing road will need to be widened to accommodate the mine construction and operations traffic. Therefore, the widening will provide an opportunity to improve culvert crossings if required at streams and wetland crossings to improve drainage.

Wetlands are also being created to offset the loss of fish habitat. In addition to providing fish habitat, these created wetlands will compensate for the ecological and hydrological functions of the wetlands that are being lost and in doing so replace some productive habitat for insect prey.

At closure, the mine facilities will be rehabilitated as discussed in the Conceptual Closure and Rehabilitation Plan. These activities will restore some of the drainage that was lost during the construction period.

4.1.1.3 Effect 3 – Change in Water Levels

Changes to the water levels in rivers and lakes may decrease the wetted area thereby reducing the spatial capacity for insect prey production and decrease the forage base for bats.

Based on the reduced tributary drainage areas and the proposed water taking activities from the Upper Marmion Reservoir, it is predicted in the Hydrology TSD that during the operations of the Project, the maximum relative change (decreases) in monthly mean water levels in Upper Marmion Reservoir ranges from -8 to -9 cm for average, wet and dry year conditions, and the maximum relative change (decreases) in monthly mean outflows ranges from -0.8% to -4.0% for average, wet and dry year conditions, between baseline conditions and Project conditions. Water taking from Upper Marmion Reservoir is expected to decrease/lower the water level in

Sawbill Bay by 5-7 cm annually. The existing water level fluctuations in Upper Marmion Reservoir annually are up to 2.5 m. Therefore, an incremental change of 5-7 cm annually is expected to have a negligible effect on the water levels and extent of aquatic habitat in Upper Marmion Reservoir.

The estimated maximum change in monthly mean water level in Lizard Lake is -3 cm as a result of runoff interception at the TMF. Surface water modelling was completed for Lizard Lake based on the bathymetry survey in 2011. The estimated maximum change in monthly mean inflows and outflows to Lizard Lake using the same model is -8%. The reduction in tributary drainage area to the lake outlet is 7%. An incremental decrease of 3 cm annually is expected to have a negligible effect on the water levels and extent of aquatic habitat in Lizard Lake. Consequently, changes in water levels are not expected to have an impact on the production or availability of insect prey for bats.

Environmental Design Features and Mitigation

Environmental design features to reduce the amount of water required for plant operations and domestic uses include the capture and reuse of site water. The water requirements for the Project are not expected to change drainage flows and surface water levels beyond the natural variability of the baseline conditions in Upper Marmion Reservoir, and should result in a minor change to shoreline wetlands in the Upper Marmion Reservoir. Therefore, this pathway is expected to have negligible effects to the persistence of aquatic habitat in Upper Marmion Reservoir for bats.

4.1.1.4 Effect 4 – Changes to Surface Water and Groundwater Quality

Surface runoff from the newly cleared lands during construction could potentially carry sediment downstream to receiving aquatic habitats. Surface water that collects in the open pits and Project site runoff could potentially affect surface water and groundwater quality and thus the quality of habitats and food resources for bats.

Leaching of dissolved metals from WRMF may cause changes to groundwater and surface water quality and soils, which may affect the health of aquatic ecosystems. The effects of contaminants in the environment are assessed in the Human and Ecological Risk Assessment TSD.

Environmental Design Features and Mitigation

During mine operations, effluent discharge from the site to the environment will only occur via the Effluent Treatment Plant (ETP), which will discharge treated water into the Upper Marmion Reservoir.

A surface water drainage system will be established to collect the runoff generated from each site component during operations. Ditches will divert runoff flows to a series of pumping stations, which in turn will pump all collected flows to the process plant collection pond (PPCP) for treatment or use as re-claim water in the mill.

Water that collects in the open pits from groundwater seepage and from rain and snow will be pumped to the PPCP. Other runoff from the Project Site will be collected in the site drainage systems and transferred to the TMF retention pond and the PPCP. Water collected in the PPCP will be recycled into the system to the extent that it is needed. Excess water will be treated and released into Upper Marmion Reservoir. Sewage will be treated in the STP and the effluent will either be reused during the processing of ore or discharged to Upper Marmion Reservoir after treatment.

Implementation of these environmental design features is expected to result in no detectable changes to surface water or groundwater quality. Subsequently, this pathway was determined to have no interaction with bat habitats or food resources.

4.1.1.5 Effect 5 – Sensory Disturbance

Sensory disturbance can change the amount of different quality habitats, and alter wildlife movement and behaviour (distribution). Types of sensory disturbance include increased noise levels during construction and operations, visual disturbances from moving vehicles and human intrusion throughout construction and operations. Animals may respond to such disturbances by reducing their use of certain areas or altering their movement patterns within an area (e.g., Tyler 1991; Fortin and Andruskiw 2003; Bayne et al. 2008). Individuals may also respond to sensory disturbances by changing the timing of feeding activities and reducing the amount of time spent feeding. In some situations these behavioural changes can lead to a reduction in fitness (Habib et al. 2007). Effects can vary and responses appear to be species-specific and seem to depend on the type of disturbance (e.g., visual, noise, smells), the frequency and intensity of the disturbance, and the level of habituation to disturbance (Fortin and Andruskiw 2003; Bayne et al. 2008; Fahrig and Rytwinksi 2009).

All bats of the Vespertilionidae family in North America use echolocation for navigation and hunting of insect prey (Kunz and Racey 1998). Bats also use auditory cues for recognize offspring in their maternal roosting colonies, and to detect member of their social groups (Bohn K.M. et. al. 2004). Noise generated by the mine operations has the potential to interfere with the transmission and reception of auditory cues that a bat requires to function.

For the noise quality modelling for the Project, it was assumed that the operational noise levels are a bounding scenario and the expected levels during construction would not exceed those during operations. Un-weighted noise levels, described as dB_{lin}, were considered to be more appropriate for evaluating potential effects on ecological receptors than A-weighted levels (dBA), which are used in describing human response to noise. The un-weighted noise levels represent the actual acoustic energy in the atmosphere, and are considered to be a less biased representation of how ecological receptors react to noise levels in the environment. The noise model for predictions based on ecological receptors, a baseline noise level of 45 dB_{lin} at night and 50 dB_{lin} during the day in the vicinity of the Project Mine Site was used. Appendix 2.VII Figure 1 of the Terrestrial Environment TSD shows the predicted noise levels in dB_{lin} for the Project.

As depicted on Appendix 2.VII Figure 1, the highest noise levels are centered on the mine pits (70-85 dB) which are predicted to be 20-40 dB_{lin} higher than baseline. However, most of the habitat near the open pits will be cleared and thus it is not likely that bats will be exposed to the maximum noise levels near the pits. Up the peninsula to the location northeast of the proposed WRMF, the predicted noise level ranges between 50-60 dB_{lin} which is an increase of only 5-15 dB_{lin} maximum. Then further northeast, the predicted noise levels quickly attenuate back to normal ranges of 45-50 dB_{lin} which corresponds to habitat areas outside of the mine footprint.

The noise modelling also predicts the noise levels around the access road (Hardtack/Sawbill road). Table 4-11 of the Atmospheric TSD summarizes the predicted noise levels from the center of the access road based on a maximum of 18 heavy trucks per hour travelling at a speed of 80 KM per hour. The predicted noise levels reach baseline range of 45-50 dB_{lin} at 300-500 meters from the center of the road. Immediately adjacent areas to the proposed road (within 30 meters), the predicted noise level is 63 dB_{lin}. The noise from truck traffic is anticipated

to be sporadic and during the day time hours. As such, the frequency of these noise levels at dusk and during the night when bats are most active is expected to be infrequent. Based upon the infrequent occurrence of road noise events during active periods for bats and the attenuation of noise at 300-500 meters back to baseline, a residual adverse effect from road noise on bats in not expected to occur.

Furthermore, research has indicated that free-flying bats may encounter continuous interfering noises in natural situations. For instance, the Mexican free-tailed bat (*Tadarida brasiliensis)* has been found to adjust its frequency of echolocation emissions in the presence of high frequency sounds produced by chorusing insects, but only when the frequency of such choruses is within the range of the bats' own emissions (Gillam and McCracken, 2007). Other observations from the field suggest that bats may actively avoid hunting in areas that contain high levels of ultrasonic background noise (e.g. near turbulent water in streams) because this noise interferes with their echolocation (Von Frenckell and Barclay, 1987). Bates also found that bats modify their signals when confronted with an interfering stimulus (Bates et. al. 2008). Therefore, bats are not expected to be adversely affected by the noise generated from the project as there is a tendency to modify their echolocation calls to avoid interference and it is unlikely that the areas in which bats are inhabiting during the development and operations of the mine will be located within the areas predicted to have the greatest change in noise levels.

Environmental Design Features and Mitigation

Stationary equipment will be housed in buildings and all equipment will be regularly maintained to avoid excess emissions. The use of all-terrain vehicles on trails will be limited. There will be a "no hunting/fishing" policy for all employees working at the mine. This will help to minimize human intrusion into the remaining natural habitats in the LSA.

If noise guidelines (MOE publication NPC 300 "Environmental Noise Guideline – Stationary and Transportation Noise Sources – Approval and Planning) are exceeded, potential noise reduction measures such as mufflers, rubber lining of haul truck boxes and physical barriers may be implemented.

4.1.1.6 Effect 6 –Injury/Mortality

Site preparations, in particular land clearing activities have the potential to destroy maternity roosts and injure or kill young bats. Blasting and excavation during mine operations has the potential to disturb the old mine adits and thus hibernating bats, thereby making them susceptible to mortality during the winter.

Injuries and mortality due to collisions with buildings and other structures could be a risk to bats. Bats use multiple senses to orient themselves and visual cues are becoming recognized as important for bats (Orbach and Fenton 2010). Recent studies on the sensory ecology of bats are seeking to determine how they integrate visual and acoustic information. Orbach and Fenton's study on captive bats demonstrate orientation using visual cues, and suggest that high levels of light affect orientation abilities, resulting in increased rates of collision (Orbach and Fenton 2010). The proposed structures on site for the mine are not expected to have reflective surfaces or to be brightly lit. Therefore, bat injury/mortality due to collision with the buildings on the Project Site is not expected to cause an adverse effect on bats and thus is not advanced for further consideration.

Environmental Design Features and Mitigation

Awareness training of the hazards to bats, particularly the SAR bats will be provided as standard training to mine staff. Safe handling procedures will also be taught to mine staff to instruct on how to safely remove an individual from harm's way during encounters.

To avoid harming or killing bats during land clearing and construction activities, potential maternity roosting habitat (forested communities) will be cleared outside of the maternity season in June. Additionally, potential hibernacula in the footprint of the open pits will be sealed shut during site preparation activities outside of the hibernation period (before September and after May).

4.1.1.7 Effect 7 – Dust Deposition and Air Emissions

The direct effects of dust on wildlife have not thoroughly researched but may include stressed respiratory function. Sources of dust generation for the Project include vehicular traffic, blasting activities, and the operation of the Ore processing Facility. Air quality modeling was completed to predict the spatial extent of dust deposition and air emissions from the Project. The air emission modelling results are displayed in Appendix 2.VI Figures 1, 2 and 3 of the Terrestrial Environment TSD.

Dust concentrations are not expected to result in measurable changes to vegetation. Thus, changes to bats, bat habitat or their insect prey are not anticipated and thus not advanced further for consideration.

Acid deposition from air emissions includes the deposition of sulphur oxides, nitrogen oxides, hydrogen, metals, and some organic compounds (Rusek and Marshall 2000) onto soil and vegetation. Potential acid input from air emissions can change the chemical properties of soil and water, which can affect the larval stages of insects in water. Sulfur dioxide and nitrogen oxides are the major precursors of acid rain.

The air emission modelling results show that predicted annual peak concentrations for sulphur dioxide and nitrogen dioxide are very low, at 1.5 ug/m^3 and 40 ug/m^3 respectively. These peak concentrations occur to the southeast of the open pits. Beyond the LSA, the NO_2 concentration is low at 5-10 ug/m^3 and within the LSA and beyond the SO^2 concentration is very low at 0.26-0.50 ug/m^3.

The Geochemistry, Geology and Soils TSD indicates that the interaction between air emissions and soils, in particular NO_x and SO_2 is anticipated to be negligible to low and thus was not assessed further (Table 7-7, Section 4.3 in that TSD).

Although concentrations are predicted to be above baseline conditions, the anticipated changes are localized and considered minor, which should have a negligible effect on wildlife. The maximum predicted annual deposition rate of potential acid input and maximum concentration of nitrogen dioxide are both expected to occur to the southeast of the Project centre but these values are relatively low. The deposition predictions are considered to be conservative, and therefore the presented deposition rates are most likely overestimated. Therefore, changes in bat habitat quality and insect forage base due to dust deposition and air emissions are anticipated to be minor relative to baseline conditions. Consequently, residual effects to bats from dust deposition and air emissions are predicted to be negligible.

Environmental Design Features and Mitigation

Design features and mitigation measures to control dust and other air emissions include:

- The watering of roads and laydown areas during the non-winter period will facilitate dust suppression.
- Enforcing speed limits will help reduce dust production.
- Equipment and fleet equipped with industry-standard emission control systems.
- Sources of particulate emissions at the processing facility will be controlled through the use of baghouses
- Operating procedures will be developed that reduce dust generation and air emissions (e.g., regular maintenance of equipment to meet emission standards).

4.1.2 Residual Effects

There are two residual effects on bats that cannot be fully mitigated: the loss of habitat and the alteration of flow and drainage patterns.

4.1.2.1 Residual Effect 1- Loss of Habitat

The assessment of effects to bats is most relevant in the LSA. The habitat loss that will occur is confined to the Project mine site and thus the geographic extent is evaluated as low. Of the preferred bat maternity roost habitat present in the LSA, 11.9% of it will be removed for the Project mine site development. The loss of maternity roost habitat is of moderate magnitude.

The loss of the potential hibernation habitat will also occur. The loss of both types of habitat will be offset by the creation or enhancement of other habitats for bats. The details of the compensation plan have yet to be determined, however preliminary concepts include the installation of bat condos and boxes (see Appendix A for design specifications) as well as the improvement of other mine adits for use a hibernation sites.

The loss of maternity roosting habitat will take place during site preparation. The constructed maternity roosting structures will be in place prior to the first maternity season of land clearing (June). Therefore, this effect of this habitat loss on bats will not persist. Habitat loss is reversible with time, and will take a number of years for the rehabilitated mine site to mature into quality maternity roosting habitats for bats. The duration is evaluated as moderate.

The loss of potential hibernacula is being considered within the framework of the Endangered Species Act. If a permit under 17 (c) of the ESA is required, an overall benefit package will be developed in consultation with MNR which will include compensation for the loss of the potential hibernation site. The magnitude of this effect will be offset by the benefit to SAR bats developed in the ESA permit process. Therefore, although the entire hibernation site is lost due to the project, the overall benefit under the ESA will need to provide no net loss to the species. Therefore, the magnitude of this loss is downgraded to moderate.

The loss of the old mine adits will take place during the site preparation period. The objectives of the ESA overall benefit package will be initiated as soon as the permit is issued. These activities should take place at the same time or if feasible, the habitat enhancement should be undertaken before the habitat loss. Therefore, the effect of hibernation habitat loss on bats will not persist as bats will find other suitable locations in the area. The duration is evaluated as moderate.

4.1.2.2 Residual Effect 2-Alteration of Flows and Drainage Patterns

To assess the effect of changes in hydrology on bats, the LSA was determined to be the most relevant study area. The geographic extent is evaluated as moderate. The incremental predicted change in flows at a local watershed scale range from +1% to -8% as a result of interception of flow in the site water collection system and the discharges from the treatment facilities. The magnitude of residual effect on bats and bat habitat would be considered low.

The effect will take place during the construction period and continue into the operations and closure. Some wetlands will be created through fish habitat compensation during construction, which may create some additional foraging habitat for bats.

At closure, the Project will no longer be taking water from the surrounding resources. Secondly, the majority of the lands that were developed for the Project facilities will be returned back to natural states (i.e., rehabilitated and restored). Certain areas will be re-graded with contours that will be continuous with the landscape. Those flow and drainage patterns that were interrupted in these areas will be reconnected where possible. Overall, the duration of effects is considered moderate.

4.1.3 Summary of Residual Effects

Table 7: Summary of Residual Effects to SAR

Effect	Geographic Extent	Magnitude	Duration
Habitat Loss-Maternity Roosting	Low	Moderate	Moderate
Habitat Loss-Hibernation	Low	Low-Negligible	Moderate
Alteration of Flows and Drainage Patterns	Moderate	Low	Moderate

The primary threat to bats in this part of Ontario is the impact that WNS is having on populations of cave-dwelling bats. In comparison to the effect of WNS, the removal of a small proportion of bat habitat appears inconsequential to the survival of the population of bats in the province. Particularly the removal of maternity roost locations, as mature mixed forest is common in the regional landscape and is therefore not a population limiting feature. Maternity roosting habitat will be recreated using bat condos and bat boxes which are proven to be effective as artificial roosting habitat (see Appendix A for design specifications). The loss of potential hibernacula is considered to be a substantial loss to bats using this feature. However, the development and implementation of a compensation package to offset the loss will provide an overall benefit to the population of bats in this part of Ontario as is required through the ESA. Therefore, habitat loss due to the Project is expected to have low significance to bat populations.

The predicted changes in water levels as a result of the Project are not anticipated to be a threat to the survival or recovery of bats. The changes are not anticipated to prevent the achievements of a self-sustaining population of any known bat species. Under existing conditions, the water management for hydro-electric development in the area is having an influence on hydrology in the MSA, LSA, and beyond. Therefore, the incremental modification of flow by the Project footprint is considered to have a low significance for bat populations.

5.0 MONITORING

The swarming field surveys suggested that the abandoned mine adits located within the footprint of the open pit have a high potential to be bat hibernacula. Continued monitoring of the potential hibernation habitat will be undertaken to verify the use of the old mine adits as hibernation sites. This monitoring will seek to verify the use of the mine adits as hibernation sites and determine the species of bats utilizing these sites. The surveys may entail the entry of the mine adits during the hibernation period to identify bats. These surveys would be performed by trained and qualified bat specialist. These surveys would be undertaken only if strict health and safety requirements for entry into abandoned mines are met.

Due to the presence and potential for habitat of SAR bats, an ESA permit may be required for the mine project activities. If the requirement for an ESA permit under 17 (c) is triggered, an overall benefit permit package will be developed in consultation with the MNR. This permit package will also contain a monitoring component for the overall benefit components (e.g. monitoring of bat condos for use). At his point in time, the details of overall benefit have not been finalized and thus the monitoring program is only speculation.

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Report Signature Page

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APPENDIX A

Design Specifications for Bat Boxes and Condos

BAT CONSERVATION INTERNATIONAL
www.batcon.org

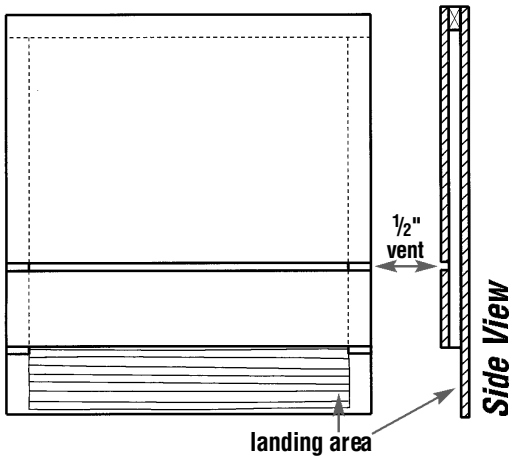
Single-chamber Bat House (wall mounted)

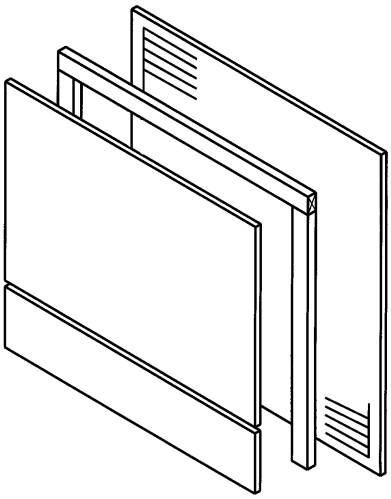
Materials (makes one house)

¼ sheet (2' x 4') ½" AC, BC or T1-11 (outdoor grade) plywood
One piece 1" x 2" (¾" x 1½" finished) x 8' pine (furring strip)
20 to 30 exterior-grade screws, 1"
One pint dark, water-based stain, exterior grade
One pint water-based primer, exterior grade
One quart flat, water-based paint or stain, exterior grade
One tube paintable latex caulk
1" x 4" x 28" board for roof (optional, but highly recommended)
Black asphalt shingles or galvanized metal (optional)
6 to10 roofing nails, ⅞" (if using shingles or metal roofing)

Recommended tools

Table saw or handsaw	Caulking gun
Variable-speed reversing drill	Paintbrushes
Screwdriver bit for drill	Hammer (optional)
Tape measure or yardstick	Tin snips (optional)





More bat-house plans and additional information can be found in BCI's *Bat House Builder's Handbook*, available at *www.batcatalog.com*.

Construction

1. Measure and cut plywood into three pieces:
   26½" x 24" 16½" x 24" 5" x 24"
2. Roughen inside of backboard and landing area by cutting horizontal grooves with sharp object or saw. Space grooves ⅛" to ½" apart, cutting 1/32" to 1/16" deep.
3. Apply two coats of dark, water-based stain to interior surfaces. Do not use paint, as it will fill grooves.
4. Cut furring strip into one 24" and two 20½" pieces.
5. Attach furring strips to back, caulking first. Start with 24" piece at top. Roost chamber spacing is ¾".
6. Attach front to furring strips, top piece first (caulk first). Leave ½" vent space between top and bottom front pieces.
7. Caulk all outside joints to further seal roost chamber.
8. Attach a 1" x 4" x 28" board to the top as a roof (optional, but highly recommended).
9. Apply three coats of paint or stain to the exterior (use primer for first coat).
10. Cover roof with shingles or galvanized metal (optional).
11. Mount on building (south or east sides usually best).

Optional modifications to the single-chamber bat house

1. Wider bat houses can be built for larger colonies. Be sure to adjust dimensions for back and front pieces and ceiling strip. A ¾" support spacer may be needed in the center of the roosting chamber for bat houses over 24" wide to prevent warping.
2. To make a taller version for additional temperature diversity, use these modifications: From a 2' x 8' piece of plywood, cut three pieces: 51" x 24", 33" x 24" and 12" x 24". Cut two 8' furring strips into one 24" and two 44" pieces. Follow assembly procedure above.
3. Two bat houses can be placed back-to-back, mounted between two poles, to create a three-chamber nursery house. Before assembly, cut a horizontal ¾" slot in the back of each house about 9" from the bottom edge of the back piece to permit movement of bats between houses. Two pieces of wood, 1" x 4" x 4¼", screwed horizontally to each side, will join the two boxes. Leave a ¾" space between the two houses, and roughen the wood surfaces or cover the back of each with plastic mesh (see item 5 below). Do not cover the rear exit slots with mesh. One 1" x 4" x 34" vertical piece, attached to each side over the horizontal pieces, blocks light but allows bats and air to enter. A galvanized metal roof, covering both houses, protects the center roosting area from rain. Eaves should be about 3" in southern areas and about 1½" in the north.
4. Ventilation may not be necessary in cold climates. In this case, the front should be a single piece 23" long. Smaller bat houses like this one will be less successful in cool climates. However, those mounted on buildings maintain thermal stability better and are more likely to attract bats.
5. Durable plastic mesh can be substituted to provide footholds for bats. Attach one 20" x 24½" piece to backboard after staining interior, but prior to assembly.

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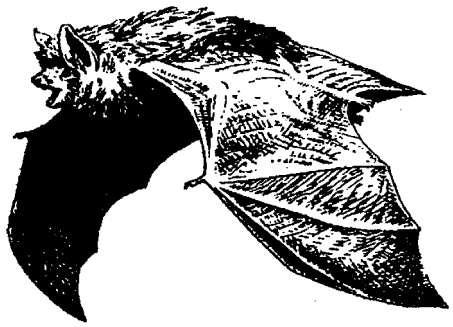


Wildlife Diversity Section

Bat Condo Directions

By

Cal Butchkoski
and
Jerry Hassinger

May 15, 1997
(rev. 08/98)

PA GAME COMMISSION BAT CONDO

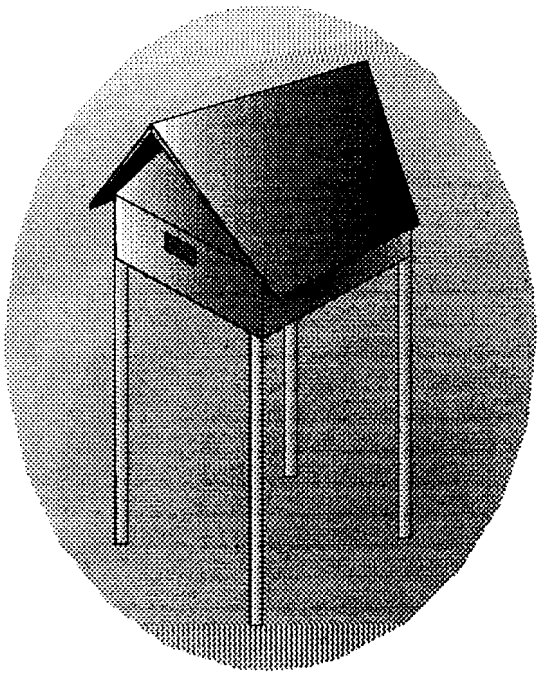
INTRODUCTION

The Bat Condo is a large bat house designed for use by little brown bat maternity colonies. Potentially, this roost could house more than 6,000 mother bats and their young. The condo, measuring 8' x 8' (wide) x 8 1/2' (bottom to peak), is elevated with the bottom at least 8' above the ground.

A prototype of the Bat Condo has been constructed at Canoe Creek State Park, Blair County, Pennsylvania. It is used by bats from spring through early autumn. The purpose of this prototype is to serve as an "insurance policy" in the event a nearby (within 500 meters) maternity site, an old church housing over 10,000 bats, is destroyed.

The Wildlife Diversity section of the Pennsylvania Game Commission is pursuing a course of community bat management. The problem is that when bats are excluded from someone's house, they are forced to seek refuge elsewhere. We'd prefer this refuge to be the Bat Condo rather than another house.

The dual purposes of community bat management are (1) to save bats in numbers sufficient to suppress local insect pest populations, and (2) to reduce nuisance problems associated with the eviction or exclusion of maternity colonies of bats from houses.



PA GAME COMMISSION

Bureau of Wildlife Management
Wildlife Diversity Section

Bat Condo Directions

(Directions are to be used with numbered sketches)

SKETCH #

PAGE 1A&1B: This design provides for 3/4" roosting crevices created using 1/4" plywood. Yellow pine plywood (AC or BC) is recommended. Avoid using luan plywood, it does not hold up well.

All lumber dimensions are finished lumber sizes. For example, a 2"x6"x8' actually measures 1 1/2"x 5 1/2" x 8'.

ALL INTERIOR SURFACES MUST BE ROUGHENED. This is probably the most labor intensive part of the project. It is usually easier to roughen plywood sheets before cutting using a board with many multipurpose screws screwed through, using the sharp protruding points to roughen the wood. It looks like a very nasty paddle.

An interior flyway is incorporated to provide exercise space for young bats. Extended roof overhangs are designed to provide overhead protection from predators while exiting. The black roof aids in solar warming during cool spring days. The fly-in entrance provides a land free entrance as well as ventilation for lower portion of roost. Rough exterior walls allow for easy landing to access entrance crevices. A closed bottom (with doors) minimizes cold spring breezes from robbing heat from the roost, and discourages vandalism.

The roost should be:
*Erected with bottom at least 8 feet off the ground.
*Placed in open area receiving at least 10 hours of direct sun.
*Placed within 1/4 mile of water (stream, lake, etc.)
*Located within 10-30 yards of cover (forest or treeline) for protection after exiting. Bats are vulnerable to predation when exiting roost.
*Located in good foraging habitat containing forests, clearings, and wetlands with abundant insect activity.

The roost should <u>not</u> be:
*Erected in shaded location.
*Located near burn barrels where smoke will disturb bats.
*Erected where roost is prone to vandalism.
*Erected within 30 yards of busy highways. Bats swarm the roosts during the dawn return and are vulnerable to automobile traffic.
*Placed in brightly lighted areas.
*Erected on exposed hilltops or other windswept areas.

PAGE 2: A site layout should plan for one of the sides to be oriented to the southeast. An aspect of 130 to 140 degrees is preferred. At these aspects, the spring time sun is high enough to really start warming the roost. Foundations should be good and solid, especially if the roost is located in a wet area that may flood.

PAGE 3A,B&C: When framing the lower section of the bat roost, one of the SIDE VIEW details (page 3B) should be oriented to the southeast. These two views will have a flat roof plane. Optional homemade hangers for 6"x6" sills can be made with 5"x 3/8" mild steel angle. Pay attention to their different orientation in the side & end view on page 3C.

PA GAME COMMISSION BAT CONDO DIRECTIONS

SKETCH #

PAGE 4A&B: Before erecting siding, the interior side must be roughened. If not using the rough exterior T-111 siding, the exterior must also be roughened. Cut fly-in entrances on two end sheets and crevice entrances on side sheets. The corner joints can be caulked with brown latex caulk or trim boards can be installed. The top dimensions on page 4B refer to bat crevice lengths. These 1/2" wide slits are basically cut to avoid interior 2x4 framing.

PAGE 5: After the 5 roof trusses are assembled, they should be roughened for bat roosting. A 3/4" hole should also be drilled in the peak. This hole will be useful to attach a sling and pulley to use with a longer rope in lifting roost baffles into place.

PAGE 6: If you're not into carpentry, these roof extensions will be a "real joy" to make. Two matching pairs are needed. Pay close attention to the compound angles on front (long) 2x4 and the central (peak) 2x4s.

PAGE 7A&B: Start by placing the roof trusses into the spaces between short 2x4s made as part of lower framing (page 3A top view and 3B side view). Once two are in place, make them plum and nail scrap lumber or 2x4s between them to hold them in place. Of course they should also be nailed to the lower framing. Once all trusses are in place, install roof extensions one section at a time, attach to each other and the end roof trusses. Its best to use 3" wood or deck screws for attachment. It is also helpful to have four C-Clamps to hold them in place. Install the 2"x6"x 8' fascia planks to the ends of the roof trusses. Use 3" wood screws for this installation (predrill if necessary).

PAGE 8A,B&C: Nail plywood sheeting to roof using 3 sheets per side, staggering the seams. Apply felt paper and drip edging around edges and then shingle the roof. If installing experimental parasite traps (page 8C), install them before applying felt paper. Scaffolding and roof jacks are necessary items for this roof work. Rent them if necessary.

Attach T-111 siding to peak ends. A 4" trim board is needed to trim the gap between the lower and upper (peak) siding on ends. The top edge of this board should be caulked with brown latex caulking.

Install 1/2" plywood soffit on the underside of roof overhangs on sides. Roughen the interior surface first. Be sure to leave a 1/2" to 3/4" space between the soffit and the fascia plank for a bat exit. **This crevice has been found to be a preferred exit route.**

Inspect inside of upper half of the roost for any cracks or gaps. Caulk any gaps found. The upper half (peak) of the roost must be airtight to hold heat during cool spring days.

PAGE 9: Attach 2x4s around inside edges of roost bottom. Recess them 1/2" up so that 1/2" plywood doors close flush with the bottom. Install four doors with hinges. Hasps with locks may be necessary depending on location. Use 2x4s as base for screwing doors shut with two or three 1 1/4" deck screws per side. This is a convenient way of securing the doors since they will only be opened once or twice a year.

PA GAME COMMISSION BAT CONDO DIRECTIONS

SKETCH #

PAGE 10: The roost baffle bundles are made to fit between the roof trusses and framing. The triangular shaped baffles are for the upper sections, and the rectangular pieces are for the lower roost areas. Eight bundles go above and eight go below. Nineteen to twenty-two 1/4" plywood baffles per bundle are needed. Spacer length variability will decide on the number of baffles per bundle. Also, end bundles will be thinner than middle bundles due to different dimensions between roof trusses. Measurements should be taken between trusses before bundles are assembled since slight variations may occur. Notice the two-inch notch cut out of four of the lower roost bundles to accommodate the four corner posts.

3/4" Dia. Schedule 40 PVC pipe is used as the spacers in the bundles. The pieces of pipe are cut to 3/4" lengths to create 3/4" roosting crevices between the plywood. These are used with four 3/8" threaded rods per bundle. It takes a lot of the little pieces of pipe and is best to precut during a cold winter day using a band saw.

The 3/8" threaded rod should be cut 1/4" shorter than the dimension between the roof trusses the bundle is to fit between. This is especially sensitive for the upper roost baffles and less so for the lower.

All apartment bundles do not have to be put in at once. You may only want to put half in and wait to do more the next year.

PAGE11A&B: If Optional parasite traps have been installed on roof, screen inside access to traps using 1/4 inch hardware cloth to restrict bat access to the trap.

Apply two foot wide fiberglass window screening to inside of roof peak. Use a staple gun with many 3/8" staples to make it secure. Screening should extend one foot on either side of roof peak.

Insert the baffles in side walls. Baffles in side walls can be made of many extra pieces of plywood with several horizontal cracks in each baffle. This provides many options for bat travel after entering through side entrance crevices. Do not run these baffles against the top 2x4, leave at least a 1/2 inch gap.

Inspect and roughen all interior walls, posts, framing etc.

With the help of several people, use sling, pulley and rope, lift upper roost apartment bundles into place, pushing pointed side into roof overhang. Use premeasured 2x4 to secure bundle by screwing the 2x4 ends to the roof trusses. If bottom of a roost bundle is not flat and wobbles, wedge scrap 2x4s and shims between sides of roost bundle and trusses. Secure with deck screws.

Install PEAK BAFFLE SPACERS (page 11B) for baffles that extend to roof peak. Insert premeasured peak roost panels and secure with screws at bottom.

Install four 2"x 6"x 8' planks on ends to support lower roost bundles.

With assistance, lift lower roost apartment bundles into place.

Insert two 1"x 8"x 8' roughened and/or screened boards for bat landing plates, against lower roost baffles. Secure these boards to end walls of structure.

Close the bottom doors, stain the exterior a dark brown color and you're finished.
Nothing to it !!!

BAT CONDO MATERIAL LIST (3 pages)

ITEM	NUMBER	UNIT COST	TOTAL COST
FOOTERS			
1/2" Rebar (#4)	160 FT		
1" Stand-off Column Bases (Simpson CBS66)*	4		
Class "A" Concrete (Cubic Yard)	1.3		
LOWER FRAMING			
6"x6"x12' #2 Yellow Pine, P.T. Posts	4		
6"x6"x8' #2 Yellow Pine, P.T. POSTS (sills)	4		
4"x6"x8' #2 Yellow Pine, P.T. POST (spanner)	1		
6"x6" Concealed Flange Face Mount Hangers (Simpson HUC66)*	8		
4"x6" Face Mount Hangers (Simpson U46)*	2		
2" x 4" x 8' Lumber	21		
5/8"x 6 1/2" Grade 5 Bolts,Nuts & Washers	8		
10d Common Coated Sinker Nails	5 LB		
Optional Hangers (see page 3C of Sketches)			
3/8"x5"x5" mild steel angle, 5"Long	*8*		
3/8"x5"x 5" mild steel angle, 3 1/2"Long	*2*		
3/8"x3" lag bolts	*48*		
SIDING			
T-111 Siding, 4'x8' sheets	6		
1 5/8" Galvanized Deck Screws	5 LB		
ROOF TRUSSES			
2"x6"x8' Lumber	20		
6"x 6" Nailplates	60		
Truss Nails	5 LB		

BAT CONDO MATERIAL LIST (3 pages)

ITEM	NUMBER	UNIT COST	TOTAL COST
ROOF EXTENSION			
2" x 4" x 8' Lumber	7		
2" x 4" x 10' Lumber	4		
3" Galvanized Deck Screws	3 LB		
ROOFING & TRIM			
2" x 6" x 8' Lumber (fascia for truss edges)	2		
1/2"x 4' x 8' Exterior Plywood for roof sheeting, soffit & doors	9		
30 lb Felt Paper (roof underlayment)	1 Roll		
Brown Drip Edging, 10 ft. long	6		
Black Fiberglass Shingles	2 Squares		
7/8" Roofing Nails	8 LB		
5" Strap Hinges	8		
4d, 1 1/2" Coated Ring Drywall Nails (Sheeting)	5 LB		
1"x4"x10' End Trim Board	2		
BROWN STAIN	3 Gallon		
Brown Latex Caulk	5 Tubes		
Roofing Cement (for Optional Parasite Traps)	2 Tubes		
Snap-off Blade Roofing Knife	2		

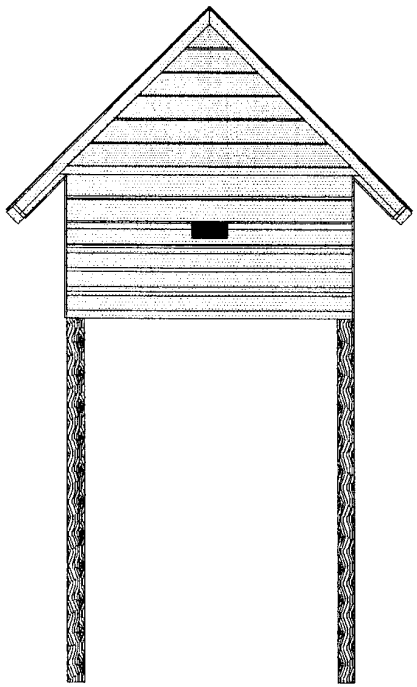
BAT CONDO MATERIAL LIST (3 pages)

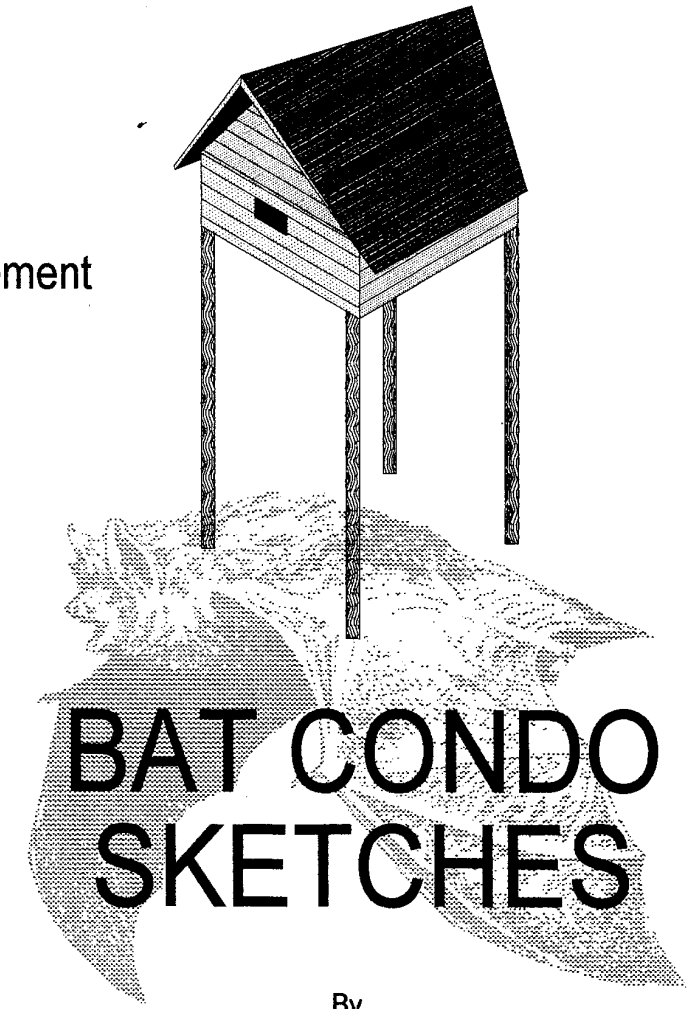
ITEM	NUMBER	UNIT COST	TOTAL COST
ROOST BAFFLES			
3/8" Threaded Steel Rod	130 FT		
3/8" Nuts with Washers	130		
3/4" Dia. Sch.40 PVC Pipe			
cut in 3/4" lengths as baffle spacers	120 FT		
1/4" x 4' x 8' Plywood (Yellow pine, AC or BC)			
total # may vary somewhat	86		
1" x 8" x 8' Board (interior landing plate)	2		
2" x 6" x 8' Lumber (lower baffle supports)	4		
2" x 4" x 8' Lumber (upper baffle supports)	2		
2' Wide Fiberglass Window Screening			
attached with staple gun & 3/8"staples	30 FT		
1" X 3/4" X 2' wooden baffle spacer strips (walls)	48		
1 1/4" Multipurpose (Drywall) Screws	3 LB		
2"x4"x8' (to cut 16 Peak Baffle Spacers out of)			
See Sketches Page 11B	1		
Bundle of Wood Shims	1		
*Simpson Strong-Tie Company Inc.			
1-800/999-5099			

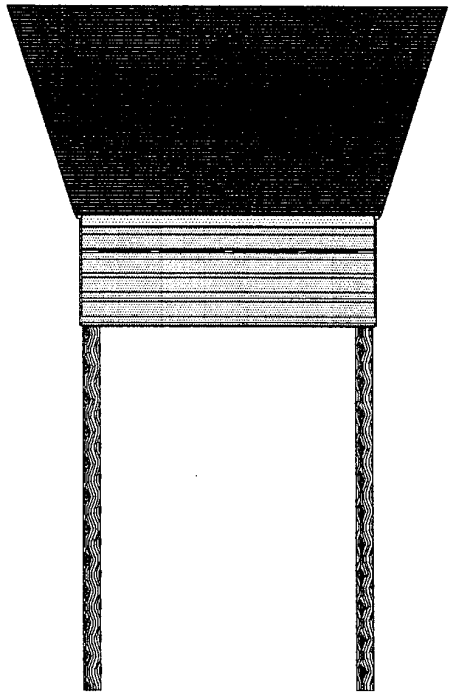
PENNSYLVANIA GAME COMMISSION
2001 Elmerton Avenue, Harrisburg, PA 17110-9797

Bureau of Wildlife Management

Wildlife Diversity Section





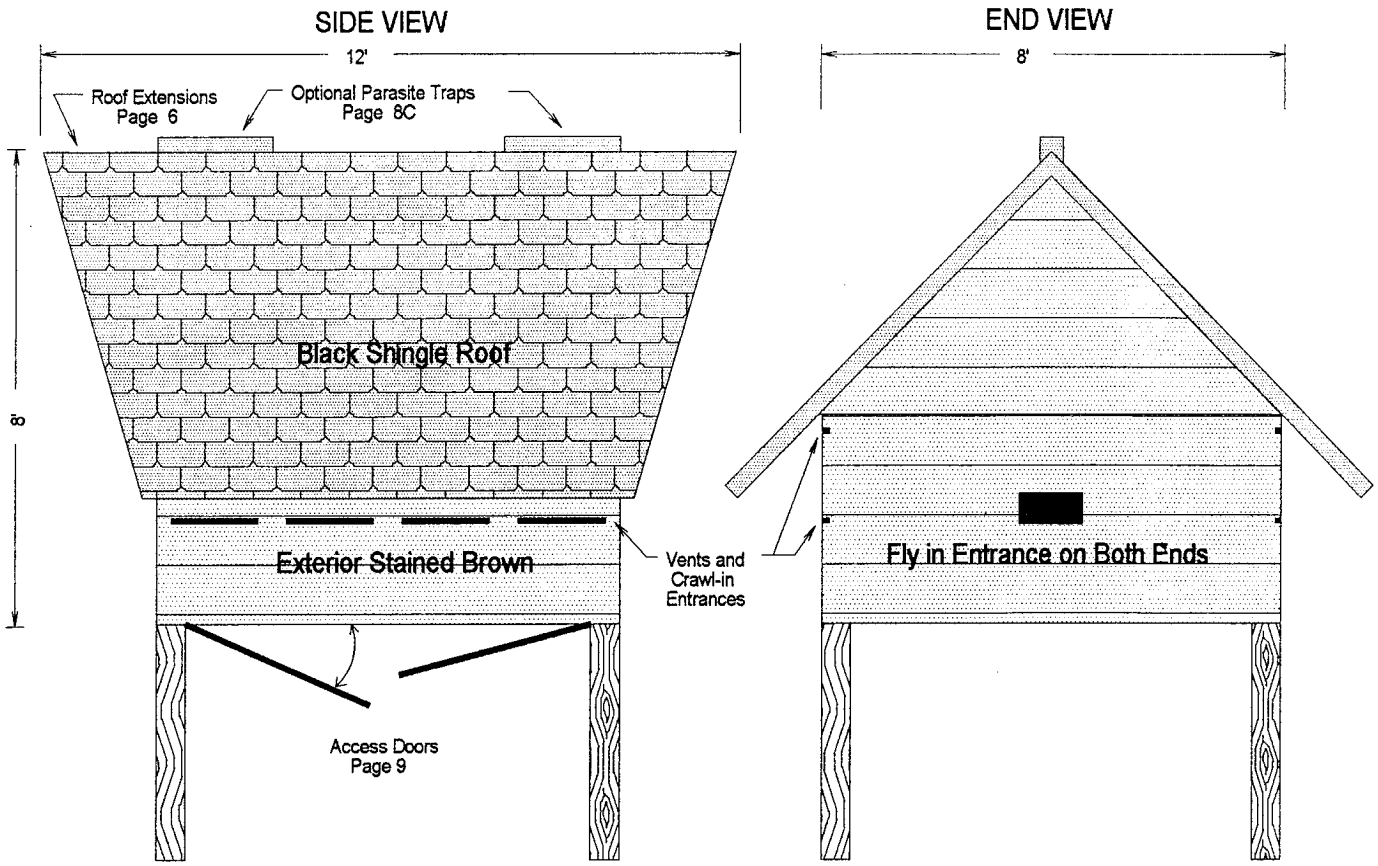


BAT CONDO SKETCHES

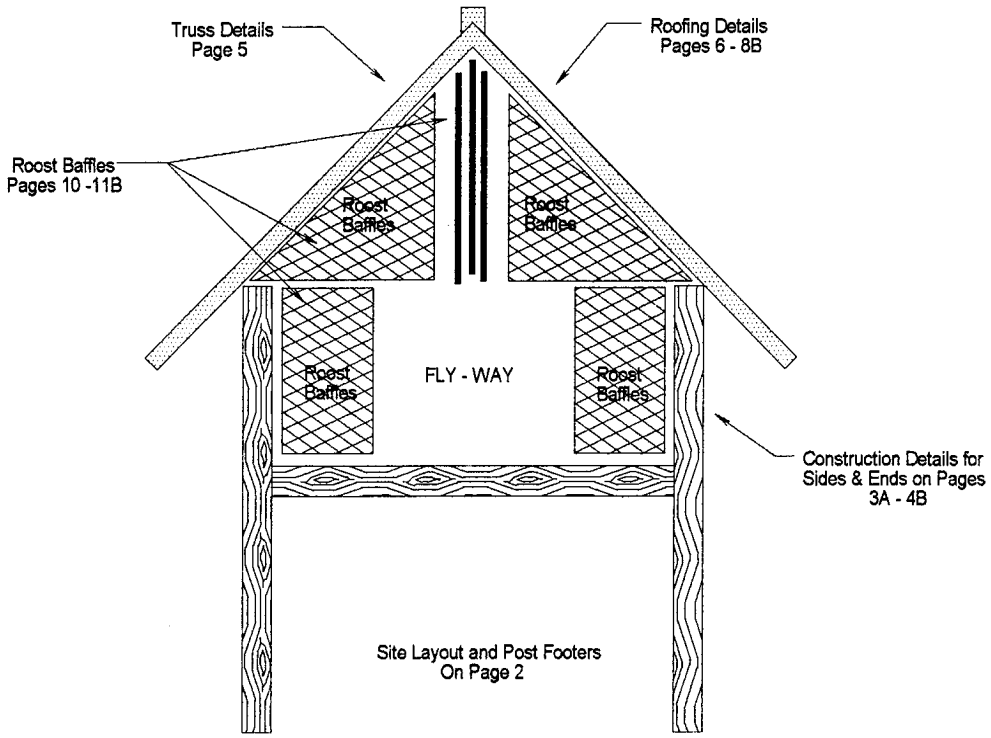
By
Cal Butchkoski
and
Jerry Hassinger

May 15, 1997
(rev. 08/98)

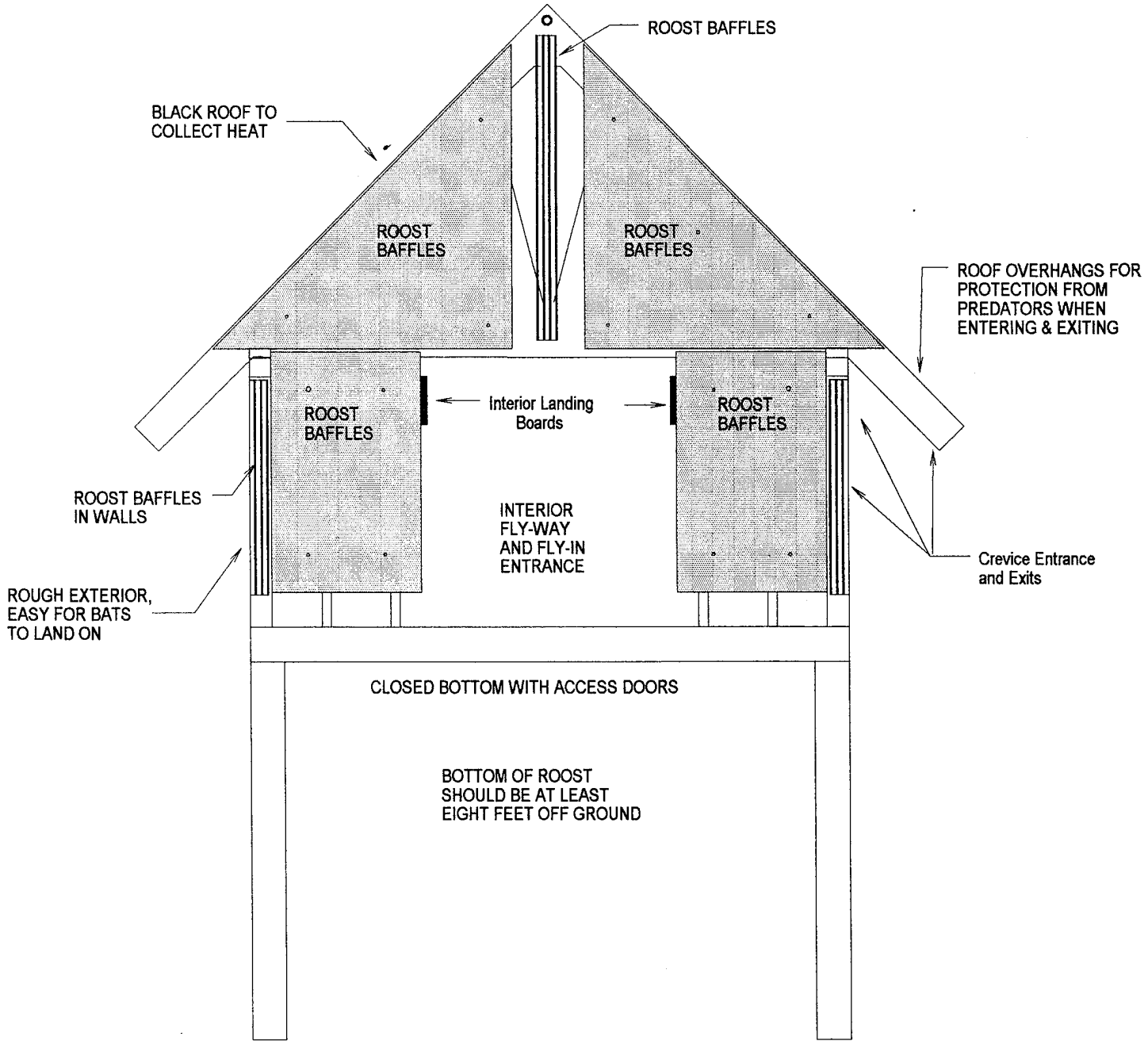
PA GAME COMMISSION BAT CONDO
BASIC DESIGN



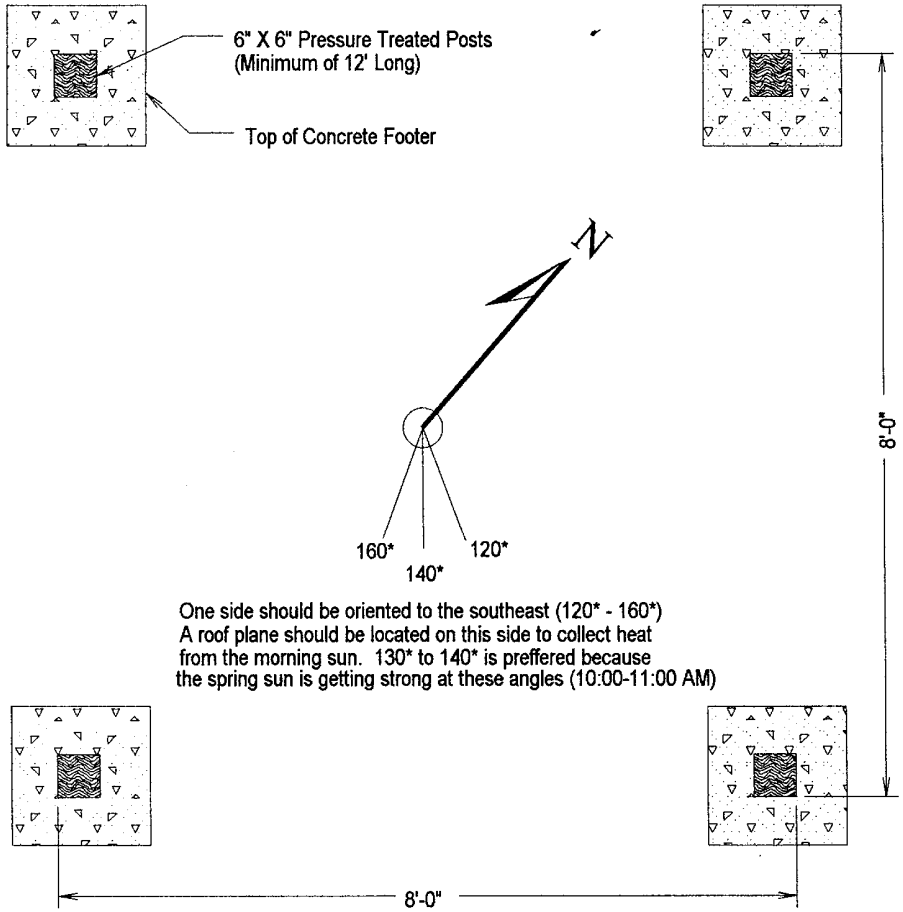
END VIEW
(Cutaway)



BAT CONDO HIGHLIGHTS
(Cutaway view of END)

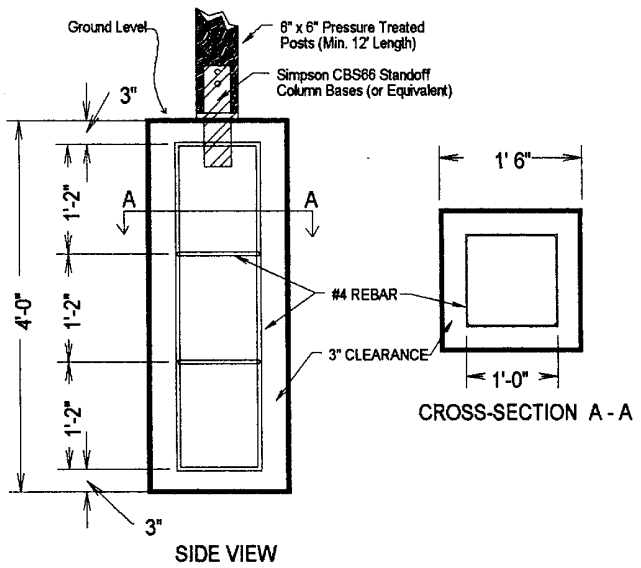


TOP VIEW OF POST AND FOOTER LAYOUT



One side should be oriented to the southeast (120* - 160*)
A roof plane should be located on this side to collect heat
from the morning sun. 130* to 140* is preffered because
the spring sun is getting strong at these angles (10:00-11:00 AM)

POST FOOTERS (4) AND STEEL REINFORCING DETAILS

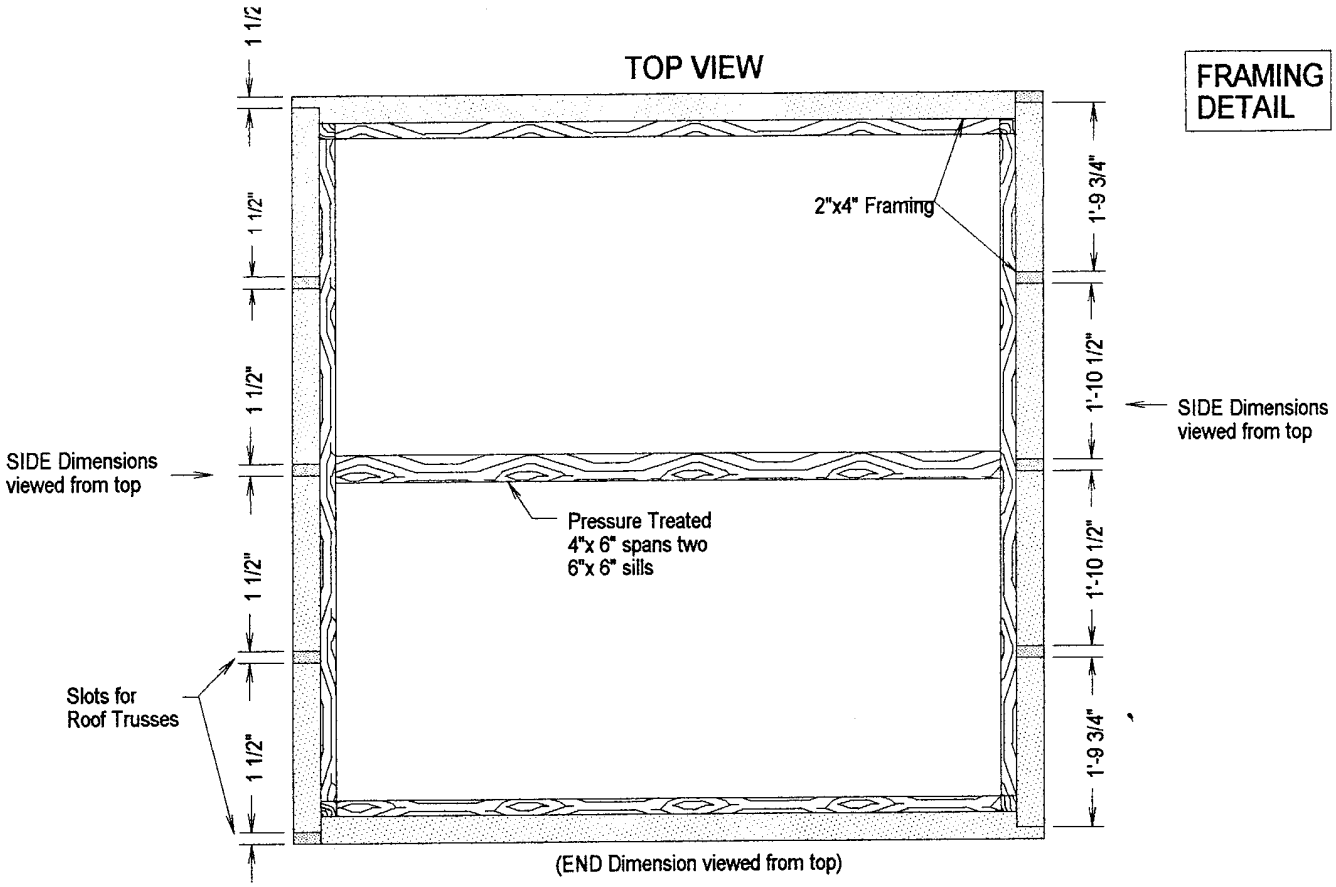


MATERIALS LIST

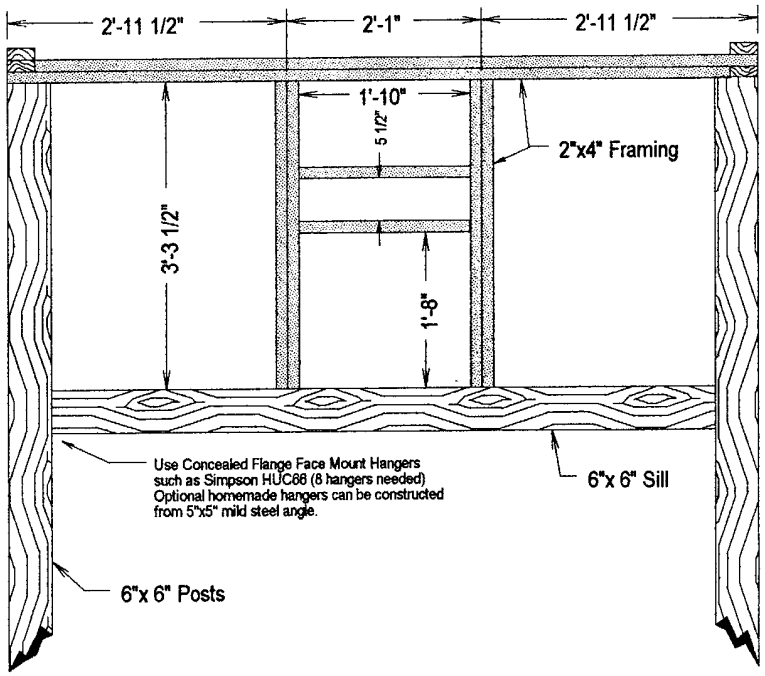
(4)---Simpson CBS66 Standoff Column Bases (1" Standoff)
(16)--1/2" Rebar - 42" long
(16)--1/2" Rebar - 48" long
(1.3)----Cubic Yards Class A Concrete
(8)----5/8" ϕGrade 5 Bolts, 6 1/2" long

FRAMING DETAIL

TOP VIEW



(END Dimension viewed from top)

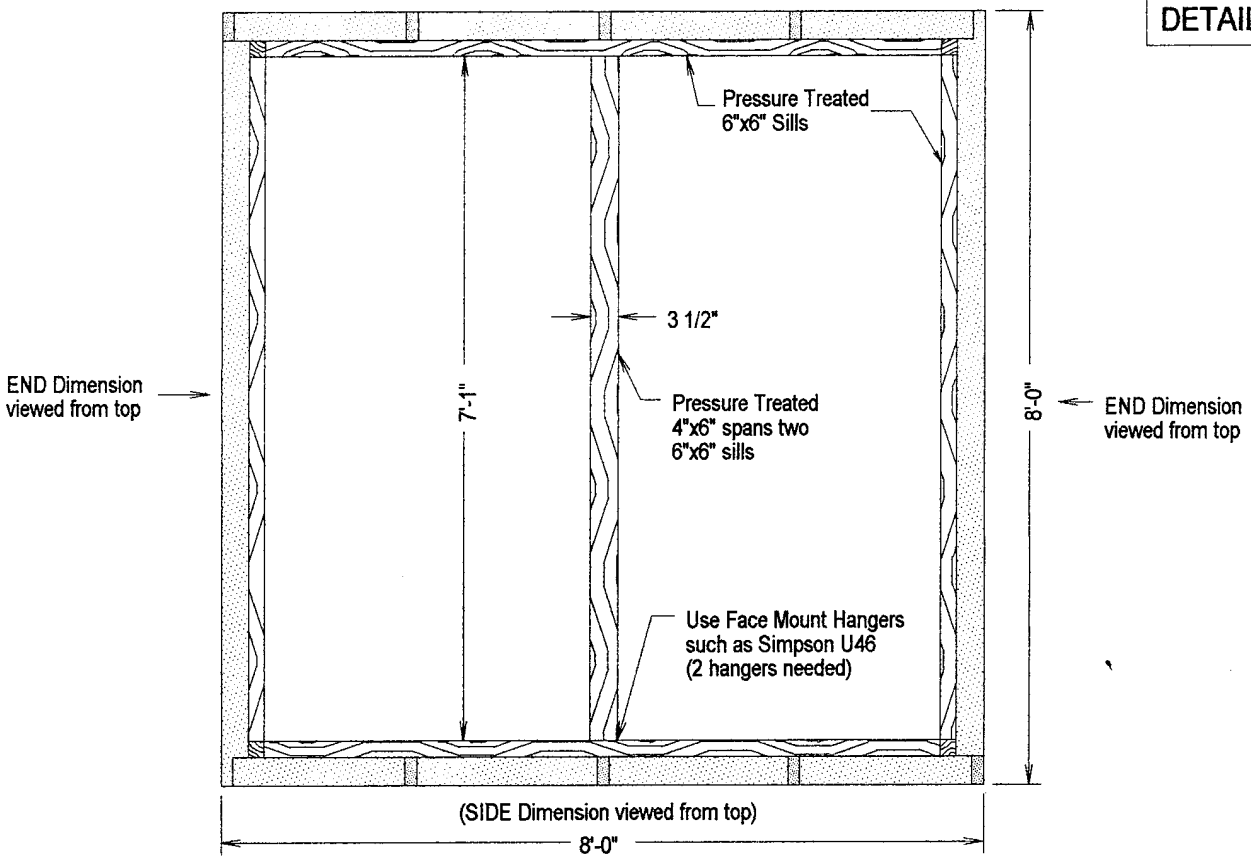


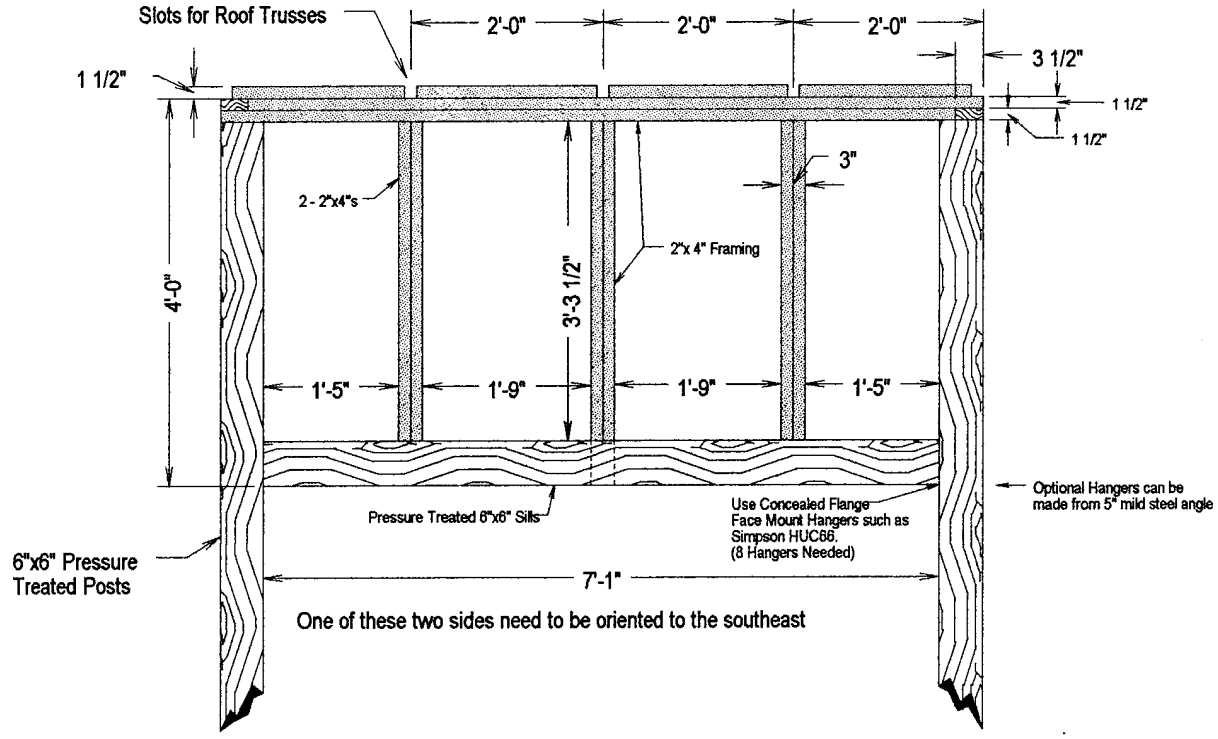
END VIEW

(Sides with Bat Fly-in Entrances)

FRAMING DETAIL

TOP VIEW

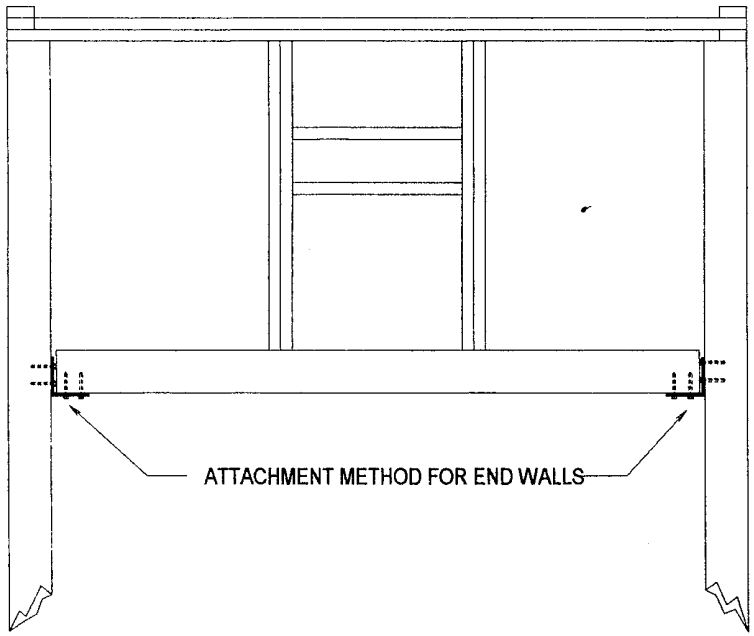


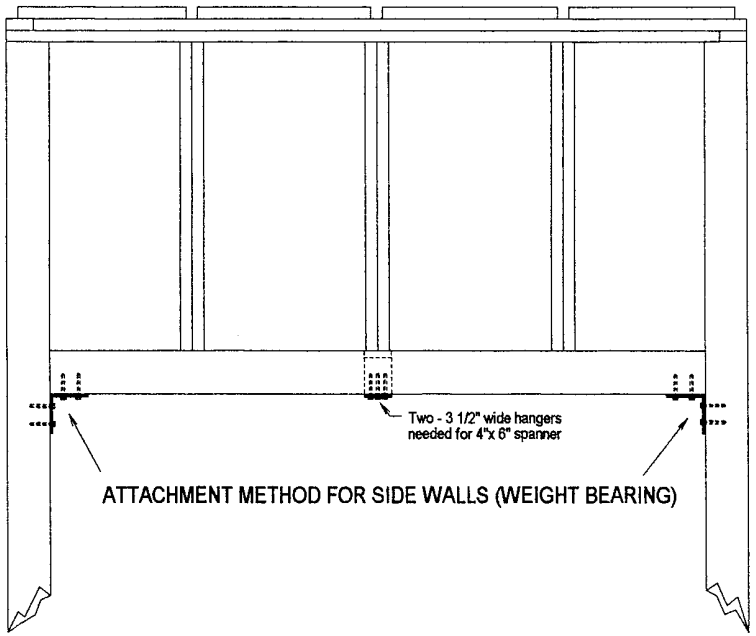


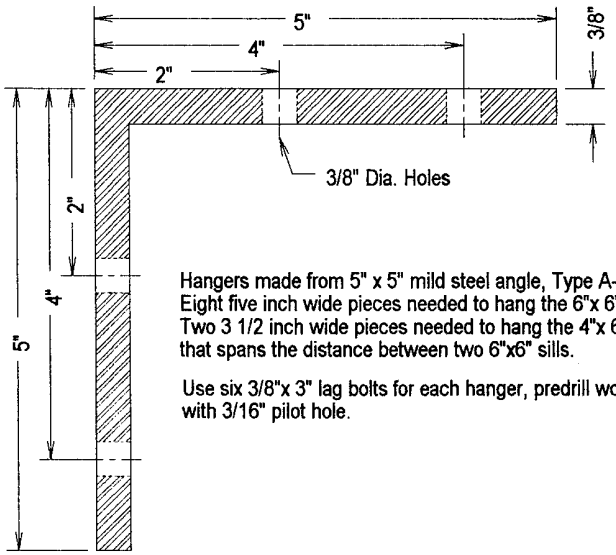
SIDE VIEW

(Weight Bearing Wall)

OPTIONAL HOMEMADE HANGER DETAILS



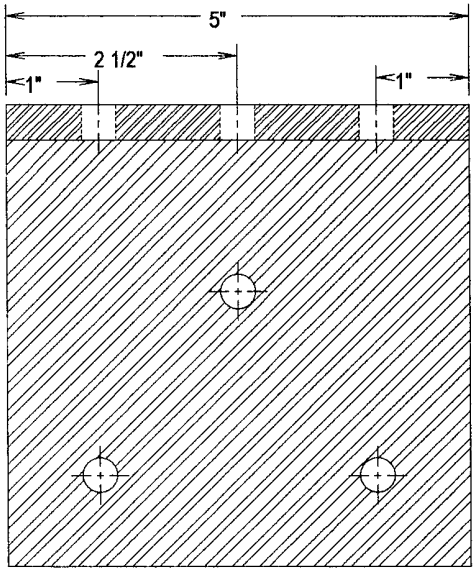




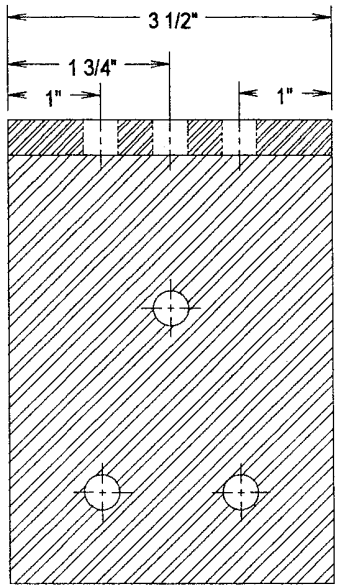
Hangers made from 5" x 5" mild steel angle, Type A-36.
Eight five inch wide pieces needed to hang the 6"x 6" sills.
Two 3 1/2 inch wide pieces needed to hang the 4"x 6"
that spans the distance between two 6"x6" sills.

Use six 3/8"x 3" lag bolts for each hanger, predrill wood
with 3/16" pilot hole.

SIDE VIEW (Both Sizes)
of HOMEMADE HANGER



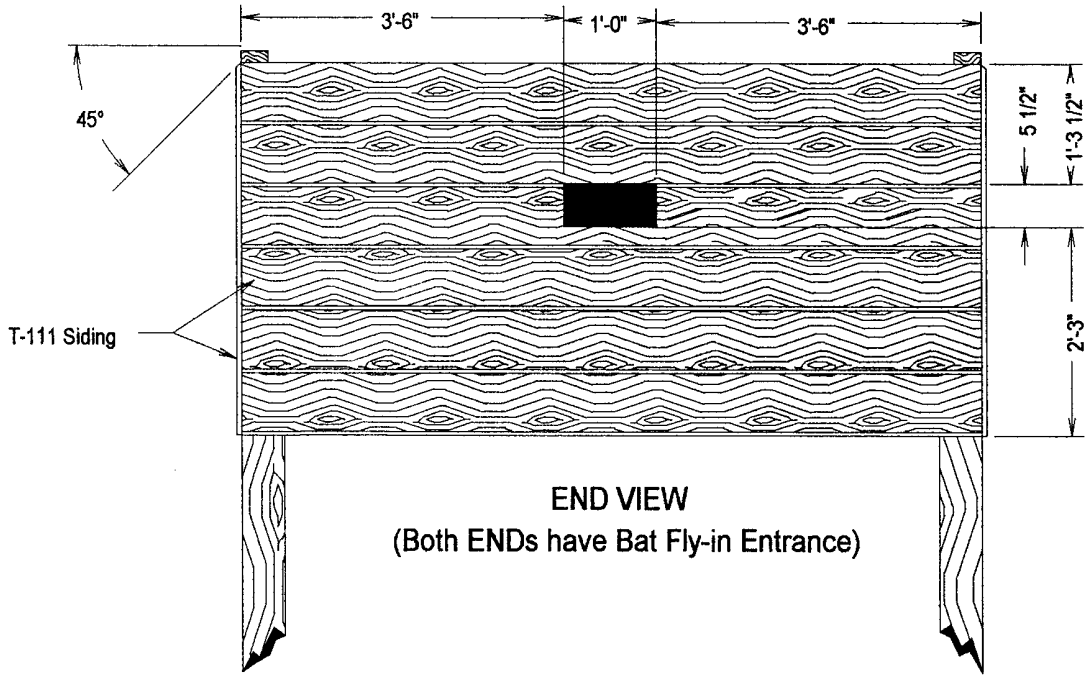
FRONT VIEW (5" Wide Pieces, 8 Needed)



FRONT VIEW (3 1/2" Wide Pieces, 2 Needed)

SIDING DETAIL - END VIEW

IMPORTANT !!!
INTERIOR SIDE OF ALL SIDING MUST BE ROUGHENED
IF EXTERIOR OF SIDING IS NOT ROUGH, THEN IT TOO MUST BE ROUGHENED SO BATS CAN LAND EASILY.

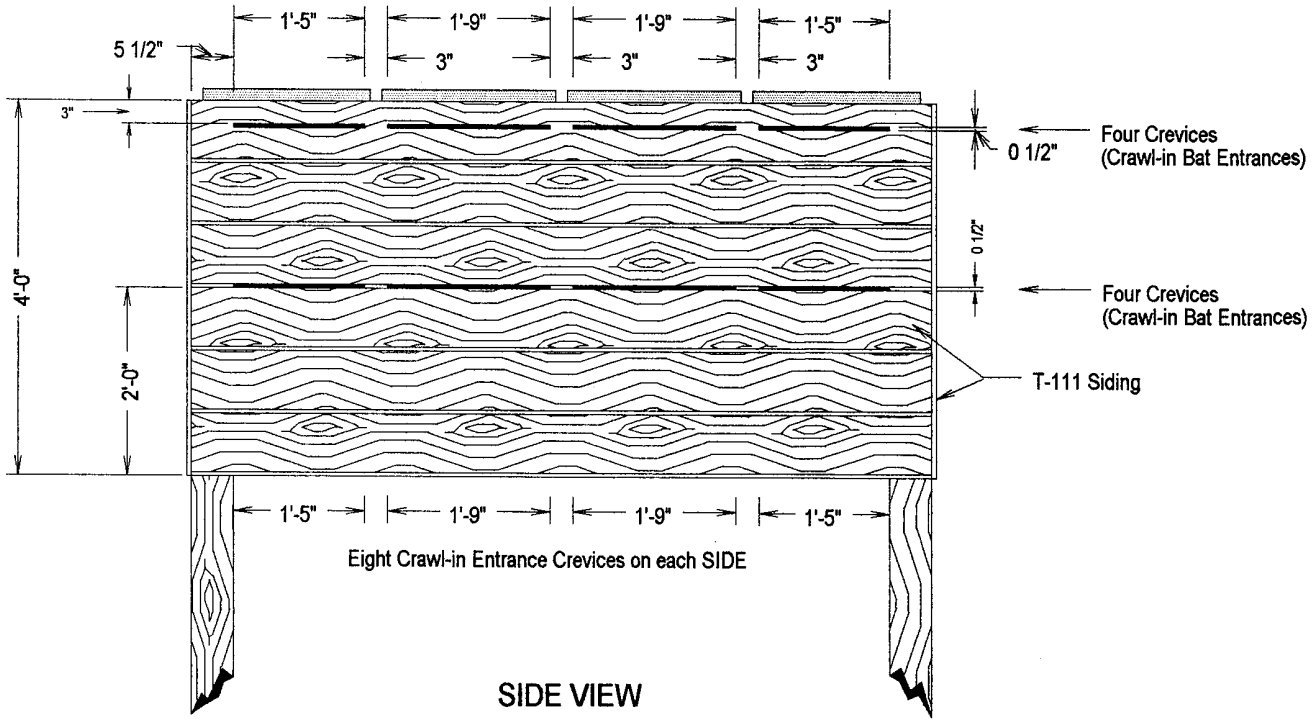


END VIEW
(Both ENDs have Bat Fly-in Entrance)

SIDE VIEW - SIDING DETAIL

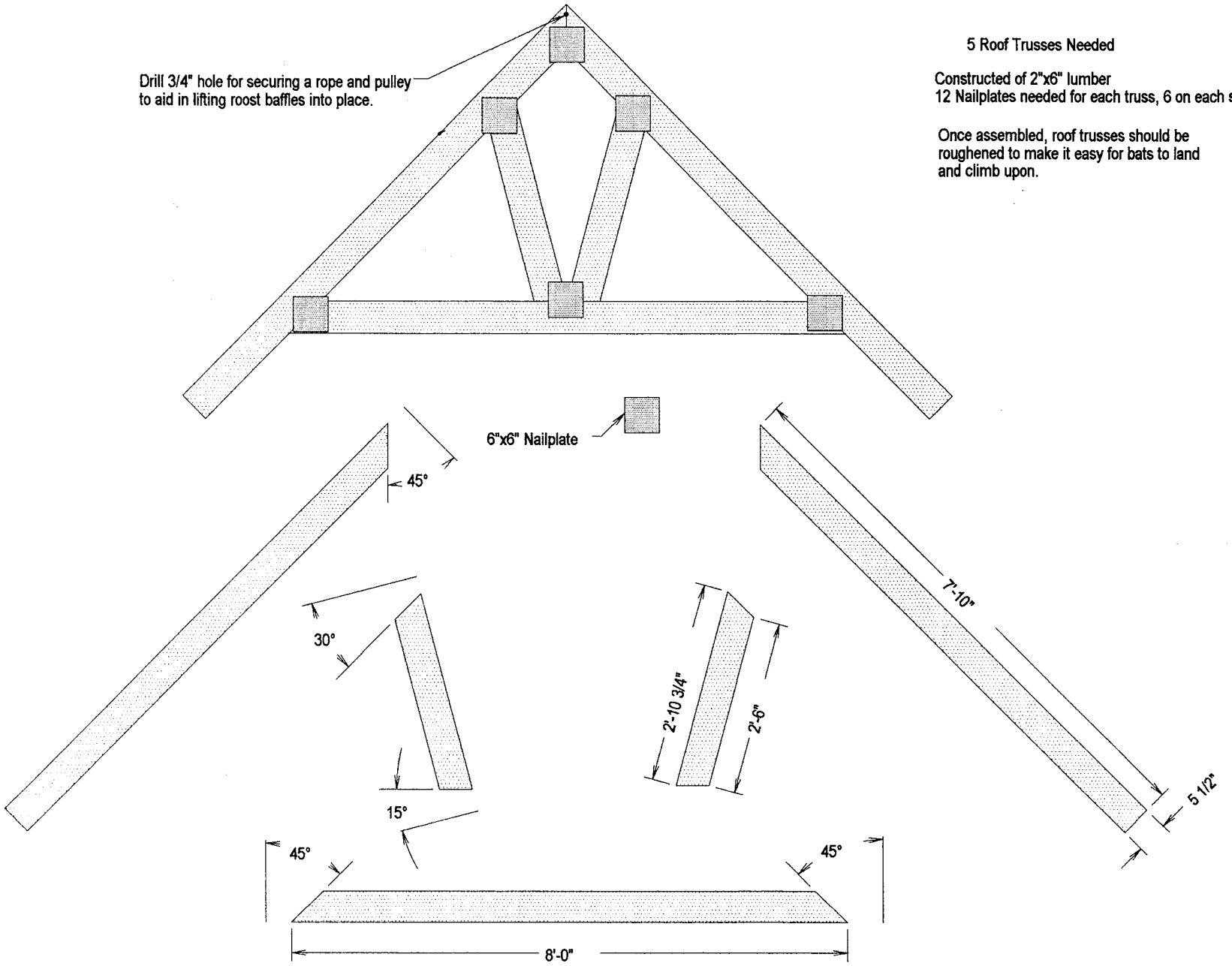
IMPORTANT !!!

INTERIOR SIDES OF ALL SIDING MUST BE ROUGHENED
IF EXTERIOR OF SIDING IS NOT ROUGH, THEN IT TOO MUST
BE ROUGHENED SO BATS CAN LAND EASILY.



SIDE VIEW
(Weight Bearing Wall)

ROOF TRUSS DETAIL



5 Roof Trusses Needed

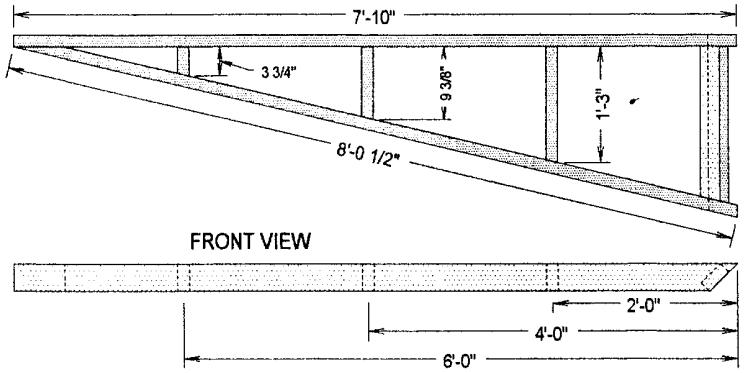
Constructed of 2"x6" lumber
12 Nailplates needed for each truss, 6 on each side.

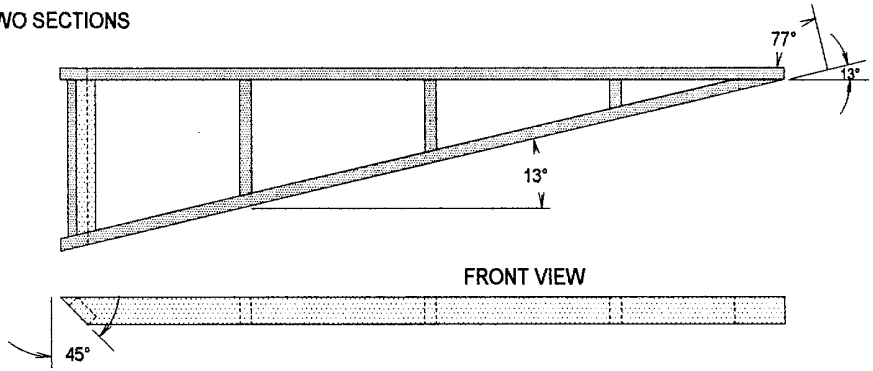
Once assembled, roof trusses should be roughened to make it easy for bats to land and climb upon.

ROOF EXTENSION FRAMING DETAIL

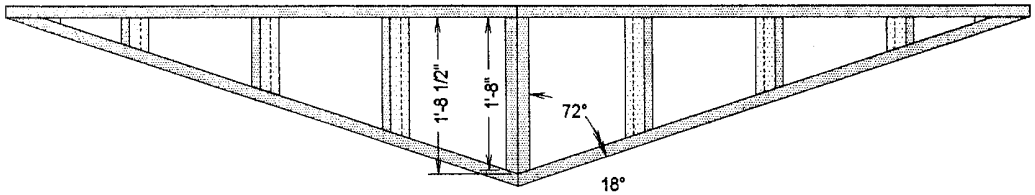
(2" x 4" LUMBER)

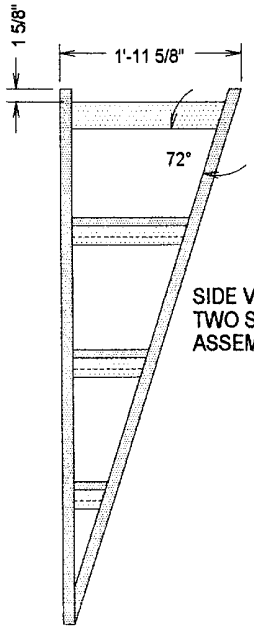
TOP VIEW OF TWO SECTIONS



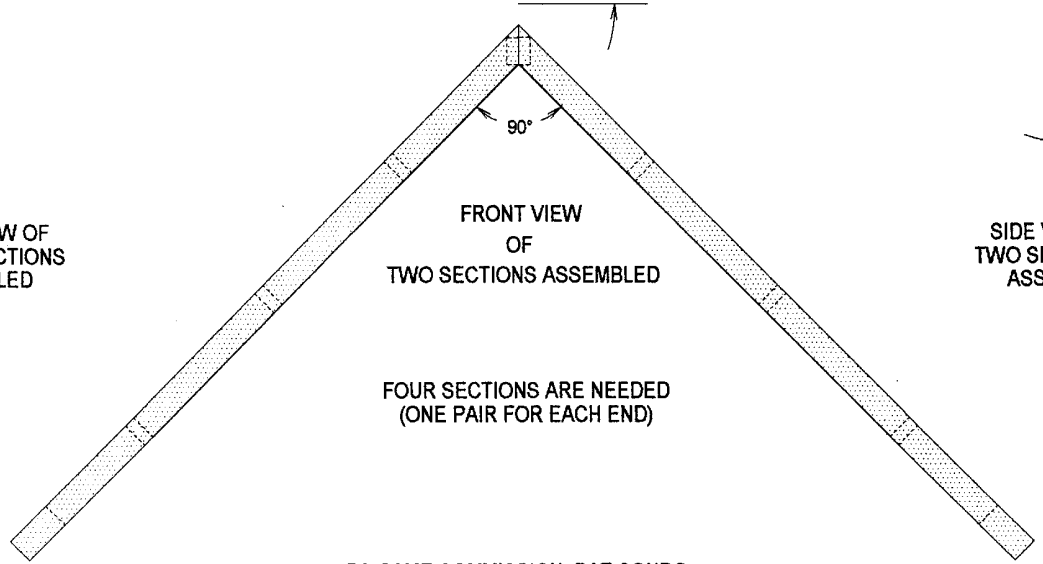


TOP VIEW OF TWO SECTIONS ASSEMBLED (see page 1A for side view of completed roof extension)



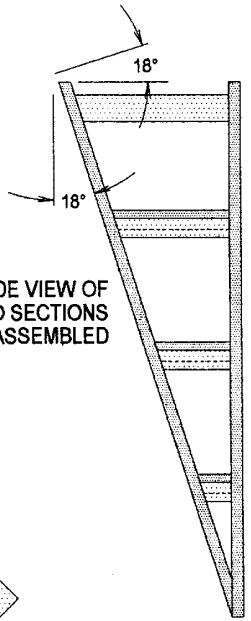


SIDE VIEW OF
TWO SECTIONS
ASSEMBLED



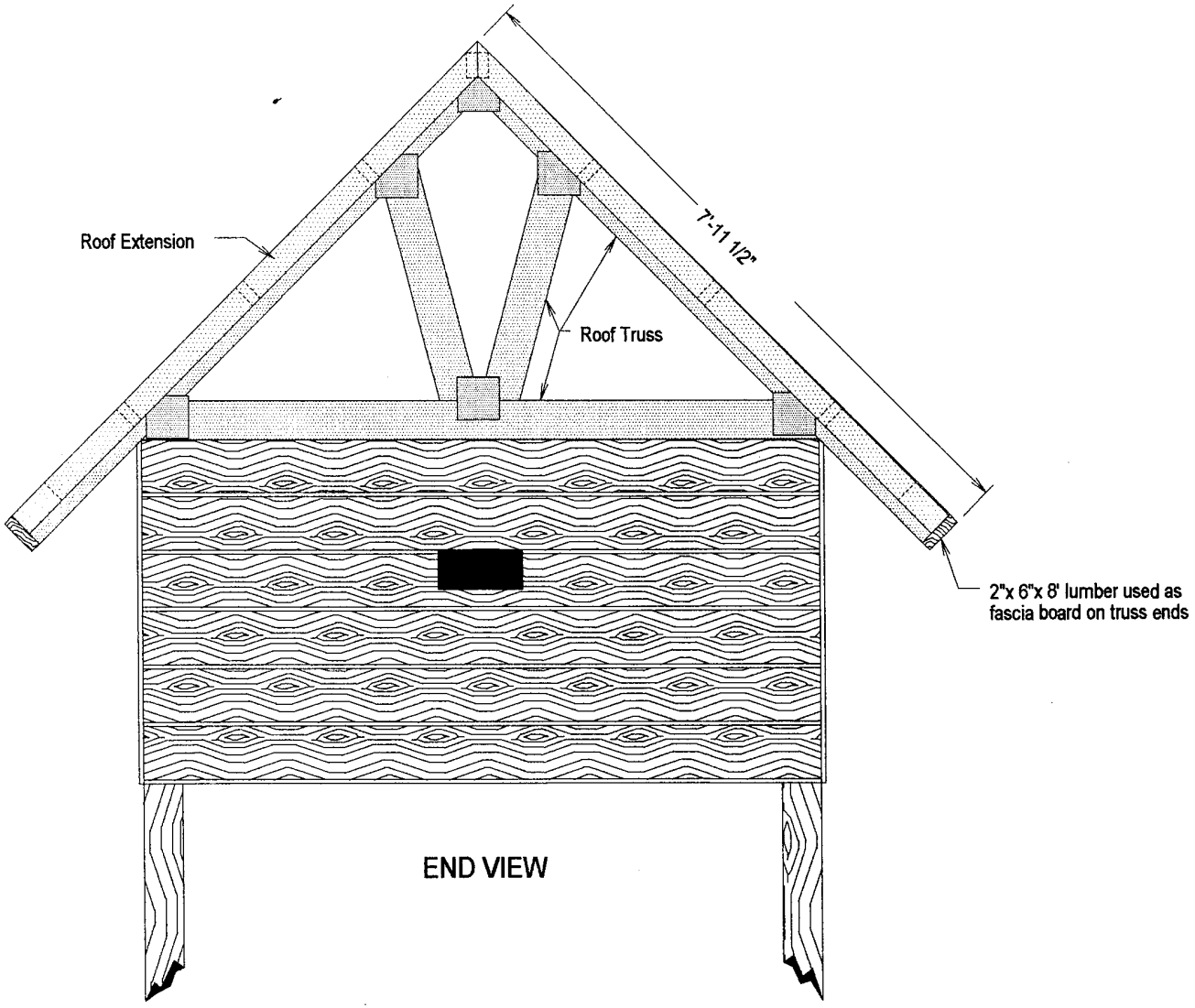
FRONT VIEW
OF
TWO SECTIONS ASSEMBLED

FOUR SECTIONS ARE NEEDED
(ONE PAIR FOR EACH END)



SIDE VIEW OF
TWO SECTIONS
ASSEMBLED

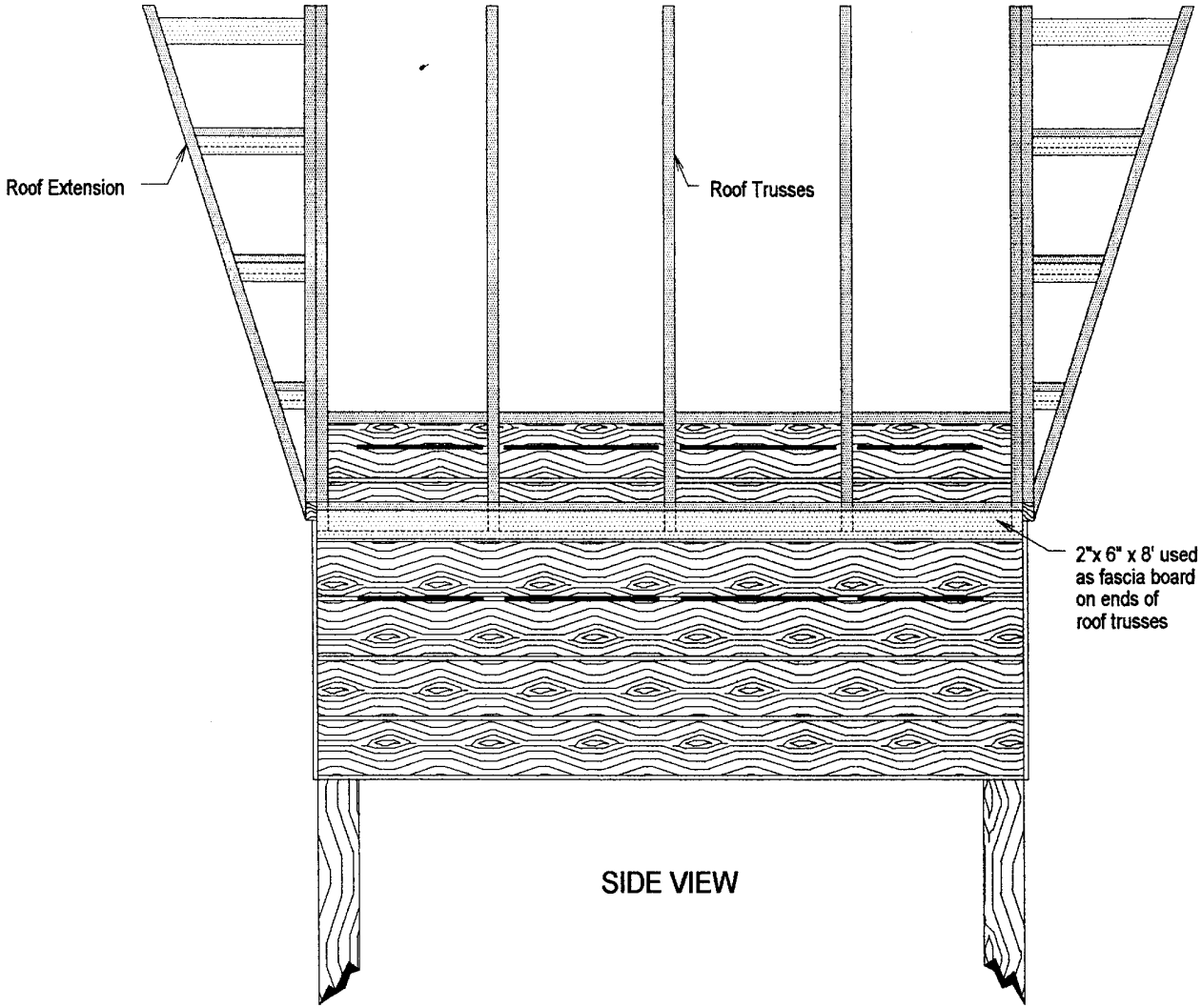
ROOF FRAMING DETAIL



END VIEW

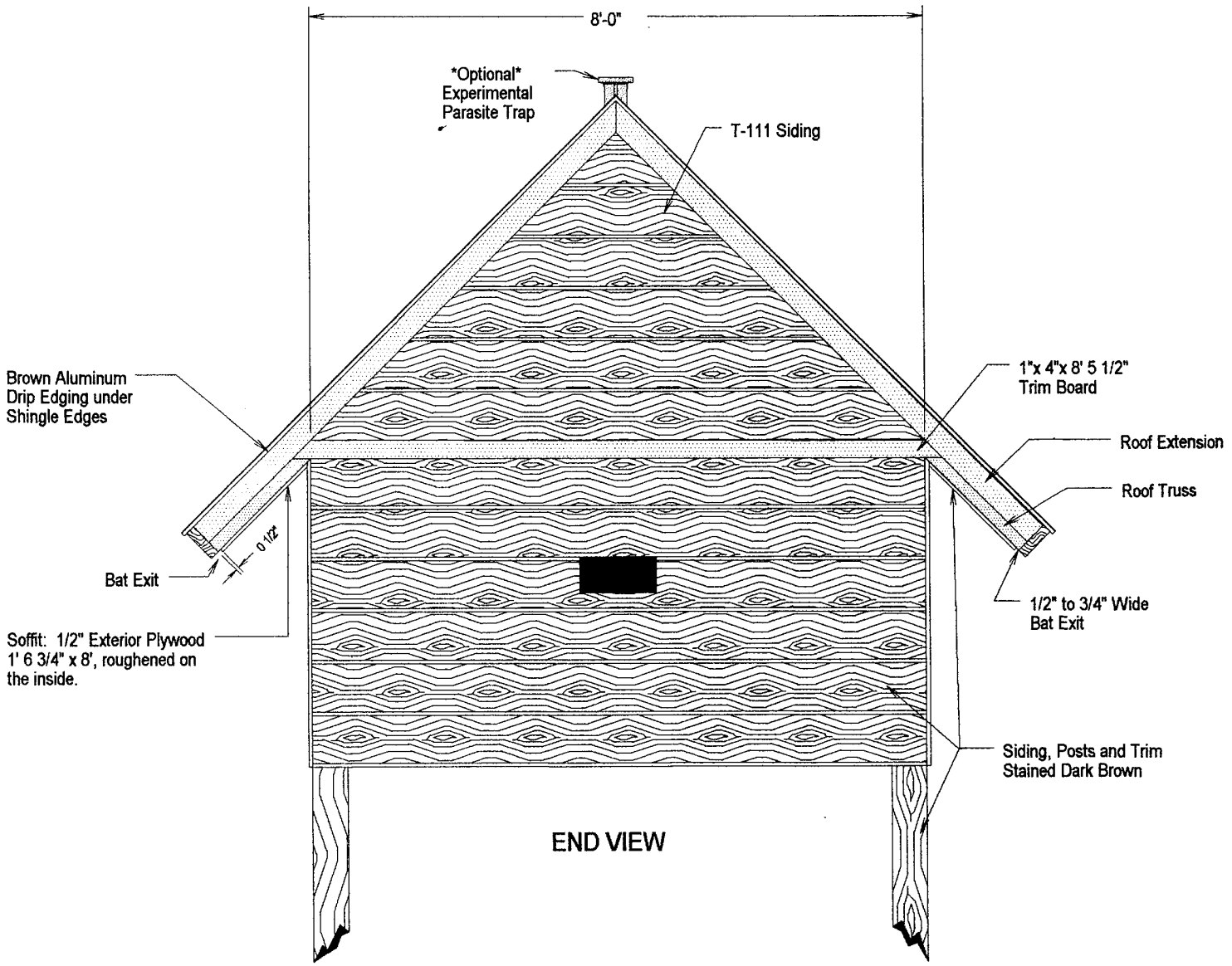
ROOF FRAMING DETAIL

USE 2"X 4"s OR SCRAP LUMBER TO TEMPORARILY NAIL ROOF TRUSSES TOGETHER



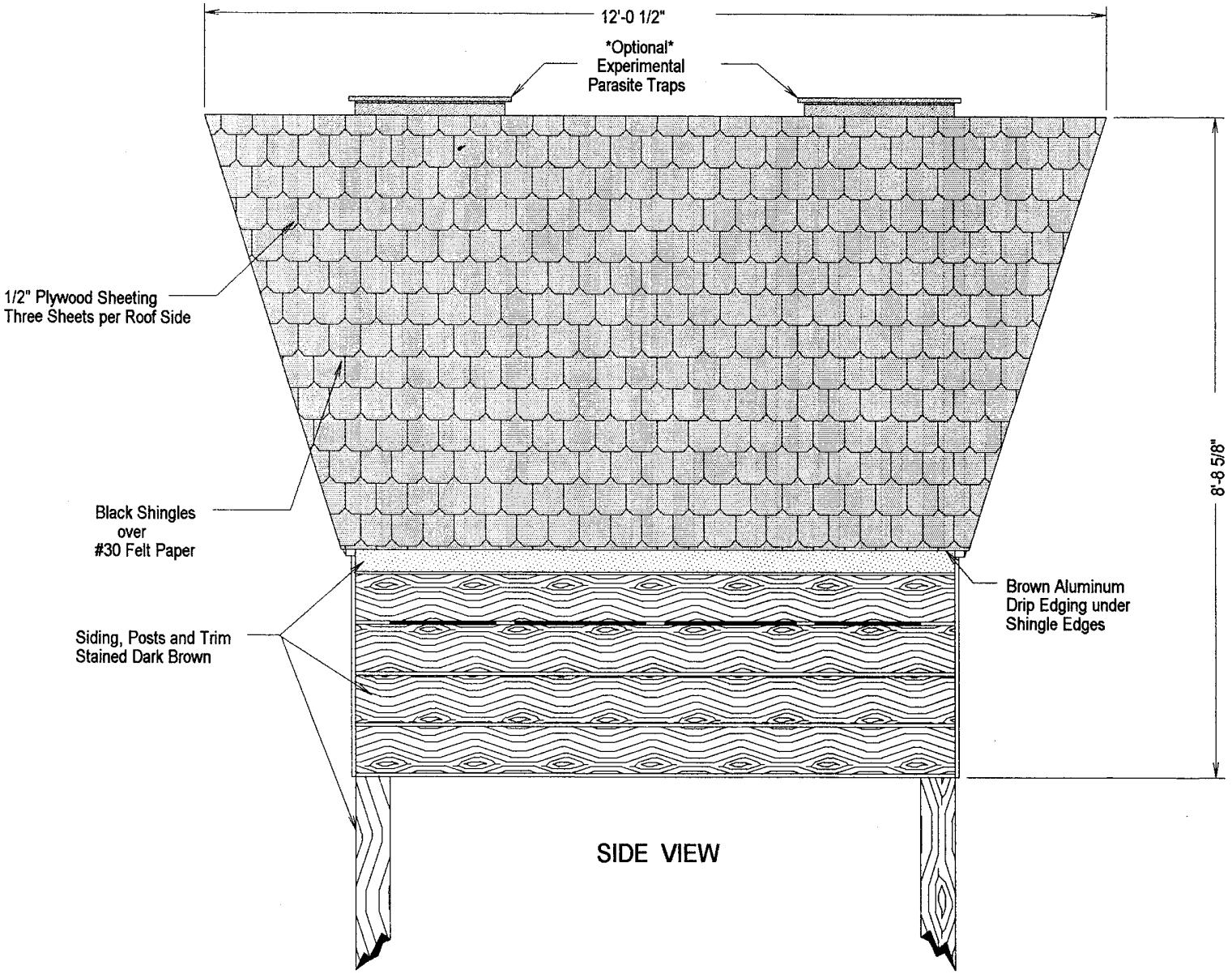
SIDE VIEW

ROOFING DETAIL



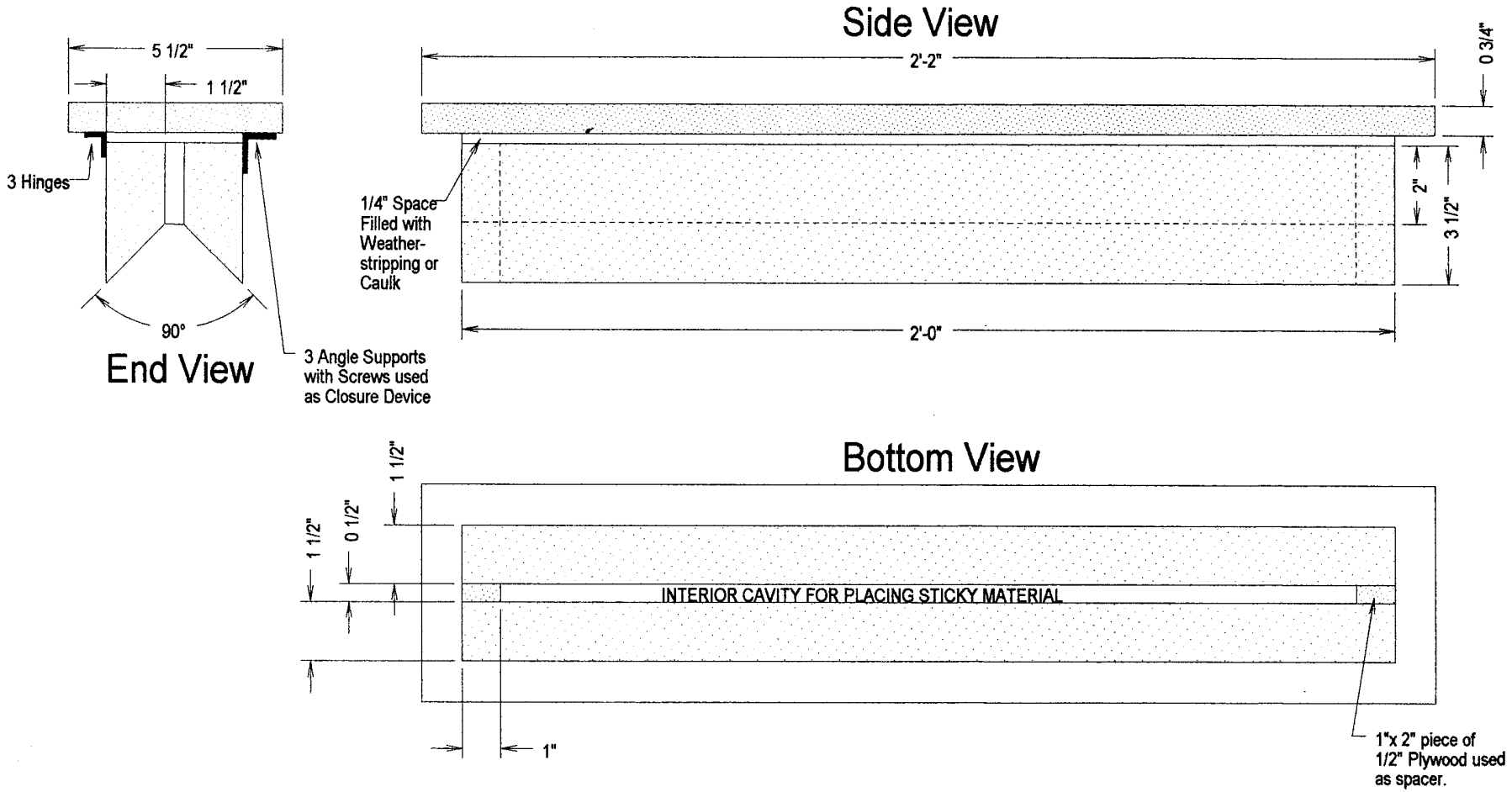
END VIEW

ROOFING DETAIL



SIDE VIEW

EXPERIMENTAL PARASITE TRAP (Optional)

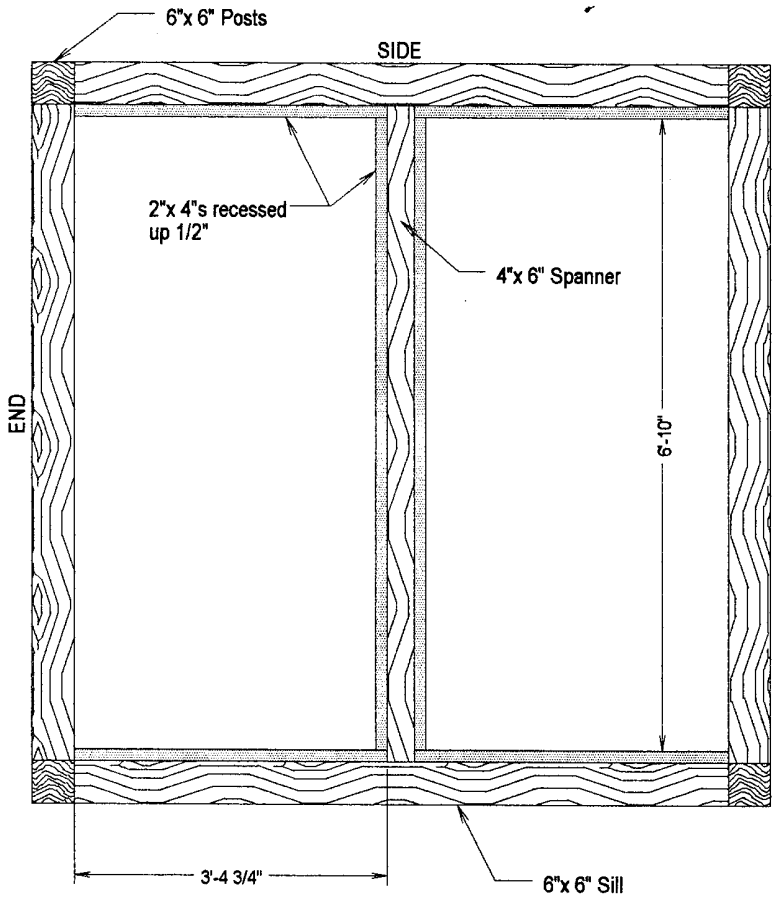


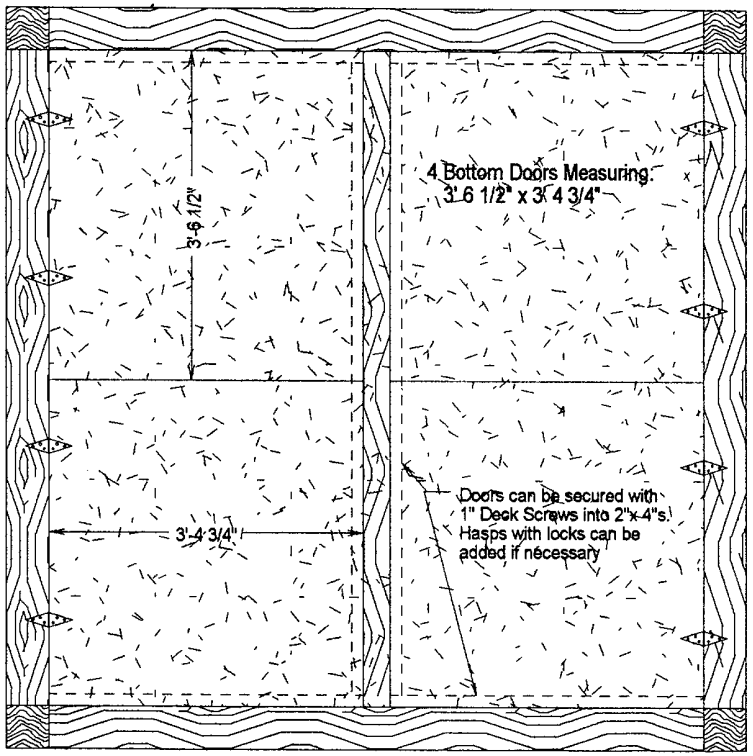
The Parasite Trap is basically an airtight box attached to the peak of the roof. There is a 1/2" wide opening that accesses the interior of the Bat Roost.

1/4" Hardware Cloth must be placed between the parasite trap and the bat roost to prevent bats from getting into the sticky material used in the parasite trap.

The Parasite Traps should be placed on each end of the roost, before the shingles are applied. All cracks must be sealed with roofing cement.
The traps should be stained black and rolled roofing applied to the top. Access for inspection and application of sticky material is through the hinged roof of the trap.
At the time these plans were drawn up, it is not known if this technique works or is necessary. Plans are to use material such as flypaper in this device.

DOOR DETAIL
(Viewed From Underside)



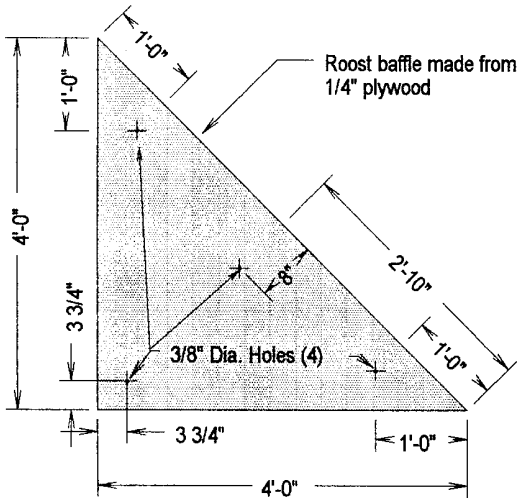


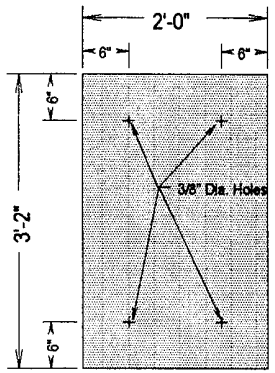
ROOST BAFFLE DETAIL

UPPER ROOST BAFFLES

All baffles MUST be roughened or scored for bat roosting

LOWER ROOST BAFFLES

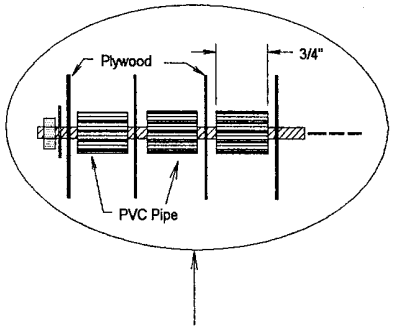




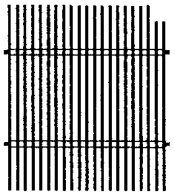
Roost Baffles made from 1/4" plywood

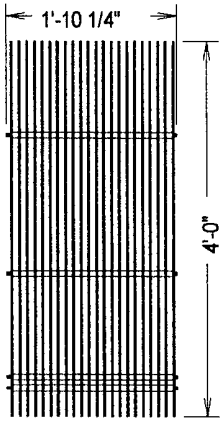
2" notch cut out of 4 narrow lower bundles to fit around post

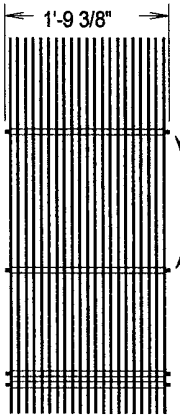
Roost Baffles bundled together with 3/8" threaded rod and 3/4" long pieces of Schedule 40 3/4" PVC pipe to form roost apartments.



Top View of narrow bundle

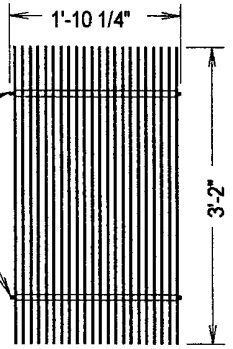


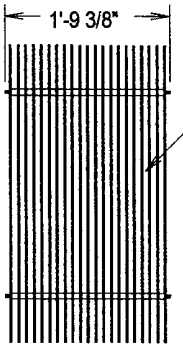




3/8" Threaded Rod with nuts and 1" washers on each end.

Plywood separated with 3/4" long pieces of schedule 40, 3/4" PVC pipe.



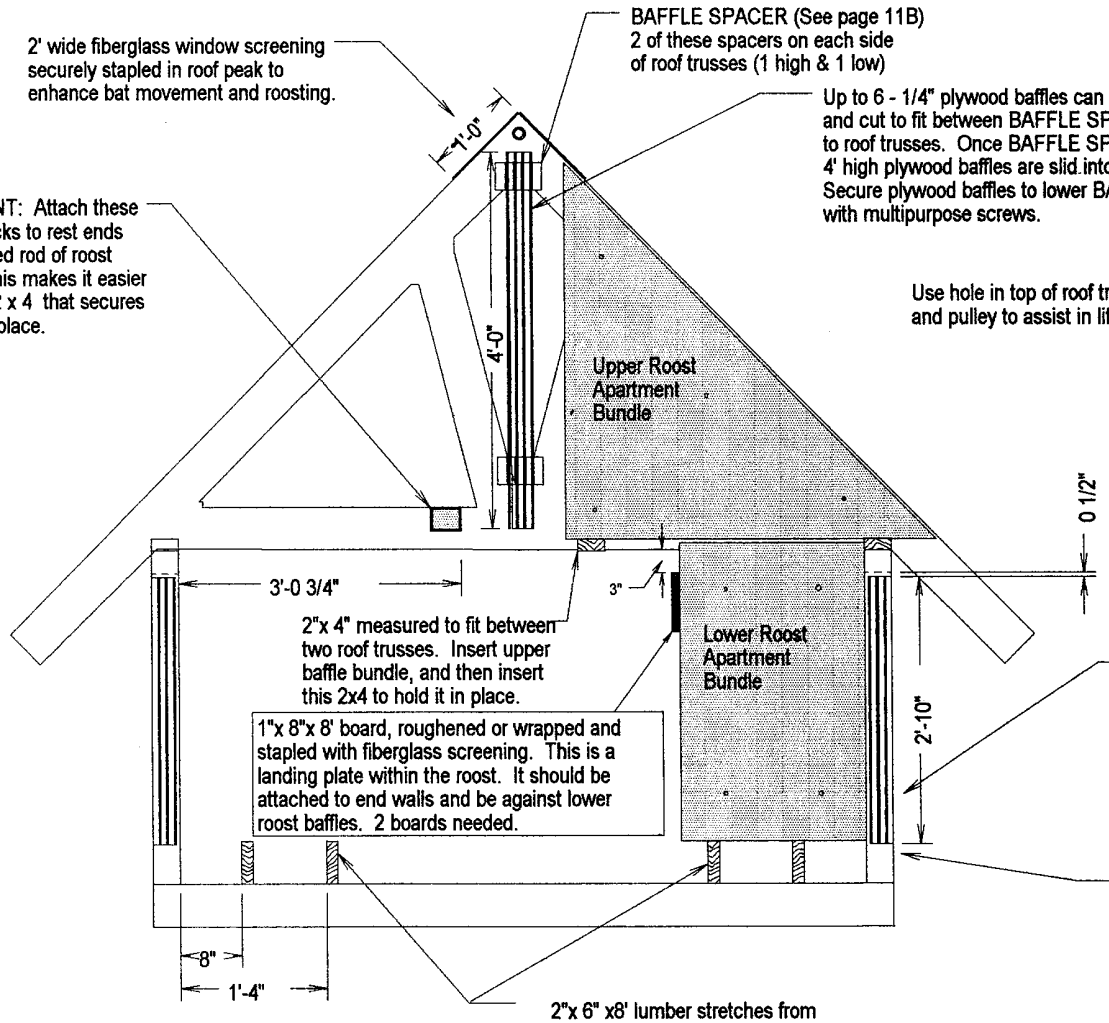


3/4" wide roosting crevices

End View of Upper Roost Apartments made to fit between the roof trusses. Measurements and number of baffles needed may vary somewhat. Eight apartments needed of two different sizes. One size fits the middle areas, and the narrower fits the end sections.

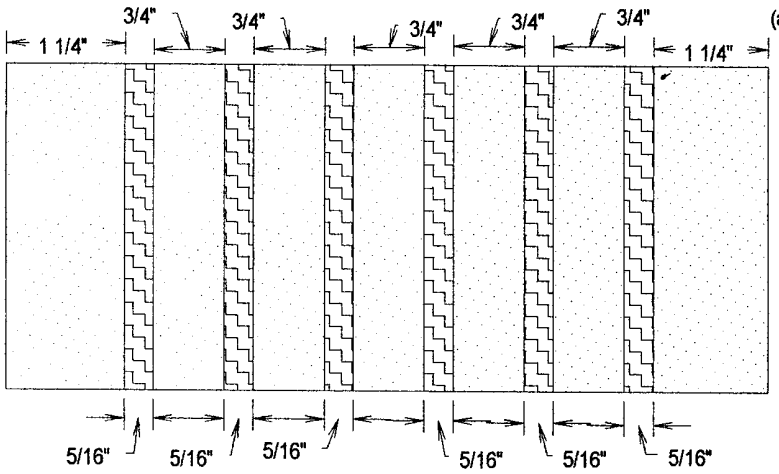
END VIEW of lower roost apartments. Eight bundles needed of two different sizes. The four wider apartments fit in the middle sections of the condo. The narrower bundles fit on ends.

ROOST BAFFLE INSERTION DETAILS

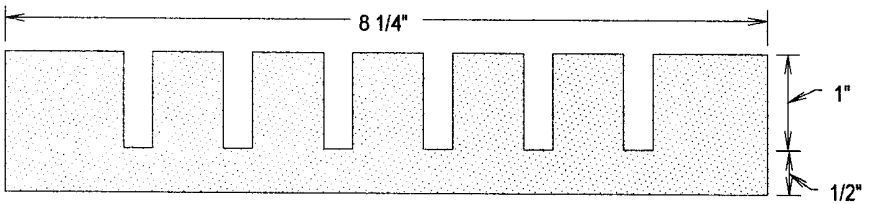


PEAK BAFFLE DETAIL

PEAK BAFFLE SPACER (Front View)

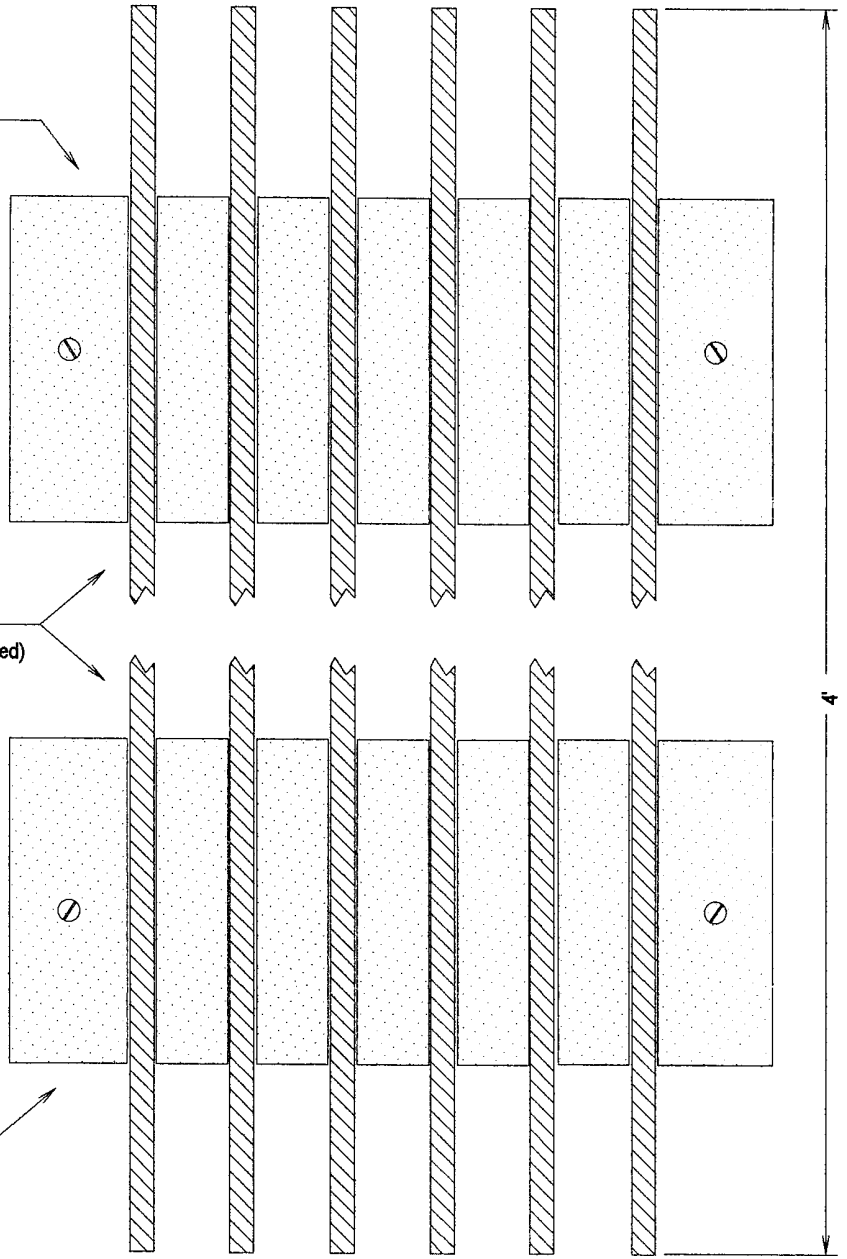


PEAK BAFFLE SPACER (Bottom View)



BAFFLE SPACERS are cut from 8 1/4" length of 2"x4"

Cutaway view of one end of Peak Baffles



Sixteen BAFFLE SPACERS are needed. Four for each of the four peak sections. Two SPACERS are attached to roof trusses near the roof peak, and two near the bottom of trusses for each section. After the spacers are in place, six - 4' high plywood baffles are slid in from the bottom. They are then secured at the bottom with 1 1/4" multipurpose screws. The width of the plywood baffles should be measured and cut to fit between the two pair of BAFFLE SPACERS.

INFORMATION REQUEST –EC-49

Source: Environment Canada

Summary of Comment

Many of the impacts to terrestrial ecology within LSA are identified, and are negligible, but some impacts within the MSA are not identified - at least not in the text. For example, it is noted in the text that with respect to the change in habitat suitability, "The effect is reversible once the operation of the mine has ceased" (p. 6-94, para. 1). Yet the pits that will ultimately fill with water as part of the proposed closure plan and rehabilitation plan will not return to original "suitable conditions" for terrestrial biota.

More specifically, it is estimated that 465 ha (11.6%) of the highly preferred habitat for Canada Warbler (i.e., Red Pine-White Pine Forest/Fir-Spruce-Mixedwoods/ Pine-Spruce Mixedwoods) will be lost in the LSA.

While it is mentioned in Table 6-50 on p. 6-122 that this impact in the MSA is "Not reversible", there should be some discussion in the text in the context of habitat suitability, or lack thereof, for VECs in particular (e.g., Canada Warbler).

Potential Environmental Effects

The information requested on Canada Warbler (listed as Threatened under SARA) and other BCR priority species is needed to adequately consider adverse effects on migratory birds.

Proposed Action

There are vague references to the possible displacement of "some individuals" (p. ES-8, para. 4), but EC recommends the number of Canada Warbler (individuals or pairs) that will be displaced by the project be highlighted, and that this information be provided for all BCR Priority species. In addition, Table 3-26 on p. 148 of the TETSD should include a column showing the "Estimated Loss of Bird Abundance in Zone of Influence (ZOI) in Application Case". The "% Change Baseline to Application" should remain in Table 3-26, to illustrate that the numbers are small in the context of the LSA.

Reference to EIS

EIS Section 6.2.1.3

Terrestrial Ecology TSD Section 3.7.1.1 and 3.7.2.1

EIS Executive Summary

Terrestrial Ecology TSD Section 3.8.1.2

Response

The predicted number of individuals or pairs of upland breeding birds (Canada Warbler and the 21 BCR 12 priority species) displaced based on the density of bird species per habitat type has been calculated and is provided in the table attached.

Attachments

Table: Estimated Displacement of BCR Priority Species of Upland Breeding Birds

Estimated Displacement of BCR Priority Species of Upland Breeding Birds					
BCR 12 Priority Species	**Habitat**	**Total area in Mine Site Area (ha.)**	**Mean Density (birds/ha)**	**Estimated Displacement by Habitat (number of birds)**	**Estimated Total Displacement (number of birds)**
Bay-breasted warbler	dense mixed	150.49	0.03	5	108
	dense coniferous	430.43	0.24	103	
Blackburnian warbler	dense coniferous	430.43	0.07	30	41
	dense mixed	150.49	0.07	11	
Black-throated green warbler	dense coniferous	430.43	0.07	30	35
	dense mixed	150.49	0.03	5	
Canada warbler	dense coniferous	430.43	0.03	13	41
	dense deciduous	191.22	0.07	13	
	dense mixed	150.49	0.1	15	
Chestnut-sided warbler	dense deciduous	191.22	0.14	27	32
	dense mixed	150.49	0.03	5	
Common yellowthroat	marsh	20.33	0.24	5	18
	open fen	48.52	0.24	12	
	thicket swamp	7.2	0.14	1	
Conneticut warbler	treed bog	16.63	0.36	6	6
Least flycatcher	dense deciduous	191.22	0.65	124	135
	dense mixed	150.49	0.07	11	
Mourning warbler	dense deciduous	191.22	0.07	13	33
	dense mixed	150.49	0.1	15	
	marsh	20.33	0.24	5	
Nashville warbler	conifer swamp	206.87	0.79	163	498
	dense coniferous	430.43	0.31	133	
	dense deciduous	191.22	0.14	27	
	dense mixed	150.49	0.51	77	
	open fen	48.52	0.48	23	
	thicket swamp	7.2	0.72	5	
	treed bog	16.63	0.72	12	
	treed fen	80.8	0.72	58	
Northern flicker	dense coniferous	430.43	0.03	13	19
	marsh	20.33	0.24	5	
	thicket swamp	7.2	0.14	1	
Purple finch	dense coniferous	430.43	0.03	13	30
	dense mixed	150.49	0.03	5	
	open fen	48.52	0.12	6	
	treed bog	16.63	0.36	6	
Ruffed grouse	dense deciduous	191.22	0.07	13	13
Swamp sparrow	conifer swamp	206.87	0.03	6	58
	dense mixed	150.49	0.03	5	
	marsh	20.33	0.24	5	
	open fen	48.52	0.84	41	
	thicket swamp	7.2	0.14	1	
Veery	dense deciduous	191.22	0.36	69	81
	dense mixed	150.49	0.07	11	
	thicket swamp	7.2	0.14	1	
White-throated sparrow	conifer swamp	206.87	0.51	106	550
	dense coniferous	430.43	0.55	237	
	dense deciduous	191.22	0.22	42	
	dense mixed	150.49	0.41	62	
	marsh	20.33	0.48	10	
	open fen	48.52	0.24	12	
	thicket swamp	7.2	0.72	5	
	treed bog	16.63	0.72	12	
	treed fen	80.8	0.79	64	
Yellow-bellied sapsucker	dense coniferous	430.43	0.07	30	62
	dense deciduous	191.22	0.14	27	
	dense mixed	150.49	0.03	5	

INFORMATION REQUEST – MNR-286

Source: Ministry of Natural Resources

Summary of Comment

For each site, need to indicate the amount of area being rehabilitated, type of rehabilitation, and change in ecological condition from pre-mine (e.g. For TMF, indicate ecosite type prior to mine and future condition post closure.)

Potential Environmental Effects

Clear presentation of the project is a fundamental and important part of the environmental assessment.

Proposed Action

Please include the required information.

Reference to EIS

Conceptual Closure and Rehabilitation Plan section 2.4 pg. 7

Response

The existing vegetation communities within the footprint of the Tailings Management Facility (TMF) are a mix of 30 different wetland and upland ecosite types (Table 1). After mine development the TMF will have a tailings surface area of 675 ha that will be directly revegetated with grasses. It is not planned to plant trees; however it is expected that the area will eventually be covered with trees following natural succession. The TMF will also include a post-closure residual pond with an area of about 65 ha that will replace some of the lost wetland areas. The remaining 23 ha is the area occupied by the dams around the TMF which will remain in post-closure.

The Waste Rock Management Facility (WRMF), under existing conditions is composed of dense coniferous and dense deciduous forest with some smaller extents of mixed forest and wetland. The WRMF will have a surface area of about 166 ha. It will not be deliberately seeded, so it will initially be exposed rock material with eventual sparse ingrowth of vegetation in the long term.

The footprint area of the overburden stockpile currently contains mainly dense coniferous forest with smaller spatial coverage of mixed forest and wetland communities. At the end of operations, the Overburden Stockpile will contain about 4.5 Mm3 of overburden from the Open Pit stripping. The foot print area will be about 37 ha. Some of the overburden will be used for site grading at closure. The remaining overburden will be regraded to flat slopes and the pile will then be revegetated by direct application of fertilizer and grass seeds. No tree planting is planned; however it is expected that trees will overgrow the site by natural succession.

Under existing conditions, the area in which the Low Grade Ore stockpile will be located contains mostly dense coniferous forest with smaller spatial extents of deciduous and mixed forest (Table 4). It is planned that the Low Grade Ore will be milled before the end of operations. As a result, the Low Grade Ore Stockpile will likely not exist after closure. The site, which will have an area of about 23 ha, will not be deliberately revegetated; however it is expected that trees will eventually grow into the area and will eventually become a forest.

The Open Pits will be allowed to flood to a final water level of 420 m. This will result in a final pond area of about 138 ha.

The Project facilities (e.g. the Processing Plant and equipment, the maintenance shops, the accommodation camp, the Effluent Treatment Plant, etc.) will all be redundant at closure. Portable facilities such as trailers will be removed from the site. Permanent facilities will be decommissioned and demolished. These areas will be regraded if necessary and any exposed slabs will be punctured and covered over with overburden. On-site access roads and haul roads not required for post-closure monitoring and maintenance will be scarified and culverts will be removed to restore natural drainage conditions. It is not planned to deliberately revegetate these infrastructure areas; however it is expected that trees will over grow the area by natural succession. Based on the mine study area of 2062 ha, the infrastructure area involved is estimated at about 905 ha.

Attachments

Tables

Table 1: Ecosite Types and Spatial Coverage in the TMF

	Type	Area (ha)
TMF	ES-B	158.00
	ES-B	28.14
	ES-C	13.72
	ES-E	102.43
	ES-F	15.57
	ES-G	29.58
	ES-H	14.42
	ES-I	53.35
	Open Water	13.02
	Other	0.33
	W12	2.22
	W13	6.12
	W16	10.45
	W18	49.13
	W19	26.72
	W20	14.42
	W22	16.85
	W25	16.63
	W27	16.69
	W28	12.00
	W29	39.35
	W3	2.36
	W30	1.70
	W31	75.93
	W32	32.41
	W33	0.87
	W35	2.30
	W36	4.02
	W4	2.77
	W5	1.46
Total Area		***762.97***

Table 2: Ecosite Types and Spatial Coverage in the WRMF

	Type	Area (ha)
Waste Rock	ES-B	12.24
	ES-E	49.94
	ES-F	17.48
	ES-H	65.27
	Other	1.89
	W14	1.21
	W29	6.85
	W30	1.19
	W31	6.56
	W32	0.49
	Open Water	2.77
Total Area		***165. 89***

Table 3: Ecosite Types and Spatial Coverage in the Overburden Stockpile

	Type	Area (ha)
Overburden	W13	1.56
	W30	0.19
	W32	1.35
	ES-H	6.37
	ES-B	18.08
	ES-F	9.22
Total Area		***36.78***

Table 4: Ecosite Types and Spatial Coverage in the Low Grade Ore Stockpile

	Type	Area (ha)
Low Grade Ore	ES-A	0.08
	ES-B - Disturbed	0.65
	ES-B - Disturbed	0.66
	ES-E	1.92
	ES-F	4.93
	ES-H	14.06
Total Area		***22.31***

600000

700000

5400000

N

Highway 17

Ignace

Raleigh Lake

Stormy Lake

Wawang Lake

Highway 622

Irene Lake

Jones Lake

White Otter Lake

PROJECT LOCATION

Franklin Lake

Lizard Lake

Sawbill Bay

Light Lake

Turtle Lake

Dashwa Lake

Marmion Lake

Hawk Bay

Pike Lake

Relief Lake

Reserve Island

Steep Rock Lake

Atikokan

Sapawe

Kawene

Owakonze

Huronian

Quetico

Calm Lake

Mine Centre

Horse Collar Junction

Seine River Village

Flanders

Kashabowie

Burchell Lake

Shebandowan

Highway 17

Shabaqua Corners

Shabaqua

Highway 11

Glenwater

Sunshine

Kasakokwog Lake

Pickerel Lake

Quetico Lake

Namakan Lake

Wolseley Lake

Tubman Lake

Jones Lake

U. S. A.

LEGEND

- Project Location
- City/Town
- Small Community
- Power Transmission Line
- Provincial Highway
- Road
- Existing Railway
- River/Stream
- Lake
- Regional Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

5 2.5 0 5 10 15 20 25 30 35

SCALE 1:750,000 KILOMETRES

PROJECT

HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE

REGIONAL STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 13-1118-0010			SCALE AS SHOWN	VERSION 2
DESIGN	CGE	14 Nov. 2008		
GIS	JO	30 May. 2013		
CHECK	AVS	30 May. 2013		
REVIEW	KT	30 May. 2013		

FIGURE: 1-3

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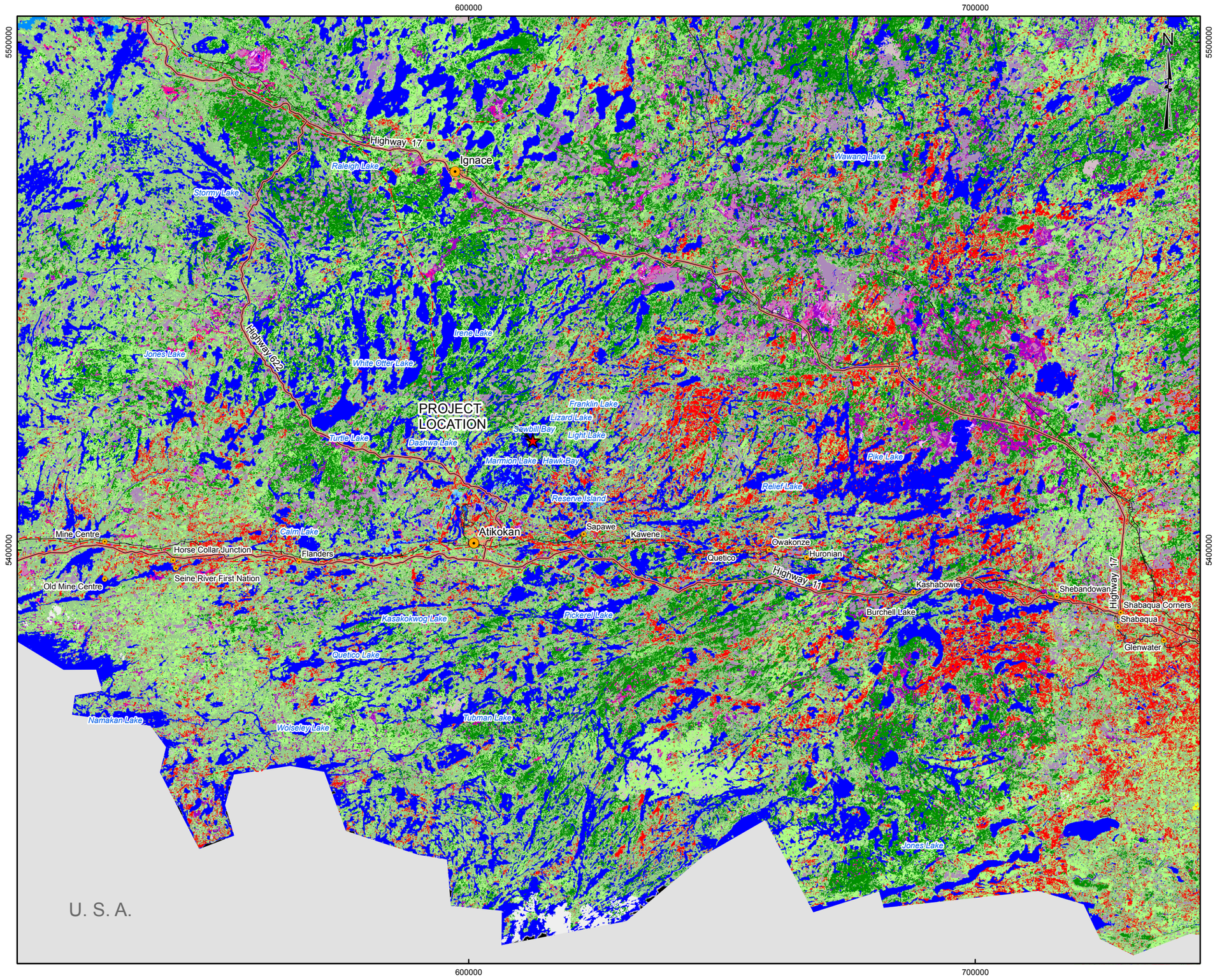

LEGEND

- Project Location
- City/Town
- Small Community
- Provincial Highway
- Existing Railway
- Regional Study Area

Land Cover

- Water - deep clear
- Water - shallow / sedimented
- Settlement / Infrastructure
- Sand / Gravel / Mine Tailings
- Bedrock
- Mudflats
- Forest Depletion - cuts
- Forest Depletion - burns
- Forest - regenerating depletion
- Forest - sparse
- Forest - dense deciduous
- Forest - dense mixed
- Forest - dense coniferous
- Marsh - intertidal
- Marsh - supertidal
- Marsh - inland
- Swamp - deciduous
- Swamp - coniferous
- Fen - open
- Fen - treed
- Bog - open
- Bog - treed
- Tundra Heath
- Agriculture - Pasture / abandoned fields
- Agriculture - cropland
- Other - unknown
- Other - cloud / shadow
- Seine River Wetland Mapping

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

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SCALE 1:750,000 KILOMETRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
LANDCOVER IN THE REGIONAL STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 13-1118-0010			SCALE AS SHOWN	VERSION 2
DESIGN	CGE	14 Nov. 2008		
GIS	JO	30 May. 2013		
CHECK	AVS	30 May. 2013		
REVIEW	KT	30 May. 2013		

FIGURE: 2-5

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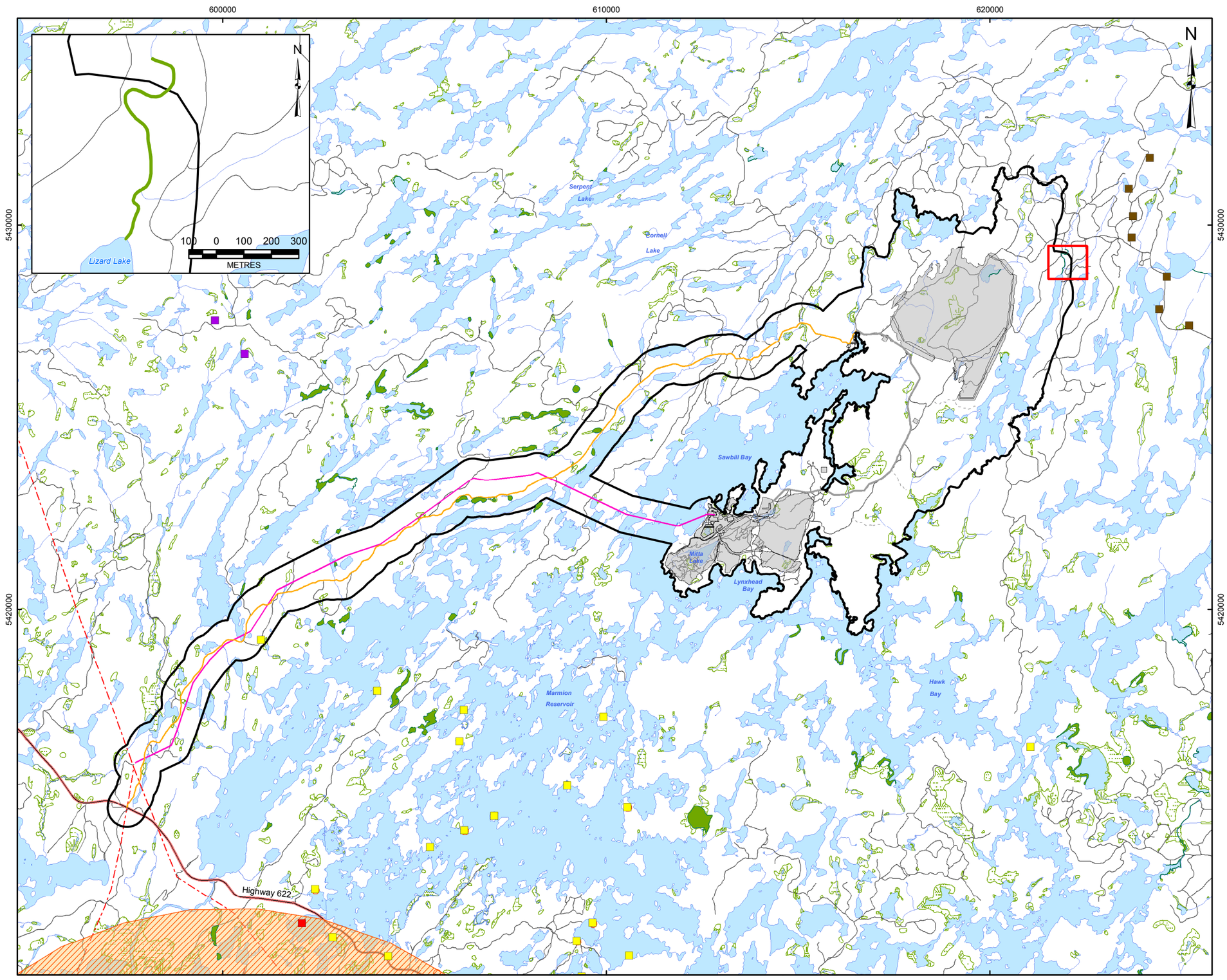


LEGEND

- Bald Eagle Nesting Site
- Black Tern Nesting Site/Colony
- Great Gray Owl Nesting Site
- Great Blue Heron Nesting Site/Colony
- Osprey Nesting Site
- Bear Baiting Station
- Provincial Highway
- Trail
- Road
- Power Transmission Line
- River/Stream
- Lake
- Wetland
- Moose Aquatic Feeding Site
- Species Occurrence
- Species Observation
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000
SCALE 1:100,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

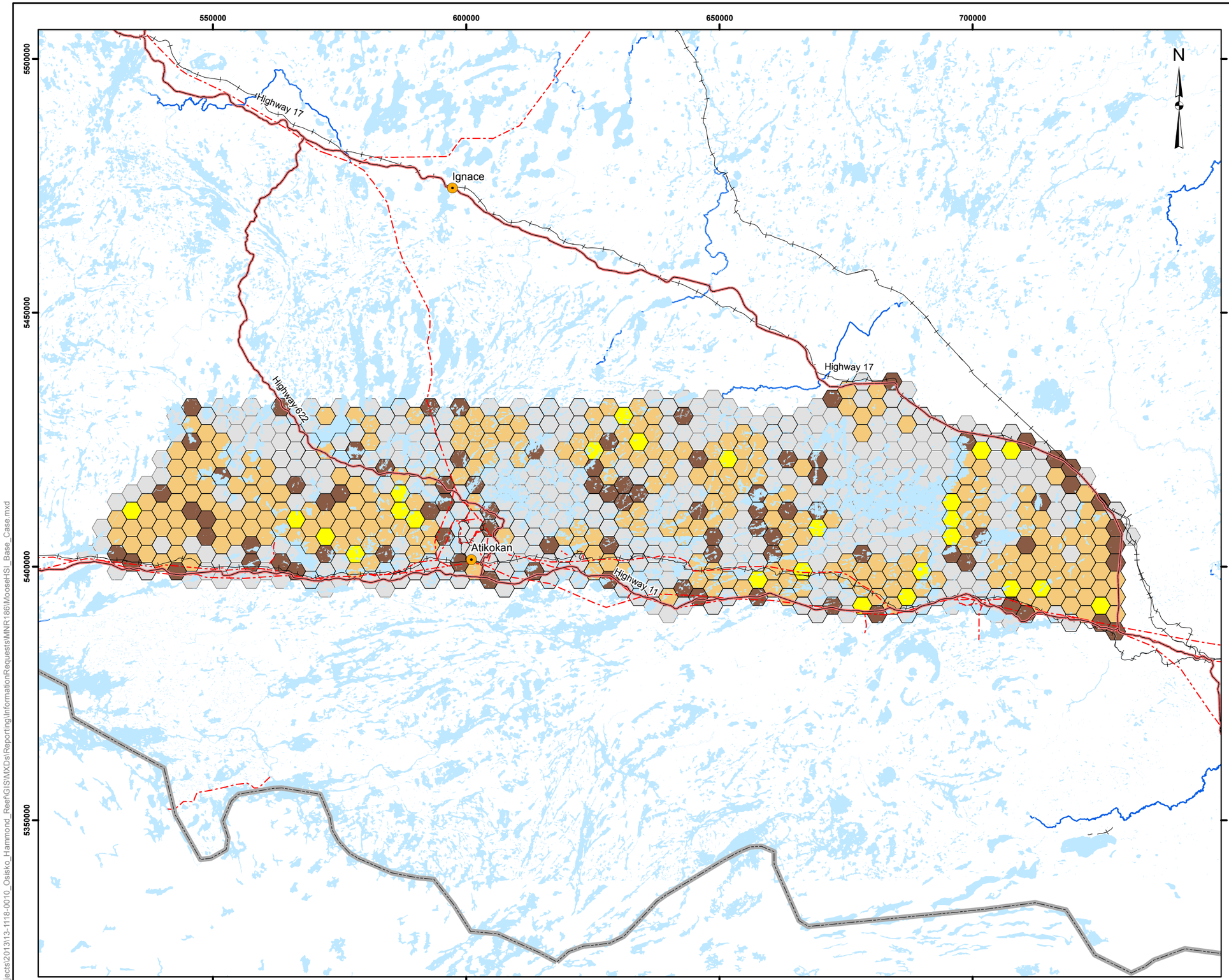
TITLE
MOOSE HABITAT, NESTING SITES, AND SPECIES OBSERVATIONS IN THE MINE AND LOCAL STUDY AREAS

Golder Associates
Mississauga, Ontario

PROJECT NO. 13-1118-0010			SCALE AS SHOWN	VERSION 2
DESIGN	CGE	14 Nov. 2008		
GIS	JO	30 May. 2013		
CHECK	AVS	30 May. 2013		
REVIEW	KT	30 May. 2013		

FIGURE: 2-10

G:\Projects\2013\13-1118-0010_Osisko_Hammond_Reef\GIS\MXDs\Reporting\InformationRequests\MNR187\Moose_Aquatic_Feeding_Sites.mxd



LEGEND

- City/Town
- Provincial Highway
- Power Transmission Line
- Existing Railway
- Project Facilities
- Lake

Habitat Categories

- Least Suitable Habitat (0 - 0.31)
- Suitable Habitat (0.32 - 66)
- Most Suitable Habitat (0.67-1.0)
- Unstuitable Habitat
- Regional Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

18,000 0 18,000
SCALE 1:750,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
MOOSE HABITAT SUITABILITY INDEX BASE CASE

Golder Associates
Mississauga, Ontario

PROJECT NO. 13-1118-0010			SCALE AS SHOWN	VERSION 2
DESIGN	JO	23 Jan. 2013		
GIS	JO	30 May 2013		
CHECK	EG	30 May 2013		
REVIEW	EG	30 May 2013		

FIGURE: 3-2

G:\Projects\2013\13-1118-0010_Osisko_Hammond_Reef\GIS\MXDs\Reporting\InformationRequests\MNR186\MooseHSI_Base_Case.mxd

PART C

Terrestrial Ecology Technical Support Document, Version 1

December 2013
Project No. 13-1118-0010
Hammond Reef Gold Project

February 2013

HAMMOND REEF GOLD PROJECT
Terrestrial Ecology Technical Support Document

VERSION 1

Submitted to:
Osisko Hammond Reef Gold Ltd.
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Hammond Reef Gold Project
Terrestrial Environment Technical Support Document

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1.0 INTRODUCTION

Osisko Hammond Reef Gold Ltd. (OHRG) proposes the development of an open pit gold mine in north-western Ontario, herein referred to as the Hammond Reef Gold Project (Project). This Technical Support Document (TSD) is one of a series of reports in support of the Project's Environmental Impact Statement/Environmental Assessment Report (EIS/EA Report).

The following reports have been prepared to support the EIS/EA Report:

- Atmospheric Environment TSD.
- Geochemistry, Geology and Soil TSD.
- Hydrogeology TSD.
- Hydrology TSD.
- Water and Sediment Quality TSD.
- Site Water Quality TSD.
- Lake Water Quality TSD.
- Aquatic Environment TSD.
- **Terrestrial Ecology TSD.**
- Aboriginal Interests TSD.
- Cultural Heritage Resources TSD.
- Human Health and Ecological Risk Assessment TSD.
- Socio-economic Environment TSD.
- Alternatives Assessment Report.
- Conceptual Closure and Rehabilitation Plan.

The EIS/EA Report will summarize the findings of this TSD and of the above-listed supporting reports.

1.1 Purpose and Scope

The purpose of this TSD is to fulfill the assessment scope outlined in the Project's Terms of Reference (ToR) approved by the Ontario Minister of the Environment (July 2012), and in the Environmental Impact Statement Guidelines (EIS Guidelines) published by the Canadian Environmental Assessment Agency (CEA Agency) (December 2011).

Table 1-1 contains the contents of the EIS Guidelines that pertain to the terrestrial ecological environment and compares these to the applicable discussions in this TSD.

Table 1-1: Canadian Environmental Assessment Agency Environmental Impact Statement Guidelines Concordance Table

Section in Environmental Impact Statement Guidelines	Requirement	Section in Terrestrial Ecology Technical Support Document
9.1.7 Vegetation	The EIS shall characterize the baseline vegetative communities within the area potentially affected by the Project. In particular, the EIS shall include information on the following key communities, species groups or ecosystems that have intrinsic ecological or social value: • forests; • wetland ecosystems; • riparian ecosystems; and, • plant species and ecological communities of conservation concern.	2.2.2 Vegetation
		2.2.2.2.1.1 Upland Ecosites (Forests)
		2.2.2.2.1.2 Wetland Ecosites (includes a discussion on riparian ecosystems)
		2.2.2.2.2 Plant Species Richness 2.2.2.2.2.1 Rare Plants Appendix 2.II Table 3
		2.2.2.2.3 Ecological Communities of Conservation Concern
9.1.8 Wildlife	The EIS shall describe and identify: • the terrestrial species and their habitat at the site and within the local and regional study areas	2.2.3 Wildlife
9.1.8 Wildlife	• any wildlife corridors and physical barriers to movement that exist within the Project Site;	2.2.3.5 Wildlife Corridors
9.1.8 Wildlife	• available data from Environment Canada and Ontario Ministry of Natural Resources.	2.1.3 Secondary Data Review
9.1.8 Wildlife	• all protected and conservation areas established by federal, provincial and municipal jurisdictions (e.g., wilderness areas, parks, sites of historical or ecological significance, nature reserves, federal migratory bird sanctuaries and wildlife management areas).	2.1.3 Secondary Data Review 2.2.1 Protected Areas and Conservation Lands 2.2.2.2.3 Ecological Communities of Conservation Concern
9.1.8 Wildlife	The EIS shall also provide the following information on: • the level of use of the mine site area by large carnivores such as black bears and wolves.	2.2.3.1.2 Large Carnivores and Omnivores
9.1.8 Wildlife	• furbearer and small mammal species known and potentially occurring in the proposed mine development area.	2.2.3.1.3 Furbearers and Small Mammals
9.1.8 Wildlife	• raptors and raptor habitat in the proposed mine site area, and their abundance.	2.2.3.2 Birds 2.2.3.2.2 Field Data Results Table 2-14– Raptors, Owls and Vultures

Table 1-1: Canadian Environmental Assessment Agency Environmental Impact Statement Guidelines Concordance Table (Continued)

Section in Environmental Impact Statement Guidelines	Requirement	Section in Terrestrial Ecology Technical Support Document
9.1.8 Wildlife	• the relative abundance, distribution and density of migratory birds, including: ▪ breeding, migration, staging and stopover as well as wintering populations; and ▪ available data from Environment Canada and Ontario Ministry of Natural Resources.	2.2.3.2 Birds 2.2.3.2.2 Field Data Results Appendix 2.I Table 3
9.1.8 Wildlife	The results of wildlife surveys conducted during the seasons and during times of day which facilitate detection of the target species or species groups will be summarized in the EIS (with further detail provided in accompanying appendices). The following shall be provided: • Identification of species of conservation concern that may occur in potential habitats in the Project Site during critical life stages (e.g., Breeding, nesting, over-wintering and hibernating) will be identified;	2.2 Results 2.2.4 Species of Conservation Concern
	• the relative abundance, distribution and habitat use of wildlife species of conservation concern, including detailed description of the methodology (survey description, timing, etc.) for each species of conservation concern identified;	2.1.4 Field Surveys 2.1.4.2.6 Species of Conservation Concern Surveys 2.2.4 Species of Conservation Concern
9.1.8 Wildlife	• identification of ungulate species occurring in the proposed mine development area and along the transmission corridor; and	2.2.2.1 Mammals 2.2.3.1.1 Ungulates
9.1.8 Wildlife	• Results of the results of reconnaissance amphibian and amphibian habitat inventory.	2.2.3.3 Amphibians and Reptiles

Table 1-1: Canadian Environmental Assessment Agency Environmental Impact Statement Guidelines Concordance Table (Continued)

Section in Environmental Impact Statement Guidelines	Requirement	Section in Terrestrial Ecology Technical Support Document
9.1.8 Wildlife	*Species At Risk* The EIS shall describe and identify any biological species of conservation status at a federal, provincial, regional or local level and their critical habitats, as outlined in the sections above. The results of wildlife surveys conducted during the seasons and during times of day which facilitate detection of the target species or species groups will be summarized in the EIS (with further detail provided in accompanying appendices). This includes information pertaining to species of conservation concern (i.e., COSEWIC-listed species, species listed under the Species at Risk Act and/or the Endangered Species Act, 2007) that may occur in potential habitats in the Project Site during critical life stages (e.g., breeding, nesting, over-wintering and hibernating) in the Project Site; including their conservation status relative abundance, distribution and habitat use.	2.2.4.1 Species at Risk
Impact Assessment		
10.2.6 Vegetation	**Vegetation** The EIS shall identify potential effects on vegetation during all phases and on all the components of the Project. The Proponent shall develop appropriate mapping products to assist in assessing the effects of the Project on key vegetative communities, and identifying rare ecosystems and species at risk. The EIS shall include a detailed assessment of key indicator communities, species groups or ecosystems representative of overall ecosystem condition and are sensitive to Project activities.	3.0 Effects Assessment 3.3 Wetlands 3.4 Forest Cover
10.2.6 Vegetation	The EIS shall: • assess the potential effects of the Project on vegetation, including species known to be important to Aboriginal people and groups;	3.3 Wetlands 3.3.1.1 Effect 1-Physical Loss or Alteration of Vegetation 3.4 Forest Cover 3.4.1.1 Effect 1-Physical Loss or Alteration of Vegetation

Table 1-1: Canadian Environmental Assessment Agency Environmental Impact Statement Guidelines Concordance Table (Continued)

Section in Environmental Impact Statement Guidelines	Requirement	Section in Terrestrial Ecology Technical Support Document
10.2.6 Vegetation	• document ambient concentrations of trace elements in wetland and upland vegetation to determine the potential for contamination of vegetation that may be consumed by wildlife or people; and	Human Health and Ecological Risk Assessment TSD 3.3 Wetlands 3.3.1.5 Effect 5-Dust Deposition and Air Emissions 3.4 Forest Cover 3.4.1.4 Effect 4-Dust Deposition and Air Emissions
10.2.6 Vegetation	• develop mitigation measures to minimize or eliminate Project effects on vegetation, ecosystem function and wildlife habitat.	3.0 Effects Assessment 3.3 Wetlands 3.4 Forest Cover 3.5 Moose 3.6 Furbearers 3.7 Species at Risk 3.8 Upland Breeding Birds
10.2.6 Vegetation	With respect to the proposed transmission line, the EIS shall include a discussion of the following issues: • the potential effects of invasive vegetation within the corridor and proposed methods of controlling invasive or undesired vegetation; and • whether the proposed corridor will be seeded.	3.3 Wetlands 3.3.1.5 Effect 5 – Introduction of Invasive Plant Species 3.4 Forest Cover 3.4.1.5 Effect 5 – Introduction of Invasive Plant Species
10.2.7 Wildlife	**Wildlife** The EIS shall identify potential effects on wildlife during all phases and on all the components of the Project. The EIS shall include: • the identification and assessment of the potential effects of the Project on ungulates, large carnivores, furbearers, small mammals, raptors, waterfowl and other birds, reptiles, and amphibians that may be affected by the Project with particular attention to riparian, wetland, cliff and forest ecotone habitats, where applicable;	3.0 Effects Assessment

Table 1-1: Canadian Environmental Assessment Agency Environmental Impact Statement Guidelines Concordance Table (Continued)

Section in Environmental Impact Statement Guidelines	Requirement	Section in Terrestrial Ecology Technical Support Document
10.2.7 Wildlife	• a summary of the amount and type of wildlife habitat potentially impacted by the Project. These summaries will include wildlife habitat suitability interpretations for ungulates, black bear and species of conservation concern that are known or likely to occur in the Project Site.	3.0 Effects Assessment 3.5 Moose 3.7 Species at Risk
10.2.7 Wildlife	• identification of mitigation measures to minimize or eliminate any adverse effects on wildlife, including wildlife habitat, and to reduce potential bird loss resulting from collisions with the transmission line, particularly in the vicinity of wetland, lake and riparian habitats and on migratory corridors; and	3.0 Effects Assessment 3.5 Moose 3.6 Furbearers 3.8 Upland Breeding Birds
10.2.7 Wildlife	• an evaluation of the effect of the project on wildlife mortality risk and movement patterns.	3.5 Moose 3.5.1.2 Effect 2-Habitat Suitability (Quality, Movement and Behaviour) 3.5.1.5 Effect 5 – Vehicle Injury/Mortality 3.5.1.7 Effect 7-Attraction of Predators 3.6 Furbearers 3.6.1.6 Effect 6 – Vehicle Injury/Mortality 3.6.1.8 Effect 8-Attraction of Predators 3.7 Species at Risk 3.7.1.6 Effect 6 – Injury/Mortality of SAR
10.2.7 Wildlife	Species At Risk The EIS shall address issues related to species at risk for the areas potentially affected by the Project, including the transmission line corridor. This shall include the identification and assessment of the potential effects of the Project on wildlife species of conservation concern (i.e., COSEWIC-listed species, species listed under the Species at Risk Act and/or Endangered Species Act and their habitats).	3.0 Effects Assessment 3.7 Species at Risk

This TSD describes the terrestrial ecology existing conditions focusing on Valued Ecosystem Components (VECs). The TSD provides sufficient detail to allow the prediction and assessment of potential effects on terrestrial ecology VECs, and to determine of the significance of these effects. The TSD also proposes mitigation measures, and outlines monitoring programs to enable effective testing of predictions. An explanation of the approach used for this TSD is provided in Section 3-1 of this report.

1.2 Report Organization

This TSD is structured as follows:

- Section 1 presents the purpose and scope of the TSD, an overview of the Project, the general assessment approach, VECs, and assessment boundaries of the TSD, and other aspects of the Project relevant to terrestrial ecology.
- Section 2 describes the existing terrestrial ecology conditions within the Project's spatial boundaries.
- Section 3 presents the assessment of Project effects on terrestrial ecology, focusing on VECs. The effects assessment includes the screening of effects, the identification of additional mitigation measures, the description of residual effects, and the assessment of significance of residual effects.
- Section 4 outlines the monitoring program requirements for the terrestrial ecology environment during each of the Project's phases.
- Section 5 summarizes the findings of this report.

1.3 Project Overview

The Project overview and Project description are provided in Chapter 5 of the EIS/EA Report. Project aspects that influence the terrestrial ecology evaluation are described in Sections 1.3 to 1.8.

1.3.1 Project Location

The Project is located within the Thunder Bay Mining District in north-western Ontario, approximately 170 kilometres (km) west of Thunder Bay and 23 km northeast of the town of Atikokan (Figure 1-1).

Access to the Project Site is presently via two routes: the Premier Lake Road, a gravel road that intersects Highway 623 near Sapawe and the Hardtack-Sawbill Road, a gravel road that intersects Highway 622 northwest of the Town of Atikokan. Currently, an exploration camp is located at the northern end of Sawbill Bay in Upper Marmion Reservoir. The Project Site is also accessible by water from the southwest end of the Marmion Reservoir at its access point from Highway 622. The existing Hardtack-Sawbill road (access road) located to the north of Finlayson Lake has been upgraded to provide an improved and more direct linkage to the Project Site in support of the expanded exploration program.

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.;
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

100 0 100 200 300 400
SCALE 1:10,000,000 KILOMETRES

Golder Associates
Mississauga, Ontario

PROJECT No.	10-1118-0020
SCALE	AS SHOWN
VERSION	1
DATE	February 2013
DESIGN	JO
GIS	JO
CHECK	AVS
REVIEW	KT

TITLE

SITE LOCATION PLAN

PROJECT HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

FIGURE: 1-1

G:\Projects\2010\10-1118-0020_BrettResources_HammondReef\GIS\MXDs\Draft\Terrestrial\TSD\ProjectLocation.mxd

The Hammond Reef deposit is located on a peninsula of land extending into the north end of the Upper Marmion Reservoir. The peninsula containing the Hammond Reef deposit is surrounded by the Marmion Reservoir on three sides with Sawbill Bay to the northwest and Lynxhead Bay to the southeast. The Project Site also contains a number of smaller lakes. Mitta Lake is a small, steep-sided waterbody located atop mineralized zones of the deposit. Due to its location, the proposed open pit mine will encompass Mitta Lake.

1.3.2 Climate

The Project is located in a typical boreal climate region, which is characterized by long, usually very cold winters, and short, cool to mild summers. The annual temperature average is 1.6 degrees Celsius (°C) for Atikokan with a seasonal maximum of 16.2°C (average) for summer and a minimum of minus 15.4°C (average) for winter. Temperatures lower than minus 37°C have been recorded during the fall and winter. The annual normal total for precipitation is 788 millimetres (mm) (568 mm of rainfall and 220 mm of snowfall) for Atikokan with a seasonal maximum of 299 mm for the summer period.

1.3.3 Project Phases

The Project comprises four phases: construction, operations, closure and post-closure. With regards to assessment of terrestrial ecology resources, the most relevant Project phase is construction.

Activities expected to have the greatest influence include:

- Site preparation (i.e. site clearing and grubbing).
- Sensory disturbance from noise.
- Behavioural modifications due to human proximity.

Additional details regarding activities expected to take place in each phase of the Project are provided in Chapter 5 of the EIS/EA Report.

1.3.4 Project Components

The Project consists of the following eight main components:

- Mine, including two open pits (i.e., east pit and west pit).
- Waste Rock Management Facility (WRMF).
- Ore Processing Facility.
- Tailings Management Facility (TMF).
- Support and Ancillary Infrastructure.
- Water Management System.
- Linear Infrastructure.
- Borrow Sites.
- Project components are shown in Figure 1-2. A detailed description of Project components is provided in Chapter 5 of the EIS/EA Report.

610000
615000
620000
5430000
5425000
5420000
N
Serpent Lake
Cornell Lake
Long Hike Lake
Vista Lake
Lizard Lake
Light Lake
Turtle Bay
Trap Bay
Sawbill Bay
Marmion Reservoir
Lynxhead Bay
Upper Seine Bay
ACCOMMODATION CAMP
TAILINGS MANAGEMENT FACILITY
PUMPING STATION
PUMPING STATION
DETONATOR STORAGE
EMULSION PLANT
PEBBLE CRUSHING STATION
CONCENTRATOR
POWER SUBSTATION
PROPANE FARM
EFFLUENT TREATMENT PLANT
PROCESS PLANT COLLECTION POND
GYRATORY CRUSHER PAD
LIVE ORE STOCKPILE
PARKING LOT
SECURITY STATION
TRUCK SHOP / MINE OFFICE
PARKING LOT
FUEL BAY
EAST PIT
WEST PIT
WASTE ROCK STOCKPILE
LOW-GRADE ORE STOCKPILE
OVERBURDEN STOCKPILE

LEGEND

- Index Contour (5m interval)
- Ditch
- Marsh/Swamp
- River/Stream
- Road
- Trail
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Accommodation Camp
- Laydown Area
- Office and Truck Shop, Explosives Storage and Processing Plant
- Open Pits
- Low-Grade Ore Stockpile
- Overburden Stockpile
- Process Plant Collection Pond
- Pumping Station
- Tailings Management Facility
- Tailings Management Facility Reclaim Pond
- Waste Rock Stockpile

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

500 0 500 1,000 1,500 2,000 2,500
SCALE 1:50,000 METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
PROJECT COMPONENTS

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 1-2

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1.4 Incorporation of Traditional Knowledge

Traditional knowledge in combination with other information sources is valuable in achieving a better understanding of the Project's potential effects on the biophysical and socio-economic environment. It also contributes to the description of the existing biophysical and human environment, natural cycles, resource distribution and abundance, and the use of land and water resources. A detailed discussion on traditional knowledge, including any aspects relevant to terrestrial ecology, is included in the Aboriginal Interests TSD.

An Aboriginal workshop focusing specifically on traditional knowledge of the resource base in the Local Study Area was held at the Lac Des Milles Lacs First Nations Roundhouse on August 16, 2012. A number of key points were raised in this workshop concerning traditional use of terrestrial ecological resources:

- Several individuals use the Upper Marmion Reservoir and vicinity for hunting, trapping and fishing.
- In addition to trapping of furbearers in the LSA, there is also traditional hunting of deer, moose and waterfowl in this area.
- Hunted and trapped wildlife is traditionally used for food, medicine, clothing, shelter and trade.
- The wetlands and upland areas are important sources for traditionally used plants.
- There was no indication of historical or current wild rice harvesting in the LSA.
- There is interest among Aboriginal peoples in giving ceremonial recognition to the loss of local resources, for example Mitta Lake, and for opportunities to participate in its restoration post-closure.
- There is also an interest in getting a First Nation youth group to harvest traditionally used plants before site clearing for the Project.

1.5 Precautionary Approach

Environmental assessments are forward-looking planning tools, used in early stages of project development. As such, environmental assessments are based on a precautionary approach. This approach is guided by judgement, based on values, and intended to address uncertainties in the assessment. This approach is consistent with the Canadian government's framework for applying precaution in decision-making processes.

This approach is also consistent with Principle 15 of the 1992 Rio Declaration on Environment and Development, which states that "where there are threats of serious or irreversible damage, lack of full scientific certainty must not be used as a reason for postponing cost effective measures to prevent environmental degradation" (United Nations Conference on Environment and Development 1992).

This TSD applies a precautionary approach to the assessment of potential Project effects. The Project is conservatively considered, and effects are advanced through the assessment process if they cannot be systematically removed from consideration through rigorous scientific evidence. The evaluation of effects is based both on regulatory compliance and on predicted changes to the existing environment. This captures and assesses changes to the existing environment that may fall outside or below applicable regulatory frameworks. In addition, all residual effects are assumed to occur and assessed for significance.

1.6 Selection of Valued Ecosystem Components

The purpose of this TSD is to determine whether the Project will have effects on terrestrial ecology, the extent to which the Project may affect terrestrial ecology, and to identify means by which potential effects can be mitigated. While all aspects of the environment are important, it is neither possible, nor particularly useful, to attempt to measure effects on all possible receptors. Thus the assessment is focussed on sensitive and locally significant species or groups of species, with the understanding that impacts on other components of the ecosystem would be similar.

The CEA Agency describes VECs as:

"Any part of the environment that is considered important by the proponent, public, scientists and government involved in the assessment process. Importance may be determined on the basis of cultural values or scientific concerns" (Hegmann et al. 1999).

The VECs are typically selected through an issues scoping exercise that identifies the particular components of the environment for which there is public, Aboriginal, regulatory or scientific concern. The VECs provide structure and focus for the environmental assessment and ensure that the likely effects of a project are considered.

Since the VECs are assessment endpoints, it is important that the selected VECs can be used to meaningfully measure the potential effects of the Project. The VECs for this TSD were selected based on the following considerations:

1) What major or special ecological features of the Project Site or surrounding area should be protected from adverse effects from the Project?

2) What aspects of the physical environment could be sensitive to the effects from the Project?

3) What individual species or range of species, of wildlife and plants could be sensitive to the effects of the Project?

4) What aspects of the socio-economic environment should be considered in assessing the Project?

A VEC can be an individual component of the environment (e.g., a species), or a collection of components that represent one aspect of the environment (e.g., a wetland ecosystem). From an ecological perspective, VECs can represent features of the natural environment considered to be culturally or scientifically important (e.g., a local wetland or stream). These ecological feature VECs are complex, comprising several ecological aspects, and affected by a range of pathways (i.e., routes of exposure or effect).

The VECs are characterized using indicators; where indicators are the attributes of the VEC that might be affected by the Project. Each indicator requires specific measures that can be quantified and assessed.

Table 1-2 provides the list of VECs selected for this TSD, the rationales for their selection, and proposed indicators and measures.

Table 1-2: Valued Ecosystem Components Selected for Terrestrial Ecology

VEC	Rationale for Selection	Indicators	Measures
Habitat VECs			

Wetlands	• Supports the ecological integrity of the boreal region
	• Important as wildlife habitat
	  • Support migratory waterfowl breeding;
	  • Supports critical habitats for beaver, moose, etc.
	• Hydrological functions
	• Supports traditional use plants
	• Agency concern
		• Plant community and habitat
		• Hydrological function
			• Areal extent of wetland habitat
			• Composition/diversity of wetland plant communities
			• Change in hydrological regime

Forest Cover	• Ecological importance of the transitional boreal forest region
	• Important as wildlife habitat
	  • Supports populations of large carnivores such as black bear, wolves and lynx as well as prey animals such as hare, marten and red squirrel
	  • Abundance of migratory birds utilize habitat for breeding
	• Socio-economic importance
		• Plant community and habitat
		• Wildlife habitat function
			• Extent of forested habitat
			• Composition of forest plant community
			• Suitability of habitat in supporting wildlife populations

Table 1-1: Valued Ecosystem Components Selected for Terrestrial Ecology (Continued)

VEC		Rationale for Selection	Indicators	Measures
Group VECs				
Species at Risk	Bald Eagle	• Observed in the vicinity of the Project Site. • Cultural significance • Provincially, Bald eagles are designated as Special Concern under Ontario's Endangered Species Act.	• Species presence • Persistence of eagle population	• Habitat suitability and availability for Bald eagle
	Common Nighthawk	• Bird SAR observed on and in the vicinity of the Project Site • Provincially, Common nighthawk is designated as Special Concern under Ontario's Endangered Species Act. • Breeding habitat occurs on the Project Site.	• Species presence • Persistence of population	• Habitat suitability and availability for Common nighthawk
	Canada Warbler	• Bird SAR observed on and in the vicinity of the Project Site • Provincially, Canada warbler is designated as Special Concern under Ontario's Endangered Species Act. • Breeding habitat occurs on the Project Site.	• Species presence • Persistence of population	• Habitat suitability and availability for Canada warbler
	Snapping Turtle	• Herpetofaunal SAR observed on and in the vicinity of the Project Site • One of few reptile species in this northern ecosystem • Indicator of wetland function	• Species presence • Persistence of population	• Habitat suitability and availability for Snapping turtle
Furbearers	Marten Muskrat	• Common and abundant in the Project Site • Important prey species for many carnivores in northern environments • May be tolerant of human activities, but may be affected by habitat loss • Traditional and non-traditional uses	• Furbearer presence • Persistence of population	• Habitat suitability and availability for furbearers

Table 1-1: Valued Ecosystem Components Selected for Terrestrial Ecology (Continued)

VEC	Rationale for Selection	Indicators	Measures
Group VECs (Continued)			
Upland Breeding Birds	• small territory size and high bird density means large numbers of upland birds may be affected by habitat loss • migratory birds are susceptible to population declines as a result of changing environmental conditions on breeding and overwintering habitats	• Persistence of breeding bird population • Distribution • Relative abundance • Habitat use	• Relative abundance of breeding birds • Habitat suitability and availability for upland breeding birds
Species VECs			
Moose	• Observed on and in the vicinity of the Project Site • Social, ecological and economic importance in Ontario • Important subsistence and cultural species • Large herbivorous mammal requiring a large home range • Prey species for large carnivores	• Species presence • Persistence of population	• Presence/persistence of moose in the area • Habitat suitability and availability for moose
Wild rice	• traditional use plant • sensitive to fluctuating water levels	• Species presence • Persistence of population	• Presence/persistence of wild rice in the area

1.7 Temporal and Spatial Boundaries

Project activities and the potential changes that they may produce on the environment are subject to temporal and spatial boundaries. These boundaries are common to all environmental components but with some modifications. The temporal and spatial boundaries specific the terrestrial ecology assessment are described below.

1.7.1 Temporal Boundaries

The human health and ecological health temporal boundaries are directly related to the Project phases, namely:

- Construction phase: 30 months.
- Operations phase: 11 years.
- Closure: 2 years.
- Post-closure: 10 years.

1.7.2 Spatial Boundaries

1.7.2.1 Regional Study Area

The Regional Study Area (RSA) corresponds to the wildlife management unit (WMU) within which the Project is located (WMU 12b). WMU 12B is bounded by Highway 11 to the south, Highway 17 to the east, the Turtle River to the west and the Rainy River/Kenora judicial district boundary to the north. This allows for an assessment of regional and population scale effects on wide ranging animals such as moose and black bear as well as cumulative effects (Figure 1-3). However, for most environmental components, effects are not expected to extend beyond the Local Study Area.

1.7.2.2 Local Study Area

The Local Study Area (LSA) was selected to measure the existing baseline conditions at a scale large enough to capture the maximum predicted spatial extent of the combined direct and indirect effects (i.e., zone of influence) from the Project on vegetation, and wildlife (Figure 1-4). For the terrestrial ecology assessment, this area corresponds to the site watersheds as they capture the drainage to and from the mine footprint and are associated with natural linkages on the landscape through wetlands and along riparian corridors. This area is intended to capture effects that extend beyond the immediate Project footprint, such as noise, lights, smells, and other factors that can indirectly affect the environment at a distance. The delineation of the LSA considered local landscape connections such as wildlife migration corridors and is large enough to contain all or most plant species and plant communities present in local populations.

1.7.2.3 Mine Study Area

The Mine Study Area (MSA) encompasses the footprints of the Mine, the Waste Rock Management Facility (WRMF), the Ore Processing Facility, the Tailings Management Facility (TMF), and the Support and Ancillary Infrastructure. Borrow Pits are not included, as they are subject to a separate permitting process. The MSA is outlined on Figure 1-5.

The total land area occupied by the MSA is approximately 2,062 ha. This is the area containing the mine infrastructure, the deposit, and associated servicing and maintenance areas and is referred to as the proposed

footprint. Due to the local topography, the MSA is linear, since the Mine and associated infrastructure are confined to the peninsula upon which the deposit occurs.

1.7.2.4 Linear Infrastructure Study Area

The Linear Infrastructure Study Area (LISA) encompasses the footprints of the access road (Hardtack/Sawbill) and the project transmission line (Figure 1-5). The LISA is represented by a Y-shaped area that extends 30 m on either side of the central line of the access road and a 50 m wide corridor for the Project transmission line. Note that this study area is included in the LSA for the purposes of the terrestrial ecology effects assessment.

600000

700000

5400000

N

Highway 17

Ignace

Raleigh Lake

Stormy Lake

Wawang Lake

Irene Lake

Jones Lake

White Otter Lake

Highway 622

PROJECT LOCATION

Franklin Lake

Lizard Lake

Sawbill Bay

Light Lake

Turtle Lake

Dashwa Lake

Marmion Lake

Hawk Bay

Pike Lake

Relief Lake

Reserve Island

Steep Rock Lake

Atikokan

Calm Lake

Sapawe

Kawene

Owakonze

Quetico

Huronian

Mine Centre

Horse Collar Junction

Seine River Village

Flanders

Kashabowie

Burchell Lake

Shebandowan

Highway 17

Shabaqua Corners

Shabaqua

Highway 11

Glenwater

Sunshine

Kasakokwog Lake

Pickerel Lake

Quetico Lake

Namakan Lake

Wolseley Lake

Tubman Lake

Jones Lake

U. S. A.

LEGEND

- Project Location
- City/Town
- Small Community
- Provincial Highway
- Road
- Existing Railway
- River/Stream
- Lake
- Regional Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

5 2.5 0 5 10 15 20 25 30 35

SCALE 1:750,000 KILOMETRES

PROJECT

HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE

REGIONAL STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1	
DESIGN	CGE	14 Nov. 2008	FIGURE: 1-3		
GIS	JO	4 Feb. 2013			
CHECK	AVS	4 Feb. 2013			
REVIEW	KT	4 Feb. 2013			

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600000
610000
620000
5430000
5420000
N
Serpent Lake
Cornell Lake
Sawbill Bay
Mitta Lake
Lynxhead Bay
Marmion Reservoir
Hawk Bay
Highway 622

LEGEND

- Provincial Highway
- Trail
- Road
- Power Transmission Line
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000
SCALE 1:90,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
LOCAL STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 1-4

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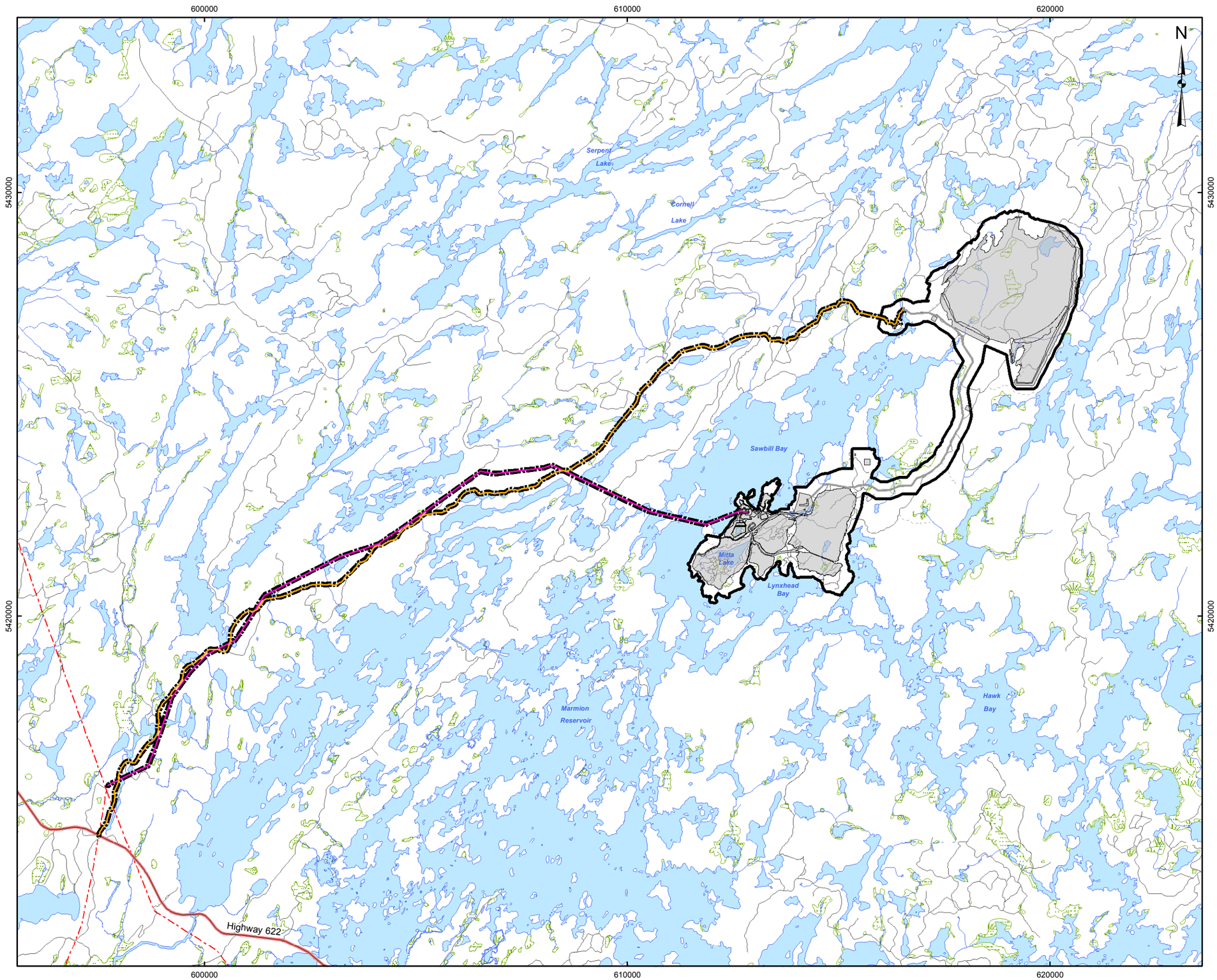

LEGEND

- Provincial Highway
- Trail
- Road
- Power Transmission Line
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Linear Infrastructure Study Area
- Mine Site Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000
SCALE 1:90,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
MINE STUDY AREA AND LINEAR INFRASTRUCTURE STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 1-5

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2.0 EXISTING CONDITIONS

2.1 Methods

Golder conducted a terrestrial biophysical inventory of the Project Site to characterize and evaluate the existing environment and to provide baseline data to support the environmental assessment process and permitting for the OHRG Project. The process consisted of consultation with regulatory agencies, Aboriginal engagement, a review of existing data sources, and terrestrial ecology field surveys, which were conducted during the spring summer and fall of 2010, 2011 and 2012.

2.1.1 Regulatory Agency Consultation

Table 2-1 shows a chronology of agency consultation for terrestrial ecology studies for the Project.

Table 2-1: Regulatory Agency Consultation for Terrestrial Ecology Studies

Date	Agency/Staff	Consultation
June 3, 2010	Ministry of Natural Resources (MNR)/Brian Jackson, Atikokan Area Biologist	Initial meeting with MNR staff (Brian Jackson) to discuss preliminary concerns, issues with the Project
May 26, 2011	CEAA, MNDM, MNR, ENE	Teleconference regarding the agency review of Golder's Terrestrial Biology Detailed 2011 Work Plan
June 2011	Environment Canada/ Sheelagh Hysenaj	Review of Golder's Terrestrial Biology Detailed 2011 Work Plan and the 2010 point count data for the Project
August 2011	MNR/Brian Jackson, Amy Godwin, Atikokan Area Biologists	Teleconference regarding the review of the result of the preliminary wetland evaluation screening for the Project
April 2012	CEAA, MNDM, Environment Canada/Sheelagh Hysenaj, and Atikokan MNR/Amy Godwin,	Presentation regarding the results of the 2010/2011 studies and upcoming 2012 studies to complete the baseline conditions.

2.1.1.1 Major Outcomes of Regulatory Agency Consultation

2.1.1.1.1 Species of Conservation Concern

Through consultation with the MNR in 2010 and 2011, a list of potential SAR was determined. During the initial meeting with the MNR, Mr. Brian Jackson noted that the forest-dwelling boreal population of woodland caribou (*Rangifer tarandus caribou*), a species that is designated as threatened on both Schedule 1 of the *Species at Risk Act* and the *Endangered Species Act* was determined not to occur on or in the vicinity of the Project location.

A list of Species of Conservation Concern was then provided by Atikokan Area MNR Biologist, Ms. Amy Godwin during a meeting with Golder project team and agencies. In subsequent discussions with the Fort Frances District Species at Risk Biologist, John Vandenbroeck, including the teleconference of May 26, 2011, he indicated that the list represents the Lake of the Woods planning area and numerous species are not anticipated to be found in the vicinity of the Project. As a result of these discussions, a Project-specific list of potential Species of Conservation Concern was developed which better reflects that region in which the Project is located

and the types of habitats which occur in the Project Site. This list was used to scope species specific surveys for the Project.

2.1.1.1.2 Migratory Bird Baseline Surveys

Environment Canada in their review of the Terrestrial Biology Detailed 2011 Work Plan and the 2010 point count data for the Project offered a prescriptive methodology for undertaking the breeding bird point counts and other migratory bird surveys (Environment Canada 2011). Their correspondence also offered recommendations for the summarization of the baseline avian data by way of Landbird Priority Species which was used in the existing conditions portions of this report. Details are contained in the methodology section.

2.1.1.1.3 Additional Migratory Bird Concerns

Additional bird species considered at the request of MNR for the terrestrial ecological studies for the Project are the Trumpeter swan (*Cygnus buccinators*), Tundra swan *(Cygnus columbianus),* Great gray owl *(Strix nebulosa),* and Great blue heron *(Ardea herodias)*

2.1.1.1.4 Wetland Evaluation

Based on consultation with the Atikokan MNR staff, wetlands in the LSA were evaluated using the methods outlined in the Northern Ontario Wetland Evaluation Manual (MNR 1993). The results of the wetland evaluations are under separate cover.

2.1.2 Aboriginal Engagement

During the terrestrial ecology field investigations of 2011 and 2012, First Nations monitors accompanied field crews conducting breeding bird surveys, turtle surveys, surveys for wild rice, wetland evaluation and vegetation classification field surveys. There were two members of the local First Nations that participated in the field activities of the 2011 season and one in 2012. Participation of the First Nations representatives facilitated an exchange of traditional knowledge with Project knowledge.

Additionally, First Nations consultation raised the concern for traditional use plants in the LSA, specifically wild rice. Field inventories for this plant were incorporated into studies for the Project.

2.1.3 Secondary Data Review

Existing data pertaining to the ecological resources of the lands in the MSA, LSA and RSA were gathered through agency contact, previous natural environment studies and database records of ecological resources in the area. This information was utilized to refine scopes for field studies so that comprehensive baseline data was acquired. The information sources included the following:

Land Information Ontario (LIO)-

LIO manages key provincial geospatial datasets. Examples of datasets are Ontario roads and trails. LIO also coordinates public and private sector organizations to collect high resolution satellite imagery for Ontario (MNR 2012a).

Environment Canada's Species at Risk Registry

The Public Registry fulfills the requirement under the *Species at Risk Act* (SARA) for the Minister of the Environment to establish a public registry for the purpose of facilitating access to SARA-related documents (Environment Canada 2012).

Natural Resource Values Information System (NRVIS)

NRVIS is a GIS-based system for managing the storage of the MNR's digital land information. It provides the ability to store, maintain and access information on over 690 different geographic feature types such as roads, lakes, spawning sites, nesting sites, moose calving sites, and trap lines (MNR 2012b)

Natural Heritage Information Centre (NHIC)

The NHIC compiles, maintains and distributes information on natural species, plant communities and spaces of conservation concern in Ontario. This information is stored in a spatial database used for tracking this information (MNR 2009a).

Royal Ontario Museum (ROM) Species at Risk Website

The ROM website provides regional lists and factsheets on Ontario's Species at Risk (ROM 2012).

Ontario Ministry of Natural Resources' Resources Reports for Wildlife Management Unit (WMU) 12B

The Ontario Ministry of Natural Resources (MNR) conducts resource assessments in WMU 12b on a regular basis (every three years) and provides information on the status of various wildlife populations in summary reports. Examples of these reports acquired for this study are *Resource Report-Status of Moose in WMU 12B* (MNR 2009b), and *Resource Report-Black Bear-WMU 12B* (MNR 2009c).

Contact with Local Naturalists and Hunters

Local bird knowledge was provided in consultation with Dave Elder, expert birder and main contact for Bird Studies Canada's Christmas Bird Count in Atikokan. Knowledge of hunting and trapping activities in the area was provided in consultation with Mr. Jeremy Dickson, local resident and owner of Canoe Canada Outfitters.

Forest Management Plans

Forest Management Plan for the Crossroute Forest 2007-2017 (Abitibi Consolidated 2006) and the Sapawe Forest Independent Forest Audit (KBM 2008).

Ontario Breeding Bird Atlas (OBBA) 2001-2005

The Ontario Breeding Bird Atlas (OBBA) is a large-scale breeding bird study completed in the province of Ontario in 20-year intervals. It is a product of the efforts of many volunteers and professional biologists. Methods include area searches for potential breeding species and breeding evidence, as well as standard point counts. The province of Ontario was split into 10 km^2 squares and 100 km^2 blocks of the Universal Transverse Mercator Grid (UTM), and all data is recorded by 10 km square (Cadman et. al., 2007).

Ontario Nocturnal Owl Surveys (ONOS) 1995-2010

The Ontario Nocturnal Owl Survey (ONOS) is a long-term monitoring program managed by Bird Studies Canada (BSC) and includes the efforts of both volunteers and staff. Methods include roadside nocturnal point counts on pre-selected routes throughout Ontario (BSC 2012).

Other Resources for Birds

Other on-line resources for bird data were searched but did not have coverage for the study areas. Some of these resources included Ontario Red-shouldered Hawk and Spring Woodpecker Survey, Black Tern Monitoring, Canadian Lakes Loon Survey, Canadian Migration Monitoring Program, Canadian Peregrine Falcon Survey, Marsh Monitoring Program, Forest Bird Monitoring Program and the Breeding Bird Census. Searches were performed using the on-line searchable database (BSC 2004) in October 2012.

2.1.4 Field Studies

The objectives of the field studies were to estimate the natural range of variation in annual and seasonal occurrence, abundance, and habitat association of Species at Risk, migratory birds (i.e., upland breeding birds, water birds, and raptors), herpetofauna (turtles and amphibians) and mammals in the MSA and LSA. Whenever appropriate, terrestrial ecology field crews included First Nations monitors.

A reconnaissance level visit to the Project Site was performed prior to the initiation of the terrestrial field studies in May 2010. The purpose of the reconnaissance was to determine access to the MSA and LSA and to provide an initial landscape level review of the terrestrial resources in the local and regional area. Based on the reconnaissance and secondary data acquired, a field study program was developed.

A summary of terrestrial baseline field sampling efforts for the Project from 2010 to 2012 is provided in Table 2-2.

Table 2-2: Summary of Terrestrial Baseline Field Sampling Efforts on Hammond Reef Gold Project Site in 2010 to 2012

Date	Type of Survey	Methodology
May 2010	Aerial wildlife survey, Raptor stick nest survey	Aerial survey throughout the MSA and LSA conducting visual searches for raptor stick nests and other visible wildlife and wildlife habitat.
June 8-10, June 30-July 1, 2010	Breeding Bird; Wildlife; Lake Watch; Basking Turtle	Ten minute breeding bird point counts conducted at 41 stations in habitat types representative of the LSA. Breeding bird point counts followed protocols used in *Breeding Bird Survey* (Downes and Collins 2003) and OBBA (Cadmen et al. 2007). Wildlife was surveyed by visual encounter throughout the LSA. Basking turtles were surveyed by visual encounter at seven stations in wetlands and ponds in the LSA. Lake watch bird surveys were conducted at three stations established along shorelines of lakes and bays in the MSA.
June 30-July 1, July 19-23, 2010	Vegetation	Upland vegetation communities surveyed through botanical inventories in the MSA and classified using the Forest Ecosystem Classification (FEC) for Northwestern Ontario (Sims et al. 1997).
August 9-13, 2010	Vegetation	Upland vegetation communities surveyed through botanical inventories in the MSA.
May 16-17, 2011	Basking Turtle; Wildlife; Whip-poor-will; Anuran Survey	Wildlife was surveyed by visual encounter throughout the LSA. Basking turtles were surveyed at five stations in the LSA. Nocturnal surveys for whip-poor-will were conducted at 24 stations in the LSA following the *Nightjar Monitoring Protocol*/*Draft Whip-poor-will Survey Protocol* (Hunt 2003; MNR 2012c). Anuran surveys were conducted in conjunction with whip-poor-will surveys.
June 10-12, 2011 June 28-29, 2011	Marsh Bird; Breeding Bird; Basking Turtle; Wildlife; Whip-poor-will; Anuran Survey	Call broadcast surveys for marsh birds conducted at 13 stations in the LSA following modified Marsh Monitoring Program (MMP) protocol (BSC 2003). Wildlife and turtles surveyed by visual encounter in the LSA. Breeding bird surveys conducted at 41 stations in the LSA. Anuran surveys, in conjunction with nocturnal surveys for whip-poor-will were conducted at 24 stations in the LSA.
July 18-22,2011	Vegetation; Wetland	Upland vegetation communities surveyed through botanical inventories in the LSA. Wetlands were surveyed and classified using Ontario Wetland Evaluation System (OWES) for Northern Ontario (MNR 1993) in the LSA.

Table 2-2: Summary of Terrestrial Baseline Field Sampling Efforts on Hammond Reef Gold Site in 2010 to 2012 (Continued)

Date	Type of Survey	Methodology
August 22-26, 2011	Vegetation; Wetland	Upland vegetation communities surveyed through botanical inventories in the LSA. Wetlands surveyed in the MSA.
September 12-16, 2011	Wetland	Wetlands surveyed in the MSA.
June 2012	Vegetation; Breeding Bird; Wild Rice; Anuran Survey; Basking Turtle; Wildlife; Marsh Bird; Lake Watch	Upland vegetation communities surveyed through botanical inventories in the LSA. Breeding bird surveys conducted at 67 stations in the LSA. Aerial surveys to locate potential presence of wild rice along shorelines of bays and lakes in the LSA. Three minute call count surveys for anurans were conducted at five stations in the LSA. Wildlife surveyed by visual encounter in the LSA. Basking turtles were surveyed at five stations in the LSA. A marsh bird survey was conducted at one station in the LSA. A lake watch bird survey was conducted at one station in the MSA.
June 28th through to August 26th, 2012	Remote Camera Survey	Three Bushnell Trophy cameras were deployed in areas with the potential for wildlife activity within the MSA/LSA for a period of approximately 9 weeks.
September 13-17, 2012	Wild Rice	Aerial survey to confirm presence/absence of wild rice along shorelines of bays and lakes in the LSA.

2.1.4.1 Vegetation Community Surveys

Vegetation community surveys were completed during the growing season from 2010 to 2012 throughout the MSA and LSA. At the request of the Atikokan MNR, the vegetation classification method followed standard Ontario classification methods in the province. Wetland communities were classified using the criteria in the *Field Guide to the Wetland Ecosystem Classification for Northwestern Ontario* (Harris et al. 1996) which classifies wetlands characteristic into 36 ecosites (W-types) based on vegetation, soil and water data. Non-wetland ecosites were described using the upland criteria outlined in the *Terrestrial and Wetland Ecosites of Northwestern Ontario* (Racey et al. 1996).

Field surveys of vegetation communities consisted of detailed plants inventories and relative abundances of the plant species observed in each plant community, as well as soils characteristics. Forty ecosites, including over 20 forested upland habitats are described, all of which are characteristic of northwestern Ontario but unique collectively in vegetation, soil and water composition. Field notes, incidental wildlife observations and representative photographs were used to complement the descriptions of the plant communities. Sensitive or significant natural features, such as significant wildlife habitat were also noted. Habitat use in the area was further characterized through observations of habitat, signs or species sightings.

Vegetation community boundaries were mapped using Light Detection and Ranging (LIDAR) images and high-resolution satellite imagery and entered into a Geographic Information System (GIS), ARC Pad. The GIS database allowed calculations of the absolute and relative areas for each plant community within the MSA and LSA.

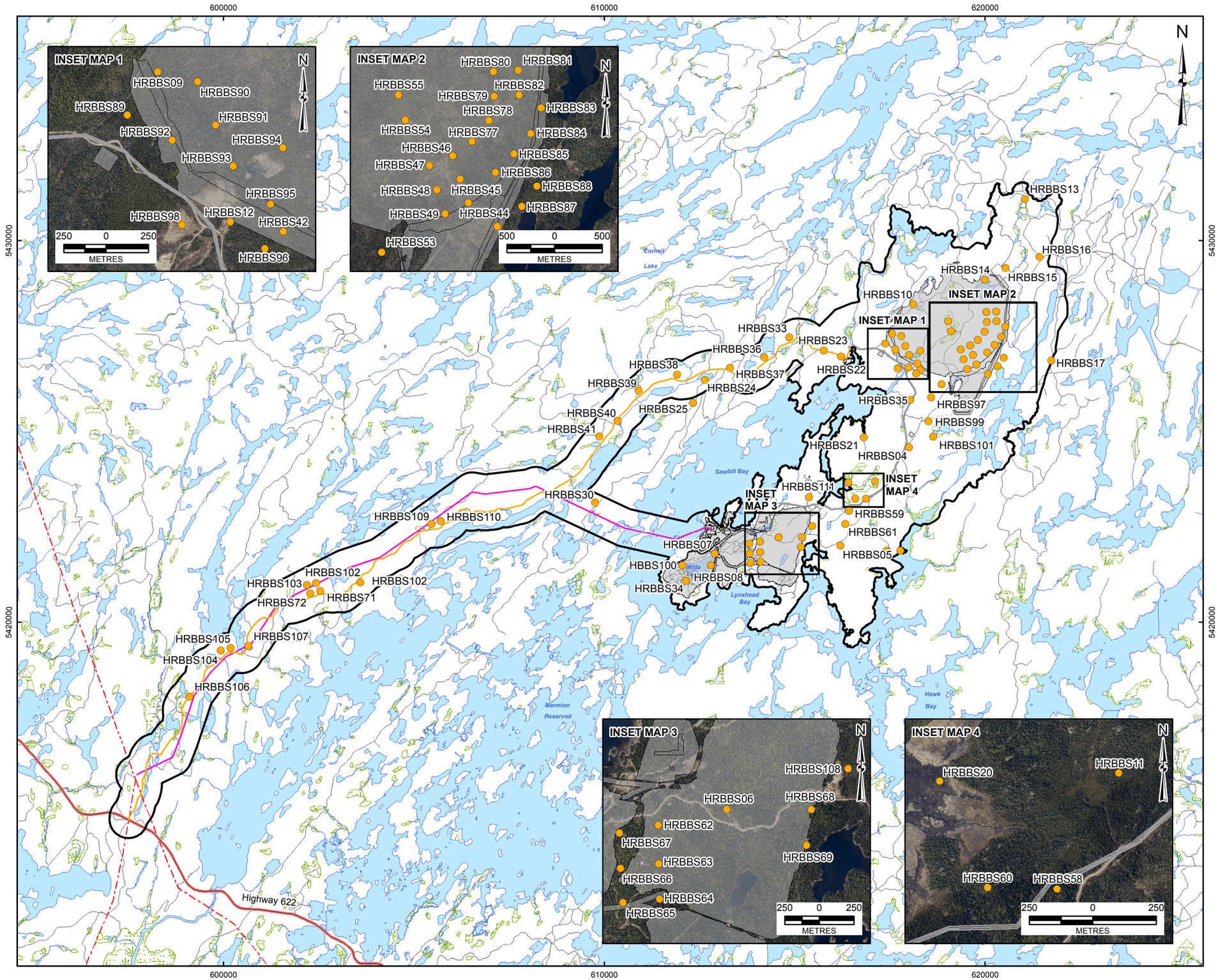
2.1.4.2 Wildlife (Terrestrial Species) Surveys

The objective of wildlife surveys (referred to as *terrestrial species* in the EIS guidelines) was to confirm the presence/absence and habitat utilization of species. Taxa-specific wildlife surveys were undertaken in the spring and summer seasons of 2010, 2011 and 2012 and consisted of breeding bird point counts, call back marsh bird surveys, lake watch bird surveys, nocturnal point count surveys, anuran call counts, turtle surveys and remote camera surveys. Particular attention was paid to the identification of federally or provincially listed SAR and significant wildlife habitat (MNR 2000). All wildlife sign based on tracks, calls, dens, pellets, scat, nests, nest cavities and sightings were recorded at all times in the field.

2.1.4.2.1 Bird Surveys

Breeding Bird Point Counts

Breeding bird surveys were conducted throughout the LSA from 2010 to 2012 to determine baseline values for species abundance and richness among habitats. Breeding bird point count surveys at 110 stations (Figure 2-1) were utilized to survey primarily for passerines (songbirds) and near passerines (e.g., woodpeckers); although other diurnal bird guilds were covered during these surveys as well (e.g., raptors). Surveys generally followed point count protocols used in the *Breeding Bird Survey* (Downes and Collins 2003), and the OBBA (Cadman et al. 2007).



LEGEND

- Breeding Bird Point Count Survey
- Provincial Highway
- Trail
- Road
- Power Transmission Line
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000
SCALE 1:100,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND BREEDING BIRD SURVEY STATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 2-1

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Point count stations were established in representative habitats within the Project Site and were spaced a minimum of 250 m apart. Stations were generally located at least 100 m from major roadways where the road footprint made a significant gap in the adjacent canopy or habitat type, this did not include abandoned forestry roads in a clear-cut landscape or ATV trails. Surveys took place between 30 minutes before sunrise and 1000 hr to encompass the period of maximum bird song. Each station consisted of a circle with a 100 m radius from the centre point (where the observer stands); birds were recorded into distance categories 0-50 m, 50-100 m and more than 100 m. Each point count was 10 minutes in duration, and was split into survey windows of 0-3 minutes, 3-5 minutes and 5-10 minutes. All birds seen or heard were noted on pre-printed datasheets and observations were made on sex, age and notable behaviour (e.g., breeding evidence), when possible. All wildlife sightings and sign were recorded throughout the LSA when incidentally encountered during field work.

Breeding Bird Data Analysis

Abundance estimates were calculated using observations within 50 m of the observer, excluding flyovers. A community-level analysis examined the variation in density and richness among habitats of all species combined. Relative abundance (density) was calculated as the mean number of individuals per effective area surveyed. The effective area surveys is calculated from the effective detection radius (EDR), a value unique to the Project and calculated from the baseline survey data.

The effective detection radius (EDR) is calculated with the following formula (Buckland et al. 2001):

$$\mathrm{EDR} = \sqrt{\frac{2}{\left[\left(\frac{2}{k^2}\right) * \ln\left(\frac{n}{n_2}\right)\right]}}$$

Where;
k = the distance at which birds are declared as being in or out of the sampling area (i.e., 50 m),
n = total number of birds detected,
n_2 = total number of birds detected outside the value of k.

The EDR for the Project is 66.5 m. The effective area surveyed is 1.39 ha.

The mean relative abundance (density) is a measure of birds per 1.39 ha and was calculated for each habitat type (Appendix 2.I Table 1). Bird abundance estimates for each habitat were calculated by the following formula:

Bird Abundance = [Area / 1.39] * Density

The abundance estimates are not true measures of population. The point count method used to survey upland bird populations has inherent limitations. Some species are not readily detected on point counts, while the probability of observing others decreases rapidly within the first four hours of daylight (Rosenberg and Blancher 2005; Cadman et al. 2007). Females of many species are much less vocal than males and are largely overlooked on point counts. No adjustments were applied to the abundance estimates to account for under-detected females or species with restricted periods of peak activity.

Nocturnal Point Counts

Nocturnal point counts at 24 stations (Figure 2-2) were utilized to survey for nocturnal species such as owls and nightjars. In order to survey for eastern-whip-poor will surveys were conducted within 1 week on either side of the full moon. These surveys were conducted during May and June of 2011. Surveys were somewhat similar to diurnal point counts and were modified from Ontario Nocturnal Owl Survey protocol (BSC 2012). Nocturnal point count stations were established along roadways and ATV trails throughout the Project Site. An unlimited radius was used, however an effort was made to estimate distance to any birds heard or observed. Surveys took place between dusk and dawn and were 10 minutes each in length. All birds (and other wildlife) heard or seen were noted on pre-printed datasheets.

Secretive marsh bird surveys

Fifteen marsh monitoring stations were established within the LSA (Figure 2-2). Fourteen stations were visited twice during the breeding season of 2011 and a 15th station was established and surveyed twice in 2012. This methodology was used to survey for secretive marsh species such as rails and bitterns. Surveys were modified from the Marsh Monitoring Program (BSC 2003), and included an initial 5-minute silent listening period as well as playback followed by 30 seconds of silent listening after each playback track. Playback included calls of Virginia rail (*Rallus limicola*), sora (*Porzana carolina*), yellow rail (*Coturnicops noveboracensis*), least bittern (*Ixobrychus exilis*), and pied-billed grebe (*Podilymbus podiceps*). Stations were spread throughout the Project Site and were located adjacent to or within wetlands with a focus on marsh and thicket swamp habitats. Surveys took place during the period from 4 hours before sunset and the end of twilight (i.e., the onset of darkness). All birds (and other wildlife) heard or seen within the wetland area were noted on pre-printed datasheets.

Lake watch surveys

Lake watch surveys at five stations (Figure 2-2) were utilized to survey for waterfowl, water birds, and piscivorous raptors on Sawbill Bay and Upper Marmion Reservoir. Surveys were 30 minutes in length and took place at various times throughout daylight hours. Observers stood on the shoreline and observed in an 180-degree arch out over the open water and adjacent shoreline using high power binoculars and a spotting scope. All birds observed over the open water and adjacent shorelines were recorded on pre-printed datasheets.

Whip-poor-will Survey

A whip-poor-will survey program was completed in accordance with the "*Draft Whip-poor-will Survey Protocol*" (MNR 2011). The protocol follows the "*Northeast Nightjar Survey Protocol*" which was developed by the New Hampshire Audubon Society and has been carried out in several U.S. states since 2003. Based on the protocol, whip-poor-will surveys are ideally conducted in Ontario between late May and early July. Whip-poor-will generally arrives in Ontario in early May, and eggs are laid between late May and early July. Intensity and duration of calling varies seasonally and vocalizations have been shown to decline in July as compared to June. The protocol also mandates that the surveys be conducted within 1 week on either side of the full moon, when the moon is above the horizon. Whip-poor-will surveys were conducted on May 16th and May 17th, 2011 and in conjunction with anuran call counts conducted from June 10-12, 28 and 29, 2011.

600000
610000
620000
5430000
5420000
N

INSET MAP 1
EWPW12/ HRFR19
HRMMP03
EWPW09/ HRFR14
HRMMP04
EWPW11/ HRFR16
EWPW08/ HRFR13
500 0 500
METRES

INSET MAP 2
HRMMP11
EWPW24
HRMMP13
EWPW13/ HRFR17
LAKEWATCH03
HRFR05
EWPW23/ HRFR26
LAKEWATCH02
500 0 500
METRES

INSET MAP 1
INSET MAP 2
INSET MAP 3

EWPW14/ HRFR18
HRMMP10
HRMMP12
EWPW10/ HRFR15
HRMMP09
HRMMP05
EWPW01/ HRFR06
HRMMP01
HRMMP02
EWPW22/ HRFR25
HRFR02
HRFR03
EWPW21/ HRFR24
HRMMP14
EWPW02
HRMMP15
Highway 622

Sawbill Bay
Mitta Lake
Lynxhead Bay
Marmion Reservoir

INSET MAP 3
LAKEWATCH01
LAKEWATCH04
HRFR01
EWPW20/ HRFR23
EWPW19/ HRFR22
EWPW18
500 0 500
METRES

LEGEND

- Lakewatch Survey
- Nightjar/Nocturnal Point Count Survey
- Nocturnal Anuran Survey
- Secretive Marsh Bird Survey
- Potential Bat Habitat
- Provincial Highway
- Trail
- Road
- Power Transmission Line
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000
SCALE 1:85,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
MARSH BIRD SURVEY, LAKE WATCH SURVEY, AND CREPUSCULAR/NOCTURNAL BIRD SURVEY STATIONS AND POTENTIAL BAT HABITAT

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 2.2	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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Breeding Bird Data Analysis-Landbird Priority Species

With guidance from Environment Canada (EC 2011), the data collected through bird surveys is reported by Landbird Priority species. Bird Studies Canada has identified Priority bird species for various regions. The Project site is located within ON BCR 12. Priority bird species are species that are experiencing population declines, or are high vulnerable to population declines and future threats and include species of Continental Concern (Partners in Flight Continental Watch List) with important populations in a particular region (e.g., Bay-breasted Warbler), or species with small global range and populations that are considered vulnerable to future change (e.g., Golden-winged Warbler) and common widespread species that have experienced population declines and face ongoing threats on their breeding or wintering grounds (e.g., Wood Thrush).

The majority of the discussion of Landbird Priority Species is contained within Appendix 2.IV. The bird data results in Section 2.2.3.2 are also summarized according to Priority species occurrence.

2.1.4.2.2 Reconnaissance Amphibian and Amphibian Habitat Inventory

Any amphibian species seen or heard incidentally throughout the course of the study were noted as supplemental observation. Particular care was taken during the Marsh Bird Surveys as well as the vegetation surveys of wetlands, to focus searching in locations where these species were likely to be found. Coarse woody debris, including fallen logs and branches were flipped over during the vegetation surveys to check for salamanders or other amphibians.

Anuran Call Counts

Anuran call count surveys at 27 stations (Figure 2-3) were utilized to survey for amphibian species (frogs and toads). Surveys followed the Marsh Monitoring Program Protocol (BSC 2003), and included a three-minute survey at each station to record the presence and relative abundance of each calling amphibian species. Stations were spread throughout the LSA, at least 500 m apart and were located adjacent to or within water bodies and marshes. Surveys took place during the period from one half-hour after sunset and midnight on evenings with little to no winds. Each station consisted of a half circle with 100 m radius from the centre point (where the observer stands). Calling amphibians were recorded as being in a distance category of less than 100 m or more than 100 m (from the center point), as well as a call level category of Code 1 (individual calls do not overlap and can be discretely counted), Code 2 (calls of individuals sometimes overlap, but an estimate of individual numbers is possible) or Code 3 (full chorus; overlap among calls seem continuous and individual estimate is not possible). All frogs and toads (and other wildlife) heard or seen within the 180-degree arch from the survey point were noted on pre-printed datasheets.

2.1.4.2.3 Turtle Surveys

In order to characterize the function of the open water wetland areas within the LSA in terms of wildlife habitat potential, turtle basking surveys were conducted. Turtle basking survey methodology employed the use of high quality 10 power binoculars to allow for detailed observation of basking turtles from a distance which also helps to avoid scaring/startling turtles. Several vantage points were used for each wetland area surveyed. Survey effort, weather, turtle observations and other observation of wildlife were noted. Turtle basking survey locations are depicted on Figure 2-3. Visual searches of road sides and rock barrens in proximity to wetland were conducted to detect basking or nesting turtles and snakes.

610000

620000

5430000

5420000

N

Serpent Lake

Cornell Lake

Sawbill Bay

Mitta Lake

Lynxhead Bay

Hawk

HRFR18
HRTU07
HRTU06
HRTU03
HRTU09
HRTU16
HRTU11
HRFR19
HRTU12
HRFR17
HRFR14
HRFR05
HRFR15
HRFR16
HRTU08
HRFR26
HRFR13
HRTU02
HRFR12
HRTU05
HRFR11
HRTU13
HRFR10
HRFR06
HRFR09
HRFR27
HRFR08
HRTU10
HRFR25
HRFR21
HRFR07
HRTU01
HRTU15
HRFR02
HRFR01
HRFR24
HRFR03
HRFR20
HRFR23
HRFR22
HRTU14
HRTU04

LEGEND

- Turtle Basking Survey
- Noctural Anuran Survey
- Provincial Highway
- Trail
- Road
- Power Transmission Line
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road
- Project Transmission Line
- Mine Facilities
- Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

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SCALE 1:60,000 METRES

PROJECT

HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE

AMPHIBIAN / TURTLE SURVEY STATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 2-3

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2.1.4.2.4 Remote Camera Surveys

Remote camera surveys were completed from June 28th to August 26th, 2012. Three Bushnell Trophy cameras were located in areas with a high concentration of game trails and likely to have wildlife activity (i.e. perimeters of waterbodies, valleys, and other potential travel corridors) within the MSA/LSA. Locations are mapped on Figure 2-4 and are described as follows: station HRCAM01 was located on a beaver dam, station HRCAM02 was located on a wildlife trail in a blueberry patch in a coniferous forest, and station HRCAM03 was located on a skidder trail in a fen.

2.1.4.2.5 Species at Risk and Species of Conservation Concern Surveys

Baseline field studies on Species at Risk ((SAR) species listed as endangered, threatened or special concern under Ontario's Endangered Species Act (ESA) and/or Canada's Species at Risk Act (SARA)) and Species of Conservation Concern (SOCC) were completed within the MSA and the LSA from 2010 to 2012.

Specifically, the following surveys were conducted to detect the potential presence of SAR and SOCC:

- Avian SAR and SOCC (Nocturnal Point Counts for Eastern Whip-poor-will, Lake Watch Surveys, Secretive Marsh Bird Surveys, Breeding Bird Point Counts).
- Turtle SAR and SOCC (Turtle Basking and Nesting Habitat Surveys).
- Plant SAR and SOCC (Botanical Inventory).
- Mammal SAR and SOCC (Remote camera surveys).

Avian SAR was surveyed for in the MSA/LSA through the various avian survey methodologies outlined above. The potential for turtle SAR (Snapping turtle) was surveyed for using visual encounter methods as well as turtle basking/nesting surveys.

2.1.4.2.6 Incidental Observations

During the vegetation community surveys and all wildlife surveys, incidental observations and sign of all wildlife and wildlife habitat including mammals and invertebrate activity were recorded to provide distribution data on species and habitats present in the MSA/LSA.

2.2 Results

2.2.1 Protected Areas and Conservation Lands

The EIS Guidelines indicates that protected areas and conservation lands are those features that are designated by federal, provincial or municipal jurisdictions as ecologically important. These designated features include wilderness areas, parks, and sites of historical or ecological significance, nature reserves; and federal migratory bird sanctuaries. There are neither lands designated as protected areas nor conservation lands within the MSA or LSA. The closest designated features are Quetico Provincial Park and Turtle River-White Otter Provincial Park.

610000

620000

5430000

5420000

N

Serpent Lake

Cornell Lake

Sawbill Bay

Mitta Lake

Lynxhead Bay

Hawk

HRCAM01

HRCAM02

HRCAM03

LEGEND

- Remote Camera Survey Station
- Provincial Highway
- Trail
- Road
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000

SCALE 1:60,000 METRES

PROJECT

HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE

REMOTE CAMERA SURVEY STATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 2-4

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Quetico Provincial Park, located southeast of the MSA and LSA, is a 475,800 ha wilderness park that offers various camping and recreational activities. Quetico Provincial Park also provides habitat for several locally rare plant species (Walshe 1998), and species typical of the boreal forest, such as jack pine and black spruce, dominate the park (Ontario Parks 2008). Quetico Provincial Park is also connected to several other protected areas along the Canada – USA border (Ontario Parks 2008).

Turtle River- White Otter Lake Provincial Park is a non-operating park located northwest of the Project that covers 49,294 hectares. The park contains vegetative and glacial features of both regional and provincial significance. Vegetation is typical of the transitional zone between the Great Lakes- St. Lawrence and Boreal forest regions, including species such as white spruce, trembling aspen, and white pine (Ontario Parks 2012).

2.2.2 Vegetation

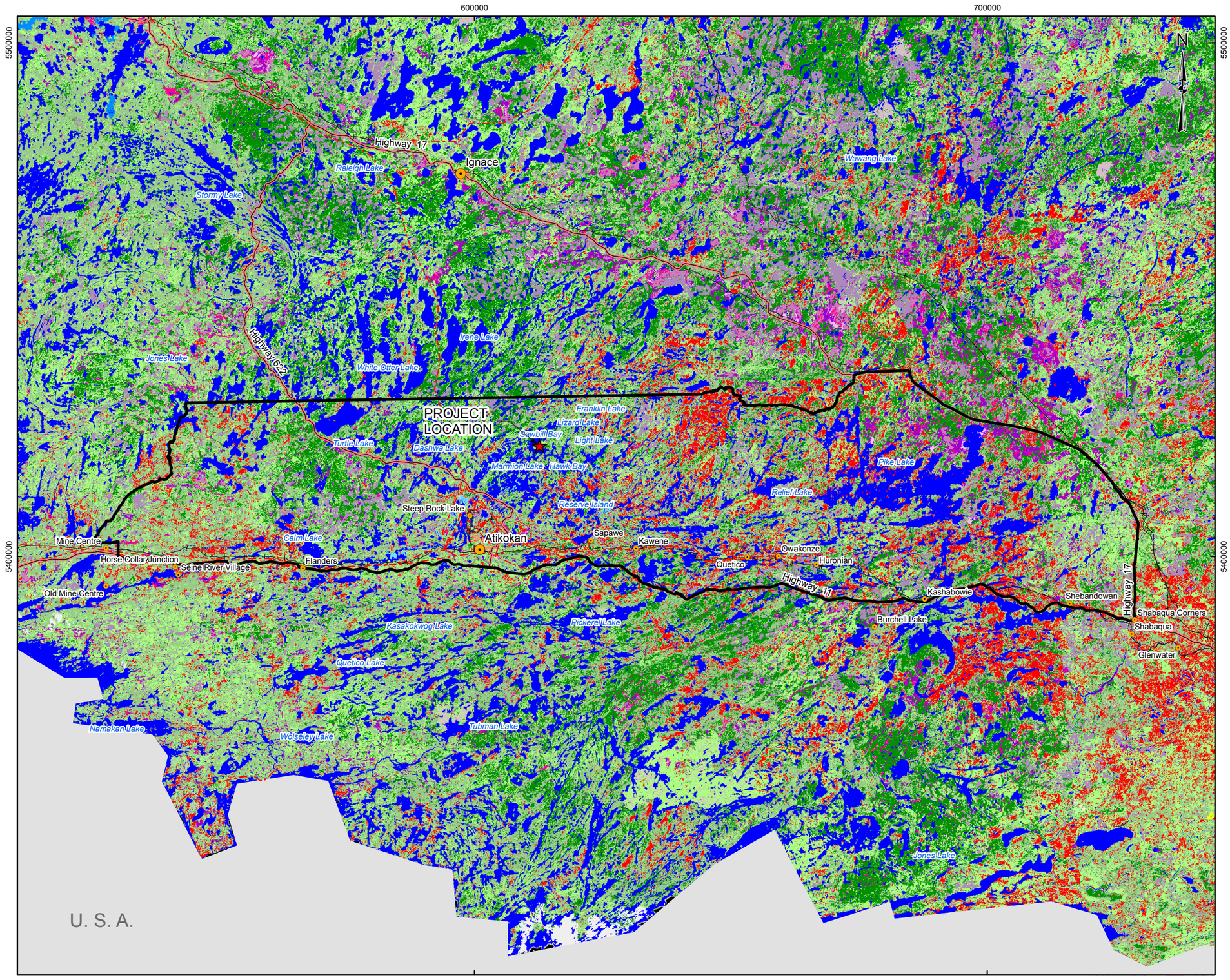
The vegetation communities in the RSA were acquired from a secondary source known as NRVIS which is available through Land Information Ontario (LIO). The NRVIS layer which maps and defines vegetative cover is referred to as landcover. The landcover data resource shows general land cover classification types for the province of Ontario. This information is based on the 1:250,000 NTS map sheets, and was made using Landsat imagery.

2.2.2.1 Regional Study Area

The Regional Study Area (RSA) covers 6,565 km^2 and is located in the Ontario Shield Ecozone within Hill's Site Regions 4W-Pigeon River, 4S, and 3W (Hills 1959) or the Thunder Bay/Quetico Uplands Ecoregion. An analysis of the forest compositions in northern Ontario indicated that this ecoregion contains almost equal representation in land coverage between mixed forests with black spruce conifer-conifer mix, black spruce conifer-hardwood mix, jack pine conifer-conifer mix and jack pine conifer-hardwood mix (Racey et al. 1999). The forests stands in ecoregion 4W are predominantly within the 50-100 year age class. The vegetation in this region is a mix of boreal and Great Lakes/St. Lawrence forest types.

2.2.2.1.1 Land Cover Types

The RSA is classified into 14 land cover types (Figure 2-5) and is located mainly within the Crossroute Forest Management Unit and the Sapawe Forest (Figure 2-6) (Table 2-3). The majority of soils are shallow coarse loamy soils over bedrock. The shallow soils are conducive to the regenerations of Jack Pine through seeding or planting (Abitibi Consolidated 2006). The organic soils between the bedrock hills are conducive to the growth of wetland communities dominated by cedar, black spruce and tamarack.



LEGEND

- Project Location
- City/Town
- Small Community
- Provincial Highway
- Existing Railway
- Regional Study Area

Land Cover

- Water - deep clear
- Water - shallow / sedimented
- Settlement / Infrastructure
- Sand / Gravel / Mine Tailings
- Bedrock
- Mudflats
- Forest Depletion - cuts
- Forest Depletion - burns
- Forest - regenerating depletion
- Forest - sparse
- Forest - dense deciduous
- Forest - dense mixed
- Forest - dense coniferous
- Marsh - intertidal
- Marsh - supertidal
- Marsh - inland
- Swamp - deciduous
- Swamp - coniferous
- Fen - open
- Fen - treed
- Bog - open
- Bog - treed
- Tundra Heath
- Agriculture - Pasture / abandoned fields
- Agriculture - cropland
- Other - unknown
- Other - cloud / shadow
- Seine River Wetland Mapping

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

5 2.5 0 5 10 15 20 25 30 35
SCALE 1:750,000 KILOMETRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
LANDCOVER IN THE REGIONAL STUDY AREA

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 2-5

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590000 600000 610000 620000 630000

5440000 5430000 5420000 5410000

SAPAWE FOREST

CROSSROUTE FOREST

Franklin Lake
Lizard Lake
Sawbill Bay
Light Lake
Dashwa Lake
Marmion Lake
Hawk Bay
Reserve Island
Steep Rock Lake
Highway 622

N

LEGEND

- Small Community
- Provincial Highway
- Existing Railway
- Power Transmission Line
- Road
- River/Stream
- Lake
- Old Growth Forest
- Crossroute Forest
- Sapawe Forest
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1 0.5 0 1 2 3 4 5 6 7
SCALE 1:150,000 KILOMETRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
FOREST MANAGEMENT UNITS AND OLD GROWTH FOREST

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 2-6

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Table 2-3: Ontario Land Cover Data in the Hammond Reef Gold Project Regional Study Area

Land Cover Type[(a)]	Area in Regional Study Area (ha)	% Coverage in Regional Study Area
Water – deep clear	127,663.84	19.33%
Water – shallow / sedimented	84.94	0.01%
Settlement / Infrastructure	763.27	0.12%
Sand / Gravel / Mine Tailing	199.06	0.03%
Forest Depletion – cuts	38,826.09	5.88%
Forest Depletion – burns	79.56	0.01%
Forest – sparse	94,130.24	14.25%
Forest – dense deciduous	72,974.41	11.05%
Forest – dense mixed	220,707.91	33.41%
Forest – dense coniferous	74,297.37	11.25%
Fen – open	1,132.75	0.17%
Fen – treed	6,921.55	1.05%
Bog – open	2,786.07	0.42%
Bog – treed	19,939.06	3.02%
Other – unknown	94.77	0.01%

Notes:
(a) Based on Land Information Ontario (LIO) mapping supplied by the MNR.

MNR produced the Ontario Land Cover data using interpretation of satellite remote sensing image data recorded on a range of dates between 1986 and 1997, the majority in the early 1990s. The forest cutovers and burns were updated in 1996 for most of the Boreal forest region of Ontario. While it is comparable to the land classification made through field studies for the Project, there is a deficiency in wetland classification, specifically the lack of swamp and marsh wetland community types.

As an overall comparison, the pie charts in Figures 2-7 through 2-9 illustrate the relative areal extents of different land cover classifications in the RSA from the MNR data versus the LSA and MSA land cover which were classified through field data observations. Note that in Appendix 2.II Table 1 cross-references the RSA landcover types identified by MNR with the corresponding grouped ecosite types which were identified in the LSA and MSA.

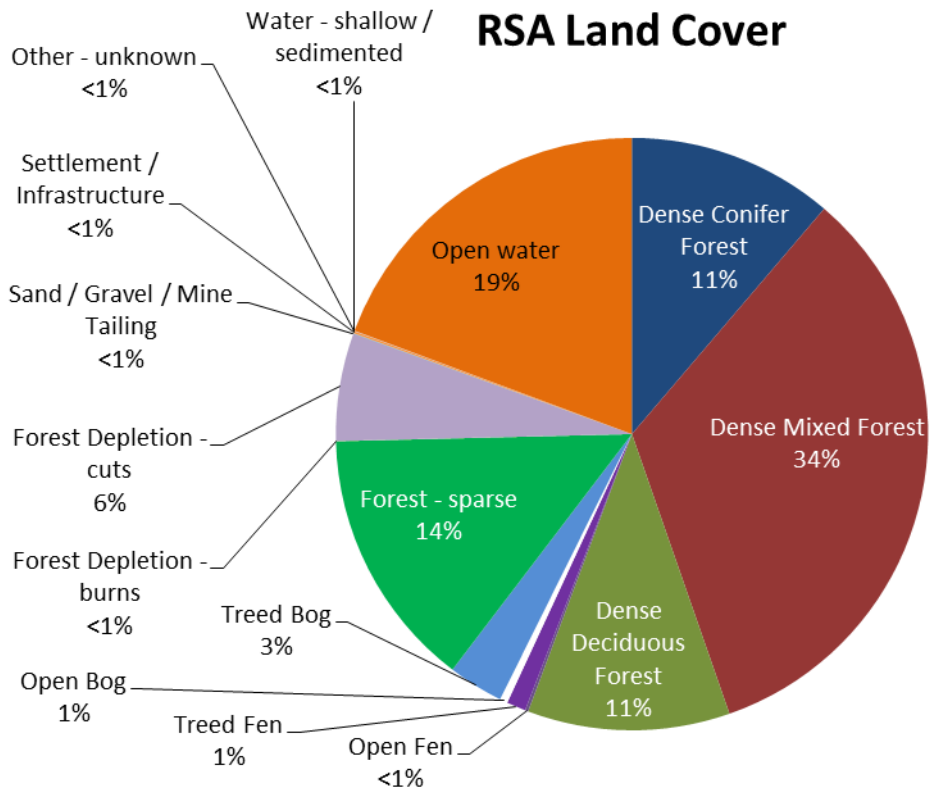

Figure 2-7: Land coverage in the Regional Study Area based on MNR's Landcover data (ref)

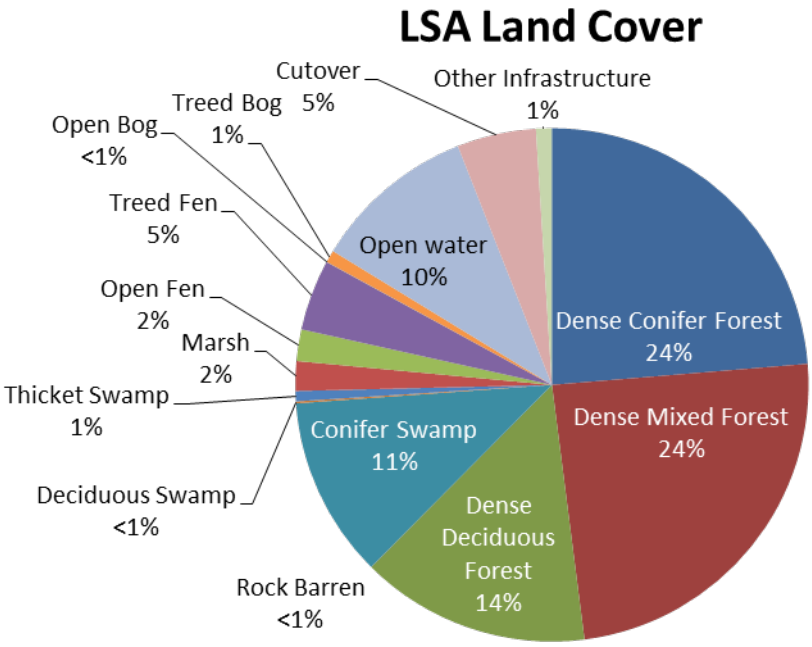

Figure 2-8: Land coverage in the Local Study Area based on groupings of ecosites

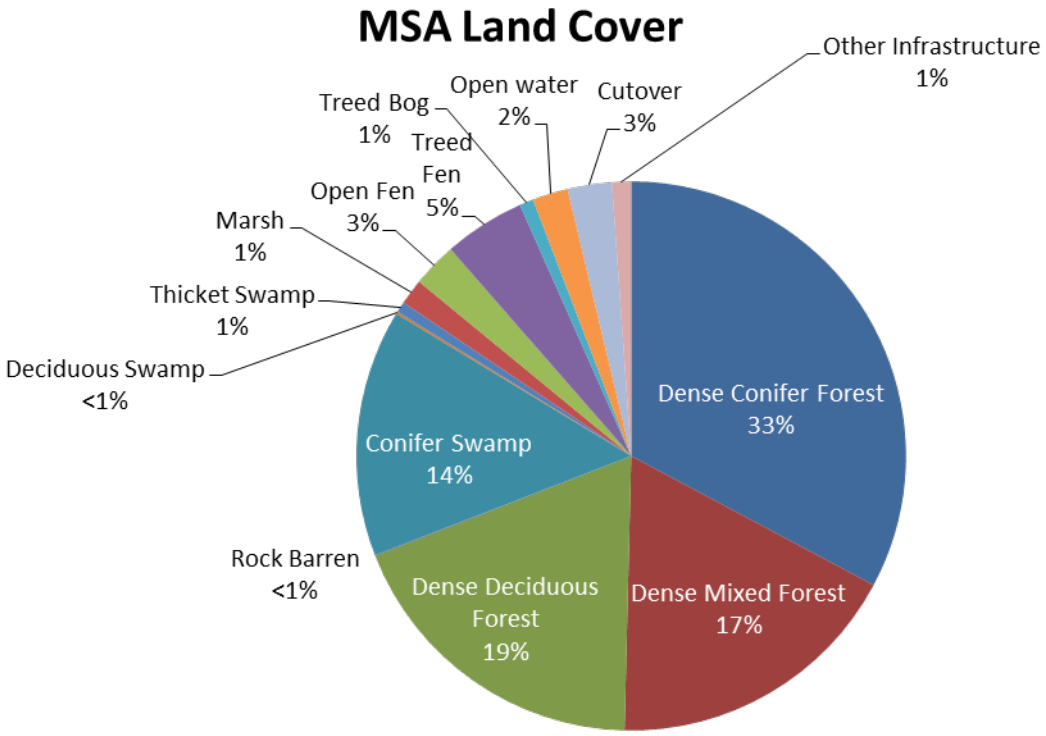

Figure 2-9: Land coverage in the Mine Study Area based on groupings of ecosites

The comparison above illustrates that the majority of land coverage in all study areas is forest cover in varying degrees of dense deciduous, dense coniferous and dense mixed forest. In all three study areas, forest cover represents 60-70% and wetlands average 25% of the land coverage in the MSA and LSA. Cut or depleted forest ranges from 3-6% of the land cover in all three study areas. Open water makes up the remainder in the study areas.

2.2.2.2 Local Study Area and Mine Site

The LSA occupies approximately 8,495 ha and the MSA occupies 2,063 ha. The majority of the MSA and LSA are contained within the Crossroutes Forest Management Area with the eastern portion lying within the Sapawe Forest Management Area (Figure 2-6). The LSA consists of a forest types in various stages of succession that are dominated by common boreal species such as jack pine, white and black spruce, balsam fir, white birch, and aspen along with some typical Great Lakes forest species such as white pine, red pine and cedar. Mature stands of trees are typically restricted to the margins of drainages and wetlands, and isolated patches of upland. Drainages and depressions in the LSA support a mix of marshes, swamps and fens, which are composed of black spruce, tamarack, ericaceous shrubs (e.g., leatherleaf), tall shrubs (e.g., willows and alders), sedges and mosses.

The LSA has been subject to large-scale anthropogenic changes in the past which has had an impact on the some of the natural landscape. Activities such as power generation, logging, aggregate extraction and other

human uses such as campsites and cutovers have created disturbances in vegetation communities which are at varying degrees of naturalization and succession.

2.2.2.2.1 Ecosite Classification

The areal distribution of upland and wetland vegetation ecosites in the MSA and LSA is contained in Tables 2-3 and 2-4. Approximately 67% of the LSA is forested versus wetlands and open water. Approximately 78% of the MSA contains upland ecosites versus wetland and open water. The ecosite occupying the most area in the LSA is ES-F, a Fir-Spruce Mixedwood. In the MSA, the ecosite occupying the most area is ES-E, a Hardwood-Fir-Spruce Mixedwood.

2.2.2.2.1.1 Upland Ecosites (Forests)

There are 9 different terrestrial/upland ecosites identified within the MSA/LSA. Mapping of ecosites in the MSA/LSA are on Figure 2-10 and in Appendix 2.II (Map sheets 1 to 22). The predominant upland ecosites based on areal extent are ES-B (Black Spruce-Jack Pine), ES-E (Hardwood-Fir-Spruce Mixedwood), ES-F (Fir-Spruce Mixedwood) and ES-H (Spruce-Pine/Feathermoss). Detailed descriptions of all upland ecosites are located in Appendix 2.II Table 2.

Table 2-4: Upland Ecosite Classification and Area Summaries for the Mine Study Area and Local Study Area

Ecosite Code	Name	Traditional Use Plant Potential[(b)]	Mine Study Area		Local Study Area	
			Area (ha)	%	Area (ha)	%
ES-A	Red Pine-White Pine-Jack Pine: Very Shallow Soil	High	9.29	0.45	216.87	2.55
ES-B	Black Spruce-Jack Pine: Very Shallow Soil	Moderate	286.60	13.89	722.71	8.51
ES-C	Jack Pine-Conifer: Dry-Moderately Fresh	Moderate	40.24	1.95	163.89	1.93
ES-D	Red Pine-White Pine	High	0.00	0.00	88.07	1.04
ES-E	Hardwood-Fir-Spruce Mixedwood	High	385.36	18.68	1228.75	14.46
ES-F	Fir-Spruce-Mixedwood	Moderate	226.86	11.00	1280.84	15.08
ES-G	Pine-Spruce Mixedwood	High	73.22	3.55	578.13	6.81
ES-H	Spruce-Pine/Feathermoss	High	340.19	16.49	821.04	9.67
ES-I	White Cedar: Fresh-Moist, Coarse-Fine Loamy Soil	Moderate	62.81	3.05	203.80	2.40
TOTAL[(a)]			**1,424.56**	**69.09%**	**5304.10**	**62.44%**

Notes:

(a) Totals do not include existing disturbed areas and coverage by open water.

(b) Traditional use plant potential is based on the occurrence of traditional plants as documented in the Aboriginal TSD.

600000
610000
620000
5430000
5420000

N

Serpent Lake
Cornell Lake
Sawbill Bay
Mitta Lake
Lynxhead Bay
Marmion Reservoir
Hawk Bay
Highway 622

LEGEND

- Bald Eagle Nesting Site
- Black Tern Nesting Site/Colony
- Great Gray Owl Nesting Site
- Great Blue Heron Nesting Site/Colony
- Osprey Nesting Site
- Bear Baiting Station
- Provincial Highway
- Trail
- Road
- Power Transmission Line
- River/Stream
- Lake
- Wetland
- Moose Aquatic Feeding Site
- Species Occurrence
- Species Observation
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000
SCALE 1:100,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
MOOSE HABITAT, NESTING SITES, AND SPECIES OBSERVATIONS IN THE MINE AND LOCAL STUDY AREAS

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 2-10

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2.2.2.2.1.2 Wetland Ecosites

There are 28 different wetland ecosites identified in the MSA and an additional two wetland ecosites within the LSA. Wetland ecosites are illustrated on Figure 2-10. Wetland ecosites represent 21.28% of the LSA and 25.07% of the MSA (Table 2-5).

The predominant wetland ecosites based on areal extent are conifer swamps such as W27 (Poor Conifer Swamp: Black Spruce/Labrador Tea) and W31 (Rich Conifer Swamp: Cedar-Tamarack-Black Spruce) followed by W29 (Intermediate Conifer Swamp: Black Spruce/ Tall Shrub/ Labrador Tea), W30 (Intermediate Conifer Swamp: Conifer/Tall Shrub/Herb-rich) and W32 (Rick Conifer Swamp: Cedar-Tamarack). A full description of all wetland ecosites identified in the LSA is in Appendix 2.II Table 2.

Table 2-5: Wetland Ecosite Classification and Area Summaries for the Mine Study Area and Local Study Area

Ecosite Code	Name	Traditional Use Plant Potential[(b)]	Mine Study Area		Local Study Area	
			Area (ha)	%	Area (ha)	%
W1	Open Water Marsh: Mixed: Mineral Substrate	Low	0.59	0.03	2.43	0.03
W2	Open Water Marsh: Pipewort-Water Lobelia: Mineral Substrate	Low	1.67	0.08	4.02	0.05
W3	Open Water Marsh: Mixed: Organic Substrate	Low	3.72	0.18	15.20	0.18
W4	Open Water Marsh: Floating-leaved Plants	Low	3.88	0.19	18.38	0.22
W5	Marsh: Mixed: Mineral Substrate	Low	5.21	0.25	17.51	0.21
W10	Marsh: Mixed: Organic Substrate	Low	1.78	0.09	9.84	0.12
W11	Marsh: Cattail	Low	0.00	0.00	2.75	0.03
W12	Meadow Marsh: Tall Sedge	Low	6.66	0.32	54.07	0.64
W13	Meadow Marsh: Blue-joint Grass	Low	7.68	0.37	34.20	0.40
W14	Open Graminoid Shore Fen: Wire Sedge	Low	9.12	0.44	81.76	0.96
W15	Low Shrub Shore Fen: Leatherleaf-Sweet Gale/Graminoid	Low	3.39	0.16	18.48	0.22
W16	Tall Shrub Shore Fen: Speckled Alder-Willow/Dwarf Birch/Ericaceous Shrub	Moderate	14.82	0.72	53.02	0.62
W18	Moderately Rich Fen: Tamarack-Black Spruce/Ericaceous Shrub	Moderate	59.95	2.91	203.01	2.39
W19	Moderately Rich Fen: Graminoid	Low	27.22	1.32	27.22	0.32
W20	Poor Fen: Ericaceous Shrub/Wire Sedge/peatmoss	Moderate	14.45	0.70	26.39	0.31

Table 2-5: Wetland Ecosite Classification and Area Summaries for the Mine Study Area and Local Study Area (Continued)

Ecosite Code	Name	Traditional Use Plant Potential[(b)]	Mine Study Area		Local Study Area	
			Area (ha)	%	Area (ha)	%
W21	Poor Fen: Ericaceous Shrub/ peatmoss	Low	0.02	0.00	15.14	0.18
W22	Poor Fen: Black Spruce-Tamarack/Ericaceous Shrub/peatmoss	Low	23.91	1.16	123.39	1.45
W24	Open Low Shrub Bog: Ericaceous Shrub/ peatmoss	Low	0.00	0.00	1.05	0.01
W25	Semi-treed bog: Black Spruce/Ericaceous Shrub/peatmoss	Low	16.86	0.82	36.12	0.43
W26	Treed Bog: Black Spruce/ Ericaceous Shrub/peatmoss	Low	0.00	0.00	29.89	0.35
W27	Poor Conifer Swamp: Black Spruce/Labrador Tea./ peatmoss	Moderate	24.68	1.20	230.40	2.71
W28	Poor Conifer Swamp: Black Spruce/ Labrador Tea/peatmoss	Moderate	31.98	1.55	58.09	0.68
W29	Intermediate Conifer Swamp: Black Spruce/ Tall Shrub/ Labrador Tea	Moderate	53.07	2.57	147.04	1.73
W30	Intermediate Conifer Swamp: Conifer/Tall Shrub/Herb-rich	Moderate	3.10	0.15	151.48	1.78
W31	Rich Conifer Swamp: Cedar-Tamarack (Black Spruce)	Moderate	138.80	6.73	222.29	2.62
W32	Rick Conifer Swamp: Cedar-Tamarack	High	48.68	2.36	159.30	1.88
W33	Hardwood Swamp: Black Ash (Other Hardwood): Upland Transition	Moderate	2.87	0.14	4.75	0.06
W34	Hardwood Swamp: Black Ash (Other Hardwood): Riparian	Moderate	0.00	0.00	5.66	0.07
W35	Thicket Swamp: Speckled Alder/Blue-joint Grass	Moderate	4.96	0.24	40.46	0.48
W36	Thicket Swamp: Tall Willow	Moderate	8.04	0.39	14.31	0.17
TOTAL[(a)]			**517.09**	**25.07%**	**1,807.64**	**21.28 %**

Notes:

(a) Totals do not include existing disturbed areas and coverage by open water.

(b) Traditional use plant potential is based on the occurrence of traditional plants as documented in the Aboriginal TSD.

2.2.2.2.2 Plant Species Richness

The rolling landscape also gives way to wetlands varying in morphology, nutrient content, and species richness. The richer wetlands support more species diversity, while some of the poor, acidic wetlands (bogs) support few species, those of which are specially adapted to restricted nutrients. A variety of species were observed throughout the LSA reflecting this variability of habitat types. A detailed list of the plant species observed and the associated ecosites is located in Appendix 2.II Table 3. In total, there were 275 plant species identified in the LSA (253 vascular species and 22 non-vascular species) were identified within the LSA. This includes 60 woody species (trees and shrubs), 145 forbs, 48 graminoids, 13 mosses, 8 lichens and one algae species. The compiled plant species list for the LSA with their associate global, federal, and provincial ranks and local rarity are presented in Appendix 2.II Table 3.

A majority of the upland habitat is mature conifer and mixedwood forest of varying soil depth and canopy cover. A large proportion of the habitat has undergone some disturbance at varying times in history, allowing for varying stages of succession within ecosites. The mixedwood ecosites ES-E, ES-F, ES-G and ES-H (see Appendix 2.II Table 2 for ecosite descriptions) are generally the richest of the forested ecosites and therefore can support the highest amount of species, as was observed in field surveys.

Black spruce, white spruce, jack pine, trembling aspen, white cedar and white birch were the most common tree species and were observed throughout the LSA. Common tall shrubs include mountain maple, green alder, speckled alder, and mountain ash (American and showy). The most common shrubs observed are all ericaceous shrubs, predominantly Labrador tea, leatherleaf, meadowsweet and blueberry (velvet leaved and lowbush). Understory species such as herbs, graminoids (grasses, rushes and sedges), ferns, groundpines, lichens and mosses were diverse with many recorded in numerous different ecosites.

Various disturbances in the LSA have led to the invasion of exotic or competitive plant species. Most of these species are limited to the roadsides and other disturbance areas, but a few have been documented in the dominant natural communities.

2.2.2.2.2.1 Rare Plants

The plant communities in the LSA support some plant species listed as locally rare for Ecoregion 4W in *Plants of Quetico and the Ontario shield* (Walshe 1998). Species of flora observed in the LSA and their respective ecosites and rarity ranks can be found in Appendix 2.II Table 3. All of the locally rare species and their habitat characteristics are listed in Table 2-6.

Table 2-6: Locally rare plant species observed in the Local Study Area

Common Name	Scientific Name	G-Rank	S-Rank	Preferred Habitat	Observed Location
Kalm's Lobelia	*Lobelia kalmia*	G5	S5	Rich peatlands, wet meadows, sandy shores, cedar and tamarack swamps, calcareous rock crevices	On hummocks in meadow marsh and along ATV trail in ecosite 155 (W13) (Appendix 2. III Figure 12)
Indian Tobacco	*Lobelia inflata*	G5	S5	Path edges, cleared portions in woodlands, shaded seeps, abandoned fields, prefers disturbed areas	In northeast portion of ecosite 214 (ES-H) in disturbed (ATV trail, cleared trees and topsoil) (Appendix 2.III Figure 18) Under conifers in ecosite 175 (ES-G) not far from 167 (W31) (Appendix 2.III Figure 11)
Northern Comandra	*Geocaulon lividum*	G5	S5	Moist woods, poor swamps, treed bogs, poor fens, associated with sphagnum and feather moss	In treed fen raised slightly above surrounding graminoid fen on northwest portion of LSA in polygon 122 (W22: Black Spruce-Tamarack/Ericaceous Shrub/Sphagnum Poor Fen) (Appendix 2.III Figure 11)
Marsh Grass of Parnassus	*Parnassia palustris*	G5	S5	Prefers calcareous wetlands, rich fens, wet meadows, shorelines and marshes	Observed in meadow marsh ecosite 189 (W12) at edge of beaver pond and ATV trail (Appendix 2.III Figure 13)
Arrowhead Sweet-Colts Foot	*Petasites sagittatus*	G5	S5	Fens, marshes, wet meadows, swamps, bogs, areas with standing water, disturbed areas, moist woods, woodland edges, recent clearcuts	In ecosite 131 (W31-Rich Conifer Swamp: Cedar-Tamarack (Black Spruce) between the edge of a graminoid fen and steep bedrock of upland conifer forest (Appendix 2.III Figure 11)

One provincially rare species, blue sedge (*Carex glaucodea*) (ranked S1) was recorded within the east boundary of the LSA. This species was found in a dry, open patch of mixedwood habitat along an ATV trail near ecosite 59 (W26) and 167 (ES-B) (Appendix 2.III Figure 20). This species was not observed in any other location within the LSA but has potential to exist in other locations. Blue sedge prefers mesic to moist forests and meadows like some of those that exist in the LSA.

No federally or provincially listed (endangered, threatened or special concern) species of flora were observed in the LSA.

2.2.2.2.3 Ecological Communities of Conservation Concern

There are no ecological communities of conservation concern in the MSA or LSA. In the province of Ontario, these communities could represent rare vegetation community types, environmentally sensitive areas, and Life Science ANSIs (areas of natural and scientific interest). In southern Ontario, wetlands that have been evaluated as provincially significant using the Ontario Wetland Evaluation System (OWES) also are considered an ecological community of conservation concern due to the limited extent of wetlands in this part of Ontario. However, due to the extensive nature of wetlands in northern Ontario, the evaluation of wetlands as provincially significant does not afford the same conservation status as wetlands in the south.

There are a few patches of old growth forest, identified by the MNR, present within the RSA to the east and south of the MSA and LSA. These patches are depicted on Figure 2-6.

2.2.3 Wildlife

2.2.3.1 Mammals

A total of 11 mammal species were observed either during targeted surveys or incidentally during the conduct of other baseline studies completed between 2010 and 2012. Based on range maps and knowledge of current distribution, an additional 35 species of mammals potentially occur in the LSA. The following table summarizes the mammals occurring and potentially occurring in the study area (Table 2-7). Of the observed and potentially occurring mammal species, two are classified as Species at Risk, Gray fox and Little brown bat. No Gray foxes or Little brown bats were observed during field surveys in the LSA. Gray fox sightings are exceedingly rare outside of Pelee Island in Ontario and thus it is not likely to inhabit the LSA. Little brown bat has the potential to occur in the LSA and is discussed further in the Species at Risk section (Section 2.2.2).

Table 2-7: Mammal Species Occurring or Potentially Occurring in the Mine Study Area and Local Study Area

Common Name	Scientific Name	Origin[(a)]	Global Rarity Status[(b)]	Ontario Rarity Status[(b)]	SARA[(c)]	ESA[(d)]
American mink[(e)(f)]	*Neovison vison*[3]	N	G5	S4	—	—
Beaver[(e)(f)]	*Castor canadensis*	N	G5	S5	—	—
Big brown bat[(f)]	*Eptesicus fuscus*	N	G5	S5	—	—
Black bear[(e)(f)]	*Ursus americanus*	N	G5	S5	Not at Risk	
Black-backed shrew[(f)]	*Sorex arcticus*	N	G5	S5	—	—
Canada lynx[(e)(f)]	*Lynx canadensis*	N	G5	S5	Not at Risk	

Table 2-7: Mammal Species Occurring or Potentially Occurring in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Origin[a]	Global Rarity Status[b]	Ontario Rarity Status[b]	SARA[c]	ESA[d]
Common shrew[f]	*Sorex cinereus*	N	G5	S5	—	—
Coyote[f]	*Canis latrans*	N	G5	S5	—	—
Deer mouse[f]	*Peromyscus maniculatus*	N	G5	S5	—	—
Eastern chipmunk[e][f]	*Tamias striatus*	N	G5	S5	—	—
Fisher[e][f]	*Martes pennanti*	N	G5	S5	—	—
Gray squirrel[f]	*Sciurus carolinensis*	N	G5	S5	—	—
Gray wolf[e][f]	*Canis lupus*	N	G4G5	S4	Not at Risk	
Gray fox[f]	*Urocyon cinereoargenteus*[4]	N	G5	S1	THR	THR
Heath vole[f]	*Phenacomys ungava*	N	G5	S4	—	—
Hoary bat[f]	*Lasiurus cinereus*	N	G5	S4	—	—
House mouse[f]	*Mus musculus*	I	G5	SNA	—	—
Least chipmunk[f]	*neotamias minimus*	N	G5	S5	—	—
Little brown bat[f]	*Myotis lucifugus*	N		S4	No status	END
Long-tailed weasel[f]	*Mustela frenata*	N	G5	S4	—	—
Marten[f]	*Martes americana*	N	G5	S5	—	—
Meadow jumping mouse[f]	*Zapus hudsonius*	N	G5	S5	—	—
Meadow vole[f]	*Microtus pennsylvanicus*	N	G5	S5	—	—
Moose[e][f]	*Alces alces*	N	G5	S5	—	—
Muskrat[f]	*Ondatra zibethicus*	N	G5	S5	—	—
Northern flying squirrel[f]	*Glaucomys sabrinus*	N	G5	S5	—	—
Northern short-tailed shrew[f]	*Blarina brevicauda*	N	G5	S5	—	—
Norway rat[f]	*Rattus norvegicus*	I	G5	SNA	—	—
Porcupine[f]	*Erethizon dorsatum*	N	G5	S5	—	—
Pygmy shrew[f]	*Sorex hoyi*	N	G5	S4	—	—
Raccoon[f]	*Procyon lotor*	N	G5	S5	—	—
Red fox[e][f]	*Vulpes vulpes*	N	G5	S5	—	—
Red squirrel[e][f]	*Tamiasciurus hudsonicus*	N	G5	S5	—	—
River otter[f]	*Lontra canadensis*	N	G5	S5	—	—
Rock vole[f]	*Microtus chrotorrhinus*	N	G4	S4	—	—
Short-tailed weasel[f] (ermine)	*Mustela erminea*	N	G5	S5	—	—
Snowshoe hare[f]	*Lepus americanus*	N	G5	S5	—	—
Southern bog lemming[f]	*Synaptomys cooperi*	N	G5	S4	—	—

Table 2-7: Mammal Species Occurring or Potentially Occurring in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Origin[a]	Global Rarity Status[b]	Ontario Rarity Status[b]	SARA[c]	ESA[d]
Southern red-backed vole[f]	*Myodes gapperi*	N	G5	S5	—	—
Star-nosed mole[f]	*Condylura cristata*	N	G5	S5	—	—
Striped skunk[f]	*Mephitis mephitis*	N	G5	S5	—	—
Water shrew[f]	*Sorex palustris*	N	G5	S5	—	—
Weasel[f]	*Mustela sp.*	N			—	—
White-tailed deer[f]	*Odocoileus virginianus*	N	G5	S5	—	—
Woodchuck[e][f]	*Marmota monax*	N	G5	S5	—	—
Woodland jumping mouse[f]	*Napaeozapus insignis*	N	G5	S5	—	—

Notes:

— = Species is not currently designated under SARA or ESA.

G = Global.

S = Provincial.

SNA = Not applicable for Ontario Ranking (e.g., Exotic species).

Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.

[a] Origin: N = Native; (N) = Native but not in study area region; I = Introduced.

[b] Ranks based upon determinations made by the Natural Heritage Information Centre (2010).

[c] Canada Species at Risk Act (Schedule 1; checked February 20, 2012).

[d] Ontario Endangered Species Act (O. Reg. 4/12 amending O.Reg.230/08; checked February 20, 2012).

[e] Confirmed on the study area during 2010 -2012 field work.

[f] Potentially present in study area based upon broad distribution and suitable habitat.

[g] Formerly classified as Mustela vison. Updated via ITIS website (http://www.itis.gov/).

[h] COSEWIC report on Gray fox indicates the population west of Lake Superior may not be a distinct breeding population but individuals dispersing from the population in the United States.

2.2.3.1.1 Ungulates

Ungulate species are also referred to as cervids: a term used to describe members of the deer family. The cervids known to occur within the RSA, LSA and MSA are moose and white-tailed deer. The MNR is responsible for the protection and management of cervids and developed a policy called the Cervid Ecological Framework (CEF) (MNR 2009a). The study areas fall within the cervid ecological zone (CEZ) C_1 from the CEF (MNR 2009a). According to the CEF, the management directive is to maintain moose populations at moderate (20-40/100 km^2) to high (40-60/100 km^2) densities within CEZ-C_1 (MNR 2009a).

Moose

Moose are common and widespread in Ontario and their general status in Canada is “secure” (MNR 2012e). The estimated number of moose in Ontario is approximately 120,000 individuals (MNR 2009a). Currently in Ontario, moose are managed primarily by controlling the hunting season for residents and non-residents (MNR 2009b). The LSA is located within Wildlife Management Unit (WMU) 12b. In WMU 12b, the cervid strategy is to manage moose as the primary cervid species and maintain moderate to high moose populations. The moose aerial inventory completed within WMU 12b in 2009 indicates that numbers of moose in the area are

increasing. There was a declining population trend for moose in the late 90's; however, since 2000 their numbers have been increasing. In 2009, the number of moose in WMU 12b was approximately 2500 animals or 0.45 moose per km^2 (MNR 2009b). From the 2009 survey, the population breakdown was found to be 22% bulls, 63% cows and 15% calves. This population then supports the hunting quotas for this subsistence species. Moose are also a culturally important species, as well as important prey for large carnivores. As stated above, the management directive within CEZ-C_1 is to maintain moose populations at moderate (20-40/100 km^2) to high (40-60/100 km^2) densities (MNR 2009a). Based on the results of the 2009 moose aerial survey, the densities of moose in WMU 12b lies within the CEF recommended densities.

Optimal moose habitat is characterized by semi-open forest cover, an abundance of willow and aspen stands, and often these are located close to lakes, river valleys, stream banks, or sand bars. They have an affinity for recently disturbed forests (i.e. recent burns or logging) in which sunlight can penetrate the forest floor and promote the abundant growth of herbaceous plants. During the late spring/summer, moose will utilize forbs and aquatic plants (Regelin et.al. 1985) for feeding. Summer season moose browse sources, in particular species such as mountain maple tend to be relatively abundant in over-mature mixedwoods. For calving habitat, cows usually select areas in immediate proximity to small ponds and marshes. In late winter, moose will seek refuge in dense coniferous forested areas (at least 60% canopy closure in northern Ontario) near open water wetlands with aquatic macrophyte growth in spring (MNR 2000).

The LSA appears to provide quality habitat for moose, with abundant moose sign (tracks, fecal pellets). Incidental observations of moose (sightings and sign) were made during all field campaigns. The remote camera surveys detected two young moose at station HRCAM01 (Figure 2-4).

Correspondence with staff at MNR (A. Godwin, pers. comm. 2012) regarding overwintering habitat for moose in wetlands across the LSA, indicated that most of the treed wetlands are not large enough to provide quality winter cover for moose, albeit that little is known about faunal use of the habitat over the winter. Additionally, given the abundance of forested wetlands in the area and adjacent to the LSA, and their occurrence across much of the Atikokan area, the significance of the wetlands in the LSA for winter cover can be considered low.

The MNR's NRVIS mapping identifies moose aquatic feeding areas in the MSA and LSA. These areas are depicted on Figure 2-10. Moose aquatic feeding areas are very important foraging areas for moose in which they can consume large quantities of aquatic plants such as pondweeds, water lilies and water milfoil. Moose aquatic feeding areas are found distributed throughout WMU 12b (MNR 2010). There are identified moose aquatic feeding areas in shallow bays at the inlet of Lizard Lake and a small lake within the MSA. The moose aquatic feeding areas in the LSA are ranked as Class 2 and 3 (moderate to high; Ranta 1993).

Moose data from the MNR does not identify any known moose calving sites in the LSA, however, consultation with trap line holders in the LSA identified a moose calving/herding area on the east side of Lizard Lake. Moose also require mineral licks to consume salts that are found in the soils of groundwater upwelling areas (Oehlers et al. 2011). There were no identified mineral licks during the baseline data collection.

2.2.3.1.2 Large Carnivores and Omnivores

Black Bear

Black bear are widely distributed across northern Ontario. In 2006 the bear density for WMU 12b was estimated at 0.40 bears/km^2, with local densities varying considerably. Signs of black bears were evident in the MSA and LSA during baseline studies, and photographic observation was obtained from the remote camera surveys in 2012 at HRCAM01 (Figure 2-4).

Black bears tend to be habitat generalists, often occurring in forest areas characterized by pure stands of conifer in lowland areas with mixed wood in upland areas with substantial amounts of disturbed or second growth forests (MNR 2009c). Habitat selection is primarily affected by food availability particularly summer and fall feeding areas (Taylor 2006). In spring, black bears in WMU 12b feed on a variety of grasses, flowers and leaves. These include willow catkins, grasses, dandelions, clover, and newly emerging aspen leaves. Important sources of protein for black bears in the spring may consist of spawning fish and winter-killed or live young deer or moose. In summer in WMU 12b, ant colonies and nests of bumblebees and wasps are excavated and eaten, providing major protein sources (MNR 2009c). Blueberries and other fleshy fruit are eaten as they become ripened throughout the summer. In the fall, hazelnuts and the fruits of mountain ash are preferred foods in WMU 12B. Mountain ash is common and abundant throughout the LSA.

Forested areas with a mixture of clearings, lakes and deciduous forest can provide the supply and variety of foods required by bears throughout the active time of year (Taylor 2006). The study site does not appear to provide higher than average habitat quality. The majority of the study area contains conifer dominated and hardwood-conifer mixedwood forest with a moderately rich understory. However, most of the forest is mature with limited forest openings except in rocky areas, wetlands and watercourses. Bear density in the MSA/LSA is likely comparable to those in the surrounding landscape.

Gray Wolf

Gray wolf occurrence in the MSA and LSA was recorded through anecdotal evidence (TUS survey, Osisko staff observations). Wolf densities and trend data in the immediate vicinity of the MSA and LSA were not obtained but hunter surveys indicate a steady increase in their numbers regionally, throughout the 2000s (Patterson and de Almeida, 2011). Generally the increase in wolf numbers in this part of Ontario is thought to be in response to increased moose and deer numbers.

2.2.3.1.3 Furbearers and Small Mammals

A number of furbearers are known to inhabit the study areas, although some species are not likely to be present due to uneven distribution and lack of habitat. Incidental field observations and remote wildlife camera surveys revealed the presence of approximately 9 furbearers in the study areas including marten, fisher, otter, mink, lynx, and red fox.

Trapping and the management of furbearers is an important aspect of First Nations traditional use of the pelts for clothing, shelter, ceremony and trade. There are six trap lines in the LSA. The data obtained for these trap lines from 2006-2010 indicated the largest catch of muskrat, marten, and beaver followed by weasel, mink and otter. The marten is one of the most sought after furbearers. Although harvest numbers cannot be assumed to directly reflect the population, it appears that the medium sized furbearer, marten is more heavily trapped than other furbearers of similar size such as fisher and Canada lynx. The two most prevalent furbearers in the LSA, muskrat and marten are discussed further as indicators of the furbearer VEC.

Marten

Marten are a medium sized member of the weasel family that occupy coniferous forest habitats across North America from Alaska to Newfoundland. Their diet is predominantly comprised of small mammals such as red-backed voles and snowshoe hare, but also includes a variety of animal and plant materials (Baker et. al., 1996). Prey such as vole and hare are especially important during the winter months and the abundance of these prey species can have an affect on the reproductive success of the marten (Baker et. al., 1996). Breeding takes place in late June to early August and young are born in March or April.

The preferred habitat of marten is mature to overmature coniferous forests with a closed tree canopy. Overhead canopy cover is important for protection from avian predators, as well as providing habitat for foraging and den sites (Bowman et. al., 1996). Canopy closures between 40% and 70% seem to be preferred, while areas with canopy cover less than 30% are avoided in the winter months (Baker et. al., 1996). Tree cavities and woody debris on the forest floor such as stumps and deadfall are important resting and den sites for marten. Stumps and hollow logs on the ground are especially important in the winter months when they are utilized for den sites under the snow. These woody structures also provide air pockets and natural hollow areas under the snow which marten utilize to effectively hunt voles and hare, which remain active in the winter. The rate at which marten can capture prey in the winter has a significant affect on habitat choice.

Vegetation types also have an affect on marten habitat preference. It has been reported in numerous studies that they prefer moist or mesic conifer and conifer-dominated mixed forests, (Baker et. al., 1996) (Abitibi Consolidated 2006). In central areas of Ontario, it has been found that marten prefer mixed forests over pure conifer stands. Preference for cedar and white spruce dominated canopies has been observed in northwestern Ontario (Abitibi Consolidated 2006). In Newfoundland, marten were found to prefer black spruce and balsam fir forests, while black and white spruce habitats were used in Alaska (Baker et. al., 1996).

The ecosite in the LSA that provides the highest quality of marten habitat is ES-F; a spruce-fir mixedwood forest that currently occupies 1280.84 ha of the LSA. Table 2-8 shows the habitat suitability ranking for marten.

Table 2-8: Habitat Suitability Rankings for Marten

Ecosite Code	Habitat Suitability Ranking for marten
ES-A	Low
ES-B	Low
ES-C	Low
ES-D	Low
ES-E	Medium
ES-F	High
ES-G	Medium
ES-H	Medium
ES-I	Medium
ES-J	Low

Muskrat

Muskrats are the largest and most aquatic member of the vole family (Dobbyn 1994). Muskrats occur throughout most of North America, with the exception of Florida, coastal Georgia, South Carolina and Tundra regions (Dobbyn 1994; Allen and Hoffman 1984). This species is an important part of marsh ecosystems, being prey to many predators and utilizing wetland plant species for food, and materials for lodge construction.

Muskrats are primarily herbivores, although they will eat some animal matter (Allen and Hoffman 1984). Broad-leaved cattail (*Typha latifolia*) is a preferred food source (Bellrose 1950) and can support 2 to 7 times as many individuals as other vegetation types (Allen and Hoffman 1984). Stream dwelling muskrats tend to have more diverse diets than those that live in marshes. Individuals that inhabit lakes are more opportunistic feeders and may ingest more animal matter than other populations (Allen and Hoffman 1984).

High quality habitats for muskrat include waterbodies and riparian areas consisting of recently burned, fen, or bog habitat. In addition muskrats will occur in marshes, ponds, lakes, and slow-moving rivers. Water at a site must be deep enough that some of the water column remains unfrozen during winter, but shallow enough to allow the growth of aquatic vegetation in the summer. Ideal water depths are between 1 and 2 m (Messier et al. 1990). Further, deep water, when in close proximity to where burrows are situated, provides refugia from predators, as well as potential access to energy-rich submerged macrophytes (Jelinski 1989; Virgl and Messier 1996). Interestingly, researchers have shown that muskrats can shift their burrow from deep water locations in winter to shallow water habitat in the summer as a life-history strategy for maximizing nutritional intake in northern environments (Jelinski 1989).

Muskrat habitat in northern ecosystems has been described for James Bay, Quebec (Nadeau et al. 1995). The occurrence of burrows along shoreline sections was 6% for lakes, 14% for beaver ponds, 20% for slow-flowing streams and 44% for slow-flowing rivers. Muskrats were not found in peatland areas or in fast-flowing streams. Bank slope, percent floating and submerged plant cover, presence of clay-loam soil, as well as the width of herbaceous vegetation along shorelines are important variables predicting the occurrence of muskrat burrows (Nadeau et al. 1995).

Moderate-to-highly suitable habitats are wetland ecosites classified as open water marsh or marsh containing emergent vegetation typically established in areas of low flow and in quiet bays.

The suitability of the habitats in the LSA was evaluated for muskrat based on a review of relevant literature. Using Habitat Suitability Index Models: Muskrat (Allen and Hoffman 1984), wetland ecosites in the LSA were ranked on their suitability to provide key habitat components for muskrat: availability of preferred food species, emergent vegetation for cover and overwintering conditions (Table 2-9).

Table 2-9: Habitat Suitability Rankings for Muskrat

Ecosite Code	Habitat Suitability Ranking
W1	Medium
W2	Low
W3	Medium
W4	Medium
W5	High
W10	High

Table 2-9: Habitat Suitability Rankings for Muskrat (Continued)

Ecosite Code	Habitat Suitability Ranking
W11	High
W12	Medium
W13	Low
W14	Low
W15	Low
W19	Low
W20	Low
W21	Low
W24	Low

2.2.3.1.4 Bats

Three bat species are potentially present in the LSA, although no specific monitoring studies were conducted in the LSA as part of the baseline studies. These are Little brown bat (*Myotis lucifugus*), Big brown bat (E*ptesicus fuscus*) and Hoary bat (*Lasiurus cinereus*).

The Little brown bat is a Species At Risk and has been designated as endangered under the ESA. This species uses a wide variety of palustrine and terrestrial habitats including: bog/fen, swamp, riparian, hardwood and mixed forest, grassland, old field, shrubland, agricultural and urban (NatureServe 2012). This species hibernates in caves, abandoned mines and other subterranean sites. In late summer and into the fall, Little brown bats migrate to hibernacula which can be located 300 km or more from summer roosts. These hibernacula also serve as swarming sites during mating which occurs from August to early October. High humidity and stable cool temperatures that remain above freezing are important features of a hibernacula site (Kunz and Reichard 2010). Reproductive females form large maternity colonies in barns, attics and sometimes hollow trees. Females have high roosts fidelity, returning to their natal roosts. Warm microclimates within the maternity roost structures are preferred by reproductive females and their offspring (Kunz and Reichard 2010). In general, males and non-reproductive females inhabit separate roosts in smaller groups or individually and are widely dispersed. Foraging occurs over open water, forest trails and clearings, meadows and farmland, and forest margins (NatureServe 2012).

Big brown bats are generalists when it comes to foraging behaviour and habitat selection. This species is found in a variety of habitats including riparian, coniferous, deciduous and mixed forest, old field, shrubland, agricultural and urban (Harvey et al. 2011). Caves, mines and other human-made structures are used for winter hibernacula. Maternity colonies occur in attics, barns and less commonly in tree cavities. Females practice roost fidelity, often returning to the same roost site year after year. A foraging habitat generalist, big brown bats will forage over terrestrial and aquatic habitats, the margins of waterbodies, forest canopies, clearings, and near lights in rural areas (NatureServe 2012).

Hoary bats inhabit many habitats preferring deciduous and coniferous forest as well as riparian areas. This species is a long distance migrant, moving south beginning in late summer and early fall, and therefore does not hibernate (NatureServe 2012). This species roosts solitary during the day in the foliage of trees, typically along forest borders possibly in microsites that offer protection from the wind (NatureServe 2012). Hoary bats forage in a variety of open areas, feeding on moths, true bugs, mosquitoes and other insects.

There are no known bat hibernacula, daytime roosts or maternal colonies within the LSA. Golder's Cultural Heritage TSD identified abandoned mine infrastructure in the MSA that may have potential as a roosting site or hibernacula although there is no confirmed usage of this old mine or any records of occurrence of bats in the MSA/LSA. The locations of the abandoned mines are illustrated on Figure 2-2. These abandoned mine shafts have a wire mesh covering, however it is not likely that the mesh would preclude bats from using these caverns for roosting during hibernation. It is possible that some of the cliff habitat or very mature trees may also provide some opportunities for diurnal roosts. The LSA is anticipated to provide foraging habitat for bats, particularly over lakes, near shorelines and open areas, dependent on the species.

2.2.3.2 Birds

The study areas are located in the boreal hardwood transition zone, Ontario Bird Conservation Region 12 (BCR12). There is no Important Bird Areas (IBA) in proximity to the MSA and LSA (IBA Canada 2012). The area is not considered a significant migratory bird flyway or stopover area. Discussion and analysis of the results for Landbird Priority Species in BCR12 is presented in Appendix 2.IV.

Background avian population and distribution data obtained for the MSA and LSA and the surrounding area includes Breeding Bird Survey data from the most recent Ontario Breeding Bird Atlas (Cadman et al. 2007), as well as the Ontario Nocturnal Owl Survey (BSC 2012).

The MSA and LSA include at least a portion of nine 10km^2 OBBA squares. However only two of these had reasonable survey effort and several had no coverage. A total of 68 species were observed in all 9 squares combined (Appendix 2.V Table 1). All of these species are included in the OBBA atlas block 15XQ as discussed below.

Due to the vast size of northern Ontario, OBBA coverage goals focused on 100 km^2 blocks instead of 10 km^2 squares (Cadman et al. 2007). Therefore avian data for the entire 100 km^2 atlas block 15XQ (Appendix 2.V Table 2) is also included in this report as it provides a better understanding of species diversity in the region. A total of 131 species were identified in OBBA block 15XQ. This included forest species such as Red-eyed vireo (*Vireo olivaceus*), open area species such as Savannah sparrow (*Passerculus sandwichensis*), wetland species such as American bittern (*Botaurus lentiginosus*), and waterfowl and water birds such as Common goldeneye (*Bucephala clangula*) and Herring gull (*Larus argentatus*). This also included five SAR: Canada warbler (*Cardellina canadensis*), Common nighthawk (*Chordeiles minor*), and Olive-sided flycatcher (*Contopus cooperi*) are listed as special concern under ESA, and threatened under SARA; Bald eagle (*Haliaeetus leucocephalus*), and Short-eared owl (*Asio flammeus*) are listed as special concern under ESA. Appendix 2.V Figure 1 shows a map of the labelled atlas squares for region 40 in which the project is located.

The MSA and LSA border on 2 Ontario Nocturnal Owl Survey (ONOS) routes: (1) Route # 373 to the east of the Project Site, and (2) Route # 52 to the west of the Project Site. Appendix 2.V Figure 2 shows the two survey routes. Combined observations for these routes includes six bird species: American woodcock, Boreal owl, Great-grey owl, Great-horned owl (*Bubo virginianus*), Northern saw-whet owl (*Aegolius acadicus*), and Ruffed grouse (*Bonasa umbellus*). Appendix 2.V Table 3 contains the complete dataset for these routes in the Project Site.

At the request of the MNR, four other species of birds were considered as shown in Table 2-10.

Table 2-10: Ontario Ministry of Natural Resources List of 'Other bird species to consider'

Species	Data Sources
Trumpeter swan (*Cygnus buccinators*)	This species has benefitted from reintroduction efforts in Ontario and Minnesota and although it is expanding its breeding range in northwestern Ontario it is still only present in very small numbers. It was not recorded in the OBBA atlas square containing the Project LSA. It breeds in marshes or floodplains of creeks (Cadman et al. 2007). Due to the Trumpeter swan low numbers, there is a low probability that it will occur in the Project LSA. The trumpeter swan is not listed under ESA or SARA and has a provincial rank of S4.
Tundra swan *(Cygnus columbianus)*	This species is exclusively a tundra breeder in Ontario (Cadman et al. 2007). The only time it may occur in the LSA is on migration. Therefore, no critical habitat of this species occurs in the LSA. The Tundra swan is not listed under ESA or SARA and has a provincial rank of S4.
Great gray owl *(Strix nebulosa)*	This species breeds in bogs throughout the boreal region. Its breeding distribution is closely tied to prey availability which may be locally abundant in some years and nearly absent in others. Nesting habitat is further constrained by the need for abandoned raptor nests that the Great gray owl uses for nesting (Bull et al. 1993). It was recorded in the OBBA atlas square containing the Project Site and mapping provided by the MNR indicates two nesting sites for this species located to the northwest of the LSA. The Great gray owl is not listed under ESA or SARA and has a provincial rank of S4.
Great blue heron *(Ardea herodias)*	This species is usually a colonial nester although it can breed singly. It nests in wet or dry forest, sparsely treed islands, beaver ponds and marshes (Cadman et al. 2007). There is known nesting site located to the northwest of the LSA (MNR mapping 2011). There were no observations of nesting sites for this species during field investigations in the LSA. The Great blue heron is not listed under ESA or SARA and has a provincial rank of S4.

2.2.3.2.1 Breeding Bird Point Counts

A total of 110 point count stations were surveyed in the 2010-2012 periods; however, a count of 83 point count stations are situated within the MSA and LSA (Figure 2-1; Appendix 2.I Table 2). The stations were distributed among the different habitat types in the study areas. Table 2-11 contains a list of the major habitat types that are used to describe the breeding bird habitat in the LSA. Note that these habitat types correspond to the ecosite classifications and a comparison of habitat types and ecosites can be found in Appendix 2.II Table 1.

Table 2-11: Number of Point Count Stations and Area / Habitat Type in the Mine Study Area and Local Study Area

Habitat Type	Number of Plots	Total Area in Mine Study Area (ha.)	Total Area in Local Study Area (ha.)
Dense coniferous	17	729.57	2,045.65
Dense Deciduous	10	384.47	1,296.02
Dense Mixed	14	364.99	2,253.03
Marsh	2	36.74	187.68
Conifer Swamp	18	300.46	968.97
Thicket Swamp	4	12.77	55.7

Table 2-11: Number of Point Count Stations and Area / Habitat Type in the MSA/LSA (Continued)

Habitat Type	Number of Plots	Total Area in Mine Study Area (ha.)	Total Area in Local Study Area (ha.)
Open Fen	6	54.75	177.11
Treed Bog	2	16.76	65.85
Treed Fen	10	98.42	384.53
Open Bog	0	0	1.29
Deciduous Swamp	0	2.89	10.59
Disturbed	0	24.1	146.71
Open Water	0	35.27	900.03
Total	**83**	**2,062**	**8,494**

Compiled results for the avian surveys are presented in Appendix 2.I Table 3. A total of 102 bird species were identified during all breeding season field surveys throughout the MSA and LSA and in the vicinity. A comprehensive bird species list for the LSA, including all surveys and incidental observations, is presented in Appendix 2.I Table 4. The majority of bird species were detected during morning breeding bird point counts. A total of 81 species were detected during the breeding bird point counts (at all distances from the observer) and 66 species were detected within 50 m. The species composition and density is typical of a boreal hardwood forest bird community, with a diversity of warblers, thrushes, sparrows, and vireos. White-throated sparrow (*Zonotrichia albicollis*), a habitat generalist (Falls and Kopachena 2010), was the most abundant species observed. Additional common species included mixed/deciduous forest species such as Red-eyed vireo; coniferous forest species such as Swainson's thrush (*Catharus ustulatus*) and wetland (e.g., bog and fen) species such as Yellow-bellied flycatcher (*Empidonax flavienventris).* Species at risk (SAR) observed during the breeding bird surveys were the Common nighthawk (*Chordeiles minor*) and Canada warbler (*Cardellina canadensis*). These species will be discussed further in the SAR section. No provincially threatened or endangered species were found during the field surveys (Cadman et al. 2007).

Breeding Bird Data Results

Mean density of species by habitat , measured as the number of individuals per hectare (ha), was calculated for each of the 66 species of birds detected on breeding bird point counts for each habitat type (Table 2-12). To adjust for differences in the maximum detection distances between bird species, only observations within 50 m of the observer were used in these calculations. Flyover observations were also excluded from the analysis. The density of each bird species by habitat is presented in Appendix 2.I Table 5 and summarized in Table 2-12 and in the text below.

The effective detection radius (EDR) for the Project avian study area was 66.5 m. The effective sampling area was therefore 1.39 ha, which was used to estimate density for species and communities.

Magnolia warbler (*Setophaga magnolia*) had the highest densities in dense coniferous and edge habitats. Red-eyed vireo (*Vireo olivaceus*) was the most abundant species in dense deciduous habitat. Nashville warbler (*Oreothlypis ruficapilla*) was the most abundant species in dense mixed and conifer swamp habitats, and shared the highest density in thicket swamp with Alder flycatcher (*Empidonax alnorum*). White-throated sparrow (*Zonotrichia albicollis*) was the most abundant species in treed fen habitat and shared the highest density in

marsh habitat with Song sparrow (*Melospiza melodia*). Swamp sparrow (*Melospiza georgiana*) was the most abundant species in open fen habitat. Hermit thrush (*Catharus guttatus*) was the most abundant species in treed bog habitat although only two point counts were conducted in this habitat.

American crow (*Corvus brachyrhynchos*) and Black-backed woodpecker (*Picoides arcticus*) were only detected in dense conifer habitat. Clay-colored sparrow (*Spizella pallida*) was unique to thicket swamp habitat. Common grackle (*Quiscalus quiscula*) and Sharp-shinned hawk (*Accipiter striatus*) were only detected in conifer swamp habitat. Connecticut warbler (*Oporornis agilis*) was only detected in treed bog habitat. Greater yellowlegs (*Tringa melanoleuca*) and Spruce grouse (*Falcipennis canadensis*) were only detected in open fen habitat. Ruby-throated hummingbird (*Archilochus colubris*) was found only in edge habitat. Ruffed grouse (*Bonasa umbellus*) and White-breasted nuthatch (*Sitta carolinensis*) were found only in dense deciduous habitat.

White-throated sparrow was the only species recorded in all sampled habitat types. Nashville warbler and Hermit thrush were recorded in all habitat types except for marsh.

Observed species richness ranged from one to ten species among habitats, and was highest in conifer swamp and treed bog habitats (Table 2-12 and Figure 2-11). Species richness was lowest in marsh, thicket swamp, dense deciduous and dense mixed habitats; however, the number of plots sampled for several habitats within the LSA (e.g., marsh, thicket swamp, open fen, treed bog) was constrained by limited availability of habitats.

Dense deciduous, dense conifer, treed fen, and open fen habitats had the highest average density of observed birds. Marsh and edge habitats had the lowest density of observed birds. Mean density ranged from 2.64 to 5.18 birds per 1.39 ha among all habitat types.

Table 2-12: Mean Density and Species Richness of Breeding Birds per Habitat Type

Habitat Type	Number of Plots	Density		Observed Species Richness	
		Mean ± 1SE	Min – Max	Mean ± 1SE	Min – Max
Dense Conifer Forest	17	4.90 ± 0.39	2.16 – 7.91	2.16 ± 0.08	3 to 9
Dense Deciduous Forest	10	5.18 ± 0.45	2.16 – 7.19	1.95 ± 0.14	2 to 8
Dense Mixed Forest	14	4.21 ± 0.40	1.44 – 7.91	2.03 ± 0.12	2 to 10
Edge	8	3.98 ± 0.46	0.72 – 7.19	2.11 ± 0.13	1 to 9
Marsh	2	2.64 ± 1.20	1.44 – 5.04	1.70 ± 0.28	2 to 6
Conifer Swamp	18	4.28 ± 0.30	2.16 – 7.19	2.26 ± 0.08	3 to 10
Thicket Swamp	4	4.46 ± 0.48	2.88 – 5.76	1.94 ± 0.17	4 to 6
Open Fen	6	4.80 ± 0.24	4.32 – 5.76	2.32 ± 0.10	5 to 7
Treed Bog	2	5.04[(a)]	3.60 – 6.47	2.45 ± 0.21	5 to 8
Treed Fen	10	4.82 ± 0.50	2.16 – 7.19	2.17 ± 0.07	3 to 7

Notes:
[(a)] Only the mean is reported because only two sites were surveyed in Habitat Type.

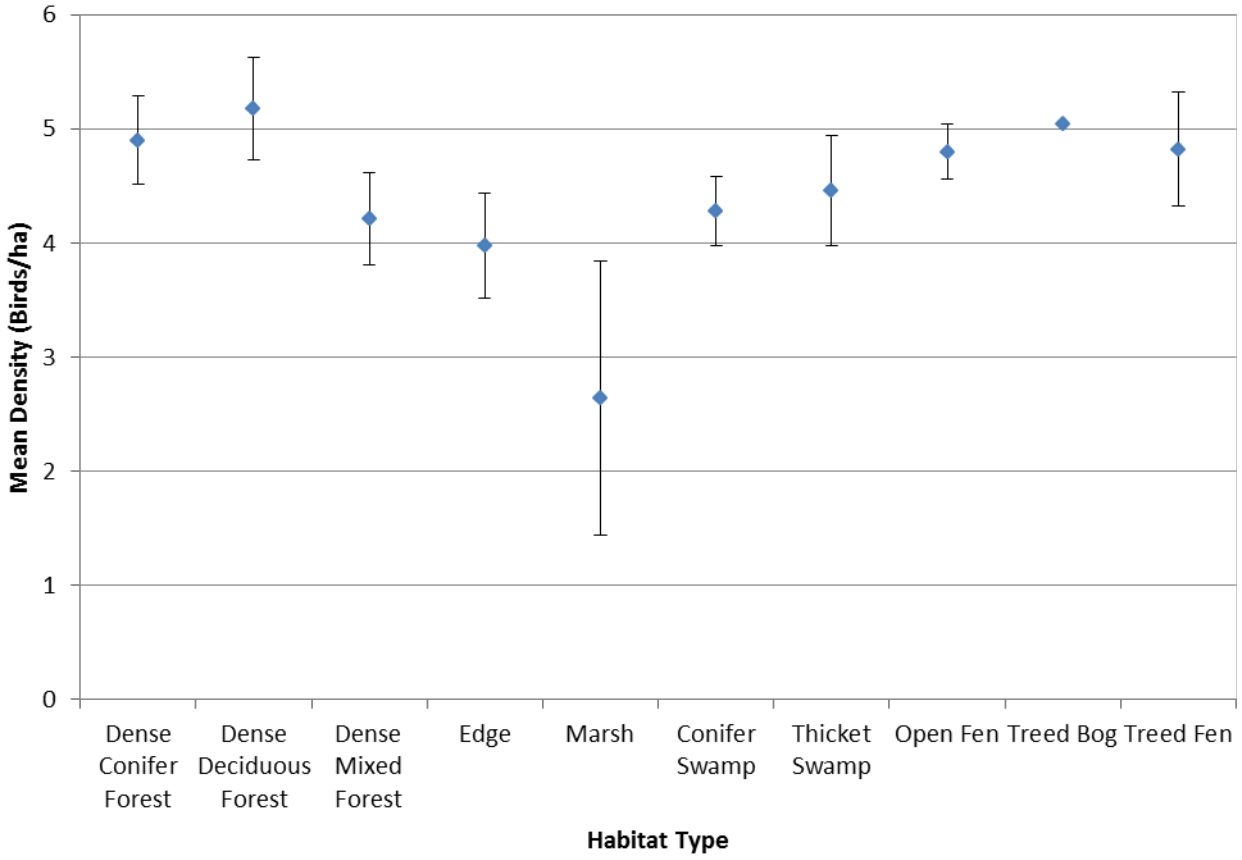

Figure 2-11: Mean Density (+/- SE) of Breeding Birds per Habitat Type

Nightjar Nocturnal Point Counts

Eastern whip-poor-will was not observed during these surveys or any other surveys within the MSA or LSA. Based on the results of the field investigation and supported by information from a local naturalist (D. Elder personal communication), and background data, Eastern whip-poor-will do not use the MSA or LSA for breeding purposes.

A total of 47 individual birds of 15 different species were observed during these point counts and of these, four individuals were priority landbird species: one ruffed grouse, one white-throated sparrow, and two common nighthawks. The relative abundance of priority landbird species observed on nightjar nocturnal point count surveys is 8.5%.

During crepuscular and nocturnal point counts, four additional species, not observed during other surveys, were detected. This includes the species American woodcock (*Scolopax minor*), Long-eared owl (*Asio otus*), Northern saw-whet owl (*Aegolius acadicus*) and Great-horned owl (*Bubo virginianus*).

Marsh Bird Surveys

A total 12 species of birds were observed on marsh monitoring surveys such as Wilson's snipe, Eastern kingbird (*Tyrannus tyrannus*), and Ring-necked duck (*Aythya collaris*). No secretive marsh birds such as Least bittern were identified during these surveys. The only potential Least bittern habitat (e.g., large emergent marshes) was located on Snail Bay in Upper Marmion Reservoir. However habitat was marginal and no Least bitterns were observed or responded to playback. This result is consistent with the input from a local naturalist (D. Elder personal communication).

A total of 22 individual birds were observed on marsh monitoring surveys; of these, five individuals were priority landbird species including one Belted kingfisher and four Swamp sparrows. The relative abundance of priority landbird species observed on marsh monitoring surveys is 23%. Table 2-13 summarizes the species observations during these surveys in the MSA/LSA.

Table 2-13: Species Detected during the 2010-2012 Marsh Bird Surveys in the Mine Study Area and Local Study Area

Common Name	Scientific Name	Global Rarity Status	Ontario Rarity Status	SARA[(a)]	ESA[(b)]
Belted kingfisher	*Ceryle alcyon*	G5	S4B	—	—
Common merganser	*Mergus merganser*	G5	S5B, S5N	—	—
Eastern kingbird	*Tyrannus tyrannus*	G5	S4B	—	—
Great blue heron	*Ardea herodias*	G5	S4	—	—
Green-winged teal	*Anas crecca*	G5	S4	—	—
Hooded merganser	*Lophodytes cucullatus*	G5	S5B, S5N	—	—
Mallard	*Anas platyrhynchos*	G5	S5	—	—
Ring-necked duck	*Aythya collaris*	G5	S5	—	—
Red-winged blackbird	*Agelaius phoeniceus*	G5	S4	—	—
Swamp sparrow	*Melospiza*	G5	S5B	—	—
Tree swallow	*Tachycineta bicolour*	G5	S4B	—	—
Wilson's snipe	*Gallinago delicate*	G5	S5B	—	—

Notes:
— = not designated under SARA/ESA.
(a) SARA = Canada *Species at Risk Act*.
(b) ESA = Ontario *Endangered Species Act*.

Lake Watch Surveys

A total of 13 species of birds were observed on lake watch surveys. In addition to those species recorded during other surveys, additional species were detected. These were American black duck (*Anas rubripes*), Common merganser (*Mergus merganser)* and Hooded merganser (*Lophodytes cucullatus*). Adult and juvenile Bald eagles were also observed during these surveys, flying along the shoreline of the Upper Marmion Reservoir. Though not observed during the lake watch surveys, Osprey (*Pandion haliaetus*) was also detected as an incidental observation in Sawbill Bay. Osprey nests are also mapped within the LSA as depicted on Figure 2-10. Table 2-14 summarizes the species observed during the lake watch surveys in the MSA and LSA.

Table 2-14: Species Observed during 2010-2012 Lake Watch Surveys in the MSA and LSA

Common Name	Scientific Name	Global Rarity Status	Ontario Rarity Status	SARA[(a)]	ESA[(b)]
American black duck	*Anas rubripes*	G5	S4	—	—
Bald eagle	*Haliaeetus leucocephalus*	G5	S2N, S4B	—	SC
Canada goose	*Branta canadensis*	G5	S5	—	—
Common goldeneye	*Bucephala clangula*	G5	S5	—	—
Common loon	*Gavia immer*	G5	S5B, S5N	—	—
Common merganser	*Mergus merganser*	G5	S5B, S5N	—	—
Common raven	*Corvus corax*	G5	S5	—	—
Herring gull	*Larus argentatus*	G5	S5B, S5N	—	—
Hooded merganser	*Lophodytes cucullatus*	G5	S5B, S5N	—	—
Pileated woodpecker	*Dryocopus pileatus*	G5	S5	—	—
Purple finch	*Carpodacus purpureus*	G5	S4B	—	—
Spotted sandpiper	*Actitis macularia*	G5	S5	—	—

Notes:

— = Not designated under SARA/ESA.

(a) SARA = Canada *Species at Risk Act*.

(b) ESA = Ontario *Endangered Species Act*.

A total of 43 individual birds were observed on lake watch surveys; of these, two individuals were priority landbird species including one Bald eagle and one Purple finch. The relative abundance of priority landbird species observed on lake watch surveys is 4.7%.

Raptors, Owls and Vultures

There were a total of nine raptor species observed during the field surveys. An additional six species could potentially occur within the MSA/LSA. Table 2-15 summarizes the observed and potential raptor species in the MSA/LSA.

Table 2-15: Raptors, Owls and Vultures Observed or Potentially Occurring in the MSA and LSA

Common Name	Scientific Name	Global Rarity Status	Ontario Rarity Status	SARA[(c)]	ESA[(d)]
American kestrel[(a)(b)]	*Falco sparverius*	G5	S4	—	—
Bald eagle[(a)(b)]	*Haliaeetus leucocephalus*	G5	S2N, S4B	—	SC
Barred owl[(b)]	*Strix varia*	G5	S5	—	—
Boreal owl[(b)]	*Aegolius funereus*	G5	S4	—	—
Broad-winged hawk[(a)(b)]	*Buteo platypterus*	G5	S5B	—	—
Great gray owl[(b)]	*Strix nebulosa*	G5	S4	—	—
Great horned owl[(a)(b)]	*Bubo virginianus*	G5	S4	—	—
Long-eared owl[(a)(b)]	*Asio otus*	G5	S4	—	—

Table 2-15: Raptors, Owls and Vultures Observed or Potentially Occurring in the MSA and LSA (Continued)

Common Name	Scientific Name	Global Rarity Status	Ontario Rarity Status	SARA[c]	ESA[d]
Merlin[b]	*Falco columbarium*	G5	S5B	—	—
Northern Harrier[b]	*Circus cyaneus*	G5	S4B	—	—
Northern saw-whet owl[a][b]	*Aegolius acadicus*	G5	S4	—	—
Red-tailed hawk[a][b]	*Buteo jamaicensis*	G5	S5	—	—
Sharp-shinned hawk[a][b]	*Accipiter striatus*	G5	S5	—	—
Short-eared owl[b]	*Asio flammeus*	G5	S2N, S4B	—	SC
Turkey vulture[a][b]	*Cathartes aura*	G5	S5B	—	—

Notes:

— = Not designated under SARA/ESA.

[a] Confirmed on the study area during 2010 -2012 field work.

[b] Potentially present in study area based upon broad distribution and suitable habitat.

[c] SARA = Canada *Species at Risk Act*.

[d] ESA = Ontario *Endangered Species Act*.

Habitat characteristics of the MSA and LSA do not suggest that there is significant overwintering use by birds. Most of the area is dense conifer forest with no open water most years from November to April. Open fields where wintering raptors congregate are absent.

In summary, based on the results of three years of avian surveys in the study areas, the bird communities are typical for the habitats that occur and they are similar to the species observed during the OBBA surveys.

2.2.3.3 Amphibians and Reptiles

The reptiles and amphibians in the LSA and MSA are generally those considered typical of the boreal region (Table 2-16). There is no indication that the species or habitats in the LSA are unique compared to the surrounding area.

Table 2-16: Amphibian and Reptile Species Occurring and Potentially Occurring in the Mine Study Area and Local Study Area

Common Name	Scientific Name	Origin[a]	Global Rarity Status[b]	Ontario Rarity Status[b]	SARA[c]	ESA[d]
Amphibians						
Gray treefrog[e] [f]	*Hyla versicolor*	N	G5	S5	—	—
Spring peeper[e] [f]	*Pseudacris crucifer*	N	G5	S5	—	—
Northern green frog[e] [f]	*Rana clamitans*	N	G5	S5	—	—
Wood frog[e] [f]	*Rana sylvatica*	N	G5	S5	—	—
American Toad[e] [f]	*Bufo americanus*	N	G5	S5	—	—
Mink frog[e]	*Rana septentrionalis*	N	G5	S5	—	—

Table 2-16: Amphibian and Reptile Species Occurring and Potentially Occurring in the MSA and LSA (Continued)

Common Name	Scientific Name	Origin[a]	Global Rarity Status[b]	Ontario Rarity Status[b]	SARA[c]	ESA[d]
Boreal chorus frog[e] [f]	*Pseudacris maculata*	N	G5	S5	—	—
Northern leopard frog[f]	*Rana pipiens*	N	G5	S5	—	—
Reptiles						
Western painted turtle[e] [f]	*Chrysemys picta bellii*	N	G5T5	S4	—	—
Common Snapping turtle[e]	*Chelydra serpentina*	N	G5	S3	SC	SC
Eastern garter snake[f]	*Thamnophis sirtalis sirtalis*	N	G5T5	S5	—	—

Notes:

— = Not designated.

G = Global.

S = Provincial.

SNA = Not applicable for Ontario Ranking (e.g., Exotic species).

Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.

[a] Origin: N = Native; (N) = Native but not in study area region; I = Introduced.

[b] Ranks based upon determinations made by the Natural Heritage Information Centre (2010).

[c] Canada *Species at Risk Act* (Schedule 1; checked February 11, 2012) END=endangered; THR=threatened; SC=special concern.

[d] Ontario *Endangered Species Act* (O. Reg. 4/12 amending O.Reg.230/08; checked February 11, 2012) END=endangered; THR=threatened; SC=special concern.

[e] Confirmed on the study area during 2010 -2012 field work.

[f] Potentially present in study area based upon broad distribution and suitable habitat.

There are eight species of amphibians common to this area including Boreal chorus frog (*Pseudacris maculate)* American toad (*Bufo americanus*), Spring peeper (*Pseudacris crucifer*) and Gray tree frog (*Hyla versicolor*). The range of only three reptile species encompasses this area and these are Common snapping turtle (*Chelydra serpentine)*, Western painted turtle (*Chrysemys picta belli*), and Eastern garter snake (*Thamnophis sirtalis sirtalis*) (Oldham and Weller 2000). The Common snapping turtle is considered to be of special concern federally and provincially.

2.2.3.4 Invertebrates

During various field surveys, 28 species of dragonfly and butterfly species have been identified in the MSA and LSA as listed in Table 2-17. All the species observed are common to the area and there are none designated under provincial or federal legislation.

Table 2-17: Dragonfly and Butterfly Species Recorded during 2010-2012 field surveys in the MSA and LSA

COMMON NAME	SCIENTIFIC NAME	Origin[a]	Global Rarity Status[b]	Ontario Rarity Status[b]	SARA[c]	ESA[d]
Milbert's tortoiseshell	*Aglais milberti*	N	G5	S5	—	—
Atlantis fritillary	*Speyeria atlantis*	N	G5	S5	—	—
Baskettail species	*Epitheca* sp.	N	G5	S5	—	—

Table 2-17: Dragonfly and Butterfly Species Recorded during 2010-2012 field surveys in the MSA and LSA (Continued)

COMMON NAME	SCIENTIFIC NAME	Origin[a]	Global Rarity Status[b]	Ontario Rarity Status[b]	SARA[c]	ESA[d]
Belted whiteface	*Leucorrhinia proxima*	N	G5	S5	—	—
Bluet species	*Enallagma* sp.	N	—	—	—	—
Boreal snaketail	*Ophiogomphus colubrinus*	N	G5	S4	—	—
Canada darner	*Aeshna canadensis*	N	G5	S5	—	—
Canadian tiger swallowtail	*Papilio canadensis*	N	G5	S5	—	—
Chalk-fronted corporal	*Ladona julia*	N	G5	S5	—	—
Common green darner	*Anax junius*	N	G5	S5	—	—
Common spreadwing	*Lestes disjunctus*	N	G5	S5	—	—
Common whitetail	*Plathemis lydia*	N	G5	S5	—	—
Compton tortoiseshell	*Nymphalis vaualbum*	N	G5	S5	—	—
Crimson-winged whiteface	*Leucorrhinia glacialis*	N	G5	S4	—	—
Dragon hunter	*Hagenius brevistylus*	N	G5	S5	—	—
Eastern comma	*Polygonia comma*	N	G5	S5	—	—
Hudsonian whiteface	*Leucorrhinia hudsonica*	N	G5	S5	—	—
Jutta arctic	*Oeneis jutta*	N	G5	S4	—	—
Mourning cloak	*Nymphalis antiopa*	N	G5	S5	—	—
Northern crescent	*Phyciodes cocyta*	N	G5	S5	—	—
Question mark	*Polygonia interrogationis*	N	G5	S5	—	—
River jewelwing	*Calopteryx aequabilis*	N	G5	S5	—	—
Silver-bordered fritillary	*Boloria selene*	N	G5	S5	—	—
Spring azure	*Celastrina ladon*	N	G5	S5	—	—
Viceroy	*Limenitis archippus*	N	G5	S5	—	—
Western-tailed blue	*Cupido amyntula*	N	G5	S5	—	—
White admiral	*Limenitis arthemis*	N	G5	S5	—	—
White-faced meadowhawk	*Sympetrum obtrusum*	N	G5	S5	—	—

Notes:

— = Not designated.

G = Global.

S = Provincial.

SNA = Not applicable for Ontario Ranking (e.g., Exotic species).

Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.

[a] Origin: N = Native; (N) = Native but not in study area region; I = Introduced.

[b] Ranks based upon determinations made by the Natural Heritage Information Centre (2010).

[c] Canada *Species at Risk Act* (Schedule 1; checked February 11, 2012).

[d] Ontario *Endangered Species Act* (O. Reg. 4/12 amending O.Reg.230/08; checked February 11, 2012).

2.2.3.5 Wildlife Corridors

The MSA and LSA are occupied by large tracts of forested landscape interspersed with wetlands. With few barriers to wildlife movement, it is expected that the majority of the MSA and LSA provide movement corridors. Other than the obvious stream corridors and valleys that animals use for movement, there are no previously identified movement corridors in the MSA or LSA. Wildlife will also use cleared roads and trails for ease of movement and such features occur quite regularly throughout the MSA and LSA. Obvious barriers to landscape level movement of wildlife (i.e., large mammal) are the waterbodies in and around the LSA. In general, the waterbodies trend in a southwest-to-northeast direction (e.g., Lizard Lake, Sawbill Bay). Therefore, it is likely that main movements through the LSA occur along the same trajectory and movement from the southeast to northwest is somewhat limited at a broad landscape scale.

2.2.4 Species of Conservation Concern and Species At Risk

The EIS Guidelines outline agency expectations for considering effects to *species of conservation concern (i.e., COSEWIC-listed species, species listed under the Species at Risk Act and/or the Endangered Species Act, 2007) that may occur in potential habitats in the Project Site during critical life stages* (CEAA 2011).

Through a review of available data sources and liaison with the Fort Frances District SAR Biologist (J. Vandenbroeck, personal communication 2011) a list of SAR with reasonable potential to be in the Project Site was compiled. Species with ranges overlapping the Project Site and/or recent occurrence records in the vicinity of the MSA, LSA and RSA were considered to have a reasonable potential to be in the area. For bird species, the range maps used were from the Ontario Breeding Bird Atlas and thus reflect their breeding ranges only and do not include species that are migrants in the Project Site.

The resulting list of species of conservation concern (SOCC) for the Project included two mammals, 10 birds, one arthropod, a reptile and a vascular plant. Less than half of these species are listed as either endangered or threatened in Ontario and thus receive legal protection under Ontario's ESA. All federally listed species of conservation concern are listed provincial as well (at least special concern). However, there is one species that is endangered in Ontario but not at risk federally and that is Eastern cougar. The MNR undertook a study of this species in Ontario which confirmed through DNA evidence that there is a wild population inhabiting parts of Ontario. This four-year study (2006-2010) collected DNA evidence (hair and scat) from locations across the province but specifically near Sudbury and Kenora. The limited physical evidence of the wild population of this species in Ontario however suggests that the population is extremely low in Ontario (MNR 2011b).

The compiled SOCC list was then screened by comparing SOCC habitat requirements to habitat conditions on and in the vicinity of the Project Site. The results of the SOCC screening provide each SOCC with a ranking of low, moderate or high probability of occurrence on and in the vicinity of the MSA and LSA (Table 2-18). A ranking of "Low" indicates no suitable habitat availability for that species in the Project Site and no specimens identified. "Moderate" probability indicates more potential for the species to occur, as suitable habitat appeared to be present in the MSA/LSA, but no occurrence of the species recorded. "High" potential indicates a known species record in the MSA/LSA (including during field surveys or background data review) and good quality habitat is present in the MSA/LSA.

Table 2-18: Species at Risk Screening and Probability of Occurrence in the Mine Study Area and Local Study Area

Common Name	Scientific Name	Provincial Rank (S-Rank*)	SARA[2] (Sch. 1)	ESA[3]	Habitat Requirements	Probability of Occurrence in Project Site	Rationale
Arthropod							
Monarch	*Danaus plexippus*	S2N, S4B	Special concern	Special concern	Found in Ontario wherever there are milkweed plants for its caterpillars and wildflowers for a nectar source; often found on abandoned farmland and roadsides, but also in city gardens and parks.	Low	A few host plants available at lake and wetland margins but not in high abundance. Very little open upland such as fields available. No individuals observed in the LSA to date.
Birds							
Bald eagle	*Haliaeetus leucocephalus*	Not tracked	Not at risk	Special concern	Most Bald eagle nests are associated with large lakes, rarely small lakes or large rivers. Lakes with <5 km of shoreline are not used unless there is a larger lake within 1 km. This species shows a distinct preference for islands, but no preference for mixed, coniferous, or deciduous forest. Forest structure is important. Bald eagles nest in mature or old-growth forest with discontinuous or open canopy, usually where there is 20 to 50% crown coverage. They show a preference for live trees and conifers in Ontario (MNR 1987).	High/ Confirmed	Bald eagles were detected by Golder staff on breeding bird surveys and lakewatch surveys. This species was recorded in the OBBA square containing the LSA. (Cadman et al. 2007)

Table 2-18: Species at Risk Screening and Probability of Occurrence in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Provincial Rank (S-Rank*)	SARA[2] (Sch. 1)	ESA[3]	Habitat Requirements	Probability of Occurrence in Project Site	Rationale
Black tern	*Chlidonias niger*	S3B	Not at risk	Special concern	Marshes, wet meadows, and ponds. Builds floating nests in loose colonies in shallow marshes, especially in cattails.	Low	Black terns were not recorded in the OBBA square containing the LSA or on the breeding bird surveys conducted by Golder in 2010-2012. (Cadman et al. 2007)
Canada warbler	*Cardellina canadensis*	S4B	Threatened	Special concern	Uses a wide range of deciduous, coniferous and mixed forests, with a well-developed shrub layer and a structurally complex forest floor. It is most abundant in moist, mixed forests. It also occurs in riparian shrub forest on slopes and in ravines, in stands regenerating after natural and anthropogenic disturbances and in old-growth forests with canopy openings and a well-developed shrub layer.	High/ Confirmed	Canada warbler was observed in the LSA by Golder during breeding bird surveys in 2010 -2012.

Table 2-18: Species at Risk Screening and Probability of Occurrence in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Provincial Rank (S-Rank*)	SARA[2] (Sch. 1)	ESA[3]	Habitat Requirements	Probability of Occurrence in Project Site	Rationale
Common nighthawk	*Chordeiles minor*	S4B	Threatened	Special concern	They can be found in a wide variety of habitats, in particular those with open or semi-open areas such as farmland, open woodlands, clear-cuts, burns, rock outcrops, bogs, fens, prairies, gravel pits and urban rooftops (SARA 2011).	High/ Confirmed	Common nighthawk was observed by Golder staff while conducting field surveys. This species was recorded in the OBBA square containing the Project Site. (Cadman et al. 2007)
Olive-sided flycatcher	*Contopus cooperi*	S4B	Threatened	Special concern	The olive-sided flycatcher is most often found along natural forest edges and openings. It will use forests that have been logged or burned if there are ample tall snags and trees to use for foraging perches. Olive-sided flycatchers' breeding habitat usually consists of coniferous or mixed forest adjacent to rivers or wetlands. In Ontario, Olive-sided flycatchers commonly nest in conifers such as white spruce, black spruce, jack pine and balsam fir (MNR 2009e).	Moderate	Although this species was not detected by Golder during breeding bird surveys, records for this species were recorded in the OBBA square containing the Project Site. (Cadman et al. 2007)

Table 2-18: Species at Risk Screening and Probability of Occurrence in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Provincial Rank (S-Rank*)	SARA[2] (Sch. 1)	ESA[3]	Habitat Requirements	Probability of Occurrence in Project Site	Rationale
Short-eared owl	*Asio flammeus*	S2N, S4B	Special concern (Sch. 3)[4]	Special concern	The Short-eared owl makes use of a wide variety of open habitats, including arctic tundra, grasslands, peat bogs, marshes, sand-sage concentrations and old pastures. It also occasionally breeds in agricultural fields (SARA 2011).	Low	Although this species was listed in the OBBA square containing the LSA, habitat is not present within the LSA and no Short-eared owls were observed by Golder during field surveys in 2010 through 2012 (Cadman et al. 2007)
Peregrine Falcon	*Falco pereginus*	S3B	Threatened	Special Concern	Nests are usually scrapes made on cliff ledges on steep cliffs, usually near wetlands - including artificial cliffs such as quarries and buildings; prefers to hunt in open habitats such as wetlands, tundra, savannah, sea coasts and mountain meadows, but will also hunt over open forest.	Low	Peregrine falcons were not recorded on the OBBA for this square, although they do breed nearby along the north shore of Lake Superior.
Least Bittern	*Ixobrychus exilis*	S4B	Threatened	Threatened	Nests in freshwater marshes, where dense tall aquatic vegetation is interspersed with clumps of woody vegetation and open water; are most regular in marshes exceeding 5 ha.	Low	This species was only found in three OBBA squares in north-western Ontario far from the LSA. The ideal habitat for Least bittern is not present on or in the vicinity of the mine site.

Table 2-18: Species at Risk Screening and Probability of Occurrence in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Provincial Rank (S-Rank*)	SARA[2] (Sch. 1)	ESA[3]	Habitat Requirements	Probability of Occurrence in Project Site	Rationale
Eastern whip-poor-will	*Caprimulgus vociferus*	S4B	Threatened	Threatened	Dry, open, deciduous woodlands of small to medium trees; oak of beech with lots of clearings and shaded leaf litter; wooded edges, forest clearings with little herbaceous growth; pine plantations; associated with >100ha forests; may require 500-1000ha to maintain population. Found in a mix of open and forested areas, such as savannahs, open woodlands or openings in more mature, deciduous, coniferous and mixed forests (ROM 2012)	Low	Nocturnal nightjar surveys conducted by Golder staff in 2011 detected no Eastern whip-poor-will. Furthermore, other spring nighttime surveys failed to detect this species. The habitat in the LSA is of low suitability for this species.
Yellow rail	*Coturnicops noveboracensis*	S4B	Special concern	Special concern	Found in marshes dominated by sedges, true grasses, and rushes, where there is little or no standing water, and where the substrate remains saturated throughout the summer; can be found in damp fields and meadows, on the floodplains of rivers and streams, and in the herbaceous vegetation of bogs (SARA 2011).	Low	Although small areas of graminoid marsh are present in the Project Site, no detections of yellow rail were made by Golder on marsh bird surveys, and no records of this species were listed in the OBBA square containing the LSA (Cadman et al. 2007)

Table 2-18: Species at Risk Screening and Probability of Occurrence in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Provincial Rank (S-Rank*)	SARA[2] (Sch. 1)	ESA[3]	Habitat Requirements	Probability of Occurrence in Project Site	Rationale
Mammals							
Grey fox	*Urocyon cinereoargenteus*	S1	Threatened	Threatened	This species inhabits deciduous forests and marshes, and will den in a variety of features including rock outcroppings, hollow trees, burrows or brush piles, usually where dense brush provides cover and in close proximity to water.	Low	Outside of Pelee Island, gray fox sightings are exceedingly rare in Ontario (ROM 2012)
Eastern Cougar	*Puma concolor couguar*	SU	Not at risk	Endangered	This species historically inhabited extensive forested areas in Ontario.	Low	The population status, distribution, and range of the Eastern cougar are not well understood.

Table 2-18: Species at Risk Screening and Probability of Occurrence in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Provincial Rank (S-Rank*)	SARA[2] (Sch. 1)	ESA[3]	Habitat Requirements	Probability of Occurrence in Project Site	Rationale
Little Brown Myotis	*Myotis lucifugus*		Not at risk	Endangered	This species uses a wide variety of palustrine and terrestrial habitats including: bog/fen, swamp, riparian, hardwood and mixed forest, grassland, old field, shrubland, agricultural and urban (NatureServe 2012). This species hibernates in caves, abandoned mines and other subterranean sites. (Kunz and Reichard 2010). Reproductive females form large maternity colonies in barns, attics and sometimes hollow trees. (Kunz and Reichard 2010). Foraging occurs over open water, forest trails and clearings, meadows and farmland, and forest margins (NatureServe 2012).	Moderate	This species was not detected by Golder during field surveys but there is potential for this species to occur in the MSA and LSA.

Table 2-18: Species at Risk Screening and Probability of Occurrence in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Provincial Rank (S-Rank*)	SARA[2] (Sch. 1)	ESA[3]	Habitat Requirements	Probability of Occurrence in Project Site	Rationale
Reptile							
Snapping turtle	*Chelydra serpentina*	S3	Special concern	Special concern	This species utilizes a wide range of waterbodies, but shows preference for areas with shallow, slow-moving water, soft substrates and dense aquatic vegetation. Hibernation takes place in soft substrates under water. Nesting sites which consist of sand or gravel banks along waterways.	High/ Confirmed	Shell of snapping turtle was observed by Golder biologist and Osisko camp staff observed an individual near the exploration camp in the LSA.

Table 2-18: Species at Risk Screening and Probability of Occurrence in the Mine Study Area and Local Study Area (Continued)

Common Name	Scientific Name	Provincial Rank (S-Rank*)	SARA[2] (Sch. 1)	ESA[3]	Habitat Requirements	Probability of Occurrence in Project Site	Rationale
Vascular Plants							
Small-flowered lipocarpha	*Lipocarpha micrantha*	S2	Endangered	Endangered	The Small-flowered Lipocarpha grows on wet, sandy, exposed shorelines of lakes and rivers in areas prone to flooding. It requires some protection from waves and strong currents, and does not tolerate the presence of organic sediment. It appears to prefer fairly open spaces, avoiding strong competition from other plant species. However, it does occur with other species common in this habitat, including a variety of Cyperus, Bidens, and Salix species. Cyperus squarrosus has been present at all sites where the Small-flowered Lipocarpha has been found in Canada. (COSEWIC 2002)	Low	Although potential habitat exists on the Project Site, this sedge is exceedingly rare and only known from a few locations in Ontario (COSEWIC 2002). John Vanderbroeck, MNR SAR Biologist indicated that this species is not anticipated to be in the LSA.

2.2.4.1 Species at Risk

2.2.4.1.1 Bald Eagle

Five Bald eagle (*Haliaeetus leucocephalus*) observations were made during 2010-2012 surveys conducted in the MSA/LSA. One adult and two juvenile Bald eagles were observed during Lake Watch surveys at stations LW02, LW04 and LW05 in Sawbill Bay, one Bald eagle was observed during Breeding Bird Surveys at station #18, and one incidental Bald eagle observation was made on Sawbill Bay (Figure 2-12). A potential Bald eagle nest was observed on a cliff along the shoreline of Turtle Bay. Based on the structure of the nest and expert opinion, the potential for the observed nest to belong to a Bald eagle is considered to be high however; it is rare for a Bald eagle to nest on cliffs with a dense cover of trees.

Nesting habitat for Bald eagles typically consists of forested areas adjacent to large water bodies. Nests are typically built in large super-canopy trees within mature and old growth forests containing some edge habitat. Distance from water body varies depending on the quality of the foraging habitat and degree of shoreline development (Buehler 2000, Armstrong 2007).

The habitat in the LSA provides opportunity for Bald eagle nesting however the closest known recorded nest is located in the southwestern portion of the LSA. All other known recorded nests in the area occur south of the LSA.

Winter habitat typically contains open water providing food availability, sheltered roost sites, and the absence of human disturbance. Large numbers of individuals can congregate in over wintering areas (Buehler 2000). Habitat suitability for winter foraging in the LSA is low because there are no known open water areas.

Bald eagle is “not at risk” in Canada and listed as “special concern” in Ontario under the ESA. This species was downlisted in Ontario from “endangered” as their populations are increasing due to conservation efforts and recovery programs.

2.2.4.1.2 Canada Warbler

A total of twelve observations of Canada warbler (*Cardellina canadensis*) were made during 2010-2012 field studies of which ten observations are at stations located within the LSA (Figure 2-12). Eight of the 10 observations in the LSA were recorded during Breeding Bird Surveys and two observations were incidental. The observations were made at stations located primarily within dense mixed and dense deciduous habitat types, and at one station located in marsh habitat. The stations are located within the particular upland ecosites ES-D (Red Pine-White Pine Forest), ES-F / ES-E (Fir-Spruce-Mixedwoods), ES-G/ES-H (Pine-Spruce Mixedwoods) and one wetland ecosite, W12 (Meadow Marsh: Tall Sedge). Three observations were recorded in the MSA, and seven in the LSA.

Canada warblers breed in deciduous, coniferous and mixed forest and are most abundant in mixed forest with a well-developed understory and complex ground cover (Reitsma et. al., 2010). The presence of nearby standing water and a stratified complex canopy structure are characteristic of good Canada warbler habitat. Nests are built on the ground and are difficult to locate (McLaren 2007).

Canada warbler is listed by SARA as “threatened” in Canada and “special concern” in Ontario under the ESA. A Recovery Strategy has yet to be developed for Canada warbler. However, Canada warbler, their eggs, and nests are also protected under the *Migratory Birds Convention Act*.

2.2.4.1.3 Common Nighthawk

A total of four observations of Common nighthawk (*Chordeiles minor*) were recorded during the 2010-2012 field surveys of which three observations are within the LSA (Figure 2-12). Of the three observations in the LSA, one was made during a Breeding Bird Survey, one during nocturnal Whip-poor-will surveys and one was incidental. The observations were at stations located within conifer swamp and coniferous forest habitat types, in the particular upland ecosite ES-D (Red Pine-White Pine Forest) and wetland ecosite W18 (Tamarack-Black Spruce/Ericaceous Shrub Fen) (Figure 2-12).

The Common nighthawk is an open country breeder that nests on the ground in open areas such as gravel beaches, woodland clearings, rocky outcrops, burned-over woodlands, flat gravel roofs, bogs and alvars. Eggs are laid in the open and no nests are constructed (Brigham et al. 2011, Sandilands 2007).

Common nighthawk is listed by SARA as “threatened” in Canada and “special concern” in Ontario under the ESA. A Recovery Strategy has yet to be developed for Common nighthawks. However, Common Nighthawks, their eggs, and nests are also protected under the *Migratory Birds Convention Act*.

2.2.4.1.4 Snapping Turtle

One incidental Snapping turtle (*Chelydra serpentina*) and one shell fragment was observed in the LSA (Figure 2-12). These observations were recorded in the upland ecosite ES-E and the wetland ecosite W18.

Preferred Snapping turtle habitat consists of shallow, slow moving water with dense aquatic vegetation and a substrate of soft mud. Populations are found in wetlands such as ponds, shallow bays, river edges and slow streams. Nesting occurs in gravelly or sandy areas often adjacent to water bodies (COSEWIC 2008).

Adult mortality is the biggest threat to Snapping turtles. They are slow-moving and susceptible to road mortality when they are on the move in search of mates and nesting locations (MNR 2009d).

600000
610000
620000
5430000
5420000
N
Serpent Lake
Cornell Lake
Sawbill Bay
Mitta Lake
Lynxhead Bay
Marmion Reservoir
Hawk Bay
Highway 622
BBS104
HRTU16
BBS41
Incidental
BBS27
Incidental
BBS38
BBS24
BBS33
Incidental
BBS10
Incidental
BBS15
BBS81
Incidental
BBS18
LW02
LW05
LW04
HRFR01
BBS62
EWPW15

LEGEND

- Potential Bald Eagle Nest
- Provincial Highway
- Trail
- Road
- Power Transmission Line
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

Bald Eagle	Canada Warbler	Common Nighthawk	Snapping Turtle
No Data	No Data	No Data	ES-E/W18
ES-A	ES-D	W18	W18
W1	ES-E	ES-H	
	ES-F	W18	
	ES-G		
	W12		

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000
SCALE 1:100,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
SPECIES AT RISK OBSERVATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	12 Feb. 2013		
CHECK	AVS	12 Feb. 2013		
REVIEW	KT	12 Feb. 2013		

FIGURE: 2-12

G:\Projects\2010\10-1118-0020_BrettResources_HammondReefGIS\MXDs\Draft\TerrestrialTSDSAR_Locations.mxd

3.0 EFFECTS ASSESSMENT

This section predicts and describes the changes to the Terrestrial Ecological environment that are likely to result from the Project. These changes are then assessed to determine if an adverse effect is expected, whether said adverse effect can be mitigated, and for adverse effects that cannot be fully mitigated (residual effects), the significance of the effect is determined. Section 3.1 provides a description of effects assessment methods.

3.1 Effects Assessment Methods

The effects assessment comprises the following steps:

- Step 1: Screening of Project activities with the potential to have interactions with the VECs of the terrestrial Environment] (Section 3.2).
- Step 2: Prediction (i.e. identification and description) of potential effects of the Project (Sections 3.3 through 3.8).
- Step 3: Identification of suitable mitigation measures to reduce or eliminate the identified effects.
- Step 4: Assessment of whether adverse effects remain after mitigation (i.e., residual effects) (Sections 3.3 through 3.8).
- Step 5: Determination of the significance of residual effects. If there is uncertainty of whether an effect remains after mitigation, the effect is forwarded for determination of significance (Sections 3.3 through 3.8).

The effects assessment is completed within the framework of temporal and spatial boundaries described in Section 1.7. The assessment takes into account a precautionary approach and incorporates Aboriginal traditional knowledge, where available.

The effects assessment identifies potential effects of the Project on the environment following a source-pathway-receptor approach. Project activities represent sources of effects, measurable changes to the environment represent pathways, and VECs represent receptors. In some cases, VECs may act as both pathways and receptors.

Project effects may occur through direct or indirect pathways. Direct pathways occur when a VEC is affected by a Project activity directly, such as vegetation clearing and grubbing contributing to habitat loss.

Indirect pathways occur when a VEC is affected by changes to another VEC, for example, the effect of air quality on forest cover. The effects assessment recognizes the widest, reasonable range of potential direct and indirect effects without specific regard for their probability of occurrence.

The effects assessment uses three criteria, as following:

- Geographic extent.
- Magnitude.
- Duration.

Geographic Extent

Geographic extent refers to the area in which the condition causing the effect to Terrestrial VECs occurs. It is categorized into 3 scales based on the MSA, LSA and RSA. MSA scale impacts mostly represent changes that are directly related to the Project footprint and activities, but may also include small-scale indirect effects. Changes at the LSA are largely associated with indirect impacts from the Project, and represent the maximum predicted spatial extent of direct and indirect effects from the Project. Impacts beyond, at the RSA scale are mostly associated with VECs that have large spatial distributions such as moose.

Magnitude

Magnitude is a measure of the intensity of an impact, or the degree of change caused by the Project relative to baseline conditions. This measurement will vary depending on the ecological VEC that is being assessed. For example, an effect in the MSA would have a less intense impact on moose, a wide ranging species than to a turtle that fulfills all life history requirements over a much smaller range. Thus the most relevant spatial area for each VEC as outlined in Table 3-1 is used to determine or give context to the magnitude of the effect.

Table 3-1: Valued Ecosystem Component Relevant Spatial Areas for the Assessment

VEC	Relevant Spatial Areas for Assessment of Effects
Wetlands	LSA
Forest Cover	LSA
Moose	RSA
Furbearers	LSA
Species At Risk	LSA
Upland Breeding Birds	LSA

Therefore, the magnitude of the residual effect being assessed will be considered in the context of the spatial area that is most applicable to each VEC. The change in the measurement endpoints which related to the magnitude will be considered within these spatial areas.

Magnitude is classified into 4 scales: negligible, low, moderate, and high. Magnitude can relate to relative (percentage) or absolute changes that are above or below baseline conditions, guidelines, or threshold values. In ecology, there are no guidelines or criteria with which to compare changes that constitute a low, moderate or high magnitude. Therefore, the measured change will relate to the baseline conditions as reported in this TSD.

The approach used to classify the magnitude of changes in measurement endpoints (and related impacts) was based on scientific literature and professional opinion, and incorporated conservatism. Other environmental assessments often use the universal effect size approach for categorizing magnitude such as negligible changes (0 to 10%), small changes (10 to 25%), and medium changes (25 to 40%) (Munkittrick et al. 2009). Ideally, effect threshold values would be known, and measurement endpoints could be quantified accurately with a high degree of confidence. However, little is known about ecological thresholds, and biological parameters are typically associated with large amounts of natural variation; therefore, the classification of magnitude included a level of conservatism so that the impacts would not be underestimated.

Changes of less than 10% are considered within the normal range of variation for biological populations (Krebs 1972) and are considered to represent a low magnitude effect. While Cohen (1988 cited in Munkittrick et

al. 2009) considers a change of 10% or less to represent a low magnitude change, Munkittrick et al. (2009) suggests that such a threshold in biological and social systems remains unproven. Also, small changes are difficult to detect with sufficient certainty due to the natural variation inherent in biological systems (Osenberg et al. 1994). Biological systems and populations vary on several different spatial and temporal scales, including seasonal and annual, and are cyclic over longer periods due to varying physical features, such as precipitation patterns and severe weather phenomena. As a result, comparisons between data sets must be made with caution. The low change in value reflects that caution.

Changes between 10% and 25% are treated as a change of moderate magnitude. Changes in this interval cover the difference between low and high magnitude.

The ecological literature points to changes in measurement endpoints equal to or greater than 20% to 30%, as compared to existing conditions, as having an effect of high magnitude on biological systems. Measurement endpoints are parameter values taken as a specific time. Suter et al. (1995) identified that the 20% rule for the severity of adverse effects is applicable by analogy to real scales of ecological effects. Lande's (1987) demographic model predicts that species with low demographic potential cannot persist if suitable habitat is reduced by more than 20%. Flather and Bevers (2002) reported that there is a rapid decline in connectivity once 30% or more of habitat is lost. These effects are variable; species are predicted to exhibit a diverse array of responses to habitat fragmentation depending upon the specific combination of life history traits and dispersal capabilities (With and King 1997). Therefore, a 25% criterion is the basis used for a high magnitude change in the effects assessment, unless additional data suggest a higher or lower value.

The definitions of magnitude are provided in Table 3-2. Note that "% change" refers to a change in any of the VEC defined measurement endpoints in Table 1-1.

Table 3-2: Magnitude Levels for Valued Ecosystem Components

	Magnitude			
	Negligible	**Low**	**Medium**	**High**
VECs	Effect is <1% change from baseline conditions (in the VEC relevant spatial area)	1-10% change from baseline conditions (in the VEC relevant spatial area)	Greater than10% to 25% change from baseline conditions (in the VEC relevant spatial area)	Effect is >25% change from baseline conditions (in the VEC relevant spatial area)

Duration

Duration of impacts, which includes reversibility, is a function of ecological resilience, and these ecological principles are applied to the evaluation of significance. Although difficult to measure, resilience is the capacity of the system to absorb disturbance, and reorganize and retain the same structure, function, and feedback responses. Resilience includes resistance, capability to adapt to change, and how close the system is to a threshold before shifting states (i.e., precariousness).

Table 3-3: Duration Levels for the Terrestrial Ecology Assessment

	Duration		
	Low	**Medium**	**High**
VECs	Effect persists in the short-term (during construction) and is reversible	Effect persists in the medium-term (until closure and post-closure) and is reversible	Effect persists in the long-term (throughout operations and into closure and post-closure) and is irreversible

The decision tree for assigning significance to residual effects on the terrestrial environment is depicted in Figure 3-1.

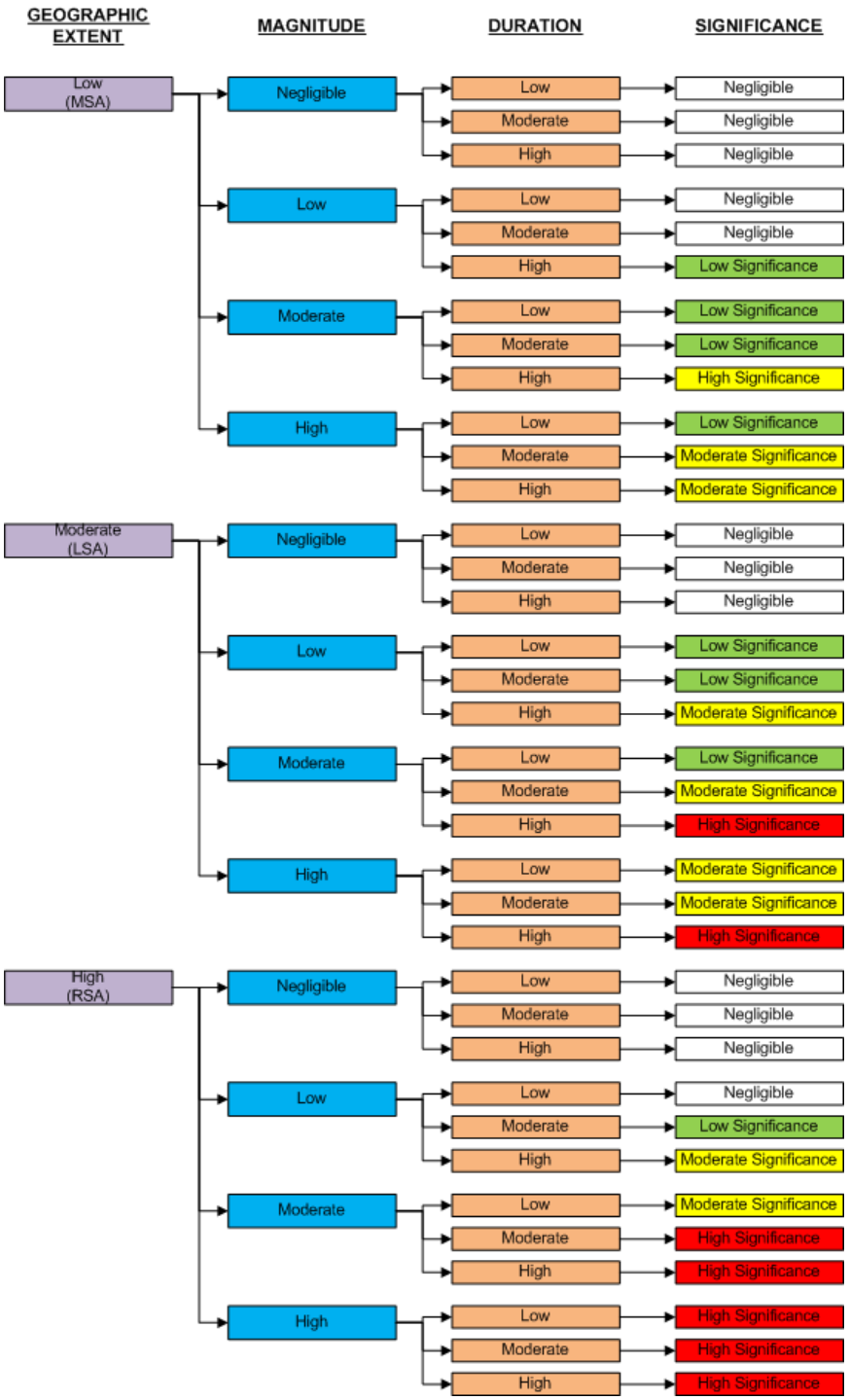

Figure 3-1: Decision Tree for Assigning Significance to Residual Effects on the Terrestrial Environment

3.2 Screening of Project Activities and VEC Interactions

Sections 3.2.1 through 3.2.4 identify which Project activities may have a direct interaction with the VECs of Terrestrial Ecology environment by Project phase.

3.2.1 Construction Phase

Table 3-4: Construction Phase Activities and Interaction with the Terrestrial Ecological Environment

Project Activities	Wetlands	Forest Cover	Species At Risk	Furbearers	Upland Breeding Birds	Moose	Wild rice
General construction works							
Site preparation (i.e. ,clearing, grubbing and stripping of vegetation)	✓	✓	✓	✓	✓	✓	
Soil removal and stockpiling	✓	✓	✓	✓	✓	✓	
Building of accommodation camp			✓	✓	✓	✓	
Operation of concrete batch plant			✓	✓	✓	✓	
Operation of mobile crushing and screening plant	✓	✓	✓	✓	✓	✓	
Linear Infrastructure							
Upgrading/construction of access road	✓	✓	✓	✓	✓	✓	
Construction of project transmission line	✓	✓	✓	✓	✓	✓	
Transportation of people and materials	✓	✓	✓	✓	✓	✓	
Mine							
Installation of temporary power and pumping			✓	✓	✓	✓	
Mitta Lake dewatering and discharge to Upper Marmion Reservoir	✓		✓	✓	✓	✓	
Sediment removal and stockpiling	✓		✓	✓	✓	✓	
Soil removal and stockpiling	✓		✓	✓	✓	✓	
Processing Plant							
Building of Ore Processing Facility			✓	✓	✓	✓	
Tailings Management Facility (TMF)							
Dam foundation site preparation			✓	✓	✓	✓	
Construction of diversion ditching an seepage collection ditches around TMF	✓	✓	✓	✓	✓	✓	
Installation of temporary sediment control structures							

Table 3-4: Construction Phase Activities and Interaction with the Terrestrial Ecological Environment (Continued)

Project Activities	Wetlands	Forest Cover	Species At Risk	Furbearers	Upland Breeding Birds	Moose	Wild rice
Construction of perimeter containment dam	✓	✓	✓	✓	✓	✓	
Construction of reclaim pond and pump station	✓	✓	✓	✓	✓	✓	
Waste Rock Management Facility							
Waste rock transfer and stockpiling	✓	✓	✓	✓		✓	
Support and Ancillary Facilities							
Progressive building of Project facilities including: ■ Administration complex. ■ Assay laboratory. ■ Warehouses, shops and storages. ■ Electrical substation and distribution network. ■ Water management facilities. ■ Storm water ditching and collection systems. ■ Effluent treatment facility. ■ Any additional supporting facilities.	✓	✓	✓	✓	✓	✓	
Construction of diversion ditches and seepage collection ditches	✓	✓	✓	✓	✓	✓	
Construction of mine site roads	✓	✓	✓	✓	✓	✓	
Laydown of pipelines to and from Ore Processing Facility, effluent treatment plant, Tailings Management Facility, reclaim pond and other facilities	✓	✓	✓	✓	✓	✓	

Notes:
✓ = Involved in a potential pathway of effect to Terrestrial VECs.

3.2.2 Operations Phase

Table 3-5: Operations Phase Activities and Interaction with the Terrestrial Ecological Environment

Project Activities	Wetlands	Forest Cover	Species At Risk	Furbearers	Upland Breeding Birds	Moose	Wild rice
General operations							
Building and infrastructure maintenance							
Vehicle fuelling and maintenance							
Surface water and erosion control							
Water management, including start-up intake from Upper Marmion Reservoir and continuous supply to the Processing Facility	✓		✓	✓		✓	
Domestic water and sewage management							
Domestic and industrial waste management							
Operation of mobile crushing and screening plant	✓	✓	✓	✓	✓	✓	
Linear Infrastructure							
Transportation of people and materials			✓	✓	✓	✓	
Mine							
Initial open pit mining (62 Mt of waste rock)							
Blasting			✓	✓	✓	✓	
Ore loading							
Overburden and top soil removal and stockpiling							
Top soil and overburden removal and stockpiling	✓	✓					
Processing Plant							
Ore transfer and stockpiling							
Operation of Ore Processing Facility							
Tailings Management Facility (TMF)							
Tailings management							
Reclaim water management							

Table 3-5: Operations Phase Activities and Interaction with the [Biological/socio-economic discipline] Environment (Continued)

Project Activities	Wetlands	Forest Cover	Species At Risk	Furbearers	Upland Breeding Birds	Moose	Wild rice
Waste Rock Management Facility							
Waste rock transfer and stockpiling	✓	✓	✓	✓	✓	✓	
Support and Ancillary Facilities							
General operation of support and ancillary facilities							

Notes:
✓ = Involved in a potential pathway of effect to Terrestrial VECs.

3.2.3 Closure Phase

Table 3-6: Closure Phase Activities and Interaction with the Terrestrial Ecological Environment

Project Activities	Wetlands	Forest Cover	Species At Risk	Furbearers	Moose	Wild rice
Decommissioning of Project facilities						
Site reclamation	✓	✓	✓	✓	✓	
Tailings pond management		✓	✓	✓	✓	
Transportation of people and materials	✓	✓	✓	✓	✓	
Water management	✓					

Notes:
✓ = Involved in a potential pathway of effect to Terrestrial VECs.

3.2.4 Post-closure Phase

Table 3-7: Post-closure Phase Activities and Interaction with the Terrestrial Ecological Environment

Project Activities	Wetlands	Forest Cover	Species At Risk	Furbearers	Moose	Wild rice
Tailings pond management		✓	✓	✓	✓	
Water management	✓		✓	✓	✓	
Transportation of people and materials	✓	✓	✓	✓	✓	

Notes:
✓ = Involved in a potential pathway of effect to Terrestrial VECs.

3.2.5 Summary of Potential Pathways of Effect

Construction, operation, and closure and post-closure phases of the Project are assessed independently for each Project activity in the tables above. The potential pathways for the major project activities to affect Terrestrial Ecology VECs are summarized in Table 3-8. The Project Component column refers to the main Project activities (grouping of common activities). The Effect Pathway is composed of the physical effect of the Project (e.g., alteration of flows and drainage patterns) and the ecological consequence (e.g., changes in vegetation). The table is used as a transition into the detailed discussion beginning in Section 3.3.

Table 3-8: Potential Pathways for Effects to the Terrestrial Ecology Valued Ecosystems Components

Project Component	Potential Effect Pathway	VECs	Environmental Design Features and Mitigation
Mine Footprint (open pits, TMF, Ore processing Facility, WRMF, etc.) Footprint of Project access road and transmission corridor	Physical loss or alteration of vegetation	Wetlands Forest cover	The design and layout of the mine footprint and linear corridor limits the amount of vegetation that is disturbed. Stockpiling of overburden and topsoil as a potential seed source for rehabilitation of temporary work spaces (e.g., laydown areas).
	Habitat Loss and Fragmentation	Moose Furbearers Species At Risk Upland Breeding Birds	The design and layout of the mine footprint limits the amount of habitat that is disturbed. Major movement corridors maintained around project components.
	Alteration of flows and drainage patterns can cause changes to vegetation and soils and in turn changes to wildlife habitats	Wetlands Forest Cover Moose Furbearers Species At Risk Upland Breeding Birds	Site drainage management plan. Installation of culverts to minimize alteration of flows and drainage patterns along linear corridor. Creation of wetlands for fish habitat compensation will attenuate flows.
Mine Operations	Changes to wildlife habitat suitability	Moose Furbearers Species At Risk Upland Breeding Birds	

Table 3-8: Potential Pathways for Effects to the Terrestrial Ecology Valued Ecosystem Components (Continued)

Project Component	Potential Effect Pathway	VECs	Environmental Design Features and Mitigation
	Changes to surface water and groundwater quality based on the discharge of treated effluent, runoff from WRMF and other mine facilities which may affect vegetation, soils, sediments and wildlife habitat	Wetlands Moose Furbearers (e.g., beaver, muskrat) Species At Risk (Bald eagle, Snapping turtle)	The water management plan will manage surface water on the site Any potential for acid generating mine rock will be sequestered and treated on-site. Runoff from the processing facility will be captured and diverted to the Effluent Treatment Plant. The water management mine facilities will have enough capacity to store both operating flow and storm events. Sewage will be treated in the STP and the treated effluent will either be re-used during processing or discharged to Upper Marmion Reservoir.
	Changes to water levels. Water taking from Upper Marmion Reservoir for process and potable water supply can affect vegetation in wetlands and wildlife habitat	Wetlands Moose Furbearers (e.g., Beaver, Muskrat) Species At Risk (Bald eagle, Snapping turtle)	Water taking for the processing and make-up water will be minimized by reusing the on-site water supply for multiple undertakings (e.g., water from the tailings will be recycled for the processing plant operations) Excess water will be treated and discharged to the Upper Marmion Reservoir.
General Construction and Operation of the Mine, Ore Processing Facility and Support and Ancillary Infrastructure	Air emissions and dust deposition can cause changes to the chemical and physical properties of surface water, soils, and vegetation which in turn affect wildlife health	Wetlands Forest Cover Moose Furbearers Species At Risk Upland Breeding Birds	Dust suppression on site using watering techniques Enforcing speed limits on access roads and mine roads Emission controls on construction and operation equipment Processing facility equipped to reduce emissions Operating procedures developed to reduce dust generation and emissions
	Introduction of invasive plant species can affect native vegetation	Wetlands Forest Cover	Invasive Species Management Plan Cleaning of construction equipment and vehicles

Table 3-8: Potential Pathways for Effects to the Terrestrial Ecology Valued Ecosystem Components (Continued)

Project Component	Potential Effect Pathway	VECs	Environmental Design Features and Mitigation
General Construction and Operation of the Mine, Ore Processing Facility and Support and Ancillary Infrastructure	Accidental spills on the mine site or along the access road can affect soils and vegetation	Wetlands Forest Cover	Emergency spill management program Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and the workers Demarked areas will be established for the storage and handling of hazardous wastes
	Sensory disturbance. Noise, vibrations and proximity to humans can cause the disturbance and displacement of wildlife	Moose Furbearers Species At Risk Upland Breeding Birds	Project design will incorporate baffles and noise suppressors on equipment. Stationary equipment will be housed in buildings Equipment will be regularly maintained to avoid excess emissions Blasting will be temporarily stopped if large mammals are observed within the danger zone as identified by the blast supervisor. Limit the use of all-terrain vehicles on trails.
	Destruction of birds' nests	Species At Risk Upland Breeding Birds	Clearing of vegetation shall take place outside of the nesting bird season (May 15th-July 30th), where possible. If clearing must take place within this period, a biologist will undertake a nest search to determine if there are any active nests in the habitat being cleared. If a nest is observed a protected buffer is placed around the nest until the bird and its young have left the nest.
	Improved access for harvesting can affect wildlife population sizes	Moose Furbearers Species At Risk (Snapping turtle)	Develop a strict "no hunting, harvesting, trapping or fishing" policy

3.3 Wetlands

The potential interaction between the Project activities and wetlands are identified in Tables 3-4 through 3-8. Each interaction is initially considered to have a linkage to potential effects on the VECs.

3.3.1 Potential Pathways for Effects

Potential pathways through which the Project could affect wetlands are presented in Table 3-12 and are as follows:

- Physical Loss or Alteration of Vegetation *(construction phase).*
- Alteration of flows and drainage patterns *(construction phase).*
- Changes to water levels (*operations phase).*
- Changes to surface water and groundwater quality *(construction and operations phase).*
- Air emissions and dust deposition *(construction and operations phase).*
- Introduction of invasive plant species *(construction and operations phase).*
- Accidental spills and malfunctions *(construction and operations phase).*

3.3.1.1 Effect 1 – Physical Loss or Alteration of Vegetation

Wetland vegetation will be removed or altered due to clearing associated with the mine footprint (e.g., excavation of the open pits, WRMF, access road, transmission corridor, tailings management facility, ore processing facility). In addition to the physical loss of vegetation community coverage, the removal and fragmentation of wetland communities by the development of the mine, ore processing facilities, access road and transmission corridor can result in the isolation of plant populations as the footprint may act as a barrier to plant distribution and thus create a loss of genetic exchange between habitats on the landscape. New openings created by site clearing for construction can attract light demanding species and may be avoided by other species.

To quantify the direct loss of wetland vegetation due to the mine development, the footprint of the mine facilities and the proposed access road and transmission corridor were overlaid on the ecosite mapping generated for the LSA. The entire mine footprint will require clearing of approximately 1,199.72 ha of vegetation (excluding existing infrastructure and open water areas). Of the 1807.64 ha of wetland in the LSA, the mine footprint will require clearing of 381.22 ha. This is 21.09% of the wetland occurring in the LSA and approximately 0.06% of the wetland in the RSA.

On an ecosite basis, Table 3-9 provides the areal extent of wetland ecosite lost through removal for the Project.

Table 3-9: Quantified Wetland Ecosite Losses in the Hammond Reef Mine Study Area and Local Study Area

Wetland Ecosite	Mine Study Area			Local Study Area		
	Habitat Available (ha)	Habitat Lost (ha)	% Lost	Habitat Available (ha)	Habitat Lost (ha)	% Lost
W1	0.59	0.59	100.00%	2.43	0.59	24.27%
W2	1.67	0.00	0.00%	4.02	0.00	0.00%
W3	3.72	3.58	96.28%	15.20	3.58	23.55%
W4	3.88	3.00	77.29%	18.38	3.00	16.30%
W5	5.21	2.66	51.02%	17.51	2.66	15.17%
W10	1.78	0.00	0.00%	9.84	0.00	0.00%
W11	0.00	0.00	0.00%	2.75	0.00	0.00%
W12	6.66	2.82	42.38%	54.07	2.82	5.22%
W13	7.68	7.68	100.00%	34.20	7.68	22.46%
W14	9.12	4.35	47.73%	81.76	4.35	5.33%
W15	3.39	3.03	89.33%	18.48	3.03	16.41%
W16	14.82	10.45	70.56%	53.02	10.45	19.72%
W18	59.95	49.13	81.95%	203.01	49.13	24.20%
W19	27.22	26.72	98.19%	27.22	26.72	98.19%
W20	14.45	14.42	99.82%	26.39	14.42	54.65%
W21	0.02	0.00	0.00%	15.14	0.00	0.00%
W22	23.91	21.22	88.75%	123.39	21.22	17.20%
W24	0.00	0.00	0.00%	1.05	0.00	0.00%
W25	16.86	16.63	98.63%	36.12	16.63	46.05%
W26	0.00	0.00	0.00%	29.89	0.00	0.00%
W27	24.68	17.51	70.96%	230.40	17.51	7.60%
W28	31.98	14.24	44.52%	58.09	14.24	24.51%
W29	53.07	46.21	87.07%	147.04	46.21	31.42%

Table 3-9: Quantified Wetland Ecosite Losses in the Hammond Reef Mine Study Area and Local Study Area (Continued)

Wetland Ecosite	Mine Study Area			Local Study Area		
	Habitat Available (ha)	Habitat Lost (ha)	% Lost	Habitat Available (ha)	Habitat Lost (ha)	% Lost
W30	3.10	3.02	97.52%	151.48	3.02	1.99%
W31	138.80	89.42	64.42%	222.29	89.42	40.23%
W32	48.68	36.47	74.92%	159.30	36.47	22.89%
W33	2.87	0.87	30.19%	4.75	0.87	18.23%
W34	0.00	0.00	0.00%	5.66	0.00	0.00%
W35	4.96	3.18	64.10%	40.46	3.18	7.85%
W36	8.04	4.02	50.05%	14.31	4.02	28.10%
Totals	**517.09**	**381.22**	**73.72%**	**1,807.64**	**381.22**	**21.09%**

Some locally rare plant species were found in ecosites W12, W13, W22 and W31. These ecosites as well as others with the moderate to high potential to support locally rare plant species (W25, 26, 27, 28) (Appendix 2.II Table 3) occupy approximately 788 ha in the LSA. The mine footprint will remove and disturb approximately 170 ha or 21.5% of this habitat for locally rare species in the LSA.

A rich conifer swamp (ecosite W32) was identified as having the potential to support a high number of traditional use plants. Other swamp communities (W27-W36) were identified as having the potential to support a moderate number of traditional use species. Based on this evaluation, there will be a loss or disturbance of approximately 215 ha of these swamp ecosites out of approximately 1,033 ha in the LSA. This swamp wetland community loss equals approximately 21% of the habitat for a moderate to high number of these traditional use wetland plant species. However, the traditional knowledge studies identified that plants and berries are harvested in the larger RSA. The removal of all wetland communities due to the Project footprint equals 0.03% of the RSA and thus is expected to have a negligible effect on the traditional use plants in wetlands.

Environmental Design Features and Mitigation

For the most part, the design and layout of the mine infrastructure was developed to avoid ecologically sensitive areas (e.g., Lizard Lake) and limit the amount of vegetation removal. The alignment of the access road is situated along an existing road (Hardtack/Sawbill Road). As such, the extent to which intact vegetation communities will be disturbed will be limited. The pathway of the transmission line will be cleared but not graded and stripped of topsoil, thus allowing for quick regrowth of vegetation in the transmission corridor. Vegetated riparian buffers will remain around watercourses at access road crossings to the extent possible and disturbed soils will be stabilized to assist vegetation regrowth and control erosion. During the operations phase, the encroachment into areas adjacent to established facilities is not anticipated.

Mitigation will include implementing progressive reclamation for the Project to minimize the net area disturbed at any one time. The Soil Salvage Plan developed for the Project includes the salvage of suitable overburden and topsoil material. Organic material (peat) will be salvaged in wetland areas for subsequent use in reclamation. The Aquatic Environment TSD identifies some wetland creation concepts for fish habitat compensation.

At closure, all developed areas, excluding the open pits, will be revegetated as detailed in the Conceptual Closure and Rehabilitation Plan. The majority of the areas will be re-forested (792.7 ha) and the open pits will be left to fill with water. The shallower edges of the open pits will re-colonize with aquatic plants and create a fringe of wetland around the pits. The resulting habitat after reclamation will include a mixture of several habitat types which will create a diverse landscape.

Overall, wetland vegetation removal for the Project footprint will result in a residual effect that is advanced to the assessment of significance.

3.3.1.2 Effect 2 – Loss or Alteration of Flows and Drainage Patterns

The Project footprint will alter surface water flows and interrupt natural drainage patterns. Thus, the hydrological conditions of wetlands will be altered which can lead to changes in wetland soils and vegetation. Removal of vegetation leads to changes in drainage patterns, drying out of soils, especially the deep, organic soils of the wetland communities and a change in the soil pH, mineralization of the soils.

A summary of predicted changes to the site watersheds, as discussed in the Hydrology TSD is as follows:

The greatest changes in flows as a result of Project activities during the Operations phase are expected to occur in MSA watercourses as a result of changes to their tributary drainage areas. Of the 44 watersheds evaluated, five will be unaffected, three will be reduced in size by less than 10%, six will be reduced in size by less than 50%, nine will be reduced in size by less than 90%, and six will be reduced in size by more than 90% (one by 100%). Changes to tributary drainage areas will occur due to the interception of runoff from areas within the Project footprint by the water collection system. Changes in flows are expected to be roughly proportional to changes in tributary drainage area.

The expected changes in flows in local scale watercourses are as follows:

- A reduction in flows in Lumby Creek (Figure 2-3 Local Watersheds in Hydrology TSD) of approximately 7% to 8% as a result of the interception of runoff from the Project footprint by the water collection system; and
- An increase in flows in Sawbill Creek (Figure 2-3 Local Watersheds in Hydrology TSD) of less than 1% due to the discharge of treated sewage effluent from the Accommodation Camp.

The water levels and flows in the wetlands that are located upstream of the footprint of the Project infrastructure (i.e., in the upper part of the watersheds) are not expected to change since runoff reaching the Project Site footprint will be collected in the site drainage system and used in the Site operation. The wetlands that are not being directly removed in the Project Site footprint but that are located downstream of the footprint (i.e., in the lower portion of the watersheds) will have a reduction in flows and water levels.

Environmental Design Features and Mitigation

A site water balance was derived for use in Project design to minimize the alteration of flows throughout the LSA. While there will be changes to flows and drainage patterns, these changes have been minimized through a site drainage management plan. The site drainage system has been designed to convey drainage across the Project Site with minimal disruption to the habitats surrounding the Project Site footprint. In this manner, the wetlands that are located upstream of the footprint of the Project infrastructure are not expected to change because runoff will be intercepted at the Project footprint for use in the Project operation.

The water management plan has been designed to convey drainage across the site with minor disruption to the habitats surrounding the Project footprint. The access road (Hardtack/Sawbill) follows an existing road way. Required widening will provide an opportunity to improve culvert crossings as needed at streams and wetland crossings to improve drainage.

As discussed in the Aquatic Environment TSD, wetlands are being created to offset the loss of fish habitat. These wetlands are being created for the fish habitat compensation package. However, these created wetlands will compensate also for the ecological and hydrological functions of the wetlands that are being lost.

At closure, the Project Site will be revegetated as detailed in the Conceptual Closure and Rehabilitation Plan and normal runoff flow directions will be restored.

In summary, since there will be residual effects of flow change on wetlands, this effect is carried forward to the analysis of significance.

3.3.1.3 Effect 3 – Change in Water Levels

Based on the reduced tributary drainage areas and the proposed water taking activities from the Upper Marmion Reservoir , it is predicted in the Hydrology TSD that during the operations of the Project the maximum relative change (decreases) in monthly mean water levels in Upper Marmion Reservoir ranges from -8 to -9 cm for average, wet and dry year conditions, and the maximum relative change (decreases) in monthly mean outflows ranges from -0.8% to -4.0% for average, wet and dry year conditions, between baseline conditions and Project conditions. Water taking from Upper Marmion Reservoir is expected to decrease/lower the water level in Sawbill Bay by 5-7 cm annually. The existing water level fluctuations in Upper Marmion Reservoir annually are up to 2.5 m. Therefore, an incremental change of 5-7 cm annually is expected to have a negligible effect on the shoreline wetlands in Upper Marmion Reservoir.

Surface water modelling was completed for Lizard Lake based on the bathymetry survey in 2011. The estimated maximum change in monthly mean water level in Lizard Lake is -3 cm as a result of runoff interception at the TMF. The estimated maximum change in monthly mean inflows and outflows to Lizard Lake using the same model is -8%. The reduction in tributary drainage area to the lake outlet is 7%. The greatest changes are expected to occur during the spring and summer months, and the smallest changes during the late fall/winter. An incremental decrease of 3 cm annually is expected to have a negligible effect on the shoreline wetlands in Lizard Lake.

Water levels in an Unnamed Lake (API #8 in the Aquatic Environment TSD) located to the east of the TMF in site scale watershed R are expected to be influenced by Project activities. Changes in the range of -2.1 cm to 0.0 cm are expected during the Operations phase, with the greatest changes occurring during the spring and the

smallest changes occurring during the late fall/winter. An incremental decrease of 2 cm is expected to have a negligible effect on the riparian wetland downstream of this lake.

One concern is the effects of water level changes on wild rice growing areas in downstream areas of the Seine River. The changes in water levels are not likely to result in measurable changes in water levels downstream. Due to natural fluctuations, water level changes of less than 10% cannot be reliably measured. As well, the hydro-electric facility at Valerie Falls would tend to minimize any changes in downstream areas due to the Project activities through regulation of flows at the facility. As a result, no effects are predicted on wild rice growing areas in the Seine River.

Environmental Design Features and Mitigation

Environmental design features that will be implemented to reduce the amount of water required for Project operations including domestic uses include the capture and reuse of water from the Project Site. The water requirements for the Project are not expected to significantly change drainage flows and surface water levels beyond the natural variability of the baseline conditions in Upper Marmion Reservoir, and should result in a minor change to wetlands. This pathway is expected to have negligible effects to the persistence of wetland plant populations and wetland communities in the LSA.

3.3.1.4 Effect 4 – Changes to Surface Water and Groundwater Quality

Surface runoff from the newly cleared lands during construction could potentially carry sedimentation into wetlands. Surface water that collects in the open pits and run-off from the WRMF and the ore processing facility could potentially affect surface water quality and thus vegetation in wetlands.

Leaching of dissolved metals from WRMF may cause changes to groundwater and surface water quality and soils, which may affect vegetation growth and health. The release of grey water or other nutrients from accommodation camp operations could also potentially affect plant health and could lead to a shift in plant community structure (e.g., increased algal growth). The effects of contaminants in the environment are assessed in the Human Health and Ecological Risk Assessment TSD.

Environmental Design Features and Mitigation

Water that collects in the open pits from groundwater seepage and from rain and snow will be pumped to the process plant collection pond (PPCP). Other runoff from the Project Site will be collected and managed in the site drainage systems and transferred to the PPCP or the TMF retention pond. Water collected in the PPCP will be recycled into the system to the extent that it is needed. Excess water will be pumped to the effluent treatment facility and released through a diffuser into Upper Marmion Reservoir. Sewage will be treated in the STP and the effluent will either be reused during the processing of ore or discharged after treatment.

After closure, dewatering of the open pit will cease and the open pit will fill with water. At closure, the Ore Processing Facility will be demolished and the area will be rehabilitated as detailed in the Conceptual Closure and Rehabilitation Plan.

Implementation of these environmental design features is expected to result in no detectable changes to vegetation adjacent to the Project. Subsequently, this pathway was determined to have no interaction with wetland plants and communities.

3.3.1.5 Effect 5 – Dust Deposition and Air Emissions

Dust deposition may cover vegetation and lead to physical and/or physiological damage, including reduced water content, increased conductivity, reduced chlorophyll content, reduced respiration, reduced reception of radiation or photosynthesis, and reduced carbon uptake (Spatt and Miller 1981). In some cases visible symptoms such as chlorosis or necrosis of the leaves (e.g., brown or black spots) may occur in affected plants. Dust deposition can also lead to early snowmelt and, thus, early flowering in some plant species (Walker and Everett 1991; Forbes 1995)

Acid deposition from air emissions includes the deposition of sulphur oxides, nitrogen oxides, hydrogen, metals, and some organic compounds (Rusek and Marshall 2000) onto soil and vegetation. Potential acid input from air emissions can change the chemical properties of soil and water, which can affect vegetation growth. Sulfur dioxide and nitrogen oxides are the major precursors of acid rain.

Sources of dust generation for the Project include blasting activities, and the operation of the processing plant. Air quality modeling was completed to predict the spatial extent of dust deposition and air emissions from the Project. The air emission modelling results are displayed in Appendix 2.VI, Figures 1, 2 and 3.

As discussed in the Air Quality TSD, the results of the air quality modelling predicted that the maximum annual dust deposition resulting from the Project is 150 grams per square metre per year ($g/m^2/y$) to the east-southeast of the open pits and processing plant and 90 $g/m^2/y$ to the east-southeast of the WRMF (Appendix 2.VI Figure 3). At approximately 750 m away from the open pits the deposition rate is down to half of the peak, at 70 $g/m^2/y$. This is considered minimal dust deposition. Further north on the peninsula away from the open pits, the concentration goes down to 20 $g/m^2/y$ near Snail Bay. These concentrations are not expected to result in measurable changes to vegetation in the remaining wetland.

The air emission modelling results show that predicted annual peak concentrations for sulphur dioxide and nitrogen dioxide are very low, at 1.5 ug/m^3 and 40 ug/m^3 respectively. These peak concentrations occur to the southeast of the open pits. Beyond the LSA, the NO_2 concentration is low at 5-10 $ug/m^{3.}$ And in the LSA and beyond the SO^2 concentration is very low at 0.26-0.50 ug/m^3.

The Geochemistry, Geology and Soil TSD (Section 4.3 and Table 7-7) indicates that the interaction between air emissions and soils, in particular NO_x and SO_2 is anticipated to be negligible to low and thus was not assessed further.

Plant health can also be affected by other industrial air emissions, and operational activities such as salt application associated with road use and maintenance because these activities can lead to reduced plant photosynthetic capability and reproductive effort (Eller 1977), retarded growth (Spatt and Miller 1981), and altered respiration processes (Svoboda 1997). These effects have been considered in the Human Health and Ecological Risk Assessment TSD.

Although concentrations are predicted to be above baseline conditions, the anticipated changes to vegetation are localized and considered minor, which are predicted to have a negligible effect on plant populations and communities. The maximum predicted annual deposition rate of potential acid input and maximum concentration of nitrogen dioxide are both expected to occur to the southeast of the Project centre but these values are relatively low. The deposition predictions are considered to be conservative, and therefore the presented deposition rates are most likely overestimated. Therefore, changes in vegetation quality due to dust

deposition and air emissions are anticipated to be minor relative to baseline conditions. Consequently, residual effects to the persistence of plant populations and communities from dust deposition and air emissions are predicted to be negligible.

Environmental Design Features and Mitigation

Design features and mitigation measures to control dust and other air emissions include:

- The watering of roads and laydown areas during the non-winter period will facilitate dust suppression.
- Enforcing speed limits will help reduce dust production.
- Equipment and fleet equipped with industry-standard emission control systems.
- Sources of particulate emissions at the processing facility will be controlled through the use of baghouses
- Enclosing conveyance systems and processing facilities (baghouse).
- Processing equipment with high efficiency bag houses to reduce emissions of particulate matter
- Operating procedures will be developed that reduce dust generation and air emissions (e.g., regular maintenance of equipment to meet emission standards).

With the use of these design features and mitigation measures the residual effects to the persistence of plant populations and communities from dust deposition and air emissions are predicted to be negligible.

3.3.1.6 Effect 6 – Introduction of Invasive Plant Species

The construction and operation of the Project have the potential to introduce non-native plant species and disrupt native plant communities (Mack et al. 2000). The ground disturbance associated with construction activities can create the type of habitat favoured by invasive plant species.

The development and use of transportation corridors can also lead to the introduction and invasion of non-native plant species into previously pristine areas. The main contributor to the introduction of invasive and noxious weeds is human transport (Mack et al. 2000). Transportation corridors to and from construction areas provide a means of ingress for invasive plant species, as well as additional habitat in the form of disturbed road edges. Vehicles and machinery can serve as dispersal mechanisms for plant propagules (seeds and/or vegetative parts) that can get lodged in tires, the undercarriage, or mud on the surface of the vehicle.

Non-native invasive plant species, or weeds, may alter nutrient cycling, competition, and the energy budget of an ecosystem, which may lead to a decrease in native plant community structure and species diversity (Jager et al. 2009), and lower native species survival and abundance (Mack et al. 2000). Invasive plant species are those species whose rapid establishment and spread can adversely affect ecosystems, habitats and/or other species (Haber 1997). Specific surveys aimed at searching for weeds were not completed during baseline surveys; however, had they been present within vegetation plots they would have been recorded.

Environmental Design Features and Mitigation

The key to invasive plant management is to develop and implement a strategy early in the Project. The strategy should address the introduction, spread, and effects of invasive species on the environment (Haber 1997). An

invasive plant management strategy will be designed and implemented to prevent, detect, control (remove), and monitor areas with invasive plant species.

To mitigate the transport and introduction of non-native plant species into native plant communities, construction equipment will be regularly cleaned on-site, particularly before moving into sensitive vegetation areas. Areas undergoing natural regeneration may need to be isolated until native vegetation is established.

With the implementation of mitigation and environmental design features mentioned, it is anticipated to result in minor changes in the abundance and distribution of wetland plant species relative to baseline conditions. Therefore, the residual effect to the persistence of wetland plant populations and communities from the introduction of non-native species is predicted to be negligible.

3.3.1.7 Effect 7 – Accidental Spills and Malfunctions

Spills of hazardous chemicals such as gasoline, diesel, hydraulic fluid, or other deleterious substances on the mine site or access road during construction or operations can affect soils and surrounding vegetation in a localized area.

Environmental Design Features and Mitigation

Emergency Spill Response Plan will be developed so that chemical spills that are reported can be quickly and efficiently managed. Strict adherence to the Emergency Plan will limit the frequency and extent of spills that result from the Project activities. Hazardous materials will be stored according to regulatory requirements. Storage tanks with substances such as engine oil, hydraulic oil, waste oil, and coolant will be double walled, and located in lined and bermed containment areas. Individuals working on-site and handling hazardous materials will be trained in the Transportation of Dangerous Goods. Emergency spill kits will be available wherever toxic materials or fuel are stored and transferred.

Additionally, all site runoff will be directed to the Project Site drainage systems and treated before release to the environment. If a spill is not limited through the emergency response, contaminated site runoff will be treated.

The implementation of the Emergency Spill Response Plan and the above-mentioned environmental design features are anticipated to reduce the frequency and severity of spills on the environment. Thus, spills on the mine site and access road are not predicted to result in detectable changes to soil and vegetation relative to baseline conditions. Consequently, this pathway was determined to have no interaction with wetland plant populations and communities.

3.3.2 Residual Effects

There are two residual effects on wetlands that cannot be fully mitigated: the loss of wetland vegetation and the alteration of flow and drainage patterns.

3.3.3 Significance of Residual Effects

3.3.3.1 Residual Effect 1-Physical Loss or Alteration of Vegetation

The effect from the physical loss of wetland vegetation is confined to the Project footprint and is therefore evaluated as low for geographic extent. The relevant area within which effects on the wetland VEC are assessed is the LSA (Table 3-2). Approximately 381 ha of wetland ecosite coverage will be removed to accommodate the Project footprint. This is approximately 21% of the LSA or a moderate magnitude.

The loss and alteration of wetlands in the Project Site footprint will occur during construction activities. Some wetlands will be permanently lost and others will be restored at the end of operations, in the closure and post-closure phase. Thus the effect is reversible. Wetland creation is a standard compensatory measure in development projects. Wetlands will be created for fish habitat compensation during the construction period, therefore counteracting some of the loss of wetlands during the operations period. Duration of this effect is evaluated as moderate.

3.3.3.2 Residual Effect 2-Alteration of Flows and Drainage Patterns

The alteration of flows and drainage patterns extends to the site watersheds which make up the LSA and is evaluated as moderate in geographic extent. The incremental predicted change in flows at a local watershed scale range from +1% to -8% as a result of interception of flow in the water collection system and the discharges from the effluent treatment plant. The magnitude of residual effect on wetland hydrology would be considered low.

The incremental change in flow will take place during the construction period and continue into the operations. However, some wetlands will be created through fish habitat compensation during construction, which will attenuate some flow and alleviate some of the effects. At closure, the Project will no longer be taking water from the surrounding resources. Therefore, the effect persists in the medium-term. Also, the majority of the lands that were developed for the mine facilities will be returned back to natural states (i.e., rehabilitated and restored). Certain areas will be re-graded with contours that will be continuous with the landscape as detailed in the Conceptual Closure and Rehabilitation Plan. Those flow and drainage patterns that were interrupted in these areas will be reconnected where possible. It is not possible to re-grade all lands during reclamation activities, for instance, the change in Project Site drainage around the WRMF and the TMF will continue into perpetuity. Overall, the duration of effects is considered moderate.

3.3.4 Summary of Residual Effects

Table 3-10: Summary of Residual Effects to Wetlands

Effect	Geographic Extent	Magnitude	Duration
Loss and Alteration of Wetland Vegetation	Low	Moderate	Moderate
Alteration of Flows and Drainage Patterns	Moderate	Low	Moderate

There are extensive wetlands throughout the study areas, and many of these wetlands have been created or maintained by the management of water levels for hydro-electric development on Marmion Reservoir. The operation of hydro-electric development in the area is having a large influence on hydrology in the MSA, LSA and beyond (all areas under the influence of the water management for hydro power). Therefore, the effects of Project on wetlands would be considered of low significance.

3.4 Forest Cover

Interactions between Project activities and forest cover in the LSA are identified in Tables 3-4 through 3-8. Each interaction is initially considered to have a linkage to potential effects on the VECs.

3.4.1 Potential Pathways for Effects

Potential pathways through which the Project could affect wetlands are presented in Table 3-12 and are as follows:

- Physical Loss or Alteration of Vegetation *(construction phase).*
- Alteration of flows and drainage patterns *(construction phase).*
- Air emissions and dust deposition *(construction and operations phase).*
- Introduction of invasive plant species *(construction and operations phase).*
- Accidental spills and malfunctions *(construction and operations phase).*

3.4.1.1 Effect 1 – Physical Loss or Alteration of Vegetation

Forest cover will be removed or altered due to clearing associated with the Project footprint (e.g., excavation of the open pits, WRMF, access road, transmission corridor, tailings management facility, processing plant, etc.). In addition to the physical loss of vegetation community coverage, the removal and fragmentation of forest communities by the development of the mine facilities, site access road and transmission corridor can result in the isolation of plant populations as the developed spaces act as barriers to plant distribution and thus create a loss of genetic exchange between habitats on the landscape. New openings created by site clearing for construction can attract light demanding species and may be avoided by other species.

To quantify the direct loss of forest cover due to the Project, the footprint of the Project Site and the proposed access road and transmission corridor were overlaid on the ecosite mapping generated for the LSA. The entire Project footprint will require clearing of approximately 1,240.31 ha of vegetation, of which 772.15 ha is forest cover. The overall forest cover loss is approximately 15% of forest available in the LSA and 0.21% of the forest occurring in the RSA.

On an ecosite basis, Table 3-11 below provides the areal extent of intact forest ecosites lost through removal for the Project facilities.

Table 3-11: Quantified Forest Ecosite Losses in the Hammond Reef Gold Project Mine Study Area and Local Study Area

Forest Ecosite	Mine Study Area			Local Study Area		
	Forest Cover Available (ha)	Forest Cover Lost (ha)	% Lost	Forest Cover Available (ha)	Forest Cover Lost (ha)	% Lost
ES-A	9.29	0.35	3.73%	216.87	0.35	0.16%
ES-B	286.60	233.60	81.51%	722.71	233.60	32.32%
ES-C	40.24	17.69	43.95%	163.89	17.69	10.79%
ES-D	0.00	0.00	0.00%	88.07	0.00	0.00%
ES-E	385.36	191.22	49.62%	1228.75	191.22	15.56%

Table 3-11: Quantified Forest Ecosite Losses in the Hammond Reef Gold Project Mine Study Area and Local Study Area (Continued)

Forest Ecosite	Mine Study Area			Local Study Area		
	Forest Cover Available (ha)	Forest Cover Lost (ha)	% Lost	Forest Cover Available (ha)	Forest Cover Lost (ha)	% Lost
ES-F	226.86	65.51	28.88%	1280.84	65.51	5.11%
ES-G	73.22	29.58	40.40%	578.13	29.58	5.12%
ES-H	340.19	178.79	52.56%	821.04	178.79	21.78%
ES-I	62.81	55.40	88.21%	203.80	55.40	27.19%

Based on the MNR's landcover data, the ecosites identified in the LSA were grouped into comparable forest landcover types in Table 3-12 to allow for a comparison with the forest cover in the RSA. The forest cover lost based on the Project footprint is approximately 0.21% of the forest cover available in the RSA.

Table 3-12: Forest Losses in the Regional Study Area

Forest Ecosite/Type	Forest Cover Available in the Regional Study Area (ha)	Forest Cover Lost (ha)	% Lost in the Regional Study Area
Dense Coniferous Forest (ES-A, ES-B, ES-C, ES-D, ES-H)	74,297.4	430.43	0.58%
Dense Deciduous (ES-E)	72,974.4	191.22	0.26%
Dense Mixed Forest (ES-F, ES-G, ES-I)	220,707.9	150.50	0.07%
Total	**367,979.7**	**772.15**	**0.21%**

The provincially rare Blue sedge (*Carex glaucodea*) was recorded in ecosite ES-E (deciduous forest type). Deciduous forest occupies 1228.75 ha of the LSA. The mine footprint will remove and disturb 191.22 ha or 15.56% of these ecosites in the LSA and only 0.26% of the deciduous forest in the RSA.

Of the forested ecosites with a potential to support a high number of traditional use plants (ES-A, ES-D, ES-E, ES-G, ES-H), there will be a loss or disturbance of 399.94 ha out of 2932.86 ha available in the LSA. This forest community loss equals approximately 14% of the habitat available in the LSA for a high number of these traditional use plant species. As determined through the Traditional Use Study, aboriginal people harvest traditional use plants from a vast area, comparable to the RSA. Therefore, the loss of forested ecosites with a high potential to support traditional use plants in the RSA would be <1% and therefore negligible.

The lands in the LSA are being operated under a forest management lease and as such numerous areas are undergoing regrowth after logging. These areas were identified as disturbed forests or cutover areas. Areas that are currently undergoing regeneration back to forests occupy 54.42 ha of the LSA. The Project footprint will remove 46.36 ha of this regenerating forest which equals an 85% loss of regenerating forest in the LSA. In comparison to the amount of regenerating forest in the RSA, there will be a loss of 0.12%.

Environmental Design Features and Mitigation

The design and layout of the Project infrastructure was developed to avoid ecologically sensitive areas and minimize the amount of vegetation removal. The alignment of the access road is situated along an existing road (Hardtack/Sawbill Road). As such, the extent to which intact vegetation communities will be disturbed will be limited. The pathway of the transmission line will be selectively cleared but not graded and stripped of topsoil, thus allowing for quick regrowth of vegetation in the transmission corridor.

Progressive reclamation of disturbed lands will be executed, where appropriate. When the temporary construction work spaces are cleared, overburden and topsoil will be stockpiled and subsequently used as a seed source for quick rehabilitation/restoration of vegetative species.

Vegetated riparian buffers will remain around watercourses at access road crossings to the extent possible. Disturbed soils will be stabilized to assist vegetation regrowth and control erosion. During the operations phase, the encroachment into areas adjacent to established facilities will be avoided to prevent further encroachment and loss of vegetation.

At closure, all developed areas, excluding the open pits, will be rehabilitated as detailed in the Conceptual Closure and Rehabilitation Plan. The following areas will be re-habilitated: TMF (675 ha), processing plant area (50 ha), emulsion plant area (20 ha), detonator storage area (0.2 ha), overburden stockpile (27.5 ha), and other site maintenance/accommodation camp/office areas (20 ha), for a total of 792.7 ha of forested land reclaimed. As the direct loses of forest cover during construction of the Project Site are 772.15, the reclamation at closure will allow for an increase of approximately 20.5 ha of forest cover. Native species of trees, shrubs and other vascular plants will be used for revegetation at closure. Where feasible, the same variety of plant species currently composing the different forest ecosites will be used for reclamation.

3.4.1.2 Effect 2 – Loss or Alteration of Flows and Drainage Patterns

Removal of vegetation leads to changes in drainage patterns, drying out of soils, and potential changes in the soil pH in forested areas. The predicted losses and alterations of flows and drainage patterns from the Project footprint on the site watersheds are summarized in the Hydrology TSD. The predicted changes are minor on the local watershed scale (those draining through Lizard Lake and to Sawbill Bay) and represent a maximum reduction of 8% in the Lizard Lake Watershed and an increase of >1% in the Sawbill Bay watershed. These changes are not expected to have a measurable effect on forest cover and thus are not advanced for further assessment.

Environmental Design Features and Mitigation

The water management system for the Project has been optimized in terms of internal recycling within the Ore Processing Facility, thickening of the tailings, and high level of reclaim water from the TMF Reclaim Pond back to the PPCP. The site drainage system has been designed to convey drainage across the Project Site with minor disruption to the habitats surrounding the Project footprint.

At closure, the Project Site will be rehabilitated as detailed in the Conceptual Closure and Rehabilitation Plan. This will restore some of the drainage, particularly surface runoff that was lost during the construction and operations period.

The implementation of the mitigation practices and environmental design features is expected to result in a minor change to the hydrology in the LSA from the Project relative to baseline conditions, which should have a negligible effect on forests.

3.4.1.3 Effect 3 – Changes to Surface Water and Groundwater Quality

Surface runoff from the newly cleared lands during construction could potentially carry sedimentation and deposit in forested areas. Surface water that collects in the open pits and run off from the Project Site could potentially affect surface water and groundwater quality and thus vegetation in forested wetlands.

Leaching of dissolved metals from WRMF may cause changes to groundwater and surface water quality and soils, which may affect vegetation growth and health. The effects of contaminants in the environment are assessed in the Human Health and Ecological Risk Assessment TSD.

Environmental Design Features and Mitigation

Water that collects in the open pits from groundwater seepage and from rain and snow will be pumped to the PPCP. Other runoff from the Project Site will be collected in the site drainage systems and transferred to the TMF retention pond and the PPCP. Excess water from the PPCP will be treated as necessary and released into Upper Marmion Reservoir. Sewage will be treated in the STP and the effluent will either be reused during the processing of ore or discharged to Upper Marmion Reservoir after treatment.

Implementation of these environmental design features is expected to result in no detectable changes to vegetation adjacent to the Project. Subsequently, this pathway was determined to have no interaction with forest plants and communities.

3.4.1.4 Effect 4 – Dust Deposition and Air Emissions

Dust deposition may cover vegetation and lead to physical and/or physiological damage, including reduced water content, increased conductivity, reduced chlorophyll content, reduced respiration, reduced reception of radiation or photosynthesis, and reduced carbon uptake (Spatt and Miller 1981). In some cases, visible symptoms such as chlorosis or necrosis of the leaves (e.g., brown or black spots) may occur in affected plants. Dust deposition can also lead to early snowmelt and, thus, early flowering in some plant species (Walker and Everett 1987; Forbes 1995)

Acid deposition from air emissions includes the deposition of sulphur oxides, nitrogen oxides, hydrogen, metals, and some organic compounds (Rusek and Marshall 2000) onto soil and vegetation. Potential acid input from air emissions can change the chemical properties of soil and water, which can affect vegetation growth. Sulfur dioxide and nitrogen oxides are the major precursors of acid rain.

Sources of dust generation for the Project include vehicular traffic, blasting activities, and the operation of the Ore Processing Facility. Air quality modeling was completed to predict the spatial extent of dust deposition and air emissions from the Project. The air emission modelling results are displayed in Appendix 2.VI Figures 1, 2 and 3.

As detailed in the Air Quality TSD, the results of the air quality modelling predicted annual dust deposition resulting from the Project (Appendix 2.VI Figure 3). Dust concentrations are not expected to result in measurable changes to vegetation.

The air emission modelling results show that predicted annual peak concentrations for sulphur dioxide and nitrogen dioxide are very low, at 1.5 ug/m^3 and 40 ug/m^3 respectively. These peak concentrations occur to the southeast of the open pits. Beyond the LSA the NO_2 concentration is low at 5-10 ug/m^3. And in the LSA and beyond the SO^2 concentration is very low at 0.26-0.50 ug/m^3.

The Geochemistry, Geology and Soil TSD (Section 4.3 and Table 7-7) indicates that the interaction between air emissions and soils, in particular NO_x and SO_2 is anticipated to be negligible to low and thus was not assessed further).

Plant health can also be affected by other industrial air emissions, and operational activities such as salt application associated with road use and maintenance because these activities can lead to reduced plant photosynthetic capability and reproductive effort (Eller 1977; Forbes 1995), retarded growth (Spatt and Miller 1981), and altered respiration processes (Svoboda 1997). These effects have been considered in the Human Health and Ecological Risk Assessment TSD.

Although concentrations are predicted to be above baseline conditions, the anticipated changes to vegetation are localized and considered minor, which should have a negligible effect on plant populations and communities. The maximum predicted annual deposition rate of potential acid input and maximum concentration of nitrogen dioxide are both expected to occur to the southeast of the Project centre but these values are relatively low. The deposition predictions are considered to be conservative, and therefore the presented deposition rates are most likely overestimated. Therefore, changes in vegetation quality due to dust deposition and air emissions are anticipated to be minor relative to baseline conditions. Consequently, residual effects to the persistence of plant populations and communities from dust deposition and air emissions are predicted to be negligible.

Environmental Design Features and Mitigation

Design features and mitigation measures to control dust and other air emissions include:

- The watering of roads and laydown areas during the non-winter period will facilitate dust suppression.
- Enforcing speed limits will help reduce dust production.
- Equipment and fleet equipped with industry-standard emission control systems.
- Sources of particulate emissions at the processing facility will be controlled through the use of baghouses
- Enclosing conveyance systems and processing facilities (baghouse).
- Processing equipment with high efficiency bag houses to reduce emissions of particulate matter
- Operating procedures will be developed that reduce dust generation and air emissions (e.g., regular maintenance of equipment to meet emission standards).

With the use of these design features and mitigation measures the residual effects to the persistence of plant populations and communities from dust deposition and air emissions are predicted to be negligible.

3.4.1.5 Effect 5 – Introduction of Invasive Plant Species

The construction and operation of the Project have the potential to introduce non-native plant species and disrupt native plant communities (Mack et al. 2000). The ground disturbance associated with construction activities can create the type of habitat favoured by invasive plant species.

The development and use of transportation corridors can also lead to the introduction and invasion of non-native plant species into previously pristine areas. The main contributor to the introduction of invasive and noxious weeds is human transport (Mack et al. 2000). Transportation corridors to and from construction areas provide a means of ingress for invasive plant species, as well as additional habitat in the form of disturbed road edges. Vehicles and machinery can serve as dispersal mechanisms for plant propagules (seeds and/or vegetative parts) that can get lodged in tires, the undercarriage, or mud on the surface of the vehicle.

Non-native invasive plant species, or weeds, may alter nutrient cycling, competition, and the energy budget of an ecosystem, which may lead to a decrease in native plant community structure and species diversity (Jager et al. 2009), and lower native species survival and abundance (Mack et al. 2000). Invasive plant species are those species whose rapid establishment and spread can adversely affect ecosystems, habitats and/or other species (Haber 1997). Specific surveys aimed at searching for weeds were not completed during baseline surveys; however, had they been present within vegetation plots they would have been recorded.

Environmental Design Features and Mitigation

The key to invasive plant management is to develop and implement a strategy early in the Project. The strategy should address the introduction, spread, and effects of invasive species on the environment (Haber 1997). An invasive plant management strategy will be designed and implemented to prevent, detect, control (remove), and monitor areas with invasive plant species.

To mitigate the transport and introduction of non-native plant species into native plant communities, construction equipment will be regularly cleaned on-site, particularly before moving into sensitive vegetation areas. Areas undergoing natural regeneration may need to be isolated until native vegetation established.

With the implementation of mitigation and environmental design features mentioned, it is anticipated to result in minor changes in the abundance and distribution of wetland plant species relative to baseline conditions. Therefore, the residual effect to the persistence of forest plant populations and communities from the introduction of non-native species is predicted to be negligible.

3.4.1.6 Effect 6 – Accidental Spills and Malfunctions

Spills of hazardous chemicals on the mine site or access road during construction or operations can affect soils and vegetation.

Environmental Design Features and Mitigation

Emergency Spill Response Plan will be developed so that chemical spills that are reported can be quickly and efficiently managed. Strict adherence to the Emergency Plan will limit the frequency and extent of spills that result from the Project activities. Hazardous materials will be stored according to regulatory requirements. Storage tanks with substances such as engine oil, hydraulic oil, waste oil, and coolant will be double walled, and located in lined and bermed containment areas. Individuals working on-site and handling hazardous materials

will be trained in the Transportation of Dangerous Goods. Emergency spill kits will be available wherever toxic materials or fuel are stored and transferred.

Additionally, all Project Site runoff will be directed to the Project Site drainage systems and treated before release to the environment. The implementation of the Emergency Spill Response Plan and the above-mentioned environmental design features are anticipated to reduce the frequency and severity of spills on the environment. Thus, spills on the Mine Site and access road are not predicted to result in detectable changes to soil and vegetation relative to baseline conditions. Consequently, this pathway was determined to have no interaction with forest plant populations and communities.

3.4.2 Residual Effects

There is one residual effect on forest cover that cannot be fully mitigated: the loss of forest cover.

3.4.2.1 Residual Effect 1-Physical Loss or Alteration of Vegetation

The residual effect from the loss of forest cover will be confined to the Project footprint or within the MSA and thus is a low geographic extent. To assess effects on the forest cover VEC, the LSA was determined to be the most relevant study area (Table 3-2). The Project footprint will require clearing of 772.15 ha is forest cover or 15% of forest cover available in the LSA and approximately 0.21% of the forest cover available in the RSA. The Project footprint will remove and disturb 191.22 ha or 15.56% of the ecosites that have the potential to support the provincially rare Blue sedge in the LSA. This results in a moderate magnitude of effect on forest cover.

The removal of forest cover will occur at construction and the effect will persist through operations. During operations, progressive rehabilitation will take place as appropriate in the TMF. At closure, all developed areas, excluding the open pits, will be actively revegetated (regraded, replanted, reseeded, as detailed in the Conceptual Closure and Rehabilitation Plan). The following areas are included: TMF (675 ha), Ore Processing Facility (50 ha), emulsion plant area (20 ha), detonator storage area (0.2 ha), overburden stockpile (27.5 ha), and other Project maintenance/accommodation camp/office areas (20 ha), for a total of 792.7 ha of land reclaimed with the majority of that being reforested. As the direct loses of forest cover during construction of the Project Site are 772.15, the reclamation at closure will allow for approximately equivalent revegetated coverage with the majority being reforested. Therefore, the duration is evaluated as low.

3.4.3 Summary of Residual Effects

Table 3-13: Summary of Residual Effects to Forest Cover

Effect	Geographic Extent	Magnitude	Duration
Loss and Alteration of Forest Cover	Low	Moderate	Low

Dense forest cover is extensive throughout the LSA and RSA. Active forestry is operational in these Project areas. The Project Site actively rehabilitated to promote forest growth as detailed in the Conceptual Closure and Rehabilitation Plan. Therefore, the residual effects on forest cover from the Project are considered of low significance.

3.5 Moose

3.5.1 Potential Pathways for Effects

Potential pathways through which the Project could affect moose are presented in Tables 3-4 to 3-8 and are as follows:

- Habitat Loss or Fragmentation *(construction)*
- Changes to Habitat Suitability for Moose (construction and operations phases)
- Alteration of flows and drainage patterns in habitat *(construction)*
- Changes in surface water quality and groundwater quality *(construction and operations)*
- Sensory Disturbances *(construction and operations)*
- Vehicle Injury/Mortality*(construction and operations)*
- Air emissions and dust deposition *(construction and operations)*
- Attraction of predators *(construction and operations)*

3.5.1.1 Effect 1-Habitat Loss or Fragmentation

The total area of the Project footprint is estimated to be 1205.73 ha (excludes open water). Of the 3873.55 ha of highly suitable moose habitat: regenerating forest (summer foraging), non-forested wetland (spring foraging), spruce/fir forest, and deciduous forest; approximately 408.41 ha will be removed for the Project footprint. This corresponds to 10.5% of the highly suitable habitat available in the LSA and approximately 0.1% in the RSA.

There are no MNR identified moose aquatic feeding areas within the footprint of the Project Site. Movement corridors to these special habitats will not be affected by the Project footprint. New roads are not being constructed near identified moose aquatic feeding areas in the LSA.

The Project footprint will leave large natural patches intact in the LSA and beyond. The Mine footprint is confined to the peninsula. The access road follows existing road corridors. Research on moose habitat fragmentation has indicated that it is the size of remaining habitat patches that seems to be most relevant to moose, as small patches were less used (Stewart and Komers 2011). Therefore, the layout of the Project facilities is not expected to leave small habitat patches. Therefore, habitat fragmentation is expected to have a negligible effect on moose.

Environmental Design Features and Mitigation

The Project layout, design and infrastructure placement has been selected in order to minimize the ecological footprint. The intent has been to keep intact as much existing forest and wetland as possible by avoiding options to put facilities further to the east (southeast of Lizard Lake) and by using existing access routes for linear infrastructure. Lizard Lake provides somewhat of a natural barrier to the movement of certain species from east to west into the MSA/LSA. By placing the TMF to the west of Lizard Lake, the existing movement corridors for moose and other mammals would not be as interrupted as it would have otherwise. Similarly by utilizing the Hardtack Road corridor for the new access road and transmission corridor it avoid further fragmenting new areas.

3.5.1.2 Effect 2-Change in Habitat Suitability for Moose

Assessment Methodology

To determine the changes in the habitat suitability for moose, the Lake Superior Habitat Suitability Index (HSI) Model (Allen et al. 1987) was used to evaluate the quality of the habitat available to moose in the LSA and in the RSA. Habitat Suitability Index models translate existing knowledge of species' life history requirements into quantitative measures of habitat quality. The numerical HSI represents the ability of ecological communities to provide the habitat requirements for a species and therefore the calculation of changes to these communities can give an indication of the qualitative impacts of the Project on these wildlife habitat resources.

Two moose models were developed for evaluation of moose habitat in the Lake Superior region (Allen et al. 1987). Model II allows for large scale applications by using remotely sensed data. The study area used for this Project is the RSA and thus model II was used. The remotely sensed data used for this analysis in the RSA is land cover data acquired from LIO and the habitats in the LSA were identified through the field surveys. As the LIO land cover data was limited in its identification of wetlands, particularly non-forested wetlands, the wetland data mapped for the Seine River wetland mapping exercise (MNR 2010) and the NRVIS moose aquatic feeding area layer were used to determine the location of wetlands in the RSA.

The model quantifies four variables based on annual land cover types, representing major habitat components for moose: (1) regenerating forest; (2) non-forested wetland; (3) spruce/fir forest; and (4) deciduous/mixed forest. This model assumes that adult moose need each of these habitat types to fulfill annual life history requirements and thus each habitat is weighted equally. However, if any one of the variables does not occur within the evaluation area, other than wetlands, suitability will equal zero.

The model was found to be useful in comparing the relative habitat suitability of different plots of land in Vermont as well as quantifying change in habitat suitability following habitat altering events and identifying habitat variation between the plots (Koitzsch 2002).

HSI model analysis was performed in a GIS platform and compared the relative habitat suitability in the following two assessment cases in Table 3-14.

Table 3-14: Contents of Each Assessment Case

Baseline Case	Application Case
Range of conditions of all previous and existing projects prior to the Project	Baseline Case plus the Project

In order to calculate HSI values for the various habitat variables, formulas were developed as follows:

Regenerating forest <20 years old- (Suitability Index) SI_1

$SI_1 = \frac{5}{2}x$ [0%-40% areal coverage in evaluation unit];

$SI_1 = 1$ [40% -50% areal coverage in evaluation unit]*

*formula not developed for >50% areal coverage as this extent was not determined in any evaluation unit.

Non-forested wetlands- SI_2

$SI_2 = 16x + 0.2$ [0%-5% areal coverage in evaluation unit]

$SI_2 = 1$ [5% to 10% areal coverage in evaluation unit]

$SI_2 = -\frac{10}{9}x + \frac{10}{9}$ [10%-100% areal coverage in evaluation unit]

Spruce-Fir Forest - SI_3

$SI_3 = 20x$ [0%-5% areal coverage in evaluation unit]

$SI_3 = 1$ [5% to 15% areal coverage in evaluation unit]

$SI_3 = -\frac{10}{9}x + \frac{10}{9}$ [15%-100% areal coverage in evaluation unit]

Deciduous/Mixed Forest - SI_4

$SI_4 = \frac{20}{7}x$ [0%-35% areal coverage in evaluation unit]

$SI_4 = 1$ [35% to 55% areal coverage in evaluation unit]

$SI_4 = -\frac{20}{9}x + \frac{20}{9}$ [55%-100% areal coverage in evaluation unit]

To determine change in habitat suitability among the assessment cases, the RSA was subdivided into 10 km^2 evaluation units/areas. Each 10 km^2 polygon was given the score based on the percentage of the variables SI_1, SI_2, SI_3, and SI_4 in a given hexagonal polygon. Once that was completed, the calculation $HS = \sqrt[4]{(SI_1 * SI_2 * SI_3 * SI_4)}$ was applied to each hexagon.

Polygons were ranked as *most suitable*, *suitable* and *least suitable* habitat based on the HS scores and categorized as *unsuitable* when any one of the variables other than wetlands did not occur within the evaluation area. *Most suitable* habitats include habitats with HS scores greater than or equal to 0.67, *suitable* habitats included habitats with scores greater than or equal to 0.32 but less than 0.66, and *least suitable* habitats included habitats with score less than or equal to 0.31.

To determine Project effects on moose habitat quality, movement, and behaviour, a 500 meter zone of influence was applied to all developments in the RSA (Laurian et al. 2008). To provide a conservative estimate of sensory disturbance effects, all habitat within the zone of influence was considered to be removed from the landscape (i.e., moose were considered to not use any habitat within 500 m of human developments). The incremental and cumulative changes on moose habitat quality from sensory disturbance associated with the Project and other developments were estimated by calculating the relative difference between the application case and baseline case and the following equation was used:

- (application case value – baseline value) / baseline value

The resulting value was then multiplied by 100 to give the percent change in the amount of most suitable, suitable, least suitable and unsuitable habitats for comparison, and provides both direction and magnitude of the effect.

Results

The results are illustrated in Figures 3-2 and 3-3 and are provided in the table below.

Table 3-15: Relative Change in the Availability of Different Habitats in the RSA for Moose from Baseline to the Application of the Project

Habitat Type	Baseline Case (area) km^2	Application Case	% change
Unsuitable	3770	3780	0.26
Least Suitable	870	870	0
Suitable	2520	2510	-0.39
Most Suitable	250	250	0

The total area of the most suitable moose habitat in the RSA is 250 km^2. Under the application case, there is no change predicted to this habitat. The area of suitable moose habitat is predicted to decrease by 10 km^2 due to the presence of the Project, which is a decrease of 0.39%. The area of least suitable habitat is not predicted to change due to the Project. The area of unsuitable habitat is expected to increase by 10 km^2 and this is an increase of 0.26%. These changes are expected to have a negligible effect on moose population and distribution in the RSA. The effects of sensory disturbances on moose are further discussed in Section 3.5.1.5.

Environmental Design Features and Mitigation

Moose will eventually habituate to the noise and level of disturbance of the Project. The proposed project works and activities will be conducted in accordance with the *Fish and Wildlife Conservation Act,* 1997, in that wildlife shall not be knowingly (or with any intent) killed, harmed or harassed during construction, operations or closure activities.

550000
600000
650000
700000
5500000
5450000
5400000
5350000

Highway 17
Ignace
Highway 17
Highway 622
Atikokan
Highway 17

N

LEGEND

- City/Town
- Provincial Highway
- Power Transmission Line
- Existing Railway
- Project Facilities
- Lake

Habitat Categories

- Least Suitable Habitat (0 - 0.31)
- Suitable Habitat (0.32 - 66)
- Most Suitable Habitat (0.67-1.0)
- Habitat Categories
- Regional Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

18,000 0 18,000
SCALE 1:750,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
MOOSE HABITAT SUITABILITY INDEX BASE CASE

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	JO	23 Jan. 2013		
GIS	JO	13 Feb. 2013		
CHECK	EG	13 Feb. 2013		
REVIEW	EG	13 Feb. 2013		

FIGURE: 3-2

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550000
600000
650000
700000
5500000
5450000
5400000
5350000

Highway 17
Ignace
Highway 17
Highway 622
Atikokan
Highway 11

N

LEGEND

- City/Town
- Provincial Highway
- Power Transmission Line
- Existing Railway
- Project Facilities

Habitat Categories

- Least Suitable Habitat (0 - 0.31)
- Suitable Habitat (0.32 - 66)
- Most Suitable Habitat (0.67-1.0)
- Unstuitable Habitat
- Lake
- Regional Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

18,000 0 18,000
SCALE 1:750,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
MOOSE HABITAT SUITABILITY INDEX APPLICATION CASE

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	JO	23 Jan. 2013		
GIS	JO	13 Feb. 2013		
CHECK	EG	13 Feb. 2013		
REVIEW	EG	13 Feb. 2013		

FIGURE: 3-3

G:\Projects\2010\10-1118-0020_BretHResources_HammondReef\GIS\MXDs\Working\Terrestrial\MooseHSI_Application.mxd

3.5.1.3 Effect 3 – Alteration of Flows and Drainage Patterns in Habitat

Critical components of moose habitat are the aquatic feeding area(s) in which they consume large quantities of predominantly submergent vegetation. Some of these feeding areas have been identified by the MNR as depicted on Figure 2-10, and the potential for others have been identified through the assessment of suitable ecosites in the LSA. The ecosites that have the potential to support moose aquatic feeding requirements are marshes: W1, W2, W3, W4, W5, and W10. These marshes rely on water levels and flows to maintain growth of the favored plant species for moose.

A summary of predicted changes to the flows in the local watersheds (Hydrology TSD, Figure 2-3) indicate a reduction in flows in Lumby Creek (watershed that includes Lizard Lake) of approximately 7% to 8% as a result of the interception of runoff from the Project footprint by the water collection system; and an increase in flows in Sawbill Creek (flows into Sawbill Bay) of less than 1% due to the discharge of treated sewage effluent from the accommodation camp.

The watersheds in the Project area will experience the greatest changes in flows as a result of changes to their tributary drainage areas. Of the 44 watersheds evaluated, three will be reduced in size by less than 10%, six will be reduced in size by less than 50%, nine will be reduced in size by less than 90%, and six will be reduced in size by more than 90% (one by 100%). Changes to tributary drainage areas will occur due to the interception of runoff from areas within the Project footprint by the water collection system. Changes in flows are expected to be roughly proportional to changes in tributary drainage area.

Based on the reduced tributary drainage areas and the proposed water taking activities from the Upper Marmion Reservoir, it is predicted in the Hydrology TSD that during the operations of the Project the maximum relative change (decreases) in monthly mean water levels in Upper Marmion Reservoir ranges from -8 to -9 cm for average, wet and dry year conditions, and the maximum relative change (decreases) in monthly mean outflows ranges from -0.8% to -4.0% for average, wet and dry year conditions, between baseline conditions and Project conditions. Water taking from Upper Marmion Reservoir is expected to decrease/lower the water level in Sawbill Bay by 5-7 cm annually. The existing water level fluctuations in Upper Marmion Reservoir annually are up to 2.5 m. Therefore, an incremental change of 5-7 cm annually is expected to have a negligible effect on the suitability of shoreline wetlands in Upper Marmion Reservoir for moose.

Surface water modelling was completed for Lizard Lake based on the bathymetry survey in 2011. The estimated maximum change in monthly mean water level in Lizard Lake is -3 cm as a result of runoff interception at the TMF. The estimated maximum change in monthly mean inflows and outflows to Lizard Lake using the same model is -8%. The reduction in tributary drainage area to the lake outlet is 7%. The greatest changes are expected to occur during the spring and summer months, and the smallest changes during the late fall/winter. The MNR identified an area known to provide moose aquatic feeding opportunity at the north end of Lizard Lake (Figure 2-10). The predicted changes in the Lizard Lake watershed are expected to have a negligible effect on the shoreline wetlands in Lizard Lake and thus a negligible effect on moose habitat.

Water levels in an Unnamed Lake (API #8 in the Aquatic Environment TSD) located to the east of the TMF in site scale watershed R are expected to be influenced by Project activities. Changes in the range of -2.1 cm to 0.0 cm are expected during the Operations phase, with the greatest changes occurring during the spring and the smallest changes occurring during the late fall/winter. An incremental decrease of 2 cm is expected to have a negligible effect on the riparian wetland downstream of this lake and thus a negligible effect on moose habitat.

Environmental Design Features and Mitigation

The Project Site drainage system has been designed to convey drainage across the site with minor disruption to the habitats surrounding the Project footprint. In this manner, in the wetlands that are located outside of the footprint of the Project infrastructure but in the upper part of the watersheds are not expected to change as any runoff to the Project footprint will be collected in the site drainage system and used in the mine operation or conveyed around the footprint to the downstream catchments.

A site water balance has been calculated. This has contributed to site drainage plans to minimize the change to flows throughout the LSA. Thus the water flowing in to the Project footprint will continue to be conveyed through a drainage system around Project facilities so that water does not get backed up and flood new areas. This water either gets collected for the Project Site water needs or get re-directed to the watersheds downstream of Project facilities. Therefore, the downstream watersheds will continue to receive flows that are redirected around the Project. While there will be changes to flows and drainage patterns, these changes have been minimized through a Project Site drainage management plan.

The access road follows an existing road way, but the existing road will need to be widened to accommodate the mine construction and operations traffic. Therefore, the widening will provide an opportunity to improve culvert crossings if required at streams and wetland crossings to improve/maintain drainage.

Wetlands are also being created to offset the loss. These wetlands are being created for the fish habitat compensation package. However, these created wetlands will compensate for the loss of ecological and hydrological functions of wetlands.

Environmental design features to reduce the amount of water required for Ore Processing Facility operations and domestic uses include the capture and reuse of site water. The water requirements for the Project are not expected to change drainage flows and surface water levels beyond the natural variability of the baseline conditions in Upper Marmion Reservoir, and should result in a minor change to shoreline wetlands in the Upper Marmion Reservoir. Therefore, this pathway is expected to have negligible effects to the persistence of marsh communities and therefore potential moose aquatic feeding areas in Upper Marmion Reservoir.

3.5.1.4 Effect 4 – Changes to Surface Water and Groundwater Quality

Surface runoff from the newly cleared lands during construction could potentially carry sedimentation and deposit in moose habitat areas. Surface water that collects in the open pits and runs off of the WRMF, and the Ore Processing Facility could potentially affect surface water and groundwater quality and thus the quality of plants in moose aquatic feeding areas.

Leaching of dissolved metals from WRMF may cause changes to groundwater and surface water quality and soils, which may affect vegetation growth and health. The effects of contaminants in the environment are assessed in the Human Health and Ecological Risk Assessment TSD.

Environmental Design Features and Mitigation

Water that collects in the open pits from groundwater seepage and from rain and snow will be pumped to the PPCP. Other runoff from the Project Site will be collected in the site drainage systems and transferred to the TMF retention pond or the PPCP. Water collected in the PPCP will be recycled into the system to the extent that it is needed. Excess water will be treated and released into Upper Marmion Reservoir. Sewage will be treated

in the STP and the effluent will either be reused during the processing of ore or discharged to Upper Marmion Reservoir after treatment.

Implementation of these environmental design features is expected to result in no detectable changes to vegetation adjacent to the Project. Subsequently, this pathway was determined to have a negligible effect on moose habitats or food resources.

3.5.1.5 Effect 5 – Sensory Disturbance of Moose

Sensory disturbance can change the amount of different quality habitats, and alter wildlife movement and behaviour (distribution). Types of sensory disturbance include increased noise levels during construction and operations, visual disturbances from moving vehicles and human intrusion throughout construction and operations. Animals may respond to such disturbances by reducing their use of certain areas or altering their movement patterns within an area (e.g., Tyler 1991; Fortin and Andruskiw 2003; Bayne et al. 2008). Individuals may also respond to sensory disturbances by changing the timing of feeding activities and reducing the amount of time spent feeding. In some situations these behavioural changes can lead to a reduction in fitness (Habib et al. 2006). Effects can vary and responses appear to be species-specific and seem to depend on the type of disturbance (e.g., visual, noise, smells), the frequency and intensity of the disturbance, and the level of habituation to disturbance (Fortin and Andruskiw 2003; Bayne et al. 2008; Fahrig and Rytwinksi 2009).

For the noise quality modelling for the Project, it was assumed that the operational noise levels are a bounding scenario and the expected levels during construction would not exceed those during operations. The noise model used a baseline noise level of 45 dB at night and 50 dB during the day in the vicinity of the Project Mine Site. Appendix 2.VII Figure 1 shows the predicted noise levels for the Project.

In terms of noise disturbance, an increase in 3 dB to 10 dB corresponds to a 30% to 90% reduction in alerting distances (maximum distance at which a signal can be heard by an animal) for wildlife (Barber et al. 2010). The highest noise levels are centered on the mine pits (70-85 dB). Most of the habitat near the open pits will be cleared and thus it is not likely that moose will be exposed to the maximum noise levels near the pits. Up the peninsula to the location northeast of the proposed WRMF, the predicted noise level ranges between 50-60 dB which is an increase of only 5-15 dB maximum. Then further northeast, the predicted noise levels quickly attenuate back to normal ranges of 45-50 dB which corresponds to habitat areas outside of the mine footprint. So, while the predicted noise levels near the open pit could alter wildlife behaviour, it is not anticipated that moose will inhabit these areas once development occurs. The areas they may inhabit after development are further to the northeast of the open pits and predicted noise levels in this area are within the baseline ranges.

Other habitat areas further to the south and west of the mine operations also will have elevated noise levels such as some of the islands in Sawbill Bay and Lynxhead Bay. Predicted noise levels out in the bay however are 60-65 dB and once they reach land are lowered further to 55-60 dB which is slightly higher than baseline noise levels. Moose tend to be more sensitive to the presence of humans rather than mechanical noise (Lykkja et al. 2009). Therefore, the predicted noise levels from the operations of the Project are not expected to alter moose behavior.

A summary of the maximum distances for operation-related noise to attenuate to background levels as shown in Appendix 2.VII Figure 1 is 6.7 km. This distance is in a north-easterly direction from the open pits and processing plant. When Project noise predictions diminish to levels below background, they are not expected to be distinguishable from natural noises.

Populations of species in the RSA with moderate to large home ranges (e.g., moose, black bear, marten) and species with low densities (e.g., water birds) are not expected to be affected by noise from the Project because noise is expected to attenuate at 6.7 km for normal operations.

Environmental Design Features and Mitigation

Initially, moose and other wildlife will be displaced from the MSA during land clearing and construction activities. This initial displacement during site preparation and construction will be temporary and moose will return to the area after a period of noise habituation. The proposed project works and activities will be conducted in accordance with the *Fish and Wildlife Conservation Act*, 1997, in that wildlife shall not be knowingly (or with any intent) killed, harmed or harassed during construction, operations or closure activities.

3.5.1.6 Effect 6 – Vehicle Injury/Mortality of Moose

The construction and operation of the Project will result in an increase in the volume of traffic in the LSA. As such the potential for collisions of vehicle with wildlife may increase. Traffic speed and volume are the primary factors that contribute to road-related wildlife mortality. In Ontario, the Ministry of Transportation (MTO) reports that one out of every 17 motor vehicle collisions involves wildlife. The MTO goes on to state that in 2007, 13,954 collisions with wildlife were reported (more go unreported) and the number is increasing every year (MTO 2012).

Roads offer an easy travel route for some animals like moose, especially in the winter (Rost and Bailey 1979). Moose may also be attracted to the presence of deciduous vegetation in roadside ditches (Laurian et al. 2008) as well as the runoff from salted roads in the spring. Therefore, there is an increased risk for vehicle collisions with moose.

Environmental Design Features and Mitigation

Speed limits will be posted and enforced on the mine roads. The maximum speed will be 60 km/h on the access road and mine site road. The lower speed will permit motorists and animals to avoid collisions. Warning signs will be posted near high collision sections of the access road and mine site road. Additionally, awareness training of this hazard to wildlife and workers will be provided.

3.5.1.7 Effect 7 – Dust Deposition and Air Emissions

The direct effects of dust on wildlife have not thoroughly researched but may include stressed respiratory function. Fugitive dust deposition associated with mining activities, road use, and maintenance has the potential to alter vegetative food sources making leaves or browse unpalatable (Auerbach et. al., 1997).

Sources of dust generation for the Project include blasting activities, and the operation of the processing plant. Air quality modeling was completed to predict the spatial extent of dust deposition and air emissions from the Project. The air emission modelling results are displayed on Figures 3-1, 3-2 and 3-3 (Appendix 2.VI Figures 1, 2 and 3).

As the prevailing winds are from the northwest, the results of the air quality modelling predicted that the maximum annual dust deposition resulting from the Project is 150 grams per square metres per year ($g/m^2/y$) to the east-southeast of the open pits and processing plant and 90 $g/m^2/y$) to the east-southeast of the WRMF (Appendix 2.VI Figure 3). At approximately 750 m away from the pit the deposition rate is down to half of the peak, at 70 $g/m^2/y$. Further north on the peninsula away from the open pits, the concentration goes down to 20 $g/m^2/y$ near Snail Bay. These concentrations are not expected to result in measurable changes to vegetation

in the remaining habitat areas on the Mine Site and thus a negligible effect on moose habitat and food resources.

Acid deposition from air emissions includes the deposition of sulphur oxides, nitrogen oxides, hydrogen, metals, and some organic compounds (Rusek and Marshall 2000) onto soil and vegetation. Potential acid input from air emissions can change the chemical properties of soil and water, which can affect vegetation growth. Sulfur dioxide and nitrogen oxides are the major precursors of acid rain.

The air emission modelling results show that predicted annual peak concentrations for sulphur dioxide and nitrogen dioxide are very low at 1.5 ug/m^3 and 40 ug/m^3 respectively. These peak concentrations occur to the southeast of the open pits. Beyond the LSA, the NO_2 concentration is low at 5-10 ug/$m^{3.}$ and within the LSA and beyond the SO^2 concentration is very low at 0.26-0.50 ug/m^3.

The Geochemistry, Geology and Soil TSD indicates that the interaction between air emissions and soils, in particular NO_x and SO_2 is anticipated to be negligible to low and thus was not assessed further (Table 7-7, Section 4.3 in that TSD).

Plant health can also be affected by other industrial air emissions, and operational activities such as salt application associated with road use and maintenance because these activities can lead to reduced plant photosynthetic capability and reproductive effort (Eller 1977; Forbes 1995), retarded growth (Spatt and Miller 1981), and altered respiration processes (Svoboda 1997). These effects can then influence the wildlife species that forage on plants and ingest soils. These potential effects have been considered in the Human Health and Ecological Risk Assessment TSD.

Although concentrations are predicted to be above baseline conditions, the anticipated changes to vegetation are localized and considered minor, which should have a negligible effect on wildlife that consume these plants. The maximum predicted annual deposition rate of potential acid input and maximum concentration of nitrogen dioxide are both expected to occur to the southeast of the Project centre but these values are relatively low. The deposition predictions are considered to be conservative, and therefore the presented deposition rates are most likely overestimated. Therefore, changes in vegetation quality due to dust deposition and air emissions are anticipated to be minor relative to baseline conditions. Consequently, residual effects to moose from dust deposition and air emissions are predicted to be negligible.

Environmental Design Features and Mitigation

Design features and mitigation measures to control dust and other air emissions include:

- The watering of roads and laydown areas during the non-winter period will facilitate dust suppression.
- Enforcing speed limits will help reduce dust production.
- Equipment and fleet equipped with industry-standard emission control systems.
- Sources of particulate emissions at the processing facility will be controlled through the use of baghouses
- Enclosing conveyance systems and processing facilities (baghouse).

- Processing equipment with high efficiency bag houses to reduce emissions of particulate matter
- Operating procedures will be developed that reduce dust generation and air emissions (e.g., regular maintenance of equipment to meet emission standards).

With the use of these design features and mitigation measures the residual effects to moose from dust deposition and air emissions are predicted to be negligible.

3.5.1.8 Effect 8 – Attraction of Predators

The Project has the potential to attract predators such as black bears and wolves to the camp food wastes, etc. As such, the increase in predators around the Project has the potential to affect prey species such as moose through increased predation.

Research in recently logged area, suggests that clearing activities do not necessarily make moose more vulnerable to predation by wolves (Kunkel et al. 2000). It is suggested that clearing may allow moose to detect predators more easily and avoid areas of heavy predator use. However, the potential for this effect on moose remains and mitigation measures are detailed below.

Environmental Design Features and Mitigation

An industrial and domestic waste management plan will be developed and implemented from construction through to closure. This plan will include the utilization of appropriate waste receptacles that limit attraction of wildlife. Food wastes will be incinerated regularly and littering and feeding of wildlife will be strictly prohibited.

All workers will be educated on the risk associated with feeding wildlife and careless disposal of food garbage. Proper waste management techniques will be conveyed to all workers and visitors to the site. Periodic, ongoing review of the efficiency of the waste management program and improvement through adaptive management practices.

With diligent application of these mitigation measures, the Project is anticipated to have a negligible effect on the attraction of predatory species and thus this effect on moose is not advanced in the assessment.

3.5.2 Residual Effects

There is one residual effect on moose that has not been fully mitigated: the loss and fragmentation of habitat in the LSA.

3.5.2.1 Residual Effect 1-Habitat Loss or Fragmentation for Moose

Based on the large ranges of moose populations, the relevant spatial area for the assessment of effects on moose is the RSA. The habitat loss that will occur is confined to the mine site and thus the geographic extent is evaluated as low.

The Project footprint will remove 10.5% of the highly suitable moose habitat available in the LSA and approximately 0.1% in the RSA. This effect has a negligible magnitude.

The loss and alteration of habitats will occur during construction and persist throughout the lifetime of the project (15 years) and into closure (medium-term). Habitat loss is reversible with time, however it will take a number of

years for the rehabilitated Mine Site to mature into quality habitats for moose. The duration is evaluated as moderate.

3.5.2.2 Residual Effect 2-Change in Habitat Suitability for Moose

The presence of the Project has no effect on the most suitable areas of moose habitat available in the RSA and approximately 0.1% in the RSA. The portions of suitable moose habitat are predicted to decrease by 10km^2 or 0.39%. The area of least suitable habitat is not predicted to change due to the Project. The area of unsuitable habitat is expected to increase by 10 km^2 and this is an increase of 0.26%. These changes are expected to have a negligible effect on moose population and distribution in the RSA.

The change in habitat quality will occur during construction and persist throughout the lifetime of the project (15 years) and into closure (medium-term). Change in habitat is reversible with time, and the duration is evaluated as moderate.

3.5.3 Summary of Residual Effects

Table 3-16: Summary of Residual Effects to Moose

	Geographic Extent	Magnitude	Duration
Loss of Habitat	Low	Negligible	Moderate
Change in Habitat Suitability	Moderate	Negligible	Moderate

As moose are wide-ranging animals with extensive home ranges the highest ranking effects on this VEC would be at a large scale. Therefore, the extent of habitat loss at the MSA is expected to be of low impact to moose.

The reversibility of the habitat loss is ranked as reversible in time, meaning that during post-closure lands will be re-forested and rehabilitated so that moose may once again return to inhabit these areas. In post-closure, the mine site will be revegetated and the habitats lost to the Project will be restored. At post-closure the consequence to moose from the habitat loss is expected to be negligible.

The effect of the presence of the mine on the suitability of habitat for moose is considered to be negligible due to the availability of moose habitat in the RSA and the reversibility of the effect at closure. Overall, the significance of effects on moose is expected to be negligible.

The losses described in this section represent the worst-case scenario. Since conservative estimates of effective habitat loss were considered in the assessment. Based on this analysis, it is highly unlikely that residual impacts to moose related to the Project will result in measurable changes in moose population distribution or abundance. Monitoring activities will attempt to illustrate that this is indeed the case. If not, an adaptive management strategy will be taken to ensure that perceived significant impacts are reduced further.

3.6 Furbearers

A screening of potential interaction of the proposed mine project works and activities on furbearers is contained in Tables 3-4 to 3-8. The effects assessment below focusses on two locally abundant furbearer indicator species, namely American marten and Muskrat.

3.6.1 Potential Pathways for Effects

Potential pathways through which the Project could affect furbearers are summarized in Table 3-11 and are as follows:

- Habitat Loss or Fragmentation (construction).
- Alteration of flows and drainage patterns in habitat (construction).
- Changes in surface water quality and groundwater quality (construction and operations).
- Sensory Disturbances (construction and operations).
- Vehicle Injury/Mortality (construction and operations).
- Air emissions and dust deposition (construction and operations).
- Attraction of predators (construction and operations).

3.6.1.1 Effect 1 – Habitat Loss or Fragmentation

The removal of vegetation communities during site clearing will eliminate or alter some wildlife habitat for furbearers. The assessment of these habitat losses/alterations for furbearers is conducted on the indicator species; marten and muskrat. These two species were chosen as they require very different habitats to carry out their life stages; marten being primarily a forest species and muskrat being an aquatic mammal living in marshes and other aquatic systems. Additionally, these two species make up the majority of the trapping harvest in the LSA (MNR data, 2012). For these species, a literature review of their habitat requirements has been conducted and a ranking of the habitat suitability of the ecosites in the LSA has been conducted. The LSA is an appropriate scale at which to predict changes for this VEC, and is a scale which contains home range sizes and population interactions.

Marten

In *the Forest Management Guidelines for the Provision of Marten Habitat*, Baker et al. 2010 summarizes predicted marten forest type uses in northwestern Ontario based on FEC types used in the boreal forest of Ontario. These were used as the basis for the following table which classifies the ecosite codes present in the LSA based on their habitat suitability for marten (Table 3-17).

Table 3-17: Habitat Suitability Ranks[(a)] for Marten based on Ecosites in the Project Local Study Area

Ecosite Code	Habitat Suitability Ranking	Habitat Area in the Local Study Area (ha)	Habitat Area Lost in the Local Study Area (ha)	% Lost
ES-A	Low	216.87	0.35	0.16%
ES-B	Low	722.71	233.60	32.32%
ES-C	Low	163.89	17.69	10.79%
ES-D	Low	88.07	0.00	0.00%
ES-E	Medium	1,228.75	191.22	15.56%
ES-F	High	1,280.84	65.51	5.11%
ES-G	Medium	578.13	29.58	5.12%
ES-H	Medium	821.04	178.79	21.78%
ES-I	Medium	203.80	55.40	27.19%

Notes:
(a) Data on habitat suitability based on ecosite taken from Baker et al. 1996.

Of the 1,280.9 ha of high suitability marten habitat present in the mine site LSA, 65.51 ha (0.01% of total LSA area) or 5.11% is effectively lost due to mine development activities. Of the approximately 2,831 ha of moderately suitable marten habitat present in the LSA, 455 ha or 16.07% is lost to mine development. These losses are forwarded to the assessment of residual effects on furbearers.

Muskrat

Similarly, a ranking of suitable wetland and aquatic communities was determined for muskrat based on a review of relevant literature. Using Habitat Suitability Index Models: Muskrat (Allen and Hoffman 1984), wetland ecosites in the LSA were ranked on their suitability to provide key habitat components for muskrat (food, cover, overwintering). Moderate-to-highly suitable habitats are wetland ecosites classified as open water marsh or marsh containing emergent vegetation typically established in areas of low flow and in quiet bays (Table 3-18).

Table 3-18: Habitat Suitability Ranks for Muskrat based on Ecosites in the Project Local Study Area

Ecosite Code	Habitat Suitability Ranking	Habitat Area in the Local Study Area (ha)	Habitat Area Lost in the Local Study Area (ha)	% Lost
W1	Medium	2.43	0.59	24.27%
W2	Low	4.02	0.00	0.00%
W3	Medium	15.20	3.58	23.55%
W4	Medium	18.38	3.00	16.30%
W5	High	17.51	2.66	15.17%
W10	High	9.84	0.00	0.00%
W11	High	2.75	0.00	0.00%
W12	Medium	54.07	2.82	5.22%
W13	Low	34.20	7.68	22.46%
W14	Low	81.76	4.35	5.33%

Table 3-18: Habitat Suitability Ranks for Muskrat based on Ecosites in the Project Local Study Area (Continued)

Ecosite Code	Habitat Suitability Ranking	Habitat Area in the Local Study Area (ha)	Habitat Area Lost in the Local Study Area (ha)	% Lost
W15	Low	18.48	3.03	16.41%
W19	Low	27.22	26.72	98.19%
W20	Low	26.39	14.42	54.65%
W21	Low	15.14	0.00	0.00%
W24	Low	1.05	0.00	0.00%

Of the 30.10 ha of high suitability muskrat habitat present in the mine site LSA, 2.66 ha (.03% of total LSA area) or 8.8% is effectively lost due to mine development activities. Of the approximately 72.45 ha of moderately suitable muskrat habitat present in the LSA, 5.82 ha or 8.0% is lost to Project mine development.

Environmental Design Features and Mitigation

The Project layout, design and infrastructure placement has been selected in order to minimize the ecological footprint. The intent has been to keep intact as much existing forest and wetland as possible by avoiding options to put facilities further to the east (southeast of Lizard Lake) and by using existing access routes for linear infrastructure.

Furbearers will likely be displaced from the footprint of the Project Site once land clearing activities are underway. However, should an individual be encountered during Project construction, operations or closure activities, appropriate steps will be taken to eliminate risk to the animal. The proposed Project works and activities will be conducted in accordance with the Fish and Wildlife Conservation Act, 1997, in that wildlife shall not be knowingly (or with any intent) killed, harmed or harassed during construction, operations or closure activities. For instance, if initial clearing and construction activities disturb a den or hibernation site, the work will temporarily be stopped until the risk of killing, harming or harassing the animal(s) has been managed.

3.6.1.2 Effect 2 – Alteration of Flows and Drainage Patterns in Habitat

Muskrat and other aquatic furbearers (e.g., beaver) need permanent water bodies for most of their life requirements. As noted previously, muskrat need a consistent water level such that it's deep enough to avoid freezing to the bottom over winter. This is also true for other aquatic mammals.

A summary of predicted changes to the flows in the local watersheds (Hydrology TSD Figure 2-3) indicate a reduction in flows in Lumby Creek (watershed that includes Lizard Lake) of approximately 7% to 8% as a result of the interception of runoff from the Project footprint by the water collection system; and an increase in flows in Sawbill Creek (flows into Sawbill Bay) of less than 1% due to the discharge of treated sewage effluent from the accommodation camp.

The site watersheds will experience the greatest changes in flows as a result of changes to their tributary drainage areas. Of the 44 watersheds evaluated, three will be reduced in size by less than 10%, six will be reduced in size by less than 50%, nine will be reduced in size by less than 90%, and six will be reduced in size by more than 90% (one by 100%). Changes to tributary drainage areas will occur due to the interception of

runoff from areas within the Project footprint by the water collection system. Changes in flows are expected to be roughly proportional to changes in tributary drainage area.

Environmental Design Features and Mitigation

The Project Site drainage system has been designed to convey drainage across the site with minor disruption to the habitats surrounding the project footprint. In this manner, in the wetlands that are located outside of the footprint of the Project infrastructure but in the upper part of the watersheds are not expected to change as any runoff to the Project footprint will be collected in the site drainage system and used in the mine operation or conveyed around the footprint to the downstream catchments.

A site water balance has been calculated. This has contributed to site drainage plans to minimize the change to flows throughout the LSA. Thus the water flowing in to the Project footprint will continue to be conveyed through a drainage system around Project facilities so that water does not get backed up and flood new areas. This water either get collected for the Project water needs or get re-directed to the watersheds downstream of Project facilities. Therefore, the downstream watersheds will continue to receive flows that are redirected around the Project. While there will be changes to flows and drainage patterns, these changes have been minimized through a site drainage management plan.

The access road (Hardtack/Sawbill) follows an existing road way, but the existing road will need to be widened to accommodate the mine construction and operations traffic. Therefore, the widening will provide an opportunity to improve culvert crossings if required at streams and wetland crossings to improve/maintain drainage.

Wetlands are also being created to offset the loss. These wetlands are being created for the fish habitat compensation package. However, these created wetlands will compensate for the loss of ecological and hydrological functions of wetlands.

Environmental design features to reduce the amount of water required for Project operations and domestic uses include the capture and reuse of site water. The water requirements for the Project are not expected to change drainage flows and surface water levels beyond the natural variability of the baseline conditions in Upper Marmion Reservoir, and should result in a minor change to shoreline wetlands in the Upper Marmion Reservoir. Therefore, this pathway is expected to have negligible effects on the persistence of marsh wetland and riparian communities and therefore aquatic furbearer habitat in Upper Marmion Reservoir is not expected to be altered. However, there will be a residual effect on other wetlands in and around the LSA and this residual effect on furbearers is advanced for an assessment of significance.

3.6.1.3 Effect 3 – Change in water levels

As muskrat and other aquatic furbearers are dependent on water levels to maintain overwintering conditions, a change in water levels has the potential to affect their habitats. Based on the reduced tributary drainage areas and the proposed water taking activities from the Upper Marmion Reservoir , it is predicted in the Hydrology TSD that during the operations of the Project the maximum relative change (decreases) in monthly mean water levels in Upper Marmion Reservoir ranges from -8 to -9 cm for average, wet and dry year conditions, and the maximum relative change (decreases) in monthly mean outflows ranges from -0.8% to -4.0% for average, wet and dry year conditions, between baseline conditions and project conditions. Water taking from Upper Marmion Reservoir is expected to decrease/lower the water level in Sawbill Bay by 5-7 cm annually. The existing water level

fluctuations in Upper Marmion Reservoir annually are up to 2.5 m. Therefore, an incremental change of 5-7 cm annually is expected to have a negligible effect on the suitability of shoreline wetlands in Upper Marmion Reservoir for furbearers.

Surface water modelling was completed for Lizard Lake based on the bathymetry survey in 2011. The estimated maximum change in monthly mean water level in Lizard Lake is -3 cm as a result of runoff interception at the TMF. The estimated maximum change in monthly mean inflows and outflows to Lizard Lake using the same model is -8%. The reduction in tributary drainage area to the lake outlet is 7%. The greatest changes are expected to occur during the spring and summer months, and the smallest changes during the late fall/winter. The MNR identified an area known to provide moose aquatic feeding opportunity at the north end of Lizard Lake (Figure 2-10). The predicted changes in the Lizard Lake watershed are expected to have a negligible effect on the shoreline wetlands in Lizard Lake and thus a negligible effect on furbearer habitat.

Water levels in an Unnamed Lake (API #8 in the Aquatic Environment TSD) located to the east of the TMF in site scale watershed R are expected to be influenced by Project activities. Changes in the range of -2.1 cm to 0.0 cm are expected during the Operations phase, with the greatest changes occurring during the spring and the smallest changes occurring during the late fall/winter. An incremental decrease of 2 cm during the spring is expected to have a negligible effect on the riparian wetland downstream of this lake and thus a negligible effect on furbearer habitat.

Environmental Design Features and Mitigation

Environmental design features that will be implemented to reduce the amount of water required for operations and domestic uses include the capture and reuse of site water. The water requirements for the Project are not expected to change drainage flows and surface water levels beyond the natural variability of the baseline conditions in Upper Marmion Reservoir, and should result in a minor change to wetlands. This pathway is expected to have negligible effects to the persistence of wetland plant populations and wetland communities in the LSA.

3.6.1.4 Effect 4 – Changes to Surface Water and Groundwater Quality

Surface runoff from the newly cleared lands during construction could potentially carry sedimentation and deposit in muskrat habitat areas. Surface water that collects in the open pits and runs off of the WRMF, and the Ore Processing Facility could potentially affect surface water and groundwater quality and thus the quality of habitats and food resources for some aquatic furbearers.

Leaching of dissolved metals from WRMF may cause changes to groundwater and surface water quality and soils, which may affect vegetation growth and health. The effects of contaminants in the environment are assessed in the Human Health and Ecological Risk Assessment TSD.

Environmental Design Features and Mitigation

Water that collects in the open pits from groundwater seepage and from rain and snow will be pumped to the PPCP. Other runoff from the Project Site will be collected in the site drainage systems and transferred to the TMF retention pond or the PPCP. Water collected in the PPCP will be recycled into the system to the extent that it is needed. Excess water will be treated and released into the Upper Marmion Reservoir. Sewage will be treated in the STP and the effluent will either be reused during the processing of ore or discharged to Upper Marmion Reservoir after treatment.

Implementation of these environmental design features is expected to result in no detectable changes to vegetation adjacent to the Project. Therefore, this pathway was determined to have no interaction with furbearer habitats or food resources.

3.6.1.5 Effect 5 – Sensory Disturbance

Sensory disturbance can change the amount of different quality habitats, and alter wildlife movement and behaviour (distribution).Types of sensory disturbance including increased noise levels during construction and operations, visual disturbances from moving vehicles and human intrusion throughout construction and operations. Animals may respond to such disturbances by reducing their use of certain areas or altering their movement patterns within an area (e.g., Tyler 1991; Fortin and Andruskiw 2003; Bayne et al. 2008). Individuals may also respond to sensory disturbances by changing the timing of feeding activities and reducing the amount of time spent feeding. In some situations these behavioural changes can lead to a reduction in fitness (Harrington and Veitch 1992; Habib et al. 2006). Effects can vary and responses appear to be species-specific and seem to depend on the type of disturbance (e.g., visual, noise, smells), the frequency and intensity of the disturbance, and the level of habituation to disturbance (Fortin and Andruskiw 2003; Bayne et al. 2008; Fahrig and Rytwinksi 2009).

For the noise quality modelling for the Project, it was assumed that the operational noise level is a bounding scenario and the expected levels during construction would not exceed those during operations. The noise model used a baseline noise level of 45 dB at night and 50 dB during the day in the vicinity of the Mine Site. Appendix 2.VII Figure 1 shows the predicted noise levels for the Project.

In terms of noise disturbance, an increase in 3 dB to 10 dB corresponds to a 30% to 90% reduction in alerting distances (maximum distance at which a signal can be heard by an animal) for wildlife (Barber et. al., 2010). The highest noise levels are centered on the open pits (70-85 dB). Most of the habitat near the open pits will be cleared and thus it is not likely that furbearers will be present or exposed to the maximum noise levels in those areas. The predicted noise levels in the peninsula northeast of the proposed WRMF range between 50-60 dB which is an increase of only 5-15 dB maximum. Then further northeast, the predicted noise levels quickly attenuate further to the northeast outside of the footprint, back to normal ranges of 45-50 dB. The areas they may inhabit after development are further to the northeast of the open pits and predicted noise levels in this area are within the baseline ranges.

Other habitat areas further to the south and west of the Project mine operations, including some of the islands in Sawbill Bay and Lynxhead Bay, will also have elevated noise levels. Predicted noise levels out in the bay range from 60-65 dB and once they reach land are lowered further to 55-60 dB, which is slightly higher than baseline noise levels. Therefore, the predicted noise levels from the operations of the Project are not expected to alter furbearer behavior.

A summary of the maximum distances for operation-related noise to attenuate to background levels as shown in Appendix 2.VII Figure 1 is 6.7 km. This distance is in a north-easterly direction from the open pits and Ore Processing Facility. When Project noise predictions diminish to levels below background, they are not expected to be distinguishable from natural noises.

Environmental Design Features and Mitigation

Initially, furbearers and other wildlife will be displaced from the MSA during land clearing and construction activities. This initial displacement during site preparation and construction will be temporary and they will likely return to the MSA after a period of noise habituation.

3.6.1.6 Effect 6 – Vehicle Injury/Mortality

The construction and operation of the Osisko Hammond Reef Gold Project will result in an increase in the volume of traffic in the LSA. As such, the potential for collisions of vehicle with wildlife may increase. Traffic speed and volume are the primary factors that contribute to road-related wildlife mortality. In Ontario, the Ministry of Transportation (MTO) reports that one out of every 17 motor vehicle collisions involves wildlife (MTO 2012). Furthermore, in 2007, 13,954 collisions with wildlife were reported (more go unreported) and the number is increasing every year (MTO 2012).

Environmental Design Features and Mitigation

Speed limits will be posted and enforced on the mine roads. The maximum speed will be 60km/h on the access road and mine site road. The lower speed will permit motorists and animals avoid collisions. Warning signs will be posted near high collision sections of the access road and mine site road. Additionally, awareness training of this hazard to wildlife and worker will be provided as standard training to mine staff.

3.6.1.7 Effect 7 – Dust Deposition and Air Emissions

The direct effects of dust on wildlife have not thoroughly researched but may include stressed respiratory function. Fugitive dust deposition associated with mining activities, road use, and maintenance has the potential to alter vegetative food sources making leaves or browse unpalatable (Auerbach et. al., 1997).

Sources of dust generation for the Project include vehicular traffic, blasting activities, and the operation of the Ore Processing Facility. Air quality modeling was completed to predict the spatial extent of dust deposition and air emissions from the Project. The air emission modelling results are displayed in Appendix 2.VI Figures 1, 2 and 3.

As the prevailing winds are from the northwest, the results of the air quality modelling predicted that the maximum annual dust deposition resulting from the Project is 150 grams per square metre per year ($g/m^2/y$) to the east-southeast of the open pits and Ore Processing Facility and 90 $g/m^2/y$) to the east-southeast of the WRMF (Appendix 2.VI Figure 3). At approximately 750 m away from the pit the deposition rate is down to half of the peak, at 70 $g/m^2/y$. Further north on the peninsula away from the pits, the concentration goes down to 20 $g/m^2/y$ near Snail Bay. These concentrations are not expected to result in measurable changes to vegetation in the remaining habitat areas on the Project Site.

Acid deposition from air emissions includes the deposition of sulphur oxides, nitrogen oxides, hydrogen, metals, and some organic compounds (Rusek and Marshall 2000) onto soil and vegetation. Potential acid input from air emissions can change the chemical properties of soil and water, which can affect vegetation growth. Sulfur dioxide and nitrogen oxides are the major precursors of acid rain.

The air emission modelling results show that predicted annual peak concentrations for sulphur dioxide and nitrogen dioxide are very low, at 1.5 ug/m^3 and 40 ug/m^3 respectively. These peak concentrations occur to the

southeast of the open pits. Beyond the LSA, the NO_2 concentration is low at 5-10 ug/$m^{3.}$ and within the LSA and beyond the SO^2 concentration is very low at 0.26-0.50 ug/m^3.

The Geochemistry, Geology and Soils TSD indicates that the interaction between air emissions and soils, in particular NO_x and SO_2 is anticipated to be negligible to low and thus was not assessed further (Table 7-7, Section 4.3 in that TSD).

Plant health can also be affected by other industrial air emissions, and operational activities such as salt application associated with road use and maintenance because these activities can lead to reduced plant photosynthetic capability and reproductive effort (Eller 1977; Forbes 1995), retarded growth (Spatt and Miller 1981), and altered respiration processes (Svoboda 1997). These effects have been considered in the Human Health and Ecological Risk Assessment TSD.

Although concentrations are predicted to be above baseline conditions, the anticipated changes to vegetation are localized and considered minor, which should have a negligible effect on wildlife that consumes these plants. The maximum predicted annual deposition rate of potential acid input and maximum concentration of nitrogen dioxide are both expected to occur to the southeast of the Project centre but these values are relatively low. The deposition predictions are considered to be conservative, and therefore the presented deposition rates are most likely overestimated. Therefore, changes in vegetation quality due to dust deposition and air emissions are anticipated to be minor relative to baseline conditions. Consequently, residual effects to furbearers from dust deposition and air emissions are predicted to be negligible.

Environmental Design Features and Mitigation

Design features and mitigation measures to control dust and other air emissions include:

- The watering of roads and laydown areas during the non-winter period will facilitate dust suppression.
- Enforcing speed limits will help reduce dust production.
- Equipment and fleet equipped with industry-standard emission control systems.
- Sources of particulate emissions at the processing facility will be controlled through the use of baghouses
- Enclosing conveyance systems and processing facilities (baghouse).
- Processing equipment with high efficiency bag houses to reduce emissions of particulate matter
- Operating procedures will be developed that reduce dust generation and air emissions (e.g., regular maintenance of equipment to meet emission standards).

With the use of these design features and mitigation measures the residual effects to furbearers from dust deposition and air emissions are predicted to be negligible.

3.6.1.8 Effect 8 – Attraction of Predators

The Project has the potential to attract predators such as black bears and wolves to the camp food wastes, etc. As such, the increase in predators around the Project has the potential to affect prey species such as furbearers through increased predation.

Environmental Design Features and Mitigation

An industrial and domestic waste management plan will be developed and implemented from construction through to closure. This plan will include the utilization of appropriate waste receptacles that limit attraction of wildlife. Food wastes will be incinerated regularly and littering and feeding of wildlife will be strictly prohibited.

All workers will be educated on the risk associated with feeding wildlife and careless disposal of food garbage. Proper waste management techniques will be conveyed to all workers and visitors to the site. Periodic, ongoing review of the efficiency of the waste management program and improvement through adaptive management practices.

With diligent application of these mitigation measures, the Project is anticipated to have a negligible effect on the attraction of predatory species.

3.6.2 Residual Effects

3.6.2.1 Residual Effect 1-Habitat Loss and Fragmentation

Based on the small home ranges of the two indicator furbearer species, the relevant spatial area for the assessment of effects on furbearers is the LSA. The habitat loss that will occur is confined to the Project mine site and thus the geographic extent is evaluated as low.

Of the 1,280.9 ha of high suitability marten habitat present in the LSA, 65.51 ha (0.01% of total LSA area) or 5.11% is effectively lost due to mine development activities. Of the approximately 2,831 ha of moderately suitable marten habitat present in the LSA, 455 ha or 16.07% is lost to Project mine development. Overall this corresponds to a loss of 12.66% of the moderate to high quality marten habitat in the LSA. This is evaluated as a moderate magnitude.

Of the 30.10 ha of high suitability muskrat habitat present in the LSA, 2.66 ha (.03% of total RSA area) or 8.8% is effectively lost due to Project mine development activities. Of the approximately 72.45 ha of moderately suitable muskrat habitat present in the LSA, 5.82 ha or 8.0% is lost to mine development. Overall this corresponds to a loss of 8.27% of the moderate to high quality muskrat habitat in the LSA. This is evaluated as a low magnitude.

The loss and alteration of habitats will occur during construction and persist throughout the lifetime of the Project (15 years) and into closure and post-closure. Habitat loss is reversible with time, but it will take a number of years for the rehabilitated mine site to mature into quality habitats for most furbearers. The duration is evaluated as moderate.

3.6.2.2 Residual Effect 2 – Alteration of Flow and Drainage Patterns

Aquatic furbearer habitats will be affected by the predicted changes to the local watersheds in proximity to the Mine footprint. The incremental predicted change in flows at a local watershed scale range from +1% to -8% as a result of interception of flow in the water collection system and the treated discharges. The magnitude of residual effect on wetland hydrology would be considered low.

The effect will take place during the construction period and persist during operations. Some wetlands will be created through fish habitat compensation during construction, which can provide alternate habitat for aquatic furbearers that have been displaced. At closure, the mine will no longer be taking water from the surrounding resources. Secondly, the majority of the land that were developed for the mine facilities will be returned back to

natural states (i.e., rehabilitated and restored). Certain areas will be re-graded with contours that will be continuous with the landscape and replanted with native species. Those flow and drainage patterns that were interrupted in these areas will be reconnected where possible. Overall, the duration of effects on aquatic furbearer habitat is considered moderate.

3.6.3 Summary of Residual Effects

Table 3-19: Summary of Residual Effects to furbearers

Effect	Extent	Magnitude	Duration
Loss of Habitat	Low	Moderate	Moderate
Alteration of flow and drainage patterns	Moderate	Low	Moderate

The home ranges of small mammals are relatively small; therefore local populations of furbearer species will be affected by loss of habitat within existing home ranges. There are enough similar type habitats in the areas adjacent to the mine footprint and a low amount of existing habitat fragmentation in the landscape. Displaced individuals will find their habitat needs in adjacent areas. The furbearers displaced will need to establish new home ranges in adjacent areas which could create a change in the fitness of individuals however; it is not anticipated to affect local populations of furbearers. Populations of these species are resilient and are not expected to be negatively affected by a 5-15% habitat loss or an incremental change in hydrology in a system that is heavily influenced by hydro-electric development. Therefore, the Project effects are expected to be of low significance to furbearer populations.

3.7 Species at Risk

A screening of potential interaction of the proposed mine development with Species at Risk is contained in Tables 3-4 through 3-8. The following effects assessment is based on the SAR observed in the LSA, namely Bald eagle, Canada warbler, Common nighthawk and Snapping turtle. The SAR that is most relevant to each pathway of effect is used in the assessments below.

3.7.1 Potential Pathways for Effects

Potential pathways through which the Project could affect SAR are summarized in Table 3-12 and are as follows:

- Habitat Loss or Fragmentation (construction)--> Canada warbler
- Alteration of flows and drainage patterns in habitat (construction) --> Snapping turtle
- Changes in water level (operations) --> Snapping turtle
- Changes in surface water quality and groundwater quality (construction and operations) --> Bald Eagle
- Sensory Disturbances (construction and operations) --> Common nighthawk,
- Injury/Mortality(construction and operations) --> All SAR
- Air emissions and dust deposition (construction and operations) --> All SAR

3.7.1.1 Effect 1 – Habitat Loss or Fragmentation on Canada Warbler

Canada warbler is known to breed within the MSA and LSA and therefore will lose some nesting habitat as a result of the Project footprint. The habitats that have a high suitability for nesting Canada warbler are dense mixed and dense deciduous habitat types, in particular upland ecosites ES-D (Red Pine-White Pine Forest), ES-F / ES-E (Fir-Spruce-Mixedwoods), and ES-G/ES-H (Pine-Spruce Mixedwoods). These ecosites occupy 3996.84 ha in the LSA, of which 465.11 ha will be removed for the mine site footprint. This represents 11.6% of the highly preferred habitat for Canada warbler in the LSA. This loss of habitat is advanced for further assessment.

Common nighthawk is known to breed in open areas such as woodland clearings and rocky outcrops, but its breeding habitat is varied and it takes advantage of newly opened habitats created by land clearing (COSEWIC 2007). It is likely that breeding habitat for this species may be created with the clearing and fragmentation of forested areas. Therefore, the assessment of effects of habitat loss and fragmentation are not advanced further for the Common nighthawk.

The Project footprint does not currently support nesting Bald eagle but this species was observed on several occasions flying over Sawbill Bay and near Lizard Lake, which indicates that they likely use these main waterbodies for feeding sites and the shorelines trees for roosting. The assessment of effects on this species is more appropriately associated with potential changes to water quality and in turn its food resources as well as the effect of the transmission line, particularly across Sawbill Bay.

3.7.1.2 Effect 2 – Alteration of Flows and Drainage Patterns on Snapping turtle

Snapping turtles rely on permanent and intermittent aquatic features for many of their life processes. As such, changes to the hydrology in habitats that they utilize have the potential to impact this SAR.

The Project footprint will alter surface water flows and interrupt natural drainage patterns. Thus, the hydrological conditions of wetlands will be altered which can led to changes in wetland soils and vegetation. Removal of vegetation leads to changes in drainage patterns, drying out of soils, especially the deep, organic soils of the wetland communities and a change in the soil pH, mineralization of the soils.

A summary of predicted changes to the site watersheds, as discussed in the Hydrology TSD is as follows:

The greatest changes in flows as a result of Project activities during the operations phase are expected to occur in site scale watercourses as a result of changes to their tributary drainage areas. Of the 44 watersheds evaluated, three will be reduced in size by less than 10%, six will be reduced in size by less than 50%, nine will be reduced in size by less than 90%, and six will be reduced in size by more than 90% (one by 100%). Changes to tributary drainage areas will occur due to the interception of runoff from areas within the Project footprint by the water collection system. Changes in flows are expected to be roughly proportional to changes in tributary drainage area.

The expected changes in flows in local scale watercourses are as follows:

- A reduction in flows in Lumby Creek (Hydrology TSD, Figure 2-3) of approximately 7% to 8% as a result of the interception of runoff from the Project footprint by the water collection system; and
- An increase in flows in Sawbill Creek (Hydrology TSD, Figure 2-3) of less than 1% due to the discharge of treated sewage effluent from the Exploration and Permanent Accommodation Camps.

The water levels and flows in the wetlands that are located outside of the footprint of the Project infrastructure but in the upper part of the watersheds are not expected to change as any runoff to the Project footprint will be collected in the site drainage system and used in the mine operation. The wetlands that are not being directly removed in the Project footprint but that are located in the lower portion of the catchment basin will have a reduction in flows and water levels.

As outlined in the Hydrogeology TSD, the cone of depression, an area in which groundwater will be drawn down as a result of pit dewatering, extends about 700 m from the open pit perimeter and underlies a portion of the WRMF and overburden stockpiles. The result is a reduction or even elimination of flows in some local streams. Also within this area, seepage losses from the stockpiles results in flow increases in some local streams. These changes are expected to be of minor consequence to Snapping turtles that use more permanent water bodies and watercourses.

Environmental Design Features and Mitigation

The Project Site drainage system has been designed to convey drainage across the Project Site with minor disruption to the habitats surrounding the Project footprint. In this manner, in the wetlands that are located outside of the footprint of the Project infrastructure but in the upper part of the watersheds are not expected to change as any runoff to the Project footprint will be collected in the Project Site drainage system and used in the mine operation or conveyed around the Project footprint to the downstream catchments.

A Project Site water balance has been calculated. This has contributed to site drainage plans to minimize the change to flows throughout the LSA. Thus the water flowing in to the Project footprint will continue to be conveyed through a drainage system around Project facilities so that water does not get backed up and flood new areas. This water either gets collected for the Project Site water needs or get re-directed to the watersheds downstream of Project facilities. Therefore, the downstream watersheds will continue to receive flows that are redirected around the Project. While there will be changes to flows and drainage patterns, these changes have been minimized through a site drainage management plan.

The access road (Hardtack/Sawbill) follows an existing road way, but the existing road will need to be widened to accommodate the mine construction and operations traffic. Therefore, the widening will provide an opportunity to improve culvert crossings if required at streams and wetland crossings to improve drainage.

Wetlands are also being created to offset the loss. These wetlands are being created for the fish habitat compensation package. However, these created wetlands will compensate also for the ecological and hydrological functions of the wetlands that are being lost.

At closure, the mine facilities will be rehabilitated as detailed in the Conceptual Closure and Rehabilitation Plan. This will restore some of the drainage that was lost during the construction period.

3.7.1.3 Effect 3 – Change in Water Levels on Snapping turtle

Snapping turtles hibernate on the bottom of rivers and lakes in the mud and silt, not far from shore. Changes to the water levels in rivers and lakes may be detrimental to their overwinter survival particularly if the level drops during hibernation.

Based on the reduced tributary drainage areas and the proposed water taking activities from the Upper Marmion Reservoir , it is predicted in the Hydrology TSD that during the operations of the Project the maximum relative

change (decreases) in monthly mean water levels in Upper Marmion Reservoir ranges from -8 to -9 cm for average, wet and dry year conditions, and the maximum relative change (decreases) in monthly mean outflows ranges from -0.8% to -4.0% for average, wet and dry year conditions, between baseline conditions and Project conditions. Water taking from Upper Marmion Reservoir is expected to decrease/lower the water level in Sawbill Bay by 5-7 cm annually. The existing water level fluctuations in Upper Marmion Reservoir annually are up to 2.5 m. Therefore, an incremental change of 5-7 cm annually is expected to have a negligible effect on the water levels and extent of aquatic habitat in Upper Marmion Reservoir.

The estimated maximum change in monthly mean water level in Lizard Lake is -3 cm as a result of runoff interception at the TMF. Surface water modelling was completed for Lizard Lake based on the bathymetry survey in 2011. The estimated maximum change in monthly mean inflows and outflows to Lizard Lake using the same model is -8%. The reduction in tributary drainage area to the lake outlet is 7%. An incremental decrease of 3 cm annually is expected to have a negligible effect on the water levels and extent of aquatic habitat in Lizard Lake.

Environmental Design Features and Mitigation

Environmental design features to reduce the amount of water required for plant operations and domestic uses include the capture and reuse of site water. The water requirements for the Project are not expected to change drainage flows and surface water levels beyond the natural variability of the baseline conditions in Upper Marmion Reservoir, and should result in a minor change to shoreline wetlands in the Upper Marmion Reservoir. Therefore, this pathway is expected to have negligible effects to the persistence of aquatic habitat in Upper Marmion Reservoir for snapping turtle.

3.7.1.4 Effect 4 – Changes to Surface Water and Groundwater Quality on Bald Eagle

Surface runoff from the newly cleared lands during construction could potentially carry sedimentation and deposit in SAR habitat areas. Surface water that collects in the open pits and Project Site runs off could potentially affect surface water and groundwater quality and thus the quality of habitats and food resources for Bald eagle.

Leaching of dissolved metals from WRMF may cause changes to groundwater and surface water quality and soils, which may affect vegetation growth and health. The effects of contaminants in the environment are assessed in the Human and Ecological Risk Assessment TSD.

Environmental Design Features and Mitigation

Water that collects in the open pits from groundwater seepage and from rain and snow will be pumped to the PPCP. Other runoff from the Project Site will be collected in the site drainage systems and transferred to the TMF retention pond and the PPCP. Water collected in the PPCP will be recycled into the system to the extent that it is needed. Excess water will be treated and released into Upper Marmion Reservoir. Sewage will be treated in the STP and the effluent will either be reused during the processing of ore or discharged to Upper Marmion Reservoir after treatment.

Implementation of these environmental design features is expected to result in no detectable changes to vegetation adjacent to the Project. Subsequently, this pathway was determined to have no interaction with SAR habitats or food resources.

3.7.1.5 Effect 5 – Sensory Disturbance on Common nighthawk

The Project mine site operation will create noise and other sensory disturbances. Changes to the quality of habitats on the MSA will occur. These sensory changes in habitat quality have the potential to affect the population size and distribution of breeding birds, through the altered movement and behavior of individuals.

Upland breeding birds use vocal communication signals for many functions, including mate attraction, territory advertisement, predator alarms, and social group cohesions (Henry and Lucas 2008). Ambient low-frequency noise is present in all urban and industrial areas. Some species of bird have been shown to adapt their songs in reaction to the disturbance of urban noise by singing with a higher minimum frequency than conspecifics in quiet environments. This adaptive behavior is thought to minimize the effects of noise-masking by predominantly low-frequency urban noise. Considerable diversity in the acoustic range and properties of communication signals has been documented through the study of a wide variety of songbirds (Henry and Lucas 2008). The communication signals of some bird species are genetically predetermined rather than learned. These species including all members of the family Tyrannidae (tyrant-flycatchers) lack the song-plasticity required to adapt communication signals to the varying ambient noise levels of different environments. These species may be more acutely affected by noise disturbance (Slabbekoorn and Peet 2003; Hu and Cardoso 2010). During baseline breeding bird surveys, three species of tyrant-flycatchers were observed including: alder flycatcher (*Empidonax alnorum*), least flycatcher (*Empidonax minimus*), and yellow-bellied flycatcher (*Empidonax flaviventris*).

Environmental Design Features and Mitigation

Due to site clearing and development (clearing outside of the breeding window), upland breeding birds will be displaced from the MSA. The following year the birds will migrate back to the area and search for other habitats within which to breed and nest in the LSA and beyond. The noise in the LSA and beyond will return to normal background levels. Therefore, the elevated noise in the Project mine site is not expected to have a negative effect on the SAR breeding birds such as Common nighthawk.

3.7.1.6 Effect 6 – Vehicle Injury/Mortality of SAR

One of the main threats to Snapping turtles is vehicular injury and mortality. They cross roads in search of mates, food and nest sites. This is a high risk activity as they are slow moving and cannot get out of the way of moving vehicles. The construction and operation of the Project will result in an increase in the volume of traffic in the LSA. As such, the potential for collisions of vehicle with wildlife may increase. Traffic speed and volume are the primary factors that contribute to road-related wildlife mortality. Land clearing and construction of mine facilities also has the potential to inadvertently kill slow moving species such as snapping turtles as they may get run over by the equipment used for these activities.

Upland breeding birds, water birds, and raptors may have a higher incidence of collision during the breeding season if they are not accustomed to vehicular traffic (Mumme et al. 2000; Clevenger et al. 2003). Juvenile birds are also susceptible to vehicular collisions during their natal dispersal because they are inexperienced with vehicular traffic.

Land clearing activities have the potential to destroy bird nests and injure or kill the young. The *Migratory Birds Convention Act* 1994 protects migratory species including their nests and eggs. This pathway is applicable to Canada warbler, Common nighthawk and Bald eagle.

Birds, especially waterfowl and raptors are susceptible to collisions with transmission lines. Large birds are also at risk of being electrocuted by power lines. The risk of injury or mortality is higher if the transmission lines bisect movement corridors. Bald eagles fly along the shoreline of Sawbill Bay looking for food and as such may unknowingly fly into the proposed transmission wires that are situated across this bay. Bald eagle electrocution is another matter due to the fact that it is cited as one of the most common causes of death in raptors in the United States (Kochert and Olendorff 1999). Large birds are more prone to electrocution because they are large, and can easily span distances between energized or grounded components of power poles (Lehman 2006). The majority of electrocutions are of inexperienced juvenile birds.

Birds collide with buildings due to confusion with the lighting and/or glass reflection. The proposed structures on the Project Site are not expected to be reflective. Therefore, bird injury/mortality due to collision with the buildings on the Project Site is not expected to cause a measurable change to Canada warbler or Common nighthawk and thus is not advanced for further consideration.

Environmental Design Features and Mitigation

Speed limits will be posted and enforced on the mine roads. The maximum speed will be 60 km/h on the access road and mine site road. The lower speed will permit motorists and animals to avoid collisions. Warning signs will be posted near areas where turtles are known to cross. Additionally, awareness training of this hazard to SAR, in particular the Snapping turtle will be provided as standard training to mine staff. Safe handling procedures will also be taught to mine staff to instruct on how to safely remove an individual from harm's way during encounters. Additional mitigation for turtles may include funneling them through culverts under roads using roadside silt fencing. However the risk of injury or mortality of snapping turtles on roadways cannot be fully mitigated and is advanced for an assessment of significance.

To avoid harming or killing turtles during land clearing and construction activities a turtle rescue program will be implemented in open water habitats that will be drained within the Project footprint. Turtles will be captured and relocated to areas that are outside of the zone of disturbance.

The Migratory Birds Convention Act 1994 protects migratory bird species including their nests and eggs. In order to avoid the destruction of nests and the potential injury or mortality of migratory birds, land clearing shall take place outside of the nesting period for birds, where applicable. However, if clearing cannot be restricted to outside of the nesting period, a biological monitor must be on site to precede the land clearing activities and conduct nest searches of the entire area to be cleared. Any nest found should be protected with a buffer zone appropriate for the species and the surrounding habitat until the young have left their nest. Appropriate species-specific buffers can be determined by notifying the Canadian Wildlife Service regional office.

Collisions and electrocutions can be reduced by using avian safe construction design techniques for the transmission corridor. These techniques include equipping the facilities with devices to deter Bald eagles from building nests on the towers, fitting poles/towers with perches and guards and lines with orange balls or late diverters and modification of the transmission facility to include insulators and adequate spacing of conductors (APLIC1999, Nelson and Nelson 1976). Additionally, it has been studied that forest-dwelling raptors are rarely found in electrocution records because natural perches are abundant in forests (Lehman et al. 2006). Therefore, maintenance of forest patches around the transmission corridor will act to reduce the likelihood of Bald eagles perching on the transmission facilities. These management practices will effectively reduce the risk of Bald eagle

injury or mortality with the transmission corridor. However, the risk of injury or mortality to an individual bird cannot be fully mitigated and the effect is advanced for an assessment of significance for Bald eagle.

3.7.1.7 Effect 7 – Dust Deposition and Air Emissions

The direct effects of dust on wildlife have not thoroughly researched but may include stressed respiratory function. Fugitive dust deposition associated with mining activities, road use, and maintenance has the potential to alter vegetative food sources making leaves or browse unpalatable (Auerbach et. al., 1997).

Sources of dust generation for the Project include vehicular traffic, blasting activities, and the operation of the Ore processing Facility. Air quality modeling was completed to predict the spatial extent of dust deposition and air emissions from the Project. The air emission modelling results are displayed in Appendix 2.VI Figures 1, 2 and 3.

As detailed in the Air Quality TSD, the results of the air quality modelling predicted annual dust deposition resulting from the Project (Appendix 2.VI Figure 3) Dust concentrations are not expected to result in measurable changes to vegetation.

Acid deposition from air emissions includes the deposition of sulphur oxides, nitrogen oxides, hydrogen, metals, and some organic compounds (Rusek and Marshall 2000) onto soil and vegetation. Potential acid input from air emissions can change the chemical properties of soil and water, which can affect vegetation growth. Sulfur dioxide and nitrogen oxides are the major precursors of acid rain.

The air emission modelling results show that predicted annual peak concentrations for sulphur dioxide and nitrogen dioxide are very low, at 1.5 ug/m^3 and 40 ug/m^3 respectively. These peak concentrations occur to the southeast of the open pits. Beyond the LSA, the NO_2 concentration is low at 5-10 ug/$m^{3.}$ and within the LSA and beyond the SO^2 concentration is very low at 0.26-0.50 ug/m^3.

The Geochemistry, Geology and Soils TSD indicates that the interaction between air emissions and soils, in particular NO_x and SO_2 is anticipated to be negligible to low and thus was not assessed further (Table 7-7, Section 4.3 in that TSD).

Plant health can also be affected by other industrial air emissions, and operational activities such as salt application associated with road use and maintenance because these activities can lead to reduced plant photosynthetic capability and reproductive effort (Eller 1977; Forbes 1995), retarded growth (Spatt and Miller 1981), and altered respiration processes (Svoboda 1997). These effects have been considered in the Human Health and Ecological Risk Assessment TSD.

Although concentrations are predicted to be above baseline conditions, the anticipated changes to vegetation are localized and considered minor, which should have a negligible effect on wildlife that consumes these plants. The maximum predicted annual deposition rate of potential acid input and maximum concentration of nitrogen dioxide are both expected to occur to the southeast of the Project centre but these values are relatively low. The deposition predictions are considered to be conservative, and therefore the presented deposition rates are most likely overestimated. Therefore, changes in vegetation quality due to dust deposition and air emissions are anticipated to be minor relative to baseline conditions. Consequently, residual effects to SAR from dust deposition and air emissions are predicted to be negligible.

Environmental Design Features and Mitigation

Design features and mitigation measures to control dust and other air emissions include:

- The watering of roads and laydown areas during the non-winter period will facilitate dust suppression.
- Enforcing speed limits will help reduce dust production.
- Equipment and fleet equipped with industry-standard emission control systems.
- Sources of particulate emissions at the processing facility will be controlled through the use of baghouses
- Operating procedures will be developed that reduce dust generation and air emissions (e.g., regular maintenance of equipment to meet emission standards).

With the use of these design features and mitigation measures the residual effects to SAR from dust deposition and air emissions are predicted to be negligible.

3.7.2 Residual Effects

There are two residual effects on SAR that cannot be fully mitigated: the loss of some preferred breeding habitat for Canada warbler and changes to aquatic habitat for species like Snapping turtle as a result of the alteration of flow and drainage patterns.

3.7.2.1 Residual Effect 1-Physical Loss or Alteration of Habitat

The assessment of effects to SAR is most relevant in the LSA. The habitat loss that will occur is confined to the Project mine site and thus the geographic extent is evaluated as low. Of the highly preferred Canada warbler habitat present in the LSA, 11.6% of it will be removed for the Project mine site development. The loss of habitat is of moderate magnitude.

The loss and alteration of breeding habitats will occur during construction and persist throughout the lifetime of the project (15 years) and into closure. Habitat loss is reversible with time, and will take a number of years for the rehabilitated mine site to mature into quality breeding habitats for Canada warbler. The duration is evaluated as moderate.

3.7.2.2 Residual Effect 2-Alteration of Flows and Drainage Patterns

To assess the effect of changes in hydrology on the snapping turtle VEC, the LSA was determined to be the most relevant study area (Table 3-2). The geographic extent is evaluated as moderate. The incremental predicted change in flows at a local watershed scale range from +1% to -8% as a result of interception of flow in the Site water collection system and the discharges from the treatment facilities. The magnitude of residual effect on Snapping turtle would be considered low.

The effect will take place during the construction period and continue into the operations and closure. Some wetlands will be created through fish habitat compensation during construction, which may create some habitat for the Snapping turtle.

At closure, the Project will no longer be taking water from the surrounding resources. Secondly, the majority of the lands that were developed for the Project facilities will be returned back to natural states (i.e., rehabilitated and restored). Certain areas will be re-graded with contours that will be continuous with the landscape and

replanted with native species. Those flow and drainage patterns that were interrupted in these areas will be reconnected where possible. Overall, the duration of effects is considered moderate.

3.7.2.1 Residual Effect 3-Risk of Injury/Mortality of SAR

The risk of injury or mortality of Snapping turtles on roadways and Bald eagle due to the transmission corridor cannot be fully mitigated (i.e. mitigation measures lower the risk but do not eliminate it). The risk of injury occurs along access road (Sawbill/Hardtack) and the transmission corridor (particularly across Sawbill Bay) and thus occurs in the MSA. The geographic extent of the effect is low.

There are no baseline data for the number of Snapping turtles that currently get struck by vehicles on the roads in the LSA or the frequency of Bald eagle collisions with transmission lines. As this effect is caused by an accidental incident, it is not possible to determine the number of individuals that are likely to be injured or killed. However, based on the low incidence of occurrence of Snapping turtles and the vast tracts of habitat outside of the MSA, the frequency of vehicle collision with snapping turtles due to Project related traffic is expected to be negligible. Similarly, the occurrence of Bald eagle collisions with the transmission line is anticipated to be negligible. However, these are species that are listed 'at risk' due to a decline in populations in the province. The injury or mortality of a SAR cannot be negligible and thus the magnitude is evaluated as low.

At closure, the frequency of traffic on the access road, and mine site roads will diminish and the transmission line will be removed. However, the effect results in injury or mortality of SAR which is not reversible. Therefore, the duration of effects is considered high.

3.7.3 Summary of Residual Effects

Table 3-20: Summary of Residual Effects to SAR

Effect	Geographic Extent	Magnitude	Duration
Loss and Alteration of habitat	Low	Moderate	Moderate
Alteration of Flows and Drainage Patterns	Moderate	Low	Moderate
Risk of Injury/Mortality to SAR	Low	Low	High

Habitat loss is the primary threat to many SAR including, Canada warbler. Populations of this warbler have declined steadily over the past 30 years, likely in response to forest succession and loss of forested wetlands (Reitsma et al. 2010). They are known to be somewhat resilient to the disturbances from forestry practices but are more susceptible to habitat fragmentation that occurs on a scale such that natural communities become isolated (Sherwick 2011). This type of habitat fragmentation is not anticipated to occur in this area as large intact landscapes remain outside of the LSA. Generally, the same types of impacts threaten other SAR such as the Bald eagle. The location and arrangement of the mine facilities on a peninsula do not fragment vast tracts of intact habitat that is available for SAR on the landscape. Therefore, habitat loss due to the Project is expected to have low significance to SAR populations and is not expected to prevent the establishment of self-sustaining populations of any known SAR.

The predicted changes in water levels as a result of the Project are not anticipated to be a threat to the survival or recovery of any SAR. The changes are not anticipated to prevent the achievements of a self-sustaining

population of any known SAR. Under existing conditions, the water management for hydro-electric development in the area is having an influence on hydrology in the MSA, LSA, and beyond. Therefore, the incremental modification of flow by the Project footprint is considered to have a low significance for SAR populations.

The Project mitigation measures and the anticipated low frequency of occurrence are expected to result in a negligible to low risk of injuring or causing the death of a SAR. This effect is irreversible to the individual but is not anticipated to affect the populations of SAR in the LSA. Overall, the residual effect is of low significance.

3.8 Upland Breeding Birds

3.8.1 Potential Pathways for Effects

- Habitat Loss and Fragmentation (construction phase)
- Changes to Habitat Suitability for Upland Breeding Birds (construction, operation)
- Sensory disturbances or displacement (construction and operations phase)
- Vehicle injury/mortality (construction and operations phase)
- Changes to surface water and groundwater quality (construction and operations phase)
- Air emissions and dust deposition (construction and operations phase)

3.8.1.1 Effect 1 – Habitat Loss or Fragmentation

Methodology

To analyze the direct impact of the application of the Project on bird populations, bird abundances for all habitats types within the LSA were estimated based on habitat area and the mean breeding bird densities determined by baseline studies (Table 2-13). Abundance estimates were calculated using observations within 50 m of the observer, excluding flyovers. A community-level analysis examined the variation in density and richness among habitats of all species combined. Relative abundance (density) was calculated as the mean number of individuals per effective area surveyed. The effective area surveys is calculated from the effective detection radius (EDR), a value unique to the Project and calculated from the baseline survey data.

The effective detection radius (EDR) is calculated with the following formula (Buckland et al. 2001):

$$\mathrm{EDR} = \sqrt{\frac{2}{\left[\left(\frac{2}{k^2}\right) * \ln\left(\frac{n}{n_2}\right)\right]}}$$

Where;
k = the distance at which birds are declared as being in or out of the sampling area (i.e., 50 m),
n = total number of birds detected,
n^2 = total number of birds detected outside the value of k

The EDR for the Project is 66.5 m. The effective area surveyed is 1.39 ha.

The mean relative abundance (density) is a measure of birds per 1.39 ha and was calculated for each habitat type. Bird abundance estimates for each habitat were calculated with by the following formula:

Bird Abundance = [Area / 1.39] * Density

Bird density and abundances were estimated for rock barren, open bog, and deciduous swamp habitat types using the average density of all other habitat types. Due to the small area of these habitat types present in the LSA, no breeding bird surveys were conducted within these habitat types. The combined area of these habitat types within the LSA accounts for less than 0.2% of total area excluding open water. The average density value assigned to these habitat types was 4.5 birds per 1.39 ha. Average density value was also assigned to cutover habitat. The LSA contained 369.2 ha of cutover habitat accounting for 4.8% of total LSA landcover excluding open water. No cutover habitat is present within the project footprint.

The abundance estimates are not true measures of population. The point count method used to survey upland bird populations has inherent limitations. Some species are not readily detected on point counts, while the probability of observing others decreases rapidly within the first four hours of daylight (Rosenberg and Blancher 2005; Cadman et al. 2007). Females of many species are much less vocal than males and are largely overlooked on point counts. No adjustments were applied to the abundance estimates to account for under-detected females or species with restricted periods of peak activity.

Results

Habitat loss as a result of the development of the Project is expected to have a direct effect on upland breeding bird abundances in the LSA. The total area of the Project footprint excluding open water is estimated to be approximately 1206 ha. The total area of the LSA excluding open water is 7,620 ha. The Project footprint will alter approximately 16% of the LSA (Table 3-21).

Upland breeding bird habitats in the LSA include, dense coniferous, dense deciduous, dense mixed; edge, marsh, conifer swamp, thicket swamp, open fen, treed bog and treed fen open bog, deciduous swamp, and rock barren. Development of the Project is expected to decrease the area of the above breeding habitats within the LSA (Table 3-21).

Table 3-21: Projected Change in Habitat Type Area within the Local Study Area excluding Open Water

Habitat Type	Area within Local Study Area at Baseline (ha.) excluding open water	Area of Project Footprint (ha.) excluding open water	Projected % Change in Local Study Area landcover Area - Baseline to Application
Dense Coniferous	2,012.58	430.43	-21.39
Dense Deciduous	1,228.75	191.22	-15.56
Dense Mixed	2,062.77	150.49	-7.3
Marsh	158.4	20.33	-12.83
Conifer Swamp	968.6	206.87	-21.36
Thicket Swamp	54.77	7.2	-13.15

Table 3-21: Projected Change in Habitat Type Area within the Local Study Area excluding Open Water (Continued)

Habitat Type	Area within Local Study Area at Baseline (ha.) excluding open water	Area of Project Footprint (ha.) excluding open water	Projected % Change in Local Study Area landcover Area - Baseline to Application
Open Fen	169.09	48.52	-28.69
Treed Bog	66.01	16.63	-25.19
Treed Fen	379.42	80.8	-21.3
Open Bog	1.05	0	0
Deciduous Swamp	10.41	0.87	-8.36
Cutover	369.2	0	0
Disturbed	54.43	46.37	-85.19
Other - Infrastructure	84.57	6	-7.09
Total	**7,620.05**	**1,205.73**	**-15.82**

Within the LSA, dense coniferous and dense mixed forest habitat types make up the largest proportions of landcover and comprise 26% and 27% respectively of total landcover excluding open water. Dense deciduous and conifer swamp habitat types also make up large percentages of the LSA landcover at 16% and 13% respectively. With development of the Project, dense coniferous forest is expected to be reduced within the LSA by 430.43 hectares, a reduction of approximately 21%. This represents the largest area of habitat reduction of any habitat type and the fourth highest proportional reduction of a habitat type. Baseline breeding bird surveys determined that the mean density of breeding birds within dense coniferous forest was 4.9 birds per 1.39 ha. Open fen habitat comprises only 2.2% of total the total landcover of the LSA and is expected to be reduced by 48.52 hectares. This is a reduction of 28.69% and it represents the largest proportional reduction of any habitat type. Baseline breeding bird surveys (Table 3-22) determined that the mean density of breeding birds within open fen habitat was 4.8 birds per 1.39 ha.

Table 3-22: Estimated Abundance of Upland Breeding Birds in Habitat Types within the Local Study Area at Baseline

Habitat Type	Relative Abundance (Birds/1.39 ha.)	Total Area in Local Study Area (ha.)	Estimated Bird Abundance
Dense coniferous	4.9	2,012.58	7,095
Dense Deciduous	5.2	1,228.75	4,597
Dense Mixed	4.2	2,062.77	6,233
Marsh	2.6	158.4	296
Conifer Swamp	4.3	968.6	2,996
Thicket Swamp	4.5	54.77	177
Open Fen	4.8	169.09	584
Treed Bog	5	66.01	237
Treed Fen	4.8	379.42	1,310

Table 3-22: Estimated Abundance of Upland Breeding Birds in Habitat Types within the Local Study Area at Baseline (Continued)

Habitat Type	Relative Abundance (Birds/1.39 ha.)	Total Area in Local Study Area (ha.)	Estimated Bird Abundance
Open Bog*	4.5	1.05	3
Deciduous Swamp*	4.5	10.41	34
Cutover*	4.5	369.2	1,195
Disturbed	N/A	54.42	N/A
Other - Infrastructure	N/A	84.57	N/A
Total		**7,620.04**	**24,757**

Notes:
* = Relative abundance estimated using average of all other habitat types.

To assess the effects of the habitat loss due to the project footprint the estimated baseline bird abundances for habitat types within the project footprint are shown in Table 3-23.

Table 3-23: Estimated Abundance of Upland Breeding Birds in Habitat Types within the Project Footprint at Baseline

Habitat Type	Relative Abundance (Birds/1.39 ha.)	Total Area Project Footprint (ha.)	Estimated Bird Abundance
Dense coniferous	4.9	430.43	1517
Dense Deciduous	5.2	191.22	715
Dense Mixed	4.2	150.49	455
Marsh	2.6	20.33	38
Conifer Swamp	4.3	206.87	640
Thicket Swamp	4.5	7.2	23
Open Fen	4.8	48.52	168
Treed Bog	5	16.63	60
Treed Fen	4.8	80.8	279
Open Bog*	4.5	0	0
Deciduous Swamp*	4.5	0.87	3
Cutover*	4.5	0	0
Disturbed	N/A	46.37	N/A
Other – Infrastructure	N/A	6	N/A
Total			3898

Notes:
* = Relative abundance estimated using average of all other habitat types.

This analysis assumes that the density for all species will be reduced to zero within the area of the project footprint post-application. Table 3-24 shows the expected change in bird abundance by habitat type within the LSA post-application.

Table 3-24: Expected Change in Bird Abundance within the LSA due to Habitat Removal

Effects / Habitat Type	Estimated Bird Abundance within the LSA at Baseline	Estimated Bird Abundance Project Footprint at Baseline	% Change of Bird Abundance within the LSA -Baseline to Application
Direct Effects			
Dense Coniferous	7095	1517	-21.38
Dense Deciduous	4597	715	-15.55
Dense Mixed	6233	455	-7.3
Marsh	296	38	-12.84
Conifer Swamp	2996	640	-21.36
Thicket Swamp	177	23	-12.99
Open Fen	584	168	-28.77
Treed Bog	237	60	-25.32
Treed Fen	1310	279	-21.3
Open Bog	3	0	0
Deciduous Swamp	34	3	-8.82
Cutover	1195	0	0
Disturbed	N/A	N/A	N/A
Other - Infrastructure	N/A	N/A	N/A
Open water	N/A	N/A	N/A
Total	**24757**	**3898**	**-15.75**

The decline in bird abundance within the LSA is expected to average 15.75% across all habitat types. Bird abundance within the LSA is predicted to decline by 3898 birds as a result of direct habitat loss. The largest decline in absolute numbers is expected to occur in the dense coniferous forest where the expected decline is 1517 birds representing 21.38% of bird abundance. The largest proportional decline is expected to occur in the open fen habitats where the expected decline of 168 birds represents a decline of 28.77%.

Effects of Habitat Fragmentation

In addition to direct loss of habitat, the project will also result in fragmentation of the existing landscape. Fragmentation can influence several ecological processes including movement between nesting and foraging areas, nest predation and parasitism along habitat edges, encounter rate between potential breeders, and dispersal between local populations (Desrochers and Hannon 1997).

Although fragmentation can influence individual, population, and community processes, fragmentation effects have less influence than habitat loss when there is a large proportion of natural habitat on the landscape (Fahrig 1997, 2003; Andrén 1999; Flather and Bevers 2002; Swift and Hannon 2010). In other studies, effects from habitat fragmentation on populations are small until habitat amounts decrease below a threshold level (70 to 90% habitat loss) related to population persistence (Flather and Bevers 2002; Swift and Hannon 2010).

Distances of 50 to 200 m have been reported to effectively isolate birds in forested landscapes. For some species of forest dwelling birds, an apparent unwillingness to cross wide forest openings in response to mobbing

call broadcasts is likely due to predator avoidance (Desrochers and Hannon 1997; Schmiegelow et al. 1997; St. Clair et al. 1998). The ability and willingness of a bird to cross a matrix (i.e., less preferred habitat portions of the landscape) may also be influenced by the quality of the matrix. That is, a matrix may decrease the survival probability of an individual because of increased risk of predation or collision with a vehicle (Swift and Hannon 2010).

Habitat fragmentation can also increase edge habitat, which can increase nest predation and parasitism (Robinson and Wilcove 1994). Brood parasitism from species such as brown-headed cowbirds is not likely to occur in the LSA; cowbirds were not observed during baseline studies and are unlikely to occur in the LSA. Habitat in the LSA is suboptimal for the brown-headed cowbird due to high levels of forest cover and limited feeding opportunities. The brown-headed cowbird has declined drastically in the northern and southern shield regions (Falk 2007). Although some studies have detected increased predation rate on nests near edges in forested and non-forested landscapes, other studies have shown no effect of distance from disturbed edge on nest success (Johnson and Temple 1990; Hanski 1996; Donovan et al. 1997; Winter et al. 2000; Chalfoun et al. 2002). At the Ekati Diamond Mine, Male and Nol (2005) found that nest success of Lapland longspurs was independent of distance to roads.

Environmental Design Features and Mitigation

Land clearing activities have the potential to destroy bird nests and injure or kill the offspring. The Migratory Birds Convention Act 1994 protects migratory bird species including their nests and eggs. In order to avoid the destruction of nests and the potential injury or mortality of migratory birds, land clearing shall take place outside of the nesting period for birds, where applicable. However, if clearing cannot be restricted to outside of the nesting period, a biological monitor must be on site to precede the land clearing activities and conduct nest searches of the entire area to be cleared. Any nest found should be protected with a buffer zone appropriate for the species and the surrounding habitat until the young have left their nest. Appropriate species-specific buffers can be determined by notifying the Canadian Wildlife Service regional office.

3.8.1.2 Effect 2-Changes in Habitat Suitability

In addition to habitat loss and fragmentation, changes to habitat quality from the Project have the potential to indirectly affect the population size and distribution of upland breeding birds, through altered movement and behaviour of individuals. Upland breeding birds are a diverse array of species with a range of habitat requirements. A HSI model based on key life requisites would be very complex and so a different method of approximating the effect from the Project on upland birds was used. Effects from the Project on upland breeding birds were estimated using relative abundance (density) data from baseline studies (Table 2-13). All calculations were completed using raster file types within a GIS platform. Each 28.5 x 28.5 m raster cell in the LSA that represented a habitat type (other than deep water) was assigned a density value equal to the mean density estimate for the habitat type. Deep water habitat was not included in the analysis because upland breeding birds do not nest in this habitat type.

Table 3-25: Mean Relative Abundance of Upland Breeding Birds in Habitat Types within the LSA

Habitat Type	Relative Abundance (Birds/1.39 ha.)
Dense coniferous	4.9
Dense Deciduous	5.2
Dense Mixed	4.2
Marsh	2.6
Conifer Swamp	4.3
Thicket Swamp	4.5
Open Fen	4.8
Treed Bog	5
Treed Fen	4.8
Open Bog	4.5
Deciduous Swamp	4.5
Cutover	4.5

For the development scenarios, the quality of habitats (i.e., raster cell bird density values) associated with habitat types within the Project footprint was reduced to zero (direct habitat loss effects). The effects of sensory disturbances on movements and behavior were estimated to extend up to about 1 km from the perimeter of high human-use areas (Miramar 2005; Male and Nol 2005; Smith et al. 2005; Bayne et al. 2008). The effects of sensory disturbance were captured in the proposed model with a curvilinear one-asymptote relationship and a 1 km zone of influence (Figure 3-4 below). For example, at 100 m from an active development, the baseline value for bird density was multiplied by a disturbance modifier equal to about 0.2, which reduced the density of birds by 80%. At a distance of approximately 800 m from a development, there is a correspondent 5% decrease in density.

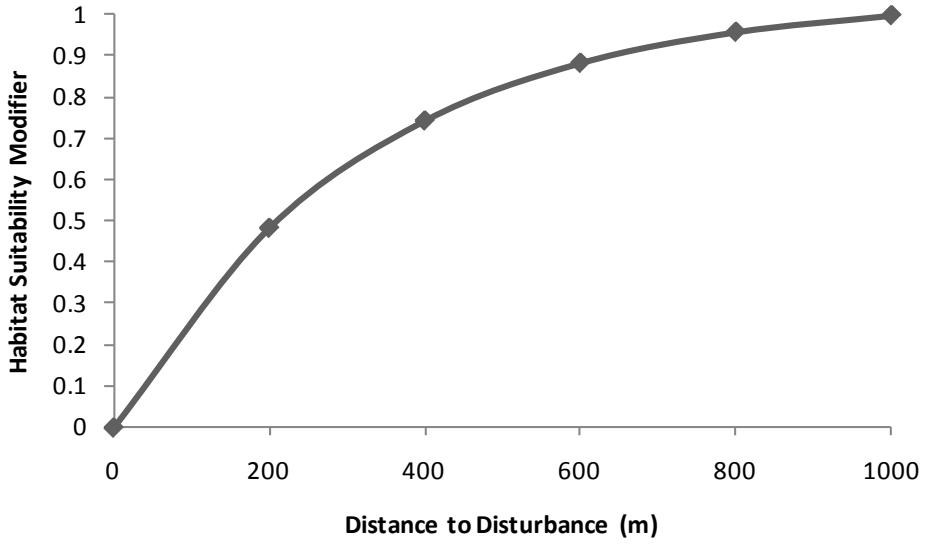

Figure 3-4: Relationship between Distance from Human Disturbance and Habitat Suitability Modifier for Upland Breeding Birds

Next, the adjusted densities were multiplied by the habitat area within the zone of influence. Abundances were then summed by habitat type within the footprint and across the zone of influence to estimate the reduction in bird abundance caused by direct and indirect effects from the Project. Effects were expressed as relative differences in upland bird abundance between the application and baseline case. A coefficient of variation of 30% was applied to the resulting effect size values to approximate the uncertainty in modelled (sensory disturbance-adjusted) density estimates.

The following equation was used to calculate the relative change in upland breeding bird abundance for the different conditions on the landscape.

- (application case abundance – 2010 baseline abundance) / 2010 baseline abundance x 100

Although the effects from noise are included in the HSI modelling, the potential effects on upland breeding birds from noise are also discussed separately in Section 3.8.1.2.

Results

Effects on the suitability of habitat (e.g., noise, presence of humans, and vehicles) in the zone of influence from application of the Project are predicted to reduced upland breeding bird abundance in the LSA by a total of 0.01% relative to baseline conditions (Table 3-26 below). The largest decline in relative abundance from changes in habitat suitability for breeding birds is expected to occur in the deciduous swamps and cutover/disturbed areas where the expected decline is 0.03 and 0.04% respectively.

Table 3-26: Relative Change in the Abundance of Upland Breeding Birds in the LSA from Baseline to Application of the Project

Habitat Type	Relative Abundance (Birds/1.39 ha.) Under Baseline Case	Estimated Bird Abundance in the ZOI* at Baseline	Relative Abundance (Birds/1.39 ha.) Under Application Case	Estimated Bird Abundance in ZOI* in Application Case	% Change Baseline to Application
Dense coniferous	4.9	6281	2.84	3640	-0.007
Dense Deciduous	5.2	4305	2.76	2285	-0.009
Dense Mixed	4.2	5848	2.16	3008	-0.009
Marsh	2.6	244	1.31	123	-0.010
Conifer Swamp	4.3	2625	1.94	1184	-0.012
Thicket Swamp	4.5	121	2.25	61	-0.010
Open Fen	4.8	382	2.84	226	-0.007
Treed Bog	5	186	2.85	106	-0.008
Treed Fen	4.8	1030	2.92	627	-0.006
Open Bog	4.5	3	1.11	1	-0.031
Deciduous Swamp	4.5	34	1.05	8	-0.033
Cutover	4.5	535	0.88	105	-0.041
Total		**21595**		**11373**	**-0.009**

Notes:
ZOI = Zone of influence

The largest estimated abundance changes are predicted to occur in deciduous swamps and cutovers. The cutovers is likely due to the fact that the Project location is situated on more cutover areas than the lands within the 1 km ZOI. The relative abundance values change the least in those densely forested units. Overall the highest predicted change is 0.041% in the LSA which is negligible and not likely to have an effect on breeding bird populations.

3.8.1.3 Effect 2-Sensory Disturbances

In addition to direct habitat effects caused by habitat reduction and fragmentation, the Project may cause changes to habitat quality within a zone of influence extending 1 km or more from the noise generating activities and infrastructure. These sensory changes in habitat quality have the potential to affect the population size and distribution of upland breeding birds, through the altered movement and behavior of individuals. Within the 1km zone of influence, the noise levels are predicted to be in the range of 60-65 dB. This is an increase from the baseline of approximately 15-20 dB.

Upland breeding birds use vocal communication signals for many functions, including mate attraction, territory advertisement, predator alarms, and social group cohesions (Henry and Lucas 2008). Ambient low-frequency noise is present in all urban and industrial areas. Some species of bird have been shown to adapt their songs in reaction to the disturbance of urban noise by singing with a higher minimum frequency than conspecifics in quiet environments. This adaptive behavior is thought to minimize the effects of noise-masking by predominantly low-frequency urban noise. Considerable diversity in the acoustic range and properties of communication signals has been documented through the study of a wide variety of songbirds (Henry and Lucas 2008). The communication signals of some bird species are genetically predetermined rather than learned. These species including all members of the family Tyrannidae (tyrant-flycatchers) lack the song-plasticity required to adapt communication signals to the varying ambient noise levels of different environments. These species may be more acutely affected by noise disturbance (Slabbekoorn and Peet 2003; Hu and Cardoso 2010). During baseline breeding bird surveys, three species of tyrant-flycatchers were observed including: alder flycatcher (*Empidonax alnorum*), least flycatcher (*Empidonax minimus*), and yellow-bellied flycatcher (*Empidonax flaviventris*). The effect of noise disturbance from the Project is expected to impact the behavior and densities of some these bird species which may result in changes to community composition within the 1km zone of influence surrounding the Project footprint however, the majority of bird species will adapt to the noise levels.

Environmental Design Features and Mitigation

Due to site clearing and development, upland breeding birds will be displaced from the MSA. The following year the birds will migrate back to the area and search for other habitats within which to breed and nest in the LSA and beyond. The noise in the LSA and beyond will be barely detectable above normal background noise. Therefore, the elevated noise is not expected to have a negative effect on the remaining breeding birds in the LSA.

3.8.1.4 Effect 3-Injury/Mortality

Upland breeding birds may have a higher incidence of collision during the breeding season if they are not accustomed to vehicular traffic (Mumme et al. 2000; Clevenger et al. 2003). Juvenile birds are also susceptible to vehicular collisions during their natal dispersal because they are inexperienced with vehicular traffic.

Birds collide with buildings due to confusion with the lighting and/or glass reflection. The proposed structures on the Project Site are not expected to be reflective. Therefore, bird injury/mortality due to collision with the

buildings on the Project Site is not expected to cause a measurable change to upland breeding birds and thus is not advanced for further consideration.

Environmental Design Features and Mitigation

Speed limits will be posted and enforced on the mine roads. The maximum speed will be 60km/h on the access road and mine site road. The lower speed will permit motorists and animals to avoid collisions.

3.8.1.5 Effect 4 – Dust Deposition and Air Emissions

The direct effects of dust on wildlife have not thoroughly researched but may include stressed respiratory function. Fugitive dust deposition associated with mining activities, road use, and maintenance has the potential to alter vegetative food sources making leaves or browse unpalatable (Auerbach et. al., 1997).

Sources of dust generation for the Project include vehicular traffic, blasting activities, and the operation of the Ore Processing Facility. Air quality modeling was completed to predict the spatial extent of dust deposition and air emissions from the Project. The air emission modelling results are displayed in Appendix 2.VI Figures 1, 2 and 3.

As detailed in the Air Quality TSD, the results of the air quality modelling predicted annual dust deposition resulting from the Project (Appendix 2.VI Figure 3) Dust concentrations are not expected to result in measurable changes to wildlife.

Acid deposition from air emissions includes the deposition of sulphur oxides, nitrogen oxides, hydrogen, metals, and some organic compounds (Rusek and Marshall 2000) onto soil and vegetation. Potential acid input from air emissions can change the chemical properties of soil and water, which can affect vegetation growth. Sulfur dioxide and nitrogen oxides are the major precursors of acid rain.

As reported in the Atmospheric Environment TSD, the air emission modelling results show that predicted annual peak concentrations for sulphur dioxide and nitrogen dioxide are very low at 1.5 ug/m^3 and 40 ug/m^3 respectively. These peak concentrations occur to the southeast of the open pits. Beyond the LSA, the NO_2 concentration is low at 5-10 ug/m^3. and within the LSA and beyond the SO_2 concentration is very low at 0.26-0.50 ug/m^3.

The Geochemistry, Geology and Soil TSD indicates that the interaction between air emissions and soils, in particular NO_x and SO_2 is anticipated to be negligible to low and thus was not assessed further (Table 7-7, Section 4.3 in that TSD).

Plant health can also be affected by other industrial air emissions, and operational activities such as salt application associated with road use and maintenance because these activities can lead to reduced plant photosynthetic capability and reproductive effort (Eller 1977; Forbes 1995), retarded growth (Spatt and Miller 1981), and altered respiration processes (Svoboda 1997). These effects have been considered in the Human Health and Ecological Risk Assessment TSD.

Although concentrations are predicted to be above baseline conditions, the anticipated changes to vegetation are localized and considered minor, which should have a negligible effect on wildlife that consumes these plants. The maximum predicted annual deposition rate of potential acid input and maximum concentration of nitrogen dioxide are both expected to occur to the southeast of the Project centre but these values are relatively low. The deposition predictions are considered to be conservative, and therefore the presented deposition rates are most

likely overestimated. Therefore, changes in vegetation quality due to dust deposition and air emissions are anticipated to be minor relative to baseline conditions. Consequently, residual effects to upland breeding birds from dust deposition and air emissions are predicted to be negligible.

Environmental Design Features and Mitigation

Design features and mitigation measures to control dust and other air emissions include:

- The watering of roads and laydown areas during the non-winter period will facilitate dust suppression.
- Enforcing speed limits will help reduce dust production.
- Equipment and fleet equipped with industry-standard emission control systems.
- Sources of particulate emissions at the processing facility will be controlled through the use of baghouses
- Enclosing conveyance systems and processing facilities (baghouse).
- Processing equipment with high efficiency bag houses to reduce emissions of particulate matter
- Operating procedures will be developed that reduce dust generation and air emissions (e.g., regular maintenance of equipment to meet emission standards).

With the use of these design features and mitigation measures the residual effects to upland breeding birds from dust deposition and air emissions are predicted to be negligible.

3.8.2 Residual Effects

There one residual effect on upland breeding birds that cannot be fully mitigated: the loss and fragmentation of habitat.

3.8.2.1 Residual Effect 1-Physical Loss or Alteration of Habitat

The assessment of effects to upland breeding birds is most relevant in the LSA. The habitat loss that will occur is confined to the Project mine site and thus the geographic extent is evaluated as low. The decline in bird abundance within the LSA is expected to average 15.75% across all habitat types. This is evaluated as a moderate magnitude.

The loss and alteration of breeding habitats will occur during construction and linger throughout the lifetime of the project (15 years) and into closure. Habitat loss is reversible with time, as it will take a number of years for the rehabilitated mine site to mature into quality breeding habitats for most upland breeding birds. The duration is evaluated as low.

The largest decline in absolute numbers is expected to occur in the dense coniferous forest where the expected decline is 1,517 birds representing 21.38% of bird abundance. The largest proportional decline is expected to occur in the open fen habitats where the expected decline of 168 birds represents a decline of 28.77%.

3.8.2.1 Residual Effect 2-Change in Habitat Suitability

The highest predicted change is 0.041% in the LSA is of negligible magnitude. The effect of the change in habitat suitability occurs in the LSA and occurs mainly during construction and operations. The effect is

reversible once the operation of the mine has ceased and breeding birds come back to utilize the rehabilitated habitat areas. Thus this minor change is not likely to have an effect on breeding bird populations.

3.8.3 Summary of Residual Effects

Table 3-27: Summary of Residual Effects

Effect	Geographic Extent	Magnitude	Duration
Loss and Alteration of habitat	Low	Moderate	Low
Change in Habitat Suitability	Moderate	Negligible	Low

Habitat loss is the threat to many breeding birds. The largest decline in numbers as a result of the Project is predicted to occur in birds that breed in dense coniferous forest. The MSA and LSA are surrounded by the same types of forest. At closure, the site will be rehabilitated to forest. Therefore, habitat loss due to the Project is expected to have a low significance to populations of upland breeding birds.

The effect of the presence of the mine on the suitability of habitat for upland breeding birds is considered to be of negligible significance due to the availability of breeding bird habitat in the LSA and the reversibility of the effect at closure and the minor magnitude of change. The significance of this effect will be negligible.

The losses described in this section represent the worst-case scenario. Since conservative estimates of effective habitat loss were considered in the assessment. Based on this analysis, it is highly unlikely that residual impacts to upland breeding birds related to the Project will result in significant changes in their population distribution or abundance. Monitoring activities will attempt to illustrate that this is indeed the case. If not, an adaptive management strategy will be taken to ensure that perceived significant impacts are reduced further.

3.9 Overall Summary of the Effects Assessment

Table 3-28: Residual Effects and the Overall Significance to VECs

VEC	Residual Effect	Geographic Extent	Magnitude	Duration	Overall Significance of the Residual Effect
Wetlands	Loss and alteration of vegetation	low	moderate	moderate	**LOW**
	Alteration of Flows and Drainage Patterns	moderate	low	moderate	**LOW**
Forest cover	Loss and alteration of vegetation	low	moderate	low	**LOW**
Moose	Loss of habitat	low	negligible	low	**NEGLIGIBLE**
	Habitat suitability	moderate	negligible	moderate	**NEGLIGIBLE**
Furbearers	Loss of habitat	low	moderate	moderate	**LOW**
	Alteration of flows and drainage patterns	moderate	low	moderate	**LOW**
Species at risk	Loss of habitat	low	moderate	moderate	**LOW**
	Alteration of flows and drainage patterns	moderate	low	moderate	**LOW**

Table 3-28: Residual Effects and the Overall Significance to VECs (Continued)

VEC	Residual Effect	Geographic Extent	Magnitude	Duration	Overall Significance of the Residual Effect
	Risk of Injury/Mortality	low	low	high	**LOW**
Upland breeding birds	Loss of habitat	low	moderate	moderate	**LOW**
	Habitat Suitability	moderate	negligible	low	**NEGLIGIBLE**

4.0 TERRESTRIAL ECOLOGY MONITORING PROGRAM

The objectives of the Terrestrial Ecology monitoring program are to:

- Verify the accuracy of the environmental assessment;
- Verify the predictions of the EIS studies; or
- Confirm the effectiveness of mitigation measures, and in doing so, determine if new mitigation strategies are required.

Based on the residual effects predicted in the Terrestrial Ecology assessment, the following components of monitoring are recommended:

Table 4-1: Summary of the Recommended Terrestrial Ecology Monitoring Program

Residual Effect	Parameter	Program Objective	Method	Suggested Frequency, Duration, and Location of Monitoring
Loss and alteration of vegetation	Composition/diversity of plant communities in LSA	Confirm plant communities health, composition and diversity	Inspection of re-vegetated areas. Invasive Plant Management Plan	Throughout the MSA, in areas of progressive rehabilitation. Frequency and duration of monitoring shall be site specific and specified on re-vegetation plans Invasive Plant Management Plan will include details on the detection, control and monitoring for invasive species. This plan will be developed for areas adjacent to the footprint of development and the access road/transmission corridor. Throughout construction, operations and closure.
Alteration of Flows and Drainage Patterns	Surface water monitoring	confirm the predicted changes in flows and lake water levels in the LSA	water level data loggers and flow estimates through the use of rating curves	Daily recordings at 6 monitoring station in the LSA. Throughout the four phases of the Project.

Table 4-1: Summary of the Recommended Terrestrial Ecology Monitoring Program (Continued)

Residual Effect	Parameter	Program Objective	Method	Suggested Frequency, Duration, and Location of Monitoring
Loss of habitat	Presence/persistence of species in the LSA	Confirm the continued use of areas adjacent to the Mine Site and within the LSA by moose, furbearers, breeding birds and SAR (i.e. determine if mining activities influence the presence/absence of species)	MNR Harvest records, MNR hunting records, breeding bird point count surveys, species sightings	Breeding bird point counts. Wildlife Log: the on-going recording of SAR and other wildlife sightings. Hunting and trapping records acquired as available from MNR.
Risk of Injury/ Mortality to SAR and other wildlife	Presence/persistence of species in the LSA	Determine the risks and occurrence of mortality of SAR in the LSA	Worker training and education. Mandatory reporting of road mortality and other mortality by mine staff	Wildlife Log: the on-going recording of SAR and other wildlife sightings. Throughout construction, operations and closure.

4.1 Vegetation Monitoring

Construction of the Project will lead to the direct loss and alteration of vegetation in various types of forest cover and wetland communities. Work areas that are no longer required will be progressively rehabilitated through re-vegetation. A reclamation/vegetation monitoring program will be developed and conducted for all areas that are rehabilitated with native vegetative species. The objectives, measurement endpoints, and methods of re-vegetation will be determined as areas become available for progressive rehabilitation. The monitoring program will comply with all approval conditions. The Project reclamation monitoring plan is expected to consist of the following components:

- Ongoing reclamation monitoring that includes processes to ensure that reclamation stockpiles are stable and free of invasive plant species and methods to monitor the progress of reclamation plantings.
- Reporting on the progress of environmental monitoring as required by the approval.

Invasive Species Plant Management Strategy will be designed and implemented to prevent, detect, control (remove), and monitor areas with invasive plant species. Surveys to detect invasive plant species will be carried out on an annual basis in areas that are prone to the establishment of these plants (e.g., roadsides and other edges between development and natural plant communities). Details of the removal and subsequent monitoring will be contained in the Invasive Species Plant Management Strategy.

4.2 Surface Water Monitoring

The predicted alteration of flow and water levels for the Project has the potential to affect aquatic features, wetland communities and thus the wildlife species that rely on these habitats. Therefore, the Surface Water field monitoring will be considered as a method to confirm the predictions of the Terrestrial Ecology assessment.

The surface water monitoring program consists of flow and water level monitoring in site, local and regional scale watercourses and water bodies identified as potentially being affected by Project activities and at key points in the Project's water management system to confirm and update estimates of water takings, effluent discharges and water recycling.

Six monitoring stations will be developed through the installation of permanent data logging devices in watercourses and waterbodies. The data loggers will record water levels at half hourly intervals. Where applicable (i.e. at automatic recording stations), water level data will be converted to flow data using rating curves developed for the stations. Rating curves will be developed and maintained by collecting manual readings of water levels and direct flow measurements at the stations seasonally (i.e. four times per year in August, October, March and May) to broadly cover the range of hydrological conditions.

Existing monitoring stations are currently operating and will continue to be operated throughout the period prior to the construction phase and thereafter throughout the four phases of the Project. Monitoring at relocated and new stations will commence prior to the start of the construction phase, to establish existing conditions, and will continue throughout the four phases of the Project.

In the event that the prediction of the surface water monitoring program are different from those predicted in the environmental assessment, an additional monitoring program to determine changes to wetland and other aquatic habitats shall be developed at that time.

4.3 Wildlife Monitoring

Wildlife monitoring will be initiated during the construction phase and will continue during the Project mine's operation and post–closure. Objectives of wildlife monitoring will include the collection of data through the following:

- Secondary sources (e.g., MNR hunting and trapping records)
- Annual field surveys; and
- Incidental observation and documentation of wildlife injury, mortality or abnormal behaviour associated with mine components (e.g., access roads, waste management, etc.).

The monitoring data will be used to determine effects of mining activities on wildlife, test impact predictions, examine the effectiveness of mitigation measures, and advise adaptive management strategies.

Long-term monitoring will be conducted on upland breeding birds to assess impacts at broader temporal scales. Baseline studies for upland breeding birds focused on describing species density, diversity, and richness within the LSA. Surveys were conducted using standard point count methods (Environment Canada 2011). For the breeding bird monitoring program, point count survey methodology will continue to be used to facilitate direct comparisons of species density, richness, and diversity within and among survey years. Annual monitoring of upland bird populations will continue through post-closure operations, specifically during breeding season.

Wildlife logs will be kept at the site to record all wildlife sightings and or encounters. All personnel at the Project Site will be encouraged to report wildlife sightings to the environmental staff for recording and reporting purposes. Incidental observations of all SAR will be recorded and submitted to a central repository for incorporation into the wildlife log and the annual report.

4.4 Reporting

Vegetation and wildlife monitoring data that has been collected annually shall be reported and provided to the MNR and to other interested parties (e.g., Environment Canada).

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6.0 GLOSSARY OF TERMS

Table 6-1: Glossary of Terms

Term	Definition
Algae	Simple plants containing chlorophyll; most live submerged in water. Microscopic plants which contain chlorophyll and live floating or suspended in water. They also may be attached to structures, rocks or other submerged surfaces. They are food for fish and small aquatic animals. Excess algal growths can impart tastes and odors to potable water. Algae produce oxygen during sunlight hours and use oxygen during the night hours. Their biological activities appreciably affect the pH and dissolved oxygen of the water. (U.S. Department of the Interior 2012)
Anthropogenic	Generated by humans. Used to indicate soil conditions, disturbances, or stresses that are created by people. (USDA 2012)
Attenuation	Decrease in amplitude of the seismic waves with distance due to geometric spreading, energy absorption and scattering. (U.S. Department of the Interior 2012)
Baseline	Conditions that would prevail if no actions were taken. (U.S. Department of the Interior 2012)
Bedrock	The solid rock at the surface or underlying other surface materials. Rock of relatively great thickness and extent in its native location. A general term for any solid rock, not exhibiting soil-like properties, that underlies soil or other unconsolidated surficial materials. As distinguished from boulders. The consolidated body of natural solid mineral matter which underlies the overburden soils. The solid rock that underlies all soil, sand, clay, gravel, and other loose materials on the earth's surface. Any sedimentary, igneous, or metamorphic material represented as a unit in geology; being a sound and solid mass, layer, or ledge of mineral matter; and with shear wave velocities greater than 2500 feet per second. (U.S. Department of the Interior 2012)
Catchment	Unit watershed; an area from which all the drainage water passes into one stream or other body of water. (U.S. Department of the Interior 2012)
Chlorophyll	One of the two pigments responsible for the green colour of most plants. It is an essential component of the machinery to absorb light energy for photosynthesis. (FAO 2012)
Conifers	Cone-bearing trees or shrubs, mostly evergreens such as pine, cedar, and spruce. (U.S. Department of the Interior 2012)
Diurnal	An event that occurs repetitively on a daily basis, generally during daylight hours. (FAO 2012)
Effluent	Partially or completely treated wastewater flowing out of a treatment facility, reservoir, or basin. (U.S. Department of the Interior 2012)
Forb	A weed or a broad-leafed plant. (U.S. Department of the Interior 2012)
Grubbing	Removal of stumps, roots, and vegetable matter from the ground surface after clearing and prior to excavation. (U.S. Department of the Interior 2012)
Hummock	A hillock of broken ice which has been forced upward by pressure. (NOAA 2012)
Invertebrate	All animals without a vertebral column. (U.S. Department of the Interior 2012)

Table 6-1: Glossary of Terms (Continued)

Term	Definition
Lichen	A composite of fungi and algae or cyanobacteria. The fungi capture and cultivate photosynthetic organisms which together provide themselves needed water and nutrients. Lichen species occur in many colors including black, brown, dark olive green, red, yellow and white. (USDA 2012)
Loam	A soft, easily worked soil containing sand, silt, and clay. (U.S. Department of the Interior 2012)
Macrophyte	A plant large enough to be seen by the naked eye. (U.S. Department of the Interior 2012)
Mineralization	The conversion of organic compounds into inorganic, plant-available compounds such as ammonium. This is accomplished by soil organisms as they consume organic matter and excrete wastes. (USDA 2012)
Moss	Photosynthetic plants with small leaves that unfurl when moistened (thus the moss appears to swell). When dry, mosses are dark and dull-colored; when moistened, the color changes markedly to a bright, light green to brown. This makes them easy to distinguish from lichens. (USDA 2012)
Ore	Rock or earth containing workable quantities of a mineral or minerals of commercial value. (U.S. Department of the Interior 2012)
Overburden	Soil or rock lying on top of a pay formation. (U.S. Department of the Interior 2012)
Palustrine Habitat	Marsh habitat. (U.S. Department of the Interior 2012)
Parasitism	The close association of two or more dissimilar organisms, where the association is harmful to the host, but beneficial to the parasite. (FAO 2012)
Riparian	Living on or adjacent to a water supply such as a riverbank, lake, or pond. Of, on, or pertaining to the bank of a river, pond, or lake. (U.S. Department of the Interior 2012)
Runoff	The portion of precipitation, snow melt, or irrigation that flows over the soil, eventually making its way to surface water supplies. Liquid water that travels over the surface of the Earth, moving downward due to the law of gravity; runoff is one way in which water that falls as precipitation returns to the ocean. (U.S. Department of the Interior 2012)
Sedimentation	Deposition of waterborne sediments due to a decrease in velocity and corresponding reduction in the size and amount of sediment which can be carried. (U.S. Department of the Interior 2012)
Seepage	The slow movement or percolation of water through soil or rock. Movement of water through soil without formation of definite channels. The movement of water into and through the soil from unlined canals, ditches, and water storage facilities. The slow movement or percolation of water through small cracks, pores, interstices, etc., from an embankment, abutment, or foundation. (U.S. Department of the Interior 2012)
Substrate	Surface on which a plant or animal grows or is attached. The base on which an organism lives; a substance acted upon. (U.S. Department of the Interior 2012)
Topsoil	The topmost layer of soil, usually containing organic matter. Usually refers to soil containing humus which is capable of supporting plant growth. (U.S. Department of the Interior 2012)

Table 6-1: Glossary of Terms (Continued)

Term	Definition
Tributary	River or stream flowing into a larger river or stream. (U.S. Department of the Interior 2012)
Vascular	Plant tissue specialized for the conduction of water or nutrients. (FAO 2012)
Watercourse	Any surface flow such as a river, stream, or tributary. (NOAA 2012)
Watershed	Surface drainage area above a specified point on a stream. Area which drains into or past a point. A geographical portion of the Earth's surface from which water drains or runs off to a single place like a river. The area of land that drains its water into a stream or river. All the land and water within the confines of a certain drainage area. Vertically, it extends from the top of the vegetation to the underlying rock layers that confine water movement. An area of land that contributes runoff to one specific delivery point. (U.S. Department of the Interior 2012)

7.0 LIST OF ABBREVIATIONS, ACRONYMS AND INITIALISMS

Table 7-1: List of Abbreviations, Acronyms and Initialisms

Acronym	Definition
ANSI	Area of Natural and Scientific Interest
API	Area of Potential Impact
ARC Pad	Mobile field mapping and data collection software
ATV	All-terrain Vehicle
BCR	Bird Conservation Region
BSC	Bird Studies Canada
CEA Agency	Canadian Environmental Assessment Agency
CEAA	Canadian Environmental Assessment Act
CEF	Cervid Ecological Framework
CEZ	Cervid Ecological Zone
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DNA	Deoxyribonucleic Acid
EA	Environmental Assessment
EDR	Effective Detection Radius
EIS	Environmental Impact Statement
ENE	Ministry of the Environment
ESA	Endangered Species Act
FEC	Forest Ecosystem Classification
GIS	Geographic Information System
HSI	Habitat Suitability Index
IBA	Important Bird Areas
LIDAR	Light Detection and Ranging
LIO	Land Information Ontario
LISA	Linear Infrastructure Study Area
LSA	Local Study Area
MMP	Marsh Monitoring Program
MNDM	Ministry of Northern Development and Mines
MNR	Ontario Ministry of Natural Resources
MSA	Mine Study Area
MTO	Ministry of Transportation Ontario
NHIC	Natural Heritage Information Centre
NOWES	Northern Ontario Wetland Evaluation System
NRVIS	Natural Resource Values Information System
NTS	Not To Scale
OBBA	Ontario Breeding Bird Atlas

Table 7-1: List of Abbreviations, Acronyms and Initialisms (Continued)

Acronym	Definition
OHRG	Osisko Hammond Reef Gold Ltd.
ONOS	Ontario Nocturnal Owl Surveys
OWES	Ontario Wetland Evaluation System
ROM	Royal Ontario Museum
RSA	Regional Study Area
SAR	Species at Risk
SARA	Species at Risk Act
SOCC	Species of Conservation Concern
STP	Sewage Treatment Plant
TMF	Tailings Management Facility
ToR	Terms of Reference
TSD	Technical Support Document
TUS	Traditional Use Study
UTM	Universal Transverse Mercator (coordinate system)
VEC	Valued Ecosystem Component
WMU	Wildlife Management Unit
WRMF	Waste Rock Management Facility

8.0 LIST OF UNITS

Table 8-1: List of Units

Abbreviation	Unit
°C	degrees Celsius
µg/m^3	micrograms per cubic metres
cm	centimetre
dB	decibel
g/m^2/y	grams per square metres per year
ha	hectare
hr	hour
km	kilometre
km/h	kilometres per hour
km^2	square kilometres
m	metre
mm	millimetre

APPENDIX 2.I

Bird Species in the Local Study Area

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in All Habitats

All Habitats (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	107	0.1224	1
Oreothlypisa ruficapilla	Nashville Warbler	99	0.1133	2
Setophaga magnolia	Magnolia Warbler	60	0.0686	3
Vireo olivaceus	Red-eyed Vireo	50	0.0572	4
Setophaga coronata	Yellow-rumped Warbler	44	0.0503	5
Catharus ustulatus	Swainson's Thrush	39	0.0446	6
Catharus guttatus	Hermit Thrush	37	0.0423	7
Regulus calendula	Ruby-crowned Kinglet	32	0.0366	8
Empidonax flaviventris	Yellow-bellied Flycatcher	26	0.0297	9
Regulus satrapa	Golden-crowned Kinglet	20	0.0229	10
Seiurus aurocapilla	Ovenbird	20	0.0229	10
Melospiza lincolnii	Lincoln's Sparrow	18	0.0206	12
Bombycilla cedrorum	Cedar Waxwing	17	0.0195	13
Melospiza georgiana	Swamp Sparrow	17	0.0195	13
Perisoreus canadensis	Gray Jay	17	0.0195	13
Setophaga palmarum palmarum	Palm Warbler	16	0.0183	16
Empidonax alnorum	Alder Flycatcher	13	0.0149	17
Mniotilta varia	Black-and-white Warbler	13	0.0149	17
Turdus migratorius	American Robin	13	0.0149	17
Empidonax minimus	Least Flycatcher	12	0.0137	20
Oporornis philadelphia	Mourning Warbler	12	0.0137	20
Sitta canadensis	Red-breasted Nuthatch	12	0.0137	20
Troglodytes hiemalis	Winter Wren	11	0.0126	23
Catharus fuscescens	Veery	10	0.0114	24
Junco hyemalis	Dark-eyed Junco	9	0.0103	25
Poecile atricapilla	Black-capped Chickadee	9	0.0103	25
Vermivora peregrina	Tennessee Warbler	9	0.0103	25
Melospiza melodia	Song Sparrow	8	0.0092	28
Sphyrapicus varius	Yellow-bellied Sapsucker	8	0.0092	28
Setophaga americana	Northern Parula	7	0.0080	30
Vireo solitarius	Blue-headed Vireo	7	0.0080	30
Geothlypis trichas	Common Yellowthroat	6	0.0069	32
Setophaga castanea	Bay-breasted Warbler	6	0.0069	32
Setophaga virens	Black-throated Green Warbler	6	0.0069	32
Wilsonia canadensis	Canada Warbler	6	0.0069	32
Wilsonia pusilla	Wilson's Warbler	6	0.0069	32
Colaptes auratus	Northern Flicker	5	0.0057	37
Picoides villosus	Hairy Woodpecker	5	0.0057	37
Poecile hudsonicus	Boreal Chickadee	5	0.0057	37
Setophaga pensylvanica	Chestnut-sided Warbler	5	0.0057	37
Cyanocitta cristata	Blue Jay	4	0.0046	41
Quiscalus quiscula	Common Grackle	4	0.0046	41
Seiurus noveboracensis	Northern Waterthrush	4	0.0046	41
Setophaga fusca	Blackburnin Warbler	4	0.0046	41
Spizella passerina	Chipping Sparrow	4	0.0046	41
Carpodacus purpureus	Purple Finch	3	0.0034	46
Picoides arcticus	Black-backed Woodpecker	3	0.0034	46
Spinus pinus	Pine Siskin	3	0.0034	46
Archilochus colubris	Ruby-throated Hummingbird	2	0.0023	49
Corvus corax	Common Raven	2	0.0023	49
Gallinago delicata	Wilson's Snipe	2	0.0023	49
Larus philadelphia	Bonaparte's Gull	2	0.0023	49
Tachycineta bicolor	Tree Swallow	2	0.0023	49
Tringa melanoleuca	Greater Yellowlegs	2	0.0023	49
Anas platyrhynchos	Mallard	1	0.0011	55
Bonasa umbellus	Ruffed Grouse	1	0.0011	55
Corvus brachyrhynchos	American Crow	1	0.0011	55
Gavia immer	Common Loon	1	0.0011	55
Oporornis agilis	Conneticut Warbler	1	0.0011	55
Picoides tridactylus	Three-toed Woodpecker	1	0.0011	55

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in All Habitats

All Habitats (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (largest to smallest)**
Sitta carolinensis	White-breasted Nuthatch	1	0.0011	55
Spizella pallida	Clay-colored Sparrow	1	0.0011	55
Falcipennis canadensis	Spruce Grouse	1	0.0011	55
Pheucticus ludovicianus	Rose-breasted Grosbeak	1	0.0011	55
Larus argentatus	Herring Gull	1	0.0011	55
	Total Number of Birds	**874**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Dense Coniferous Forest Habitat

Dense Conifer Forest (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (Largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	24	0.1412	1
Setophaga magnolia	Magnolia Warbler	19	0.1118	2
Oreothlypisa ruficapilla	Nashville Warbler	16	0.0941	3
Catharus ustulatus	Swainson's Thrush	14	0.0824	4
Vireo olivaceus	Red-eyed Vireo	10	0.0588	5
Setophaga coronata	Yellow-rumped Warbler	8	0.0471	6
Setophaga americana	Northern Parula	6	0.0353	7
Sitta canadensis	Red-breasted Nuthatch	6	0.0353	7
Empidonax flaviventris	Yellow-bellied Flycatcher	5	0.0294	9
Regulus calendula	Ruby-crowned Kinglet	5	0.0294	9
Setophaga castanea	Bay-breasted Warbler	5	0.0294	9
Catharus guttatus	Hermit Thrush	4	0.0235	12
Perisoreus canadensis	Gray Jay	4	0.0235	12
Poecile atricapilla	Black-capped Chickadee	4	0.0235	12
Vireo solitarius	Blue-headed Vireo	4	0.0235	12
Regulus satrapa	Golden-crowned Kinglet	3	0.0176	16
Troglodytes hiemalis	Winter Wren	3	0.0176	16
Bombycilla cedrorum	Cedar Waxwing	2	0.0118	18
Mniotilta varia	Black-and-white Warbler	2	0.0118	18
Picoides arcticus	Black-backed Woodpecker	2	0.0118	18
Picoides villosus	Hairy Woodpecker	2	0.0118	18
Quiscalus quiscula	Common Grackle	2	0.0118	18
Seiurus aurocapilla	Ovenbird	2	0.0118	18
Setophaga fusca	Blackburnin Warbler	2	0.0118	18
Setophaga virens	Black-throated Green Warbler	2	0.0118	18
Sphyrapicus varius	Yellow-bellied Sapsucker	2	0.0118	18
Turdus migratorius	American Robin	2	0.0118	18
Carduelis pinus	Pine Siskin	1	0.0059	28
Colaptes auratus	Northern Flicker	1	0.0059	28
Corvus brachyrhynchos	American Crow	1	0.0059	28
Cyanocitta cristata	Blue Jay	1	0.0059	28
Oporornis philadelphia	Mourning Warbler	1	0.0059	28
Seiurus noveboracensis	Northern Waterthrush	1	0.0059	28
Setophaga palmarum palmarum	Palm Warbler	1	0.0059	28
Spizella passerina	Chipping Sparrow	1	0.0059	28
Vermivora peregrina	Tennessee Warbler	1	0.0059	28
Wilsonia canadensis	Canada Warbler	1	0.0059	28
	Total Number of Birds	**170**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Conifer Swamp Habitat

Conifer Swamp (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (Largest to smallest)**
Oreothlypisa ruficapilla	Nashville Warbler	27	0.1646	1
Zonotrichia albicollis	White-throated Sparrow	19	0.1159	2
Catharus guttatus	Hermit Thrush	16	0.0976	3
Setophaga coronata	Yellow-rumped Warbler	16	0.0976	3
Regulus calendula	Ruby-crowned Kinglet	12	0.0732	5
Catharus ustulatus	Swainson's Thrush	7	0.0427	6
Empidonax flaviventris	Yellow-bellied Flycatcher	7	0.0427	6
Setophaga magnolia	Magnolia Warbler	6	0.0366	8
Junco hyemalis	Dark-eyed Junco	5	0.0305	9
Melospiza lincolnii	Lincoln's Sparrow	4	0.0244	10
Regulus satrapa	Golden-crowned Kinglet	4	0.0244	10
Vermivora peregrina	Tennessee Warbler	4	0.0244	10
Bombycilla cedrorum	Cedar Waxwing	3	0.0183	13
Setophaga palmarum palmarum	Palm Warbler	3	0.0183	13
Troglodytes hiemalis	Winter Wren	3	0.0183	13
Wilsonia pusilla	Wilson's Warbler	3	0.0183	13
Empidonax alnorum	Alder Flycatcher	2	0.0122	17
Perisoreus canadensis	Gray Jay	2	0.0122	17
Picoides villosus	Hairy Woodpecker	2	0.0122	17
Poecile hudsonicus	Boreal Chickadee	2	0.0122	17
Seiurus noveboracensis	Northern Waterthrush	2	0.0122	17
Spizella passerina	Chipping Sparrow	2	0.0122	17
Turdus migratorius	American Robin	2	0.0122	17
Vireo olivaceus	Red-eyed Vireo	2	0.0122	17
Vireo solitarius	Blue-headed Vireo	2	0.0122	17
Corvus corax	Common Raven	1	0.0061	26
Geothlypis trichas	Common Yellowthroat	1	0.0061	26
Melospiza georgiana	Swamp Sparrow	1	0.0061	26
Picoides arcticus	Black-backed Woodpecker	1	0.0061	26
Picoides tridactylus	Three-toed Woodpecker	1	0.0061	26
Quiscalus quiscula	Common Grackle	1	0.0061	26
Tachycineta bicolor	Tree Swallow	1	0.0061	26
	Total Number of Birds	**164**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Dense Deciduous Forest Habitat

Dense Deciduous (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (Largest to smallest)**
Vireo olivaceus	Red-eyed Vireo	20	0.2857	1
Seiurus aurocapilla	Ovenbird	10	0.1429	2
Empidonax minimus	Least Flycatcher	9	0.1286	3
Catharus fuscescens	Veery	5	0.0714	4
Setophaga magnolia	Magnolia Warbler	4	0.0571	5
Turdus migratorius	American Robin	3	0.0429	6
Zonotrichia albicollis	White-throated Sparrow	3	0.0429	6
Mniotilta varia	Black-and-white Warbler	2	0.0286	8
Oreothlypisa ruficapilla	Nashville Warbler	2	0.0286	8
Poecile atricapilla	Black-capped Chickadee	2	0.0286	8
Setophaga pensylvanica	Chestnut-sided Warbler	2	0.0286	8
Sphyrapicus varius	Yellow-bellied Sapsucker	2	0.0286	8
Bonasa umbellus	Ruffed Grouse	1	0.0143	13
Catharus guttatus	Hermit Thrush	1	0.0143	13
Oporornis philadelphia	Mourning Warbler	1	0.0143	13
Sitta carolinensis	White-breasted Nuthatch	1	0.0143	13
Troglodytes hiemalis	Winter Wren	1	0.0143	13
Wilsonia canadensis	Canada Warbler	1	0.0143	13
	Total Number of Birds	**70**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Dense Mixed Forest Habitat

Dense Mixed (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	28	0.1386	1
Oreothlypisa ruficapilla	Nashville Warbler	25	0.1238	2
Catharus ustulatus	Swainson's Thrush	15	0.0743	3
Setophaga magnolia	Magnolia Warbler	14	0.0693	4
Vireo olivaceus	Red-eyed Vireo	14	0.0693	4
Mniotilta varia	Black-and-white Warbler	8	0.0396	6
Oporornis philadelphia	Mourning Warbler	8	0.0396	6
Seiurus aurocapilla	Ovenbird	8	0.0396	6
Catharus guttatus	Hermit Thrush	6	0.0297	9
Empidonax flaviventris	Yellow-bellied Flycatcher	6	0.0297	9
Perisoreus canadensis	Gray Jay	6	0.0297	9
Setophaga coronata	Yellow-rumped Warbler	6	0.0297	9
Regulus calendula	Ruby-crowned Kinglet	5	0.0248	13
Regulus satrapa	Golden-crowned Kinglet	5	0.0248	13
Bombycilla cedrorum	Cedar Waxwing	4	0.0198	15
Catharus fuscescens	Veery	4	0.0198	15
Wilsonia canadensis	Canada Warbler	4	0.0198	15
Setophaga pensylvanica	Chestnut-sided Warbler	3	0.0149	18
Setophaga virens	Black-throated Green Warbler	3	0.0149	18
Sitta canadensis	Red-breasted Nuthatch	3	0.0149	18
Sphyrapicus varius	Yellow-bellied Sapsucker	3	0.0149	18
Cyanocitta cristata	Blue Jay	2	0.0099	22
Empidonax minimus	Least Flycatcher	2	0.0099	22
Poecile atricapilla	Black-capped Chickadee	2	0.0099	22
Setophaga fusca	Blackburnin Warbler	2	0.0099	22
Troglodytes hiemalis	Winter Wren	2	0.0099	22
Turdus migratorius	American Robin	2	0.0099	22
Carpodacus purpureus	Purple Finch	1	0.0050	28
Empidonax alnorum	Alder Flycatcher	1	0.0050	28
Falcipennis canadensis	Spruce Grouse	1	0.0050	28
Melospiza georgiana	Swamp Sparrow	1	0.0050	28
Melospiza lincolnii	Lincoln's Sparrow	1	0.0050	28
Melospiza melodia	Song Sparrow	1	0.0050	28
Picoides villosus	Hairy Woodpecker	1	0.0050	28
Seiurus noveboracensis	Northern Waterthrush	1	0.0050	28
Setophaga americana	Northern Parula	1	0.0050	28
Setophaga castanea	Bay-breasted Warbler	1	0.0050	28
Spinus pinus	Pine Siskin	1	0.0050	28
Vireo solitarius	Blue-headed Vireo	1	0.0050	28
	Total Number of Birds	**202**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Edge Habitat

Edge (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (Largest to smallest)**
Setophaga magnolia	Magnolia Warbler	12	0.1277	1
Zonotrichia albicollis	White-throated Sparrow	10	0.1064	2
Oreothlypisa ruficapilla	Nashville Warbler	8	0.0851	3
Bombycilla cedrorum	Cedar Waxwing	6	0.0638	4
Regulus calendula	Ruby-crowned Kinglet	6	0.0638	4
Setophaga coronata	Yellow-rumped Warbler	6	0.0638	4
Melospiza georgiana	Swamp Sparrow	5	0.0532	7
Regulus satrapa	Golden-crowned Kinglet	5	0.0532	7
Empidonax flaviventris	Yellow-bellied Flycatcher	4	0.0426	9
Melospiza lincolnii	Lincoln's Sparrow	4	0.0426	9
Catharus guttatus	Hermit Thrush	3	0.0319	11
Archilochus colubris	Ruby-throated Hummingbird	2	0.0213	12
Catharus ustulatus	Swainson's Thrush	2	0.0213	12
Colaptes auratus	Northern Flicker	2	0.0213	12
Melospiza melodia	Song Sparrow	2	0.0213	12
Troglodytes hiemalis	Winter Wren	2	0.0213	12
Vireo olivaceus	Red-eyed Vireo	2	0.0213	12
Carduelis pinus	Pine Siskin	1	0.0106	18
Gallinago delicata	Wilson's Snipe	1	0.0106	18
Gavia immer	Common Loon	1	0.0106	18
Geothlypis trichas	Common Yellowthroat	1	0.0106	18
Junco hyemalis	Dark-eyed Junco	1	0.0106	18
Larus argentatus	Herring Gull	1	0.0106	18
Mniotilta varia	Black-and-white Warbler	1	0.0106	18
Poecile hudsonicus	Boreal Chickadee	1	0.0106	18
Quiscalus quiscula	Common Grackle	1	0.0106	18
Setophaga virens	Black-throated Green Warbler	1	0.0106	18
Sitta canadensis	Red-breasted Nuthatch	1	0.0106	18
Sphyrapicus varius	Yellow-bellied Sapsucker	1	0.0106	18
Spizella passerina	Chipping Sparrow	1	0.0106	18
	Total Number of Birds	**94**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Marsh Habitat

Marsh (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (Largest to smallest)**
Turdus migratorius	American Robin	2	0.1176	1
Oporornis philadelphia	Mourning Warbler	2	0.1176	1
Melospiza melodia	Song Sparrow	2	0.1176	1
Zonotrichia albicollis	White-throated Sparrow	2	0.1176	1
Empidonax alnorum	Alder Flycatcher	1	0.0588	5
Geothlypis trichas	Common Yellowthroat	1	0.0588	5
Anas platyrhynchos	Mallard	1	0.0588	5
Colaptes auratus	Northern Flicker	1	0.0588	5
Melospiza georgiana	Swamp Sparrow	1	0.0588	5
Empidonax minimus	Least Flycatcher	1	0.0588	5
Poecile atricapilla	Black-capped Chickadee	1	0.0588	5
Setophaga magnolia	Magnolia Warbler	1	0.0588	5
Pheucticus ludovicianus	Rose-breasted Grosbeak	1	0.0588	5
	Total Number of Birds	**17**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Open Fen Habitat

Open Fen (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (Largest to smallest)**
Melospiza georgiana	Swamp Sparrow	8	0.1778	1
Melospiza lincolnii	Lincoln's Sparrow	6	0.1333	2
Setophaga palmarum palmarum	Palm Warbler	5	0.1111	3
Oreothlypisa ruficapilla	Nashville Warbler	4	0.0889	4
Empidonax flaviventris	Yellow-bellied Flycatcher	3	0.0667	5
Zonotrichia albicollis	White-throated Sparrow	3	0.0667	5
Geothlypis trichas	Common Yellowthroat	2	0.0444	7
Larus philadelphia	Bonaparte's Gull	2	0.0444	7
Perisoreus canadensis	Gray Jay	2	0.0444	7
Tringa melanoleuca	Greater Yellowlegs	2	0.0444	7
Bombycilla cedrorum	Cedar Waxwing	1	0.0222	11
Carpodacus purpureus	Purple Finch	1	0.0222	11
Catharus guttatus	Hermit Thrush	1	0.0222	11
Junco hyemalis	Dark-eyed Junco	1	0.0222	11
Melospiza melodia	Song Sparrow	1	0.0222	11
Setophaga coronata	Yellow-rumped Warbler	1	0.0222	11
Turdus migratorius	American Robin	1	0.0222	11
Wilsonia pusilla	Wilson's Warbler	1	0.0222	11
	Total Number of Birds	**45**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Thicket Swamp Habitat

Thicket Swamp (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (largest to smallest)**
Empidonax alnorum	Alder Flycatcher	6	0.2000	1
Oreothlypisa ruficapilla	Nashville Warbler	5	0.1667	2
Zonotrichia albicollis	White-throated Sparrow	5	0.1667	2
Setophaga coronata	Yellow-rumped Warbler	2	0.0667	4
Vermivora peregrina	Tennessee Warbler	2	0.0667	4
Bombycilla cedrorum	Cedar Waxwing	1	0.0333	6
Catharus fuscescens	Veery	1	0.0333	6
Colaptes auratus	Northern Flicker	1	0.0333	6
Geothlypis trichas	Common Yellowthroat	1	0.0333	6
Melospiza georgiana	Swamp Sparrow	1	0.0333	6
Melospiza melodia	Song Sparrow	1	0.0333	6
Regulus calendula	Ruby-crowned Kinglet	1	0.0333	6
Spizella pallida	Clay-colored Sparrow	1	0.0333	6
Wilsonia pusilla	Wilson's Warbler	1	0.0333	6
Melospiza lincolnii	Lincoln's Sparrow	1	0.0333	6
	Total Number of Birds	**30**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Treed Bog Habitat

Treed Bog (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (largest to smallest)**
Catharus guttatus	Hermit Thrush	3	0.2308	1
Oreothlypisa ruficapilla	Nashville Warbler	2	0.1538	2
Zonotrichia albicollis	White-throated Sparrow	2	0.1538	2
Junco hyemalis	Dark-eyed Junco	1	0.0769	4
Oporornis agilis	Conneticut Warbler	1	0.0769	4
Regulus satrapa	Golden-crowned Kinglet	1	0.0769	4
Setophaga magnolia	Magnolia Warbler	1	0.0769	4
Setophaga palmarum palmarum	Palm Warbler	1	0.0769	4
Sitta canadensis	Red-breasted Nuthatch	1	0.0769	4
	Total Number of Birds	**13**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Relative Abundance of Breeding Bird Species in Treed Fen Habitat

Treed Fen (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	11	0.1594	1
Oreothlypisa ruficapilla	Nashville Warbler	10	0.1449	2
Setophaga palmarum palmarum	Palm Warbler	6	0.0870	3
Setophaga coronata	Yellow-rumped Warbler	5	0.0725	4
Catharus guttatus	Hermit Thrush	3	0.0435	5
Empidonax alnorum	Alder Flycatcher	3	0.0435	5
Perisoreus canadensis	Gray Jay	3	0.0435	5
Regulus calendula	Ruby-crowned Kinglet	3	0.0435	5
Setophaga magnolia	Magnolia Warbler	3	0.0435	5
Melospiza lincolnii	Lincoln's Sparrow	2	0.0290	10
Poecile hudsonicus	Boreal Chickadee	2	0.0290	10
Regulus satrapa	Golden-crowned Kinglet	2	0.0290	10
Vermivora peregrina	Tennessee Warbler	2	0.0290	10
Vireo olivaceus	Red-eyed Vireo	2	0.0290	10
Carpodacus purpureus	Purple Finch	1	0.0145	15
Catharus ustulatus	Swainson's Thrush	1	0.0145	15
Corvus corax	Common Raven	1	0.0145	15
Cyanocitta cristata	Blue Jay	1	0.0145	15
Empidonax flaviventris	Yellow-bellied Flycatcher	1	0.0145	15
Gallinago delicata	Wilson's Snipe	1	0.0145	15
Junco hyemalis	Dark-eyed Junco	1	0.0145	15
Melospiza melodia	Song Sparrow	1	0.0145	15
Sitta canadensis	Red-breasted Nuthatch	1	0.0145	15
Tachycineta bicolor	Tree Swallow	1	0.0145	15
Turdus migratorius	American Robin	1	0.0145	15
Wilsonia pusilla	Wilson's Warbler	1	0.0145	15
	Total Number of Birds	**69**		

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Percent Composition of Breeding Bird Species in All Habitats

All Stations (less than and greater than 50 m)				
Scientific Name	**Common Name**	**Number of Stations Recorded At[a]**	**Percent Composition (%)[b]**	**Rank (Largest to smallest)**
Oreothlypisa ruficapilla	Nashville Warbler	96	87.27	1
Zonotrichia albicollis	White-throated Sparrow	96	87.27	1
Vireo olivaceus	Red-eyed Vireo	64	58.18	3
Troglodytes hiemalis	Winter Wren	58	52.73	4
Setophaga magnolia	Magnolia Warbler	56	50.91	5
Setophaga coronata	Yellow-rumped Warbler	53	48.18	6
Regulus calendula	Ruby-crowned Kinglet	52	47.27	7
Catharus guttatus	Hermit Thrush	51	46.36	8
Catharus ustulatus	Swainson's Thrush	48	43.64	9
Empidonax flaviventris	Yellow-bellied Flycatcher	48	43.64	9
Seiurus aurocapilla	Ovenbird	38	34.55	11
Turdus migratorius	American Robin	26	23.64	12
Regulus satrapa	Golden-crowned Kinglet	24	21.82	13
Sitta canadensis	Red-breasted Nuthatch	24	21.82	13
Empidonax alnorum	Alder Flycatcher	22	20.00	15
Melospiza georgiana	Swamp Sparrow	22	20.00	15
Setophaga palmarum palmarum	Palm Warbler	22	20.00	15
Colaptes auratus	Northern Flicker	21	19.09	18
Gavia immer	Common Loon	21	19.09	18
Melospiza lincolnii	Lincoln's Sparrow	21	19.09	18
Perisoreus canadensis	Gray Jay	20	18.18	21
Vireo solitarius	Blue-headed Vireo	19	17.27	22
Cyanocitta cristata	Blue Jay	18	16.36	23
Junco hyemalis	Dark-eyed Junco	18	16.36	23
Geothlypis trichas	Common Yellowthroat	17	15.45	25
Oporornis philadelphia	Mourning Warbler	17	15.45	25
Setophaga virens	Black-throated Green Warbler	16	14.55	27
Mniotilta varia	Black-and-white Warbler	15	13.64	28
Seiurus noveboracensis	Northern Waterthrush	15	13.64	28
Setophaga americana	Northern Parula	15	13.64	28
Bombycilla cedrorum	Cedar Waxwing	14	12.73	31
Catharus fuscescens	Veery	14	12.73	31
Corvus corax	Common Raven	12	10.91	33
Poecile atricapilla	Black-capped Chickadee	12	10.91	33
Sphyrapicus varius	Yellow-bellied Sapsucker	12	10.91	33
Empidonax minimus	Least Flycatcher	11	10.00	36
Vermivora peregrina	Tennessee Warbler	11	10.00	36
Corvus brachyrhynchos	American Crow	10	9.09	38
Setophaga pensylvanica	Chestnut-sided Warbler	10	9.09	38
Melospiza melodia	Song Sparrow	9	8.18	40
Picoides villosus	Hairy Woodpecker	9	8.18	40
Setophaga castanea	Bay-breasted Warbler	9	8.18	40
Wilsonia canadensis	Canada Warbler	9	8.18	40
Wilsonia pusilla	Wilson's Warbler	9	8.18	40
Setophaga fusca	Blackburnin Warbler	8	7.27	45
Spizella passerina	Chipping Sparrow	7	6.36	46
Gallinago delicata	Wilson's Snipe	6	5.45	47
Larus argentatus	Herring Gull	6	5.45	47
Poecile hudsonicus	Boreal Chickadee	6	5.45	47
Carpodacus purpureus	Purple Finch	5	4.55	50
Dryocopus pileatus	Pileated Woodpecker	5	4.55	50
Carduelis pinus	Pine Siskin	4	3.64	52
Quiscalus quiscula	Common Grackle	4	3.64	52
Ceryle alcyon	Belted Kingfisher	3	2.73	54
Larus philadelphia	Bonaparte's Gull	3	2.73	54
Oporornis agilis	Conneticut Warbler	3	2.73	54
Picoides arcticus	Black-backed Woodpecker	3	2.73	54
Tringa melanoleuca	Greater Yellowlegs	3	2.73	54
Archilochus colubris	Ruby-throated Hummingbird	2	1.82	59
Bonasa umbellus	Ruffed Grouse	2	1.82	59
Charadrius vociferus	Killdeer	2	1.82	59
Spizella pallida	Clay-colored Sparrow	2	1.82	59
Tachycineta bicolor	Tree Swallow	2	1.82	59
Pheucticus ludovicianus	Rose-breasted Grosbeak	2	1.82	59
Actitis macularia	Spotted Sandpiper	1	0.91	65
Agelaius phoeniceus	Red-winged Blackbird	1	0.91	65
Anas platyrhynchos	Mallard	1	0.91	65
Botaurus lentiginosus	American Bittern	1	0.91	65
Bucephala clangula	Common Goldeneye	1	0.91	65
Buteo jamaicensis	Red-tailed Hawk	1	0.91	65
Buteo platypterus	Broad-winged Hawk	1	0.91	65
Certhia americana	Brown Creeper	1	0.91	65
Chordeiles minor	Common Nighthawk	1	0.91	65
Coccothraustes vespertinus	Evening Grosbeak	1	0.91	65

TABLE 1
Breeding Bird Survey – Species Relative Abundance and Percent Composition

Percent Composition of Breeding Bird Species in All Habitats

All Stations (less than and greater than 50 m)				
Scientific Name	**Common Name**	**Number of Stations Recorded At[a]**	**Percent Composition (%)[b]**	**Rank (Largest to smallest)**
Haliaeetus leucocephalus	Bald Eagle	1	0.91	65
Picoides tridactylus	Three-toed Woodpecker	1	0.91	65
Porzana carolina	Sora	1	0.91	65
Setophaga ruticilla	American Redstart	1	0.91	65
Sialia sialis	Eastern Bluebird	1	0.91	65
Sitta carolinensis	White-breasted Nuthatch	1	0.91	65
Falcipennis canadensis	Spruce Grouse	1	0.91	65

Notes:
[a] Total Number of Stations is 110.
[b] % of stations each species was recorded at.

TABLE 2
Breeding Bird Survey Station Locations

Station Number	Datum	Position
1	NAD83	15 U 620531 5421994
2	NAD83	15 U 620404 5422827
3	NAD83	15 U 621503 5423709
4	NAD83	15 U 618003 5424580
5	NAD83	15 U 616201 5422006
6	NAD83	15 U 614585 5422225
7	NAD83	15 U 612902 5421795
8	NAD83	15 U 612802 5421492
9	NAD83	15 U 617560 5427553
10	NAD83	15 U 618116 5428329
11	NAD83	15 U 617114 5423689
12	NAD83	15 U 617989 5426669
13	NAD83	15 U 621042 5431088
14	NAD83	15 U 619997 5428973
15	NAD83	15 U 620534 5429283
16	NAD83	15 U 621426 5429569
17	NAD83	15 U 621737 5426856
18	NAD83	15 U 625031 5427574
19	NAD83	15 U 627225 5430581
20	NAD83	15 U 616409 5423658
21	NAD83	15 U 616817 5424843
22	NAD83	15 U 616217 5426964
23	NAD83	15 U 615767 5427119
24	NAD83	15 U 612637 5426349
25	NAD83	15 U 612328 5425748
26	NAD83	15 U 611891 5425092
27	NAD83	15 U 611414 5424399
28	NAD83	15 U 610990 5424052
29	NAD83	15 U 610409 5423726
30	NAD83	15 U 609756 5423141
31	NAD83	15 U 609257 5422150
32	NAD83	15 U 609224 5421569
33	NAD83	15 U 614858 5427460
34	NAD83	15 U 612143 5421087
35	NAD83	15 U 618029 5425828
36	NAD83	15 U 614201 5426942
37	NAD83	15 U 613302 5426667
38	NAD83	15 U 611914 5426487
39	NAD83	15 U 610901 5426071
40	NAD83	15 U 610352 5425278
41	NAD83	15 U 609870 5424865
42	NAD83	15 U 618301 5426613
43	NAD83	15 U 609686 5421014
44	NAD83	15 U 619770 5426754

TABLE 2
Breeding Bird Survey Station Locations

Station Number	Datum	Position
45	NAD83	15 U 619684 5427002
46	NAD83	15 U 619606 5427246
47	NAD83	15 U 619360 5427141
48	NAD83	15 U 619437 5426887
49	NAD83	15 U 619525 5426636
50	NAD83	15 U 619644 5422943
51	NAD83	15 U 619436 5422780
52	NAD83	15 U 619675 5422676
53	NAD83	15 U 618858 5426234
54	NAD83	15 U 619105 5427617
55	NAD83	15 U 619034 5427880
56	NAD83	15 U 620477 5421337
57	NAD83	15 U 620740 5421331
58	NAD83	15 U 616871 5423233
59	NAD83	15 U 616431 5422913
60	NAD83	15 U 616597 5423239
61	NAD83	15 U 616329 5422578
62	NAD83	15 U 614091 5422112
63	NAD83	15 U 614093 5421834
64	NAD83	15 U 614100 5421580
65	NAD83	15 U 613835 5421554
66	NAD83	15 U 613818 5421802
67	NAD83	15 U 613810 5422056
68	NAD83	15 U 615196 5422224
69	NAD83	15 U 615163 5421968
70	NAD83	15 U 603593 5421039
71	NAD83	15 U 602541 5420814
72	NAD83	15 U 602282 5420750
73	NAD83	15 U 617401 5421856
74	NAD83	15 U 617778 5421877
76	NAD83	15 U 620074 5426503
77	NAD83	15 U 619808 5427395
78	NAD83	15 U 619986 5427613
79	NAD83	15 U 620040 5427865
80	NAD83	15 U 620033 5428125
81	NAD83	15 U 620292 5428139
82	NAD83	15 U 620302 5427880
83	NAD83	15 U 620535 5427745
84	NAD83	15 U 620424 5427476
85	NAD83	15 U 620248 5427266
86	NAD83	15 U 620056 5427069
87	NAD83	15 U 620331 5426713
88	NAD83	15 U 620491 5426926
89	NAD83	15 U 617380 5427298

TABLE 2
Breeding Bird Survey Station Locations

Station Number	Datum	Position
90	NAD83	15 U 617796 5427495
91	NAD83	15 U 617902 5427239
92	NAD83	15 U 617645 5427150
93	NAD83	15 U 618005 5426997
94	NAD83	15 U 618299 5427106
95	NAD83	15 U 618226 5426774
96	NAD83	15 U 618193 5426511
97	NAD83	15 U 618583 5425890
98	NAD83	15 U 617703 5426652
99	NAD83	15 U 618512 5425265
100	NAD83	15 U 612048 5421486
101	NAD83	15 U 618635 5424863
102	NAD83	15 U 602428 5421023
103	NAD83	15 U 602192 5420971
104	NAD83	15 U 599928 5419255
105	NAD83	15 U 600190 5419319
106	NAD83	15 U 599108 5418044
107	NAD83	15 U 600656 5419376
108	NAD83	15 U 615462 5422519
109	NAD83	15 U 605461 5422577
110	NAD83	15 U 605706 5422648
111	NAD83	15 U 615378 5423277

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
1	6/30/2010	*Picoides arcticus*	Black-backed Woodpecker	0-50 m	0-3 min	m	Dense conifer forest
1	6/30/2010	*Vireo solitarius*	Blue-headed Vireo	0-50 m	0-3 min	s	Dense conifer forest
1	6/30/2010	*Vireo solitarius*	Blue-headed Vireo	50-100 m	0-3 min	s	Dense conifer forest
1	6/30/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense conifer forest
1	6/30/2010	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	3-5 min	s	Dense conifer forest
1	6/30/2010	*Porzana carolina*	Sora	50-100 m	0-3 min	c	Dense conifer forest
1	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	c	Dense conifer forest
1	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	3-5 min	s	Dense conifer forest
1	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense conifer forest
1	6/30/2010	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	s	Dense conifer forest
2	6/9/2010	*Empidonax alnorum*	Alder Flycatcher	50-100 m	0-3 min	s	Edge
2	6/9/2010	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s	Edge
2	6/9/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Edge
2	6/9/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Edge
2	6/9/2010	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Edge
2	6/9/2010	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Edge
2	6/9/2010	*Regulus calendula*	Ruby-crowned Kinglet	>100 m	0-3 min	s	Edge
2	6/9/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Edge
2	6/9/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Edge
2	6/9/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Edge
2	6/9/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Edge
3	6/9/2010	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Setophaga pensylvanica*	Chestnut-sided Warbler	50-100 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Melospiza lincolnii*	Lincoln's Sparrow	50-100 m	5-10 min	s	Dense mixed forest
3	6/30/2010	*Setophaga magnolia*	Magnolia Warbler	50-100 m	5-10 min	s	Dense mixed forest
3	6/30/2010	*Oporornis philadelphia*	Mourning Warbler	0-50 m	3-5 min	s	Dense mixed forest
3	6/30/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	v	Dense mixed forest
3	6/30/2010	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Catharus fuscescens*	Veery	0-50 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Dense mixed forest
3	6/30/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	3-5 min	c	Dense mixed forest
4	6/9/2010	*Corvus corax*	Common Raven	50-100 m	0-3 min	fo	Dense mixed forest
4	6/9/2010	*Perisoreus canadensis*	Gray Jay	50-100 m	0-3 min	c	Dense mixed forest
4	6/9/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense mixed forest
4	6/9/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense mixed forest
4	6/9/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense mixed forest
4	6/9/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Dense mixed forest
4	6/9/2010	*Setophaga americana*	Northern Parula	0-50 m	5-10 min	s	Dense mixed forest
4	6/9/2010	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense mixed forest
4	6/9/2010	*Catharus ustulatus*	Swainson's Thrush	50-100 m	3-5 min	s	Dense mixed forest
4	6/9/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense mixed forest
4	6/9/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	3-5 min	s	Dense mixed forest
4	6/9/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Empidonax alnorum*	Alder Flycatcher	>100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Turdus migratorius*	American Robin	>100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	3-5 min	s	Dense mixed forest
5	6/30/2010	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	c	Dense mixed forest
5	6/30/2010	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Melospiza georgiana*	Swamp Sparrow	0-50 m	3-5 min	s	Dense mixed forest
5	6/30/2010	*Melospiza georgiana*	Swamp Sparrow	>100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	s	Dense mixed forest
5	6/30/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	3-5 min	s	Dense mixed forest
5	6/30/2010	*Sphyrapicus varius*	Yellow-bellied Sapsucker	50-100 m	0-3 min	d	Dense mixed forest
5	6/30/2010	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	s	Dense mixed forest
6	6/9/2010	*Turdus migratorius*	American Robin	50-100 m	0-3 min	c	Dense conifer forest
6	6/9/2010	*Picoides villosus*	Hairy Woodpecker	0-50 m	3-5 min	c	Dense conifer forest
6	6/9/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
6	6/9/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
6	6/9/2010	*Setophaga magnolia*	Magnolia Warbler	50-100 m	5-10 min	c	Dense conifer forest
6	6/9/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	—	Dense conifer forest
6	6/9/2010	*Setophaga americana*	Northern Parula	0-50 m	5-10 min	s	Dense conifer forest
6	6/9/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	3-5 min	s	Dense conifer forest
6	6/9/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	5-10 min	c	Dense conifer forest
6	6/9/2010	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Dense conifer forest
7	6/9/2010	*Poecile atricapilla*	Black-capped Chickadee	>100 m	5-10 min	c	Edge
7	6/9/2010	*Buteo platypterus*	Broad-winged Hawk	50-100 m	3-5 min	fo	Edge
7	6/9/2010	*Gavia immer*	Common Loon	0-50 m	5-10 min	sw	Edge

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
7	6/9/2010	*Corvus corax*	Common Raven	>100 m	5-10 min	fo	Edge
7	6/9/2010	*Oporornis agilis*	Conneticut Warbler	>100 m	0-3 min	s	Edge
7	6/9/2010	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	3-5 min	—	Edge
7	6/9/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	—	Edge
7	6/9/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Edge
7	6/9/2010	*Seiurus noveboracensis*	Northern Waterthrush	>100 m	0-3 min	s	Edge
7	6/9/2010	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Edge
7	6/9/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Edge
7	6/9/2010	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Edge
7	6/9/2010	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Edge
8	6/30/2010	*Junco hyemalis*	Dark-eyed Junco	50-100 m	3-5 min	s	Dense conifer forest
8	6/30/2010	*Larus argentatus*	Herring Gull	50-100 m	5-10 min	fo	Dense conifer forest
8	6/30/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
8	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense conifer forest
8	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	c	Dense conifer forest
8	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	3-5 min	a	Dense conifer forest
8	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense conifer forest
8	6/30/2010	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Dense conifer forest
9	6/10/2010	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
9	6/10/2010	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Conifer swamp
9	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	5-10 min	s	Conifer swamp
9	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Conifer swamp
9	6/10/2010	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Conifer swamp
9	6/10/2010	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Conifer swamp
9	6/10/2010	*Tachycineta bicolor*	Tree Swallow	0-50 m	0-3 min	fo	Conifer swamp
9	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
9	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Conifer swamp
9	6/10/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	c	Conifer swamp
9	6/10/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	c	Conifer swamp
9	6/10/2010	*Sphyrapicus varius*	Yellow-bellied Sapsucker	>100 m	5-10 min	d	Conifer swamp
9	6/10/2010	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	5-10 min	s	Conifer swamp
10	7/1/2010	*Turdus migratorius*	American Robin	>100 m	3-5 min	c	Edge
10	7/1/2010	*Wilsonia canadensis*	Canada Warbler	50-100 m	3-5 min	s	Edge
10	7/1/2010	*Regulus satrapa*	Golden-crowned Kinglet	50-100 m	0-3 min	s	Edge
10	7/1/2010	*Catharus guttatus*	Hermit Thrush	0-50 m	5-10 min	c	Edge
10	7/1/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	3-5 min	s	Edge
10	7/1/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Edge
10	7/1/2010	*Colaptes auratus*	Northern Flicker	0-50 m	0-3 min	—	Edge
10	7/1/2010	*Seiurus aurocapilla*	Ovenbird	>100 m	3-5 min	s	Edge
10	7/1/2010	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Edge
10	7/1/2010	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Edge
10	7/1/2010	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Edge
10	7/1/2010	*Catharus ustulatus*	Swainson's Thrush	>100 m	0-3 min	s	Edge
10	7/1/2010	*Catharus fuscescens*	Veery	>100 m	0-3 min	c	Edge
10	7/1/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	0-3 min	c	Edge
10	7/1/2010	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Edge
11	6/10/2010	*Empidonax alnorum*	Alder Flycatcher	>100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Empidonax alnorum*	Alder Flycatcher	>100 m	5-10 min	s	Conifer swamp
11	6/10/2010	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Melospiza lincolnii*	Lincoln's Sparrow	50-100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	3-5 min	s	Conifer swamp
11	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Conifer swamp
11	6/10/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	5-10 min	c	Conifer swamp
12	6/30/2010	*Falco sparverius*	American Kestrel	>100 m	0-3 min	fo	Thicket swamp
12	6/30/2010	*Gavia immer*	Common Loon	>100 m	0-3 min	c	Thicket swamp
12	6/30/2010	*Geothlypis trichas*	Common Yellowthroat	0-50 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Regulus satrapa*	Golden-crowned Kinglet	50-100 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Picoides villosus*	Hairy Woodpecker	>100 m	0-3 min	c	Thicket swamp
12	6/30/2010	*Oporornis philadelphia*	Mourning Warbler	>100 m	3-5 min	s	Thicket swamp
12	6/30/2010	*Seiurus noveboracensis*	Northern Waterthrush	50-100 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Carpodacus purpureus*	Purple Finch	50-100 m	3-5 min	s	Thicket swamp
12	6/30/2010	*Sitta canadensis*	Red-breasted Nuthatch	>100 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Regulus calendula*	Ruby-crowned Kinglet	>100 m	0-3 min	—	Thicket swamp
12	6/30/2010	*Melospiza melodia*	Song Sparrow	0-50 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Melospiza melodia*	Song Sparrow	>100 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Actitis macularia*	Spotted Sandpiper	>100 m	5-10 min	c	Thicket swamp
12	6/30/2010	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	s	Thicket swamp

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
12	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Thicket swamp
12	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Thicket swamp
13	6/10/2010	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	3-5 min	ft	Edge
13	6/10/2010	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	3-5 min	ft	Edge
13	6/10/2010	*Setophaga pensylvanica*	Chestnut-sided Warbler	50-100 m	0-3 min	s	Edge
13	6/10/2010	*Spizella passerina*	Chipping Sparrow	50-100 m	0-3 min	s	Edge
13	6/10/2010	*Spizella pallida*	Clay-colored Sparrow	50-100 m	0-3 min	s	Edge
13	6/10/2010	*Junco hyemalis*	Dark-eyed Junco	0-50 m	0-3 min	s	Edge
13	6/10/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	3-5 min	s	Edge
13	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Edge
13	6/10/2010	*Seiurus aurocapilla*	Ovenbird	>100 m	0-3 min	s	Edge
13	6/10/2010	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Edge
13	6/10/2010	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Edge
13	6/10/2010	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Edge
13	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Edge
13	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Edge
13	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Edge
13	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Edge
13	6/10/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	0-3 min	s	Edge
13	6/10/2010	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	f	Edge
14	6/10/2010	*Gavia immer*	Common Loon	50-100 m	3-5 min	sw	Conifer swamp
14	6/10/2010	*Junco hyemalis*	Dark-eyed Junco	>100 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Coccothraustes vespertinus*	Evening Grosbeak	50-100 m	3-5 min	fo	Conifer swamp
14	6/10/2010	*Coccothraustes vespertinus*	Evening Grosbeak	50-100 m	3-5 min	fo	Conifer swamp
14	6/10/2010	*Coccothraustes vespertinus*	Evening Grosbeak	50-100 m	3-5 min	fo	Conifer swamp
14	6/10/2010	*Catharus guttatus*	Hermit Thrush	>100 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Seiurus noveboracensis*	Northern Waterthrush	0-50 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Regulus calendula*	Ruby-crowned Kinglet	>100 m	5-10 min	s	Conifer swamp
14	6/10/2010	*Catharus ustulatus*	Swainson's Thrush	50-100 m	5-10 min	s	Conifer swamp
14	6/10/2010	*Melospiza georgiana*	Swamp Sparrow	>100 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Vermivora peregrina*	Tennessee Warbler	0-50 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Gallinago delicata*	Wilson's Snipe	50-100 m	0-3 min	di	Conifer swamp
14	6/10/2010	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Conifer swamp
14	6/10/2010	*Bucephala clangula*	Common Goldeneye	50-100 m	0-3 min	fo	Conifer swamp
15	6/10/2010	*Vireo solitarius*	Blue-headed Vireo	50-100 m	3-5 min	s	Edge
15	6/10/2010	*Corvus corax*	Common Raven	>100 m	0-3 min	c	Edge
15	6/10/2010	*Setophaga magnolia*	Magnolia Warbler	>100 m	0-3 min	s	Edge
15	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Edge
15	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Edge
15	6/10/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Edge
15	6/10/2010	*Vireo olivaceus*	Red-eyed Vireo	>100 m	0-3 min	s	Edge
15	6/10/2010	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	c	Edge
15	6/10/2010	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Edge
15	6/10/2010	*Catharus ustulatus*	Swainson's Thrush	50-100 m	3-5 min	s	Edge
15	6/10/2010	*Melospiza georgiana*	Swamp Sparrow	0-50 m	5-10 min	s	Edge
15	6/10/2010	*Melospiza georgiana*	Swamp Sparrow	50-100 m	0-3 min	s	Edge
15	6/10/2010	*Vermivora peregrina*	Tennessee Warbler	50-100 m	5-10 min	s	Edge
15	6/10/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Edge
15	6/10/2010	*Gallinago delicata*	Wilson's Snipe	0-50 m	0-3 min	di	Edge
15	6/10/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	5-10 min	s	Edge
15	6/10/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	s	Edge
16	7/1/2010	*Gavia immer*	Common Loon	>100 m	3-5 min	fo	Dense mixed forest
16	7/1/2010	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense mixed forest
16	7/1/2010	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
16	7/1/2010	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
16	7/1/2010	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense mixed forest
16	7/1/2010	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Dense mixed forest
17	6/30/2010	*Geothlypis trichas*	Common Yellowthroat	50-100 m	0-3 min	s	Edge
17	6/30/2010	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s	Edge
17	6/30/2010	*Catharus guttatus*	Hermit Thrush	>100 m	0-3 min	s	Edge
17	6/30/2010	*Setophaga magnolia*	Magnolia Warbler	0-50 m	3-5 min	s	Edge
17	6/30/2010	*Oporornis philadelphia*	Mourning Warbler	50-100 m	5-10 min	s	Edge
17	6/30/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Edge
17	6/30/2010	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	3-5 min	s	Edge
17	6/30/2010	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Edge
17	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Edge
17	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Edge
17	6/30/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Edge
17	6/30/2010	*Troglodytes hiemalis*	Winter Wren	50-100 m	5-10 min	s	Edge
17	6/30/2010	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Edge
17	6/30/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	c	Edge
17	6/30/2010	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	3-5 min	s	Edge
17	6/30/2010	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Edge

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
18	6/30/2010	*Haliaeetus leucocephalus*	Bald Eagle	>100 m	0-3 min	cs	Dense conifer forest
18	6/30/2010	*Poecile atricapilla*	Black-capped Chickadee	<50 m	0-3 min	c	Dense conifer forest
18	6/30/2010	*Poecile atricapilla*	Black-capped Chickadee	<50 m	0-3 min	c	Dense conifer forest
18	6/30/2010	*Vireo solitarius*	Blue-headed Vireo	<50 m	0-3 min	s	Dense conifer forest
18	6/30/2010	*Buteo platypterus*	Broad-winged Hawk	>100 m	0-3 min	cs	Dense conifer forest
18	6/30/2010	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	—	Dense conifer forest
18	6/30/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	<50 m	0-3 min	s	Dense conifer forest
18	6/30/2010	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
18	6/30/2010	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Empidonax alnorum*	Alder Flycatcher	>100 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Turdus migratorius*	American Robin	50-100 m	3-5 min	s	Dense conifer forest
19	7/1/2010	*Gavia immer*	Common Loon	>100 m	5-10 min	c	Dense conifer forest
19	7/1/2010	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Catharus guttatus*	Hermit Thrush	>100 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	5-10 min	s	Dense conifer forest
19	7/1/2010	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	5-10 min	s	Dense conifer forest
19	7/1/2010	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Catharus ustulatus*	Swainson's Thrush	>100 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	s	Dense conifer forest
19	7/1/2010	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	—	Dense conifer forest
19	7/1/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense conifer forest
19	7/1/2010	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	—	Dense conifer forest
19	7/1/2010	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	s	Dense conifer forest
20	6/10/2011	*Cyanocitta cristata*	Blue Jay	>100 m	0-3 min	—	Marsh
20	6/10/2011	*Empidonax alnorum*	Alder Flycatcher	50-100 m	0-3 min	s	Marsh
20	6/10/2011	*Quiscalus quiscula*	Common Grackle	50-100 m	0-3 min	fo	Marsh
20	6/10/2011	*Gavia immer*	Common Loon	>100 m	0-3 min	—	Marsh
20	6/10/2011	*Junco hyemalis*	Dark-eyed Junco	50-100 m	0-3 min	s	Marsh
20	6/10/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Marsh
20	6/10/2011	*Agelaius phoeniceus*	Red-winged Blackbird	>100 m	0-3 min	s	Marsh
20	6/10/2011	*Agelaius phoeniceus*	Red-winged Blackbird	50-100 m	0-3 min	s	Marsh
20	6/10/2011	*Regulus calendula*	Ruby-crowned Kinglet	>100 m	0-3 min	c	Marsh
20	6/10/2011	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Marsh
20	6/10/2011	*Tachycineta bicolor*	Tree Swallow	0-50 m	0-3 min	fo	Marsh
20	6/10/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Marsh
20	6/10/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Marsh
20	6/10/2011	*Gallinago delicata*	Wilson's Snipe	>100 m	0-3 min	s	Marsh
20	6/10/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	5-10 min	s	Marsh
20	6/10/2011	*Setophaga coronata*	Yellow-rumped Warbler	>100 m	0-3 min	s	Marsh
20	6/10/2011	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Marsh
21	6/10/2011	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Thicket swamp
21	6/10/2011	*Empidonax alnorum*	Alder Flycatcher	50-100 m	0-3 min	s	Thicket swamp
21	6/10/2011	*Setophaga castanea*	Bay-breasted Warbler	50-100 m	3-5 min	—	Thicket swamp
21	6/10/2011	*Cyanocitta cristata*	Blue Jay	50-100 m	5-10 min	c	Thicket swamp
21	6/10/2011	*Regulus satrapa*	Golden-crowned Kinglet	50-100 m	5-10 min	s	Thicket swamp
21	6/10/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Thicket swamp
21	6/10/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Thicket swamp
21	6/10/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	5-10 min	s	Thicket swamp
21	6/10/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Thicket swamp
21	6/10/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Thicket swamp
21	6/10/2011	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Thicket swamp
21	6/10/2011	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Thicket swamp
21	6/10/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	—	Thicket swamp
21	6/10/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	ny	Thicket swamp
21	6/10/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	ny	Thicket swamp
21	6/10/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	—	Thicket swamp
21	6/10/2011	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	—	Thicket swamp
22	6/10/2011	*Turdus migratorius*	American Robin	0-50 m	0-3 min	s	Dense mixed forest
22	6/10/2011	*Mniotilta varia*	Black-and-white Warbler	0-50 m	0-3 min	s	Dense mixed forest
22	6/10/2011	*Vireo solitarius*	Blue-headed Vireo	50-100 m	0-3 min	s	Dense mixed forest
22	6/10/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	5-10 min	s	Dense mixed forest
22	6/10/2011	*Colaptes auratus*	Northern Flicker	50-100 m	3-5 min	s	Dense mixed forest
22	6/10/2011	*Carduelis pinus*	Pine Siskin	0-50 m	0-3 min	fo	Dense mixed forest
22	6/10/2011	*Carduelis pinus*	Pine Siskin	0-50 m	0-3 min	fo	Dense mixed forest
22	6/10/2011	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
22	6/10/2011	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Dense mixed forest
23	6/11/2011	*Turdus migratorius*	American Robin	>100 m	0-3 min	s	Conifer swamp
23	6/11/2011	*Turdus migratorius*	American Robin	0-50 m	3-5 min	c	Conifer swamp
23	6/11/2011	*Junco hyemalis*	Dark-eyed Junco	0-50 m	0-3 min	s	Conifer swamp
23	6/11/2011	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
23	6/11/2011	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
23	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	3-5 min	s	Conifer swamp
23	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
23	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	5-10 min	s	Conifer swamp
23	6/11/2011	*Colaptes auratus*	Northern Flicker	50-100 m	0-3 min	d	Conifer swamp
23	6/11/2011	*Carduelis pinus*	Pine Siskin	0-50 m	5-10 min	c, fo	Conifer swamp
23	6/11/2011	*Sitta canadensis*	Red-breasted Nuthatch	50-100 m	5-10 min	c	Conifer swamp
23	6/11/2011	*Regulus calendula*	Ruby-crowned Kinglet	>100 m	5-10 min	s	Conifer swamp
23	6/11/2011	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
23	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	5-10 min	s	Conifer swamp
23	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Conifer swamp
23	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
23	6/11/2011	*Troglodytes hiemalis*	Winter Wren	>100 m	5-10 min	s	Conifer swamp
23	6/11/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	s	Conifer swamp
23	6/11/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Conifer swamp
23	6/11/2011	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Conifer swamp
24	6/11/2011	*Seiurus aurocapilla*	Ovenbird	>100 m	5-10 min	s	Dense mixed forest
24	6/11/2011	*Ceryle alcyon*	Belted Kingfisher	50-100 m	0-3 min	—	Dense mixed forest
24	6/11/2011	*Ceryle alcyon*	Belted Kingfisher	50-100 m	0-3 min	—	Dense mixed forest
24	6/11/2011	*Mniotilta varia*	Black-and-white Warbler	0-50 m	3-5 min	s	Dense mixed forest
24	6/11/2011	*Cyanocitta cristata*	Blue Jay	50-100 m	0-3 min	c	Dense mixed forest
24	6/11/2011	*Wilsonia canadensis*	Canada Warbler	0-50 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Gavia immer*	Common Loon	>100 m	5-10 min	—	Dense mixed forest
24	6/11/2011	*Perisoreus canadensis*	Gray Jay	0-50 m	0-3 min	—	Dense mixed forest
24	6/11/2011	*Perisoreus canadensis*	Gray Jay	0-50 m	0-3 min	—	Dense mixed forest
24	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	5-10 min	s	Dense mixed forest
24	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Oporornis philadelphia*	Mourning Warbler	0-50 m	0-3 min	c	Dense mixed forest
24	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Setophaga americana*	Northern Parula	50-100 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Dryocopus pileatus*	Pileated Woodpecker	50-100 m	0-3 min	d	Dense mixed forest
24	6/11/2011	*Melospiza melodia*	Song Sparrow	50-100 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Melospiza melodia*	Song Sparrow	0-50 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	c	Dense mixed forest
24	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	c	Dense mixed forest
24	6/11/2011	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Dense mixed forest
24	6/11/2011	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	s	Dense mixed forest
25	6/29/2011	*Mniotilta varia*	Black-and-white Warbler	0-50 m	0-3 min	s	Dense mixed forest
25	6/29/2011	*Setophaga virens*	Black-throated Green Warbler	50-100 m	3-5 min	s	Dense mixed forest
25	6/29/2011	*Corvus corax*	Common Raven	>100 m	5-10 min	c	Dense mixed forest
25	6/29/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense mixed forest
25	6/29/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense mixed forest
25	6/29/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	5-10 min	s	Dense mixed forest
25	6/29/2011	*Sitta canadensis*	Red-breasted Nuthatch	50-100 m	5-10 min	c	Dense mixed forest
25	6/29/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense mixed forest
25	6/29/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense mixed forest
25	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense mixed forest
25	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	5-10 min	s	Dense mixed forest
25	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
25	6/29/2011	*Troglodytes hiemalis*	Winter Wren	>100 m	3-5 min	s	Dense mixed forest
25	6/29/2011	*Troglodytes hiemalis*	Winter Wren	>100 m	5-10 min	s	Dense mixed forest
25	6/29/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	—	Dense mixed forest
25	6/29/2011	*Sphyrapicus varius*	Yellow-bellied Sapsucker	50-100 m	0-3 min	d	Dense mixed forest
25	6/29/2011	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Mniotilta varia*	Black-and-white Warbler	>100 m	3-5 min	s	Dense mixed forest
26	6/11/2011	*Poecile atricapilla*	Black-capped Chickadee	0-50 m	3-5 min	—	Dense mixed forest
26	6/11/2011	*Certhia americana*	Brown Creeper	50-100 m	5-10 min	s	Dense mixed forest
26	6/11/2011	*Gavia immer*	Common Loon	>100 m	3-5 min	c	Dense mixed forest
26	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Setophaga americana*	Northern Parula	50-100 m	3-5 min	s	Dense mixed forest
26	6/11/2011	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	3-5 min	s	Dense mixed forest
26	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	3-5 min	s	Dense mixed forest
26	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	5-10 min	c	Dense mixed forest
26	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Dense mixed forest
26	6/11/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	5-10 min	s	Dense mixed forest
26	6/11/2011	*Sphyrapicus varius*	Yellow-bellied Sapsucker	>100 m	5-10 min	s	Dense mixed forest
27	6/29/2011	*Cyanocitta cristata*	Blue Jay	0-50 m	0-3 min	c	Dense mixed forest
27	6/29/2011	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Dense mixed forest
27	6/29/2011	*Empidonax minimus*	Least Flycatcher	50-100 m	0-3 min	s	Dense mixed forest
27	6/29/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Dense mixed forest
27	6/29/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense mixed forest
27	6/29/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	5-10 min	s	Dense mixed forest
27	6/29/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	5-10 min	s	Dense mixed forest
27	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	5-10 min	—	Dense mixed forest
27	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense mixed forest
27	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
27	6/29/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Dense mixed forest
27	6/29/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	0-3 min	c	Dense mixed forest
28	6/11/2011	*Oporornis philadelphia*	Mourning Warbler	>100 m	5-10 min	s	Dense mixed forest

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
28	6/11/2011	*Mniotilta varia*	Black-and-white Warbler	0-50 m	0-3 min	s	Dense mixed forest
28	6/11/2011	*Cyanocitta cristata*	Blue Jay	50-100 m	0-3 min	c	Dense mixed forest
28	6/11/2011	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	3-5 min	fo	Dense mixed forest
28	6/11/2011	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	3-5 min	fo	Dense mixed forest
28	6/11/2011	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	3-5 min	fo	Dense mixed forest
28	6/11/2011	*Gavia immer*	Common Loon	>100 m	5-10 min	c	Dense mixed forest
28	6/11/2011	*Catharus guttatus*	Hermit Thrush	0-50 m	3-5 min	s	Dense mixed forest
28	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	3-5 min	s	Dense mixed forest
28	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	5-10 min	s	Dense mixed forest
28	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense mixed forest
28	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	>100 m	0-3 min	s	Dense mixed forest
28	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	3-5 min	s	Dense mixed forest
28	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense mixed forest
28	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	3-5 min	s	Dense mixed forest
28	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense mixed forest
28	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense mixed forest
28	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense mixed forest
28	6/11/2011	*Sphyrapicus varius*	Yellow-bellied Sapsucker	0-50 m	0-3 min	d	Dense mixed forest
29	6/29/2011	*Empidonax alnorum*	Alder Flycatcher	50-100 m	3-5 min	s	Dense mixed forest
29	6/29/2011	*Cyanocitta cristata*	Blue Jay	50-100 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	0-3 min	—	Dense mixed forest
29	6/29/2011	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	0-3 min	—	Dense mixed forest
29	6/29/2011	*Setophaga pensylvanica*	Chestnut-sided Warbler	50-100 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Setophaga pensylvanica*	Chestnut-sided Warbler	50-100 m	3-5 min	s	Dense mixed forest
29	6/29/2011	*Setophaga pensylvanica*	Chestnut-sided Warbler	0-50 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Perisoreus canadensis*	Gray Jay	0-50 m	0-3 min	—	Dense mixed forest
29	6/29/2011	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	5-10 min	—	Dense mixed forest
29	6/29/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	5-10 min	s	Dense mixed forest
29	6/29/2011	*Oporornis philadelphia*	Mourning Warbler	0-50 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	3-5 min	s	Dense mixed forest
29	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Dense mixed forest
29	6/29/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	3-5 min	c	Dense mixed forest
30	6/11/2011	*Seiurus noveboracensis*	Northern Waterthrush	>100 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Empidonax alnorum*	Alder Flycatcher	>100 m	3-5 min	s	Dense mixed forest
30	6/11/2011	*Turdus migratorius*	American Robin	50-100 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Mniotilta varia*	Black-and-white Warbler	0-50 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Setophaga virens*	Black-throated Green Warbler	>100 m	5-10 min	s	Dense mixed forest
30	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	3-5 min	s	Dense mixed forest
30	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	5-10 min	s	Dense mixed forest
30	6/11/2011	*Setophaga americana*	Northern Parula	50-100 m	0-3 min	—	Dense mixed forest
30	6/11/2011	*Seiurus noveboracensis*	Northern Waterthrush	50-100 m	5-10 min	s	Dense mixed forest
30	6/11/2011	*Seiurus noveboracensis*	Northern Waterthrush	50-100 m	3-5 min	s	Dense mixed forest
30	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	s	Dense mixed forest
30	6/11/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	5-10 min	s	Dense mixed forest
31	6/29/2011	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	0-3 min	c	Edge
31	6/29/2011	*Quiscalus quiscula*	Common Grackle	0-50 m	0-3 min	ft	Edge
31	6/29/2011	*Gavia immer*	Common Loon	>100 m	0-3 min	c	Edge
31	6/29/2011	*Gavia immer*	Common Loon	50-100 m	0-3 min	c	Edge
31	6/29/2011	*Regulus satrapa*	Golden-crowned Kinglet	>100 m	3-5 min	s	Edge
31	6/29/2011	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	3-5 min	s	Edge
31	6/29/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Edge
31	6/29/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Edge
31	6/29/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	5-10 min	s	Edge
31	6/29/2011	*Seiurus noveboracensis*	Northern Waterthrush	50-100 m	0-3 min	s	Edge
31	6/29/2011	*Sitta canadensis*	Red-breasted Nuthatch	0-50 m	0-3 min	c	Edge
31	6/29/2011	*Vireo olivaceus*	Red-eyed Vireo	>100 m	0-3 min	s	Edge
31	6/29/2011	*Archilochus colubris*	Ruby-throated Hummingbird	0-50 m	0-3 min	ft	Edge
31	6/29/2011	*Melospiza melodia*	Song Sparrow	50-100 m	0-3 min	s	Edge
31	6/29/2011	*Melospiza melodia*	Song Sparrow	0-50 m	0-3 min	s	Edge
31	6/29/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	—	Edge
31	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Edge
31	6/29/2011	*Sphyrapicus varius*	Yellow-bellied Sapsucker	0-50 m	0-3 min	—	Edge
32	6/11/2011	*Larus argentatus*	Herring Gull	>100 m	0-3 min	—	Dense conifer forest
32	6/11/2011	*Quiscalus quiscula*	Common Grackle	0-50 m	0-3 min	c	Dense conifer forest
32	6/11/2011	*Picoides villosus*	Hairy Woodpecker	0-50 m	5-10 min	c	Dense conifer forest
32	6/11/2011	*Larus argentatus*	Herring Gull	>100 m	0-3 min	—	Dense conifer forest
32	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Dense conifer forest
32	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
32	6/11/2011	*Oporornis philadelphia*	Mourning Warbler	0-50 m	0-3 min	s	Dense conifer forest
32	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense conifer forest

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
32	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense conifer forest
32	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense conifer forest
32	6/11/2011	*Colaptes auratus*	Northern Flicker	>100 m	3-5 min	—	Dense conifer forest
32	6/11/2011	*Vireo olivaceus*	Red-eyed Vireo	>100 m	0-3 min	s	Dense conifer forest
32	6/11/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
32	6/11/2011	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense conifer forest
32	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	3-5 min	s	Dense conifer forest
32	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	3-5 min	s	Dense conifer forest
32	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense conifer forest
33	6/30/2011	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Turdus migratorius*	American Robin	50-100 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Catharus guttatus*	Hermit Thrush	0-50 m	3-5 min	c	Dense mixed forest
33	6/30/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	5-10 min	c	Dense mixed forest
33	6/30/2011	*Colaptes auratus*	Northern Flicker	50-100 m	0-3 min	c	Dense mixed forest
33	6/30/2011	*Seiurus aurocapilla*	Ovenbird	>100 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Carduelis pinus*	Pine Siskin	0-50 m	5-10 min	fo	Dense mixed forest
33	6/30/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Catharus ustulatus*	Swainson's Thrush	>100 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Melospiza georgiana*	Swamp Sparrow	>100 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
33	6/30/2011	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Dense mixed forest
34	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Edge
34	6/11/2011	*Turdus migratorius*	American Robin	50-100 m	0-3 min	—	Edge
34	6/11/2011	*Spizella passerina*	Chipping Sparrow	0-50 m	5-10 min	s	Edge
34	6/11/2011	*Charadrius vociferus*	Killdeer	50-100 m	0-3 min	—	Edge
34	6/11/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Edge
34	6/11/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	3-5 min	s	Edge
34	6/11/2011	*Cathartes aura*	Turkey Vulture	>100 m	0-3 min	fo	Edge
34	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	5-10 min	—	Edge
34	6/11/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Edge
34	6/11/2011	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Edge
35	6/29/2011	*Poecile atricapilla*	Black-capped Chickadee	50-100 m	0-3 min	—	Dense mixed forest
35	6/29/2011	*Perisoreus canadensis*	Gray Jay	>100 m	5-10 min	c	Dense mixed forest
35	6/29/2011	*Picoides villosus*	Hairy Woodpecker	50-100 m	0-3 min	d	Dense mixed forest
35	6/29/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Dense mixed forest
35	6/29/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	3-5 min	s	Dense mixed forest
35	6/29/2011	*Seiurus aurocapilla*	Ovenbird	>100 m	3-5 min	s	Dense mixed forest
35	6/29/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	5-10 min	s	Dense mixed forest
35	6/29/2011	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
35	6/29/2011	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Dense mixed forest
35	6/29/2011	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	c	Dense mixed forest
36	6/12/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	5-10 min	s	Dense mixed forest
36	6/12/2011	*Botaurus lentiginosus*	American Bittern	>100 m	5-10 min	s	Dense mixed forest
36	6/12/2011	*Setophaga fusca*	Blackburnin Warbler	50-100 m	0-3 min	s	Dense mixed forest
36	6/12/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	3-5 min	s	Dense mixed forest
36	6/12/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense mixed forest
36	6/12/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense mixed forest
36	6/12/2011	*Seiurus aurocapilla*	Ovenbird	50-100 m	5-10 min	s	Dense mixed forest
36	6/12/2011	*Dryocopus pileatus*	Pileated Woodpecker	50-100 m	5-10 min	c	Dense mixed forest
36	6/12/2011	*Vireo olivaceus*	Red-eyed Vireo	>100 m	3-5 min	s	Dense mixed forest
36	6/12/2011	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
36	6/12/2011	*Buteo jamaicensis*	Red-tailed Hawk	>100 m	5-10 min	c	Dense mixed forest
36	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense mixed forest
36	6/12/2011	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Dense mixed forest
36	6/12/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	0-3 min	s	Dense mixed forest
37	6/30/2011	*Setophaga virens*	Black-throated Green Warbler	50-100 m	5-10 min	—	Edge
37	6/30/2011	*Vireo solitarius*	Blue-headed Vireo	50-100 m	3-5 min	s	Edge
37	6/30/2011	*Spizella passerina*	Chipping Sparrow	50-100 m	0-3 min	s	Edge
37	6/30/2011	*Gavia immer*	Common Loon	>100 m	5-10 min	c	Edge
37	6/30/2011	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Edge
37	6/30/2011	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Edge
37	6/30/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	3-5 min	s	Edge
37	6/30/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Edge
37	6/30/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Edge
37	6/30/2011	*Sitta canadensis*	Red-breasted Nuthatch	50-100 m	5-10 min	c	Edge
37	6/30/2011	*Vireo olivaceus*	Red-eyed Vireo	>100 m	0-3 min	s	Edge
37	6/30/2011	*Regulus calendula*	Ruby-crowned Kinglet	>100 m	0-3 min	s	Edge
37	6/30/2011	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Edge
37	6/30/2011	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	s	Edge
37	6/30/2011	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	a	Edge
37	6/30/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	—	Edge
37	6/30/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Edge
37	6/30/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	s	Edge
37	6/30/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	5-10 min	—	Edge
37	6/30/2011	*Junco hyemalis*	Dark-eyed Junco	50-100 m	3-5 min	s	Edge
38	6/12/2011	*Dryocopus pileatus*	Pileated Woodpecker	>100 m	3-5 min	c	Dense conifer forest
38	6/12/2011	*Setophaga castanea*	Bay-breasted Warbler	0-50 m	0-3 min	s	Dense conifer forest
38	6/12/2011	*Poecile atricapilla*	Black-capped Chickadee	0-50 m	5-10 min	c	Dense conifer forest
38	6/12/2011	*Wilsonia canadensis*	Canada Warbler	50-100 m	0-3 min	s	Dense conifer forest

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
38	6/12/2011	*Wilsonia canadensis*	Canada Warbler	0-50 m	0-3 min	s	Dense conifer forest
38	6/12/2011	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	0-3 min	fo	Dense conifer forest
38	6/12/2011	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	0-3 min	fo	Dense conifer forest
38	6/12/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	3-5 min	s	Dense conifer forest
38	6/12/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	5-10 min	s	Dense conifer forest
38	6/12/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense conifer forest
38	6/12/2011	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense conifer forest
38	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	>100 m	3-5 min	s	Dense conifer forest
38	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense conifer forest
38	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense conifer forest
38	6/12/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Dense conifer forest
38	6/12/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	—	Dense conifer forest
38	6/30/2011	*Setophaga fusca*	Blackburnin Warbler	0-50 m	0-3 min	s	Dense conifer forest
38	6/30/2011	*Setophaga virens*	Black-throated Green Warbler	0-50 m	3-5 min	—	Dense conifer forest
38	6/30/2011	*Gavia immer*	Common Loon	>100 m	5-10 min	c	Dense conifer forest
38	6/30/2011	*Corvus corax*	Common Raven	>100 m	0-3 min	c	Dense conifer forest
38	6/30/2011	*Perisoreus canadensis*	Gray Jay	50-100 m	0-3 min	c	Dense conifer forest
38	6/30/2011	*Perisoreus canadensis*	Gray Jay	50-100 m	0-3 min	c	Dense conifer forest
38	6/30/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	3-5 min	s	Dense conifer forest
38	6/30/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
38	6/30/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
38	6/30/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
38	6/30/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense conifer forest
38	6/30/2011	*Sphyrapicus varius*	Yellow-bellied Sapsucker	50-100 m	3-5 min	c	Dense conifer forest
38	6/30/2011	*Sphyrapicus varius*	Yellow-bellied Sapsucker	0-50 m	0-3 min	d	Dense conifer forest
39	6/12/2011	*Seiurus aurocapilla*	Ovenbird	>100 m	3-5 min	c	Dense conifer forest
39	6/30/2011	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Dense conifer forest
39	6/12/2011	*Ceryle alcyon*	Belted Kingfisher	>100 m	5-10 min	—	Dense conifer forest
39	6/12/2011	*Mniotilta varia*	Black-and-white Warbler	0-50 m	3-5 min	s	Dense conifer forest
39	6/12/2011	*Gavia immer*	Common Loon	>100 m	0-3 min	—	Dense conifer forest
39	6/12/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
39	6/12/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	5-10 min	s	Dense conifer forest
39	6/12/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	3-5 min	s	Dense conifer forest
39	6/12/2011	*Setophaga americana*	Northern Parula	0-50 m	5-10 min	s	Dense conifer forest
39	6/12/2011	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense conifer forest
39	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense conifer forest
39	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	5-10 min	c	Dense conifer forest
39	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	50-100 m	3-5 min	s	Dense conifer forest
39	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	—	Dense conifer forest
39	6/12/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense conifer forest
39	6/12/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	3-5 min	s	Dense conifer forest
39	6/12/2011	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	0-3 min	s	Dense conifer forest
39	6/30/2011	*Ceryle alcyon*	Belted Kingfisher	>100 m	0-3 min	c	Dense conifer forest
39	6/30/2011	*Cyanocitta cristata*	Blue Jay	50-100 m	3-5 min	c	Dense conifer forest
39	6/30/2011	*Gavia immer*	Common Loon	>100 m	5-10 min	c	Dense conifer forest
39	6/30/2011	*Perisoreus canadensis*	Gray Jay	0-50 m	0-3 min	cf	Dense conifer forest
39	6/30/2011	*Perisoreus canadensis*	Gray Jay	0-50 m	0-3 min	cf	Dense conifer forest
39	6/30/2011	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Dense conifer forest
39	6/30/2011	*Oporornis philadelphia*	Mourning Warbler	>100 m	3-5 min	s	Dense conifer forest
39	6/30/2011	*Setophaga americana*	Northern Parula	0-50 m	5-10 min	s	Dense conifer forest
39	6/30/2011	*Seiurus aurocapilla*	Ovenbird	50-100 m	5-10 min	s	Dense conifer forest
39	6/30/2011	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense conifer forest
39	6/30/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
39	6/30/2011	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense conifer forest
39	6/30/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense conifer forest
40	6/12/2011	*Seiurus aurocapilla*	Ovenbird	>100 m	0-3 min	s	Marsh
40	6/12/2011	*Spizella passerina*	Chipping Sparrow	50-100 m	0-3 min	s	Marsh
40	6/12/2011	*Geothlypis trichas*	Common Yellowthroat	0-50 m	0-3 min	s	Marsh
40	6/12/2011	*Empidonax minimus*	Least Flycatcher	>100 m	0-3 min	s	Marsh
40	6/12/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Marsh
40	6/12/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Marsh
40	6/12/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Marsh
40	6/12/2011	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Marsh
41	6/12/2011	*Vireo olivaceus*	Red-eyed Vireo	>100 m	0-3 min	s	Dense mixed forest
41	6/12/2011	*Turdus migratorius*	American Robin	0-50 m	0-3 min	s	Dense mixed forest
41	6/12/2011	*Setophaga fusca*	Blackburnin Warbler	>100 m	5-10 min	—	Dense mixed forest
41	6/12/2011	*Setophaga fusca*	Blackburnin Warbler	0-50 m	0-3 min	—	Dense mixed forest
41	6/12/2011	*Cyanocitta cristata*	Blue Jay	50-100 m	0-3 min	—	Dense mixed forest
41	6/12/2011	*Wilsonia canadensis*	Canada Warbler	50-100 m	0-3 min	s	Dense mixed forest
41	6/12/2011	*Picoides villosus*	Hairy Woodpecker	50-100 m	5-10 min	—	Dense mixed forest
41	6/12/2011	*Empidonax minimus*	Least Flycatcher	50-100 m	0-3 min	s	Dense mixed forest
41	6/12/2011	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	s	Dense mixed forest
41	6/12/2011	*Setophaga magnolia*	Magnolia Warbler	0-50 m	5-10 min	s	Dense mixed forest
41	6/12/2011	*Oporornis philadelphia*	Mourning Warbler	0-50 m	0-3 min	s	Dense mixed forest
41	6/12/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense mixed forest
41	6/12/2011	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense mixed forest
41	6/12/2011	*Sitta canadensis*	Red-breasted Nuthatch	50-100 m	0-3 min	—	Dense mixed forest
41	6/12/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	3-5 min	s	Dense mixed forest
41	6/12/2011	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	3-5 min	s	Dense mixed forest
41	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	>100 m	5-10 min	s	Dense mixed forest
41	6/12/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	3-5 min	c	Dense mixed forest
42	6/26/2012	*Poecile hudsonicus*	Boreal Chickadee	0-50 m	0-3 min	c	Conifer swamp

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
42	6/26/2012	*Larus argentatus*	Herring Gull	50-100 m	5-10 min	fo	Conifer swamp
42	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Conifer swamp
42	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	<100 m	0-3 min	s	Conifer swamp
42	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
42	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
42	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	3-5 min	s	Conifer swamp
42	6/26/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Conifer swamp
42	6/26/2012	*Carduelis pinus*	Pine Siskin	50-100 m	0-3 min	fo	Conifer swamp
42	6/26/2012	*Vermivora peregrina*	Tennessee Warbler	0-50 m	0-3 min	s	Conifer swamp
42	6/26/2012	*Vermivora peregrina*	Tennessee Warbler	50-100 m	0-3 min	s	Conifer swamp
42	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Conifer swamp
43	6/26/2012	*Poecile hudsonicus*	Boreal Chickadee	0-50 m	3-5 min	c	Treed Fen
43	6/26/2012	*Geothlypis trichas*	Common Yellowthroat	50-100 m	5-10 min	s	Treed Fen
43	6/26/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	5-10 min	s	Treed Fen
43	6/26/2012	*Perisoreus canadensis*	Gray Jay	0-50 m	0-3 min	c	Treed Fen
43	6/26/2012	*Perisoreus canadensis*	Gray Jay	50-100 m	0-3 min	c	Treed Fen
44	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Open Fen
44	6/6/2012	*Geothlypis trichas*	Common Yellowthroat	0-50 m	0-3 min	s	Open Fen
44	6/6/2012	*Geothlypis trichas*	Common Yellowthroat	<100 m	3-5 min	s	Open Fen
44	6/6/2012	*Empidonax minimus*	Least Flycatcher	>100 m	0-3 min	s	Open Fen
44	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	3-5 min	s	Open Fen
44	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Open Fen
44	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	50-100 m	0-3 min	s	Open Fen
44	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	s	Open Fen
44	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	3-5 min	s	Open Fen
44	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	50-100 m	0-3 min	s	Open Fen
44	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	5-10 min	s	Open Fen
44	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	—	Open Fen
44	6/6/2012	*Gallinago delicata*	Wilson's Snipe	50-100 m	0-3 min	c	Open Fen
44	6/6/2012	*Wilsonia pusilla*	Wilson's Warbler	0-50 m	0-3 min	s	Open Fen
44	6/6/2012	*Wilsonia pusilla*	Wilson's Warbler	50-100 m	0-3 min	s	Open Fen
44	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Open Fen
45	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	50-100 m	0-3 min	—	Open Fen
45	6/6/2012	*Larus philadelphia*	Bonaparte's Gull	<100 m	5-10 min	—	Open Fen
45	6/6/2012	*Corvus corax*	Common Raven	50-100 m	0-3 min	—	Open Fen
45	6/6/2012	*Perisoreus canadensis*	Gray Jay	0-50 m	3-5 min	—	Open Fen
45	6/6/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Open Fen
45	6/6/2012	*Melospiza lincolnii*	Lincoln's Sparrow	50-100 m	0-3 min	s	Open Fen
45	6/6/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Open Fen
45	6/6/2012	*Melospiza lincolnii*	Lincoln's Sparrow	<100 m	0-3 min	s	Open Fen
45	6/6/2012	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Open Fen
45	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Open Fen
45	6/6/2012	*Colaptes auratus*	Northern Flicker	<100 m	5-10 min	—	Open Fen
45	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	<100 m	3-5 min	c	Open Fen
45	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Open Fen
45	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	0-3 min	?	Open Fen
45	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	<100 m	3-5 min	s	Open Fen
45	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	—	Open Fen
45	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	—	Open Fen
45	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Open Fen
45	6/6/2012	*Catharus ustulatus*	Swainson's Thrush	<100 m	0-3 min	—	Open Fen
45	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	—	Open Fen
45	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	—	Open Fen
45	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	—	Open Fen
45	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	—	Open Fen
45	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Open Fen
45	6/6/2012	*Wilsonia pusilla*	Wilson's Warbler	50-100 m	3-5 min	s	Open Fen
45	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	5-10 min	—	Open Fen
46	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	0-50 m	0-3 min	—	Treed Fen
46	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	50-100 m	0-3 min	—	Treed Fen
46	6/6/2012	*Cyanocitta cristata*	Blue Jay	0-50 m	0-3 min	ft	Treed Fen
46	6/6/2012	*Geothlypis trichas*	Common Yellowthroat	<100 m	0-3 min	—	Treed Fen
46	6/6/2012	*Geothlypis trichas*	Common Yellowthroat	50-100 m	5-10 min	—	Treed Fen
46	6/6/2012	*Perisoreus canadensis*	Gray Jay	0-50 m	5-10 min	c	Treed Fen
46	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	5-10 min	—	Treed Fen
46	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed Fen
46	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed Fen
46	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Treed Fen
46	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	<100 m	0-3 min	s	Treed Fen
46	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	0-3 min	s	Treed Fen
46	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	3-5 min	s	Treed Fen
46	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	<100 m	0-3 min	s	Treed Fen
46	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Treed Fen
46	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	5-10 min	s	Treed Fen
46	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	<100 m	3-5 min	s	Treed Fen
46	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed Fen
46	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed Fen
46	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Treed Fen
46	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	—	Treed Fen
46	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Treed Fen
46	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	—	Treed Fen
47	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	50-100 m	0-3 min	s	Treed Fen

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
47	6/6/2012	*Geothlypis trichas*	Common Yellowthroat	<100 m	5-10 min	s	Treed Fen
47	6/6/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s	Treed Fen
47	6/6/2012	*Catharus guttatus*	Hermit Thrush	<100 m	0-3 min	s	Treed Fen
47	6/6/2012	*Catharus guttatus*	Hermit Thrush	<100 m	0-3 min	s	Treed Fen
47	6/6/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	5-10 min	s	Treed Fen
47	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed Fen
47	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed Fen
47	6/6/2012	*Colaptes auratus*	Northern Flicker	50-100 m	5-10 min	—	Treed Fen
47	6/6/2012	*Seiurus aurocapilla*	Ovenbird	<100 m	0-3 min	s	Treed Fen
47	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Treed Fen
47	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	3-5 min	s	Treed Fen
47	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Treed Fen
47	6/6/2012	*Vermivora peregrina*	Tennessee Warbler	<100 m	3-5 min	s	Treed Fen
47	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Treed Fen
47	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	—	Treed Fen
47	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Treed Fen
47	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed Fen
47	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	5-10 min	s	Treed Fen
47	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Treed Fen
47	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	5-10 min	s	Treed Fen
48	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	0-50 m	0-3 min	c	Treed Fen
48	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	50-100 m	0-3 min	s	Treed Fen
48	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	0-50 m	0-3 min	s	Treed Fen
48	6/6/2012	*Sialia sialis*	Eastern Bluebird	50-100 m	0-3 min	s	Treed Fen
48	6/6/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Treed Fen
48	6/6/2012	*Catharus guttatus*	Hermit Thrush	<100 m	5-10 min	s	Treed Fen
48	6/6/2012	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Treed Fen
48	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	a, s	Treed Fen
48	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	0-3 min	s	Treed Fen
48	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Treed Fen
48	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Treed Fen
48	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	<100 m	3-5 min	s	Treed Fen
48	6/6/2012	*Vermivora peregrina*	Tennessee Warbler	0-50 m	0-3 min	s	Treed Fen
48	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Treed Fen
48	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Treed Fen
48	6/6/2012	*Gallinago delicata*	Wilson's Snipe	0-50 m	0-3 min	—	Treed Fen
48	6/6/2012	*Wilsonia pusilla*	Wilson's Warbler	0-50 m	0-3 min	s	Treed Fen
48	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	—	Treed Fen
48	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Treed Fen
49	6/6/2012	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Conifer swamp
49	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	50-100 m	0-3 min	s	Conifer swamp
49	6/6/2012	*Vireo solitarius*	Blue-headed Vireo	50-100 m	0-3 min	s	Conifer swamp
49	6/6/2012	*Catharus guttatus*	Hermit Thrush	<100 m	0-3 min	s	Conifer swamp
49	6/6/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	3-5 min	s	Conifer swamp
49	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
49	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
49	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
49	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	3-5 min	s	Conifer swamp
49	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	5-10 min	s	Conifer swamp
49	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
49	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	s	Conifer swamp
49	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	5-10 min	s	Conifer swamp
49	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
49	6/6/2012	*Gallinago delicata*	Wilson's Snipe	<100 m	5-10 min	c	Conifer swamp
49	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	—	Conifer swamp
50	6/6/2012	*Picoides arcticus*	Black-backed Woodpecker	0-50 m	3-5 min	c	Conifer swamp
50	6/6/2012	*Junco hyemalis*	Dark-eyed Junco	0-50 m	0-3 min	c	Conifer swamp
50	6/6/2012	*Melospiza lincolnii*	Lincoln's Sparrow	50-100 m	0-3 min	s	Conifer swamp
50	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
50	6/6/2012	*Colaptes auratus*	Northern Flicker	<100 m	0-3 min	s	Conifer swamp
50	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	<100 m	0-3 min	s	Conifer swamp
50	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	0-3 min	s	Conifer swamp
50	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
50	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
50	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	3-5 min	s	Conifer swamp
50	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Conifer swamp
50	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Conifer swamp
50	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	s	Conifer swamp
50	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Conifer swamp
51	6/6/2012	*Larus philadelphia*	Bonaparte's Gull	0-50 m	5-10 min	a	Open Fen
51	6/6/2012	*Larus philadelphia*	Bonaparte's Gull	50-100 m	0-3 min	fo	Open Fen
51	6/6/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Open Fen
51	6/6/2012	*Melospiza lincolnii*	Lincoln's Sparrow	<100 m	0-3 min	s	Open Fen
51	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Open Fen
51	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Open Fen
51	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	<100 m	3-5 min	c	Open Fen
51	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Open Fen
51	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	0-3 min	s	Open Fen
51	6/6/2012	*Carpodacus purpureus*	Purple Finch	0-50 m	3-5 min	fo	Open Fen
51	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Open Fen
51	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	<100 m	0-3 min	s	Open Fen
51	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	3-5 min	s	Open Fen

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
51	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Open Fen
51	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Open Fen
51	6/6/2012	*Wilsonia pusilla*	Wilson's Warbler	50-100 m	0-3 min	s	Open Fen
51	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	3-5 min	s	Open Fen
52	6/6/2012	*Turdus migratorius*	American Robin	50-100 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Junco hyemalis*	Dark-eyed Junco	50-100 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Picoides villosus*	Hairy Woodpecker	0-50 m	0-3 min	c	Conifer swamp
52	6/6/2012	*Melospiza lincolnii*	Lincoln's Sparrow	<100 m	0-3 min	—	Conifer swamp
52	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Colaptes auratus*	Northern Flicker	<100 m	0-3 min	c	Conifer swamp
52	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	3-5 min	s	Conifer swamp
52	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Catharus ustulatus*	Swainson's Thrush	<100 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	c, a	Conifer swamp
52	6/6/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Melospiza georgiana*	Swamp Sparrow	<100 m	5-10 min	s	Conifer swamp
52	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
52	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	c	Conifer swamp
52	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Poecile hudsonicus*	Boreal Chickadee	0-50 m	3-5 min	c	Conifer swamp
53	6/6/2012	*Junco hyemalis*	Dark-eyed Junco	0-50 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Perisoreus canadensis*	Gray Jay	0-50 m	3-5 min	c	Conifer swamp
53	6/6/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	3-5 min	s	Conifer swamp
53	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	<100 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	c	Conifer swamp
53	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	3-5 min	s	Conifer swamp
53	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Conifer swamp
53	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	f	Conifer swamp
53	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Conifer swamp
54	6/6/2012	*Junco hyemalis*	Dark-eyed Junco	0-50 m	0-3 min	s	Open Fen
54	6/6/2012	*Tringa melanoleuca*	Greater Yellowlegs	0-50 m	0-3 min	—	Open Fen
54	6/6/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Open Fen
54	6/6/2012	*Melospiza lincolnii*	Lincoln's Sparrow	<100 m	3-5 min	—	Open Fen
54	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Open Fen
54	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50- 100 m	0-3 min	s	Open Fen
54	6/6/2012	*Colaptes auratus*	Northern Flicker	<100 m	0-3 min	—	Open Fen
54	6/6/2012	*Colaptes auratus*	Northern Flicker	50-100 m	0-3 min	s	Open Fen
54	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Open Fen
54	6/6/2012	*Carpodacus purpureus*	Purple Finch	0-50 m	0-3 min	s	Open Fen
54	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Open Fen
54	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	3-5 min	s	Open Fen
54	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Open Fen
54	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Open Fen
54	6/6/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Open Fen
54	6/6/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	—	Open Fen
55	6/6/2012	*Oporornis agilis*	Conneticut Warbler	0-50 m	0-3 min	s	Treed bog
55	6/6/2012	*Junco hyemalis*	Dark-eyed Junco	50-100 m	0-3 min	s	Treed bog
55	6/6/2012	*Tringa melanoleuca*	Greater Yellowlegs	50-100 m	0-3 min	c	Treed bog
55	6/6/2012	*Catharus guttatus*	Hermit Thrush	<100 m	3-5 min	s	Treed bog
55	6/6/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Treed bog
55	6/6/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	5-10 min	s	Treed bog
55	6/6/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Treed bog
55	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed bog
55	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Treed bog
55	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	0-3 min	s	Treed bog
55	6/6/2012	*Carpodacus purpureus*	Purple Finch	0-50 m	3-5 min	fo	Treed bog
55	6/6/2012	*Sitta canadensis*	Red-breasted Nuthtch	0-50 m	0-3 min	—	Treed bog
55	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	—	Treed bog
55	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	—	Treed bog
55	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed bog
56	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
56	6/6/2012	*Turdus migratorius*	American Robin	50- 100 m	3-5 min	s	Conifer swamp
56	6/6/2012	*Poecile atricapilla*	Black-capped Chickadee	50-100 m	0-3 min	s	Conifer swamp
56	6/6/2012	*Vireo solitarius*	Blue-headed Vireo	50-100 m	5-10 min	s	Conifer swamp
56	6/6/2012	*Corvus corax*	Common Raven	<100 m	3-5 min	c	Conifer swamp
56	6/6/2012	*Junco hyemalis*	Dark-eyed Junco	0-50 m	0-3 min	s	Conifer swamp
56	6/6/2012	*Larus argentatus*	Herring Gull	<100 m	5-10 min	fo	Conifer swamp
56	6/6/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
56	6/6/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	0-3 min	s	Conifer swamp
56	6/6/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Conifer swamp
56	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
56	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
56	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	—	Conifer swamp
56	6/6/2012	*Wilsonia pusilla*	Wilson's Warbler	50-100 m	0-3 min	s	Conifer swamp
57	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	50-100 m	5-10 min	s	Conifer swamp
57	6/6/2012	*Empidonax alnorum*	Alder Flycatcher	<100 m	5-10 min	s	Conifer swamp
57	6/6/2012	*Geothlypis trichas*	Common Yellowthroat	0-50 m	0-3 min	s	Conifer swamp
57	6/6/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	5-10 min	c	Conifer swamp
57	6/6/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Conifer swamp
57	6/6/2012	*Colaptes auratus*	Northern Flicker	<100 m	3-5 min	c	Conifer swamp
57	6/6/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
57	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
57	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Conifer swamp
57	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
57	6/6/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	f	Conifer swamp
57	6/6/2012	*Wilsonia pusilla*	Wilson's Warbler	50-100 m	0-3 min	s	Conifer swamp
57	6/6/2012	*Wilsonia pusilla*	Wilson's Warbler	0-50 m	0-3 min	s	Conifer swamp
57	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	f	Conifer swamp
57	6/6/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Conifer swamp
58	06/07/2012	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	—	Dense Conifer Forest
58	06/07/2012	*Corvus corax*	Common Raven	<100 m	0-3 min	c	Dense Conifer Forest
58	06/07/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Regulus calendula*	Ruby-crowned Kinglet	<100 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Corvus brachyrhynchos*	American Crow	<100 m	0-3 min	c	Dense Conifer Forest
58	06/07/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	c	Dense Conifer Forest
58	06/07/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s, p	Dense Conifer Forest
58	06/07/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	p	Dense Conifer Forest
58	06/07/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Setophaga castanea*	Bay-breasted Warbler	0-50 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Sitta canadensis*	Red-breasted Nuthatch	50-100 m	5-10 min	c	Dense Conifer Forest
58	06/07/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense Conifer Forest
58	06/07/2012	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	5-10 min	s	Dense Conifer Forest
58	06/07/2012	*Seiurus aurocapilla*	Ovenbird	<100 m	0-3 min	—	Dense Conifer Forest
58	06/07/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	—	Dense Conifer Forest
58	06/07/2012	*Vireo solitarius*	Blue-headed Vireo	50-100 m	5-10 min	s	Dense Conifer Forest
58	06/07/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	—	Dense Conifer Forest
58	06/07/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense Conifer Forest
59	6/7/2012	*Cyanocitta cristata*	Blue Jay	50-100 m	5-10 min	c	Dense mixed forest
59	6/7/2012	*Setophaga pensylvanica*	Chestnut-sided Warbler	0-50 m	0-3 min	s	Dense mixed forest
59	6/7/2012	*Geothlypis trichas*	Common Yellowthroat	>100 m	5-10 min	c	Dense mixed forest
59	6/7/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	3-5 min	s	Dense mixed forest
59	6/7/2012	*Perisoreus canadensis*	Gray Jay	0-50 m	0-3 min	c	Dense mixed forest
59	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense mixed forest
59	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	>100 m	0-3 min	s	Dense mixed forest
59	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	3-5 min	s	Dense mixed forest
59	6/7/2012	*Seiurus noveboracensis*	Northern Waterthrush	>100 m	5-10 min	s	Dense mixed forest
59	6/7/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense mixed forest
59	6/7/2012	*Carpodacus purpureus*	Purple Finch	50-100 m	0-3 min	s	Dense mixed forest
59	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense mixed forest
59	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
59	6/7/2012	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Dense mixed forest
59	6/7/2012	*Catharus fuscescens*	Veery	0-50 m	0-3 min	c	Dense mixed forest
59	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	c	Dense mixed forest
59	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	—	Dense mixed forest
59	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	c	Dense mixed forest
59	6/7/2012	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Dense mixed forest
59	6/7/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	0-3 min		Dense mixed forest
59	6/7/2012	*Sphyrapicus varius*	Yellow-bellied Sapsucker	0-50 m	5-10 min	c	Dense mixed forest
60	6/7/2012	*Empidonax alnorum*	Alder Flycatcher	>100 m	0-3 min	s	Dense conifer forest
60	6/7/2012	*Corvus brachyrhynchos*	American Crow	>100 m	5-10 min	c	Dense conifer forest
60	6/7/2012	*Setophaga castanea*	Bay-breasted Warbler	0-50 m	0-3 min	s	Dense conifer forest
60	6/7/2012	*Geothlypis trichas*	Common Yellowthroat	>100 m	0-3 min	s	Dense conifer forest
60	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	—	Dense conifer forest
60	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
60	6/7/2012	*Sitta canadensis*	Red-breasted Nuthatch	0-50 m	0-3 min	s	Dense conifer forest
60	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense conifer forest
60	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense conifer forest
60	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	3-5 min	s	Dense conifer forest
60	6/7/2012	*Vermivora peregrina*	Tennessee Warbler	50-100 m	0-3 min	s	Dense conifer forest
60	6/7/2012	*Vermivora peregrina*	Tennessee Warbler	0-50 m	0-3 min	s	Dense conifer forest
60	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense conifer forest
61	6/7/2012	*Turdus migratorius*	American Robin	0-50 m	0-3 min	c	Dense deciduous forest
61	6/7/2012	*Mniotilta varia*	Black-and-white Warbler	50-100 m	3-5 min	s	Dense deciduous forest
61	6/7/2012	*Poecile atricapilla*	Black-capped Chickadee	0-50 m	5-10 min	cf	Dense deciduous forest
61	6/7/2012	*Picoides villosus*	Hairy Woodpecker	50-100 m	5-10 min	c	Dense deciduous forest

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
61	6/7/2012	*Empidonax minimus*	Least Flycatcher	50-100 m	0-3 min	s	Dense deciduous forest
61	6/7/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	s	Dense deciduous forest
61	6/7/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	s	Dense deciduous forest
61	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense deciduous forest
61	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous forest
61	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous forest
61	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous forest
61	6/7/2012	*Catharus fuscescens*	Veery	50-100 m	0-3 min	—	Dense deciduous forest
61	6/7/2012	*Catharus fuscescens*	Veery	0-50 m	3-5 min	s	Dense deciduous forest
61	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	5-10 min	s	Dense deciduous forest
61	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Setophaga virens*	Black-throated Green Warbler	50-100 m	3-5 min	s	Dense deciduous forest
62	6/7/2012	*Wilsonia canadensis*	Canada Warbler	0-50 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Empidonax minimus*	Least Flycatcher	50-100 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Empidonax minimus*	Least Flycatcher	50-100 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Empidonax minimus*	Least Flycatcher	50-100 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	c	Dense deciduous forest
62	6/7/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	c	Dense deciduous forest
62	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	5-10 min	s	Dense deciduous forest
62	6/7/2012	*Sitta canadensis*	Red-breasted Nuthatch	50-100 m	0-3 min	c	Dense deciduous forest
62	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	>100 m	5-10 min	s	Dense deciduous forest
62	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	c	Dense deciduous forest
62	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense deciduous forest
62	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	s	Dense deciduous forest
63	6/7/2012	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Dense conifer forest
63	6/7/2012	*Gavia immer*	Common Loon	>100 m	5-10 min	c	Dense conifer forest
63	6/7/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	3-5 min	s	Dense conifer forest
63	6/7/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	3-5 min	s	Dense conifer forest
63	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
63	6/7/2012	*Oporornis philadelphia*	Mourning Warbler	50-100 m	0-3 min	s	Dense conifer forest
63	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	3-5 min	s	Dense conifer forest
63	6/7/2012	*Setophaga americana*	Northern Parula	50-100 m	5-10 min	s	Dense conifer forest
63	6/7/2012	*Sitta canadensis*	Red-breasted Nuthatch	0-50 m	0-3 min	c	Dense conifer forest
63	6/7/2012	*Sitta canadensis*	Red-breasted Nuthatch	0-50 m	0-3 min	c	Dense conifer forest
63	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	>100 m	3-5 min	s	Dense conifer forest
63	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
63	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	—	Dense conifer forest
63	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense conifer forest
63	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense conifer forest
63	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense conifer forest
63	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense conifer forest
63	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense conifer forest
64	6/7/2012	*Turdus migratorius*	American Robin	>100 m	0-3 min	s	Dense conifer forest
64	6/7/2012	*Turdus migratorius*	American Robin	>100 m	0-3 min	s	Dense conifer forest
64	6/7/2012	*Setophaga virens*	Black-throated Green Warbler	50-100 m	3-5 min	s	Dense conifer forest
64	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
64	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense conifer forest
64	6/7/2012	*Sitta canadensis*	Red-breasted Nuthatch	0-50 m	5-10 min	c	Dense conifer forest
64	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
64	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense conifer forest
64	6/7/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Dense conifer forest
65	6/7/2012	*Corvus brachyrhynchos*	American Crow	>100 m	0-3 min	—	Dense conifer forest
65	6/7/2012	*Turdus migratorius*	American Robin	>100 m	0-3 min	s	Dense conifer forest
65	6/7/2012	*Turdus migratorius*	American Robin	>100 m	0-3 min	s	Dense conifer forest
65	6/7/2012	*Turdus migratorius*	American Robin	0-50 m	5-10 min	c	Dense conifer forest
65	6/7/2012	*Setophaga castanea*	Bay-breasted Warbler	0-50 m	0-3 min	—	Dense conifer forest
65	6/7/2012	*Setophaga virens*	Black-throated Green Warbler	50-100 m	3-5 min	s	Dense conifer forest
65	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense conifer forest
65	6/7/2012	*Seiurus noveboracensis*	Northern Waterthrush	50-100 m	0-3 min	s	Dense conifer forest
65	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense conifer forest
65	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	—	Dense conifer forest
65	6/7/2012	*Troglodytes hiemalis*	Winter Wren	>100 m	5-10 min	s	Dense conifer forest
65	6/7/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	s	Dense conifer forest
65	6/7/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Dense conifer forest
65	6/7/2012	*Sphyrapicus varius*	Yellow-bellied Sapsucker	0-50 m	5-10 min	d	Dense conifer forest
65	6/7/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	c	Dense conifer forest
66	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Corvus brachyrhynchos*	American Crow	0-50 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Setophaga fusca*	Blackburnin Warbler	0-50 m	5-10 min	s	Dense conifer forest
66	6/7/2012	*Vireo solitarius*	Blue-headed Vireo	>100 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Vireo solitarius*	Blue-headed Vireo	0-50 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	5-10 min	s	Dense conifer forest
66	6/7/2012	*Oporornis philadelphia*	Mourning Warbler	>100 m	3-5 min	s	Dense conifer forest
66	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Setophaga americana*	Northern Parula	>100 m	3-5 min	s	Dense conifer forest
66	6/7/2012	*Seiurus noveboracensis*	Northern Waterthrush	>100 m	0-3 min	s	Dense conifer forest

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
66	6/7/2012	*Seiurus noveboracensis*	Northern Waterthrush	0-50 m	3-5 min	s	Dense conifer forest
66	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	c	Dense conifer forest
66	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	—	Dense conifer forest
66	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	>100 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Troglodytes hiemalis*	Winter Wren	>100 m	0-3 min	s	Dense conifer forest
66	6/7/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	>100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Setophaga castanea*	Bay-breasted Warbler	0-50 m	5-10 min	s	Dense conifer forest
67	6/7/2012	*Setophaga pensylvanica*	Chestnut-sided Warbler	<100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Gavia immer*	Common Loon	>500 m	3-5 min	—	Dense conifer forest
67	6/7/2012	*Larus argentatus*	Herring Gull	>500 m	3-5 min	—	Dense conifer forest
67	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Setophaga americana*	Northern Parula	0-50 m	5-10 min	s	Dense conifer forest
67	6/7/2012	*Sitta canadensis*	Red-breasted Nuthatch	0-50 m	0-3 min	c	Dense conifer forest
67	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	<100 m	3-5 min	s	Dense conifer forest
67	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	c	Dense conifer forest
67	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	50- 100 m	0-3 min	s	Dense conifer forest
67	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	p	Dense conifer forest
67	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	p	Dense conifer forest
67	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Setophaga ruticilla*	American Redstart	50-100 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Setophaga castanea*	Bay-breasted Warbler	50-100 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Setophaga castanea*	Bay-breasted Warbler	0-50 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Empidonax minimus*	Least Flycatcher	<100 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	f, cf	Dense conifer forest
68	6/7/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Setophaga americana*	Northern Parula	0-50 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Sitta canadensis*	Red-breasted Nuthatch	0-50 m	5-10 min	c	Dense conifer forest
68	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	3-5 min	s	Dense conifer forest
68	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense conifer forest
68	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	—	Dense conifer forest
68	6/7/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	3-5 min	s	Dense conifer forest
68	6/7/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Dense conifer forest
69	6/7/2012	*Setophaga castanea*	Bay-breasted Warbler	0-50 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Setophaga fusca*	Blackburnin Warbler	0-50 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Setophaga americana*	Northern Parula	50-100 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Carduelis pinus*	Pine Siskin	0-50 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Sitta canadensis*	Red-breasted Nuthatch	50-100 m	0-3 min	c	Dense mixed forest
69	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	5-10 min	s	Dense mixed forest
69	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense mixed forest
69	6/7/2012	*Catharus fuscescens*	Veery	0-50 m	3-5 min	s	Dense mixed forest
69	6/7/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	5-10 min	s	Dense mixed forest
70	6/7/2012	*Setophaga fusca*	Blackburnin Warbler	50-100 m	0-3 min	s	Dense deciduous
70	6/7/2012	*Cyanocitta cristata*	Blue Jay	<100 m	0-3 min	—	Dense deciduous
70	6/7/2012	*Setophaga pensylvanica*	Chestnut-sided Warbler	50-100 m	0-3 min	s	Dense deciduous
70	6/7/2012	*Setophaga pensylvanica*	Chestnut-sided Warbler	0- 50 m	0-3 min	s	Dense deciduous
70	6/7/2012	*Corvus corax*	Common Raven	0-50 m	5-10 min	fo	Dense deciduous
70	6/7/2012	*Coccothraustes vespertinus*	Evening Grosbeak	<100 m	0-3 min	c	Dense deciduous
70	6/7/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense deciduous
70	6/7/2012	*Colaptes auratus*	Northern Flicker	<100 m	3-5 min	c	Dense deciduous
70	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	5-10 min	s	Dense deciduous
70	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
70	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	3-5 min	s	Dense deciduous
70	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous
70	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Dense deciduous
70	6/7/2012	*Catharus fuscescens*	Veery	0-50 m	0-3 min	s	Dense deciduous
70	6/7/2012	*Sphyrapicus varius*	Yellow-bellied Sapsucker	50-100 m	0-3 min	d	Dense deciduous
71	6/7/2012	*Turdus migratorius*	American Robin	0-50 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Setophaga pensylvanica*	Chestnut-sided Warbler	50-100 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Setophaga pensylvanica*	Chestnut-sided Warbler	0-50 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Catharus guttatus*	Hermit Thrush	<100 m	3-5 min	s	Dense deciduous

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
71	6/7/2012	*Empidonax minimus*	Least Flycatcher	50-100 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Empidonax minimus*	Least Flycatcher	50-100 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Setophaga americana*	Northern Parula	50-100 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	3-5 min	s	Dense deciduous
71	6/7/2012	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	3-5 min	s	Dense deciduous
71	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
71	6/7/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	5-10 min	s	Dense deciduous
71	6/7/2012	*Sphyrapicus varius*	Yellow-bellied Sapsucker	0-50 m	0-3 min	—	Dense deciduous
72	6/7/2012	*Setophaga virens*	Black-throated Green Warbler	<100 m		s	Dense deciduous
72	6/7/2012	*Seiurus aurocapilla*	Ovenbird	<100 m	0-3 min	s	Dense deciduous
72	6/7/2012	*Seiurus aurocapilla*	Ovenbird	50-100 m	3-5 min	s	Dense deciduous
72	6/7/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense deciduous
72	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous
72	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	—	Dense deciduous
72	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	—	Dense deciduous
72	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
72	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	5-10 min	c	Dense deciduous
72	6/7/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Dense deciduous
73	6/26/2012	*Larus philadelphia*	Bonaparte's Gull	0-50 m	0-3 min	c	Open fen
73	6/26/2012	*Tringa melanoleuca*	Greater Yellowlegs	0-50 m	0-3 min	c,a	Open fen
73	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	c	Open fen
73	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Open fen
73	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Open fen
73	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	3-5 min	s	Open fen
73	6/26/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	s	Open fen
73	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Open fen
73	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Open fen
73	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Open fen
74	6/28/2012	*Poecile hudsonicus*	Boreal Chickadee	0-50 m	0-3 min	c,cf	Treed fen
74	6/28/2012	*Quiscalus quiscula*	Common Grackle	50-100 m	0-3 min	s	Treed fen
74	6/28/2012	*Corvus corax*	Common Raven	0-50 m	5-10 min	c	Treed fen
74	6/28/2012	*Corvus corax*	Common Raven	>100 m	0-3 min	c	Treed fen
74	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	c	Treed fen
74	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed fen
74	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed fen
74	6/28/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	3-5 min	s	Treed fen
74	6/28/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Treed fen
74	6/28/2012	*Melospiza georgiana*	Swamp Sparrow	50-100 m	0-3 min	s	Treed fen
74	6/28/2012	*Vermivora peregrina*	Tennessee Warbler	0-50 m	0-3 min	s	Treed fen
74	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed fen
74	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed fen
74	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Treed fen
74	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	5-10 min	s	Treed fen
74	6/28/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Treed fen
76	6/28/2012	*Turdus migratorius*	American Robin	0-50 m	0-3 min	s	Open fen
76	6/28/2012	*Perisoreus canadensis*	Gray Jay	0-50 m	3-5 min	c	Open fen
76	6/28/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Open fen
76	6/28/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Open fen
76	6/28/2012	*Melospiza lincolnii*	Lincoln's Sparrow	>100 m	0-3 min	s	Open fen
76	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	3-5 min	s	Open fen
76	6/28/2012	*Colaptes auratus*	Northern Flicker	>100 m	5-10 min	c	Open fen
76	6/28/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	3-5 min	s	Open fen
76	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s,a	Open fen
76	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Open fen
76	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	50 - 100 m	0-3 min	s	Open fen
77	6/29/2011	*Vireo solitarius*	Blue-headed Vireo	50-100 m	3-5 min	s	Treed Fen
77	6/29/2011	*Oporornis philadelphia*	Mourning Warbler	>100 m	3-5 min	s	Treed Fen
77	6/29/2011	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed Fen
77	6/29/2011	*Colaptes auratus*	Northern Flicker	50-100 m	5-10 min	c	Treed Fen
77	6/29/2011	*Seiurus noveboracensis*	Northern Waterthrush	>100 m	0-3 min	s	Treed Fen
77	6/29/2011	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Treed Fen
77	6/29/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Treed Fen
77	6/29/2011	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Treed Fen
77	6/29/2011	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Treed Fen
77	6/29/2011	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Treed Fen
77	6/29/2011	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed Fen
78	6/26/2012	*Geothlypis trichas*	Common Yellowthroat	50-100 m	3-5 min	s	Treed fen
78	6/26/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Treed fen
78	6/26/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	5-10 min	s	Treed fen
78	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed fen
78	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	5-10 min	s	Treed fen
78	6/26/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Treed fen
78	6/26/2012	*Carduelis pinus*	Pine Siskin	0-50 m	0-3 min	fo	Treed fen
78	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed fen
78	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Treed fen
78	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed fen
79	6/26/2012	*Bucephala clangula*	Common Goldeneye	<100 m	0-3 min	c	Treed fen
79	6/26/2012	*Junco hyemalis*	Dark-eyed Junco	<100 m	0-3 min	s	Treed fen

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
79	6/26/2012	*Junco hyemalis*	Dark-eyed Junco	50-100 m	0-3 min	s	Treed fen
79	6/26/2012	*Junco hyemalis*	Dark-eyed Junco	0-50 m	3-5 min	s	Treed fen
79	6/26/2012	*Catharus guttatus*	Hermit Thrush	<100 m	0-3 min	s	Treed fen
79	6/26/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Treed fen
79	6/26/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Treed fen
79	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Treed fen
79	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Treed fen
79	6/26/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Treed fen
79	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Treed fen
79	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed fen
79	6/26/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Treed fen
79	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Treed fen
79	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	5-10 min	s	Treed fen
80	6/26/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Setophaga palmarum palmarum*	Palm Warbler	<100 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
80	6/26/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	5-10 min	s	Conifer swamp
80	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Conifer swamp
81	6/27/2012	*Chordeiles minor*	Common Nighthawk	50-100 m	0-3 min	s	Treed fen
81	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	5-10 min	s	Treed fen
81	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50	3-5 min	s	Treed fen
81	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed fen
81	6/27/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Treed fen
82	6/27/2012	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	3-5 min	c	Conifer swamp
82	6/27/2012	*Spizella passerina*	Chipping Sparrow	0-50 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Quiscalus quiscula*	Common Grackle	0-50 m	0-3 min	c	Conifer swamp
82	6/27/2012	*Geothlypis trichas*	Common Yellowthroat	50-100 m	5-10 min	s	Conifer swamp
82	6/27/2012	*Perisoreus canadensis*	Gray Jay	0-50 m	5-10 min	c	Conifer swamp
82	6/27/2012	*Perisoreus canadensis*	Gray Jay	<100 m	3-5 min	c	Conifer swamp
82	6/27/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Setophaga magnolia*	Magnolia Warbler	50-100 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Setophaga palmarum palmarum*	Palm Warbler	50-100 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Picoides tridactylus*	Three-toed Woodpecker	0-50 m	0-3 min	c	Conifer swamp
82	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	5-10 min	s	Conifer swamp
82	6/27/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Conifer swamp
82	6/27/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	<100 m	3-5 min	s	Conifer swamp
83	6/27/2012	*Turdus migratorius*	American Robin	0-50 m	0-3 min	c	Dense conifer forest
83	6/27/2012	*Gavia immer*	Common Loon	<100 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Perisoreus canadensis*	Gray Jay	0-50 m	5-10 min	c	Dense conifer forest
83	6/27/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	c	Dense conifer forest
83	6/27/2012	*Catharus guttatus*	Hermit Thrush	<100 m	3-5 min	s	Dense conifer forest
83	6/27/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	3-5 min	s	Dense conifer forest
83	6/27/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	5-10 min	s	Dense conifer forest
83	6/27/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	5-10 min	s	Dense conifer forest
83	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	3-5 min	s	Dense conifer forest
83	6/27/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	c	Dense conifer forest
83	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense conifer forest
83	6/27/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Dense conifer forest
84	6/26/2012	*Empidonax alnorum*	Alder Flycatcher	0-50 m	0-3 min	s, cf	Conifer swamp
84	6/26/2012	*Cyanocitta cristata*	Blue Jay	50-100 m	5-10 min	c	Conifer swamp
84	6/26/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Conifer swamp
84	6/26/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	5-10 min	c	Conifer swamp
84	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
84	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
84	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	5-10 min	s	Conifer swamp
84	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
84	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	<100 m	5-10 min	s	Conifer swamp
84	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
84	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
84	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	c	Conifer swamp
84	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
84	6/26/2012	*Wilsonia pusilla*	Wilson's Warbler	0-50 m	0-3 min	—	Conifer swamp
84	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	s	Conifer swamp
85	6/26/2012	*Junco hyemalis*	Dark-eyed Junco	50-100 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	5-10 min	s	Dense conifer forest
85	6/26/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	—	Dense conifer forest
85	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Dense conifer forest
85	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	s	Dense conifer forest
86	6/27/2012	*Setophaga castanea*	Bay-breasted Warbler	50-100 m	0-3 min	s	Dense conifer forest
86	6/27/2012	*Picoides arcticus*	Black-backed Woodpecker	0-50 m	0-3 min	d, ny	Dense conifer forest
86	6/27/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Dense conifer forest
86	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense conifer forest
86	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Dense conifer forest
86	6/27/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Dense conifer forest
86	6/27/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Dense conifer forest
86	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Dense conifer forest
86	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense conifer forest
86	6/27/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Dense conifer forest
86	6/27/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Dense conifer forest
87	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	50-100 m	5-10 min	ne	Open fen
87	6/26/2012	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	0-3 min	c	Open fen
87	6/26/2012	*Gavia immer*	Common Loon	<100 m	0-3 min	s	Open fen
87	6/26/2012	*Geothlypis trichas*	Common Yellowthroat	0-50 m	0-3 min	s	Open fen
87	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	50-100 m	0-3 min	s	Open fen
87	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	50-100 m	0-3 min	s	Open fen
87	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	<100 m	5-10 min	s	Open fen
87	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Open fen
87	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Open fen
87	6/26/2012	*Melospiza melodia*	Song Sparrow	0-50 m	0-3 min	s	Open fen
87	6/26/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	s	Open fen
87	6/26/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	s	Open fen
87	6/26/2012	*Melospiza georgiana*	Swamp Sparrow	50-100 m	0-3 min	—	Open fen
87	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	5-10 min	s	Open fen
87	6/26/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Open fen
87	6/26/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	3-5 min	s	Open fen
88	6/26/2012	*Junco hyemalis*	Dark-eyed Junco	0-50 m	0-3 min	s	Treed Bog
88	6/26/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s	Treed Bog
88	6/26/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Treed Bog
88	6/26/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	3-5 min	s	Treed Bog
88	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	50-100 m	0-3 min	s	Treed Bog
88	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Treed Bog
88	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Treed Bog
88	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	5-10 min	s	Treed Bog
88	6/26/2012	*Melospiza melodia*	Song Sparrow	<100 m	3-5 min	s	Treed Bog
88	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed Bog
88	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed Bog
88	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed Bog
88	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed Bog
88	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	3-5 min	s	Treed Bog
89	6/26/2012	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Conifer swamp
89	6/26/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	—	Conifer swamp
89	6/26/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Conifer swamp
89	6/26/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Conifer swamp
89	6/26/2012	*Catharus guttatus*	Hermit Thrush	<100 m	0-3 min	s	Conifer swamp
89	6/26/2012	*Catharus guttatus*	Hermit Thrush	<100 m	3-5 min	s	Conifer swamp
89	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
89	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
89	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Conifer swamp
89	6/26/2012	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	—	Conifer swamp
89	6/26/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Conifer swamp
89	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	5-10 min	c	Conifer swamp
89	6/26/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Conifer swamp
89	6/26/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	—	Conifer swamp
89	6/26/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	5-10 min	c	Conifer swamp
89	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	s	Conifer swamp
90	6/26/2012	*Catharus guttatus*	Hermit Thrush	<100 m	0-3 min	s	Dense conifer forest
90	6/26/2012	*Vireo solitarius*	Blue-headed Vireo	50-100 m	3-5 min	s	Dense conifer forest
90	6/26/2012	*Spizella passerina*	Chipping Sparrow	0-50 m	0-3 min	s	Dense conifer forest
90	6/26/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Dense conifer forest
90	6/26/2012	*Catharus guttatus*	Hermit Thrush	<100 m	5-10 min	s	Dense conifer forest
90	6/26/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense conifer forest

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
90	6/26/2012	*Setophaga magnolia*	Magnolia Warbler	50-100 m	3-5 min	s	Dense conifer forest
90	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense conifer forest
90	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense conifer forest
90	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	5-10 min	s	Dense conifer forest
90	6/26/2012	*Colaptes auratus*	Northern Flicker	0-50 m	0-3 min	c	Dense conifer forest
90	6/26/2012	*Colaptes auratus*	Northern Flicker	50-100 m	0-3 min	c	Dense conifer forest
90	6/26/2012	*Colaptes auratus*	Northern Flicker	<100 m	0-3 min	c	Dense conifer forest
90	6/26/2012	*Carduelis pinus*	Pine Siskin	0-50 m	0-3 min	—	Dense conifer forest
90	6/26/2012	*Carpodacus purpureus*	Purple Finch	0-50 m	3-5 min	fo	Dense conifer forest
90	6/26/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	3-5 min	c	Dense conifer forest
90	6/26/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	5-10 min	s	Dense conifer forest
90	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense conifer forest
90	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense conifer forest
90	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense conifer forest
90	6/26/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	—	Dense conifer forest
91	6/26/2012	*Empidonax alnorum*	Alder Flycatcher	0-50 m	3-5 min	s	Conifer swamp
91	6/26/2012	*Vireo solitarius*	Blue-headed Vireo	50-100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Geothlypis trichas*	Common Yellowthroat	<100 m	0-3 min	—	Conifer swamp
91	6/26/2012	*Junco hyemalis*	Dark-eyed Junco	0-50 m	3-5 min	s	Conifer swamp
91	6/26/2012	*Picoides villosus*	Hairy Woodpecker	0-50 m	0-3 min	d	Conifer swamp
91	6/26/2012	*Picoides villosus*	Hairy Woodpecker	50-100 m	0-3 min	d	Conifer swamp
91	6/26/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Melospiza lincolnii*	Lincoln's Sparrow	<100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Setophaga magnolia*	Magnolia Warbler	50-100 m	3-5 min	s	Conifer swamp
91	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Carduelis pinus*	Pine Siskin	<100 m	0-3 min	—	Conifer swamp
91	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Regulus calendula*	Ruby-crowned Kinglet	<100 m	5-10 min	s	Conifer swamp
91	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	—	Conifer swamp
91	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	3-5 min	s	Conifer swamp
91	6/26/2012	*Wilsonia pusilla*	Wilson's Warbler	0-50 m	5-10 min	s	Conifer swamp
91	6/26/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	s	Conifer swamp
91	6/26/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	3-5 min	s	Conifer swamp
91	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Conifer swamp
92	6/28/2012	*Turdus migratorius*	American Robin	50-100 m	0-3 min	s	Dense mixed forest
92	6/28/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense mixed forest
92	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
92	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense mixed forest
92	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense mixed forest
92	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Dense mixed forest
93	6/27/2012	*Vireo solitarius*	Blue-headed Vireo	50-100 m	0-3 min	s	Conifer swamp
93	6/27/2012	*Corvus corax*	Common Raven	0-50 m	3-5 min	c	Conifer swamp
93	6/27/2012	*Perisoreus canadensis*	Gray Jay	<100 m	5-10 min	c	Conifer swamp
93	6/27/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	a,c	Conifer swamp
93	6/27/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
93	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
93	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
93	6/27/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	0-50 m	0-3 min	s	Conifer swamp
93	6/27/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Conifer swamp
94	6/26/2012	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Conifer swamp
94	6/26/2012	*Geothlypis trichas*	Common Yellowthroat	<100 m	3-5 min	s	Conifer swamp
94	6/26/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
94	6/26/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	5-10 min	s	Conifer swamp
94	6/26/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	5-10 min	s	Conifer swamp
94	6/26/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	s	Conifer swamp
94	6/26/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Conifer swamp
94	6/26/2012	*Catharus ustulatus*	Swainson's Thrush	<100 m	0-3 min	s	Conifer swamp
94	6/26/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	5-10 min	s	Conifer swamp
94	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
94	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
94	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
94	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	c	Conifer swamp
94	6/26/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	5-10 min	s	Conifer swamp
94	6/26/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	50-100 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	3-5 min	s	Conifer swamp
95	6/28/2012	*Colaptes auratus*	Northern Flicker	50-100 m	5-10 min	c	Conifer swamp
95	6/28/2012	*Regulus calendula*	Ruby-crowned Kinglet	50-100 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
95	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	3-5 min	s	Conifer swamp
95	6/28/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Conifer swamp
95	6/28/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	s	Conifer swamp
96	6/28/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Vermivora peregrina*	Tennessee Warbler	0-50 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Vermivora peregrina*	Tennessee Warbler	50-100 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Conifer swamp
96	6/28/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Conifer swamp
96	6/28/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	s	Conifer swamp
97	6/26/2012	*Catharus guttatus*	Hermit Thrush	<100 m	3-5 min	s	Conifer swamp
97	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
97	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
97	6/26/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Conifer swamp
97	6/26/2012	*Seiurus aurocapilla*	Ovenbird	<100 m	0-3 min	s	Conifer swamp
97	6/26/2012	*Setophaga palmarum palmarum*	Palm Warbler	0-50 m	0-3 min	s	Conifer swamp
97	6/26/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	3-5 min	s	Conifer swamp
97	6/26/2012	*Vermivora peregrina*	Tennessee Warbler	50-100 m	0-3 min	s	Conifer swamp
97	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Conifer swamp
97	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Conifer swamp
97	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
97	6/26/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	3-5 min	s	Conifer swamp
97	6/26/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	5-10 min	s	Conifer swamp
98	6/28/2012	*Empidonax alnorum*	Alder Flycatcher	0-50 m	0-3 min	s	Marsh
98	6/28/2012	*Empidonax alnorum*	Alder Flycatcher	<100 m	3-5 min	s	Marsh
98	6/28/2012	*Setophaga pensylvanica*	Chestnut-sided Warbler	50-100 m	3-5 min	s	Marsh
98	6/28/2012	*Gavia immer*	Common Loon	<100 m	0-3 min	—	Marsh
98	6/28/2012	*Gavia immer*	Common Loon	<100 m	0-3 min	—	Marsh
98	6/28/2012	*Anas platyrhynchos*	Mallard	0-50 m	5-10 min	f, ft	Marsh
98	6/28/2012	*Oporornis philadelphia*	Mourning Warbler	0-50 m	0-3 min	s	Marsh
98	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Marsh
98	6/28/2012	*Colaptes auratus*	Northern Flicker	0-50 m	0-3 min	s	Marsh
98	6/28/2012	*Seiurus aurocapilla*	Ovenbird	<100 m	0-3 min	s	Marsh
98	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Marsh
98	6/28/2012	*Melospiza melodia*	Song Sparrow	0-50 m	0-3 min	a	Marsh
98	6/28/2012	*Melospiza melodia*	Song Sparrow	0-50 m	0-3 min	a	Marsh
98	6/28/2012	*Melospiza georgiana*	Swamp Sparrow	0-50 m	0-3 min	s	Marsh
98	6/28/2012	*Catharus fuscescens*	Veery	50-100 m	0-3 min	s	Marsh
98	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Marsh
98	6/28/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Marsh
98	6/28/2012	*Setophaga coronata*	Yellow-rumped Warbler	<100 m	0-3 min	s	Marsh
99	6/27/2012	*Empidonax alnorum*	Alder Flycatcher	0-50 m	0-3 min	s	Thicket swamp
99	6/27/2012	*Empidonax alnorum*	Alder Flycatcher	0-50 m	3-5 min	c	Thicket swamp
99	6/27/2012	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	0-3 min	—	Thicket swamp
99	6/27/2012	*Spizella pallida*	Clay-colored Sparrow	0-50 m	0-3 min	s	Thicket swamp
99	6/27/2012	*Regulus satrapa*	Golden-crowned Kinglet	50-100 m	0-3 min	s	Thicket swamp
99	6/27/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Thicket swamp
99	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Thicket swamp
99	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Thicket swamp
99	6/27/2012	*Sitta canadensis*	Red-breasted Nuthatch	50-100 m	5-10 min	c	Thicket swamp
99	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	0-3 min	s	Thicket swamp
99	6/27/2012	*Regulus calendula*	Ruby-crowned Kinglet	<100 m	0-3 min	s	Thicket swamp
99	6/27/2012	*Vermivora peregrina*	Tennessee Warbler	0-50 m	5-10 min	s	Thicket swamp
99	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	c	Thicket swamp
99	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Thicket swamp
99	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	5-10 min	s	Thicket swamp
99	6/27/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	5-10 min	s	Thicket swamp
99	6/27/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Thicket swamp
100	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	c	Treed fen
100	6/28/2012	*Corvus brachyrhynchos*	American Crow	50-100 m	0-3 min	c	Treed fen
100	6/28/2012	*Turdus migratorius*	American Robin	0-50 m	0-3 min	s	Treed fen
100	6/28/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Treed fen
100	6/28/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Treed fen
100	6/28/2012	*Charadrius vociferus*	Killdeer	<100 m	5-10 min	c	Treed fen
100	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Treed fen
100	6/28/2012	*Melospiza melodia*	Song Sparrow	0-50 m	5-10 min	s	Treed fen
100	6/28/2012	*Tachycineta bicolor*	Tree Swallow	0-50 m	5-10 min	ft	Treed fen
100	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed fen
100	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed fen
100	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	—	Treed fen
100	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Treed fen
100	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed fen

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
100	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed fen
100	6/28/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Treed fen
100	6/28/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Treed fen
100	6/28/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	5-10 min	f	Treed fen
101	6/27/2012	*Perisoreus canadensis*	Gray Jay	0-50 m	0-3 min	—	Treed fen
101	6/27/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Treed fen
101	6/27/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Treed fen
101	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Treed fen
101	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	5-10 min	s	Treed fen
101	6/27/2012	*Carpodacus purpureus*	Purple Finch	0-50 m	0-3 min	s	Treed fen
101	6/27/2012	*Sitta canadensis*	Red-breasted Nuthatch	0-50 m	0-3 min	c	Treed fen
101	6/27/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Treed fen
101	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed fen
101	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Treed fen
101	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	s	Treed fen
101	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed fen
101	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Treed fen
101	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	c	Treed fen
101	6/27/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Treed fen
102	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous
102	6/27/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	c	Dense deciduous
102	6/27/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	5-10 min	s	Dense deciduous
102	6/27/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	5-10 min	s	Dense deciduous
102	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
102	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
102	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
102	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	5-10 min	s	Dense deciduous
102	6/27/2012	*Catharus fuscescens*	Veery	50-100 m	0-3 min	s	Dense deciduous
102	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	—	Dense deciduous
103	6/27/2012	*Setophaga virens*	Black-throated Green Warbler	50-100 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Catharus guttatus*	Hermit Thrush	0-50 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Catharus fuscescens*	Veery	0-50 m	0-3 min	—	Dense deciduous
103	6/27/2012	*Catharus fuscescens*	Veery	50-100 m	0-3 min	s	Dense deciduous
103	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	3-5 min	s	Dense deciduous
103	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	5-10 min	s	Dense deciduous
103	6/27/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	5-10 min	s	Dense deciduous
104	6/27/2012	*Turdus migratorius*	American Robin	<100 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Poecile atricapilla*	Black-capped Chickadee	0-50 m	0-3 min	c	Dense mixed forest
104	6/27/2012	*Setophaga virens*	Black-throated Green Warbler	0-50 m	3-5 min	s	Dense mixed forest
104	6/27/2012	*Wilsonia canadensis*	Canada Warbler	0-50 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Wilsonia canadensis*	Canada Warbler	0-50 m	3-5 min	f, c	Dense mixed forest
104	6/27/2012	*Corvus corax*	Common Raven	<100 m	0-3 min	—	Dense mixed forest
104	6/27/2012	*Corvus corax*	Common Raven	50-100 m	5-10 min	c	Dense mixed forest
104	6/27/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Setophaga americana*	Northern Parula	50-100 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Seiurus aurocapilla*	Ovenbird	<100 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Sitta canadensis*	Red-breasted Nuthatch	0-50 m	3-5 min	c	Dense mixed forest
104	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense mixed forest
104	6/27/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Dense mixed forest
105	6/27/2012	*Corvus corax*	Common Raven	<100 m	0-3 min	s	Dense conifer forest
105	6/27/2012	*Turdus migratorius*	American Robin	50-100 m	0-3 min	s	Dense conifer forest
105	6/27/2012	*Setophaga virens*	Black-throated Green Warbler	0-50 m	0-3 min	s	Dense conifer forest
105	6/27/2012	*Cyanocitta cristata*	Blue Jay	0-50 m	0-3 min	—	Dense conifer forest
105	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Dense conifer forest
105	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	3-5 min	s	Dense conifer forest
105	6/27/2012	*Setophaga americana*	Northern Parula	0-50 m	0-3 min	c	Dense conifer forest
105	6/27/2012	*Seiurus noveboracensis*	Northern Waterthrush	50-100 m	5-10 min	s	Dense conifer forest
105	6/27/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense conifer forest
105	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense conifer forest
105	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	5-10 min	p	Dense conifer forest
105	6/27/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	5-10 min	p	Dense conifer forest
105	6/27/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	5-10 min	c	Dense conifer forest
105	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense conifer forest
105	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	cf	Dense conifer forest
105	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense conifer forest
105	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	s	Dense conifer forest
105	6/27/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	<100 m	0-3 min	s	Dense conifer forest
106	6/27/2012	*Poecile hudsonicus*	Boreal Chickadee	0-50 m	3-5 min	c	Edge
106	6/27/2012	*Setophaga pensylvanica*	Chestnut-sided Warbler	50-100 m	5-10 min	s	Edge
106	6/27/2012	*Regulus satrapa*	Golden-crowned Kinglet	0-50 m	0-3 min	s	Edge

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
106	6/27/2012	*Catharus guttatus*	Hermit Thrush	<100 m	0-3 min	s	Edge
106	6/27/2012	*Catharus guttatus*	Hermit Thrush	50-100 m	0-3 min	s	Edge
106	6/27/2012	*Setophaga magnolia*	Magnolia Warbler	<100 m	0-3 min	s	Edge
106	6/27/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Edge
106	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Edge
106	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	3-5 min	s	Edge
106	6/27/2012	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Edge
106	6/27/2012	*Carduelis pinus*	Pine Siskin	0-50 m	3-5 min	ft	Edge
106	6/27/2012	*Sitta canadensis*	Red-breasted Nuthatch	50-100 m	0-3 min	s	Edge
106	6/27/2012	*Regulus calendula*	Ruby-crowned Kinglet	0-50 m	0-3 min	s	Edge
106	6/27/2012	*Archilochus colubris*	Ruby-throated Hummingbird	0-50 m	5-10 min	—	Edge
106	6/27/2012	*Catharus ustulatus*	Swainson's Thrush	0-50 m	0-3 min	c	Edge
106	6/27/2012	*Catharus ustulatus*	Swainson's Thrush	<100 m	5-10 min	s	Edge
106	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	3-5 min	s	Edge
106	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	5-10 min	c	Edge
106	6/27/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Edge
106	6/27/2012	*Troglodytes hiemalis*	Winter Wren	50-100 m	0-3 min	s	Edge
106	6/27/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	0-3 min	s	Edge
106	6/27/2012	*Setophaga coronata*	Yellow-rumped Warbler	0-50 m	3-5 min	c	Edge
107	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Thicket swamp
107	6/27/2012	*Empidonax alnorum*	Alder Flycatcher	0-50 m	3-5 min	s	Thicket swamp
107	6/27/2012	*Cyanocitta cristata*	Blue Jay	<100 m	0-3 min	s	Thicket swamp
107	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Thicket swamp
107	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Thicket swamp
107	6/27/2012	*Colaptes auratus*	Northern Flicker	0-50 m	0-3 min	c	Thicket swamp
107	6/27/2012	*Colaptes auratus*	Northern Flicker	50-100 m	0-3 min	d	Thicket swamp
107	6/27/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	5-10 min	s	Thicket swamp
107	6/27/2012	*Melospiza georgiana*	Swamp Sparrow	50-100 m	0-3 min	s	Thicket swamp
107	6/27/2012	*Vermivora peregrina*	Tennessee Warbler	0-50 m	0-3 min	s	Thicket swamp
107	6/27/2012	*Catharus fuscescens*	Veery	0-50 m	0-3 min	s	Thicket swamp
107	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Thicket swamp
107	6/27/2012	*Wilsonia pusilla*	Wilson's Warbler	0-50 m	5-10 min	s	Thicket swamp
107	6/27/2012	*Empidonax flaviventris*	Yellow-bellied Flycatcher	<100 m	0-3 min	s	Thicket swamp
107	6/27/2012	*Setophaga coronata*	Yellow-rumped Warbler	50-100 m	0-3 min	s	Thicket swamp
108	6/27/2012	*Vireo solitarius*	Blue-headed Vireo	<100 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Vireo solitarius*	Blue-headed Vireo	0-50 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	0-3 min	c	Conifer swamp
108	6/27/2012	*Bombycilla cedrorum*	Cedar Waxwing	0-50 m	0-3 min	c	Conifer swamp
108	6/27/2012	*Spizella passerina*	Chipping Sparrow	0-50 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Melospiza lincolnii*	Lincoln's Sparrow	<100 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Melospiza lincolnii*	Lincoln's Sparrow	0-50 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	<100 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	0-50 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Regulus calendula*	Ruby-crowned Kinglet	<100 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Vermivora peregrina*	Tennessee Warbler	0-50 m	0-3 min	cf	Conifer swamp
108	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Conifer swamp
108	6/27/2012	*Zonotrichia albicollis*	White-throated Sparrow	50-100 m	0-3 min	—	Conifer swamp
109	6/28/2012	*Troglodytes hiemalis*	Winter Wren	0-50 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Turdus migratorius*	American Robin	0-50 m	3-5 min	c	Dense deciduous
109	6/28/2012	*Mniotilta varia*	Black-and-white Warbler	0-50 m	5-10 min	s	Dense deciduous
109	6/28/2012	*Setophaga virens*	Black-throated Green Warbler	<100 m	5-10 min	s	Dense deciduous
109	6/28/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Empidonax minimus*	Least Flycatcher	0-50 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Setophaga magnolia*	Magnolia Warbler	0-50 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Colaptes auratus*	Northern Flicker	50-100 m	3-5 min	c	Dense deciduous
109	6/28/2012	*Colaptes auratus*	Northern Flicker	<100 m	5-10 min	c	Dense deciduous
109	6/28/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Seiurus aurocapilla*	Ovenbird	50-100 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Seiurus aurocapilla*	Ovenbird	<100 m	5-10 min	s	Dense deciduous
109	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	c	Dense deciduous
109	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	0-50 m	0-3 min	s	Dense deciduous
109	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense deciduous
110	6/28/2012	*Mniotilta varia*	Black-and-white Warbler	0-50 m	0-3 min	s	Dense deciduous
110	6/28/2012	*Poecile atricapilla*	Black-capped Chickadee	0-50 m	5-10 min	c	Dense deciduous
110	6/28/2012	*Setophaga virens*	Black-throated Green Warbler	50-100 m	5-10 min	s	Dense deciduous
110	6/28/2012	*Corvus corax*	Common Raven	50-100 m	3-5 min	c	Dense deciduous
110	6/28/2012	*Oporornis philadelphia*	Mourning Warbler	0-50 m	3-5 min	s	Dense deciduous
110	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense deciduous
110	6/28/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense deciduous
110	6/28/2012	*Seiurus aurocapilla*	Ovenbird	50-100 m	5-10 min	s	Dense deciduous
110	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
110	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous

TABLE 3
Summary of Breeding Bird Survey Results

Point Count Station #	Date (mm-dd-yy)	SCIENTIFIC NAME	COMMON NAME	Distance	Time Period first observed	Behavior/ Breeding Evidence	Habitat Type
110	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
110	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous
110	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	<100 m	3-5 min	s	Dense deciduous
110	6/28/2012	*Bonasa umbellus*	Ruffed Grouse	50-100 m	5-10 min	d	Dense deciduous
110	6/28/2012	*Catharus ustulatus*	Swainson's Thrush	50-100 m	0-3 min	s	Dense deciduous
110	6/28/2012	*Catharus fuscescens*	Veery	0-50 m	0-3 min	s	Dense deciduous
110	6/28/2012	*Sitta carolinensis*	White-breasted Nuthatch	0-50 m	0-3 min	c	Dense deciduous
110	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	—	Dense deciduous
110	6/28/2012	*Troglodytes hiemalis*	Winter Wren	<100 m	0-3 min	s	Dense deciduous
111	6/28/2012	*Cyanocitta cristata*	Blue Jay	50-100 m	0-3 min	c	Dense deciduous
111	6/28/2012	*Gavia immer*	Common Loon	<100 m	3-5 min	c	Dense deciduous
111	6/28/2012	*Larus argentatus*	Herring Gull	<100 m	3-5 min	c	Dense deciduous
111	6/28/2012	*Oreothlypisa ruficapilla*	Nashville Warbler	50-100 m	0-3 min	s	Dense deciduous
111	6/28/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	s	Dense deciduous
111	6/28/2012	*Seiurus aurocapilla*	Ovenbird	0-50 m	0-3 min	cf, a	Dense deciduous
111	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
111	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	0-50 m	0-3 min	s	Dense deciduous
111	6/28/2012	*Vireo olivaceus*	Red-eyed Vireo	50-100 m	0-3 min	s	Dense deciduous
111	6/28/2012	*Bonasa umbellus*	Ruffed Grouse	0-50 m	5-10 min	d	Dense deciduous
111	6/28/2012	*Catharus fuscescens*	Veery	0-50 m	0-3 min	s	Dense deciduous
111	6/28/2012	*Catharus fuscescens*	Veery	<100 m	0-3 min	s	Dense deciduous
111	6/28/2012	*Zonotrichia albicollis*	White-throated Sparrow	<100 m	0-3 min	s	Dense deciduous
111	6/28/2012	*Sphyrapicus varius*	Yellow-bellied Sapsucker	0-50 m	0-3 min	c	Dense deciduous

Notes:

— = No behaviour code assigned.

Behaviour codes:

m = male	di = displaying
s = singing male	cs = circle soar
c = calling	ny = nest with young
fo = flyover	cf = carrying food
d = drumming	p = pair
sw = swimming	ne = nest with eggs
a = agitated	
ft = fly through	
f = female	

TABLE 4
Comprehensive Bird Species List

COMMON NAME	SCIENTIFIC NAME	Origin[a]	Global Rarity Status[b]	Ontario Rarity Status[b]	SARA[c]	ESA[d]
Alder Flycatcher	*Empidonax alnorum*	N	G5	S5B	—	—
American Bittern	*Botaurus lentiginosus*	N	G4	S4B	—	—
American black duck	*Anas rubripes*	N	G5	S4	—	—
American Crow	*Corvus brachyrhynchos*	N	G5	S5B	—	—
American kestrel	*Falco sparverius*	N	G5	S4	—	—
American Redstart	*Setophaga ruticilla*	N	G5	S5B	—	—
American Robin	*Turdus migratorius*	N	G5	S5B	—	—
American woodcock	*Scolopax minor*	N	G5	S4B	—	—
Bald eagle	*Haliaeetus leucocephalus*	N	G5	S2N, S4B	—	SC
Barred owl	*Strix varia*	N	G5	S5	—	—
Bay-breasted Warbler	*Setophaga castanea*	N	G5	S5B	—	—
Belted Kingfisher	*Ceryle alcyon*	N	G5	S4B	—	—
Black-and-white Warbler	*Mniotilta varia*	N	G5	S5B	—	—
Black-backed Woodpecker	*Picoides arcticus*	N	G5	S4	—	—
Blackburnin Warbler	*Setophaga fusca*	N	G5	S5B	—	—
Black-capped Chickadee	*Poecile atricapilla*	N	G5	S5	—	—
Black-throated Green Warbler	*Setophaga virens*	N	G5	S5B	—	—
Blue Jay	*Cyanocitta cristata*	N	G5	S5	—	—
Blue-headed Vireo	*Vireo solitarius*	N	G5	S5B	—	—
Bonaparte's Gull	*Larus philadelphia*	N	G5	S4B, S4N	—	—
Boreal Chickadee	*Poecile hudsonicus*	N	G5	S5	—	—
Boreal Owl	*Aegolius funereus*	N	G5	S4	—	—
Broad-winged Hawk	*Buteo platypterus*	N	G5	S5B	—	—
Brown Creeper	*Certhia americana*	N	G5	S5B	—	—
Canada Goose	*Branta canadensis*	N	G5	S5	—	—
Canada Warbler	*Cardellina canadensis*	N	G5	S4B	THR	SC
Cedar Waxwing	*Bombycilla cedrorum*	N	G5	S5B	—	—
Chestnut-sided Warbler	*Setophaga pensylvanica*	N	G5	S5B	—	—
Chipping Sparrow	*Spizella passerina*	N	G5	S5B	—	—
Clay-colored Sparrow	*Spizella pallida*	N	G5	S4B	—	—
Common Goldeneye	*Bucephala clangula*	N	G5	S5	—	—
Common Grackle	*Quiscalus quiscula*	N	G5	S5B	—	—
Common Loon	*Gavia immer*	N	G5	S5B, S5N	—	—
Common Merganser	*Mergus merganser*	N	G5	S5B, S5N	—	—
Common Nighthawk	*Chordeiles minor*	N	G5	S4B	THR	SC
Common Raven	*Corvus corax*	N	G5	S5	—	—
Common Yellowthroat	*Geothlypis trichas*	N	G5	S5B	—	—
Conneticut Warbler	*Oporornis agilis*	N	G4	S4B	—	—
Dark-eyed Junco	*Junco hyemalis*	N	G5	S5B	—	—
Eastern Bluebird	*Sialia sialis*	N	G5	S5B	—	—
Eastern Kingbird	*Tyrannus tyrannus*	N	G5	S4B	—	—
Evening Grosbeak	*Coccothraustes vespertinus*	N	G5	S4B	—	—
Golden-crowned Kinglet	*Regulus satrapa*	N	G5	S5B	—	—
Gray Jay	*Perisoreus canadensis*	N	G5	S5	—	—
Great Blue Heron	*Ardea herodias*	N	G5	S4	—	—
Great Gray Owl	*Strix nebulosa*	N	G5	S4	—	—
Great Horned owl	*Bubo virginianus*	N	G5	S4	—	—
Greater Yellowlegs	*Tringa melanoleuca*	N	G5	S4B, S4N	—	—
Green-winged Teal	*Anas crecca*	N	G5	S4	—	—
Hairy Woodpecker	*Picoides villosus*	N	G5	S5	—	—
Hermit Thrush	*Catharus guttatus*	N	G5	S5B	—	—
Herring Gull	*Larus argentatus*	N	G5	S5B, S5N	—	—
Hooded merganser	*Lophodytes cucullatus*	N	G5	S5B, S5N	—	—
Killdeer	*Charadrius vociferus*	N	G5	S5B, S5N	—	—
Least Flycatcher	*Empidonax minimus*	N	G5	S4B	—	—
Lincoln's Sparrow	*Melospiza lincolnii*	N	G5	S5B	—	—
Long-eared Owl	*Asio otus*	N	G5	S4	—	—
Magnolia Warbler	*Setophaga magnolia*	N	G5	S5B	—	—
Mallard	*Anas platyrhynchos*	N	G5	S5	—	—
Merlin	*Falco columbarium*	N	G5	S5B	—	—
Mourning Warbler	*Oporornis philadelphia*	N	G5	S4B	—	—

TABLE 4
Comprehensive Bird Species List

COMMON NAME	SCIENTIFIC NAME	Origin[a]	Global Rarity Status[b]	Ontario Rarity Status[b]	SARA[c]	ESA[d]
Nashville Warbler	*Oreothlypisa ruficapilla*	N	G5	S5B	—	—
Northern Flicker	*Colaptes auratus*	N	G5	S4B	—	—
Northern Harrier	*Circus cyaneus*	N	G5	S4B	—	—
Northern Parula	*Setophaga americana*	N	G5	S4B, SZN	—	—
Northern Saw-whet Owl	*Aegolius acadicus*	N	G5	S4	—	—
Northern Waterthrush	*Seiurus noveboracensis*	N	G5	S5B	—	—
Ovenbird	*Seiurus aurocapilla*	N	G5	S4B	—	—
Palm Warbler	*Setophaga palmarum palmarum*	N	G5TU	S1B	—	—
Pileated Woodpecker	*Dryocopus pileatus*	N	G5	S5	—	—
Pine Siskin	*Spinus pinus*	N	G5	S4B	—	—
Purple Finch	*Carpodacus purpureus*	N	G5	S4B	—	—
Red-breasted Nuthatch	*Sitta canadensis*	N	G5	S5	—	—
Red-eyed Vireo	*Vireo olivaceus*	N	G5	S5B	—	—
Red-tailed Hawk	*Buteo jamaicensis*	N	G5	S5	—	—
Red-winged Blackbird	*Agelaius phoeniceus*	N	G5	S4	—	—
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	N	G5	S4B	—	—
Ring-necked duck	*Aythya collaris*	N	G5	S5	—	—
Ruby-crowned Kinglet	*Regulus calendula*	N	G5	S4B	—	—
Ruby-throated Hummingbird	*Archilochus colubris*	N	G5	S5B	—	—
Ruffed Grouse	*Bonasa umbellus*	N	G5	S4	—	—
Sharp-shinned Hawk	*Accipiter striatus*	N	G5	S5	—	—
Short-eared Owl	*Asio flammeus*	N	G5	S2N, S4B	—	SC
Song Sparrow	*Melospiza melodia*	N	G5	S5B	—	—
Sora	*Porzana carolina*	N	G5	S4B	—	—
Spotted Sandpiper	*Actitis macularia*	N	G5	S5	—	—
Swainson's Thrush	*Catharus ustulatus*	N	G5	S4B	—	—
Spruce Grouse	*Falcipennis canadensis*	N	G5	S5	—	—
Swamp Sparrow	*Melospiza georgiana*	N	G5	S5B	—	—
Tennessee Warbler	*Vermivora peregrina*	N	G5	S5B	—	—
Three-toed Woodpecker	*Picoides tridactylus*	N	G5	S4	—	—
Tree Swallow	*Tachycineta bicolor*	N	G5	S4B	—	—
Turkey Vulture	*Cathartes aura*	N	G5	S5B	—	—
Veery	*Catharus fuscescens*	N	G5	S4B	—	—
White-breasted Nuthatch	*Sitta carolinensis*	N	G5	S5	—	—
White-throated Sparrow	*Zonotrichia albicollis*	N	G5	S5B	—	—
Wilson's Snipe	*Gallinago delicata*	N	G5	S5B	—	—
Wilson's Warbler	*Wilsonia pusilla*	N	G5	S4B	—	—
Winter Wren	*Troglodytes hiemalis*	N	G5	S5B	—	—
Yellow-bellied Flycatcher	*Empidonax flaviventris*	N	G5	S5B	—	—
Yellow-bellied Sapsucker	*Sphyrapicus varius*	N	G5	S5B	—	—
Yellow-rumped Warbler	*Setophaga coronata*	N	G5	S5B	—	—

Notes:
— = Not designated under Canada *Species at Risk Act* or Ontario *Endangered Species Act*.
G = Global; S = Provincial; Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.
SNA = Not applicable for Ontario Ranking (e.g. Exotic species)
[a] Origin: N = Native; (N) = Native but not in study area region; I = Introduced.
[b] Ranks based upon determinations made by the Natural Heritage Information Centre (2012).
[c] Canada *Species at Risk Act* (Schedule 1; checked February 20, 2012).
[d] Ontario *Endangered Species Act* (O. Reg. 4/12 amending O.Reg.230/08; checked February 20, 2012).

TABLE 5
Mean Density of Upland Bird Species by Habitat in the Local Study Area

Mean (± 1SE) Density (Birds per Hectare) of Upland Breeding Bird Species by Habitat within the Local Study Area, 2010 to 2012

Common Name	Dense Conifer Forest	Dense Deciduous Forest	Dense Mixed Forest	Edge	Marsh	Conifer Swamp	Thicket Swamp	Open Fen	Treed Bog	Treed Fen
Total Visits	**21**	**10**	**21**	**13**	**3**	**21**	**5**	**6**	**2**	**10**
Alder Flycatcher	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.24 ± 0.33	0.07 ± 0.07	0.72 ± 0.45	0 ± 0	0 ± 0	0.22 ± 0.21
American Crow	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
American Robin	0.07 ± 0.07	0.22 ± 0.15	0.07 ± 0.07	0 ± 0	0.24 ± 0.33	0.07 ± 0.07	0 ± 0	0.12 ± 0.17	0 ± 0	0.07 ± 0.1
Bay-breasted Warbler	0.24 ± 0.11	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Black-and-white Warbler	0.03 ± 0.05	0.14 ± 0.13	0.14 ± 0.09	0.06 ± 0.08	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Black-backed Woodpecker	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Blackburnin Warbler	0.07 ± 0.07	0 ± 0	0.07 ± 0.07	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Black-capped Chickadee	0.07 ± 0.07	0.14 ± 0.13	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Black-throated Green Warbler	0.07 ± 0.07	0 ± 0	0.03 ± 0.05	0.06 ± 0.08	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Blue Jay	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.07 ± 0.1
Blue-headed Vireo	0.07 ± 0.07	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0.07 ± 0.07	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Bonaparte's Gull	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.12 ± 0.17	0 ± 0	0 ± 0
Boreal Chickadee	0 ± 0	0 ± 0	0 ± 0	0.06 ± 0.08	0 ± 0	0.07 ± 0.07	0 ± 0	0 ± 0	0 ± 0	0.07 ± 0.1
Canada Warbler	0.03 ± 0.05	0.07 ± 0.1	0.1 ± 0.1	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Cedar Waxwing	0.1 ± 0.1	0 ± 0	0 ± 0	0.17 ± 0.17	0 ± 0	0.1 ± 0.1	0.43 ± 0.4	0.12 ± 0.17	0 ± 0	0 ± 0
Chestnut-sided Warbler	0 ± 0	0.14 ± 0.13	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Chipping Sparrow	0.03 ± 0.05	0 ± 0	0 ± 0	0.06 ± 0.08	0 ± 0	0.07 ± 0.07	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Clay-colored Sparrow	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.14 ± 0.2	0 ± 0	0 ± 0	0 ± 0
Common Grackle	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Common Loon	0 ± 0	0 ± 0	0 ± 0	0.06 ± 0.08	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Common Raven	0 ± 0	0.07 ± 0.1	0 ± 0	0 ± 0	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0.07 ± 0.1
Common Yellowthroat	0 ± 0	0 ± 0	0 ± 0	0.06 ± 0.08	0.24 ± 0.33	0 ± 0	0.14 ± 0.2	0.24 ± 0.21	0 ± 0	0 ± 0
Conneticut Warbler	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.36 ± 0.5	0 ± 0
Dark-eyed Junco	0 ± 0	0 ± 0	0 ± 0	0.06 ± 0.08	0 ± 0	0.1 ± 0.08	0 ± 0	0.12 ± 0.17	0.36 ± 0.5	0.07 ± 0.1
Golden-crowned Kinglet	0.17 ± 0.14	0 ± 0	0.17 ± 0.1	0.17 ± 0.12	0 ± 0	0.14 ± 0.09	0 ± 0	0 ± 0	0.36 ± 0.5	0.07 ± 0.1
Gray Jay	0.14 ± 0.11	0 ± 0	0.17 ± 0.14	0 ± 0	0 ± 0	0.07 ± 0.07	0 ± 0	0.24 ± 0.21	0 ± 0	0.14 ± 0.13
Greater Yellowlegs	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.24 ± 0.21	0 ± 0	0 ± 0
Hairy Woodpecker	0.03 ± 0.05	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Hermit Thrush	0.1 ± 0.1	0.07 ± 0.1	0.03 ± 0.05	0.17 ± 0.12	0 ± 0	0.48 ± 0.14	0 ± 0	0.12 ± 0.17	1.08 ± 0.5	0.22 ± 0.21
Herring Gull	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Least Flycatcher	0 ± 0	0.65 ± 0.38	0.07 ± 0.07	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Lincoln's Sparrow	0 ± 0	0 ± 0	0 ± 0	0.11 ± 0.1	0 ± 0	0.14 ± 0.11	0.14 ± 0.2	0.6 ± 0.31	0 ± 0	0.14 ± 0.13
Magnolia Warbler	0.58 ± 0.16	0.29 ± 0.16	0.31 ± 0.13	0.55 ± 0.12	0 ± 0	0.17 ± 0.12	0 ± 0	0 ± 0	0.36 ± 0.5	0.22 ± 0.15
Mallard	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.24 ± 0.33	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Mourning Warbler	0 ± 0	0.07 ± 0.1	0.1 ± 0.08	0 ± 0	0.24 ± 0.33	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Nashville Warbler	0.31 ± 0.11	0.14 ± 0.13	0.51 ± 0.18	0.44 ± 0.14	0 ± 0	0.79 ± 0.15	0.72 ± 0.45	0.48 ± 0.21	0.72 ± 0	0.72 ± 0.33
Northern Flicker	0.03 ± 0.05	0 ± 0	0 ± 0	0.11 ± 0.1	0.24 ± 0.33	0 ± 0	0.14 ± 0.2	0 ± 0	0 ± 0	0 ± 0
Northern Parula	0.21 ± 0.1	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Northern Waterthrush	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.07 ± 0.07	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Ovenbird	0.07 ± 0.07	0.72 ± 0.26	0.27 ± 0.11	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Palm Warbler	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.1 ± 0.08	0 ± 0	0.48 ± 0.21	0.36 ± 0.5	0.43 ± 0.16
Pine Siskin	0.03 ± 0.05	0 ± 0	0.14 ± 0.11	0.06 ± 0.08	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0.07 ± 0.1
Purple Finch	0.03 ± 0.05	0 ± 0	0.03 ± 0.05	0.06 ± 0.08	0 ± 0	0 ± 0	0 ± 0	0.12 ± 0.17	0.36 ± 0.5	0 ± 0
Red-breasted Nuthatch	0.21 ± 0.12	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.36 ± 0.5	0.07 ± 0.1
Red-eyed Vireo	0.27 ± 0.13	1.51 ± 0.18	0.38 ± 0.13	0.06 ± 0.08	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0.14 ± 0.13
Rose-breasted Grosbeak	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0

TABLE 5
Mean Density of Upland Bird Species by Habitat in the Local Study Area

Mean (± 1SE) Density (Birds per Hectare) of Upland Breeding Bird Species by Habitat within the Local Study Area, 2010 to 2012

Common Name	Dense Conifer Forest	Dense Deciduous Forest	Dense Mixed Forest	Edge	Marsh	Conifer Swamp	Thicket Swamp	Open Fen	Treed Bog	Treed Fen
Ruby-crowned Kinglet	0.14 ± 0.11	0 ± 0	0.17 ± 0.12	0.33 ± 0.18	0 ± 0	0.31 ± 0.11	0.14 ± 0.2	0 ± 0	0 ± 0	0.22 ± 0.15
Ruby-throated Hummingbird	0 ± 0	0 ± 0	0 ± 0	0.06 ± 0.08	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Ruffed Grouse	0 ± 0	0.07 ± 0.1	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Sharp-shinned hawk	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Song Sparrow	0 ± 0	0 ± 0	0.03 ± 0.05	0 ± 0	0.48 ± 0.67	0 ± 0	0.14 ± 0.2	0 ± 0	0 ± 0	0.07 ± 0.1
Spruce Grouse	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.12 ± 0.17	0 ± 0	0 ± 0
Swainson's Thrush	0.48 ± 0.16	0 ± 0	0.31 ± 0.16	0.11 ± 0.1	0 ± 0	0.17 ± 0.12	0 ± 0	0 ± 0	0 ± 0	0.07 ± 0.1
Swamp Sparrow	0 ± 0	0 ± 0	0.03 ± 0.05	0.22 ± 0.17	0.24 ± 0.33	0.03 ± 0.05	0.14 ± 0.2	0.84 ± 0.4	0 ± 0	0 ± 0
Tennessee Warbler	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.14 ± 0.09	0.29 ± 0.24	0 ± 0	0 ± 0	0.14 ± 0.13
Three-toed Woodpecker	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Tree Swallow	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.1 ± 0.08	0 ± 0	0 ± 0	0 ± 0	0.07 ± 0.1
Veery	0 ± 0	0.36 ± 0.17	0.07 ± 0.07	0 ± 0	0 ± 0	0 ± 0	0.14 ± 0.2	0 ± 0	0 ± 0	0 ± 0
White-breasted Nuthatch	0 ± 0	0.07 ± 0.1	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
White-throated Sparrow	0.55 ± 0.23	0.22 ± 0.15	0.41 ± 0.16	0.39 ± 0.24	0.48 ± 0.33	0.51 ± 0.16	0.72 ± 0.45	0.24 ± 0.21	0.72 ± 0	0.79 ± 0.31
Wilson's Snipe	0 ± 0	0 ± 0	0 ± 0	0.06 ± 0.08	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.07 ± 0.1
Wilson's Warbler	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0.07 ± 0.07	0.14 ± 0.2	0.12 ± 0.17	0 ± 0	0.07 ± 0.1
Winter Wren	0.14 ± 0.09	0.07 ± 0.1	0.07 ± 0.07	0.11 ± 0.1	0 ± 0	0.1 ± 0.08	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Yellow-bellied Flycatcher	0.21 ± 0.12	0 ± 0	0.1 ± 0.08	0.11 ± 0.1	0 ± 0	0.24 ± 0.13	0 ± 0	0.36 ± 0.22	0 ± 0	0.07 ± 0.1
Yellow-bellied Sapsucker	0.07 ± 0.07	0.14 ± 0.13	0.03 ± 0.05	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Yellow-rumped Warbler	0.17 ± 0.1	0 ± 0	0.17 ± 0.1	0.28 ± 0.18	0 ± 0	0.45 ± 0.13	0.29 ± 0.24	0.12 ± 0.17	0 ± 0	0.36 ± 0.22

APPENDIX 2.II

Vegetation and Land Cover in the Local Study Area

TABLE 1
Comparison of Habitat Types and Ecosite Communities

Landcover Type	Related Ecosites
Dense Conifer Forest	ES-A
	ES-B
	ES-C
	ES-D
	ES-H
Dense Deciduous	ES-E
Dense Mixed Forest	ES-F
	ES-G
	ES-I
Disturbed[(a)]	Cutover
Rock Barren	ES-J
Conifer swamp	W27/ W28/ W29/ W30/ W31/ W32
Deciduous Swamp	W33/ W34
Marsh	W1/ W2/ W3/ W4/ W5/ W10/ All moose aquatic feeding sites[(b)]
	W11/ W12/ W13
Open Bog	W24
Open Fen	W14/ W15/ W17/ W19
	W20/ W21
Thicket swamp	W35/ W36
Treed bog	W25/ W26
Treed Fen	W16/W18
	W22

Notes:

ES-A = Red Pine-White Pine-Jack Pine: Very Shallow Soil.

ES-B = Black Spruce-Jack Pine: Very Shallow Soil.

ES-C = Jack Pine-Conifer: Dry-Moderately Fresh, Sandy Soil.

ES-D = Red Pine-White Pine.

ES-E = Hardwood-Fir-Spruce Mixedwood.

ES-F = Fir-Spruce-Mixedwood.

ES-G = Pine-Spruce Mixedwood: Sandy Soil.

ES-H = Spruce-Pine/Feather-moss.

ES-I = White Cedar: Fresh-Moist, Course-Fine Loamy Soil.

W1 = Open Water Marsh: Mineral Substrate.

W2 = Open Water Marsh: Pipewort-Water Lobelia: Mineral Substrate.

W3 = Open Water Marsh: Mixed: Organic Substrate.

W4 = Open Water Marsh: Floating-leaved Plants.

W5 = Marsh: Mixed: Mineral Substrate.

W10 = Marsh:Mixed: Organic Substrate.

W11 = Marsh: Cattail.

W12 = Meadow Marsh: Tall Sedge.

W13 = Meadow Marsh: Blue-joint Grass.

W14 = Open Graminoid Shore Fen: Wire Sedge.

W15 = Low Shrub Shore Fen: Leatherleaf-Sweet Gale/Graminoid.

W16 = Tall Shrub Shore Fen: Speckled Alder-Willow/Dwarf Brich/Ericaceous Shrub.

W18 = Moderately Rich Fen: Tamarack-Black Spruce/Ericaceious Shrub.

W19 = Moderately Rich Fen: Graminoid.

W20 = Poor Fen: Ericaceous Shrub/Wire sedge/Sphagnum.

W21 = Poor Fen: Ericaceous Shrub/Sphagnum.

W22 = Poor Fen: black Spruce-Tamarack/Ericaceous Shrub/Sphagnum.

W24 = Open Low Shrub Bog: Ericaceous Shrub/Sphagnum.

W25 = Semi-treed Bog: Black Spruce/Ericaceous Shrub/Sphagnum.

W26 = Treed Bog: Black Spruce/Ericaceous Shrub/Sphagnum.

W27 = Poor Conifer Swamp: Black Spruce/Labrador Tea/Sphagnum.

W28 = Poor Conifer Swamp: Black Spruce/Labrador Tea/Sphagnum.

W29 = Intermediate Conifer Wamp: Black Spruce/Tall Shrub/Labrador Tea.

W30 = Intermediate Conifer Swamp: Conifer/Tall Shrub/Herb-rich.

W31 = Rich Conifer Swamp: Cedar-Tamarack (Black Spruce).

W32 = Rich Conifer Swamp: Cedar-Tamarack.

W33 = Hardwood Swamp: Black Ash (Other Hardwood): Upland Transition.

W34 = Hardwood Swamp: Black Ash (Other Hardwood): Riparian.

W35 = Thicket Swamp: Speckled Alder/Blue-joint Grass.

W36 = Thicket Swamp: Tall Willow.

[a] Encompasses the following land cover types: Forest – regenerating depletion; Forest – sparse; Forest Depletions – cuts; and Forest Depletions – burns.
[b] Moose aquatic feeding sites as mapped by the MNR.

TABLE 2
Description of Upland and Wetland Ecosite Communities in the Local Study Area

Table 1: Upland Ecosites

Ecosite Code	Name	Ecosite Components	Description
ES-A	Red Pine-White Pine-Jack Pine: Very Shallow Soil	ES11: Red Pine-White Pine-Jack Pine: Very Shallow Soil	Conifer-dominated forests with red, white and jack pine. Trembling aspen, white birch, white spruce and patches of white cedar may also be present. Understory may include balsam fir, bush honey suckle, velvetleaf and late lowbush blueberry, and prickly wild rose. Herb cover includes wild sarsaparilla, wild-lily-of-the-valley, Virginia strawberry and large-leaf wood-aster. Soils are often shallow and covered with needle litter, Shreber's moss, fork moss, and lichens-yellow-green, reindeer and star reindeer-with bedrock outcrops.
ES-B	Black Spruce-Jack Pine: Very Shallow Soil	ES12: Black Spruce-Jack Pine: Very Shallow Soil	Forests with open to patchy canopy cover dominated with black spruce and jack pine. Patches of balsam fir, trembling aspen and white birch may also be present. Shrub and herbs are scarce, but may include velvetleaf and late lowbush blueberry, creeping snowberry, twinflower, wild-lily-of-the-valley and blue bead-lily. Ground cover usually consists of bedrock outcrops with shallow litter layer with lichens -yellow-green, reindeer and star reindeer- and feathermosses-Shreber's, plume and stair-step moss.
ES-C	Jack Pine-Conifer: Dry-Moderately Fresh	ES13: Jack Pine-Conifer: Dry-Moderately Fresh, Sandy Soil	Jack pine-dominated in even-aged stands with sparse to abundant patches of black spruce. White birch and trembling aspen may also accompany. Shrub cover includes velvetleaf and late lowbush blueberry, bush honeysuckle, prickly wild rose, beaked hazelnut, green alder and species of serviceberry. Herbs include wild-lily-of-the-valley, bunchberry, wild sarsaparilla, cow wheat and blue bead-lily. Soils are deep, dry to fresh, coarse to fine sands often covered with Shreber's feathermoss, fork moss and lichens such as yellow-green, reindeer and star reindeer.

Table 1: Upland Ecosites (Continued)

Ecosite Code	Name	Ecosite Components	Description
ES-D	Red Pine-White Pine	ES15: Red Pine-White Pine: Sandy Soil	Red pine- and white pine-dominated stands often with white birch. Balsam fir and black spruce or white cedar occasionally in patches. Shrub and herb cover include mountain maple, beaked hazelnut, bush honeysuckle, twinflower, prince's pine, common juniper, blueberry, large-leaf wood-aster, rose-twisted stalk, wild sarsaparilla, blue bead-lily, wild-lily-of-the-valley, bunchberry, and clubmosses such as wolf's foot clubmoss. Soils can be dry to fresh, and sandy to loamy. Ground cover consists of conifer and broadleaf litter and feathermosses-shreber's, plume and stair-step moss-and fork moss.
		ES24: Red Pine-White Pine: Fresh, Fine Loamy Soil	
ES-E	Hardwood-Fir-Spruce Mixedwood	ES16: Hardwood-Fir-Spruce Mixedwood: Sandy Soill	Forests dominated with over 50% deciduous trees comprised of trembling aspen and white birch with balsam fir. Occasional presence of white spruce, black spruce and jack pine. Typically herb- and shrub-rich often including mountain maple, beaked hazelnut, honeysuckle, showy mountain ash, large leaved aster, naked bishop's cap, rose-twisted stalk, kidney-leaf white violet, wild sarsaparilla, sweet-scent bedstraw, blue bead-lily, northern starflower, wild-lily-of-the-valley, bunchberry, red baneberry, and groundpines. Ground cover consists primarily of mosses-Shreber's, plume, stair-step and electrified cat tail moss. Soils are typically deep, dry to fresh and coarse to loamy. Some sites may be more moist, silty to clayey soils in and support trees that thrive in more damp conditions such as white spruce and balsam fir (instead of jack pine), and other species such as Catharinette's berry, speckled alder, prickly rose, swamp red currant, naked bishop's-cap, spindulose shield fern, oak fern, sweet coltsfoot, woodland horsetail and sweet-scent bedstraw.
		ES19: Hardwood-Fir-Spruce Mixedwood: , Fresh, Sandy-Course Loamy Soil	
		ES23: Hardwood-Fir-Spruce Mixedwood: Moist, Sandy-Coarse Loamy Soil	
		ES28: Hardwood-Fir-Spruce Mixedwood: Fresh, Silty Soil	
		ES29: Hardwood-Fir-Spruce Mixedwood: Fresh, Fine Loamy-Clayey Soil	
		ES33: Hardwood-Fir-Spruce Mixedwood: Moist, Silty-Clayey Soil	

Table 1: Upland Ecosites (Continued)

Ecosite Code	Name	Ecosite Components	Description
ES-F	Fir-Spruce-Mixedwood	ES21: Fir-Spruce Mixedwood: Fresh, Coarse Loamy Soil ES27: Fir-Spruce Mixedwood: Fresh, Silty-Fine Loamy Soil	Forests dominated by balsam fir, white spruce and black spruce with mixtures of trembling aspen and white birch. Usually shrub- and herb-poor with some sites being more shrub- and herb-rich, which may include mountain maple, beaked hazelnut, bush honeysuckle, American fly honeysuckle, red raspberry, large-leaf wood-aster, rose-twisted stalk, wild sarsaparilla, kidney-leaf white violet, sweet-scent bedstraw, blue bead-lily, northern starflower, wild-lily-of-the-valley and bunchberry. Feathermossess-Shreber's, plume, stair-step-and shaggy moss dominate the groundcover over fresh, coarse loamy to fine loamy soils, and broadleaf, conifer and wood litter.
ES-G	Pine-Spruce Mixedwood	ES14: Pine-Spruce Mixedwood: Sandy Soil	Jack pine- and black spruce-dominated forests with white birch and trembling aspen. Herbs and shrubs are usually variable and abundant including mountain maple, beaked hazelnut, bush honeysuckle, red raspberry, green alder, balsam fir, prickly wild rose, velvetleaf and late lowbush blueberry, large-leaf wood-aster, rose-twisted stalk, wild sarsaparilla, blue bead-lily, northern starflower, kidney-leaf white violet, wild-lily-of-the-valley, bunchberry and clubmosses. The ground cover primarily feathermosses-shreber's, plume and stair-step moss-and fork moss.

Table 1: Upland Ecosites (Continued)

Ecosite Code	Name	Ecosite Components	Description
ES-H	Spruce-Pine/Feathermoss	ES20: Spruce-Pine/ Feathermoss: Fresh, Sandy-Course Loamy Soil	Forests dominated by black spruce and jack pine with occasional patches of trembling aspen, white birch and balsam fir. Usually shrub- and herb-poor, which may include northern bush honeysuckle, twinflower, velvetleaf and late lowbush blueberry, Labrador tea, blue bead-lily, wild sarsaparilla, northern starflower, wild-lily-of-the-valley and bunchberry. Soils in ES20 are dry to fresh and fine sandy to silt loams with a groundcover consisting of broadleaf, conifer and wood litter, with feathermosses-Shreber's, plume, stair-step and shaggy moss. More fresh sites may also include peatmosses and or reindeer lichen in addition to feathermoss.
		ES22: Spruce-Pine/*Ledum*/Feathermoss: Moist, Sandy-Coarse Loamy Soil	
		ES25: Pine-Spruce/Feathermoss: Fresh, Silty Soil	
		ES26: Spruce-Pine/Feathermoss: Fresh, Fine Loamy-Clayey Soil	
ES-I	White Cedar: Fresh-Moist, Coarse-Fine Loamy Soil	ES17: White Cedar: Fresh-Moist, Coarse-Fine Loamy Soil	Cedar-dominated conifer and mixedwood forests with a variable shrub layer usually consisting of mountain maple, balsam fir and white cedar, but may also include red raspberry, showy mountain ash, American fly honeysuckle, twinflower, swamp red currant and beaked hazelnut. Herbs often occurring include northern starflower, kidney-leaf white violet, naked bishop's-cap, wild sarsaparilla, wild-lily-of-the-valley, blue bead-lily, bunchberry, rose twisted-stalk, sweet-scent bedstraw, large-leaf wood-aster and oak fern. Soil texture and moisture, and landform vary, but groundcover usually contains fernmosses-Shreber's, plume and stair-step-as well as other mosses such as shaggy moss.
ES-J	Rock Barren	ES7: Rock Barren	Bare or sparsely vegetation bedrock; patchy and very shallow soils. Because of the shallow, very dry nature of soils, very few woody vegetation, herbs and graminoids colonize these mostly bedrock-exposed ecosites. Vegetations is generally restricted to lichens, mosses and liverworts.

TABLE 2
Description of Upland and Wetland Ecosite Communities in the Local Study Area

Table 2: Wetland Ecosites

Ecosite Code	Name	Description
W1	Open Water Marsh: Mixed: Mineral Substrate	Open water marsh over mineral substrates dominated with floating-leaved plants such as variable-leaved pondweed, yellow cowlily, redheadgrass, grassy pondweed, flatstem pondweed and floating bur-reed. Submergent and emergent cover is low but may include great bladderwort, common hornwort, broad waterweed and least spike-rush.
W2	Open Water Marsh: Pipewort-Water Lobelia: Mineral Substrate	Shallow water marsh over mineral substrates dominated with plants that can withstand wave action or rocky shorelines such as seven-angled pipewort and spiny-spore quillwort.
W3	Open Water Marsh: Mixed: Organic Substrate	Shallow open water over sedimentary peat dominated with submergent plants such as stoneworts, broad waterweed, redheadgrass, flatleaf pondweed, eel-grass, great bladderwort, water milfoils and common hornwort. Floating-leaved plants such as duckweed, yellow cowlily and floating pondweed may also occur in large patches. Few submergents occur but species such as wild rice may be observed. May be difficult to distinguish from W9 in aerial interpretations.
W4	Open Water Marsh: Floating-leaved Plants	Open water marsh over sedimentary peat dominated with floating-leaved cover usually comprised of white water lily, floating bur-reed, yellow cowlily, floating pondweed. Submergents and emergent species that may occur include flatleaf pondweed, common hornwort, water marigold, great bladderwort and water horsetail.
W5	Marsh: Mixed: Mineral Substrate	Shallow water over mineral substrates (often sand) with variable species composition but often dominated with a single species. Species include emergents such as hemlock water-parsnip, water horsetail, broadleaf arrowhead, large bur-reed, creeping spike-rush, small floating manna-grass and hard-stem club-rush. Floating-leaved and submergents may include great bladderwort, pondweed spp., duckweed spp., common hornwort, water milfoil spp., broad waterweed, and water smartweed.
W10	Marsh: Mixed: Organic Substrate	Shallow marshes over sedimentary peat sometimes mixed with fine mineral soils in sheltered to moderately wave-washed shores or recently exposed areas such as drained beaver ponds. Species composition Is variable with few species being present at a given location usually as dense clonal stands of emergent species. Species which may occur include northern water-plantain, broadleaf arrowhead, nodding beggar-ticks, water hemlock-parsnip, water horsetail, sweetflag, sessile-fruited arrowhead, large bur-reed, creeping spike-rush, hard-stem club-rush, wild rice, beaked sedge, great bladderwort, grassy pondweed, common water-flaxseed, common hornwort, star duckweed, and yellow cowlily.

Table 2: Wetland Ecosites (Continued)

Ecosite Code	Name	Description
W11	Marsh: Cattail	Dense marshes over peaty, floating mat or rot mat fixed to mineral soil substrates typically dominated by cattails. Sites include sheltered bays and isolated bays to ditches and other disturbed depressions. Narrow-leaved cattail is usually dominant but may include broad-leaf cattail in deeper water. Other species associated with these sites include water hemlock-parsnip, water horsetail, marsh cinquefoil, creeping spikerush, common water-flaxseed, star duckweed and flatstem pondweed. Occasionally shrubs such as sweet gale and speckled alder less than 2m tall may be present at low to high cover.
W12	Meadow Marsh: Tall Sedge	Meadow marshes dominated by tall sedges such as tussock sedge, cottongrass bulrush often tussocky microtopography, occasionally on semi-floating mat of sedge stems and leaves. Floodplains, shallow bays and streams, beaver meadows and occasionally ditches and isolated basins. Substrates include mineral or well-decomposed peat. Wetter sites may include water horsetail and creeping spike-rush. Tall shrub cover may occur in small patches. Species typical also include water hemlock-parsnip, marsh cinquefoil, water smartweed, sweetflag, marsh bellflower, water loosestrife, hooded skullcap, broad-leaf cattail, beaked sedge, Canada blue-joint, water sedge, lake-bank sedge, slender sedge, flatleaf bladderwort and great bladderwort. Some moss such as common hook moss may be present. May be difficult to distinguish from W13, W14 and W15 in aerial interpretations.
W13	Meadow Marsh: Blue-joint Grass	Meadow marshes dominated with Canada blue-joint, often with tall sedges (beaked, slender and water) and sometimes other grasses (fowl manna and American manna)on flat to tussocky microtopography over mineral or well-decomposed peat substrates. May occur in floodplains of small steams, beaver meadows and lakeshores. Tall shrubs (speckled alder and white meadowsweet) may be present in small patches. Other associated species include marsh cinquefoil, broad-leaf cattail, marsh bellflower, water hemlock-parsnip, linear-leaved willow-herb, blueflag, water smartweed, cottongrass bulrush and flatleaf bladderwort. May be difficult to distinguish from W12, W14 and W14 in aerial interpretations.
W14	Open Graminoid Shore Fen: Wire Sedge	Shore fens usually dominated with wire sedge and occasionally other sedges such as beaked sedge. Typically on floating mats with peatmoss and small patches of ericaceous shrubs, especially sweet gale. Over mats of fibric to mesic peat held together with roots and rhizomes. Edges of lakes and streams with low wave energy. Other species present may include water horsetail, marsh cinquefoil, marsh St. John's wort, great bladderwort and flatleaf bladderwort. May be difficult to distinguish from W12, W3 and W15 in aerial interpretations.

TABLE 2
Description of Upland and Wetland Ecosite Communities in the Local Study Area

Table 2: Wetland Ecosites (Continued)

Ecosite Code	Name	Description
W15	Low Shrub Shore Fen: Leatherleaf-Sweet Gale/Graminoid	Low shrub fen, typically on floating mats over fibric to mesic peat, creating hummocky microhabitats of peatmoss and ericaceous shrubs such as leatherleaf, sweet gale and bog willow. Found often on the quiet edges of lakes and streams. Other associated species include marsh cinquefoil, Canada blue-joint, water sedge, slender sedge and beaked sedge. May be difficult to distinguish between 12-14 in aerial interpretations.
W16	Tall Shrub Shore Fen: Speckled Alder-Willow/Dwarf Birch/Ericaceous Shrub	Fens dominated by speckled alder, willows (pussy, bog, flat-leaved and tea-leaved), and/or dwarf birch. Microtopography is often hummocky over peatmoss with ericaceous shrubs such as leatherleaf and Labrador tea. Found on shores, inland margins of floating mats and edges of peatlands. Other species that may be present include red osier dogwood, Catharinettes berry, alderleaf buckthorn, marsh cinquefoil, rush aster, lady fern, blueflag, small bedstraw, three-leaf Solomon's seal, violets, Canada blue-joint, beaked sedge, bristle-stalk sedge, slender sedge and common reed.
W18	Moderately Rich Fen: Tamarack-Black Spruce/Ericaceous Shrub	Low shrub fen scattered with small tamarack, black spruce and eastern white cedar with dwarf birch and ericaceous shrubs such as small cranberry, bog rosemary, leatherleaf and Labrador tea. These sites have a diverse herb, graminoid and moss layers over shallow hummocks of fibric to mesic peat and are typically found on the margins of water tracks of large peatlands. Additional species that may be present include bog willow, mountain fly-honeysuckle, Catherinette's berry, alderleaf buckthorn, twinflower, three-leaf Solomon's-seal, roundleaf sundew, water horsetail, bog buckbean, marsh cinquefoil, pitcher plant, bog goldenrod, naked bishop's-cap, slender sedge, bristly-stalk sedge, inland sedge, boreal bog sedge, Canada blue-joint, small red peatmoss, Schreber's moss, ribbed bog moss, narrowleaf peatmoss, and rusty peatmoss.
W19	Moderately Rich Fen: Graminoid	Open fens dominated by sedges including white beakrush, mud sedge, livid sedge and slender sedge; ericaceous shrubs such as leatherleaf, bog rosemary, small cranberry and bog laurel; occasionally scattered with tamarack and black spruce. Ground cover is peatmoss and other mosses, bare peat, shrub and sedge litter over fibric to mesic peat over hummocks. This ecosite is typical of peatlands on wet, floating mats of basin fens and shores above the seasonal flooding level. Other species typical of these fens include pitcher plant, bog buckbean, round-leaved sundew, pod grass, water horsetail, flatleaf bladderwort and Magellan's peatmoss.

TABLE 2
Description of Upland and Wetland Ecosite Communities in the Local Study Area

Table 2: Wetland Ecosites (Continued)

Ecosite Code	Name	Description
W20	Poor Fen: Ericaceous Shrub/Wire Sedge/peatmoss	Open fens dominated by ericaceous shrubs such as leatherleaf, small cranberry and bog rosemary; sedges including slender sedge and mud sedge; and scattered, small tamarack and black spruce. Microtopography is low hummocks with hollow covered by peatmoss over fibric to mesic peat. Typical in basin fens, shores above the seasonal flooding level and larger peatlands. Other species that may be present include dwarf birch, pussy willow, bog willow, pitcher plant, small red peatmoss, Magellan's peatmoss and rusty peatmoss.
W21	Poor Fen: Ericaceous Shrub/ peatmoss	Species-poor fens dominated with ericaceous shrubs such as leatherleaf, small cranberry, bog rosemary and bog laurel, dwarf birch, and scattered, small tamarack and/or black spruce. Microtopography is hummocky with peatmoss, especially narrowleaf peatmoss, over fibric peat. Occurs on peatlands with low exposure to groundwater including basin fens, shores above the seasonal flooding level, a and margins of larger peatland. Other species present may include pitcher plant, water horsetail, bog buckbean, pod grass, roundleaf sundew, three-leaf Solomon's-seal, few-seeded sedge, mud sedge, Magellan's peatmoss and rusty peatmoss.
W22	Poor Fen: Black Spruce-Tamarack/Ericaceous Shrub/peatmoss	Fens dominated by tall black spruce and/or tamarack with an understory of dwarf birch and ericaceous shrubs such s leatherleaf, bog rosemary, bog laurel, small cranberry and Labrador tea. Species composition is poor but those present may also include bog buckbean, three-leaf Solomon's-seal, pitcher plant, water horsetail, mud sedge and few-seeded sedge. Groundcover is typically Magellan's peatmoss, rusty peatmoss, narrowleaf peatmoss and Schreber's moss over fibric peat substrates of sometimes highly hummocky terrain. These fens are typically found in peatlands wit low exposure to groundwater including basin fens, shores above the seasonal flooding mark and the margins of larger peatlands.
W24	Open Low Shrub Bog: Ericaceous Shrub/ peatmoss	Open bog with often a high cover of ericaceous shrubs and small trees including leatherleaf, bog laurel, small cranberry, Labrador tea, bog rosemary, black spruce and tamarack. Microtopography is high hummocks with some hollows within raised landforms in large peatland complexes, basin bogs and shores isolated from groundwater influences. Ground cover is a continuous peatmoss carpet over fibric peat. Species poor but may also include pitcher plant, few-seeded sedge, few-flowered sedge, Magellan's peatmoss, rusty peatmoss, and narrowleaf peatmoss.

Table 2: Wetland Ecosites (Continued)

Ecosite Code	Name	Description
W25	Semi-treed bog: Black Spruce/Ericaceous Shrub/peatmoss	Scattered occurrences of all black spruce and tamarack, ericaceous shrubs including leatherleaf, bog laurel, small cranberry, Labrador tea, bog rosemary and creeping snowberry and a graminoid understory of few-seeded sedge and few-flowered sedge. Microtopography is high hummocks with weak hollows within raised bog landforms in large peatland complexes, basin bogs and occasionally shorelines isolated from groundwater. Peatmoss carpets dominate the groundcover over fibric peat. Other species found may include pitcher plant, three-leaf Solomon's-seal, rusty peatmoss, Magellan's peatmoss, narrowleaf peatmoss and Shreber's moss.
W26	Treed Bog: Black Spruce/ Ericaceous Shrub/peatmoss	Species-poor, black spruce-dominated bogs with an understory of Labrador tea and other ericaceous shrubs. Groundcover includes peatmoss carpets with patches of feathermoss and conifer litter over fibric peat. Site is often highly hummocky and raised areas within large peatland complexes, basin bogs and sometimes shorelines isolated from groundwater. Other species that may be present include leatherleaf, small cranberry, bog laurel, creeping snowberry, bog rosemary, three-leaf Solomon's-seal, Magellan's peatmoss, Schreber's moss, rusty peatmoss and narrowleaf peatmoss. In small mineral-influenced pockets, species such as tussock sedge or water sedge may be present.
W27	Poor Conifer Swamp: Black Spruce/Labrador Tea./ peatmoss	Black spruce-dominated swamps with an understory of Labrador tea and other ericaceous shrubs including creeping snowberry, late lowbush blueberry, velvetleaf blueberry, small cranberry, bog laurel and leatherleaf. Graminoid and herb are species poor other than species such as three-leaf Solomon's-seal, bunchberry, woodland horsetail and stiff clubmoss. Occurs often on the edges of open peatlands and poorly-drained depressions in bedrock or till. Microtopography is strongly hummocky with deep (often water-filled) hollows over fibric peat and woody debris covered with conifer litter and peatmoss and feathermosses such as Schreber's moss, Magellan's peatmoss, rusty peatmoss, narrowleaf peatmoss, stair-step moss. Some lichens such as reindeer lichen may also be present.
W28	Poor Conifer Swamp: Black Spruce/ Labrador Tea/peatmoss	Black spruce- and tamarack-dominated conifer swamps with fairly open canopies and an understory largely of Labrador tea and Canada blue-joint. Strongly hummocky with often water-filled hollows covered with peatmoss, feathermosses, conifer and graminoid litter over fibric peat and woody debris. Occurs often on the edges of water tracts and open peatlands. Species common to these sites also include small cranberry, leatherleaf, speckled alder, creeping snowberry, Catherinette's berry, dwarf birch, mountain fly honeysuckle, velvetleaf blueberry, bog rosemary, bunchberry, water horsetail, three-leaf Solomon's-seal, naked bishop's-cap, bog goldenrod, softleaf sedge, bristly-stalk sedge, boreal bog sedge, Schreber's moss, small red peatmoss, Magellan's peatmoss and rusty peatmoss.

Table 2: Wetland Ecosites (Continued)

Ecosite Code	Name	Description
W29	Intermediate Conifer Swamp: Black Spruce/ Tall Shrub/ Labrador Tea	Black spruce swamps with an understory of balsam fir and/or speckled alder and low ericaceous shrubs such as Labrador tea. Groundcover is feathermoss, peatmoss and conifer litter over woody debris or peatmoss substrates. Sites are often highly hummocky that are dry and intermittent with often water-filled hollows and are found at the edges of open peatlands and poorly-drained depressions in bedrock or till. Usually species-rich and also may include creeping snowberry, velvetleaf blueberry, twinflower, late lowbush blueberry, northern mountain ash, bunchberry, woodland horsetail, three-leaf Solomon's-seal, blue bead-lily, goldthread, stiff clubmoss, Canada mayflower, northern starflower, Schreber's moss, plume moss, small red peatmoss, stair-step moss, Magellan's peatmoss and juniper moss.
W30	Intermediate Conifer Swamp: Conifer/Tall Shrub/Herb-rich	Conifer swamps dominated by black spruce and sometimes accompanied by tamarack, balsam fir and/or eastern white cedar. Tall shrubs, especially speckled alder or short black spruce may also be present. Microtopography usually presents high hummocks and deep, water-filled hollows covered with peatmoss and conifer and broadleaf litter. Usually found on the shores of lakes and rivers and outer edges of open peatlands, depressions in bedrock. Typically species rich, including creeping snowberry, Catherinette's berry, Labrador tea, twinflower, velvetleaf blueberry, mountain fly honeysuckle, swamp red currant, northern mountain ash, red osier dogwood, prickly rose, red raspberry, late lowbush blueberry, wild-lily-of-the-valley, three-leaf Solomon's-seal, blue bead-lily, sweet coltsfoot, kidney-leaf white violet, wild sarsaparilla, Canada blue-joint, softleaf sedge, Shreber's moss, stair-step moss, plume moss, small red peatmoss, ribbed bog moss, shaggy moss and Magellan's peatmoss.
W31	Rich Conifer Swamp: Cedar-Tamarack (Black Spruce)	Swamps dominated with eastern white cedar or tamarack with scattered occurrences of black spruce and shrub-, herb- and moss-rich over a substrate of well-decomposed peat. Microtopography is high hummocks with deep, water-filled hollows often with fallen, moss-covered logs, conifer litter and peatmoss over well-decomposed peat. Located on shores of lakes and rivers above the flooding level and flowage areas of peatland complexes. Other associated species include speckled alder, red osier dogwood, Catherinette's berry, creeping snowberry, Labrador tea, twinflower, balsam fir, prickly rose, bunchberry, northern starflower, goldthread, wild-lily-of-the-valley, naked bishop's-cap, kidney-leaf white violet, three-leaf Solomon's-seal, softleaf sedge, Shreber's moss, small red peatmoss, shaggy moss, stair-step moss and Magellan's peatmoss.

TABLE 2
Description of Upland and Wetland Ecosite Communities in the Local Study Area

Table 2: Wetland Ecosites (Continued)

Ecosite Code	Name	Description
W32	Rick Conifer Swamp: Cedar-Tamarack	Swamps dominated with eastern white cedar, sometimes including exceptional rich tamarack swamps. Also usually includes white spruce, balsam fir, balsam poplar, trembling aspen and white birch and is herb-rich. Ground cover is typically conifer litter with patches of feathermosses and peatmoss and high hummocks and deep hollows, sometimes filled with visibly moving groundwater. Substrate is well-decomposed peat. This ecosite is often found wherever there is significant groundwater flow such s as valleys with intermittent streams, shores and edges of watertracks in peatlands. Species also present may include Catherinette's berry, mountain maple, twinflower, American fly honeysuckle, swamp red currant, prickly rose, northern mountain ash, northern starflower, wild sarsaparilla, naked bishop's-cap, kidney-leaf white violet, blue bead-lily, bunchberry, wild-lily-of-the-valley, rose twisted-stalk, large-leaved aster, lady fern, goldthread, oak fern, Schreber's moss, shaggy moss, stair-step moss and plume moss.
W33	Hardwood Swamp: Black Ash (Other Hardwood): Upland Transition	Usually black ash-dominated swamps often with trembling aspen, white spruce or balsam fir. Mountain maple often found in the understory in high abundance with balsam fir and other shrubs. Microtopography may be flat or hummocky, often with fallen, moss-covered logs, deciduous litter and moss patches over peat or fine mineral soil. This ecosite is most commonly found on perched wet pockets on fine soils, valleys with impeded drainage, shores as an intermediate point between wetland and upland ecosites, and where groundwater flow can influence. Other species that may be present include Catherinette's berry, swamp red currant, beaked hazelnut, red osier dogwood, chokecherry, American fly honeysuckle, red raspberry, wild sarsaparilla, wild-lily-of-the-valley, Virginia strawberry, large-leaf wood-aster, naked bishop's-cap, lady fern, rose twisted-stalk, northern starflower, spindulose shield fern, small enchanter's nightshade, bladder sedge, slender wood reedgrass, plagiomnium moss species, and tree moss. May be difficult to distinguish from W33 in aerial interpretations.
W34	Hardwood Swamp: Black Ash (Other Hardwood): Riparian	Black ash-dominated swamps sometimes with other hardwoods such as white elm. Rich shrub and herb layer and sometimes high graminoid cover. Microtopography may be flat to hummocky covered primarily with deciduous litter, logs, bare soil and patches of moss over well-decomposed woody peat or fine mineral soils. This ecosite is located often along river floodplains and depressions subject to flooding by groundwater runoff. Other species likely found include mountain maple, Catherinette's berry, balsam fir, red osier dogwood, swamp red currant, red raspberry, speckled alder, white spruce, chokecherry, marsh marigold, naked bishop's-cap, lady fern, small enchanter's nightshade, spindulose shield fern, oak fern, woodland horsetail, Canada blue-joint, plagiomnium moss species, and tree moss. May be difficult to distinguish from W33 in aerial interpretations.

TABLE 2
Description of Upland and Wetland Ecosite Communities in the Local Study Area

Table 2: Wetland Ecosites (Continued)

Ecosite Code	Name	Description
W35	Thicket Swamp: Speckled Alder/Blue-joint Grass	Thicket swamps dominated by speckled alder usually accompanied by Canada blue-joint and often herb and moss rich, except in heavily flooded areas. Microtopography generally flat with exposed soil, deciduous litter, mats of grass stems and moss patches over well-decomposed peat or fine mineral soils. Ecosite found on shores, edges of beaver meadows and stream floodplains, and boarders of small streams through peatlands or upland forests. Other species found in this ecosite include red osier dogwood, red raspberry, spotted jewel-weed, northern bugleweed, hooded skullcap and tree moss. May be difficult to distinguish from W36 in aerial interpretations.
W36	Thicket Swamp: Tall Willow	Thicket swamps dominated by tall willow species including meadow willow, pussy willow, tea-leaved willow. Red-osier dogwood, white meadowsweet also often present, and herb- and moss-rich in more closed canopies or exhibit high graminoid cover in more open sites. Flat microtopography is typical of this ecosite with exposed soil, deciduous litter, grass stems and mossy patches over well-decomposed peat or fine mineral soil. Found on shores, edges of beaver meadows in stream floodplains. Other species that may be found include Catherinette's berry, red raspberry, marsh bellflower, spotted jewel-weed, woodland horsetail, northern bugleweed, hooded skullcap and Canada blue-joint. May be difficult to distinguish from W35 in aerial interpretations.

TABLE 3
Plant Species in the Local Study Area

| Type | Form (Form Symbol) | Scientific Name | Common Name | G-Rank | S-Rank | COSEWIC | ESA | SARA | Local Rarity in Quetico (Common, Occasional and Rare) | Upland and Wetland Ecosite Classification Codes | | |

TABLE 3
Plant Species in the Local Study Area

Type	Form (Form Symbol)	Scientific Name	Common Name	G-Rank	S-Rank	COSEWIC	ESA	SARA	Local Rarity in Quetico (Common, Occasional and Rare)	Upland and Wetland Ecosite Classification Codes																																				
										ES-A	ES-B	ES-C	ES-D	ES-E	ES-F	ES-G	ES-H	ES-I	W1	W2	W3	W4	W5	W10	W11	W12	W13	W14	W15	W16	W18	W19	W20	W21	W22	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36
Grass	Ground Cover (gc)	*Danthonia spicata*	*Poverty Oatgrass	G5	S5	—	—	—	Common	M	M	M																																		
Vascular Plant	Ground Cover (gc)	*Decodon verticullatus*	Hairy Swamp Loosestrife	G5	S5	—	—	—	Unknown														L	L	L	L	L	L	L	L	L	L	L												
Shrub	Low Shrub (ls)	*Diervilla lonicera*	Northern Bush-honeysuckle	G5	S5	—	—	—	Very Common	M	M	M	M	M	M	M	M	M																												
Clubmoss	Ground Cover (gc)	*Diphasiastrum complanatum*	Trailing Clubmoss	G5	S5	—	—	—	Unknown	L	L	M	M	M	M	M	M	L																												
Moss	Moss (m)	*Drepanocladus sp.*	Hook Moss	—	—	—	—	—	Unknown																L	L	L	L	L										L	L	L	L	L	L	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Drosera rotundifolia*	Roundleaf Sundew	G5	S5	—	—	—	Common																				L	L	M	M	L	M	M											
Fern	Ground Cover (gc)	*Dryopteris carthusiana*	Spindulose Shield Fern	G5	S5	—	—	—	Unknown					L	M	M	M	M																												
Fern	Ground Cover (gc)	*Dryopteris cristata*	Crested Shield Fern	G5	S5	—	—	—	Occasional																M	M	L	L	L	L	L														M	M
Fern	Ground Cover (gc)	*Dryopteris marginalis*	Marginal Wood-fern	G5	S5	—	—	—	Unknown					L	L	L	L	L																												
Sedge	Narrow-leaved Emergent (ne)	*Dulichium arundinaceum*	Three-way Sedge	G5	S5	—	—	—	Common												L	L	L	L	L	M	M	L																	
Sedge	Narrow-leaved Emergent (ne)	*Eleocharis sp.*	Spikerush sp.	—	—	—	—	—	Unknown													M	M	M	M	L	L	L	L	L	L														
Vascular Plant	Submerged Plant (su)	*Elodea canadensis*	Broad Waterweed	G5	S5	—	—	—	Occasional										L	L	L	L	L	L																					
Grass	Ground Cover (gc)	*Elymus repens*	*Creeping Wild-rye	GNR	SNA	—	—	—	Unknown																																				
Shrub	Low Shrub (ls)	*Epigaea repens*	Trailing Arbutus	G5	S5	—	—	—	Occasional	M	M	M	M	L	L	L	L																												
Vascular Plant	Ground Cover (gc)	*Epilobium angustifolium*	Fireweed	G5	S5	—	—	—	Common	L	L	L	L	L	L	L	L																												
Vascular Plant	Ground Cover (gc)	*Epilobium ciliatum*	Hairy Willow-herb	G5	S5	—	—	—	Common																M	M	M	L	L	L	L									L	L	L	L	L	L	L	L
Horsetail	Ground Cover (gc)	*Equisetum fluviatile*	Water Horsetail	G5	S5	—	—	—	Very Common													M	M	M	M	L																			
Horsetail	Ground Cover (gc)	*Equisetum scirpoides*	Dwarf Scouring Rush	G5	S5	—	—	—	Scarce						L	L	L	L																						L	L	M	M	M	M				
Horsetail	Ground Cover (gc)	*Equisetum sylvaticum*	Woodland Horsetail	G5	S5	—	—	—	Very Common					L	M	M	M	M								L	L														L	L	L	L	L	L	L	L
Horsetail	Ground Cover (gc)	*Equisetum variegatum*	Variegated Horsetail	G5	S5	—	—	—	Unknown																	L	L	L														L	L			L	L
Vascular Plant	Narrow-leaved Emergent (ne)	*Eriocaulon aquaticum*	Seven-angled Pipewort	G5	S5	—	—	—	Unknown										L	H			L																							
Sedge	Narrow-leaved Emergent (ne)	*Eriophorum tenellum*	Rough Cotton-grass	G5	S5	—	—	—	Occasional																				L	L	L	L														
Vascular Plant	Ground Cover (gc)	*Eupatorium maculatum ssp. maculatum*	Spotted Joe-pye Weed	G5TNR	S5	—	—	—	Common																L	M															L	L	L	L	M	M
Vascular Plant	Ground Cover (gc)	*Euphrasia nemorosa*	*Common Eyebright	G5	SU	—	—	—	Unknown																																					
Vascular Plant	Ground Cover (gc)	*Eurybia macrophylla*	Large-leaf Wood-aster	G5	S5	—	—	—	common	M	L	L	M	M	L	L	L	M																												
Vascular Plant	Ground Cover (gc)	*Euthamia graminifolia*	Flat-top Fragrant-golden-rod	G5	S5	—	—	—	Very Common																L	L																				
Vascular Plant	Ground Cover (gc)	*Fragaria virginiana*	Virginia Strawberry	G5	S5	—	—	—	Common	M	L	L	L	M	L	L	L	L																												
Tree	Deciduous Tree (h)	*Fraxinus nigra*	Black Ash	G5	S5	—	—	—	Occasional																																	L			H	H		
Vascular Plant	Ground Cover (gc)	*Galium palustre*	Marsh Bedstraw	G5	S5	—	—	—	Common																L	L																L	L	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Galium trifidum*	Small Bedstraw	G5	S5	—	—	—	Very Common																L	L	L	L	L	L	L	L	L	L					L	L	L	L	L	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Galium triflorum*	Sweet-scent Bedstraw	G5	S5	—	—	—	Common					M	M	L	M	M																						L	L	M	M	M	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Gallium asprellum*	Rough Bedstraw	G5	S5	—	—	—	Occasional					L	M	M	M	M																						L	L	M	M	M	M	L	L	L	L
Shrub	Ground Cover (gc)	*Gaultheria hispidula*	Creeping Snowberry	G5	S5	—	—	—	Very Common	L	M		L	M	M	M	M	M											M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Vascular Plant	Ground Cover (gc)	*Gentiana andrewsii*	Fringe-top Bottle Gentain	G5	S4	—	—	—	Unknown																L	H	L	L	L	L	L									L	L			L	L	L	L
Vascular Plant	Low Shrub (ls)	*Geocaulon lividum*	Northern Comandra	G5	S5	—	—	—	Rare																								L		L	L	L	L								
Vascular Plant	Ground Cover (gc)	*Geum aleppicum*	Yellow Avens	G5	S5	—	—	—	Occasional					L	L	L	L	L																												
Grass	Narrow-leaved Emergent (ne)	*Glyceria borealis*	Small-floating Manna-grass	G5	S5	—	—	—	Occasional										M	M	M	M	M	M	L																				
Grass	Narrow-leaved Emergent (ne)	*Glyceria canadensis*	Canada Manna-grass	G5	S4S5	—	—	—	Occasional															M	M	M	M	M	M	M	M	L	L	L					M	M	L	L	L	L	L	L
Grass	Narrow-leaved Emergent (ne)	*Glyceria grandis*	American Manna Grass	G5	S4S5	—	—	—	Unknown										L	L	L	L	L	L																					
Grass	Narrow-leaved Emergent (ne)	*Glyceria striata*	Fowl Manna-grass	G5	S5	—	—	—	Common					M	L	L	L	L							M	M	L	L	L	L	L	L	L	L	L	L	L	L	M	M	M	M	M	M	M	M
Vascular Plant	Ground Cover (gc)	*Goodyera tesselata*	Checkered Rattlesnake Plantain	G5	S4S5	—	—	—	Common			L	L	L	M	M	M	M																						L	M	M	M	M	M				
Fern	Ground Cover (gc)	*Gymnocarpium dryopteris*	Oak Fern	G5	S5	—	—	—	Common					L	L	L	L	M																												
Vascular Plant	Ground Cover (gc)	*Helenia deflexa*	Spurred Gentian	G5	S5	—	—	—	Occasional				L	M	L	L	L	M																												
Vascular Plant	Ground Cover (gc)	*Hieracium caespitosum*	*Hawkweed	GNR	SNR	—	—	—	Unknown																																					
Vascular Plant	Ground Cover (gc)	*Hieracium canadense*	Canada Hawkweed	G5	SU	—	—	—	Common																L	L																			L	L
Vascular Plant	Broad-leaved Emergent (be)	*Hippuris vulgaris*	Common Mare's-tail	G5	S5	—	—	—	Occasional										L	L	M	M	L	M	M																				
Clubmoss	Ground Cover (gc)	*Huperzia lucidula*	Shining Clubmoss	G5	S5	—	—	—	Occasional					M	M	M	M	M																												
Moss	Moss (m)	*Hylocomium splendens*	Stair-step Moss	G5	S5	—	—	—	Unknown	L	L	L	M	L	M	M	M	M																												
Vascular Plant	Ground Cover (gc)	*Hypericum elliptictum*	Pale St. John's-wort	G5	S5	—	—	—	Unknown																L	L																			L	L
Vascular Plant	Ground Cover (gc)	*Impatiens capensis*	Spotted Jewel-weed	G5	S5	—	—	—	Common														L	L	L	M	L												L	L	M	M	M	M	M	M	M	M
Vascular Plant	Robust Emergent (re)	*Iris pseudacorus*	*Yellow Iris	GNR	SNA	—	—	—	Unknown																																					
Vascular Plant	Robust Emergent (re)	*Iris versicolor*	Blueflag	G5	S5	—	—	—	Common																L	L	M	L	L	M																
Vascular Plant	Submerged Plant (su)	*Isoetes echinospora*	Spiny-spore Quillwort	G5	S5	—	—	—	Common										L	M	L	L	L																							
Shrub	Low Shrub (ls)	*Juniperus communis*	Ground Juniper	G5	S5	—	—	—	Unknown	M	M	M	L	L	L	L	L	L																												
Rush	Narrow-leaved Emergent (ne)	*Juncus brevicaudatus*	Narrow-panicled Rush	G5	S5	—	—	—	Common																			L	L	L	L	L	L	L												
Rush	Narrow-leaved Emergent (ne)	*Juncus tenuis*	*Path Rush	G5	S5	—	—	—	Very Common																L	L	L																		
Shrub	Low Shrub (ls)	*Kalmia polifolia*	Pale Laurel	G5	S5	—	—	—	Occasional																			L	L	L	L	L	M	M	M	M	M								
Tree	Coniferous Tree (c)	*Larix laricina*	American Larch	G5	S5	—	—	—	Occasional					L	L	L	L	L												H				H				M	M	M	M	H	H	L	L		
Vascular Plant	Ground Cover (gc)	*Lathyrus ochroleucus*	Pale Vetchling Peavine	G4G5	S4	—	—	—	Occasional	L	L	L	L	L	L	L	L	L																												
Shrub	Low Shrub (ls)	*Ledum groenlandicum*	Common Labrador Tea	G5	S5	—	—	—	Very Common			L	L	L	L	L	M	L										L	M	M	L	M	M	M	M	M	M	M	M	M	L	L	L			
Grass	Narrow-leaved Emergent (ne)	*Leersia oryzoides*	Rice Cut Grass	G5	S5	—	—	—	Scarce														L	L	M	M																		L	L
Vascular Plant	Free Floating (ff)	*Lemna minor*	Lesser Duckweed	G5	S5	—	—	—	Scarce										L			L	L	L	L																L	L	L				
Vascular Plant	Ground Cover (gc)	*Leucanthemum vulgare*	*Oxeye Daisy	GNR	SNA	—	—	—	Occasional																																					
Moss	Moss (m)	*Leucobryum glaucum*	Pincushion Moss	G5	S5	—	—	—	Unknown	L	L	M	M	H	H	M	M	L																						L	L	M	M	M	M	M	M	
Vascular Plant	Ground Cover (gc)	*Linnaea borealis*	Twinflower	G5	S5	—	—	—	Abundant			L	L	M	M	M	M	M																												
Vascular Plant	Ground Cover (gc)	*Lobelia inflata*	*Indian-tobacco	G5	S5	—	—	—	Rare	L	L	L	L																																	
Vascular Plant	Ground Cover (gc)	*Lobelia kalmii*	Kalm's Lobelia	G5	S5	—	—	—	Rare																L	L	L	L	L	L	L														
Shrub	Low Shrub (ls)	*Lonicera involucrata*	Fly Honeysuckle	G5	S5	—	—	—	Occasional					L	M	M	L	M																								L	L	L	L	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Lotus corniculatus*	*Birds-foot Trefoil	GNR	SNA	—	—	—	Unknown																																					
Clubmoss	Ground Cover (gc)	*Lycopodium annotinum*	Stiff Clubmoss	G5	S5	—	—	—	Common	L	L	L	M	M	M	M	M	M																						L	L	M	M	M	M				
Clubmoss	Ground Cover (gc)	*Lycopodium clavatum*	Running Pine	G5	S5	—	—	—	Common			L	M	M	M	M	M	M																												
Clubmoss	Ground Cover (gc)	*Lycopodium dendroideum*	Treelike Clubmoss	G5	S5	—	—	—	Very Common	L	L	M	M	M	M	M	M																													
Clubmoss	Ground Cover (gc)	*Lycopodium inundatum*	Northern Bog Clubmoss	G5	S5	—	—	—	Scarce																					L	L	L	L	L	L	L	L	L								
Clubmoss	Ground Cover (gc)	*Lycopodium obscurum*	Tree Clubmoss	G5	S4	—	—	—	Common	L	L	M	M	M	M	M	M	L																												
Vascular Plant	Ground Cover (gc)	*Lycopus uniflorus*	Northern Bugleweed	G5	S5	—	—	—	Very Common														L	L	M	M	L	L	L	L	L	L						L	L	L	L	L	L	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Lysimachia terrestris*	Swamp Loosestrife	G5	S5	—	—	—	Very Common																L	L	L	L	L												L	L	L	L	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Maianthemum canadense*	Wild-lily-of-the-valley	G5	S5	—	—	—	Very Common	M	M	H	H	H	H	H	H	H																						L	L	M	L	L				
Vascular Plant	Ground Cover (gc)	*Maianthemum trifolium*	Three-leaf Solomon's-seal	G5	S5	—	—	—	Common					L	L	L	L	L												M	M	L	L	M	M	L	M	M	M	M	M	M				
Vascular Plant	Floating Plant (f)	*Megalodonta beckii*	Water-marigold	G4G5	S5	—	—	—	Unknown												L	L	L																							
Vascular Plant	Ground Cover (gc)	*Melampyrum lineare*	American Cow-wheat	G5	S4S5	—	—	—	Very Common	H	H	H	H	M	M	M	M																													
Vascular Plant	Ground Cover (gc)	*Mentha arvensis*	Corn Mint	G5	S5	—	—	—	Occasional																L	L	L	L														L	L	L	L	L	L	L	L
Vascular Plant	Broad-leaved Emergent (be)	*Menyanthes trifoliata*	Bog Buckbean	G5	S5	—	—	—	Occasional																					M	M	L	L	L												
Vascular Plant	Ground Cover (gc)	*Mimulus ringens*	Square-stem Monkeyflower	G5	S5	—	—	—	Occasional																		L														L	L	L	L	L	L	L	L

TABLE 3
Plant Species in the Local Study Area

Type	Form (Form Symbol)	Scientific Name	Common Name	G-Rank	S-Rank	COSEWIC	ESA	SARA	Local Rarity in Quetico (Common, Occasional and Rare)	Upland and Wetland Ecosite Classification Codes																																					
										ES-A	ES-B	ES-C	ES-D	ES-E	ES-F	ES-G	ES-H	ES-I	W1	W2	W3	W4	W5	W10	W11	W12	W13	W14	W15	W16	W18	W19	W20	W21	W22	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36
Vascular Plant	Ground Cover (gc)	*Mitella nuda*	Naked Bishop's-cap	G5	S5	—	—	—	Common				L	L	M	M	M	M																			L	L	M	M	M	M	M		
Vascular Plant	Ground Cover (gc)	*Monotropa uniflora*	Indian-pipe	G5	S5	—	—	—	Common	L	L	L	L	M	M	M	M	M																						L	L	L	L				
Shrub	Low Shrub (ls)	*Myrica gale*	Sweet Bayberry	G5	S5	—	—	—	Common																		M	M	L																	
Vascular Plant	Submerged Plant (su)	*Myriophyllum sp.*	Water-milfoil	—	—	—	—	—	Unknown										L	L	L	L	L	L	L																					
Shrub	Tall Shrub (ts)	*Nemopanthus mucronata*	Mountain Holly	G5	S5	—	—	—	Unknown																																	L	L	L	L	L	L
Vascular Plant	Floating Plant (f)	*Nuphar variegata*	Yellow Cowlily	G5T5	S5	—	—	—	Occasional										M		L	H																								
Vascular Plant	Floating Plant (f)	*Nymphaea odorata*	White Water Lily	G5T5	S5	—	—	—	Occasional										L	L	L	M	L																								
Fern	Ground Cover (gc)	*Onoclea sensibilis*	Sensitive Fern	G5	S5	—	—	—	Not Common																	L												L	L	M	M	M	M	L	L	M	L
Vascular Plant	Low Shrub (ls)	*Orthilia secunda*	One-side Wintergreen	G5	S5	—	—	—	Unknown				L	L	L	L	L	L																												
Fern	Ground Cover (gc)	*Osmunda claytoniana*	Interrupted Fern	G5	S5	—	—	—	Unknown			L	L	H	H	H	H	L																												
Fern	Ground Cover (gc)	*Osmunda regalis*	Royal Fern	G5	S5	—	—	—	Common																																	L	L	M	M	M	M
Lichen	Lichen (l)	*Parmelia sp.*	Wax Paper Lichen	—	—	—	—	—	Unknown	M	M	M	M	M	M	M	M	M																					M	M	M	M	M	M	M	M	L	L
Vascular Plant	Ground Cover (gc)	*Parnassia palustris*	Marsh Grass-of-parnassus	G5	S5	—	—	—	Extremely Rare																L	L																				
Lichen	Lichen (l)	*Peltigera canina*	Dog Lichen	G5	S5	—	—	—	Unknown				L	L	L	L	L	L																					L	L	L	L	L	L				
Vascular Plant	Ground Cover (gc)	*Persicaria maculosa*	*Lady's Thumb	G3G5	SNA	—	—	—	Unknown																																						
Vascular Plant	Ground Cover (gc)	*Petasites frigidus*	Sweet Coltsfoot	G5	S5	—	—	—	Unknown					L	L		L	L												L										L	L	L	L	L	L	L		
Vascular Plant	Ground Cover (gc)	*Petasites sagittatus*	Arrowhead sweet-coltsfoot	G5	S5	—	—	—	Rare																	L	L	L	L	M	L	L	L	H				L	L	M	H	M	H	L	L	L	L
Fern	Ground Cover (gc)	*Phegopteris connectilis*	Northern Beech Fern	G5	S5	—	—	—	Common					M	M	M	M	M																												
Grass	Robust Emergent (re)	*Phragmites australis ssp. americanus*	Common Reed	GNR	S4	—	—	—	Unknown															L	L																					
Tree	Coniferous Tree (c)	*Picea glauca*	White Spruce	G5	S5	—	—	—	Occasional	M	M	M	M	M	H	L	M	M																							L	L	M	M	M	L		
Tree	Coniferous Tree (c)	*Picea mariana*	Black Spruce	G5	S5	—	—	—	Extremely Common	L	H	H	M	M	H	H	H	H																H		H	H	H	H	H	M	M					
Tree	Coniferous Tree (c)	*Pinus banksiana*	Jack Pine	G5	S5	—	—	—	Common	H	H	H	M	M	M	H	H																														
Tree	Coniferous Tree (c)	*Pinus resinosa*	Red Pine	G5	S5	—	—	—	Common - Occasional	H	L	L	H	L		L	L																														
Tree	Coniferous Tree (c)	*Pinus strobus*	Eastern White Pine	G5	S5	—	—	—	Common - Occasional	H	M	M	H	L	L	L	L	L																														
Vascular Plant	Ground Cover (gc)	*Platanthera clavellata*	Small Green Woodland Orchid	G5	S4S5	—	—	—	Unknown					L	L	L	L	L												L	L	L										L	L	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Platanthera huronensis*	Huron Green Orchid	G5T5	SU	—	—	—	Unknown					L	L	L	L	L								L	L	L	L	L	L	L	L	L	L	L					L	L	L	L	L	L
Moss	Moss (m)	*Pleurozium schreberi*	Schreber's Moss	G5	S5	—	—	—	Unknown	M	M	M	M	M	M	M	M	M																						L	L	L	L	L	L	L	L	L	L
Grass	Ground Cover (gc)	*Poa pratensis*	*Kentucky Bluegrass	G5	S5	—	—	—	Common																																						
Moss	Moss (m)	*Pollytrichun sp.*	Haircap Moss	—	—	—	—	—	Unknown	M	M	M	M	M	M	M	M	M										L	L	L	L	L	L	L	L	L	L	L	L	L	L	M	M	M	M	L	L	L	L
Vascular Plant	Floating Plant (f)	*Polygonum amphibium*	Water Smartweed	G5	S5	—	—	—	Occasional										L	L	L	M	L																								
Vascular Plant	Ground Cover (gc)	*Polygonum cilinode*	*Black Fringed Bindweed	G5	S5	—	—	—	Scarce	M	M	M	M	L	L	M	L																														
Vascular Plant	Ground Cover (gc)	*Polygonum sp.*	Smartweed sp.	—	—	—	—	—	Restricted to international boundary Lakes																																							L	L
Fern	Ground Cover (gc)	*Polypodium virginianum*	Rock Polypody	G5	S5	—	—	—	Unknown	M	M	M	M	L	L	L	L	L																														
Moss	Moss (m)	*Polytrichum juniperinum*	Juniper Moss	G5	S5	—	—	—	Unknown	M	M	M	M	M	M	M	M	M									L	L	L	L	L	L	L	L	L	L	L	L	L	L	M	M	M	M	L	L	L	L
Tree	Deciduous Tree (h)	*Populus tremuloides*	Trembling Aspen	G5	S5	—	—	—	Common	M	M	M	L	H	M	M	M	L																										L	M	M	L		
Vascular Plant	Floating Plant (f)	*Potamogeton amplifolius*	Large-leaf Pondweed	G5	S5	—	—	—	Unknown										L		L	H																								
Vascular Plant	Floating Plant (f)	*Potamogeton epihydrus*	Ribbonleaf Pondweed	G5	S4S5	—	—	—	Unknown										L	L	L	M	M																								
Vascular Plant	Floating Plant (f)	*Potamogeton natans*	Floating Pondweed	G5	S5	—	—	—	Unknown										L	L	L	M	L																								
Vascular Plant	Floating Plant (f)	*Potamogeton pusillus*	Slender Pondweed	G5	S4S5	—	—	—	Unknown										L	L	L	M	L	L	L	L																				
Grass	Floating Plant (f)	*Potamogeton richardsonii*	Redheadgrass	G5	S5	—	—	—	Unknown										M																												
Vascular Plant	Floating Plant (f)	*Potamogeton robbinsii*	Flatleaf Pondweed	G5	S4S5	—	—	—	Unknown										L	L	M	M	M																								
Vascular Plant	Floating Plant (f)	*Potamogeton sp.*	Leafy Pondweed	—	—	—	—	—	Unknown										M	L	M	H	L																								
Vascular Plant	Floating Plant (f)	*Potamogeton vaseyi*	Vasey's pondweed	G5	S4	—	—	—	Unknown										L		L	M	L																								
Vascular Plant	Ground Cover (gc)	*Potentilla recta*	*Sulphur Cinquefoil	GNR	SNA	—	—	—	Unknown																																						
Shrub	Tall Shrub (ts)	*Prunus pensylvanica*	Pin Cherry	G5	S5	—	—	—	Common	L	L	L	L	L	L	L	L	L																														
Shrub	Tall Shrub (ts)	*Prunus virginiana*	Choke Cherry	G5	S5	—	—	—	Occasional	L	L	L	L	L	L	L	L																									L	L	L	L	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Pyrola sp.*	Pyrola Sp.			—	—	—	Unknown	L	L	L	L	M	M	M	M	M																														
Fern	Ground Cover (gc)	*Pteridium aquilinum*	Bracken Fern	G5	S5	—	—	—	Unknown	M	M	M	M	M	M	M	M	M																														
Moss	Moss (m)	*Ptilium crista-castrensis*	Plume Moss	G5	S5	—	—	—	Unknown	L	L	L	M	M	H	H	H	H																														
Vascular Plant	Broad-leaved Emergent (be)	*Ranunculus flammula*	Creeping Spearwort	G5	S5	—	—	—	Very Common										L	L	L	L	L																								
Shrub	Tall Shrub (ts)	*Rhamnus alnifolia*	Alderleaf Buckthorn	G5	S5	—	—	—	Scarce					L	L	L	L	L											L	L									L	L	L	L	L	L	L	L	L	L
Sedge	Narrow-leaved Emergent (ne)	*Rhynchospora alba*	White Beakrush	G5	S5	—	—	—	Common																			L	L	M	M	L	L	L												
Moss	Moss (m)	*Rhytidiadelphus triquetrus*	Electofied Cattail Moss	G5	S5	—	—	—	Unknown	L	L	L	M	M	M	M	M	M																					L	L	L	L	L	L	L	L	L	L
Shrub	Low Shrub (ls)	*Ribes glandulosum*	Skunk Currant	G5	S5	—	—	—	Occasional							L	L	L																													
Shrub	Low Shrub (ls)	*Ribes hudsonianum*	Northern Black Currant	G5	S5	—	—	—	Scarce					L	L	L	L	L																									L	L	L	L	L	L
Shrub	Low Shrub (ls)	*Ribes triste*	Swamp Red Currant	G5	S5	—	—	—	Occasional					L	L	L	L	L																							L	L	M	M	M	M	M	M	L	L
Shrub	Low Shrub (ls)	*Rosa acicularis*	Prickly Rose	G5	S5	—	—	—	Common	M	M	M	M	M	L	L	L	L																														
Shrub	Low Shrub (ls)	*Rubus idaeus*	Common Red Raspberry	G5T5	SNA	—	—	—	Common	L	L	L	L	M	M	M	M	M																									L	M	L	L	M	M	M	M
Vascular Plant	Broad-leaved Emergent (be)	*Rumex sp.*	Dock sp.			—	—	—	Unknown																																					L	L
Shrub	Low Shrub (ls)	*Rubus pubescens*	Catherinettes Berry	G5	S5	—	—	—	Very Common					L	L	L	L	L																									L	M	M	M	M	M	M	M	L	M
Vascular Plant	Broad-leaved Emergent (be)	*Sagittaria latifolia*	Broadleaf Arrowhead	G5	S5	—	—	—	Very Common										L	L	M	M	M	H	H	M	M																L	L	L	L	L	L
Shrub	Tall Shrub (ts)	*Salix discolor*	Pussy Willow	G5	S5	—	—	—	Common																																				L	L	L	L	M	H
Shrub	Low Shrub (ls)	*Salix pedicellaris*	Bog Willow	G5	S5	—	—	—	Occasional																			M	M	M	M	M	M	M	M	M	L	L	L	L	L	L	L	L	M	M
Shrub	Tall Shrub (ts)	*Salix petiolaris*	Meadow Willow	G5	S5	—	—	—	Occasional																																			L	L	L	L		L	H
Shrub	Tall Shrub (ts)	*Salix pyrifolia*	Balsam Willow	G5	S5	—	—	—	Common																				M	L				L				L	L	M	L	L	L	L	L	L	H
Shrub	Tall Shrub (ts)	*Salix sp.*	Willow	—	—	—	—	—	Unknown																																						M
Shrub	Tall Shrub (ts)	*Sambucus pubens*	Red Elderberry	G5	S5	—	—	—	Occasional																																		L	L	L	L	L	L	L	L
Vascular Plant	Ground Cover (gc)	*Sarracenia purpurea*	Northern Pitcher-plant	G5	S5	—	—	—	Occasional																						M	M	M	M	M	M	M									
Vascular Plant	Ground Cover (gc)	*Scheuchzeria palustris*	Pod Grass	G5	S4S5	—	—	—	Unknown																					L	L	L	L	L	L	L	L									
Rush	Robust Emergent (re)	*Schoenoplectus acutus*	Hard-stem Club-rush	G5	S5	—	—	—	Occasional										L	M	M	M	M	M	M	L	L																				
Rush	Robust Emergent (re)	*Schoenoplectus tabernaemontani*	Soft-stem Club-rush	G5	S5	—	—	—	Common										L	M	M	M	M	M	M	L	L																				
Rush	Robust Emergent (re)	*Scirpus atrovirens*	Dark-green Bulrush	G5?	S5	—	—	—	Occasional																		L	L																		L	L
Sedge	Narrow-leaved Emergent (ne)	*Scirpus cyperinus*	*Woolgrass	G5	S5	—	—	—	Common																		M	M																		L	L
Sedge	Narrow-leaved Emergent (ne)	*Scirpus microcarpus*	*Red-tinge Bulrush	G5	S5	—	—	—	Unknown																	M	M	L	L																	L	L
Moss	Moss (m)	*Scorpidium scorpoides*	Hooked Scorpion Tail Moss	G5	S5	—	—	—	Unknown																		L	L	L	M	L	L	L												
Vascular Plant	Ground Cover (gc)	*Scutellaria galericulata*	Hooded Skullcap	G5	S5	—	—	—	Very Common																	L	M	L	L	L	L									L	L	L	L	L	L	M	M
Moss	Moss (m)	*Selaginella rupestris*	Ledge Spike-moss	G5	S5	—	—	—	Occasional	L	L																																				
Shrub	Low Shrub (ls)	*Shepherdia canadensis*	Canada Buffalo-berry	G5	S5	—	—	—	Scarce			L	L	L	L	L																															
Vascular Plant	Broad-leaved Emergent (be)	*Sium suave*	Hemlock Water-parsnip	G5	S5	—	—	—	Common												L	M	L	M	L	M	M																				
Vascular Plant	Ground Cover (gc)	*Solidago canadensis*	*Canada Goldenrod	G5T5	S5	—	—	—	Unknown	L	L	L	L	L	L	L	L	L								L	M																		L	L
Vascular Plant	Ground Cover (gc)	*Solidago uliginosa*	Bog Goldenrod	G4G5	S5	—	—	—	Very Common																	L	L	L	L	M	L	L	L						M	L	L	L				

TABLE 3
Plant Species in the Local Study Area

Type	Form (Form Symbol)	Scientific Name	Common Name	G-Rank	S-Rank	COSEWIC	ESA	SARA	Local Rarity in Quetico (Common, Occasional and Rare)	Upland and Wetland Ecosite Classification Codes																																				
										ES-A	ES-B	ES-C	ES-D	ES-E	ES-F	ES-G	ES-H	ES-I	W1	W2	W3	W4	W5	W10	W11	W12	W13	W14	W15	W16	W18	W19	W20	W21	W22	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36
Shrub	Tall Shrub (ts)	*Sorbus americana*	American Mountain-ash	G5	S5	—	—	—	Common	L	L	M	M	H	H	M	M	M																							L	L	L	L	L	L		
Shrub	Tall Shrub (ts)	*Sorbus decora*	Northern Mountain-ash	G4G5	S5	—	—	—	Common	L	L	L	M	M	M	M	M	M																							L	L	L	L	L	L	L	L
Vascular Plant	Robust Emergent (re)	*Sparganium angustifolium*	Many-stalked Burweed	G5	S4	—	—	—	Unknown										L	L	L	L	L	L	L																						
Vascular Plant	Robust Emergent (re)	*Sparganium emersum*	Common Bur-reed	G5	S5	—	—	—	Unknown															M	M	L	L	L	L	L	L																
Vascular Plant	Floating Plant (f)	*Sparganium fluctuans*	Floating Bur-reed	G5	S4	—	—	—	Unknown										M	M	M	M	M	M	L																						
Vascular Plant	Broad-leaved Emergent (be)	*Sparganium natans*	Small Bur-reed	G5	S5	—	—	—	Unknown															L	L	L	L																				
Moss	Moss (m)	*Sphagnum sp.*	Spagnum	—	—	—	—	—	Unknown	L	L	L	L	L	M	M	M	M							L	L	H	H	H	H	H	H	H	H	H	H	H	H	M	M	M	M	M	M	L	L
Shrub	Low Shrub (ls)	*Spirea alba*	White Meadowsweet	G5	S5	—	—	—	Common																L	M	L	L																		L	M
Vascular Plant	Ground Cover (gc)	*Streptopus lanceolatus*	Rose Twisted-stalk	G5	S5	—	—	—	Common	L	L	L	M	M	M	M	M	M																														
Vascular Plant	Ground Cover (gc)	*Symphyotrichum lanceolatum*	Panicled Aster	G5	S5	—	—	—	Unknown																L	L																				L	L
Vascular Plant	Ground Cover (gc)	*Symphyotrichum puniceum*	Swamp Aster	G5	S5	—	—	—	Common																L	M																	L	L	L	L	L	L	M	M
Vascular Plant	Ground Cover (gc)	*Thalictrum pubescens*	Tall Meadow-rue	G5	S5	—	—	—	Common																																	L	L	L	L	L	L	L	L
Fern	Ground Cover (gc)	*Thelypteris palustris*	Marsh Fern	G5	S5	—	—	—	Scarce																L	M	L	L	L	L	L	L															
Moss	Moss (m)	*Thuidium delicatulum*	Fern Moss	G5	S5	—	—	—	Unknown	L	L	L	L	H	H	M	H	H																							M	M	H	H	H	H	H	H	L	
Tree	Coniferous Tree (c)	*Thuja occidentalis*	Eastern White Cedar	G5	S5	—	—	—	Sparse	M	L	L	M	L	L	L	L	H												M				L							M	M	H	H				
Vascular Plant	Ground Cover (gc)	*Triadenum fraseri*	Marsh St. John's Wort	G5	S5	—	—	—	Unknown															L	L	M	L	L	L																	
Sedge	Narrow-leaved Emergent (ne)	*Trichophorum alpinum*	Alpine Leafless-bullrush	G5	S5	—	—	—	Unknown																M	M	M	M	M	M	M	M	M	L	L												
Vascular Plant	Ground Cover (gc)	*Trientalis borealis*	Northern Starflower	G5	S5	—	—	—	Common	M	M	M	M	M	M	M	M	M																														
Vascular Plant	Ground Cover (gc)	*Trifolium hybridum*	*alsike Clover	SNR	GNR	—	—	—	Occasional																																							
Vascular Plant	Ground Cover (gc)	*Trillium cernuum*	Nodding Trillium	G5	S5	—	—	—	Occasional					M	L	L																																
Vascular Plant	Robust Emergent (re)	*Typha latifolia*	Broad-leaf Cattail	G5	S5	—	—	—	Occasional										L	L	L	L	L	M	H	M	L																			L	L
Tree	Deciduous Tree (h)	*Ulmus americana*	American Elm	G5	S5	—	—	—	Occasional					L																															M	M		
Lichen	Lichen (l)	*Usnea hirta*	Old Man Beard	—	—	—	—	—	Unknown	M	M	M	M	M	M	M	M	M												M				M		M	M	M	M	M	M	M	M	L	L	L	
Vascular Plant	Submerged Plant (su)	*Utricularia intermedia*	Flatleaf Bladderwort	G5	S5	—	—	—	Occasional										L	L	M	L	L	M	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L							
Vascular Plant	Submerged Plant (su)	*Utricularia vulgaris*	Greater Bladderwort	G5	S5	—	—	—	Common										M																												
Shrub	Low Shrub (ls)	*Vaccinium angustifolium*	Late Lowbush Blueberry	G5	S5	—	—	—	Common	M	M	M	M	M	M	M	M	M																														
Shrub	Low Shrub (ls)	Vaccinium myrtilloides	Velvetleaf Blueberry	G5	S5	—	—	—	Common	M	M	M	M	M	M	M	M	M																														
Shrub	Low Shrub (ls)	*Vaccinium oxycoccos*	Small Cranberry	G5	S5	—	—	—	Common																					M	M	M	M	M	M	M	M										
Vascular Plant	Floating Plant (f)	*Vallisneria americana*	Eel-grass	G5	S5	—	—	—	Occasional										L	L	L	L	L																								
Shrub	Tall Shrub (ts)	*Viburnum opulus var. americanum*	Highbush Cranberry	G5T5	S5	—	—	—	Occasional																																	L	L			L	L	M	M
Vascular Plant	Ground Cover (gc)	*Viola renifolia*	Kidney-leaf White Violet	G5	S5	—	—	—	Occasional					L	M	L	M	M																							L	L	M	M	M				
Vascular Plant	Ground Cover (gc)	*Viola sp.*	Violet	—	—	—	—	—	Unknown	L	L	L	M	M	M	M	M	M																									L	L	L	L	L	L	L	L
Grass	Narrow-leaved Emergent (ne)	*Zizania palustris*	Wild Rice	G4G5T4T5	S4	—	—	—	Scarce															L																								
TOTAL # of Plant species recorded										74	73	79	87	116	113	114	113	93	33	26	32	33	36	34	35	68	72	52	55	55	57	50	40	37	40	27	30	25	48	48	80	85	90	86	72	72	79	78

Notes:

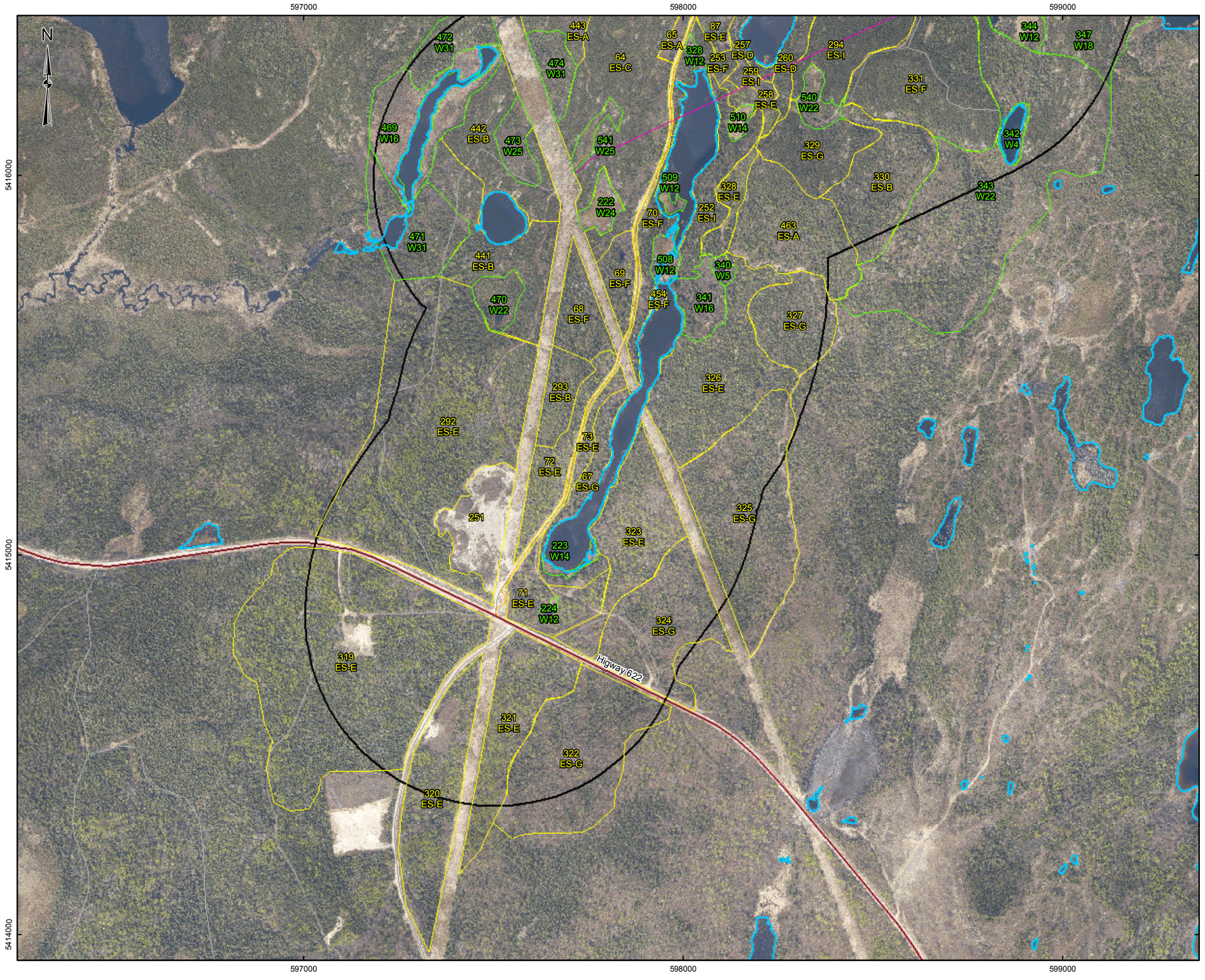
* = Exotic or colonizer of disturbed areas; often not ecosite-specific.

— = No rank assigned; not designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); not designated under the Ontario *Endangered Species Act* (ESA); not designated under the Canada *Species at Risk Act* (SARA).

ES-A = Red Pine-White Pine-Jack Pine: Very Shallow Soil.
ES-B = Black Spruce-Jack Pine: Very Shallow Soil.
ES-C = Jack Pine-Conifer: Dry-Moderately Fresh, Sandy Soil.
ES-D = Red Pine-White Pine.
ES-E = Hardwood-Fir-Spruce Mixedwood.
ES-F = Fir-Spruce-Mixedwood.
ES-G = Pine-Spruce Mixedwood: Sandy Soil.
ES-H = Spruce-Pine/Feather-moss.
ES-I = White Cedar: Fresh-Moist, Course-Fine Loamy Soil.
W1 = Open Water Marsh: Mineral Substrate.
W2 = Open Water Marsh: Pipewort-Water Lobelia: Mineral Substrate.
W3 = Open Water Marsh: Mixed: Organic Substrate.
W4 = Open Water Marsh: Floating-leaved Plants.
W5 = Marsh: Mixed: Mineral Substrate.
W10 = Marsh:Mixed: Organic Substrate.
W11 = Marsh: Cattail.
W12 = Meadow Marsh: Tall Sedge.
W13 = Meadow Marsh: Blue-joint Grass.
W14 = Open Graminoid Shore Fen: Wire Sedge.
W15 = Low Shrub Shore Fen: Leatherleaf-Sweet Gale/Graminoid.
W16 = Tall Shrub Shore Fen: Speckled Alder-Willow/Dwarf Brich/Ericaceous Shrub.
W18 = Moderately Rich Fen: Tamarack-Black Spruce/Ericaceious Shrub.
W19 = Moderately Rich Fen: Graminoid.
W20 = Poor Fen: Ericaceous Shrub/Wire sedge/Sphagnum.
W21 = Poor Fen: Ericaceous Shrub/Sphagnum.
W22 = Poor Fen: black Spruce-Tamarack/Ericaceous Shrub/Sphagnum.
W24 = Open Low Shrub Bog: Ericaceous Shrub/Sphagnum.
W25 = Semi-treed Bog: Black Spruce/Ericaceous Shrub/Sphagnum.
W26 = Treed Bog: Black Spruce/Ericaceous Shrub/Sphagnum.
W27 = Poor Conifer Swamp: Black Spruce/Labrador Tea/Sphagnum.
W28 = Poor Conifer Swamp: Black Spruce/Labrador Tea/Sphagnum.
W29 = Intermediate Conifer Wamp: Black Spruce/Tall Shrub/Labrador Tea.
W30 = Intermediate Conifer Swamp: Conifer/Tall Shrub/Herb-rich.
W31 = Rich Conifer Swamp: Cedar-Tamarack (Black Spruce).
W32 = Rich Conifer Swamp: Cedar-Tamarack.
W33 = Hardwood Swamp: Black Ash (Other Hardwood): Upland Transition.
W34 = Hardwood Swamp: Black Ash (Other Hardwood): Riparian.
W35 = Thicket Swamp: Speckled Alder/Blue-joint Grass.
W36 = Thicket Swamp: Tall Willow.
H = High probability of presence/presence confirmed.
L = Low probability of presence.
M = Moderate probability of presence.
= Habitat is unsuitable for plant species.

APPENDIX 2.III

Upland Vegetation and Wetland Ecosites in the Mine and Local Study Areas



LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4,
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 1 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 1	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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598000 599000 600000

5418000 5417000

N

LEGEND

- Road
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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 2 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	ERSION 1
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CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

G:\Projects\2010\10-1118-0020_BrettResources_HammondReef\GIS\MXDs\Working\Terrestrial\DataCheck.mxd

600000 601000 602000

5421000 5420000 5419000

N

435 ES-F
454 W4
455 W4
436 ES-F
273 ES-E
272 ES-E
275 ES-E
492 W31
225 W1
274 ES-I
494 W35
286 ES-F
74 ES-F
226 W1
493 W1
287 ES-F
338 ES-G
337 ES-F
363 W16
75 ES-F
336 ES-E
227 W15
437 ES-F
270 ES-I
364 W28
438 ES-F
502 W10
269 ES-I
489 W20
359 W29
358 W20
362 W5
360 W30
271
361 W32
439 ES-F
440 ES-F
450 ES-E
356 W1
490 W35
501 W29
357 W14
491 W35
451 ES-B
335 ES-F
499 W30
498 W15
531 W4
354 W29
268 ES-F
288 ES-F
355 W10
266 ES-F
497 W25
267 ES-F
500 W34
289 ES-F
456 W3
452 ES-B
290 ES-E
504 W32
334 ES-F
507 W5
506 W32
291 ES-B
505 W31
353 W30

LEGEND

- Road
- ELC Polygon
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 3 of 22

Golder Associates
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PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 3	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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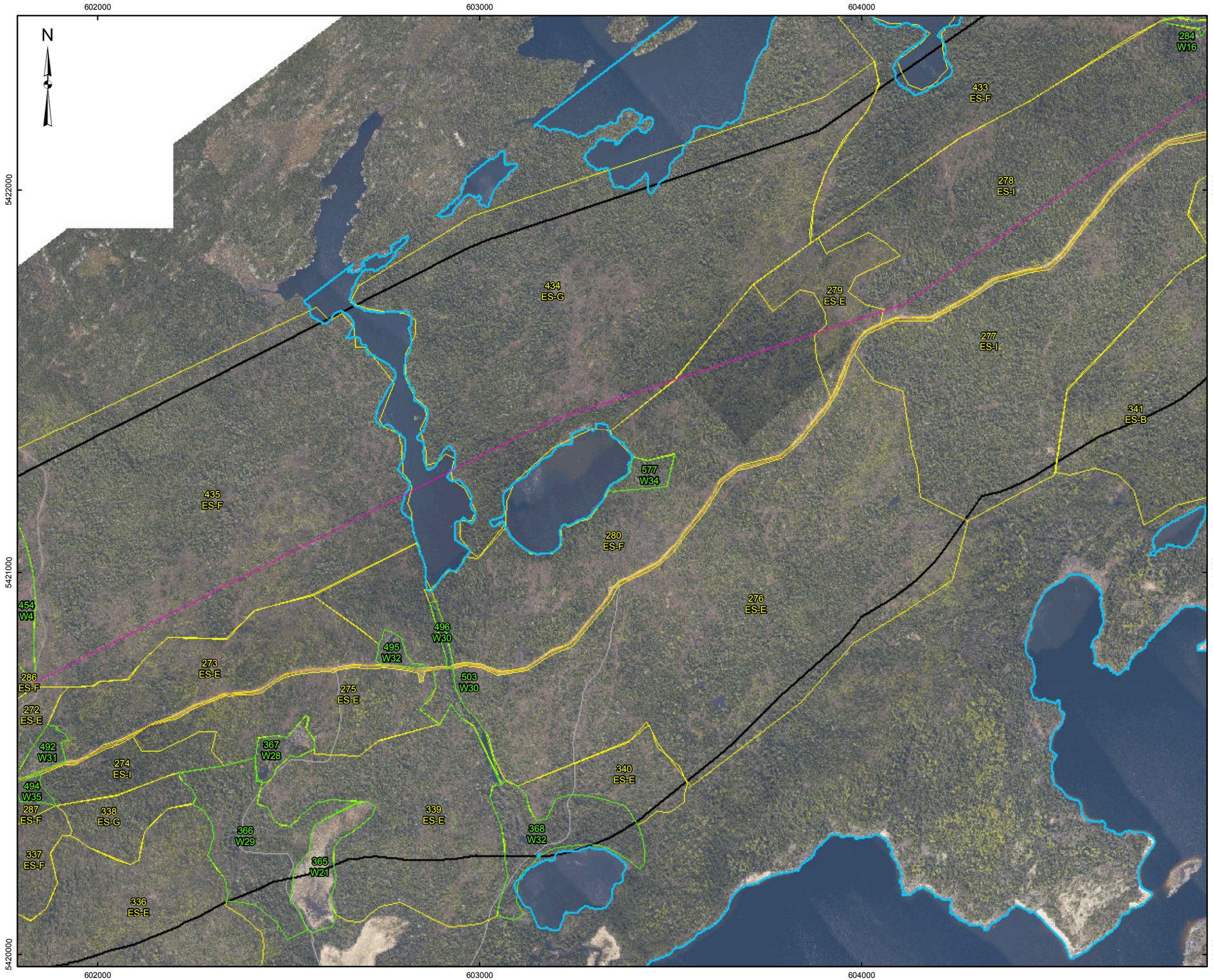

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
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250 125 0 250 500
METERS

PROJECT
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ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 4 of 22

Golder Associates
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PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
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GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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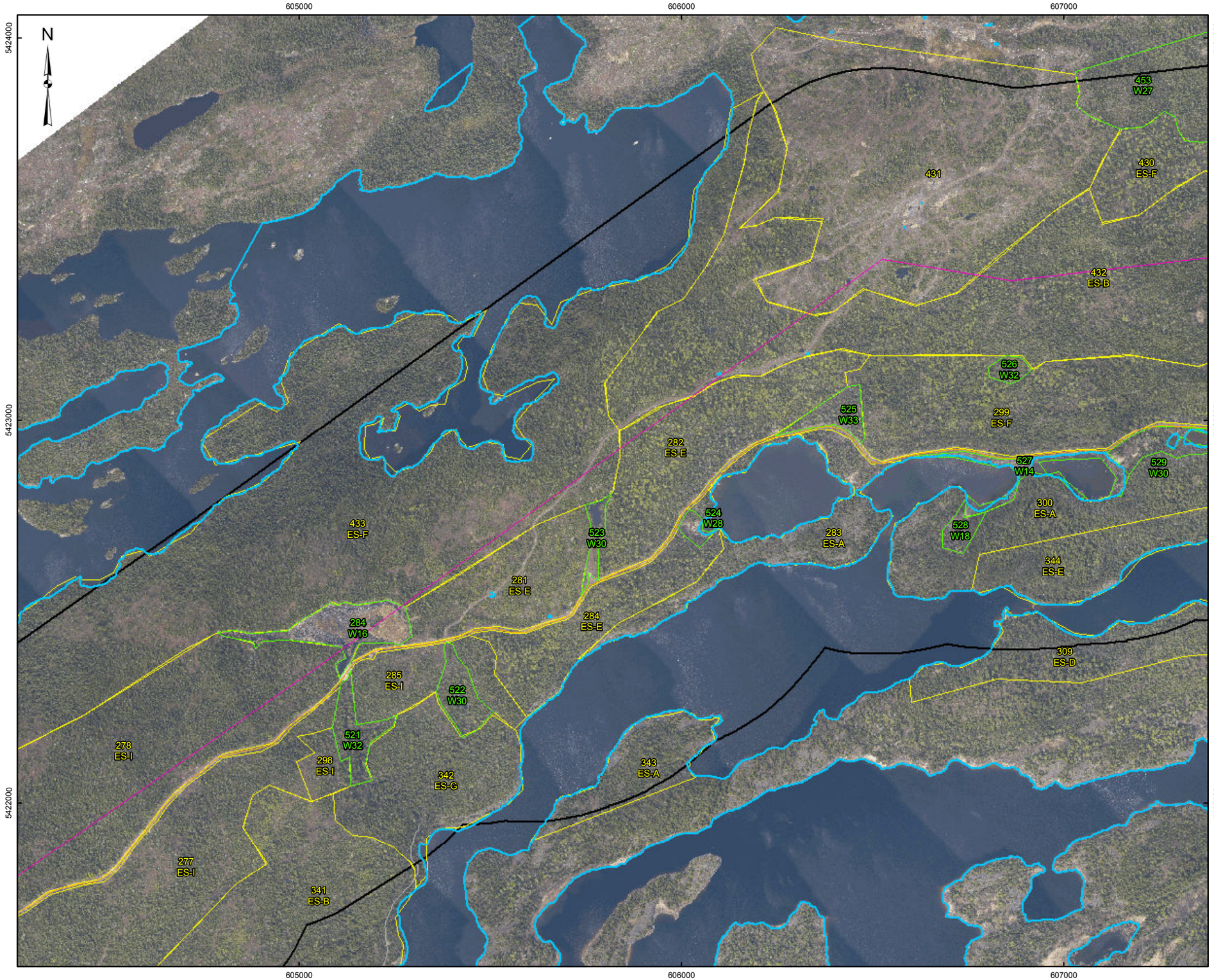

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 5 of 22

Golder Associates
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PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 5	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

G:\Projects\2010\10-1118-0020_BrettResources_HammondReef\GIS\MXDs\Working\TerrestrialDataCheck.mxd

608000 609000 610000

5424000 5423000 5422000

N

453 W27
452 W27
451 W12
429 ES-F
303 ES-E
336 W22
337 W14
335 W13
280 W32
281 W32
302 ES-E
430 ES-F
283 W32
282 W13
301 ES-E
550 W15
310 ES-C
432 ES-B
309 ES-D
299 ES-F
338 W32
339 W31
549 W14
252 W32
253 W32
529 W30
548 W14
300 ES-A
344 ES-E
311 ES-A

LEGEND

- Road
- ELC Polygon
- Wetland Complex
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 6 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 6	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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610000
611000
612000
5426000
5425000
5424000
N
449 W22
448 W4
450 W29
318 ES-H
537 W31
274 W31
272 W30
538 W30
334 W30
331 W11
331 W11
433 W16
111 ES-F
422 ES-H
113 ES-H
423 ES-F
330 W32
329 W4
275 W34
315
278 W32
314 ES-H
277 W32
276 W14
424 ES-G
112 ES-C
279 W15
429 ES-F
303 ES-E
336 W22
337 W14
335 W13
280 W32
281 W32
282 W13
550 W15
311 ES-A

LEGEND

- Road
- ELC Polygon
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 7 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 7	
GIS	JO	4 Feb. 2013		
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REVIEW	KT	4 Feb. 2013		

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611000 612000 613000

5427000 5426000

N

LEGEND

- Road
- ELC Polygon
- Wetland Complex
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REFERENCE

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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 8 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 8

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LEGEND

- Road
- ELC Polygon
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 9 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 9	
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CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

G:\Projects\2010\10-1118-0020_BrettResources_HammondReef\GIS\MXDs\Working\TerrestrialDataCheck.mxd

617000 618000 619000

5430000 5429000

N

399 ES-D
400 ES-D
393 ES-D
394 ES-D
402 W14
401 W14
395 ES-F
398 ES-F
401 ES-F
396 ES-D
397 ES-D
391 ES-F
390 ES-G
388 ES-C
389 ES-F
405 ES-D
400 W3
399 W15
398 W15
404 W15
403 W18
406 ES-D
402 ES-B
385 ES-E
71 W31
22
409 ES-H
386 ES-G
397
392 ES-E
86 W31
406 W29
404 ES-D
65 W13
405 W16
89 W31
189 ES-E
407 W30
75 W32
137 W28
92 W31
76 W13
411 ES-F
403 ES-I
135 ES-B
407 ES-H
305 ES-E
66 W33
408 W16
408 ES-F
118 W13
142 W25
412 ES-F
77 W31
70 11 W1
117 W32
78 W13
410 ES-F
73 W32

617000 618000 619000

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LEGEND

- Road
- ELC Polygon
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 10 of 22

Golder Associates
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PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
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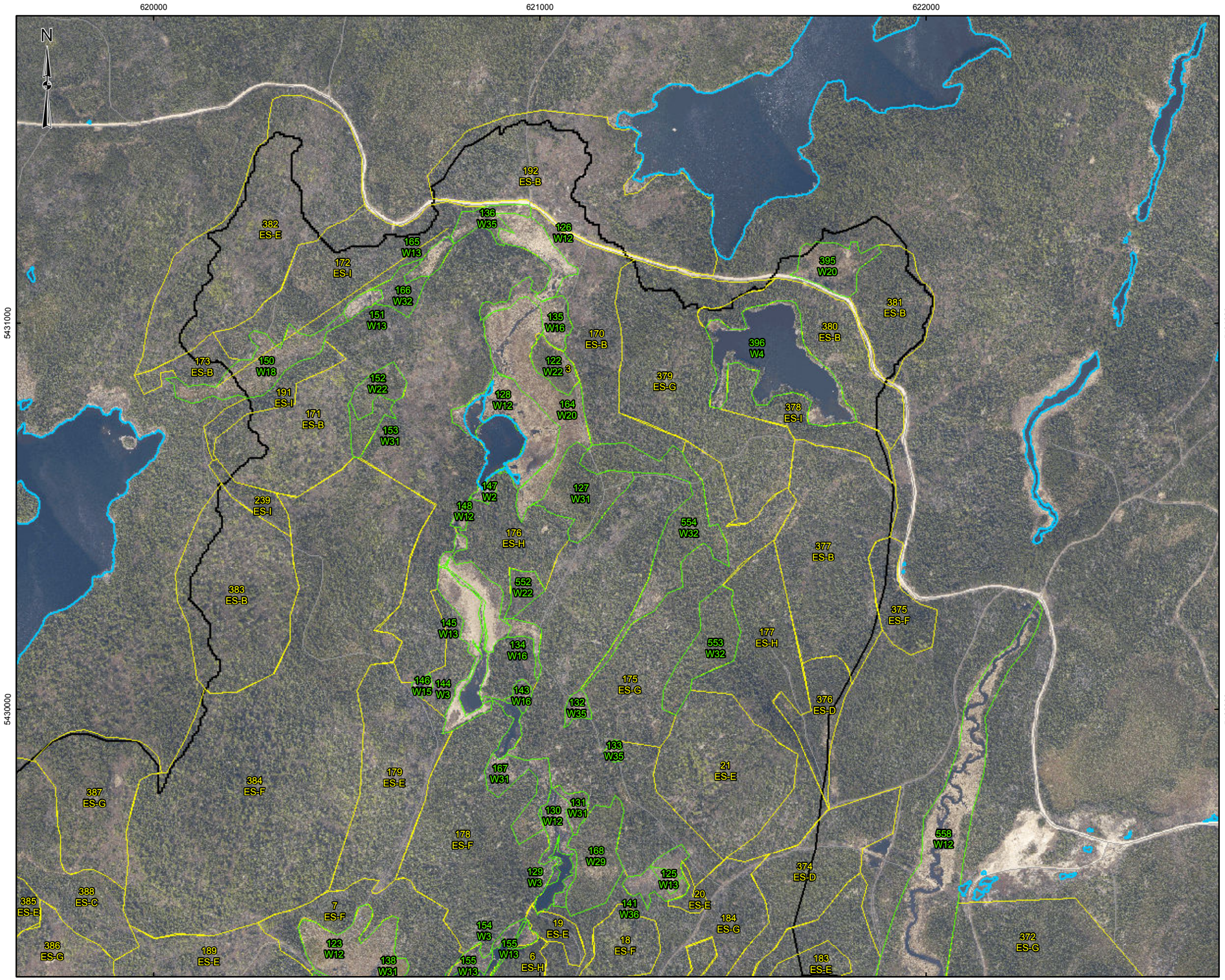

LEGEND

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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 11 of 22

Golder Associates
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PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 11	
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CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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620000 621000 622000

5429000 5428000 5427000

385 ES-E
388 ES-C
384 ES-F
189 ES-E
386 ES-G
123 W12
7 ES-F
155 W13
19 ES-E
18 ES-F
154 W3
155 W13
374 ES-D
138 W31
6 ES-H
139 W31
63 ES-E
124 W31
559 W28
140 W32
558 W12
250 ES-B
249 ES-A
190 ES-1
163 W22
156 W32
183 ES-E
184 ES-G
157 W22
98 ES-H
162 W32
159 W35
96 ES-H
4
5 ES-H
97 ES-H
193 ES-H
182 ES-C
158 W25
137 W28
90 W27
91 W29
161 W25
186 ES-I
160 W14
555 W18
142 W25
185 ES-B
187 ES-B
372 ES-G
100 W29
556 W15
101 W13
104 ES-H
102 W18
99 W20
105 ES-B
181 ES-G
536 W29
245 W29
557 W27
238 ES-H
94 W24
394 W14
93 W29
241 ES-B
64 W27
103 W19
64 W27

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 12 of 22

Golder Associates
Mississauga, Ontario

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CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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617000 618000 619000

5428000 5427000 5426000

411 ES-F
410 ES-F
408 ES-F
407 ES-H
403 ES-I
118 W13
70 W1
11
189 ES-E
77 W31
78 W13
142 W25
103 ES-E
12 ES-G
72 W12
73 W32
187 W12
188 W12
69 W4
189 W12
79 W31
102 ES-E
115 W35
248 ES-I
112 W22
185 ES-B
100 W29
102 W18
100 W29
117 W32
305 ES-E
413 ES-G
113 W22
116 W31
101 ES-E
8 ES-E
99 W20
105 ES-B
99 W20
80 W31
87 W32
114 W19
181 ES-G
188 ES-B
532 W31
534 W22
88 W22
100 ES-B
197 W12
172 W5
9
102 W18
99 ES-G
195 ES-I
93 W29
241 ES-B
175 W12
530 W28
23 ES-E
10 177 W4
477 W12
94 W24
180 ES-E
85 W31
67 W13
96 W31
103 W19
119 W36
98 W31
95 W31
84 W31
83 W36
82 W16
81 W11
97 W31
232 ES-H
456
110 W22
560 W27
230 ES-E
561 W28
196 ES-F
13
14 ES-B
74 W30
231 ES-E
89 ES-B
120 W10
229 ES-E
68 W3
194 ES-1
121 W1
237 W32
108 W22
111 W22
567 W22
106 W20
199 W12
90 ES-B
242 ES-I
393 W18

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
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- Project Facilities
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Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4,
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 13 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 13

G:\Projects\2010\10-1118-0020_BrettResources_HammondReef\GIS\MXDs\Working\Terrestrial\DataCheck.mxd

620000
621000
622000
5426000
5425000

N

93 W29
97 W31
103 W19
64 W27
241 ES-B
104 W15
105 W1
373 ES-C
97 W31
74 W30
89 ES-B
194 ES-1
106 W20
372 ES-G
108 W22
393 W18
369 ES-H
370 ES-G
367 ES-G
368 ES-H
364 ES-E
366 ES-H
371 ES-B
389 W26
365 ES-E
361 ES-H
387 W15
388 W35

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4,
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 14 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 14	
GIS	JO	4 Feb. 2013		
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REVIEW	KT	4 Feb. 2013		

G:\Projects\2010\10-1118-0020_BrettResources_HammondReef\GIS\MXDs\Working\Terrestrial\DataCheck.mxd

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
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PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 15 of 22

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PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 15	
GIS	JO	4 Feb. 2013		
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REVIEW	KT	4 Feb. 2013		

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LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
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- Project Facilities
- Terrestrial Local Study Area

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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 16 of 22

Golder Associates
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PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 16	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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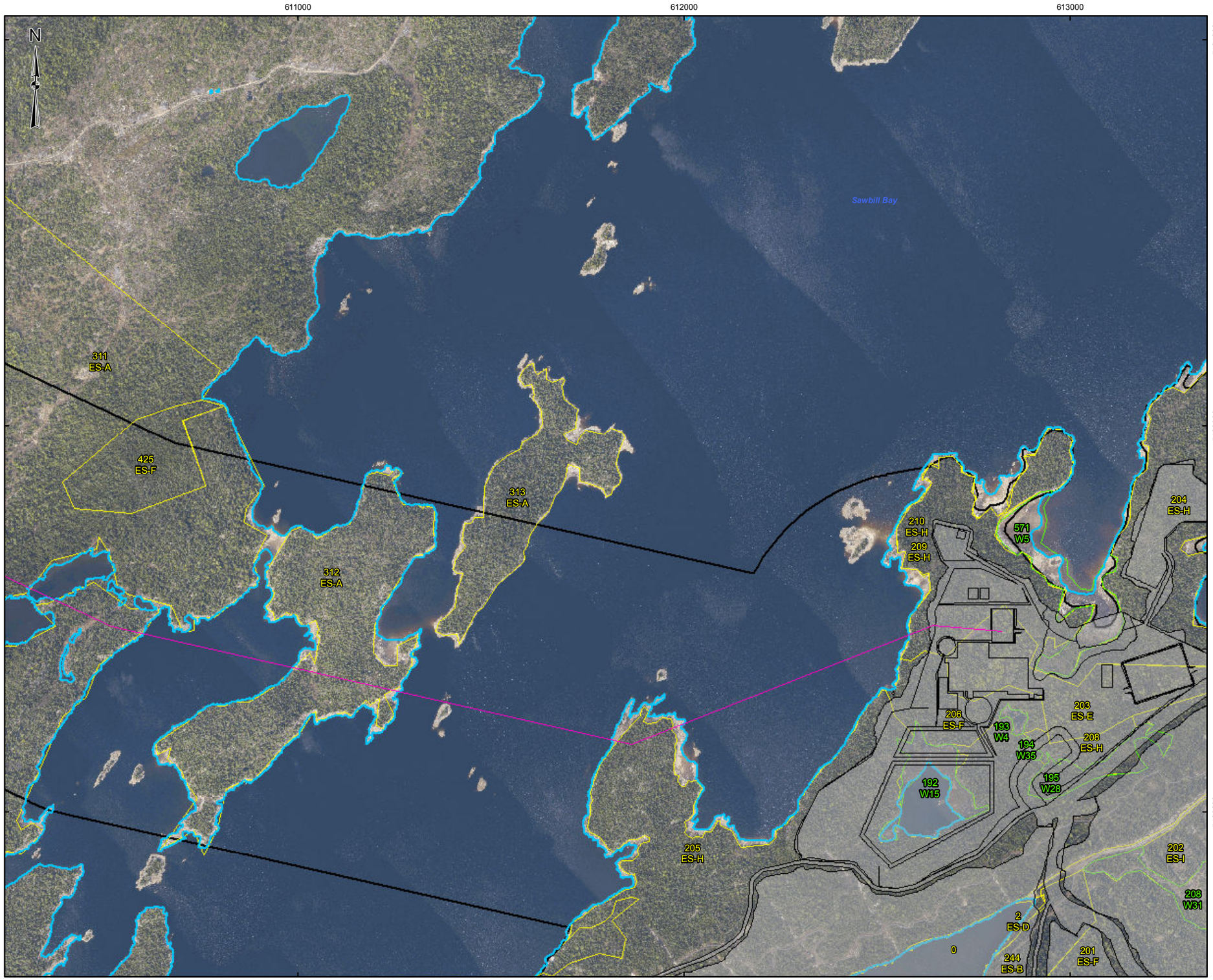

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
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TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 17 of 22

Golder Associates
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PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 17	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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LEGEND

- Road
- ELC Polygon
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- Mine Site Road
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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 18 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 18	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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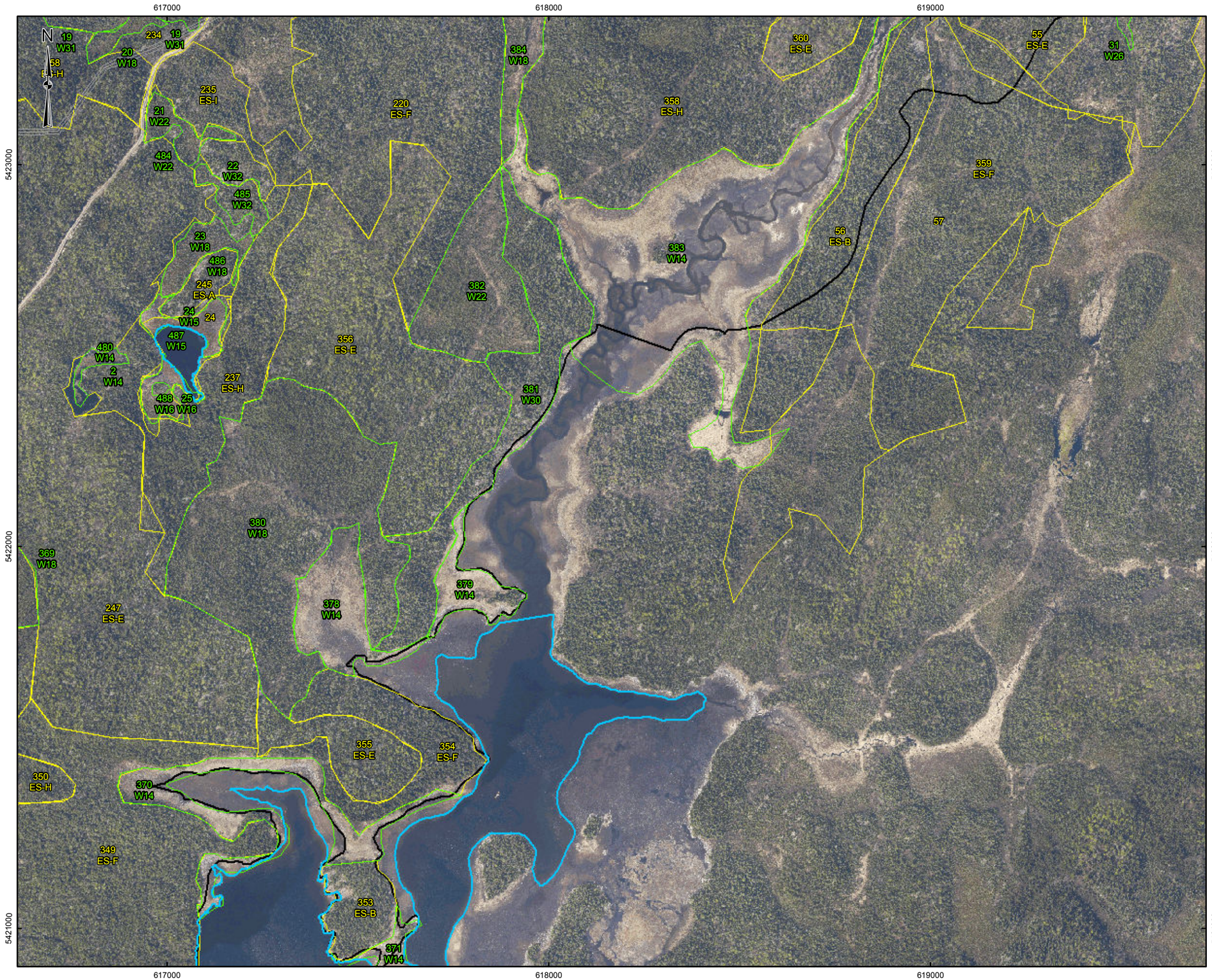

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 19 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 19	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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620000
621000
622000
5424000
5423000

N

389 W26
365 ES-E
388 W35
392 W32
361 ES-H
387 W15
366 ES-H
363 ES-F
362 ES-F
31 W26
60 W25
59 W26
168 ES-E
56 ES-B
167 ES-B
57
359 ES-F

LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 20 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 20	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

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250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 21 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 21	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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LEGEND

- Road
- ELC Polygon
- Wetland Complex
- Open Water
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Terrestrial Local Study Area

REFERENCE

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Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

250 125 0 250 500
METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
UPLAND VEGETATION AND WETLAND ECOSITES
IN THE MINE AND LOCAL STUDY AREAS
MAP SHEET 22 of 22

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 22	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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APPENDIX 2.IV

Landbird Priority Species in Bird Conservation Region 12

Landbird Priority Species

Of the 82 bird species observed during the breeding bird point counts, 21 are identified as priority species in the *Ontario Landbird Conservation Plan: Boreal Hardwood Transition, North American Bird Conservation Region 12* (PIF 2008). This plan was developed through the collaborative efforts of Partners in Flight (PIF), the Ontario Ministry of Natural Resources (OMNR), Bird Studies Canada (BSC), and Environment Canada (EC) and is intended to help guide conservation efforts in the boreal hardwood transition zone.

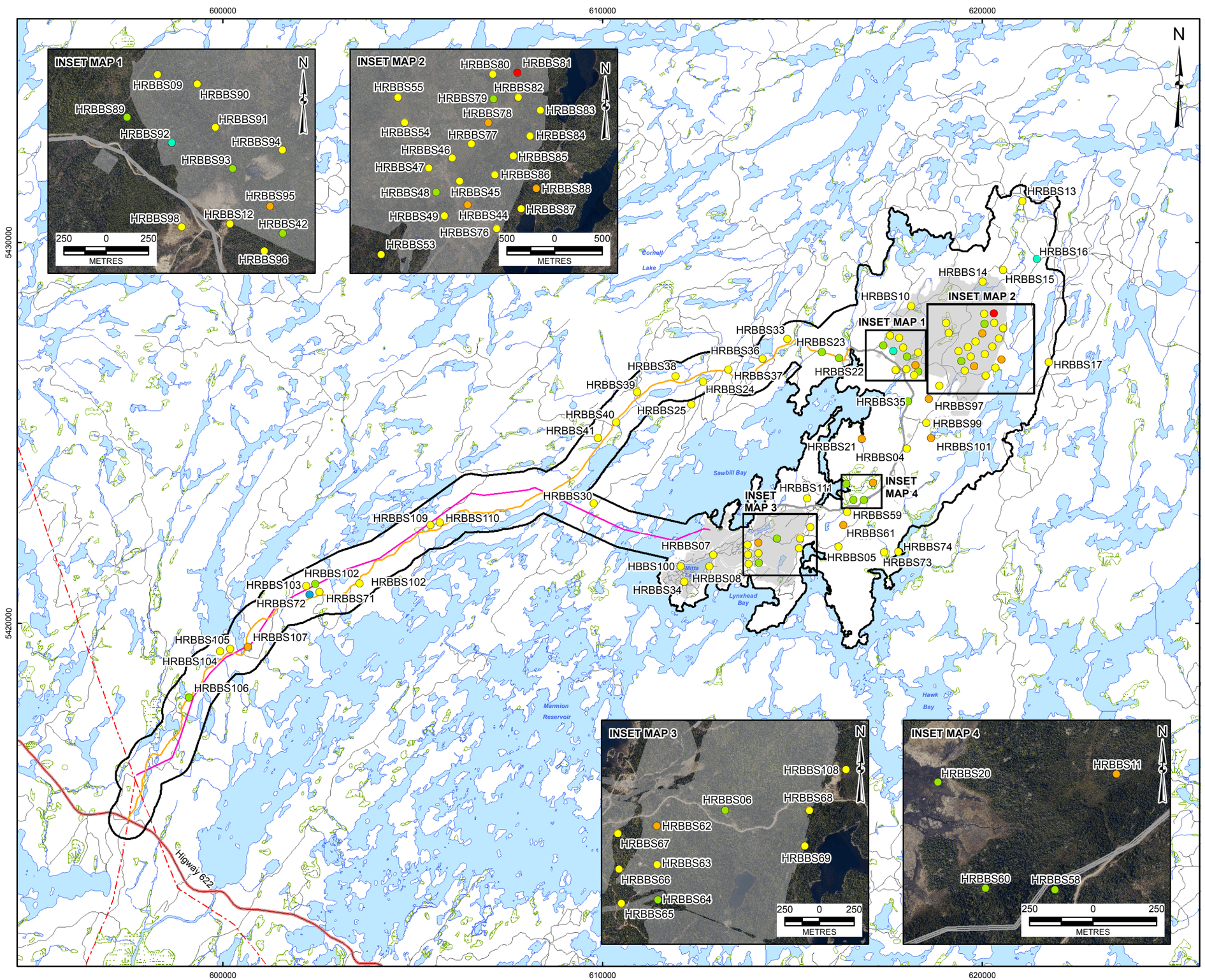
Landbirds are identified as priority species within geographically delineated Bird Conservation Regions (BCR) due to a number of variables including: population declines, vulnerability to developing threats on breeding or wintering grounds, and species with small global ranges. The Hammond Reef study area is located within BCR 12, the Boreal Hardwood Transition.

The following 21 Priority Landbird Species for BCR 12 were observed within the Local Study Area:

- Bald eagle (*Haliaeetus leucocephalus*).
- Common nighthawk (*Chordeiles minor*).
- Broad-winged hawk (*Buteo platypterus*).
- Connecticut warbler (*Oporornis agilis*).
- Belted kingfisher (*Ceryle alcyon*).
- Ruffed grouse (*Bonasa umbellus*).
- Canada warbler (*Cardellina canadensis*).
- Blackburnian warbler (*Setophaga fusca*).
- Purple finch (*Carpodacus purpureus*).
- Chestnut-sided warbler (*Setophaga pensylvanica*).
- Bay-breasted warbler (*Setophaga castanea*).
- Least flycatcher (*Empidonax minimus*).
- Yellow-bellied sapsucker (*Sphyrapicus varius*).
- Veery (*Catharus fuscescens*).
- Black-throated green warbler (*Setophaga virens*).
- Mourning warbler (*Oporornis Philadelphia*).
- Common yellowthroat (*Geothlypis trichas*).
- Swamp sparrow (*Melospiza Georgiana*).
- Northern flicker (*Colaptes auratus*).
- Nashville warbler (*Oreothlypisa ruficapilla*).
- White-throated sparrow (*Zonotrichia albicollis).*

Relative Abundance of Priority Landbird Species

Relative abundance is a measure of the number of individuals of one species as a percentage of the total number of individuals of all species within a community. Analysis of the breeding bird point count data revealed the relative abundance of priority landbird species observed across the Local Study Area (LSA) as a whole (Figure 1) and within each of the representative habitat types surveyed (Figure 2). The point count method used recorded birds observed within three distance categories: 0 to 50 metres, 50 to 100 metres, and beyond 100 metres. For the calculations of relative abundance, only birds observed within the 50-metre category were considered.



LEGEND

- Provincial Highway
- Trail
- Road
- Power Transmission Line
- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities
- Local Study Area

% Abundance of Priority Landbird Species

- <5%
- 6-10%
- 11-25%
- 26-50%
- 51-75%
- 76-100%

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
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1,000 0 1,000 2,000 3,000 4,000
SCALE 1:100,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
ABUNDANCE OF PRIORITY LANDBIRD SPECIES AT UPLAND BREEDING BIRD SURVEY STATIONS

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 1	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

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Relative Abundance across all Habitat Types

Calculated relative abundances across all habitat types, as well as for each individual habitat type in the LSA are presented in Table 1. The species found to have the highest relative abundance within the Hammond Reef study area as a whole was the white-throated sparrow, which accounted for 12.24% of all birds observed within 50 m of the observer. The Nashville warbler was found to have the second highest relative abundance within the study area as a whole, accounting for 11.33% of all birds observed within 50 m of the observer. White-throated sparrows and Nashville warblers are common in the region and were both recorded at 87.27% of all point counts. The priority bird species most commonly observed at point count stations are presented in Table 2. The swamp sparrow was ranked a distant third in relative abundance accounting for 1.95% of all birds within 50 m. No other priority species accounted for more than 2% of relative abundance.

The white-throated sparrow has priority status within BCR 12 because a high percentage of its global population breeds with this BCR and due to range-wide population declines of this species. The Nashville warbler has priority status within BCR 12 because of its high relative density, its small wintering range and because a high percentage of its global population breeds within the BCR.

Table 2: Relative Abundance of Most Commonly Observed Priority Species in the Various Habitat Types in the Local Study Area

Habitat Type	Species	Relative Abundance
Dense coniferous forest	white-throated sparrow	14.12%
	Nashville warbler	9.41%
	bay-breasted warbler	2.94%
Conifer swamp	Nashville warbler	16.46%
	white-throated sparrow	11.59%
Dense deciduous forest	Least flycatcher	12.86%
	veery	7.14%
	white-throated sparrow	4.29%
Dense mixed forest	white-throated sparrow	13.86%
	Nashville warbler	12.38%
	mourning warbler	3.96%
Edge	white-throated sparrow	10.64%
	Nashville warbler	8.51%
	swamp sparrow	5.32%
Marsh	white-throated sparrow	11.76%
	mourning warbler	11.76%
	northern flicker	5.88%
	common yellowthroat	5.88%
	swamp sparrow	5.88%
Open fen	swamp sparrow	17.78%
	Nashville warbler	8.89%
	white-throated sparrow	6.67%

Table 1: Relative Abundance Of Priority Species In The Various Habitat Types In The Project Local Study Area (Continued)

Habitat Type	Species	Relative Abundance
Thicket swamp	white-throated sparrow	16.67%
	Nashville warbler	16.67%
Treed bog	Nashville warbler	15.38%
	white-throated sparrow	15.38%
	Connecticut warbler	7.69%
Treed fen	white-throated sparrow	15.94%
	Nashville warbler	14.49%
	purple finch	1.45%

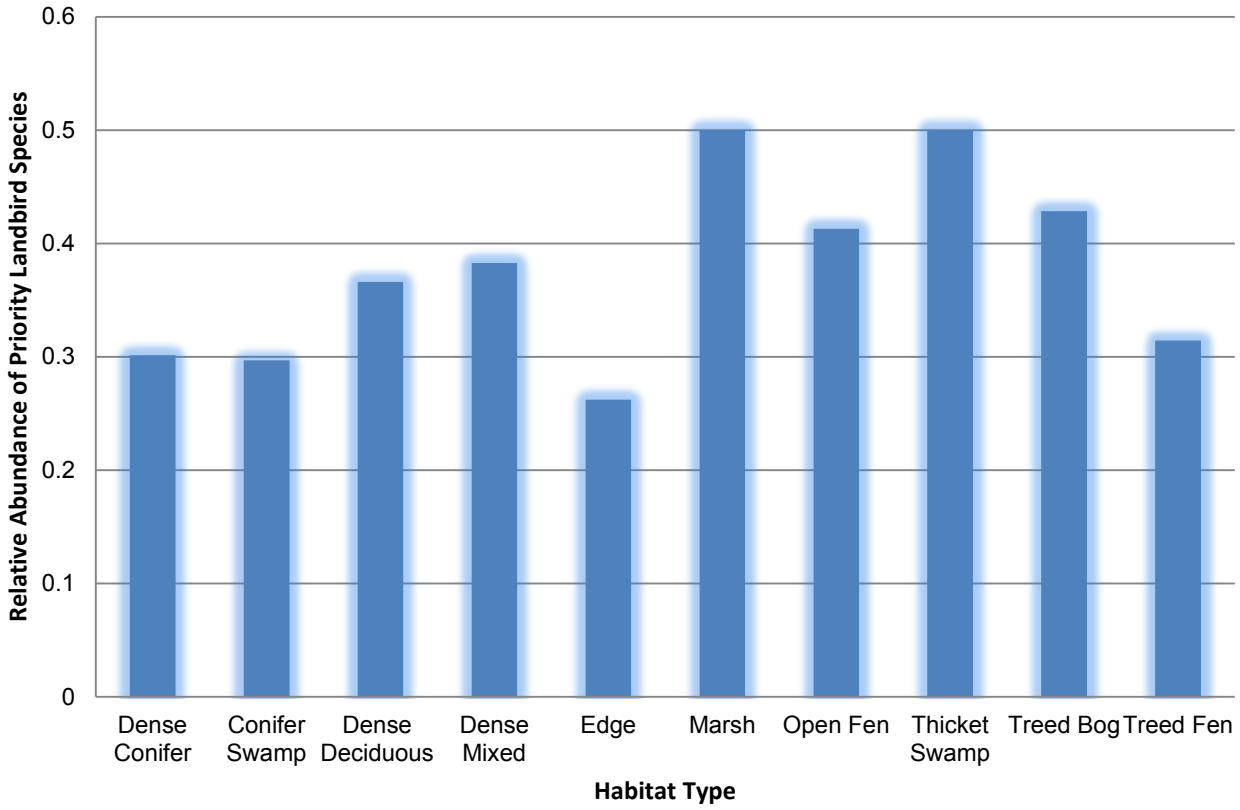

Figure 2: Relative Abundance of Priority Landbird Species by Habitat Type (observations within 50 m)

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12

All Habitats (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[(a)]**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	107	0.1224	1
Oreothlypisa ruficapilla	Nashville Warbler	99	0.1133	2
Melospiza georgiana	Swamp Sparrow	17	0.0195	3
Empidonax minimus	Least Flycatcher	12	0.0137	4
Oporornis philadelphia	Mourning Warbler	12	0.0137	4
Catharus fuscescens	Veery	10	0.0114	6
Sphyrapicus varius	Yellow-bellied Sapsucker	8	0.0092	7
Setophaga castanea	Bay-breasted Warbler	6	0.0069	8
Geothlypis trichas	Common Yellowthroat	6	0.0069	8
Wilsonia canadensis	Canada Warbler	6	0.0069	8
Setophaga virens	Black-throated Green Warbler	6	0.0069	8
Colaptes auratus	Northern Flicker	5	0.0057	12
Setophaga pensylvanica	Chestnut-sided Warbler	5	0.0057	12
Setophaga fusca	Blackburnian Warbler	4	0.0046	14
Carpodacus purpureus	Purple Finch	3	0.0034	15
Bonasa umbellus	Ruffed Grouse	1	0.0011	16
Oporornis agilis	Connecticut Warbler	1	0.0011	16

Notes:
[(a)] Total Number of All Birds in All habitats is 874.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Coniferous Forest Habitat in the Local Study Area

Dense Conifer Forest (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[(a)]**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	24	0.1412	1
Oreothlypisa ruficapilla	Nashville Warbler	16	0.0941	2
Setophaga castanea	Bay-breasted Warbler	5	0.0294	3
Setophaga fusca	Blackburnian Warbler	2	0.0118	4
Setophaga virens	Black-throated Green Warbler	2	0.0118	4
Sphyrapicus varius	Yellow-bellied Sapsucker	2	0.0118	4
Colaptes auratus	Northern Flicker	1	0.0059	7
Oporornis philadelphia	Mourning Warbler	1	0.0059	7
Wilsonia canadensis	Canada Warbler	1	0.0059	7
Carpodacus purpureus	Purple Finch	1	0.0059	7

Notes:
[(a)] Total Number of All Birds in habitat is 170.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Conifer Swamp Habitat in the Local Study Area

Conifer Swamp (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[(a)]**	**Rank (largest to smallest)**
Oreothlypisa ruficapilla	Nashville Warbler	27	0.1646	1
Zonotrichia albicollis	White-throated Sparrow	19	0.1159	2
Geothlypis trichas	Common Yellowthroat	1	0.0061	3
Melospiza georgiana	Swamp Sparrow	1	0.0061	3

Notes:
[(a)] Total Number of All Birds in habitat is 164.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Dense Deciduous Forest Habitat in the Local Study Area

Dense Deciduous (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[(a)]**	**Rank (largest to smallest)**
Empidonax minimus	Least Flycatcher	9	0.1286	1
Catharus fuscescens	Veery	5	0.0714	2
Zonotrichia albicollis	White-throated Sparrow	3	0.0429	3
Oreothlypisa ruficapilla	Nashville Warbler	2	0.0286	4
Setophaga pensylvanica	Chestnut-sided Warbler	2	0.0286	4
Sphyrapicus varius	Yellow-bellied Sapsucker	2	0.0286	4
Bonasa umbellus	Ruffed Grouse	1	0.0143	7
Oporornis philadelphia	Mourning Warbler	1	0.0143	7
Wilsonia canadensis	Canada Warbler	1	0.0143	7

Notes:
[(a)] Total Number of All Birds in habitat is 70.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Dense Mixed Forest Habitat in the Local Study Area

Dense Mixed (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[(a)]**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	28	0.1386	1
Oreothlypisa ruficapilla	Nashville Warbler	25	0.1238	2
Oporornis philadelphia	Mourning Warbler	8	0.0396	3
Catharus fuscescens	Veery	4	0.0198	4
Wilsonia canadensis	Canada Warbler	4	0.0198	4
Setophaga pensylvanica	Chestnut-sided Warbler	3	0.0149	6
Sphyrapicus varius	Yellow-bellied Sapsucker	3	0.0149	6
Setophaga virens	Black-throated Green Warbler	3	0.0149	6
Empidonax minimus	Least Flycatcher	2	0.0099	9
Setophaga fusca	Blackburnian Warbler	2	0.0099	9
Melospiza georgiana	Swamp Sparrow	1	0.0050	11
Setophaga castanea	Bay-breasted Warbler	1	0.0050	11

Notes:
[(a)] Total Number of All Birds in habitat is 202.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Edge Habitat in the Local Study Area

Edge (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[(a)]**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	10	0.1064	1
Oreothlypisa ruficapilla	Nashville Warbler	8	0.0851	2
Melospiza georgiana	Swamp Sparrow	5	0.0532	3
Colaptes auratus	Northern Flicker	2	0.0213	4
Sphyrapicus varius	Yellow-bellied Sapsucker	1	0.0106	5

Notes:
[(a)] Total Number of All Birds in habitat is 94.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Marsh Habitat in the Local Study Area

Marsh (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[(a)]**	**Rank (largest to smallest)**
Oporornis philadelphia	Mourning Warbler	2	0.1176	1
Zonotrichia albicollis	White-throated Sparrow	2	0.1176	1
Colaptes auratus	Northern Flicker	1	0.0588	3
Geothlypis trichas	Common Yellowthroat	1	0.0588	3
Melospiza georgiana	Swamp Sparrow	1	0.0588	3

Notes:
[(a)] Total Number of All Birds in habitat is 17.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Open Fen Habitat in the Local Study Area

Open Fen (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[(a)]**	**Rank (largest to smallest)**
Melospiza georgiana	Swamp Sparrow	8	0.1778	1
Oreothlypisa ruficapilla	Nashville Warbler	4	0.0889	2
Zonotrichia albicollis	White-throated Sparrow	3	0.0667	3
Geothlypis trichas	Common Yellowthroat	2	0.0444	4
Carpodacus purpureus	Purple Finch	1	0.0222	5

Notes:
[(a)] Total Number of All Birds in habitat is 45.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Thicket Swamp Habitat in the Local Study Area

Thicket Swamp (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[a]**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	5	0.1667	1
Oreothlypisa ruficapilla	Nashville Warbler	5	0.1667	1
Catharus fuscescens	Veery	1	0.0333	3
Colaptes auratus	Northern Flicker	1	0.0333	3
Geothlypis trichas	Common Yellowthroat	1	0.0333	3
Melospiza georgiana	Swamp Sparrow	1	0.0333	3

Notes:
[(a)] Total Number of All Birds in habitat is 30.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Treed Bog Habitat in the Local Study Area

Treed Bog (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[a]**	**Rank (largest to smallest)**
Oreothlypisa ruficapilla	Nashville Warbler	2	0.1538	1
Zonotrichia albicollis	White-throated Sparrow	2	0.1538	1
Oporornis agilis	Connecticut Warbler	1	0.0769	3

Notes:
(a) Total Number of All Birds in habitat is 13.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Relative Abundance of Priority Species in Bird Conservation Region 12 in Treed Fen Habitat in the Local Study Area

Treed Fen (<50 m)				
Scientific Name	**Common Name**	**Total Number**	**Relative Abundance[a]**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	11	0.1594	1
Oreothlypisa ruficapilla	Nashville Warbler	10	0.1449	2
Carpodacus purpureus	Purple Finch	1	0.0145	3

Notes:
[(a)] Total Number of All Birds in habitat is 69.

TABLE 1
Landbird Priority Species Relative Abundance and Percent Composition

Percent Composition of Landbird Priority Species Bird Conservation Region 12 in the Local Study Area

All Stations (less than and greater than 50 m)				
Scientific Name	**Common Name**	**Number of Stations Recorded At[(a)]**	**Percent Composition (%)[(b)]**	**Rank (largest to smallest)**
Zonotrichia albicollis	White-throated Sparrow	96	87.27	1
Oreothlypisa ruficapilla	Nashville Warbler	96	87.27	1
Melospiza georgiana	Swamp Sparrow	22	20.00	3
Colaptes auratus	Northern Flicker	21	19.09	4
Geothlypis trichas	Common Yellowthroat	17	15.45	5
Oporornis philadelphia	Mourning Warbler	17	15.45	5
Setophaga virens	Black-throated Green Warbler	16	14.55	7
Catharus fuscescens	Veery	14	12.73	8
Sphyrapicus varius	Yellow-bellied Sapsucker	12	10.91	9
Empidonax minimus	Least Flycatcher	11	10.00	10
Setophaga pensylvanica	Chestnut-sided Warbler	10	9.09	11
Setophaga castanea	Bay-breasted Warbler	9	8.18	12
Wilsonia canadensis	Canada Warbler	9	8.18	12
Setophaga fusca	Blackburnian Warbler	8	7.27	14
Carpodacus purpureus	Purple Finch	5	4.55	15
Ceryle alcyon	Belted Kingfisher	3	2.73	16
Oporornis agilis	Connecticut Warbler	3	2.73	16
Bonasa umbellus	Ruffed Grouse	2	1.82	18
Buteo platypterus	Broad-winged Hawk	1	0.91	19
Chordeiles minor	Common Nighthawk	1	0.91	19
Haliaeetus leucocephalus	Bald Eagle	1	0.91	19

Notes:
[(a)] Total Number of Stations is 110.
[(b)] % of stations each species was recorded at.

APPENDIX 2.V

Background Bird Resources

TABLE 1
Atlas of the Breeding Birds of Ontario Square Summary Results

Atlas Square	Species	Breeding Evidence			Point Counts			
		Max BE	Categ	#Sq	#PC	%PC	Abun	#Sq
15XQ01	Bald Eagle	NB	CONF	1	—	—	—	—
15XQ02	Ruffed Grouse	H	POSS	1	1	4.17	0.0417	1
15XQ02	Common Loon	H	POSS	1	4	16.67	0.1667	1
15XQ02	Broad-winged Hawk	S	POSS	1	—	—	—	—
15XQ02	Red-tailed Hawk	S	POSS	1	—	—	—	—
15XQ02	American Kestrel	H	POSS	1	1	4.17	0.0417	1
15XQ02	Common Snipe	S	POSS	1	1	4.17	0.0417	1
15XQ02	Herring Gull	S	POSS	1	—	—	—	—
15XQ02	Belted Kingfisher	H	POSS	1	1	4.17	0.0417	1
15XQ02	Yellow-bellied Sapsucker	S	POSS	1	1	4.17	0.0417	1
15XQ02	Hairy Woodpecker	NY	CONF	1	3	12.5	0.2083	1
15XQ02	Black-backed Woodpecker	H	POSS	1	1	4.17	0.0417	1
15XQ02	Northern Flicker	P	PROB	1	2	8.33	0.125	1
15XQ02	Olive-sided Flycatcher	S	POSS	1	2	8.33	0.0833	1
15XQ02	Yellow-bellied Flycatcher	S	POSS	1	14	58.33	0.625	1
15XQ02	Alder Flycatcher	P	PROB	1	5	20.83	0.375	1
15XQ02	Least Flycatcher	A	PROB	1	1	4.17	0.0833	1
15XQ02	Blue-headed Vireo	S	POSS	1	3	12.5	0.125	1
15XQ02	Red-eyed Vireo	S	POSS	1	12	50	0.6667	1
15XQ02	Gray Jay	H	POSS	1	2	8.33	0.0833	1
15XQ02	Blue Jay	H	POSS	1	—	—	—	—
15XQ02	American Crow	H	POSS	1	—	—	—	—
15XQ02	Common Raven	P	PROB	1	8	33.33	0.375	1
15XQ02	Black-capped Chickadee	S	POSS	1	2	8.33	0.125	1
15XQ02	Red-breasted Nuthatch	S	POSS	1	—	—	—	—
15XQ02	Winter Wren	S	POSS	1	6	25	0.25	1
15XQ02	Golden-crowned Kinglet	S	POSS	1	3	12.5	0.1667	1
15XQ02	Ruby-crowned Kinglet	S	POSS	1	7	29.17	0.2917	1
15XQ02	Veery	S	POSS	1	—	—	—	—
15XQ02	Swainson's Thrush	S	POSS	1	5	20.83	0.2917	1
15XQ02	Hermit Thrush	S	POSS	1	13	54.17	0.7917	1
15XQ02	American Robin	P	PROB	1	5	20.83	0.2083	1
15XQ02	Cedar Waxwing	P	PROB	1	3	12.5	0.2083	1
15XQ02	Nashville Warbler	P	PROB	1	21	87.5	2.125	1
15XQ02	Northern Parula	S	POSS	1	—	—	—	—
15XQ02	Chestnut-sided Warbler	S	POSS	1	2	8.33	0.0833	1
15XQ02	Magnolia Warbler	S	POSS	1	8	33.33	0.4167	1
15XQ02	Yellow-rumped Warbler	S	POSS	1	9	37.5	0.4583	1
15XQ02	Black-throated Green Warbler	S	POSS	1	—	—	—	—
15XQ02	Blackburnian Warbler	S	POSS	1	—	—	—	—
15XQ02	Palm Warbler	S	POSS	1	4	16.67	0.1667	1
15XQ02	Black-and-white Warbler	S	POSS	1	—	—	—	—
15XQ02	American Redstart	S	POSS	1	—	—	—	—
15XQ02	Ovenbird	S	POSS	1	4	16.67	0.25	1
15XQ02	Connecticut Warbler	S	POSS	1	6	25	0.25	1
15XQ02	Mourning Warbler	S	POSS	1	2	8.33	0.0833	1
15XQ02	Common Yellowthroat	S	POSS	1	1	4.17	0.0417	1
15XQ02	Chipping Sparrow	S	POSS	1	6	25	0.2917	1
15XQ02	Song Sparrow	P	PROB	1	1	4.17	0.0417	1
15XQ02	Lincoln's Sparrow	S	POSS	1	6	25	0.375	1

TABLE 1
Atlas of the Breeding Birds of Ontario Square Summary Results

Atlas Square	Species	Breeding Evidence			Point Counts			
		Max BE	Categ	#Sq	#PC	%PC	Abun	#Sq
15XQ02	Swamp Sparrow	S	POSS	1	—	—	—	—
15XQ02	White-throated Sparrow	A	PROB	1	19	79.17	2.0833	1
15XQ02	Dark-eyed Junco	CF	CONF	1	7	29.17	0.3333	1
15XQ02	Red-winged Blackbird	S	POSS	1	—	—	—	—
15XQ02	Common Grackle	CF	CONF	1	1	4.17	0.0417	1
15XQ02	Purple Finch	P	PROB	1	1	4.17	0.0833	1
15XQ02	Pine Siskin	H	POSS	1	4	16.67	0.2083	1
15XQ11	Canada Goose	H	POSS	1	—	—	—	—
15XQ11	Common Merganser	H	POSS	1	1	5.56	0.0556	1
15XQ11	Ruffed Grouse	S	POSS	1	—	—	—	—
15XQ11	Common Loon	H	POSS	1	5	27.78	0.2778	1
15XQ11	Cooper's Hawk	H	POSS	1	—	—	—	—
15XQ11	Broad-winged Hawk	H	POSS	1	—	—	—	—
15XQ11	Herring Gull	H	POSS	1	—	—	—	—
15XQ11	Yellow-bellied Sapsucker	S	POSS	1	1	5.56	0.0556	1
15XQ11	Hairy Woodpecker	S	POSS	1	2	11.11	0.1111	1
15XQ11	Northern Flicker	H	POSS	1	2	11.11	0.1111	1
15XQ11	Pileated Woodpecker	S	POSS	1	1	5.56	0.0556	1
15XQ11	Yellow-bellied Flycatcher	P	PROB	1	11	61.11	1.0556	1
15XQ11	Alder Flycatcher	S	POSS	1	—	—	—	—
15XQ11	Least Flycatcher	S	POSS	1	1	5.56	0.1111	1
15XQ11	Blue-headed Vireo	S	POSS	1	—	—	—	—
15XQ11	Red-eyed Vireo	P	PROB	1	15	83.33	1.6111	1
15XQ11	Gray Jay	P	PROB	1	2	11.11	0.1111	1
15XQ11	Blue Jay	H	POSS	1	6	33.33	0.3889	1
15XQ11	American Crow	P	PROB	1	1	5.56	0.0556	1
15XQ11	Common Raven	P	PROB	1	3	16.67	0.1667	1
15XQ11	Black-capped Chickadee	P	PROB	1	—	—	—	—
15XQ11	Boreal Chickadee	H	POSS	1	—	—	—	—
15XQ11	Red-breasted Nuthatch	S	POSS	1	3	16.67	0.2222	1
15XQ11	Brown Creeper	S	POSS	1	—	—	—	—
15XQ11	Winter Wren	S	POSS	1	1	5.56	0.0556	1
15XQ11	Golden-crowned Kinglet	S	POSS	1	—	—	—	—
15XQ11	Veery	S	POSS	1	10	55.56	0.6111	1
15XQ11	Swainson's Thrush	S	POSS	1	8	44.44	0.5556	1
15XQ11	Hermit Thrush	H	POSS	1	10	55.56	0.7222	1
15XQ11	American Robin	P	PROB	1	1	5.56	0.0556	1
15XQ11	Cedar Waxwing	P	PROB	1	1	5.56	0.0556	1
15XQ11	Nashville Warbler	A	PROB	1	14	77.78	1.6667	1
15XQ11	Northern Parula	H	POSS	1	1	5.56	0.0556	1
15XQ11	Chestnut-sided Warbler	S	POSS	1	3	16.67	0.1667	1
15XQ11	Magnolia Warbler	S	POSS	1	8	44.44	0.7222	1
15XQ11	Cape May Warbler	S	POSS	1	—	—	—	—
15XQ11	Yellow-rumped Warbler	P	PROB	1	5	27.78	0.3333	1
15XQ11	Black-throated Green Warbler	S	POSS	1	2	11.11	0.1667	1
15XQ11	Blackburnian Warbler	H	POSS	1	3	16.67	0.2222	1
15XQ11	Black-and-white Warbler	P	PROB	1	5	27.78	0.2778	1
15XQ11	American Redstart	H	POSS	1	1	5.56	0.0556	1
15XQ11	Ovenbird	A	PROB	1	14	77.78	1.1111	1
15XQ11	Northern Waterthrush	S	POSS	1	—	—	—	—

TABLE 1
Atlas of the Breeding Birds of Ontario Square Summary Results

Atlas Square	Species	Breeding Evidence			Point Counts			
		Max BE	Categ	#Sq	#PC	%PC	Abun	#Sq
15XQ11	Common Yellowthroat	A	PROB	1	—	—	—	—
15XQ11	Canada Warbler	S	POSS	1	3	16.67	0.1667	1
15XQ11	Chipping Sparrow	S	POSS	1	1	5.56	0.1111	1
15XQ11	Song Sparrow	S	POSS	1	2	11.11	0.1111	1
15XQ11	Swamp Sparrow	S	POSS	1	2	11.11	0.1111	1
15XQ11	White-throated Sparrow	CF	CONF	1	7	38.89	0.5556	1
15XQ11	Dark-eyed Junco	S	POSS	1	—	—	—	—
15XQ11	Scarlet Tanager	S	POSS	1	2	11.11	0.1111	1
15XQ11	Red-winged Blackbird	A	PROB	1	—	—	—	—
15XQ11	Common Grackle	H	POSS	1	2	11.11	0.1111	1
15XQ11	Pine Siskin	H	POSS	1	2	11.11	0.1667	1
15XQ11	Evening Grosbeak	H	POSS	1	1	5.56	0.0556	1

Notes:

— = No data available.

Max BE = Highest Breeding Evidence recorded.

Categ = Highest Breeding Category recorded (OBS = observed, POSS = possible, PROB = probable, CONF = confirmed).

#Sq = Number of squares with species (Breeding Evidence).

#PC = Number of Point Counts with species.

%PC = Percent of Point Counts with species.

Abun = Average number of birds per Point Count.

#Sq = Number of squares with species (Point Counts).

P = pair observed in suitable nesting habitat in nesting season.

H = Species observed in its breeding season in suitable nesting habitat.

NY = Nest with young seen or heard.

A = Agitated behaviour or anxiety calls of an adult.

S = Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season.

CF = Adult carying food for young.

NB = Nest-building or excavation of nest hole by a species other than a wren or a woodpecker.

TABLE 2
Results from Atlas of the Breeding Birds of Ontario Atlas Block 15XQ

Species	Breeding Evidence			Point Counts			
	Max BE	Categ	#Sq	#PC	%PC	Abun	#Sq
Canada Goose	P	PROB	2	—	—	—	—
Trumpeter Swan	H	POSS	1	—	—	—	—
Wood Duck	P	PROB	3	—	—	—	—
American Black Duck	FY	CONF	3	—	—	—	—
Mallard	FY	CONF	8	—	—	—	—
Ring-necked Duck	P	PROB	3	—	—	—	—
Common Goldeneye	FY	CONF	10	1	0.68	0.0068	1
Hooded Merganser	P	PROB	2	—	—	—	—
Common Merganser	FY	CONF	6	1	0.68	0.0068	1
Ruffed Grouse	FY	CONF	6	4	2.72	0.0272	2
Spruce Grouse	H	POSS	4	—	—	—	—
Sharp-tailed Grouse	D	PROB	2	—	—	—	—
Common Loon	NE	CONF	15	15	10.2	0.1156	5
Pied-billed Grebe	NE	CONF	1	—	—	—	—
Double-crested Cormorant	H	POSS	3	—	—	—	—
American Bittern	T	PROB	3	—	—	—	—
Great Blue Heron	H	POSS	1	—	—	—	—
Turkey Vulture	P	PROB	12	—	—	—	—
Osprey	NY	CONF	3	—	—	—	—
Bald Eagle	NY	CONF	13	—	—	—	—
Northern Harrier	T	PROB	4	—	—	—	—
Sharp-shinned Hawk	P	PROB	3	—	—	—	—
Cooper's Hawk	H	POSS	1	—	—	—	—
Northern Goshawk	H	POSS	1	—	—	—	—
Broad-winged Hawk	A	PROB	11	3	2.04	0.0204	2
Red-tailed Hawk	S	POSS	4	—	—	—	—
American Kestrel	AE	CONF	10	3	2.04	0.0204	3
Merlin	FY	CONF	5	—	—	—	—
Sora	T	PROB	2	—	—	—	—
Sandhill Crane	P	PROB	4	—	—	—	—
Killdeer	FY	CONF	2	1	0.68	0.0068	1
Spotted Sandpiper	FY	CONF	6	—	—	—	—
Greater Yellowlegs	A	PROB	2	1	0.68	0.0204	1
Wilson's Snipe	S	POSS	3	4	2.72	0.034	3
American Woodcock	T	PROB	1	—	—	—	—
Bonaparte's Gull	P	PROB	1	—	—	—	—
Ring-billed Gull	H	POSS	1	—	—	—	—
Herring Gull	NY	CONF	11	2	1.36	0.0136	2
Mourning Dove	H	POSS	1	—	—	—	—
Black-billed Cuckoo	S	POSS	1	—	—	—	—
Great Horned Owl	S	POSS	2	—	—	—	—
Barred Owl	FY	CONF	4	—	—	—	—
Great Gray Owl	S	POSS	2	—	—	—	—
Short-eared Owl	P	PROB	1	—	—	—	—
Boreal Owl	T	PROB	3	—	—	—	—
Northern Saw-whet Owl	T	PROB	3	—	—	—	—
Common Nighthawk	P	PROB	6	—	—	—	—
Ruby-throated Hummingbird	AE	CONF	4	—	—	—	—
Belted Kingfisher	FY	CONF	8	1	0.68	0.0068	1
Yellow-bellied Sapsucker	NY	CONF	9	7	4.76	0.0544	5
Downy Woodpecker	T	PROB	2	3	2.04	0.034	2
Hairy Woodpecker	NY	CONF	8	13	8.84	0.102	5

TABLE 2
Results from Atlas of the Breeding Birds of Ontario Atlas Block 15XQ

Species	Breeding Evidence			Point Counts			
	Max BE	Categ	#Sq	#PC	%PC	Abun	#Sq
Three-toed Woodpecker	H	POSS	1	—	—	—	—
Black-backed Woodpecker	H	POSS	2	1	0.68	0.0068	1
Northern Flicker	FS	CONF	14	19	12.93	0.1701	7
Pileated Woodpecker	T	PROB	8	8	5.44	0.0544	4
Olive-sided Flycatcher	T	PROB	3	3	2.04	0.0204	2
Eastern Wood-Pewee	S	POSS	2	1	0.68	0.0068	1
Yellow-bellied Flycatcher	P	PROB	8	51	34.69	0.4422	8
Alder Flycatcher	P	PROB	8	20	13.61	0.2041	6
Least Flycatcher	NY	CONF	10	15	10.2	0.1701	6
Eastern Phoebe	AE	CONF	2	—	—	—	—
Eastern Kingbird	NE	CONF	4	—	—	—	—
Blue-headed Vireo	CF	CONF	7	27	18.37	0.2109	5
Philadelphia Vireo	S	POSS	4	2	1.36	0.0136	2
Red-eyed Vireo	CF	CONF	18	87	59.18	1.0136	9
Gray Jay	FY	CONF	14	16	10.88	0.1429	8
Blue Jay	FY	CONF	11	14	9.52	0.1088	4
American Crow	NY	CONF	22	18	12.24	0.1429	6
Common Raven	NY	CONF	23	32	21.77	0.2585	7
Tree Swallow	AE	CONF	6	—	—	—	—
Cliff Swallow	CF	CONF	4	—	—	—	—
Barn Swallow	AE	CONF	3	—	—	—	—
Black-capped Chickadee	FY	CONF	11	19	12.93	0.2517	6
Boreal Chickadee	P	PROB	4	4	2.72	0.0408	3
Red-breasted Nuthatch	FY	CONF	12	25	17.01	0.2381	5
Brown Creeper	S	POSS	6	4	2.72	0.034	3
House Wren	S	POSS	1	—	—	—	—
Winter Wren	S	POSS	11	35	23.81	0.3197	7
Golden-crowned Kinglet	A	PROB	9	22	14.97	0.1973	6
Ruby-crowned Kinglet	FY	CONF	8	34	23.13	0.3197	6
Eastern Bluebird	CF	CONF	1	—	—	—	—
Veery	P	PROB	11	22	14.97	0.1837	6
Swainson's Thrush	CF	CONF	12	48	32.65	0.5034	7
Hermit Thrush	S	POSS	10	67	45.58	0.6871	8
American Robin	CF	CONF	13	23	15.65	0.1837	7
Brown Thrasher	S	POSS	1	—	—	—	—
European Starling	CF	CONF	2	—	—	—	—
Cedar Waxwing	P	PROB	13	15	10.2	0.1497	5
Tennessee Warbler	T	PROB	5	7	4.76	0.068	2
Nashville Warbler	CF	CONF	15	102	69.39	1.6054	8
Northern Parula	T	PROB	9	10	6.8	0.0748	5
Yellow Warbler	NB	CONF	2	—	—	—	—
Chestnut-sided Warbler	T	PROB	11	23	15.65	0.1973	6
Magnolia Warbler	CF	CONF	15	69	46.94	0.6735	9
Cape May Warbler	S	POSS	2	—	—	—	—
Black-throated Blue Warbler	H	POSS	1	1	0.68	0.0068	1
Yellow-rumped Warbler	CF	CONF	14	59	40.14	0.5714	8
Black-throated Green Warbler	S	POSS	6	9	6.12	0.0884	2
Blackburnian Warbler	P	PROB	9	18	12.24	0.1361	5
Palm Warbler	S	POSS	3	6	4.08	0.0408	2
Bay-breasted Warbler	NY	CONF	4	5	3.4	0.034	3
Black-and-white Warbler	P	PROB	7	11	7.48	0.0816	3
American Redstart	CF	CONF	8	6	4.08	0.0408	3

TABLE 2
Results from Atlas of the Breeding Birds of Ontario Atlas Block 15XQ

Species	Breeding Evidence			Point Counts			
	Max BE	Categ	#Sq	#PC	%PC	Abun	#Sq
Ovenbird	A	PROB	10	57	38.78	0.6395	8
Northern Waterthrush	S	POSS	7	4	2.72	0.0272	2
Connecticut Warbler	S	POSS	4	13	8.84	0.1156	3
Mourning Warbler	S	POSS	9	24	16.33	0.1905	7
Common Yellowthroat	A	PROB	10	24	16.33	0.2381	6
Wilson's Warbler	S	POSS	1	—	—	—	—
Canada Warbler	S	POSS	7	9	6.12	0.0816	3
Chipping Sparrow	NY	CONF	14	32	21.77	0.2925	7
Vesper Sparrow	CF	CONF	2	—	—	—	—
Savannah Sparrow	DD	CONF	4	—	—	—	—
Le Conte's Sparrow	S	POSS	1	—	—	—	—
Song Sparrow	CF	CONF	10	10	6.8	0.0748	6
Lincoln's Sparrow	S	POSS	5	20	13.61	0.1973	5
Swamp Sparrow	CF	CONF	10	16	10.88	0.1905	5
White-throated Sparrow	CF	CONF	21	102	69.39	1.5442	9
Dark-eyed Junco	CF	CONF	7	19	12.93	0.1565	4
Scarlet Tanager	S	POSS	2	2	1.36	0.0136	1
Northern Cardinal	S	POSS	1	—	—	—	—
Rose-breasted Grosbeak	S	POSS	3	2	1.36	0.0136	1
Red-winged Blackbird	NE	CONF	9	1	0.68	0.0272	1
Common Grackle	NY	CONF	13	4	2.72	0.0612	3
Purple Finch	FY	CONF	7	2	1.36	0.0204	2
White-winged Crossbill	P	PROB	4	2	1.36	0.0272	2
Pine Siskin	T	PROB	10	10	6.8	0.102	4
American Goldfinch	NB	CONF	3	1	0.68	0.0068	1
Evening Grosbeak	FY	CONF	8	2	1.36	0.0136	2
House Sparrow	AE	CONF	1	—	—	—	—

Notes:

— = No data available.

Max BE: Highest Breeding Evidence recorded

Categ: Highest Breeding Category recorded (OBS=observed, POSS=possible, PROB=probable, CONF=confirmed)

#Sq: Number of squares with species (Breeding Evidence)

#PC: Number of Point Counts with species

%PC: Percent of Point Counts with species

Abun: Average number of birds per Point Count

#Sq: Number of squares with species (Point Counts)

P = pair observed in suitable nesting habitat in nesting season

H = species observed in its breeding season in suitable nesting habita

FY = Recently fledged young (nidicolous species) or downy yound (nidifugous species), including incapable of sustained flight

D = Courtship or display, including interaction between a male and a female or two males, including courtship feeding or copulation

NE = Nest containing eggs

T = Permanent territory presumed through registration of territorial song, or the occurrence of an adult bird, at the same place, in breeding habitat, on at least two days a week or more apart, during its breeding season. Use discretion when using this code.

NY = Nest with young seen or heard

A = Agitated behaviour or anxiety calls of an adult

S = Singing male(s) present, or breeding calls heard, in suitable nesting habitat in breeding season

AE = Adult leaving or entering nest sites in circumstances indicating occupied nest

FS = Adult carying fecal sac

CF = Adult carying food for young

NB = Nest-building or excavation of nest hole by a species other than a wren or a woopecker

DD = Distraction display or injury feigning

570000 580000 590000 600000 610000 620000 630000

5430000 5420000 5410000 5400000 5390000

N

52-20

Highway 622

52-1

373-12
373-11
373-10
373-8
373-9
373-7
373-6
373-5
373-4
373-3
373-2
373-1

Atikokan

51-20 51-19 51-18 51-17 51-15 51-14 51-13 51-11 51-10 51-9 51-8 51-7 51-6 51-5 51-4 51-3 51-2 51-1

Highway 11

LEGEND

- Owl Station Location
- Road
- Existing Railway
- Provincial Highway
- Power Transmission Line
- River/Stream
- Waterbody
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

0 2,500 5,000 7,500 10,000 12,500 15,000

SCALE 1:200,000 METRES

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
ONTARIO NOCTURNAL OWL SURVEY MAP FOR ROUTES #373 AND #53

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	16 Nov. 2010		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 1

G:\Projects\2010\10-1118-0020_BrettResources_HammondReefGIS\MXDs\Draft\Terrestrial\TSD\OwlSurvey_Appendix.mxd

Ontario Breeding Bird Atlas
2001-2005

Region 40

Road Classification
- Car Ferry
- Multilane Divided Interchange Access Only
- Multilane Divided Mixed Access
- Multilane Undivided
- Two Lane Primary
- Two Lane Secondary
- Two Lane Tertiary
- Loose Surface

Boundaries
- First Nations Lands
- Provincial Parks
- WOOLWICH Township / Municipality Name
- Township / Municipality Boundary
- GREY County / District / Region Name
- County / District / Region Boundary

Settlements

Named settlements		Settlements that are also munipalities
Shrewsbury	0 - 2,500	Wheatley
Sottsville	2,500 - 5,000	Casselman
Fonthill	5,000 - 10,000	Perth
Courtice	10,000 - 25,000	Strathroy
Chatham	25,000 - 50,000	Orillia
	50,000 - 100,000	Windsor
	100,000 - 500,000	London
	500,000 - 2,500,000	Toronto

Landcover
- Open Habitat
- Wooded Deciduous
- Wooded Coniferous
- Farmland

- BBA Squares
- BBA Regions

Scale
1:450000

10 0 10 20 30 40 Kilometers

Ontario

Geomatics Service Centre GSC Network Peterborough

Published December 2000
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TABLE 3
Ontario Nocturnal Owl Survey
Dataset for Routes #373 and #52

Common Name	Scientific Name	Year	Month	Day	Route and Stations
Great Gray Owl	*Strix nebulosa*	1995	3	16	ON0051-1
Boreal Owl	*Aegolius funereus*	2001	4	17	ON0051-1
American Woodcock	*Scolopax minor*	2005	4	17	ON0051-1
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-10
Northern Saw-whet Owl	*Aegolius acadicus*	2004	4	4	ON0051-11
Northern Saw-whet Owl	*Aegolius acadicus*	2007	4	8	ON0051-11
Boreal Owl	*Aegolius funereus*	2001	4	17	ON0051-12
Northern Saw-whet Owl	*Aegolius acadicus*	2005	4	17	ON0051-12
Boreal Owl	*Aegolius funereus*	2001	4	17	ON0051-13
Unidentified Owl	*Strigidae sp.*	2001	4	17	ON0051-13
Northern Saw-whet Owl	*Aegolius acadicus*	2003	4	12	ON0051-13
American Woodcock	*Scolopax minor*	2005	4	17	ON0051-13
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-14
Northern Saw-whet Owl	*Aegolius acadicus*	1995	4	17	ON0051-14
Barred Owl	*Strix varia*	2001	4	17	ON0051-14
Northern Saw-whet Owl	*Aegolius acadicus*	2004	4	4	ON0051-14
Northern Saw-whet Owl	*Aegolius acadicus*	2007	4	8	ON0051-14
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-15
Northern Saw-whet Owl	*Aegolius acadicus*	1995	4	17	ON0051-15
Boreal Owl	*Aegolius funereus*	1998	3	14	ON0051-15
Northern Saw-whet Owl	*Aegolius acadicus*	2009	4	5	ON0051-15
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-16
Northern Saw-whet Owl	*Aegolius acadicus*	2009	4	5	ON0051-16
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-17
Boreal Owl	*Aegolius funereus*	2001	4	17	ON0051-17
Unidentified Owl	*Strigidae sp.*	2001	4	17	ON0051-17
Northern Saw-whet Owl	*Aegolius acadicus*	2004	4	4	ON0051-17
Wilson's Snipe	*Gallinago delicata*	2005	4	17	ON0051-17
Northern Saw-whet Owl	*Aegolius acadicus*	2008	4	—	ON0051-17
Barred Owl	*Strix varia*	1995	3	16	ON0051-18
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-18
Boreal Owl	*Aegolius funereus*	2001	4	17	ON0051-18
Ruffed Grouse	*Bonasa umbellus*	2003	4	12	ON0051-18
American Woodcock	*Scolopax minor*	2005	4	17	ON0051-18
Northern Saw-whet Owl	*Aegolius acadicus*	2010	4	4	ON0051-18
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-19
Northern Saw-whet Owl	*Aegolius acadicus*	2003	4	12	ON0051-19
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-2
Boreal Owl	*Aegolius funereus*	1995	3	16	ON0051-20
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-20
Northern Saw-whet Owl	*Aegolius acadicus*	1995	4	17	ON0051-20
Great Gray Owl	*Strix nebulosa*	2001	4	17	ON0051-20
Northern Saw-whet Owl	*Aegolius acadicus*	2005	4	17	ON0051-20

TABLE 3
Ontario Nocturnal Owl Survey
Dataset for Routes #373 and #52

Common Name	Scientific Name	Year	Month	Day	Route and Stations
Long-eared Owl	*Asio otus*	2010	4	4	ON0051-20
American Woodcock	*Scolopax minor*	2001	4	17	ON0051-3
Boreal Owl	*Aegolius funereus*	1995	3	16	ON0051-4
Wilson's Snipe	*Gallinago delicata*	2001	4	17	ON0051-4
Long-eared Owl	*Asio otus*	2009	4	5	ON0051-4
Northern Saw-whet Owl	*Aegolius acadicus*	2003	4	12	ON0051-5
American Woodcock	*Scolopax minor*	2005	4	17	ON0051-5
Northern Saw-whet Owl	*Aegolius acadicus*	2010	4	4	ON0051-5
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-6
Northern Saw-whet Owl	*Aegolius acadicus*	2003	4	12	ON0051-6
Northern Saw-whet Owl	*Aegolius acadicus*	2008	4	—	ON0051-6
Northern Saw-whet Owl	*Aegolius acadicus*	1999	4	13	ON0051-7
Northern Saw-whet Owl	*Aegolius acadicus*	2004	4	4	ON0051-7
Long-eared Owl	*Asio otus*	2007	4	8	ON0051-7
Northern Saw-whet Owl	*Aegolius acadicus*	1999	4	13	ON0051-8
Northern Saw-whet Owl	*Aegolius acadicus*	2003	4	12	ON0051-8
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	16	ON0051-9
Northern Saw-whet Owl	*Aegolius acadicus*	2003	4	12	ON0051-9
Ruffed Grouse	*Bonasa umbellus*	2003	4	12	ON0051-9
Northern Saw-whet Owl	*Aegolius acadicus*	2004	4	4	ON0051-9
Ruffed Grouse	*Bonasa umbellus*	2005	4	17	ON0051-9
Short-eared Owl	*Asio flammeus*	2008	4	—	ON0051-9
American Woodcock	*Scolopax minor*	2001	4	27	ON0052-1
American Woodcock	*Scolopax minor*	2005	4	14	ON0052-1
American Woodcock	*Scolopax minor*	2009	4	30	ON0052-1
Northern Saw-whet Owl	*Aegolius acadicus*	1995	3	19	ON0052-20
Ruffed Grouse	*Bonasa umbellus*	2009	4	30	ON0052-20
American Woodcock	*Scolopax minor*	2005	4	6	ON0373-1
Great Gray Owl	*Strix nebulosa*	2009	4	27	ON0373-10
Northern Saw-whet Owl	*Aegolius acadicus*	2010	4	10	ON0373-10
Boreal Owl	*Aegolius funereus*	2010	4	10	ON0373-11
Northern Saw-whet Owl	*Aegolius acadicus*	2010	4	10	ON0373-11
Great Horned Owl	*Bubo virginianus*	2005	4	6	ON0373-12
Great Gray Owl	*Strix nebulosa*	2009	4	27	ON0373-12
Ruffed Grouse	*Bonasa umbellus*	2009	4	27	ON0373-2
Great Gray Owl	*Strix nebulosa*	2010	4	10	ON0373-2
Great Gray Owl	*Strix nebulosa*	2008	4	1	ON0373-3
Great Gray Owl	*Strix nebulosa*	2009	4	27	ON0373-3
American Woodcock	*Scolopax minor*	2009	4	27	ON0373-5
American Woodcock	*Scolopax minor*	2009	4	27	ON0373-7
Boreal Owl	*Aegolius funereus*	2005	4	6	ON0373-8
Great Gray Owl	*Strix nebulosa*	2006	4	3	ON0373-8
Northern Saw-whet Owl	*Aegolius acadicus*	2010	4	10	ON0373-8

TABLE 3
Ontario Nocturnal Owl Survey
Dataset for Routes #373 and #52

Common Name	Scientific Name	Year	Month	Day	Route and Stations
No Observation	No Observation	1995	4	17	ON0051-1
No Observation	No Observation	1995	4	17	ON0051-10
No Observation	No Observation	1995	3	16	ON0051-11
No Observation	No Observation	1995	4	17	ON0051-11
No Observation	No Observation	1995	4	17	ON0051-12
No Observation	No Observation	1995	3	16	ON0051-12
No Observation	No Observation	1995	3	16	ON0051-13
No Observation	No Observation	1995	4	17	ON0051-13
No Observation	No Observation	1995	4	17	ON0051-16
No Observation	No Observation	1995	4	17	ON0051-17
No Observation	No Observation	1995	4	17	ON0051-18
No Observation	No Observation	1995	4	17	ON0051-19
No Observation	No Observation	1995	4	17	ON0051-2
No Observation	No Observation	1995	4	17	ON0051-3
No Observation	No Observation	1995	3	16	ON0051-3
No Observation	No Observation	1995	4	17	ON0051-4
No Observation	No Observation	1995	3	16	ON0051-5
No Observation	No Observation	1995	4	17	ON0051-5
No Observation	No Observation	1995	4	17	ON0051-6
No Observation	No Observation	1995	3	16	ON0051-7
No Observation	No Observation	1995	4	17	ON0051-7
No Observation	No Observation	1995	3	16	ON0051-8
No Observation	No Observation	1995	4	17	ON0051-8
No Observation	No Observation	1995	4	17	ON0051-9
No Observation	No Observation	1995	3	19	ON0052-1
No Observation	No Observation	1995	4	14	ON0052-1
No Observation	No Observation	1995	4	14	ON0052-20
No Observation	No Observation	1996	3	15	ON0052-1
No Observation	No Observation	1996	4	12	ON0052-1
No Observation	No Observation	1996	4	12	ON0052-20
No Observation	No Observation	1996	3	15	ON0052-20
No Observation	No Observation	1997	3	16	ON0052-1
No Observation	No Observation	1997	4	13	ON0052-1
No Observation	No Observation	1997	3	16	ON0052-20
No Observation	No Observation	1997	4	13	ON0052-20
No Observation	No Observation	1998	3	14	ON0051-1
No Observation	No Observation	1998	4	15	ON0051-1
No Observation	No Observation	1998	3	14	ON0051-10
No Observation	No Observation	1998	4	15	ON0051-10
No Observation	No Observation	1998	3	14	ON0051-11
No Observation	No Observation	1998	4	15	ON0051-11
No Observation	No Observation	1998	3	14	ON0051-12
No Observation	No Observation	1998	4	15	ON0051-12

TABLE 3
Ontario Nocturnal Owl Survey
Dataset for Routes #373 and #52

Common Name	Scientific Name	Year	Month	Day	Route and Stations
No Observation	No Observation	1998	3	14	ON0051-13
No Observation	No Observation	1998	4	15	ON0051-13
No Observation	No Observation	1998	3	14	ON0051-14
No Observation	No Observation	1998	4	15	ON0051-14
No Observation	No Observation	1998	4	15	ON0051-15
No Observation	No Observation	1998	3	14	ON0051-16
No Observation	No Observation	1998	4	15	ON0051-16
No Observation	No Observation	1998	3	14	ON0051-17
No Observation	No Observation	1998	4	15	ON0051-17
No Observation	No Observation	1998	3	14	ON0051-18
No Observation	No Observation	1998	4	15	ON0051-18
No Observation	No Observation	1998	3	14	ON0051-19
No Observation	No Observation	1998	4	15	ON0051-19
No Observation	No Observation	1998	3	14	ON0051-2
No Observation	No Observation	1998	4	15	ON0051-2
No Observation	No Observation	1998	4	15	ON0051-20
No Observation	No Observation	1998	3	14	ON0051-20
No Observation	No Observation	1998	3	14	ON0051-3
No Observation	No Observation	1998	4	15	ON0051-3
No Observation	No Observation	1998	4	15	ON0051-4
No Observation	No Observation	1998	3	14	ON0051-4
No Observation	No Observation	1998	3	14	ON0051-5
No Observation	No Observation	1998	4	15	ON0051-5
No Observation	No Observation	1998	3	14	ON0051-6
No Observation	No Observation	1998	4	15	ON0051-6
No Observation	No Observation	1998	3	14	ON0051-7
No Observation	No Observation	1998	4	15	ON0051-7
No Observation	No Observation	1998	3	14	ON0051-8
No Observation	No Observation	1998	4	15	ON0051-8
No Observation	No Observation	1998	3	14	ON0051-9
No Observation	No Observation	1998	4	15	ON0051-9
No Observation	No Observation	1998	3	19	ON0052-1
No Observation	No Observation	1998	4	15	ON0052-1
No Observation	No Observation	1998	3	19	ON0052-20
No Observation	No Observation	1998	4	15	ON0052-20
No Observation	No Observation	1999	4	13	ON0051-1
No Observation	No Observation	1999	4	13	ON0051-10
No Observation	No Observation	1999	4	13	ON0051-11
No Observation	No Observation	1999	4	13	ON0051-12
No Observation	No Observation	1999	4	13	ON0051-13
No Observation	No Observation	1999	4	13	ON0051-14
No Observation	No Observation	1999	4	13	ON0051-15
No Observation	No Observation	1999	4	13	ON0051-16

TABLE 3
Ontario Nocturnal Owl Survey
Dataset for Routes #373 and #52

Common Name	Scientific Name	Year	Month	Day	Route and Stations
No Observation	No Observation	1999	4	13	ON0051-17
No Observation	No Observation	1999	4	13	ON0051-18
No Observation	No Observation	1999	4	13	ON0051-19
No Observation	No Observation	1999	4	13	ON0051-2
No Observation	No Observation	1999	4	13	ON0051-20
No Observation	No Observation	1999	4	13	ON0051-3
No Observation	No Observation	1999	4	13	ON0051-4
No Observation	No Observation	1999	4	13	ON0051-5
No Observation	No Observation	1999	4	13	ON0051-6
No Observation	No Observation	1999	4	13	ON0051-9
No Observation	No Observation	1999	4	12	ON0052-1
No Observation	No Observation	1999	4	12	ON0052-20
No Observation	No Observation	2000	4	26	ON0052-1
No Observation	No Observation	2000	4	26	ON0052-20
No Observation	No Observation	2001	4	17	ON0051-10
No Observation	No Observation	2001	4	17	ON0051-11
No Observation	No Observation	2001	4	17	ON0051-15
No Observation	No Observation	2001	4	17	ON0051-16
No Observation	No Observation	2001	4	17	ON0051-19
No Observation	No Observation	2001	4	17	ON0051-2
No Observation	No Observation	2001	4	17	ON0051-5
No Observation	No Observation	2001	4	17	ON0051-6
No Observation	No Observation	2001	4	17	ON0051-7
No Observation	No Observation	2001	4	17	ON0051-8
No Observation	No Observation	2001	4	17	ON0051-9
No Observation	No Observation	2001	4	27	ON0052-20
No Observation	No Observation	2003	4	12	ON0051-1
No Observation	No Observation	2003	4	12	ON0051-10
No Observation	No Observation	2003	4	12	ON0051-11
No Observation	No Observation	2003	4	12	ON0051-12
No Observation	No Observation	2003	4	12	ON0051-14
No Observation	No Observation	2003	4	12	ON0051-15
No Observation	No Observation	2003	4	12	ON0051-16
No Observation	No Observation	2003	4	12	ON0051-17
No Observation	No Observation	2003	4	12	ON0051-2
No Observation	No Observation	2003	4	12	ON0051-20
No Observation	No Observation	2003	4	12	ON0051-3
No Observation	No Observation	2003	4	12	ON0051-4
No Observation	No Observation	2003	4	12	ON0051-7
No Observation	No Observation	2004	4	4	ON0051-1
No Observation	No Observation	2004	4	4	ON0051-10
No Observation	No Observation	2004	4	4	ON0051-12
No Observation	No Observation	2004	4	4	ON0051-13

TABLE 3
Ontario Nocturnal Owl Survey
Dataset for Routes #373 and #52

Common Name	Scientific Name	Year	Month	Day	Route and Stations
No Observation	No Observation	2004	4	4	ON0051-15
No Observation	No Observation	2004	4	4	ON0051-16
No Observation	No Observation	2004	4	4	ON0051-18
No Observation	No Observation	2004	4	4	ON0051-19
No Observation	No Observation	2004	4	4	ON0051-2
No Observation	No Observation	2004	4	4	ON0051-20
No Observation	No Observation	2004	4	4	ON0051-3
No Observation	No Observation	2004	4	4	ON0051-4
No Observation	No Observation	2004	4	4	ON0051-5
No Observation	No Observation	2004	4	4	ON0051-6
No Observation	No Observation	2004	4	4	ON0051-8
No Observation	No Observation	2005	4	17	ON0051-10
No Observation	No Observation	2005	4	17	ON0051-11
No Observation	No Observation	2005	4	17	ON0051-14
No Observation	No Observation	2005	4	17	ON0051-15
No Observation	No Observation	2005	4	17	ON0051-16
No Observation	No Observation	2005	4	17	ON0051-19
No Observation	No Observation	2005	4	17	ON0051-2
No Observation	No Observation	2005	4	17	ON0051-3
No Observation	No Observation	2005	4	17	ON0051-4
No Observation	No Observation	2005	4	17	ON0051-6
No Observation	No Observation	2005	4	17	ON0051-7
No Observation	No Observation	2005	4	17	ON0051-8
No Observation	No Observation	2005	4	14	ON0052-20
No Observation	No Observation	2005	4	6	ON0373-10
No Observation	No Observation	2005	4	6	ON0373-11
No Observation	No Observation	2005	4	6	ON0373-2
No Observation	No Observation	2005	4	6	ON0373-3
No Observation	No Observation	2005	4	6	ON0373-4
No Observation	No Observation	2005	4	6	ON0373-5
No Observation	No Observation	2005	4	6	ON0373-6
No Observation	No Observation	2005	4	6	ON0373-7
No Observation	No Observation	2005	4	6	ON0373-9
No Observation	No Observation	2006	4	3	ON0373-1
No Observation	No Observation	2006	4	3	ON0373-10
No Observation	No Observation	2006	4	3	ON0373-11
No Observation	No Observation	2006	4	3	ON0373-12
No Observation	No Observation	2006	4	3	ON0373-2
No Observation	No Observation	2006	4	3	ON0373-3
No Observation	No Observation	2006	4	3	ON0373-4
No Observation	No Observation	2006	4	3	ON0373-5
No Observation	No Observation	2006	4	3	ON0373-6
No Observation	No Observation	2006	4	3	ON0373-7

TABLE 3
Ontario Nocturnal Owl Survey
Dataset for Routes #373 and #52

Common Name	Scientific Name	Year	Month	Day	Route and Stations
No Observation	No Observation	2006	4	3	ON0373-9
No Observation	No Observation	2007	4	8	ON0051-1
No Observation	No Observation	2007	4	8	ON0051-10
No Observation	No Observation	2007	4	8	ON0051-12
No Observation	No Observation	2007	4	8	ON0051-13
No Observation	No Observation	2007	4	8	ON0051-15
No Observation	No Observation	2007	4	8	ON0051-16
No Observation	No Observation	2007	4	8	ON0051-17
No Observation	No Observation	2007	4	8	ON0051-18
No Observation	No Observation	2007	4	8	ON0051-19
No Observation	No Observation	2007	4	8	ON0051-2
No Observation	No Observation	2007	4	8	ON0051-20
No Observation	No Observation	2007	4	8	ON0051-3
No Observation	No Observation	2007	4	8	ON0051-4
No Observation	No Observation	2007	4	8	ON0051-5
No Observation	No Observation	2007	4	8	ON0051-6
No Observation	No Observation	2007	4	8	ON0051-8
No Observation	No Observation	2007	4	8	ON0051-9
No Observation	No Observation	2008	4	—	ON0051-1
No Observation	No Observation	2008	4	—	ON0051-10
No Observation	No Observation	2008	4	—	ON0051-11
No Observation	No Observation	2008	4	—	ON0051-12
No Observation	No Observation	2008	4	—	ON0051-13
No Observation	No Observation	2008	4	—	ON0051-14
No Observation	No Observation	2008	4	—	ON0051-15
No Observation	No Observation	2008	4	—	ON0051-16
No Observation	No Observation	2008	4	—	ON0051-18
No Observation	No Observation	2008	4	—	ON0051-19
No Observation	No Observation	2008	4	—	ON0051-2
No Observation	No Observation	2008	4	—	ON0051-20
No Observation	No Observation	2008	4	—	ON0051-3
No Observation	No Observation	2008	4	—	ON0051-4
No Observation	No Observation	2008	4	—	ON0051-5
No Observation	No Observation	2008	4	—	ON0051-7
No Observation	No Observation	2008	4	—	ON0051-8
No Observation	No Observation	2008	4	1	ON0373-1
No Observation	No Observation	2008	4	1	ON0373-10
No Observation	No Observation	2008	4	1	ON0373-11
No Observation	No Observation	2008	4	1	ON0373-12
No Observation	No Observation	2008	4	1	ON0373-2
No Observation	No Observation	2008	4	1	ON0373-4
No Observation	No Observation	2008	4	1	ON0373-5
No Observation	No Observation	2008	4	1	ON0373-6

TABLE 3
Ontario Nocturnal Owl Survey
Dataset for Routes #373 and #52

Common Name	Scientific Name	Year	Month	Day	Route and Stations
No Observation	No Observation	2008	4	1	ON0373-7
No Observation	No Observation	2008	4	1	ON0373-8
No Observation	No Observation	2008	4	1	ON0373-9
No Observation	No Observation	2009	4	5	ON0051-1
No Observation	No Observation	2009	4	5	ON0051-10
No Observation	No Observation	2009	4	5	ON0051-11
No Observation	No Observation	2009	4	5	ON0051-12
No Observation	No Observation	2009	4	5	ON0051-13
No Observation	No Observation	2009	4	5	ON0051-14
No Observation	No Observation	2009	4	5	ON0051-17
No Observation	No Observation	2009	4	5	ON0051-18
No Observation	No Observation	2009	4	5	ON0051-19
No Observation	No Observation	2009	4	5	ON0051-2
No Observation	No Observation	2009	4	5	ON0051-20
No Observation	No Observation	2009	4	5	ON0051-3
No Observation	No Observation	2009	4	5	ON0051-5
No Observation	No Observation	2009	4	5	ON0051-6
No Observation	No Observation	2009	4	5	ON0051-7
No Observation	No Observation	2009	4	5	ON0051-8
No Observation	No Observation	2009	4	5	ON0051-9
No Observation	No Observation	2009	4	27	ON0373-1
No Observation	No Observation	2009	4	27	ON0373-11
No Observation	No Observation	2009	4	27	ON0373-4
No Observation	No Observation	2009	4	27	ON0373-6
No Observation	No Observation	2009	4	27	ON0373-8
No Observation	No Observation	2009	4	27	ON0373-9
No Observation	No Observation	2010	4	4	ON0051-1
No Observation	No Observation	2010	4	4	ON0051-10
No Observation	No Observation	2010	4	4	ON0051-11
No Observation	No Observation	2010	4	4	ON0051-12
No Observation	No Observation	2010	4	4	ON0051-13
No Observation	No Observation	2010	4	4	ON0051-14
No Observation	No Observation	2010	4	4	ON0051-15
No Observation	No Observation	2010	4	4	ON0051-16
No Observation	No Observation	2010	4	4	ON0051-17
No Observation	No Observation	2010	4	4	ON0051-19
No Observation	No Observation	2010	4	4	ON0051-2
No Observation	No Observation	2010	4	4	ON0051-3
No Observation	No Observation	2010	4	4	ON0051-4
No Observation	No Observation	2010	4	4	ON0051-6
No Observation	No Observation	2010	4	4	ON0051-7
No Observation	No Observation	2010	4	4	ON0051-8
No Observation	No Observation	2010	4	4	ON0051-9

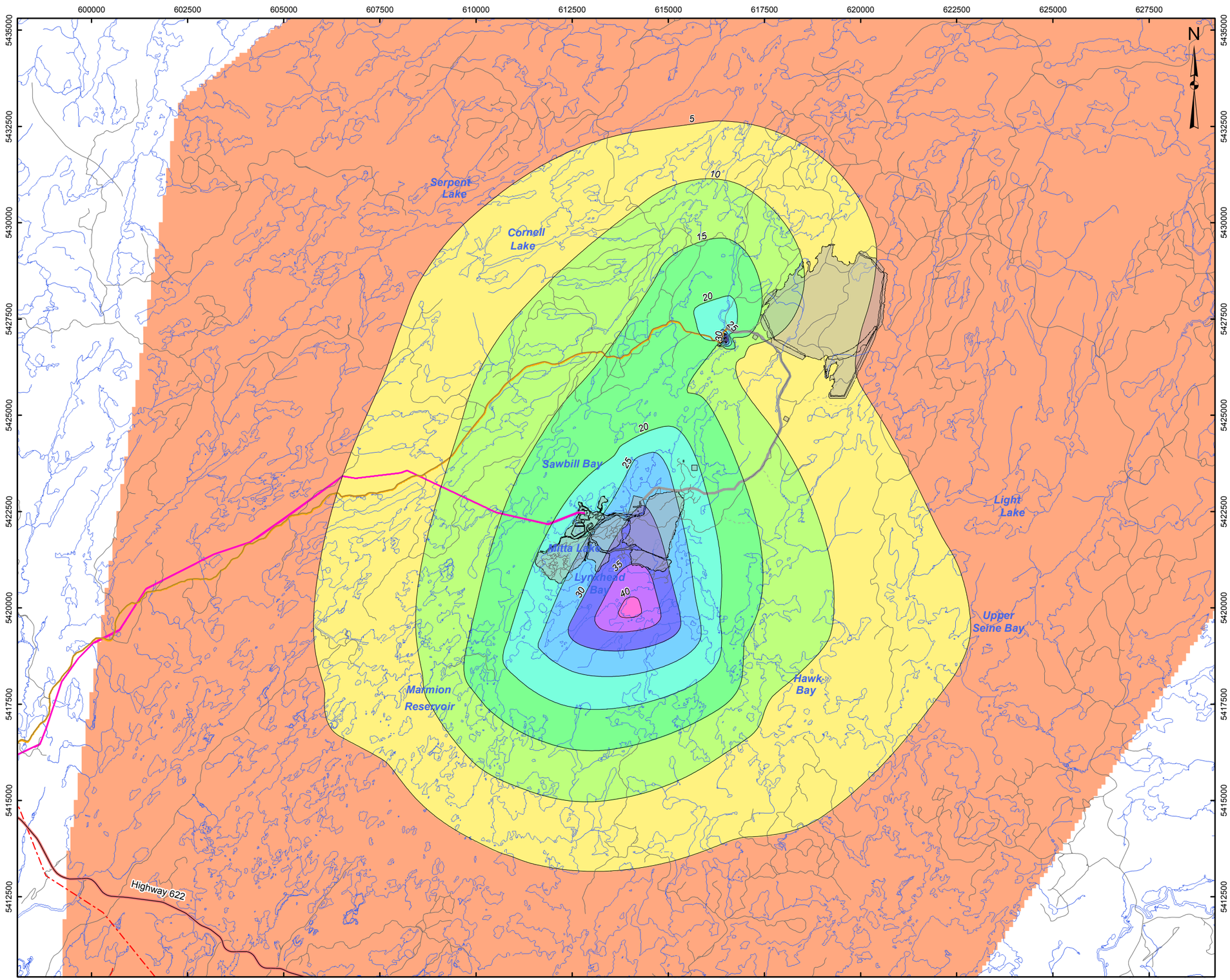
TABLE 3
Ontario Nocturnal Owl Survey
Dataset for Routes #373 and #52

Common Name	Scientific Name	Year	Month	Day	Route and Stations
No Observation	No Observation	2010	4	10	ON0373-1
No Observation	No Observation	2010	4	10	ON0373-12
No Observation	No Observation	2010	4	10	ON0373-3
No Observation	No Observation	2010	4	10	ON0373-4
No Observation	No Observation	2010	4	10	ON0373-5
No Observation	No Observation	2010	4	10	ON0373-6
No Observation	No Observation	2010	4	10	ON0373-7
No Observation	No Observation	2010	4	10	ON0373-9

Notes:
— = No data available.

APPENDIX 2.VI

Air Emission Modelling Results



LEGEND

- Provincial Highway
- Trail
- Road
- River/Stream
- Lake
- Mine Site Road
- Access Road
- Project Transmission Line
- Project Facilities

NO_2 Concentration (µg/m³)

- 40.1 - 45.0
- 35.1 - 40.0
- 30.1 - 35.0
- 25.1 - 30.0
- 20.1 - 25.0
- 15.1 - 20.0
- 10.1 - 15.0
- 5.1 - 10.0
- 0.0 - 5.0

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000 5,000
SCALE 1:100,000 METERS

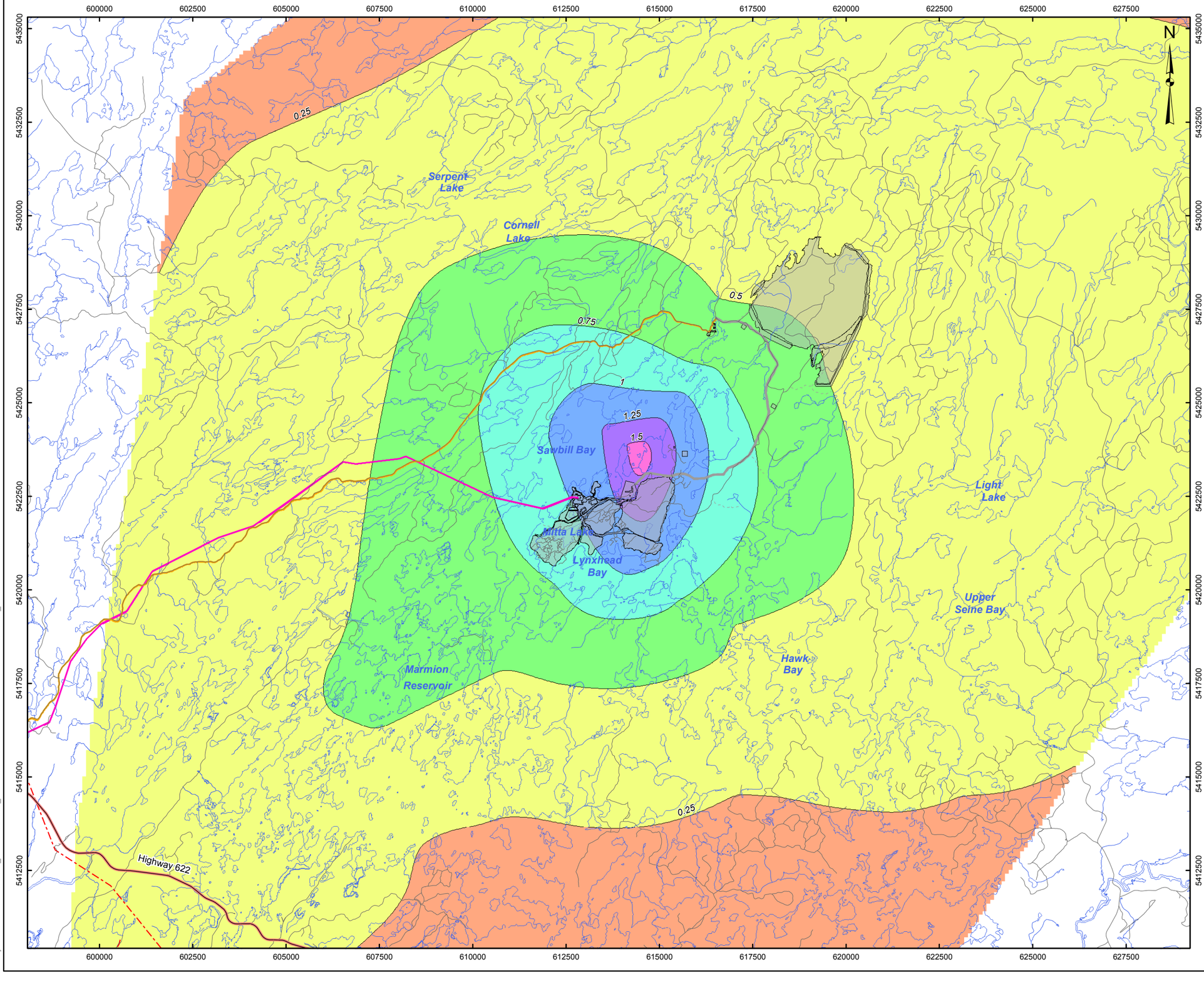
PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
NO_2 CONCENTRATION (µg/m³)

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008	FIGURE: 1	
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

G:\Projects\2010\10-1118-0020_BretlResources_HammondReef\GIS\MXDs\Draft\Terrestrial\TSDNO2_concentration.mxd



LEGEND

- Provincial Highway
- Trail
- Road
- River/Stream
- Lake
- Mine Site Road
- Access Road
- Project Transmission Line
- Project Facilities

SO_2 Concentration (µg/m³)

- 1.51 - 1.75
- 1.26 - 1.50
- 1.01 - 1.25
- 0.76 - 1.00
- 0.51 - 0.75
- 0.26 - 0.50
- 0.0 - 0.25

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000 5,000
SCALE 1:100,000 METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

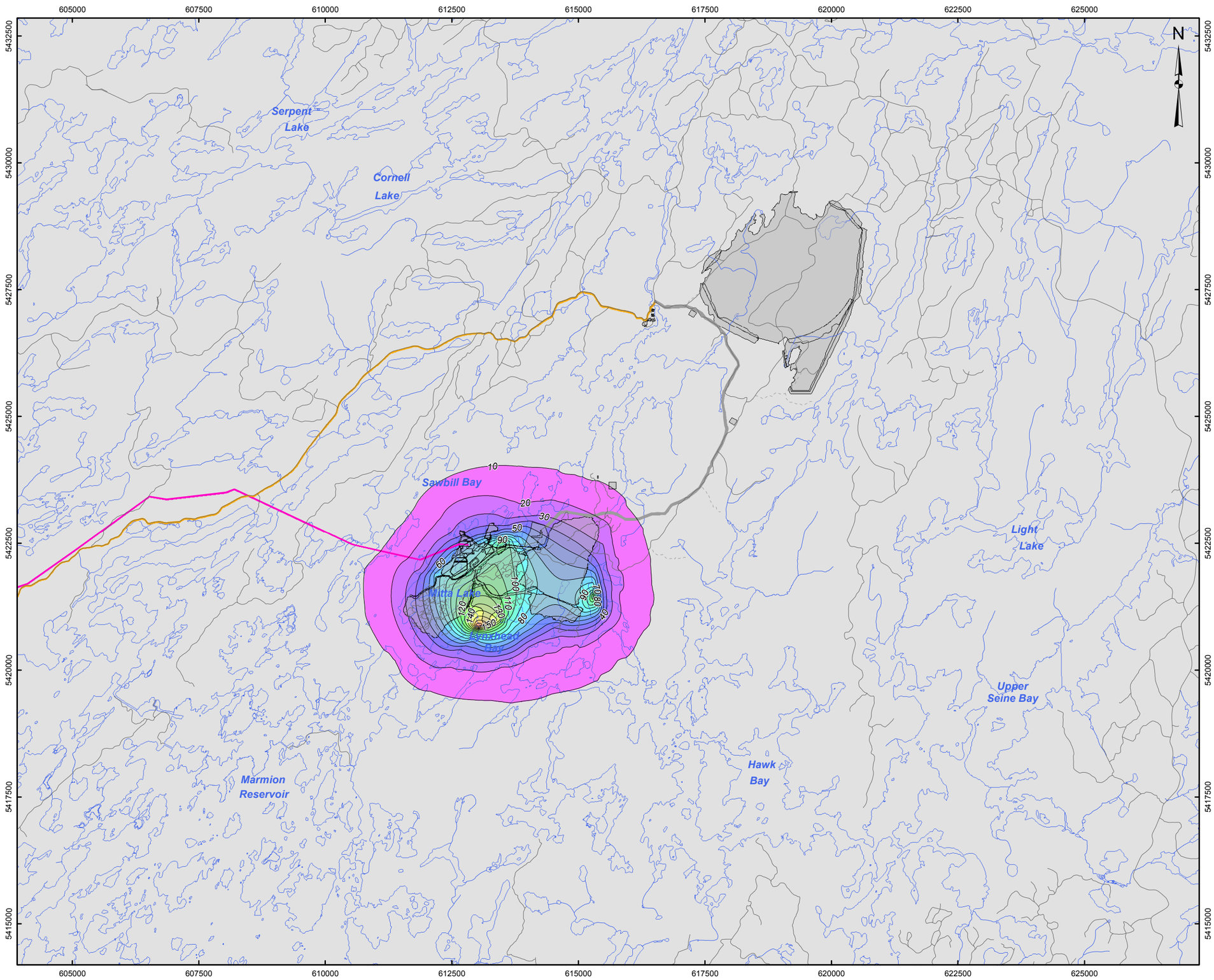
TITLE
SO_2 CONCENTRATION (µg/m³)

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 2

G:\Projects\2010\10-1118-0020_BrettResources_HammondReefGIS\MXDs\Draft\Terrestrial\TSDSO2_concentration.mxd



LEGEND

- Road
- Trail
- River/Stream
- Lake
- Mine Site Road
- Access Road
- Project Transmission Line
- Project Facilities

TSP Deposition (g/m²/yr)

- 180.1 - 190
- 170.1 - 180
- 160.1 - 170
- 150.1 - 160
- 140.1 - 150
- 130.1 - 140
- 120.1 - 130
- 110.1 - 120
- 100.1 - 110
- 90.1 - 100
- 80.1 - 90
- 70.1 - 80
- 60.1 - 70
- 50.1 - 60
- 40.1 - 50
- 30.1 - 40
- 20.1 - 30
- 10.1 - 20
- 0.0 - 10

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000
SCALE 1:75,000 METERS

PROJECT
HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE
TSP DEPOSITION (g/m²/yr)

Golder Associates
Mississauga, Ontario

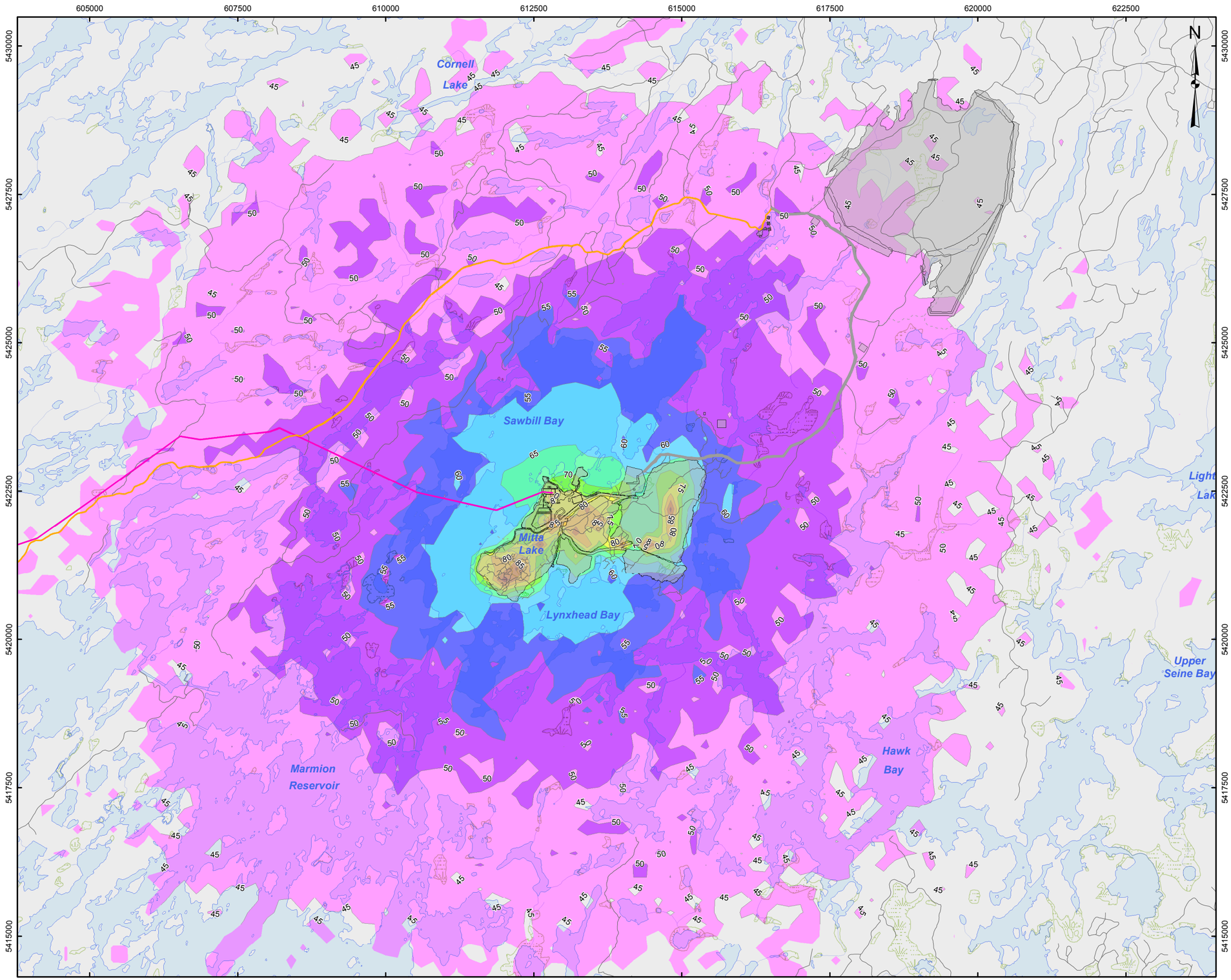
PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 3

G:\Projects\2010\10-1118-0020_BrettResources_HammondReef\GIS\MXDs\Draft\Hydrology\TSDITSP_Modelling_Results.mxd

APPENDIX 2.VII

Predicted Noise Level for Ecological Risk Assessment



LEGEND

- River/Stream
- Lake
- Wetland
- Mine Site Road
- Access Road (Hardtack / Sawbill)
- Project Transmission Line
- Project Facilities

Predicted Noise Level (dB)

- <45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- 75 - 80
- 80 - 85
- 85 - 90
- 90 - 95

REFERENCE

Base Data - Provided by OSISKO Hammond Reef Gold Project Ltd.
Base Data - MNR NRVIS, obtained 2004
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2008
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 15N

1,000 0 1,000 2,000 3,000 4,000

SCALE 1:65,000 METERS

PROJECT

HAMMOND REEF GOLD PROJECT
ATIKOKAN, ONTARIO, CANADA

TITLE

PREDICTED NOISE LEVEL FOR ECOLOGICAL RISK ASSESSMENT

Golder Associates
Mississauga, Ontario

PROJECT NO. 10-1118-0020			SCALE AS SHOWN	VERSION 1
DESIGN	CGE	14 Nov. 2008		
GIS	JO	4 Feb. 2013		
CHECK	AVS	4 Feb. 2013		
REVIEW	KT	4 Feb. 2013		

FIGURE: 1

G:\Projects\2010\10-1118-0020_BrettResources_HammondReef\GIS\MXDs\Draft\Terrestrial\TSD\ISODB_contours_wildlife.mxd