

Rook I Project

Environmental Impact Statement

Annex VIII.3: Wildlife Baseline Report 3 (Bird Migration and
Bats)

**WILDLIFE BASELINE REPORT 3
(BIRD MIGRATION AND BATS)
FOR THE ROOK I PROJECT**

Final Report

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Project No. 3008

June 2024

EXECUTIVE SUMMARY

The Rook I Project (Project) is a proposed new uranium mining and milling operation that is 100% owned by NexGen Energy Ltd. (NexGen). The Project would be located in northwestern Saskatchewan, approximately 40 kilometres (km) east of the Alberta-Saskatchewan border, 130 km north of the town of La Loche, and 640 km northwest of the city of Saskatoon. The wildlife baseline program is a component of a comprehensive baseline program that documents the natural and socio-economic environments in the anticipated area of the Project. Information obtained through database searches and field surveys will be used alongside Indigenous and Local Knowledge in the Environmental Assessment (EA) and cumulative effects assessment, to inform Project planning, and for developing future monitoring programs and reclamation plans.

The program was designed to obtain comprehensive information characterizing wildlife, including species of conservation concern (SOCC), and their habitats within near vicinity to the Project (Site Study Area [SSA]) and a broader Local Study Area (LSA). The SSA consisted of an area 25 km² in size that encompasses the Project footprint, and the LSA consisted of an area 225 km² in size that surrounds the SSA. NexGen was evaluating the feasibility of installing four wind turbines as part of the development of the Project. To supplement baseline survey efforts from 2018, Canada North Environmental Services (CanNorth) was retained to complete avian migration surveys and acoustic bat surveys with a focus on the previously contemplated locations for proposed wind turbines. Avian and acoustic bat surveys were completed as part of the 2018 wildlife baseline investigations (CanNorth 2021), with the exception of avian migration surveys which were not part of the scope of work in 2018.

The program was designed to supplement baseline data, following recommendations in the Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects (ENV 2016), the Plant and Wildlife Pre-Construction Surveys for Renewable Energy Projects (ENV 2018), the Wildlife Guidelines for Alberta Wind Energy Projects (GA 2011), and the Wildlife Directive for Alberta Wind and Energy Projects (GA 2018). As some avian and bat species are potential valued components (VCs) in the EA, resulting data will assist in identifying potential risks to species that may be protected under provincial or federal legislation, including activity restriction guidelines and/or the *Species at Risk Act* (SARA) (GC 1994; ENV 2017; SARPR 2020).

During the avian migration surveys, four point count locations were surveyed during the spring and fall survey periods in the SSA. A total of 502 birds were recorded during avian migration surveys including 344 during the spring surveys and 158 during the fall surveys. A total of 47 bird species were recorded, including five species of conservation concern. These included two species listed under the SARA: common nighthawk (*Chordeiles minor*) and barn swallow (*Hirundo rustica*). An additional three species with provincial activity restriction guidelines were observed including Bonaparte's gull (*Chroicocephalus Philadelphia*), common loon (*Gavia immer*), and bald eagle (*Haliaeetus leucocephalus*).

Three bat detectors were installed in the SSA, and were designed to detect bats in three frequency groups: high frequency, low frequency, and myotis species. A total of 320 bat passes were recorded, including 311 in the high frequency and myotis groups, and nine in the low-frequency group. Based on biogeographical range, abundance, call characteristics, and habitat suitability, bat passes categorized into either the high frequency or the Myotis groups are expected to be primarily composed of little brown myotis (*Myotis lucifugus*) (note this does not discount the presence of northern Myotis [*Myotis septentrionalis*] in the area of the Project), and those individuals in the low frequency group are expected to be primarily

composed of silver-haired (*Lasionycteris noctivagans*) or hoary bats (*Lasiurus cinereus*). Both the little brown myotis and northern myotis are federally listed as endangered under SARA (SARPR 2020), and the roosts and foraging sites for all bat species (*Vespertilionidae*) are listed under the Saskatchewan Activity Restriction Guidelines (ENV 2017), recommending a 500-m setback from high disturbance activities year-round.

Overall, nine sensitive species were detected, including four species listed under SARA: common nighthawk, barn swallow, and bat species (potentially two species listed as endangered – little brown Myotis and northern myotis). An additional five species with provincial activity restriction guidelines were detected including Bonaparte's gull, common loon, bald eagle, and four bat species in the Family *Vespertilionidae*.

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Abbreviations	Definition
CanNorth	Canada North Environmental Services
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA	Environmental Assessment
EIS	Environmental Impact Statement
LSA	Local Study Area
NexGen	NexGen Energy Ltd.
Project	Rook I Project
SARA	<i>Species at Risk Act</i>
SC	Study components
SOCC	Species of conservation concern
SSA	Site Study Area
TLU	Traditional Land Use
VC	Valued component

Units	Definition
bpm	birds per minute
cm	centimetre
dB	decibels
kHz	kilohertz
km	kilometre
m	metre
ms	millisecond
%	percent

1.0 INTRODUCTION

The Rook I Project (Project) is a proposed new uranium mining and milling operation that is 100% owned by NexGen Energy Ltd. (NexGen). The Project would be located in northwestern Saskatchewan, approximately 40 kilometres (km) east of the Alberta-Saskatchewan border, 130 km north of the town of La Loche, and 640 km northwest of the city of Saskatoon (Figure 1.0-1). The Project would reside within Treaty 8 territory and within the Métis Homeland. At a regional scale, the Project would be situated within the southern Athabasca Basin adjacent to Patterson Lake, and along the upper Clearwater River system (Figure 1.0-2). Access to the Project would be from an existing road off Highway 955. The Project would include underground and surface facilities to support the extraction and processing of uranium ore from the Arrow deposit, a land-based, basement-hosted, high-grade uranium deposit.

The wildlife baseline report represents a component of a comprehensive baseline program that documents the natural and socio-economic environments in the anticipated area of the Project. The wildlife baseline program was undertaken to provide context from which Project wildlife effects could be assessed in the Environmental Impact Statement (EIS).

Since exploration at the Project commenced in 2013, NexGen has engaged regularly and established relationships with local First Nations and Métis Groups (collectively referred to as Indigenous Groups) and northern communities, specifically those closest and with greatest access to the proposed Project. NexGen respects the rights of Indigenous Peoples and the unique relationship Indigenous Peoples have with the environment, and recognizes the importance of full and open discussion with interested or potentially affected Indigenous communities regarding the development, operation, and decommissioning of the proposed Project. Engagement activities to date, as well as future planned engagement activities, reflect the value NexGen places on meaningful engagement with Indigenous and northern communities who could be potentially affected by the proposed Project. Engagement mechanisms have included, but are not limited to: meetings with leadership, workshops and community information sessions, Project site tours, establishing Joint Working Groups to support the gathering and incorporation of Indigenous and Métis Knowledge throughout the Environmental Assessment (EA) process, and providing funding for Traditional Land Use (TLU) Studies¹ to understand how the proposed Project may interact with the Indigenous communities' traditional use of the anticipated area of the Project.

Feedback received during engagement activities was documented for contribution to the EIS for the Project; examples of feedback received include discussion of concerns, interests, potential adverse effects, mitigation, and design alternatives. Many baseline studies were initiated in advance of formal engagement on the EA for the Project; however, engagement during the execution of baseline studies has helped inform the understanding of baseline conditions and confirmed components of the natural and socio-economic environments that required study. A summary of feedback related to the terrestrial baseline program is presented in Appendix A of the Wildlife Baseline Road Map (Annex VIII).

Canada North Environmental Services (CanNorth) was retained to complete baseline investigations for select study components (SCs) for the Project. The details of studies conducted in 2020 to characterize avian migration patterns and use, as well as supplementary acoustic bat information are presented herein.

¹ Traditional Land Use (TLU) Studies include all land use studies developed by the Project's affected Indigenous Groups, including Traditional Land Use and Occupancy studies, Traditional Knowledge and Use studies, and Indigenous Rights and Knowledge studies, henceforth referred collectively as TLU Studies.

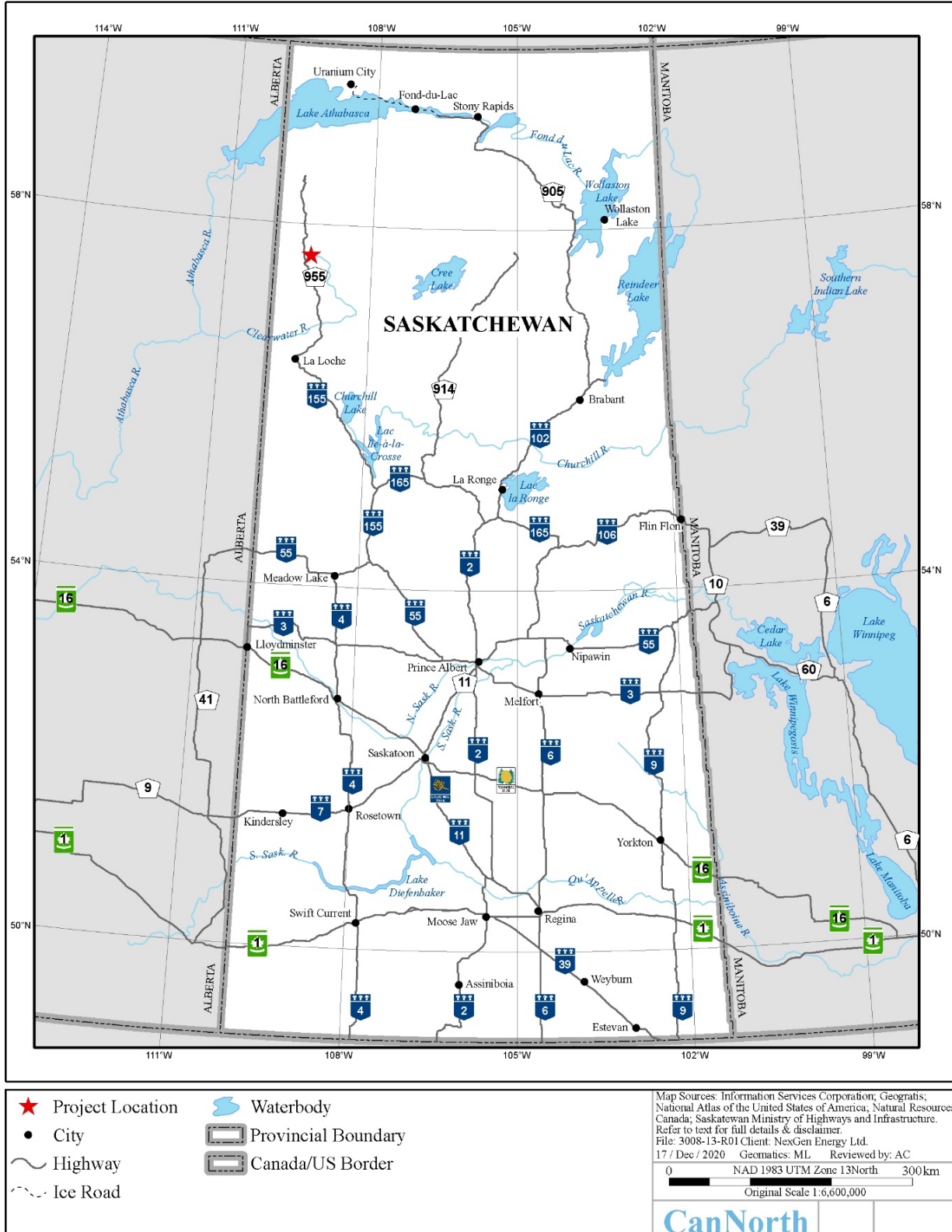


Figure 1.0-1: Location of the Rook I Project within Saskatchewan

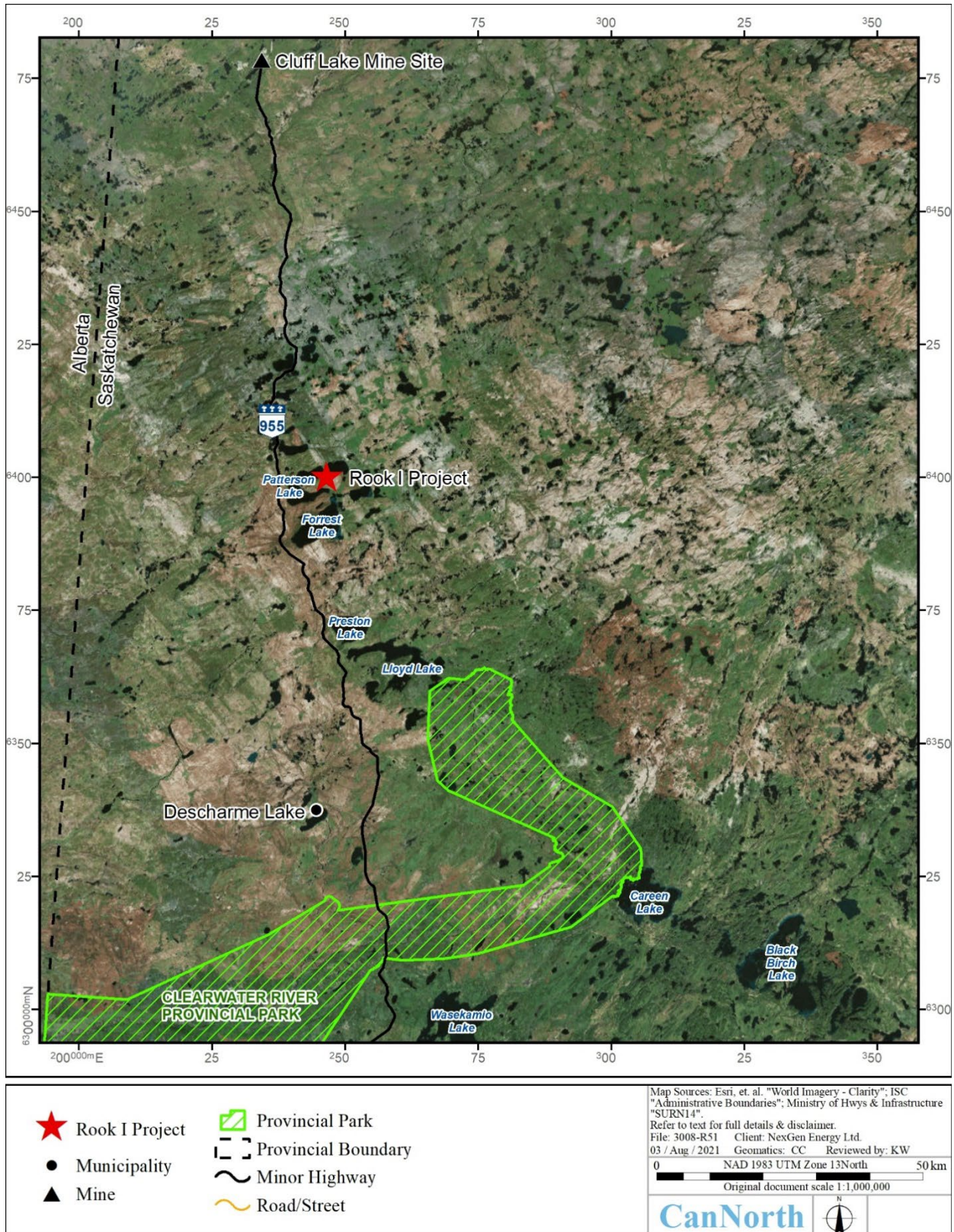


Figure 1.0-2: Location of the Rook I Project Within the Region

1.1 Study Objectives

NexGen was evaluating the feasibility of installing four wind turbines as part of the development of the Project. To supplement baseline survey efforts from 2018, CanNorth was retained to complete avian migration surveys and acoustic bat surveys with a focus on the previously contemplated locations for proposed wind turbines. Avian and acoustic bat surveys were completed as part of the 2018 wildlife baseline investigations (CanNorth 2021), with the exception of avian migration surveys which were not part of the scope of work in 2018.

The objective of the 2020 surveys was to supplement baseline data, following recommendations in the Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects (ENV 2016), the Plant and Wildlife Pre-Construction Surveys for Renewable Energy Projects (ENV 2018), the Wildlife Guidelines for Alberta Wind Energy Projects (GA 2011), and the Wildlife Directive for Alberta Wind and Energy Projects (GA 2018). As some avian and bat species are potential valued components (VCs) in the EA, resulting data will assist in identifying potential risks to species that may be protected under provincial or federal legislation, including activity restriction guidelines and/or the *Species at Risk Act* (SARA) (GC 1994; ENV 2017; SARPR 2020).

1.2 Study Area

The study area established for the 2020 avian migration and acoustic bat surveys was focused on the avian Site Study Area (SSA) established in 2018 for the Project wildlife environmental baseline investigations (CanNorth 2021). The SSA included the area where the deposit and ultimately the construction and mine operations would occur. The SSA is where effects (total area subject to vegetation and soil disturbance, which may have direct and indirect effects on wildlife) are expected to occur on terrestrial environment (GS 2014) and consisted of an area 25 square kilometres (km²) (5 km x 5 km) that encompasses the entire Project footprint (Figure 1.2-1). The SSA is of an appropriate scale and location for assessment of effects on potential VCs resulting from existing and planned activities (CanNorth 2010, 2013a,b; GS 2014; IAAC 2019). Specific survey locations for the 2020 avian migration and bat acoustic surveys were situated near to the proposed turbine locations (Figure 1.2-1); details are provided in Section 2 below.

The SSA lies in the Boreal Plain Ecozone, within the Firebag Hills landscape area of the Mid-boreal Uplands Ecoregion. This area is characterized by variable elevational gradients, ranging from 480 m to 580 m, with both strong and gentle rolling morainic hills (Acton et al. 1998). All water in this landscape area drains westward through the Clearwater River and associated watercourses. Regosolic soils are found predominantly on the eroding slopes of watercourses, whereas Dystric Brunisolic soils are found on more stable slopes and in the upland sections on top of sandy glacial till and glaciofluvial deposits. The vegetation on the northern part of this area is characterized by shrubby jack pine (*Pinus banksiana*) forests that possess lichen understoreys, a consequence of frequent forest fires and the sandy soils that lie beneath (Acton et al. 1998). Conversely, the poorly drained depression areas consist of tamarack (*Larix laricina*) and black spruce (*Picea mariana*) peatlands.

Note that the baseline study boundaries were defined at the beginning of the baseline field studies to inform the field study designs; however, the SSA and Local Study Area (LSA) vary from those chosen for the effects assessment conducted when the Project design was finalized.

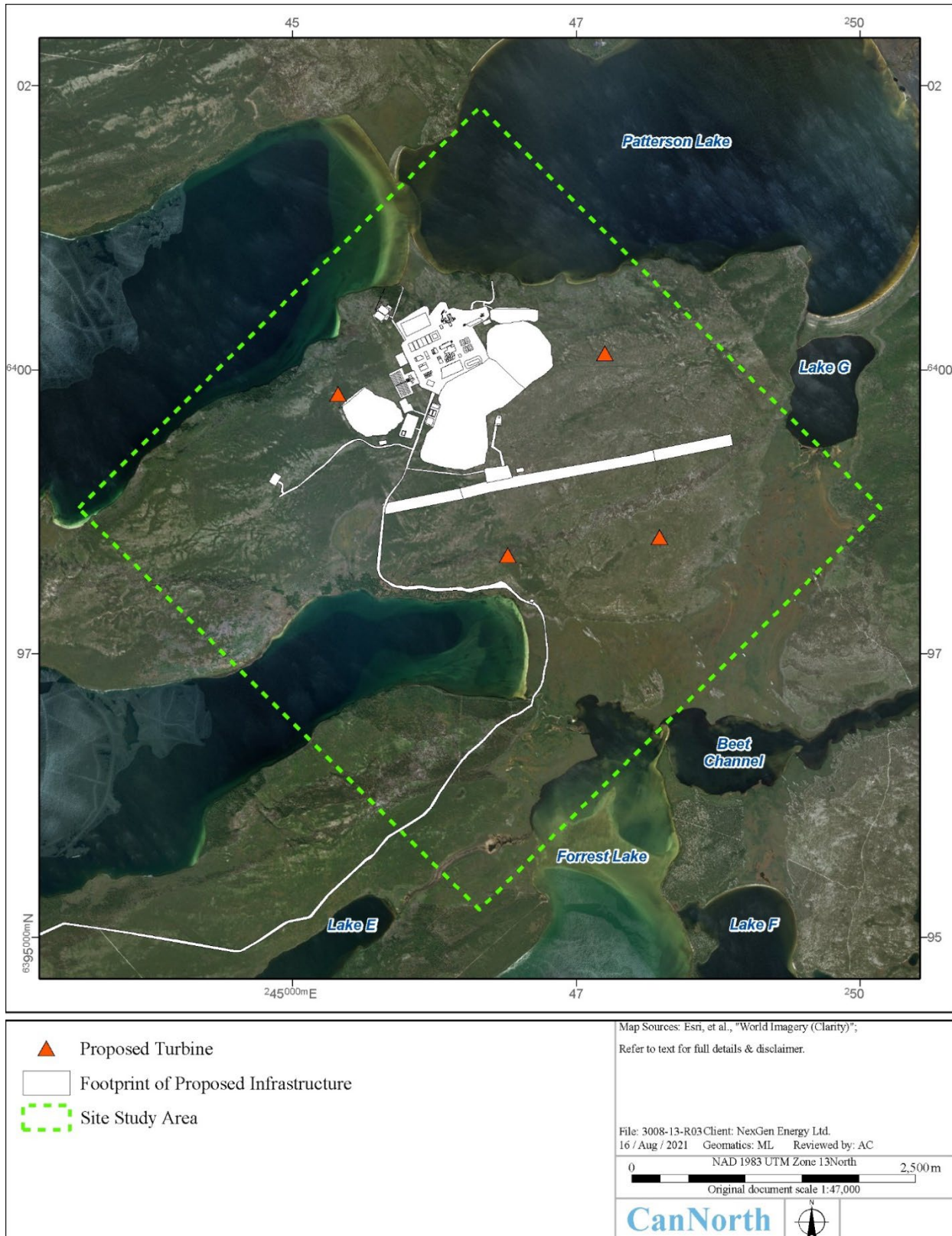


Figure 1.2-1: Locations of Project Infrastructure and Previously Proposed Wind Turbines

2.0 AVIAN MIGRATION SURVEYS

2.1 Study Objectives

A study of avian migration activity was conducted following recommendations in the Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects (ENV 2016), the Plant and Wildlife Pre-Construction Surveys for Renewable Energy Projects (ENV 2018), and the Wildlife Guidelines for Alberta Wind Energy Projects (GA 2011). The study objective was to characterize avian migration, abundance, and diversity in the areas targeted for construction of four proposed wind turbines to provide information for determining risks to migrating birds, in line with the Wildlife Directive for Alberta Wind Energy Projects (GA 2018).

2.2 Methods

To document avian migration in relative proximity to proposed wind turbine locations, spring and fall passage migration surveys were completed at four survey points in the SSA (Table 2.2-1; Figure 2.2-1; Appendix A, Photos 1 to 4). Survey locations were chosen in areas with suitable vantage points (i.e., clear sightlines where feasible) within the SSA. Data were recorded over three site visits for spring, and three site visits for fall, to capture early, mid, and late season migrants. Spring surveys were completed from 2 May 2020 to 1 June 2020, and fall surveys from 10 August 2020 to 20 September 2020.

Table 2.2-1: Locations of Avian Migration Surveys, Spring and Fall 2020

Site ID	UTM Coordinates ^a		Site Description
	Easting	Northing	
AVM 01	605253	6391035	Along access road through bog. Excellent sight lines in all directions.
AVM 02	603392	6391763	Trail through bog. Excellent sight lines to north, south, and east. Good sight line to west.
AVM 03	604488	6393418	Cleared area at high vantage point. Excellent sight lines in all directions.
AVM 04	606006	6391822	At cleared drill pad. Good sight lines to east, south, and west. North view somewhat impaired by topography.

a) UTM = NAD83, Zone 12.

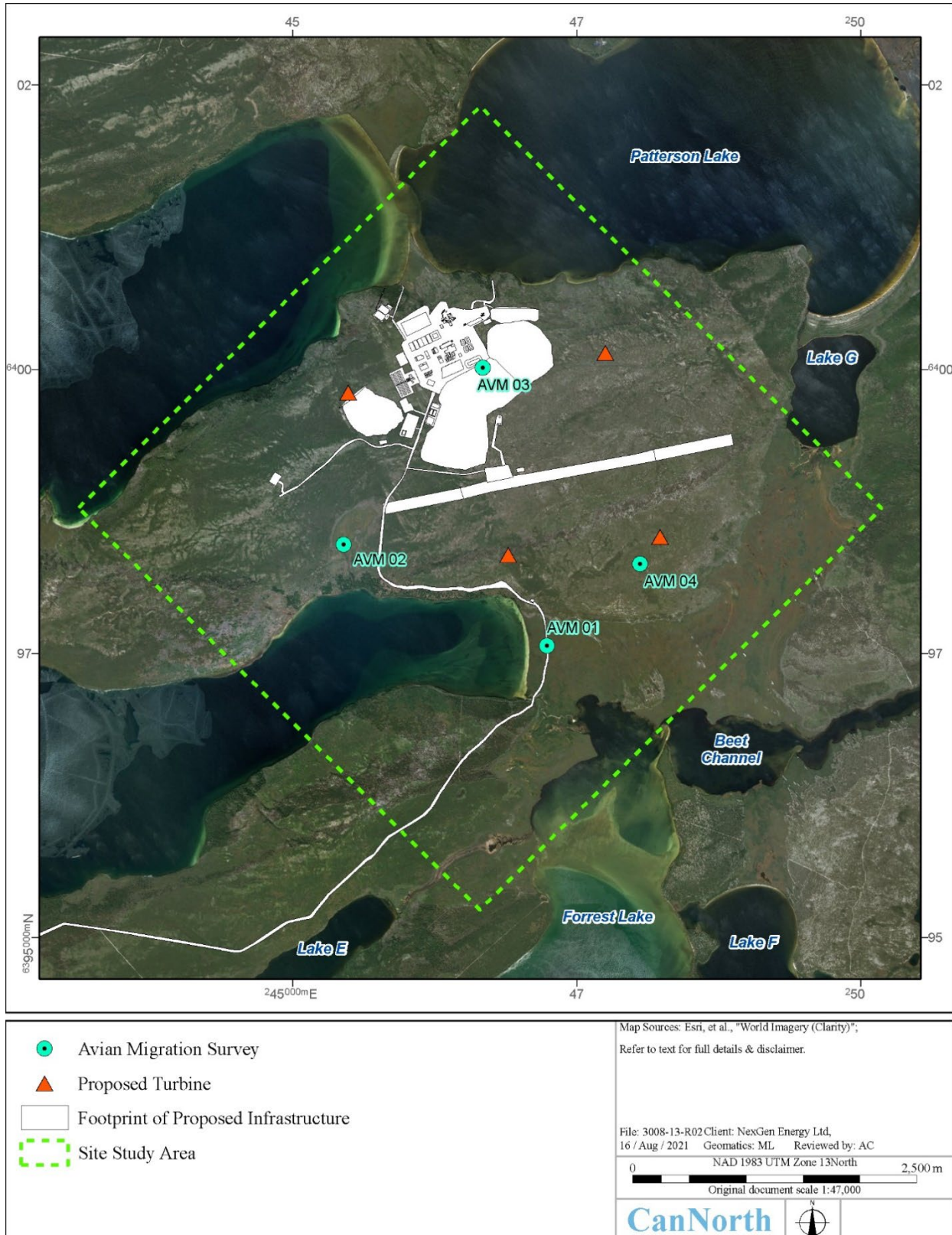


Figure 2.2-1: Locations of Avian Migration Surveys, Spring and Fall 2020

Passage migration surveys followed standard guidance and methods for migration surveys for renewable wind energy projects (AESRD 2013; GA 2011, 2018) and were completed at stationary points. Surveys consisted of 20-minute observation periods completed in both the morning and evening to capture peak movement of migratory birds during daylight hours. Morning surveys were completed starting 30 minutes before sunrise to 3.5 hours after sunrise, and evening surveys from four hours before sunset until sunset. All surveys were completed under suitable weather conditions (i.e., wind speeds below 20 km/h; no or minimal precipitation).

All birds observed were recorded. In cases where birds were observed at too great a distance to identify to species, these observations were grouped under a higher level of taxonomy (e.g., duck species, gull species) for inclusion with specified guilds under published protocols (AEP 2020), as follows:

- A) Passerines (sparrow, warbler, blackbird, jay, lark, longspur, pipit, hummingbird, nighthawk, woodpecker)
- B) Birds of prey (owl, hawk, falcon, eagle, vulture)
- C) Grouse and allies (grouse, partridge, pheasant, turkey, ptarmigan)
- D) Waterfowl (swan, goose, duck, grebe, loon, diving duck)
- E) Shorebirds/waterbirds (sandpiper, heron, crane, egret, coot, rail, gull, phalarope)
- F) Others (crow, raven, magpie, dove, pigeon)

Where large flocks of birds were observed, counting individual birds was not feasible and block-counting was used to estimate overall flock size. For a single species flock, 10 individual birds were counted, and then the remaining birds in the flock were estimated in blocks of 10 (or another suitable integer which was dependent upon flock size [e.g., 50 birds or 100 birds]). If there were a number of species within the flock of birds then observers scanned the flock, recorded percentages of specific species (e.g., 10% Canada goose, 25% Ross's goose, 65% snow goose), then counted 100 individual birds, and extrapolated this number of birds to the remainder of the flock to get total flock size. The species composition percentages were multiplied by the flock size to get species-specific totals. Finally, for each observation, the species, quantity, and flight path (i.e., height) of individuals or flocks were recorded. All bird observations during survey times were reported as the number of birds observed per minute (bpm), as per guidance and existing protocols (AEP 2020).

2.3 Results

Spring avian migration field surveys were conducted between 02 May 2020 and 01 June 2020, while the fall avian migration surveys were completed from 10 August 2020 to 20 September 2020. A total of 502 birds were recorded during avian migration surveys in the spring and fall of 2020, including 344 during the spring surveys and 158 during the fall surveys (Table 2.3-1). Overall species richness throughout the SSA encompassed 47 species of birds in 6 guilds (Appendix B, Table 1). Five species of conservation concern (SOCC) were observed during surveys. Two of these species are listed federally as Threatened under SARA including: common nighthawk (*Chordeiles minor*) and barn swallow (*Hirundo rustica*) (SARPR 2020). An additional three species were observed that are not listed under SARA or Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but have provincial activity restriction guidelines. These include Bonaparte's gull (*Chroicocephalus Philadelphia*), common loon (*Gavia immer*), and bald eagle (*Haliaeetus leucocephalus*) (ENV 2017; SKCDC 2020). Additional details on those SOCC identified in the spring and fall of 2020 can be found in Section 2.9 of the Rook I Project Wildlife Environment

Baseline Report (CanNorth 2021). Detailed results of the avian migration surveys are presented in Appendix B, Table 1.

The most abundant migrants observed during both the spring and fall surveys were snow geese (*Anser caerulescens*). A total of 120 birds were counted, all of which counted during the spring surveys; these accounted for approximately 23.9% of the total number of birds counted during the migration surveys. Canada geese (*Branta canadensis*) were also abundant migrants, with a total of 58 individuals counted; of these, 14 were recorded in the spring and 44 in the fall. Snow geese and Canada geese together comprise approximately 35.4% of total observations. No large kettles of raptors were observed during surveys; in all cases, raptors were observed singly or in pairs.

The most abundant birds were categorized into the waterfowl and passerine guilds (239 observances and 204 observances, respectively). Seven species of waterbirds were observed during spring and fall surveys, with 22 species of passerines observed across the survey periods. The station that recorded the highest diversity and abundance was at survey location AVM 01, with 259 individuals from 30 different species. It should be noted that across all guilds, survey locations, and seasons, observed birds per minute (bpm) were consistently low, averaging 0.53 bpm across the survey duration. While no significant numbers of migrating birds were observed (i.e., large flocks of foraging waterfowl or passerines), habitat usage can be highly variable among years. The numbers of migratory birds recorded at these locations are reflective of conditions that may be observed anywhere within area of the Project. As food and open water availability may vary either annually or seasonally, movement of migratory birds throughout the Project vicinity are expected to change with surrounding conditions.

Table 2.3-1: Results of Avian Migration Surveys, Spring and Fall 2020

Site ID	Guild ^a	Abundance	Total Survey Time (mins)	Birds per minute	Proportion	Loafing	Aerial Flight Height		
						0m	1-30m	31-60m	61+ m
AVM 01	SPRING 2020 (02 May 2020 to 01 June 2020)								
	A	50	120	0.42	25%	45	4	1	0
	B	6	120	0.05	3%	0	5	0	1
	C	0	120	0.00	0%	0	0	0	0
	D	139	120	1.16	68%	21	4	22	92
	E	8	120	0.07	4%	6	1	0	1
	F	0	120	0.00	0%	0	0	0	0
	TOTAL	203	120	1.69	100%	72	14	23	94
	FALL 2020 (10 August 2020 to 20 September 2020)								
	A	10	120	0.08	18%	10	0	0	0
	B	0	120	0.00	0%	0	0	0	0
	C	0	120	0.00	0%	0	0	0	0
	D	42	120	0.35	75%	1	30	11	0
	E	1	120	0.01	2%	1	0	0	0
F	3	120	0.03	5%	1	2	0	0	
TOTAL	56	120	0.47	100%	12	30	11	0	
AVM 02	SPRING 2020 (02 May 2020 to 01 June 2020)								
	A	12	120	0.10	24%	8	3	1	0
	B	3	120	0.03	6%	0	1	2	0
	C	1	120	0.01	2%	1	0	0	0
	D	30	120	0.25	59%	10	0	0	20
	E	2	120	0.02	4%	1	0	1	0
	F	3	120	0.03	6%	1	2	0	0
	TOTAL	51	120	0.43	100%	21	6	4	20
	FALL 2020 (10 August 2020 to 20 September 2020)								
	A	16	120	0.13	80%	14	0	2	0
	B	1	120	0.01	5%	0	0	1	0
	C	0	120	0.00	0%	0	0	0	0
	D	1	120	0.01	5%	0	0	1	0
	E	1	120	0.01	5%	1	0	0	0
F	1	120	0.01	5%	1	0	0	0	
TOTAL	20	120	0.17	100%	15	0	4	0	
AVM 03	SPRING 2020 (03 May 2020 to 01 June 2020)								
	A	26	120	0.22	74%	9	6	8	3
	B	0	120	0.00	0%	0	0	0	0
	C	0	120	0.00	0%	0	0	0	0
	D	5	120	0.04	14%	2	0	2	1
	E	3	120	0.03	9%	2	0	0	1
	F	1	120	0.01	3%	1	0	0	0
	TOTAL	35	120	0.29	100%	14	6	10	5
	FALL 2020 (10 August 2020 to 20 September 2020)								
	A	36	120	0.30	61%	18	3	2	13

Site ID	Guild ^a	Abundance	Total Survey Time (mins)	Birds per minute	Proportion	Loafing	Aerial Flight Height		
						0m	1-30m	31-60m	61+ m
	B	0	120	0.00	0%	0	0	0	0
	C	0	120	0.00	0%	0	0	0	0
	D	17	120	0.14	29%	17	0	0	0
	E	4	120	0.03	7%	0	3	1	0
	F	2	120	0.02	3%	1	1	0	0
	TOTAL	59	120	0.49	100%	35	6	3	13
AVM 04	SPRING 2020 (02 May 2020 to 01 June 2020)								
	A	36	120	0.30	65%	25	11	0	0
	B	0	120	0.00	0%	0	0	0	0
	C	0	120	0.00	0%	0	0	0	0
	D	4	120	0.03	7%	4	0	0	0
	E	14	120	0.12	25%	7	0	7	0
	F	1	120	0.01	2%	1	0	0	0
	TOTAL	55	120	0.46	100%	37	11	7	0
	FALL 2020 (28 August 2020 to 20 September 2020)								
	A	18	120	0.15	78%	5	11	2	0
	B	0	120	0.00	0%	0	0	0	0
	C	0	120	0.00	0%	0	0	0	0
	D	1	120	0.01	4%	1	0	0	0
	E	4	120	0.03	17%	3	1	0	0
F	0	120	0.00	0%	0	0	0	0	
TOTAL	23	120	0.19	100%	9	12	2	0	

Source: Guild categories from AEP (2020).

a) Guild Categories are defined as:

A: Passerines (sparrow, warbler, blackbird, jay, lark, longspur, pipit, hummingbird, nighthawk, woodpecker).

B: Birds of prey (owl, hawk, falcon, eagle, vulture).

C: Grouse and allies (grouse, partridge, pheasant, turkey, ptarmigan).

D: Waterfowl (swan, goose, duck, grebe, loon, diving duck).

E: Shorebirds/waterbirds (sandpiper, heron, crane, egret, coot, rail, gull, phalarope).

F: Others (crow, raven, magpie, dove, pigeon).

3.0 BAT SURVEYS

3.1 Study Objectives

Bat surveys were conducted for the proposed Project in summer 2020 to supplement the 2018 acoustic bat surveys that were conducted as a component of comprehensive wildlife baseline studies completed to describe existing conditions in the terrestrial environment for the Project (CanNorth 2021). A study of bat activity was conducted following recommendations in the Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects (ENV 2016), the Plant and Wildlife Pre-Construction Surveys for Renewable Energy Projects (ENV 2018), the Wildlife Guidelines for Alberta Wind Energy Projects (GA 2011), and the Bat Mitigation Framework for Wind Power Development (GA 2013). The study objective was to characterize seasonal bat activity in the areas targeted for construction of four proposed wind turbines to provide information for determining the risk to bat species, in line with the Wildlife Directive for Alberta Wind Energy Projects (GA 2018).

3.2 Methods

Acoustic bat surveys were conducted from 2 May 2020 to 24 September 2020 at three monitoring stations (Table 3.2-1; Figure 3.2-1), following protocols established by Vonhof (2017). Full spectrum Wildlife Acoustics SM4BAT detectors paired with ultrasonic U2 microphones were installed adjacent to proposed locations for the proposed wind turbines. Bat detectors were programmed prior to deployment and set to record ultrasonic sound at 10 minute intervals (i.e., 10 minutes on, 10 minutes off) beginning 30 minutes after sunset and continuing until 30 minutes before sunrise. To increase data collection quality and reduce extraneous noise files, the detectors were programmed with a minimum recording duration of 1.5 milliseconds (ms) with trigger frequency of 16 kilohertz (kHz), and a trigger level of 12 decibels (dB). All detectors were equipped with two 32 GB SD memory cards. Ultrasonic microphones were mounted to 5 centimetres (cm) x 5 cm x 244 cm wooden posts and secured to trees at a height of 2 metres (m) using cable ties and screws, resulting in a microphone deployment height of approximately 4.5 m. Detectors were retrieved in late September 2020.

Table 3.2-1: Locations of Bat Detectors, May To September 2020

Detector ID	UTM Coordinates ^a		Site Description	Deployment Description	Habitat Description
	Easting	Northing			
BAT 06	605103	6393820	North slope	Jack pine (<i>Pinus banksiana</i>) at a height of approximately 4.5 meters	Coniferous forest
BAT 07	603306	6393125	~10 m from well head	Jack pine (<i>Pinus banksiana</i>) at a height of approximately 4.5 meters	Coniferous forest
BAT 08	605999	6391861	Adjacent to drill pad	Jack pine (<i>Pinus banksiana</i>) at a height of approximately 4.5 meters	Coniferous forest

a) UTM = NAD83, Zone 12.

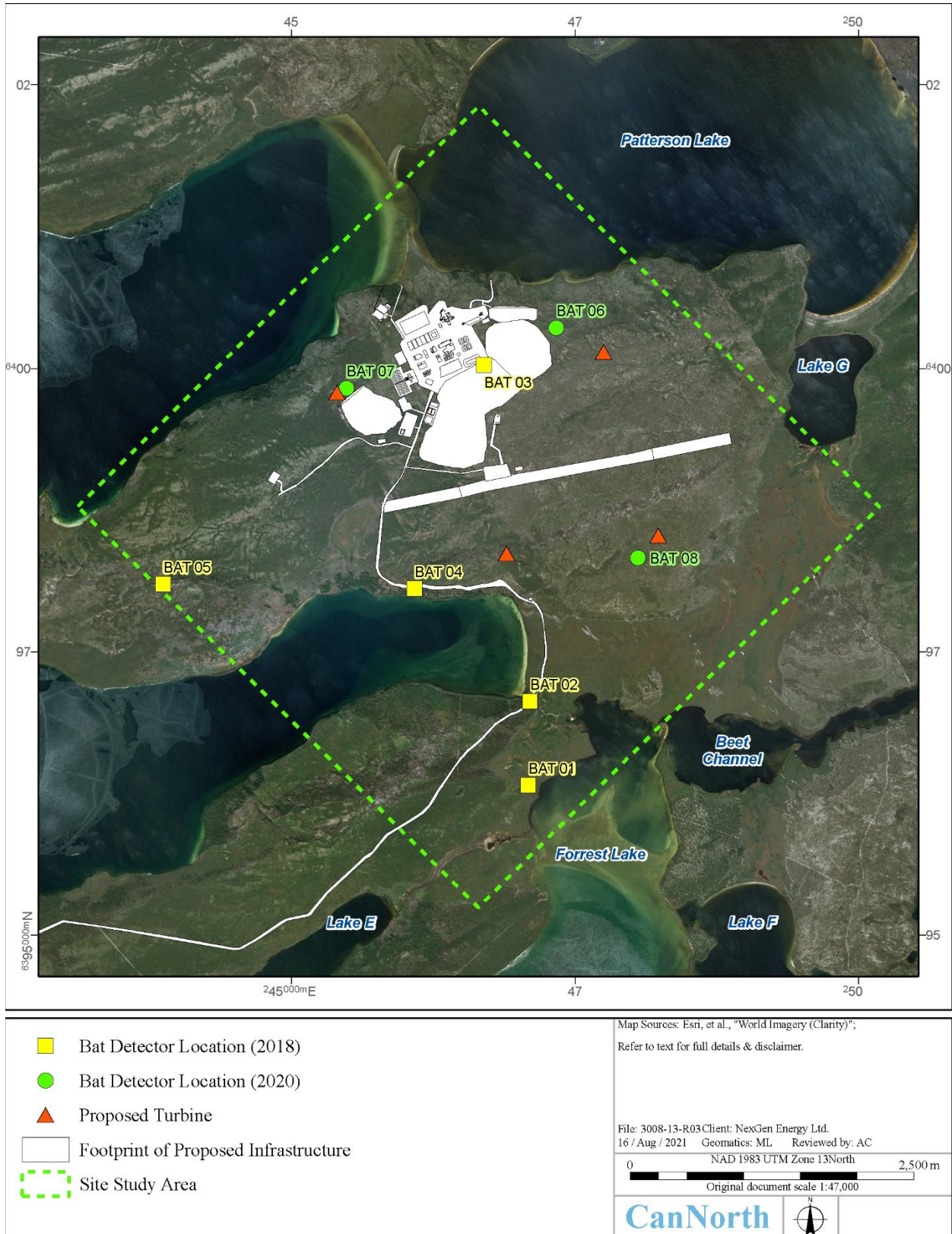


Figure 3.2-1: Location of Bat Detectors

In the analysis, the standard units of measure used were bat call sequences (i.e., bat passes) and the primary measurement for reporting activity rates were bat passes per detector night (i.e., at one detector over a one-night period). This information was used as a relative measure of bat activity in the vicinity of any given bat detector. Echolocation analysis was conducted using Kaleidoscope Pro (Version 5.1.4) to determine the number of bat passes per night and to identify the bat call sequences to species group. Files were analyzed based on parameters such as call frequency, shape, slope, and duration, and were broadly matched to the calls of species with biogeographical ranges overlapping the Project area (Table 3.2-2).

Table 3.2-2: Bat Species with Biogeographical Ranges Overlapping the Project Area

Scientific Name	Common Name	SKCDC Rank	COSEWIC	SARA Status	Schedule
<i>Eptesicus fuscus</i>	Big brown bat	S5	-	-	-
<i>Lasionycteris noctivagans</i>	Silver-haired bat	S5B	-	-	-
<i>Lasiurus borealis</i>	Eastern red bat	S4B	-	-	-
<i>Lasiurus cinereus</i>	Hoary bat	S5B	-	-	-
<i>Myotis lucifugus</i>	Little brown myotis	S4B,S4N	Endangered	Endangered	Schedule 1
<i>Myotis septentrionalis</i>	Northern myotis	S3	Endangered	Endangered	Schedule 1

Source: All scientific, common names, and provincial ranks from SKCDC (2020); federal ranks from SARPR (2020).

SKCDC = Saskatchewan Conservation Data Centre; S3 = vulnerable/rare to uncommon, S4 = apparently secure, S5 = secure/common.

B = Breeding populations of migratory species in the province, N = Non-breeding populations of migratory species in the province.

Bold text indicates species of conservation concern.

COSEWIC = Committee on the Status of Endangered Wildlife In Canada.

SARA = *Species at Risk Act*.

Manual vetting of results was completed to remove false positives. Sound categories created to identify bats in the area of the Project were based on specific audio signatures as typically calls cannot be conclusively identified to species. Uncertainty exists in differentiating calls of big brown bat (*Eptesicus fuscus*) and silver-haired bat (*Lasionycteris noctivagans*); eastern red bat (*Lasiurus borealis*) and little brown myotis; and species in the *Myotis* genus. Note that two bat species, little brown myotis and northern myotis, were listed in two species groups. While it can be difficult to distinguish between both species in the *Myotis* genus, call features can exist that enable observers to rule out the eastern red bat when considering all species in the high frequency group. In consideration of all the above variables, vocalizations of bat species were grouped into the following three categories following Vonhof (2017):

- High frequency bats: Eastern red bat, northern myotis and little brown myotis
- Low frequency bats: Big brown, silver-haired, and hoary bat (*Lasiurus cinereus*)
- *Myotis* species: Northern myotis and little brown myotis

3.3 Results

Detectors recorded a total of 320 bat passes from 2 May 2020 until 24 September 2020. Bat activity rates for all detectors ranged from 0.25 (36 recordings) to 1.46 (211 recordings) bat passes per detector night with a combined average of 0.74 bat passes per detector night (320 recordings). While the interaction of habitat variables (i.e., prey or roost availability, foraging conditions, and predator avoidance) is difficult to quantify, bats (*Myotis* especially) tend to forage over still water, rivers, forest edges/trails, and generally select larger diameter trees for roosting (COSEWIC 2013). Results are presented in Table 3.3-1, with detailed results in Appendix B, Table 2.

Table 3.3-1: Results of Acoustic Bat Surveys, May to September 2020

Detector ID	Number of Nights in Operation	Recorded Bat Passes			Total Recorded Bat Passes	Total Bat Passes Per Detector Night
		High Frequency ^a	<i>Myotis</i> spp. ^b	Low Frequency ^c		
BAT_06	145	34	34	5	73	0.50
BAT_07	145	29	7	0	36	0.25
BAT_08	145	115	92	4	211	1.46
COMBINED	435	178	133	9	320	0.74

a) Including *Myotis lucifugus*, *Myotis septentrionalis*, and *Lasirurus borealis*.

b) Including *Myotis lucifugus*, and *Myotis septentrionalis*.

c) Including *Eptesicus fuscus*, *Lasionycteris noctivagans*, and *Lasirurus cinereus*.

All three bat groups were detected at bat detector stations. Bats in the high frequency group (i.e., eastern red bats, little brown myotis, and northern myotis) and the myotis group (i.e., little brown myotis and northern myotis) accounted for the vast majority of recorded bat passes (311 recordings; 97.2%). Bats in the low-frequency group (i.e., big brown, silver-haired, and hoary bats) were recorded much less frequently than the other groups (9 recordings; 3.8%). In consideration of known species ranges and abundance, call characteristics, and habitat suitability, bat passes categorized into either the high frequency or the *Myotis* groups are expected to be primarily composed of little brown myotis. Likewise, those individuals in the low frequency group are expected to be primarily composed of silver-haired or hoary bats (M. Brigham, University of Regina, pers. comm.).

Bat activity in the area of the Project was fairly consistent from May to August with two spikes in total bat passes on 30 July and 7 August (Figure 3.3-1). Both little brown myotis and northern myotis mate during a late summer or autumn “swarming period” prior to hibernation (COSEWIC 2013). None of the detectors recorded a spike indicative of swarming activity which could indicate presence of nearby hibernacula. However, detection ranges of recorders vary based on a number of factors and under optimal conditions a detection range of only 25 m is expected (Agranat 2014).

Both the little brown myotis and northern myotis are federally listed as endangered under SARA (SARPR 2020), and the roosts and foraging sites for all bat species (*Vespertilionidae*) are listed under the Saskatchewan Activity Restriction Guidelines (ENV 2017), recommending a 500-m setback from high disturbance activities year-round. While there is some uncertainty in species identification in recordings, there is near certainty that little brown myotis occurs in the area of the Project, and a reasonable likelihood that northern myotis occurs as well (M. Brigham, University of Regina, pers. comm.). Little brown myotis is provincially ranked as S4 (apparently secure), while northern myotis is ranked as S3 (rare to

uncommon) in Saskatchewan. The remaining four species of bats potentially detected are ranked as either apparently secure (S4) or secure/common (S5) by the SKCDC.

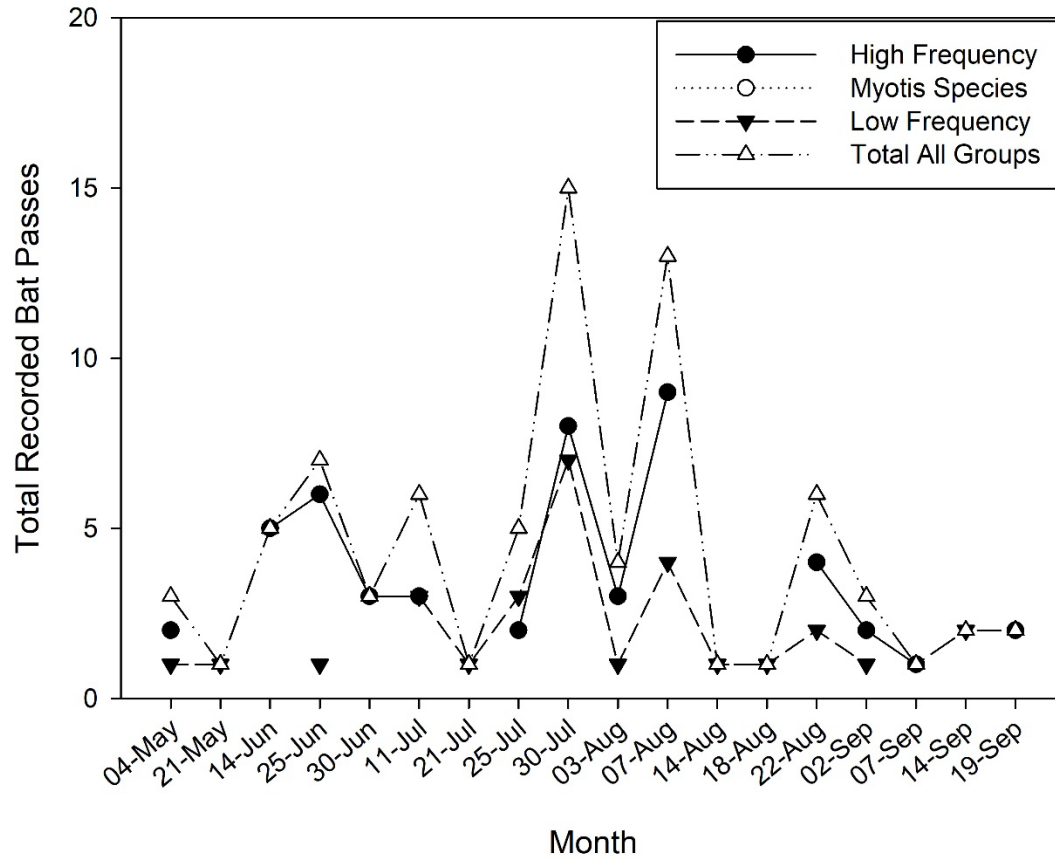


Figure 3.3-1: Total Number of Bat Passes per Month, May to September 2020

4.0 SUMMARY

The wildlife baseline program was designed to obtain comprehensive information to characterize wildlife, to include SOCC, and the associated habitats in near vicinity to the Project (SSA) and a broader LSA). Information obtained through database searches and field surveys was used alongside Indigenous and Local Knowledge in the EIS and cumulative effects assessment, to inform Project planning, and support development of future monitoring programs and reclamation plans.

NexGen was contemplating the feasibility of installing four wind turbines as part of their efforts to develop the Project. To supplement baseline survey efforts from 2018, CanNorth was retained to complete avian migration surveys and acoustic bat surveys with a focus on the locations for proposed wind turbines. Three rounds each of spring and fall avian migration surveys were completed at four survey locations in areas with suitable vantage points (i.e., clear sightlines where feasible) within the avian site study area. Bat detectors were deployed in accessible areas of habitat consistent with the proposed locations of wind turbines. It is highlighted that the turbines are not included as part of EIS for the Project.

Avian migration surveys in spring and fall totaled 920 minutes of observation time across four survey stations, with 502 birds observed. Overall species richness throughout the area of the Project encompassed 47 species of birds in 6 guilds. Five species of SOCC were observed during surveys. Two of these are listed federally as threatened under SARA including: common nighthawk and barn swallow (SARPR 2020). An additional three species have provincial activity restriction guidelines, including Bonaparte's gull (400 m, 1 May to 15 July), common loon (200 m, 15 May to 15 July), and bald eagle (1,000 m, 15 March to 15 July).

Between May and October 2020, three bat detectors were deployed to detect bats in three vocalization categories: high frequency, low frequency, and myotis. A total of 320 bat passes were recorded, including 178 high frequency, 133 myotis, and 9 low-frequency vocalization categories. Based on biogeographical range, abundance, call characteristics, and habitat suitability, bat passes categorized into either the high frequency or the *Myotis* groups are expected to be primarily composed of little brown myotis, and those individuals in the low frequency group are expected to be primarily composed of silver-haired or hoary bats. Both the little brown myotis and northern myotis are federally listed as endangered under SARA (SARPR 2020), and the roosts and foraging sites for all bat species (*Vespertilionidae*) are listed under the Saskatchewan Activity Restriction Guidelines, recommending a 500-m setback from high disturbance activities year-round.

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6.0 MAP SOURCES AND DISCLAIMERS

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APPENDIX A

WILDLIFE TERRESTRIAL ENVIRONMENT
PHOTOGRAPHS

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Photo 1. Avian migration survey point AVM 01, North view, Spring 2020



Photo 2. Avian migration survey point AVM 02, North view, Spring 2020



Photo 3. Avian migration survey point AVM 03, North view, Spring 2020



Photo 4. Avian migration survey point AVM 04, North view, Spring 2020

APPENDIX B

DETAILED DATA TABLES

APPENDIX B: DETAILED DATA TABLES
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Appendix B, Table 1

Detailed Results From The Avian Migration Surveys Conducted For The Project, Spring and Fall 2020

Site ID	Season	Survey Round	Date	UTM Coordinates ^a		Scientific Name	Common Name	Species Guild ^b	Quantity	Flight Height Grouping (m)
				Easting	Northing					
AVM 01	Spring	1	02-May-2020	605253	6391035	<i>Haliaeetus leucocephalus</i>	Bald Eagle	B	3	1-30
AVM 01	Spring	1	02-May-2020	605253	6391035	<i>Branta canadensis</i>	Canada Goose	D	2	loafing/foraging
AVM 01	Spring	1	03-May-2020	605253	6391035	<i>Perisoreus canadensis</i>	Canada Jay	A	1	1-30
AVM 01	Spring	1	02-May-2020	605253	6391035	<i>Gavia immer</i>	Common Loon	D	2	loafing/foraging
AVM 01	Spring	1	03-May-2020	605253	6391035	<i>Junco hyemalis</i>	Dark-eyed Junco	A	3	1-30
AVM 01	Spring	1	02-May-2020	605253	6391035	<i>Anas platyrhynchos</i>	Mallard	D	1	1-30
AVM 01	Spring	1	02-May-2020	605253	6391035	<i>Anas platyrhynchos</i>	Mallard	D	2	1-30
AVM 01	Spring	1	03-May-2020	605253	6391035	<i>Accipiter gentilis atricapillus</i>	Northern Goshawk	B	1	1-30
AVM 01	Spring	1	03-May-2020	605253	6391035	<i>Circus hudsonius</i>	Northern Harrier	B	1	1-30
AVM 01	Spring	1	03-May-2020	605253	6391035	<i>Antigone canadensis</i>	Sandhill Crane	E	3	loafing/foraging
AVM 01	Spring	2	14-May-2020	605253	6391035	<i>Gavia immer</i>	Common Loon	D	1	61+
AVM 01	Spring	2	15-May-2020	605253	6391035	<i>Gavia immer</i>	Common Loon	D	1	loafing/foraging
AVM 01	Spring	2	15-May-2020	605253	6391035	<i>Plectrophenax nivalis</i>	Snow Bunting	A	30	loafing/foraging
AVM 01	Spring	2	14-May-2020	605253	6391035	<i>Anser caerulescens</i>	Snow Goose	D	35	61+
AVM 01	Spring	2	15-May-2020	605253	6391035	<i>Anser caerulescens</i>	Snow Goose	D	9	31-60
AVM 01	Spring	2	15-May-2020	605253	6391035	<i>Anser caerulescens</i>	Snow Goose	D	44	61+
AVM 01	Spring	2	15-May-2020	605253	6391035	<i>Anser caerulescens</i>	Snow Goose	D	12	61+
AVM 01	Spring	2	15-May-2020	605253	6391035	<i>Cygnus columbianus</i>	Tundra Swan	D	13	31-60
AVM 01	Spring	3	31-May-2020	605253	6391035	<i>Turdus migratorius</i>	American Robin	A	1	31-60
AVM 01	Spring	3	31-May-2020	605253	6391035	<i>Turdus migratorius</i>	American Robin	A	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Turdus migratorius</i>	American Robin	A	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Turdus migratorius</i>	American Robin	A	3	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Turdus migratorius</i>	American Robin	A	1	loafing/foraging
AVM 01	Spring	3	31-May-2020	605253	6391035	<i>Haliaeetus leucocephalus</i>	Bald Eagle	B	1	61+
AVM 01	Spring	3	31-May-2020	605253	6391035	<i>Chroicocephalus philadelphia</i>	Bonaparte's Gull	E	1	1-30
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Chroicocephalus philadelphia</i>	Bonaparte's Gull	E	1	loafing/foraging
AVM 01	Spring	3	31-May-2020	605253	6391035	<i>Larus californicus</i>	California Gull	E	1	61+
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Perisoreus canadensis</i>	Canada Jay	A	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Bucephala clangula</i>	Common Goldeneye	D	15	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Bucephala clangula</i>	Common Goldeneye	D	1	loafing/foraging
AVM 01	Spring	3	31-May-2020	605253	6391035	<i>Gavia immer</i>	Common Loon	D	1	1-30
AVM 01	Spring	3	31-May-2020	605253	6391035	<i>Chordeiles minor</i>	Common Nighthawk	A	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Tringa flavipes</i>	Lesser Yellowlegs	E	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Melospiza lincolni</i>	Lincoln's Sparrow	A	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Leiothlypis celata</i>	Orange-crowned Warbler	A	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Setophaga palmarum</i>	Palm Warbler	A	2	loafing/foraging
AVM 01	Spring	3	31-May-2020	605253	6391035	<i>Regulus calendula</i>	Ruby-crowned Kinglet	A	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Catharus ustulatus</i>	Swainson's Thrush	A	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Zonotrichia albicollis</i>	White-throated Sparrow	A	1	loafing/foraging
AVM 01	Spring	3	01-Jun-2020	605253	6391035	<i>Setophaga coronata</i>	Yellow-rumped Warbler	E	1	loafing/foraging
AVM 01	Fall	1	10-Aug-2020	605253	6391035	<i>Perisoreus canadensis</i>	Canada Jay	A	1	loafing/foraging
AVM 01	Fall	2	29-Aug-2020	605253	6391035	<i>Branta canadensis</i>	Canada Goose	D	30	1-30
AVM 01	Fall	2	28-Aug-2020	605253	6391035	<i>Larus delawarensis</i>	Ring-billed Gull	E	1	loafing/foraging
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Turdus migratorius</i>	American Robin	A	1	loafing/foraging
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Turdus migratorius</i>	American Robin	A	1	loafing/foraging
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Turdus migratorius</i>	American Robin	A	1	loafing/foraging
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Cyanocitta cristata</i>	Blue Jay	A	1	loafing/foraging

Appendix B, Table 1

Detailed Results From The Avian Migration Surveys Conducted For The Project, Spring and Fall 2020

Site ID	Season	Survey Round	Date	UTM Coordinates ^a		Scientific Name	Common Name	Species Guild ^b	Quantity	Flight Height Grouping (m)
				Easting	Northing					
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Branta canadensis</i>	Canada Goose	D	11	31-60
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Perisoreus canadensis</i>	Canada Jay	A	1	loafing/foraging
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Gavia immer</i>	Common Loon	D	1	loafing/foraging
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Corvus corax</i>	Common Raven	F	2	1-30
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Corvus corax</i>	Common Raven	F	1	loafing/foraging
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Junco hyemalis</i>	Dark-eyed Junco	A	1	loafing/foraging
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Dryobates pubescens</i>	Downy Woodpecker	A	1	loafing/foraging
AVM 01	Fall	3	20-Sep-2020	605253	6391035	<i>Spinus pinus</i>	Pine Siskin	A	2	loafing/foraging
AVM 02	Spring	1	02-May-2020	603392	6391763	<i>Corvus brachyrhynchos</i>	American Crow	F	1	1-30
AVM 02	Spring	1	03-May-2020	603392	6391763	<i>Turdus migratorius</i>	American Robin	A	2	1-30
AVM 02	Spring	1	03-May-2020	603392	6391763	<i>Perisoreus canadensis</i>	Canada Jay	A	1	loafing/foraging
AVM 02	Spring	1	02-May-2020	603392	6391763	<i>Corvus corax</i>	Common Raven	F	1	loafing/foraging
AVM 02	Spring	1	03-May-2020	603392	6391763	<i>Junco hyemalis</i>	Dark-eyed Junco	A	1	loafing/foraging
AVM 02	Spring	1	03-May-2020	603392	6391763	<i>Laridae</i>	Gulls, Terns, and Skimmers*	E	1	61+
AVM 02	Spring	2	15-May-2020	603392	6391763	<i>Falco sparverius</i>	American Kestrel	B	1	1-30
AVM 02	Spring	2	14-May-2020	603392	6391763	<i>Branta canadensis</i>	Canada Goose	D	10	loafing/foraging
AVM 02	Spring	2	14-May-2020	603392	6391763	<i>Junco hyemalis</i>	Dark-eyed Junco	A	1	loafing/foraging
AVM 02	Spring	2	15-May-2020	603392	6391763	<i>Junco hyemalis</i>	Dark-eyed Junco	A	2	loafing/foraging
AVM 02	Spring	2	15-May-2020	603392	6391763	<i>Regulus calendula</i>	Ruby-crowned Kinglet	A	1	loafing/foraging
AVM 02	Spring	2	15-May-2020	603392	6391763	<i>Anser caerulescens</i>	Snow Goose	D	20	
AVM 02	Spring	3	01-Jun-2020	603392	6391763	<i>Corvus brachyrhynchos</i>	American Crow	F	1	1-30
AVM 02	Spring	3	01-Jun-2020	603392	6391763	<i>Turdus migratorius</i>	American Robin	A	1	1-30
AVM 02	Spring	3	31-May-2020	603392	6391763	<i>Haliaeetus leucocephalus</i>	Bald Eagle	B	2	61+
AVM 02	Spring	3	31-May-2020	603392	6391763	<i>Chordeiles minor</i>	Common Nighthawk	A	1	61+
AVM 02	Spring	3	31-May-2020	603392	6391763	<i>Regulus calendula</i>	Ruby-crowned Kinglet	A	1	loafing/foraging
AVM 02	Spring	3	01-Jun-2020	603392	6391763	<i>Falci pennis canadensis</i>	Spruce Grouse	C	1	loafing/foraging
AVM 02	Spring	3	01-Jun-2020	603392	6391763	<i>Cardellina pusilla</i>	Wilson's Warbler	A	1	loafing/foraging
AVM 02	Spring	3	31-May-2020	603392	6391763	<i>Setophaga coronata</i>	Yellow-rumped Warbler	E	1	loafing/foraging
AVM 02	Fall	1	10-Aug-2020	603392	6391763	<i>Chordeiles minor</i>	Common Nighthawk	A	1	31-60
AVM 02	Fall	2	29-Aug-2020	603392	6391763	<i>Perisoreus canadensis</i>	Canada Jay	A	1	loafing/foraging
AVM 02	Fall	2	29-Aug-2020	603392	6391763	<i>Corvus corax</i>	Common Raven	F	1	loafing/foraging
AVM 02	Fall	2	29-Aug-2020	603392	6391763	<i>Anatidae</i>	Ducks, Geese, Swans*	D	1	31-60
AVM 02	Fall	2	29-Aug-2020	603392	6391763	<i>Spinus pinus</i>	Pine Siskin	A	1	31-60
AVM 02	Fall	3	20-Sep-2020	603392	6391763	<i>Turdus migratorius</i>	American Robin	A	1	loafing/foraging
AVM 02	Fall	3	20-Sep-2020	603392	6391763	<i>Haliaeetus leucocephalus</i>	Bald Eagle	B	1	31-60
AVM 02	Fall	3	20-Sep-2020	603392	6391763	<i>Perisoreus canadensis</i>	Canada Jay	A	2	loafing/foraging
AVM 02	Fall	3	20-Sep-2020	603392	6391763	<i>Perisoreus canadensis</i>	Canada Jay	A	1	loafing/foraging
AVM 02	Fall	3	20-Sep-2020	603392	6391763	<i>Passerella iliaca</i>	Fox Sparrow	A	1	loafing/foraging
AVM 02	Fall	3	20-Sep-2020	603392	6391763	<i>Junco hyemalis hyemalis</i>	Slate-coloured Junco	A	8	loafing/foraging
AVM 02	Fall	3	20-Sep-2020	603392	6391763	<i>Setophaga coronata</i>	Yellow-rumped Warbler	E	1	loafing/foraging
AVM 03	Spring	1	03-May-2020	604488	6393418	<i>Corvus corax</i>	Common Raven	F	1	loafing/foraging
AVM 03	Spring	1	03-May-2020	604488	6393418	<i>Junco hyemalis</i>	Dark-eyed Junco	A	2	loafing/foraging
AVM 03	Spring	2	14-May-2020	604488	6393418	<i>Gavia immer</i>	Common Loon	D	2	31-60
AVM 03	Spring	2	15-May-2020	604488	6393418	<i>Mergus merganser</i>	Common Merganser	D	1	61+
AVM 03	Spring	2	15-May-2020	604488	6393418	<i>Anatidae</i>	Ducks, Geese, Swans*	D	1	loafing/foraging
AVM 03	Spring	2	15-May-2020	604488	6393418	<i>Laridae</i>	Gulls, Terns, and Skimmers*	E	1	61+
AVM 03	Spring	2	15-May-2020	604488	6393418	<i>Plectrophenax nivalis</i>	Snow Bunting	A	2	31-60

Appendix B, Table 1

Detailed Results From The Avian Migration Surveys Conducted For The Project, Spring and Fall 2020

Site ID	Season	Survey Round	Date	UTM Coordinates ^a		Scientific Name	Common Name	Species Guild ^b	Quantity	Flight Height Grouping (m)
				Easting	Northing					
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Turdus migratorius</i>	American Robin	A	1	loafing/foraging
AVM 03	Spring	3	31-May-2020	604488	6393418	<i>Hirundo rustica</i>	Barn Swallow	A	4	1-30
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Hirundo rustica</i>	Barn Swallow	A	2	31-60
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Chroicocephalus philadelphia</i>	Bonaparte's Gull	E	1	loafing/foraging
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Gavia immer</i>	Common Loon	D	1	loafing/foraging
AVM 03	Spring	3	31-May-2020	604488	6393418	<i>Chordeiles minor</i>	Common Nighthawk	A	1	61+
AVM 03	Spring	3	31-May-2020	604488	6393418	<i>Chordeiles minor</i>	Common Nighthawk	A	2	61+
AVM 03	Spring	3	31-May-2020	604488	6393418	<i>Junco hyemalis</i>	Dark-eyed Junco	A	1	loafing/foraging
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Junco hyemalis</i>	Dark-eyed Junco	A	1	loafing/foraging
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Eremophila alpestris</i>	Horned Lark	A	4	31-60
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Setophaga palmarum</i>	Palm Warbler	A	1	loafing/foraging
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Regulus calendula</i>	Ruby-crowned Kinglet	A	1	loafing/foraging
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Catharus ustulatus</i>	Swainson's Thrush	A	1	loafing/foraging
AVM 03	Spring	3	31-May-2020	604488	6393418	<i>Tachycineta bicolor</i>	Tree Swallow	A	2	1-30
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Zonotrichia albicollis</i>	White-throated Sparrow	A	1	loafing/foraging
AVM 03	Spring	3	01-Jun-2020	604488	6393418	<i>Setophaga coronata</i>	Yellow-rumped Warbler	E	1	loafing/foraging
AVM 03	Fall	1	10-Aug-2020	604488	6393418	<i>Hirundo rustica</i>	Barn Swallow	A	1	1-30
AVM 03	Fall	1	10-Aug-2020	604488	6393418	<i>Chordeiles minor</i>	Common Nighthawk	A	5	61+
AVM 03	Fall	1	10-Aug-2020	604488	6393418	<i>Junco hyemalis</i>	Dark-eyed Junco	A	2	1-30
AVM 03	Fall	1	10-Aug-2020	604488	6393418	<i>Tringa melanoleuca</i>	Greater Yellowlegs	E	1	1-30
AVM 03	Fall	1	10-Sep-2020	604488	6393418	<i>Setophaga coronata</i>	Yellow-rumped Warbler	E	2	1-30
AVM 03	Fall	2	29-Aug-2020	604488	6393418	<i>Charadriiformes</i>	Auks*	E	1	31-60
AVM 03	Fall	2	29-Aug-2020	604488	6393418	<i>Hirundo rustica</i>	Barn Swallow	A	2	31-60
AVM 03	Fall	2	28-Aug-2020	604488	6393418	<i>Gavia immer</i>	Common Loon	D	1	loafing/foraging
AVM 03	Fall	2	28-Aug-2020	604488	6393418	<i>Chordeiles minor</i>	Common Nighthawk	A	8	61+
AVM 03	Fall	2	28-Aug-2020	604488	6393418	<i>Anatidae</i>	Ducks, Geese, Swans*	D	11	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Anthus rubescens</i>	American Pipit	A	1	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Turdus migratorius</i>	American Robin	A	2	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Branta canadensis</i>	Canada Goose	D	3	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Perisoreus canadensis</i>	Canada Jay	A	2	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Gavia immer</i>	Common Loon	D	1	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Gavia immer</i>	Common Loon	D	1	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Corvus corax</i>	Common Raven	F	1	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Corvus corax</i>	Common Raven	F	1	1-30
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Junco hyemalis</i>	Dark-eyed Junco	A	8	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Junco hyemalis</i>	Dark-eyed Junco	A	1	loafing/foraging
AVM 03	Fall	3	20-Sep-2020	604488	6393418	<i>Spinus pinus</i>	Pine Siskin	A	4	loafing/foraging
AVM 04	Spring	1	03-May-2020	606006	6391822	<i>Corvus brachyrhynchos</i>	American Crow	F	1	loafing/foraging
AVM 04	Spring	1	03-May-2020	606006	6391822	<i>Turdus migratorius</i>	American Robin	A	4	1-30
AVM 04	Spring	1	03-May-2020	606006	6391822	<i>Turdus migratorius</i>	American Robin	A	1	1-30
AVM 04	Spring	1	02-May-2020	606006	6391822	<i>Branta canadensis</i>	Canada Goose	D	2	loafing/foraging
AVM 04	Spring	1	02-May-2020	606006	6391822	<i>Gavia immer</i>	Common Loon	D	1	loafing/foraging
AVM 04	Spring	1	02-May-2020	606006	6391822	<i>Junco hyemalis</i>	Dark-eyed Junco	A	1	loafing/foraging
AVM 04	Spring	1	02-May-2020	606006	6391822	<i>Tringa melanoleuca</i>	Greater Yellowlegs	E	2	loafing/foraging
AVM 04	Spring	2	14-May-2020	606006	6391822	<i>Junco hyemalis</i>	Dark-eyed Junco	A	6	loafing/foraging
AVM 04	Spring	2	14-May-2020	606006	6391822	<i>Junco hyemalis</i>	Dark-eyed Junco	A	5	1-30
AVM 04	Spring	2	15-May-2020	606006	6391822	<i>Junco hyemalis</i>	Dark-eyed Junco	A	1	1-30

Appendix B, Table 1

Detailed Results From The Avian Migration Surveys Conducted For The Project, Spring and Fall 2020

Site ID	Season	Survey Round	Date	UTM Coordinates ^a		Scientific Name	Common Name	Species Guild ^b	Quantity	Flight Height Grouping (m)
				Easting	Northing					
AVM 04	Spring	2	14-May-2020	606006	6391822	<i>Passerella iliaca</i>	Fox Sparrow	A	1	loafing/foraging
AVM 04	Spring	3	01-Jun-2020	606006	6391822	<i>Turdus migratorius</i>	American Robin	A	1	loafing/foraging
AVM 04	Spring	3	31-May-2020	606006	6391822	<i>Gavia immer</i>	Common Loon	D	1	loafing/foraging
AVM 04	Spring	3	31-May-2020	606006	6391822	<i>Chordeiles minor</i>	Common Nighthawk	A	1	loafing/foraging
AVM 04	Spring	3	31-May-2020	606006	6391822	<i>Junco hyemalis</i>	Dark-eyed Junco	A	2	loafing/foraging
AVM 04	Spring	3	01-Jun-2020	606006	6391822	<i>Junco hyemalis</i>	Dark-eyed Junco	A	3	loafing/foraging
AVM 04	Spring	3	31-May-2020	606006	6391822	<i>Catharus guttatus</i>	Hermit Thrush	A	2	loafing/foraging
AVM 04	Spring	3	01-Jun-2020	606006	6391822	<i>Catharus guttatus</i>	Hermit Thrush	A	1	loafing/foraging
AVM 04	Spring	3	01-Jun-2020	606006	6391822	<i>Leiothlypis celata</i>	Orange-crowned Warbler	A	2	loafing/foraging
AVM 04	Spring	3	31-May-2020	606006	6391822	<i>Setophaga palmarum</i>	Palm Warbler	A	3	loafing/foraging
AVM 04	Spring	3	01-Jun-2020	606006	6391822	<i>Setophaga palmarum</i>	Palm Warbler	A	2	loafing/foraging
AVM 04	Spring	3	31-May-2020	606006	6391822	<i>Gallinago delicata</i>	Wilson's Snipe	E	7	31-60
AVM 04	Spring	3	01-Jun-2020	606006	6391822	<i>Gallinago delicata</i>	Wilson's Snipe	E	1	loafing/foraging
AVM 04	Spring	3	31-May-2020	606006	6391822	<i>Setophaga coronata</i>	Yellow-rumped Warbler	E	3	loafing/foraging
AVM 04	Spring	3	01-Jun-2020	606006	6391822	<i>Setophaga coronata</i>	Yellow-rumped Warbler	E	1	loafing/foraging
AVM 04	Fall	2	29-Aug-2020	606006	6391822	<i>Gavia immer</i>	Common Loon	D	1	loafing/foraging
AVM 04	Fall	2	28-Aug-2020	606006	6391822	<i>Antigone canadensis</i>	Sandhill Crane	E	2	loafing/foraging
AVM 04	Fall	2	28-Aug-2020	606006	6391822	<i>Setophaga coronata</i>	Yellow-rumped Warbler	E	1	loafing/foraging
AVM 04	Fall	2	29-Aug-2020	606006	6391822	<i>Setophaga coronata</i>	Yellow-rumped Warbler	E	1	1-30
AVM 04	Fall	3	20-Sep-2020	606006	6391822	<i>Anthus rubescens</i>	American Pipit	A	2	1-30
AVM 04	Fall	3	20-Sep-2020	606006	6391822	<i>Anthus rubescens</i>	American Pipit	A	3	1-30
AVM 04	Fall	3	20-Sep-2020	606006	6391822	<i>Anthus rubescens</i>	American Pipit	A	1	loafing/foraging
AVM 04	Fall	3	20-Sep-2020	606006	6391822	<i>Turdus migratorius</i>	American Robin	A	2	31-60
AVM 04	Fall	3	20-Sep-2020	606006	6391822	<i>Perisoreus canadensis</i>	Canada Jay	A	2	loafing/foraging
AVM 04	Fall	3	20-Sep-2020	606006	6391822	<i>Junco hyemalis</i>	Dark-eyed Junco	A	1	loafing/foraging
AVM 04	Fall	3	20-Sep-2020	606006	6391822	<i>Setophaga palmarum</i>	Palm Warbler	A	1	loafing/foraging
AVM 04	Fall	3	20-Sep-2020	606006	6391822	<i>Spinus pinus</i>	Pine Siskin	A	6	1-30

Source: All scientific names and common names from SKCDC (2020); Guild categories from AEB (2020).

Bold observations denote Species of Conservation Concern (SOCC).

a) UTM = NAD83, Zone 12.

b) Guild Categories are defined as:

A: Passerines (sparrow, warbler, blackbird, jay, lark, longspur, pipit, hummingbird, nighthawk, woodpecker).

B: Birds of prey (owl, hawk, falcon, eagle, vulture).

C: Grouse and allies (grouse, partridge, pheasant, turkey, ptarmigan).

D: Waterfowl (swan, goose, duck, grebe, loon, diving duck).

E: Shorebirds/waterbirds (sandpiper, heron, crane, egret, coot, rail, gull, phalarope).

F: Others (crow, raven, magpie, dove, pigeon).

Appendix B, Table 2

Detailed Results From Acoustic Bat Surveys, May to September 2020

Site ID	Fmin (kHz)	Fmean (kHz)	Fmax (kHz)	Date	Time	Vocalization Category ^a
BAT 06	37563.867	39730.48	44092.641	2020-05-04	2:40:17	High Frequency
BAT 06	38728.68	42811.832	51789.559	2020-05-04	2:40:17	High Frequency
BAT 06	37075.727	43442.48	57679.195	2020-05-04	2:40:17	Myotis
BAT 06	37836.555	44908.922	62255.145	2020-05-07	0:50:55	Myotis
BAT 06	38575.512	47802.91	65998.227	2020-05-21	1:15:24	Myotis
BAT 06	36282.48	41459.598	56186.848	2020-06-03	1:39:02	High Frequency
BAT 06	36691.746	42163.832	51171.188	2020-06-14	0:49:16	High Frequency
BAT 06	37007.141	41277.953	47444.535	2020-06-14	0:49:16	High Frequency
BAT 06	39734.602	45625.039	58743.141	2020-06-22	0:52:32	Myotis
BAT 06	40576.25	48063.473	61698.125	2020-06-24	23:53:21	Myotis
BAT 06	38161.395	42739.387	50822.375	2020-06-28	1:54:18	High Frequency
BAT 06	37523.012	41701.422	47440.754	2020-06-28	1:57:47	Myotis
BAT 06	39316.887	45616.934	56123.902	2020-06-28	1:57:47	Myotis
BAT 06	37468.258	47394.953	63347.867	2020-07-04	1:52:21	Myotis
BAT 06	36810.172	42001.223	51098.668	2020-07-05	1:48:22	High Frequency
BAT 06	34893.355	37416.938	41959.457	2020-07-05	1:52:46	High Frequency
BAT 06	33156.832	38055.766	45411.789	2020-07-20	3:30:04	High Frequency
BAT 06	35632.008	45043.727	62162.332	2020-07-22	23:23:47	Myotis
BAT 06	17609.66	18516.039	20505.398	2020-07-22	23:25:32	Low Frequency
BAT 06	33801.621	37453.586	43278.516	2020-07-24	23:19:45	High Frequency
BAT 06	36727.105	41776.598	51616.188	2020-07-25	1:23:19	High Frequency
BAT 06	38821.551	45576.637	59390.785	2020-07-25	2:22:22	Myotis
BAT 06	37229.227	40962.148	46844.25	2020-07-27	1:18:50	High Frequency
BAT 06	36734.121	40678.844	46907	2020-07-29	2:12:08	Myotis
BAT 06	35343.598	38477.926	45249.883	2020-07-29	3:11:05	High Frequency
BAT 06	36068.773	46340.949	66204.359	2020-07-29	23:11:13	Myotis
BAT 06	38174.09	42452.613	48447.82	2020-07-30	2:12:38	Myotis
BAT 06	38065.563	41612.668	46369.82	2020-07-30	2:12:46	Myotis
BAT 06	37455.934	42456.211	49251.273	2020-07-30	2:12:46	Myotis
BAT 06	36196.238	40838.426	48667.23	2020-07-30	23:08:09	High Frequency
BAT 06	38575.508	45857.688	60967.344	2020-07-30	23:11:58	Myotis
BAT 06	39076.035	43605.324	49430.344	2020-07-31	0:07:50	Myotis
BAT 06	36732.691	40374.945	45987.023	2020-08-01	0:11:37	High Frequency
BAT 06	37009.18	40737.301	46433.551	2020-08-01	0:11:37	High Frequency
BAT 06	36073.398	47125.453	70765.906	2020-08-01	1:12:20	Myotis
BAT 06	37884.676	43609.316	53950.434	2020-08-02	0:04:31	Myotis
BAT 06	36783.961	42629.898	52257.824	2020-08-02	0:06:43	High Frequency
BAT 06	32688.461	34717.055	39518.563	2020-08-02	2:08:57	High Frequency
BAT 06	36949.773	39168.902	43298.746	2020-08-02	2:08:57	High Frequency
BAT 06	35957.063	37806.66	40921.523	2020-08-02	3:04:22	High Frequency
BAT 06	37975.887	46703.406	61211.406	2020-08-03	1:00:13	Myotis
BAT 06	37719.781	42576.5	50441.938	2020-08-07	1:52:49	High Frequency
BAT 06	36688.848	44690.926	60704.219	2020-08-07	1:52:49	Myotis
BAT 06	42078.285	46076.172	55495.129	2020-08-07	2:57:02	Myotis
BAT 06	35036.891	37264.582	40784.082	2020-08-07	2:58:32	High Frequency
BAT 06	34787.871	37366.227	40677.273	2020-08-07	2:58:32	High Frequency
BAT 06	35718.156	38950.18	44280.875	2020-08-07	2:58:32	High Frequency
BAT 06	35079.262	39013.137	47533.223	2020-08-07	2:58:32	High Frequency
BAT 06	38004.273	44305.711	57123.25	2020-08-12	1:44:49	Myotis
BAT 06	37749.793	45284.906	58236.539	2020-08-12	3:42:49	Myotis
BAT 06	36603.477	39336.957	45088.746	2020-08-15	2:34:30	High Frequency

Appendix B, Table 2

Detailed Results From Acoustic Bat Surveys, May to September 2020

Site ID	Fmin (kHz)	Fmean (kHz)	Fmax (kHz)	Date	Time	Vocalization Category ^a
BAT 06	35876.625	38082.734	42133.883	2020-08-15	2:34:30	High Frequency
BAT 06	37304.902	46441.41	64916.504	2020-08-15	22:33:18	Myotis
BAT 06	38477.023	43944.711	50990.18	2020-08-16	0:29:29	High Frequency
BAT 06	37649.359	43241.328	50519.207	2020-08-16	0:29:29	Myotis
BAT 06	38413.746	44054.012	53533.75	2020-08-17	22:28:50	Myotis
BAT 06	38683.285	46913.707	64416.785	2020-08-18	1:26:15	Myotis
BAT 06	36244.832	38235.316	41704.316	2020-08-19	2:24:49	High Frequency
BAT 06	38077.199	46016.672	59190.797	2020-08-19	2:28:08	Myotis
BAT 06	38099.816	41238.516	46652.145	2020-08-22	2:14:13	High Frequency
BAT 06	36999.59	41883.215	51609.34	2020-08-22	2:14:13	Myotis
BAT 06	37210.297	45528.691	64354.535	2020-08-22	2:14:13	Myotis
BAT 06	33789.195	35745.688	38059.023	2020-08-24	21:10:45	High Frequency
BAT 06	33226.328	38202.867	47052.883	2020-08-24	21:10:45	High Frequency
BAT 06	36237.004	40864.824	50372.363	2020-08-29	0:59:48	High Frequency
BAT 06	36708.813	42748.84	56047.055	2020-09-02	21:47:36	Myotis
BAT 06	38754.441	47046.563	62371.254	2020-09-04	2:43:47	Myotis
BAT 06	37091.883	41485.785	51102.668	2020-09-05	1:40:47	High Frequency
BAT 06	36601.543	43824.109	57313.738	2020-09-14	5:12:40	Myotis
BAT 06	32588.041	36768.234	41904.344	2020-09-20	2:57:11	High Frequency
BAT 06	34160.469	36274.336	38706.277	2020-09-20	2:57:11	High Frequency
BAT 06	32722.422	35423.094	37301.586	2020-09-20	2:57:11	High Frequency
BAT 06	33375.883	36801.719	42697.977	2020-09-22	19:48:33	High Frequency
BAT 07	37924.633	41716.672	47824.121	2020-05-09	23:55:03	Myotis
BAT 07	37840.387	43881.469	55428.5	2020-05-09	23:55:03	Myotis
BAT 07	36419.508	39542.453	44888.602	2020-06-14	1:49:15	High Frequency
BAT 07	38911.934	47352.98	63799.93	2020-06-22	0:55:35	Myotis
BAT 07	36338.73	41189.172	51670.461	2020-07-19	23:30:17	High Frequency
BAT 07	39343.426	43273.086	51212.566	2020-07-23	0:23:24	Myotis
BAT 07	37217.578	38829.598	41705.82	2020-07-26	0:19:42	High Frequency
BAT 07	36538.785	38519.012	41177.5	2020-07-26	0:19:42	High Frequency
BAT 07	37350.563	39138.113	42526.773	2020-07-26	0:19:42	High Frequency
BAT 07	37228.855	41134.902	46958.766	2020-07-30	0:11:33	High Frequency
BAT 07	40468.176	42603.277	48732.988	2020-07-30	3:09:29	High Frequency
BAT 07	33916.734	35133.227	37296.234	2020-07-30	3:09:29	High Frequency
BAT 07	37664.164	38794.008	41032.184	2020-07-30	3:09:29	High Frequency
BAT 07	36921.934	44367.828	60328.336	2020-07-30	4:09:18	Myotis
BAT 07	35937.52	38181.285	41618.758	2020-08-01	1:11:21	High Frequency
BAT 07	35204.828	38421.586	43577.363	2020-08-01	1:11:21	High Frequency
BAT 07	36869.293	39069.59	45163.574	2020-08-02	2:08:14	High Frequency
BAT 07	39429.766	42186.227	47955.195	2020-08-03	3:02:52	High Frequency
BAT 07	37604.809	40976.16	46922.098	2020-08-11	22:43:35	High Frequency
BAT 07	36842.898	39870.348	46823.496	2020-08-11	23:40:59	High Frequency
BAT 07	37266.68	42077.875	50453.742	2020-08-12	2:45:21	High Frequency
BAT 07	45208.488	48390.715	56196.625	2020-08-16	22:28:12	Myotis
BAT 07	37121.664	42713.695	55155.793	2020-08-19	1:22:00	High Frequency
BAT 07	35052.027	39267.598	45285.832	2020-08-19	23:20:23	High Frequency
BAT 07	36065.195	39506.902	46467.906	2020-08-20	0:21:47	High Frequency
BAT 07	36450.086	37714.102	39413.648	2020-09-02	23:43:53	High Frequency
BAT 07	34868.23	38440.629	46978.32	2020-09-05	2:36:21	High Frequency
BAT 07	36486.008	41918.938	56964.824	2020-09-07	3:32:59	High Frequency
BAT 07	37046.395	40050.125	45023.418	2020-09-08	23:25:03	High Frequency

Appendix B, Table 2

Detailed Results From Acoustic Bat Surveys, May to September 2020

Site ID	Fmin (kHz)	Fmean (kHz)	Fmax (kHz)	Date	Time	Vocalization Category ^a
BAT 07	37115.848	40264.402	45658.098	2020-09-08	23:25:03	High Frequency
BAT 07	34983.406	39829.539	50863.754	2020-09-10	0:24:14	High Frequency
BAT 07	34735.727	37520.789	42769.113	2020-09-15	20:05:15	High Frequency
BAT 07	35468.879	39703.707	50483.898	2020-09-15	20:05:15	High Frequency
BAT 07	35075.715	44976.516	63065.668	2020-09-16	23:02:38	Myotis
BAT 07	34411.609	38388.266	43800.875	2020-09-19	23:54:15	High Frequency
BAT 07	34992.785	41274.602	53149.621	2020-09-19	23:54:15	High Frequency
BAT 08	34784.375	38717.832	45189.82	2020-05-16	23:09:58	High Frequency
BAT 08	34340.391	36642.516	40395.383	2020-05-30	2:33:32	High Frequency
BAT 08	34901.508	38826.465	48121.207	2020-05-30	2:33:32	High Frequency
BAT 08	37003.238	40840.398	47644.652	2020-06-10	23:47:43	High Frequency
BAT 08	37569.953	41739.449	53734.684	2020-06-14	1:50:22	High Frequency
BAT 08	35542.82	39263.926	45004.023	2020-06-14	2:48:31	High Frequency
BAT 08	25683.531	26311.684	27690.721	2020-06-23	1:53:20	Low Frequency
BAT 08	25509.473	26085.395	27377.943	2020-06-23	1:53:20	Low Frequency
BAT 08	25643.66	26185.934	27043.785	2020-06-23	1:53:20	Low Frequency
BAT 08	25602.305	25967.285	26756.744	2020-06-23	1:53:20	Low Frequency
BAT 08	34886.297	40451.52	52026.953	2020-06-24	1:56:07	High Frequency
BAT 08	40201.965	42935.172	47852.789	2020-06-25	0:51:00	High Frequency
BAT 08	38551.246	42208.523	50161.086	2020-06-25	0:51:00	Myotis
BAT 08	37192.832	41158.645	48947.707	2020-06-25	23:54:55	High Frequency
BAT 08	36704.719	41223.543	51102.605	2020-06-25	23:57:35	High Frequency
BAT 08	36659.695	43027.902	59007.375	2020-06-25	23:58:51	High Frequency
BAT 08	36793.344	40815.465	48812.566	2020-06-25	23:59:11	High Frequency
BAT 08	37425.973	40730.957	46290.215	2020-06-25	23:59:18	High Frequency
BAT 08	37131.477	39678.688	45234.047	2020-06-26	0:52:56	High Frequency
BAT 08	37166.836	39872.047	45920.82	2020-06-26	0:52:56	High Frequency
BAT 08	37954.73	39986.023	44164.5	2020-06-26	0:52:56	High Frequency
BAT 08	39805.922	42327.41	47228.871	2020-06-27	0:53:32	High Frequency
BAT 08	37533.965	39386.41	42655.035	2020-06-27	0:54:24	High Frequency
BAT 08	39763.883	43645.727	50725.145	2020-06-27	0:54:24	High Frequency
BAT 08	34668.074	37278.32	44614.039	2020-06-27	1:57:54	High Frequency
BAT 08	36423.641	40177.289	46851.41	2020-06-30	1:50:35	High Frequency
BAT 08	36454.719	38327.727	40822.77	2020-06-30	1:50:35	High Frequency
BAT 08	35245.883	40915.66	52591.344	2020-06-30	1:53:48	High Frequency
BAT 08	39613.141	43329.813	49731.195	2020-07-08	2:51:29	High Frequency
BAT 08	36682.387	43019.691	54442.117	2020-07-11	1:45:27	Myotis
BAT 08	37037.656	42728.242	54008.461	2020-07-11	1:45:27	Myotis
BAT 08	40880.805	48180.762	61920.629	2020-07-11	1:45:27	Myotis
BAT 08	38354.48	42322.234	48061.039	2020-07-11	23:43:22	High Frequency
BAT 08	37041.363	40792.961	47481.906	2020-07-11	23:43:22	High Frequency
BAT 08	38071.555	42573.629	51353.93	2020-07-11	23:43:22	High Frequency
BAT 08	36395.605	38069.195	41118.359	2020-07-12	0:42:18	High Frequency
BAT 08	36963.078	38988.723	42625.16	2020-07-12	0:42:18	High Frequency
BAT 08	37125.156	42414.078	49868.984	2020-07-12	0:45:38	Myotis
BAT 08	35225.262	45019.953	60661.602	2020-07-12	0:45:38	Myotis
BAT 08	34099.512	36415.531	40007.082	2020-07-12	0:47:52	High Frequency
BAT 08	34524.402	36489.563	39575.352	2020-07-12	0:47:52	High Frequency
BAT 08	36095.926	37513.781	39478.445	2020-07-19	23:29:03	High Frequency
BAT 08	35784.27	38225.902	41708.781	2020-07-20	0:31:11	High Frequency
BAT 08	35218.828	41817.367	52080.711	2020-07-21	23:27:10	Myotis

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Detailed Results From Acoustic Bat Surveys, May to September 2020

Site ID	Fmin (kHz)	Fmean (kHz)	Fmax (kHz)	Date	Time	Vocalization Category ^a
BAT 08	37746.488	40122.379	44432.574	2020-07-22	23:25:01	High Frequency
BAT 08	37283.262	39454.93	42964.633	2020-07-22	23:25:01	High Frequency
BAT 08	37298.273	42069.039	49966.742	2020-07-23	2:23:12	High Frequency
BAT 08	37562.824	40479.016	44471.906	2020-07-23	2:23:12	High Frequency
BAT 08	36213.367	42041.09	56822.207	2020-07-24	23:19:25	High Frequency
BAT 08	37507.918	40283.379	45247.746	2020-07-24	23:20:08	High Frequency
BAT 08	36533.488	41215.836	48640.684	2020-07-25	23:19:26	High Frequency
BAT 08	36275.836	43672.703	58857.633	2020-07-25	23:19:26	Myotis
BAT 08	35663.848	44068.371	59066.977	2020-07-25	23:19:26	Myotis
BAT 08	37709.926	42370.234	51041.52	2020-07-26	1:17:01	High Frequency
BAT 08	37335.227	40900.559	46482.449	2020-07-27	3:18:51	Myotis
BAT 08	37926.777	40768.605	44879.645	2020-07-27	3:19:39	High Frequency
BAT 08	37890.523	42694.57	52276.254	2020-07-27	23:22:04	High Frequency
BAT 08	40305.094	43366.574	47991.543	2020-07-27	23:22:04	Myotis
BAT 08	39817.625	42898.242	48056.211	2020-07-29	2:13:22	Myotis
BAT 08	38466.613	40721.945	45047.953	2020-07-29	3:18:46	High Frequency
BAT 08	38837.395	40682.902	43629.664	2020-07-29	3:18:46	High Frequency
BAT 08	38704.43	41967.699	47805.707	2020-07-29	23:10:11	High Frequency
BAT 08	37456.141	42045.082	48111.43	2020-07-29	23:12:50	High Frequency
BAT 08	38730.375	41305.68	46268.207	2020-07-29	23:14:57	High Frequency
BAT 08	38929.57	41198.652	45523.578	2020-07-29	23:14:57	High Frequency
BAT 08	38558.5	40340.664	42714.59	2020-07-29	23:14:57	High Frequency
BAT 08	39417.367	42205.383	46554.109	2020-07-29	23:14:57	Myotis
BAT 08	35661.148	39860.809	51398.457	2020-07-30	0:09:09	High Frequency
BAT 08	38891.371	41436.887	45186.91	2020-07-30	0:10:37	High Frequency
BAT 08	35938.883	39214.652	46975.68	2020-07-30	1:10:44	High Frequency
BAT 08	37727.398	44109.508	55412.234	2020-07-30	1:13:26	Myotis
BAT 08	41216.645	49046.473	64016.293	2020-07-30	4:10:54	Myotis
BAT 08	39498.719	42832.359	47749.301	2020-07-31	0:08:52	High Frequency
BAT 08	38191.184	41417.402	46870.719	2020-07-31	2:10:21	High Frequency
BAT 08	37134.824	41062.563	47922.914	2020-07-31	2:10:21	Myotis
BAT 08	39798.02	43320.461	49257.898	2020-08-01	0:07:10	Myotis
BAT 08	39190.207	42914.848	49672.859	2020-08-01	0:09:27	Myotis
BAT 08	37695.898	40685.512	45115.965	2020-08-01	1:05:59	High Frequency
BAT 08	37619.41	40115.52	44588.992	2020-08-01	1:05:59	High Frequency
BAT 08	38876.348	43270.914	50424.773	2020-08-01	3:06:11	High Frequency
BAT 08	37394.23	40587.785	45374.234	2020-08-01	3:09:21	High Frequency
BAT 08	37667.473	41317.523	46860.234	2020-08-01	4:06:07	High Frequency
BAT 08	38585.617	42556.84	49096.043	2020-08-01	4:07:32	High Frequency
BAT 08	38468.656	42376.266	49243.313	2020-08-01	4:08:48	Myotis
BAT 08	37922.453	40779.258	44270.547	2020-08-01	4:08:48	Myotis
BAT 08	38026.738	42872.969	52007.516	2020-08-01	4:09:33	Myotis
BAT 08	37454.676	42929.09	54169.629	2020-08-01	23:05:09	High Frequency
BAT 08	36794.773	41351.328	49790.32	2020-08-02	0:07:39	High Frequency
BAT 08	43431.453	47574.348	55778.418	2020-08-02	1:03:46	Myotis
BAT 08	39040.926	41124.922	44971.688	2020-08-02	1:06:15	High Frequency
BAT 08	36755.965	41222.816	47675.066	2020-08-02	1:10:46	High Frequency
BAT 08	36372.492	39933.25	45419.797	2020-08-02	1:10:46	High Frequency
BAT 08	34883.891	38247.098	43983.305	2020-08-02	2:05:56	High Frequency
BAT 08	37485.965	41930.473	48669.117	2020-08-02	23:00:42	High Frequency
BAT 08	34551.199	38764.125	45360.719	2020-08-03	23:07:40	High Frequency

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Detailed Results From Acoustic Bat Surveys, May to September 2020

Site ID	Fmin (kHz)	Fmean (kHz)	Fmax (kHz)	Date	Time	Vocalization Category ^a
BAT 08	38107.191	39136.137	41044.398	2020-08-03	23:59:56	High Frequency
BAT 08	36956.957	41427.73	48768.023	2020-08-04	0:02:50	High Frequency
BAT 08	36896.043	41270.926	50522.094	2020-08-04	4:02:29	High Frequency
BAT 08	35493.633	41265.707	55477.922	2020-08-04	22:56:17	High Frequency
BAT 08	36334.652	39175.707	43115.688	2020-08-04	23:58:02	High Frequency
BAT 08	37051.328	39926.965	44414.078	2020-08-04	23:58:02	High Frequency
BAT 08	33777.879	35472.813	39613.535	2020-08-05	1:00:29	High Frequency
BAT 08	35937.34	39211.879	48229.859	2020-08-05	1:00:29	High Frequency
BAT 08	39156.66	43491.734	50058.605	2020-08-06	23:57:23	Myotis
BAT 08	38614.82	47709.109	68609.852	2020-08-06	23:57:23	Myotis
BAT 08	38489.242	44041.109	51158.652	2020-08-06	23:57:23	Myotis
BAT 08	39059.828	43175.848	52049.281	2020-08-07	0:51:12	Myotis
BAT 08	34030.719	36198.484	38746.992	2020-08-07	0:58:34	High Frequency
BAT 08	34191.996	36314.621	39256.191	2020-08-07	0:58:34	High Frequency
BAT 08	34200.785	36737.57	40746.914	2020-08-07	0:58:34	High Frequency
BAT 08	37761.301	40264.355	43961.68	2020-08-07	2:52:50	High Frequency
BAT 08	37965.73	43345.324	55623.453	2020-08-07	2:52:50	Myotis
BAT 08	44607.148	49761.969	62435.176	2020-08-08	21:51:23	Myotis
BAT 08	37752.816	40550.266	45269.387	2020-08-12	4:41:53	High Frequency
BAT 08	37596.094	42103.582	50158.246	2020-08-12	4:44:53	High Frequency
BAT 08	36210.113	41380.539	50264.711	2020-08-14	22:32:07	Myotis
BAT 08	37674.715	42784.098	50990.141	2020-08-16	2:29:55	High Frequency
BAT 08	37514.715	40616.984	44959.414	2020-08-16	2:29:55	Myotis
BAT 08	38567.984	43325.914	52022.105	2020-08-16	4:29:03	Myotis
BAT 08	40967.102	45021.617	51523.395	2020-08-16	4:29:26	Myotis
BAT 08	39813.867	45459.336	57050.262	2020-08-16	4:29:26	Myotis
BAT 08	38546.637	42561.91	50102.824	2020-08-16	4:29:47	High Frequency
BAT 08	37979.457	41597.016	47986.141	2020-08-16	4:29:47	High Frequency
BAT 08	37592.773	42445.703	52407.188	2020-08-16	4:30:51	High Frequency
BAT 08	38859.047	43120.762	51041.734	2020-08-16	4:30:51	Myotis
BAT 08	38225.359	42080.727	48836.168	2020-08-16	4:30:51	Myotis
BAT 08	38586.215	42993.371	50627.277	2020-08-16	4:30:51	Myotis
BAT 08	38840.391	44378.996	54515.125	2020-08-16	4:30:51	Myotis
BAT 08	37923.922	41613.086	47543.988	2020-08-16	4:31:17	Myotis
BAT 08	38256.32	42926.215	51904.672	2020-08-16	4:31:17	Myotis
BAT 08	39484.742	44815.262	54709.082	2020-08-16	4:31:17	Myotis
BAT 08	38236.012	42407.848	49809.883	2020-08-16	4:31:50	Myotis
BAT 08	37869.051	40817.879	45510.109	2020-08-16	4:32:14	High Frequency
BAT 08	38495.488	42818.926	50591.66	2020-08-16	4:32:14	Myotis
BAT 08	37406.887	43327.957	55494.066	2020-08-16	4:32:14	Myotis
BAT 08	38412.195	45528.148	57947.633	2020-08-16	4:32:14	Myotis
BAT 08	38351.234	44002.137	55616.969	2020-08-16	4:33:14	Myotis
BAT 08	38357.059	43479.598	52484.84	2020-08-16	4:33:14	Myotis
BAT 08	38875.207	43674.684	53650.285	2020-08-16	4:33:14	Myotis
BAT 08	39427.383	43330.594	49646.27	2020-08-16	4:33:35	Myotis
BAT 08	39467.227	44183.676	53269.277	2020-08-16	4:34:00	Myotis
BAT 08	38883.434	43867.746	53728.355	2020-08-16	4:34:00	Myotis
BAT 08	39275.563	43786.602	52050.492	2020-08-16	4:34:00	Myotis
BAT 08	37501.82	39751.324	43543.152	2020-08-16	4:34:34	High Frequency
BAT 08	39293.887	42989.953	49239.324	2020-08-16	4:34:34	Myotis
BAT 08	39282.949	43564.508	50714.273	2020-08-16	4:34:34	Myotis

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Detailed Results From Acoustic Bat Surveys, May to September 2020

Site ID	Fmin (kHz)	Fmean (kHz)	Fmax (kHz)	Date	Time	Vocalization Category ^a
BAT 08	38105.063	42482.324	51142.246	2020-08-16	4:34:53	Myotis
BAT 08	38761.82	43676.609	53349.969	2020-08-16	4:36:12	Myotis
BAT 08	38153.266	42194.285	49672.055	2020-08-16	4:36:55	High Frequency
BAT 08	38183.121	41933.559	47670.645	2020-08-17	0:29:02	High Frequency
BAT 08	39131.652	44219.914	52504.742	2020-08-17	0:29:02	Myotis
BAT 08	38719.355	43817.469	53031.25	2020-08-17	0:29:29	Myotis
BAT 08	38593.031	43196.348	50478.336	2020-08-17	0:30:12	Myotis
BAT 08	37777.934	42005.117	48327.203	2020-08-17	0:30:59	Myotis
BAT 08	40740.98	47719.086	60421.875	2020-08-17	0:31:18	Myotis
BAT 08	38382.266	43342.211	50528.453	2020-08-17	0:32:39	Myotis
BAT 08	38943.117	42015.988	46468.281	2020-08-17	0:33:13	High Frequency
BAT 08	38911.945	42682.977	47953.715	2020-08-17	0:33:13	Myotis
BAT 08	39459.324	44307.352	53162.414	2020-08-17	0:33:13	Myotis
BAT 08	38070.383	41528.695	46502.68	2020-08-17	0:34:23	Myotis
BAT 08	35715.363	39310.949	46053.957	2020-08-17	3:31:05	High Frequency
BAT 08	38771.258	43171.105	51038.563	2020-08-17	3:35:57	Myotis
BAT 08	38892.965	43434.238	50196.297	2020-08-17	3:36:36	Myotis
BAT 08	39322.094	41676.195	46184.48	2020-08-19	22:20:52	Myotis
BAT 08	37897.777	43475.375	53962.848	2020-08-19	22:20:52	Myotis
BAT 08	38242.414	44227.074	56939.785	2020-08-19	23:19:58	Myotis
BAT 08	38278.391	42167.039	48784.117	2020-08-20	2:20:12	Myotis
BAT 08	38526.145	42914.098	48980.188	2020-08-20	2:21:18	Myotis
BAT 08	39878.605	44817.609	51919.18	2020-08-20	3:23:15	Myotis
BAT 08	39864.203	46871.574	60292.043	2020-08-21	1:17:00	Myotis
BAT 08	38995.195	43561.949	53296.375	2020-08-21	3:19:50	High Frequency
BAT 08	38612.844	40741.117	42998.133	2020-08-21	4:21:57	High Frequency
BAT 08	38345.082	43339.098	51678.398	2020-08-21	4:21:57	Myotis
BAT 08	34943.773	39742.309	51697.117	2020-08-22	0:16:45	High Frequency
BAT 08	34670.75	36360.473	38294.406	2020-08-22	4:17:29	High Frequency
BAT 08	34011.043	38241.582	46310.34	2020-08-22	4:17:29	High Frequency
BAT 08	35667.41	40240.152	46887.211	2020-08-24	22:10:50	High Frequency
BAT 08	35386.359	39220.113	44833.387	2020-08-24	22:10:50	High Frequency
BAT 08	36475.016	39876.492	45292.977	2020-08-29	2:57:31	High Frequency
BAT 08	35347.18	38785.445	48361.07	2020-08-29	3:01:20	High Frequency
BAT 08	37619.164	40590.02	44979.461	2020-09-01	0:48:39	High Frequency
BAT 08	34957.34	39389.531	46294.184	2020-09-01	0:48:39	High Frequency
BAT 08	40003.426	44747.254	54237.871	2020-09-01	0:48:39	Myotis
BAT 08	39132.926	42029.441	46339.969	2020-09-01	0:48:39	Myotis
BAT 08	44152.203	45853.664	50686.301	2020-09-01	1:51:57	High Frequency
BAT 08	37972.414	41700.789	47364.242	2020-09-01	3:55:56	Myotis
BAT 08	37147.453	42942.387	58903.602	2020-09-02	0:50:46	High Frequency
BAT 08	39413.648	44051.789	50332.09	2020-09-04	23:38:23	Myotis
BAT 08	39648.238	48361.293	68192.398	2020-09-04	23:38:23	Myotis
BAT 08	39510.719	44342.672	51298.918	2020-09-05	1:36:11	Myotis
BAT 08	37477.176	40093.938	43933.613	2020-09-05	1:39:55	High Frequency
BAT 08	39328.617	45769.246	62095.617	2020-09-05	1:39:55	Myotis
BAT 08	35707.156	38411.012	42877.684	2020-09-05	2:36:46	High Frequency
BAT 08	38503.598	43999.543	53476.023	2020-09-06	0:37:14	Myotis
BAT 08	36701.922	40613.711	47028.297	2020-09-06	0:41:48	High Frequency
BAT 08	37733.859	40025.023	43454.375	2020-09-08	22:27:55	High Frequency
BAT 08	38318.867	45426.781	60366.113	2020-09-09	0:28:47	Myotis

Appendix B, Table 2

Detailed Results From Acoustic Bat Surveys, May to September 2020

Site ID	Fmin (kHz)	Fmean (kHz)	Fmax (kHz)	Date	Time	Vocalization Category ^a
BAT 08	38268.125	43217.004	52633.563	2020-09-09	0:29:09	Myotis
BAT 08	37855.094	42116.555	48979.367	2020-09-09	0:29:23	Myotis
BAT 08	37659.297	40712.254	45670.469	2020-09-09	0:29:46	High Frequency
BAT 08	39040.418	43530.172	52313.684	2020-09-09	0:29:46	Myotis
BAT 08	37215.969	40478.754	49562.656	2020-09-09	1:27:19	High Frequency
BAT 08	39677.836	40830.945	42848.922	2020-09-09	1:29:56	High Frequency
BAT 08	42413.836	44299.793	48306.539	2020-09-09	1:29:56	High Frequency
BAT 08	37384.633	43302.398	58319.98	2020-09-09	1:32:14	Myotis
BAT 08	40111.254	52005.789	73338.688	2020-09-14	1:18:17	Myotis
BAT 08	40068.219	47377.996	61025.441	2020-09-16	22:05:43	Myotis
BAT 08	36917.367	44101.605	62168.273	2020-09-18	0:00:02	Myotis
BAT 08	38760.785	42199.281	48350.82	2020-09-18	2:02:05	High Frequency
BAT 08	37314.328	45204.848	65874.844	2020-09-18	2:02:05	Myotis
BAT 08	39048.121	42354.906	47884.367	2020-09-22	22:46:57	Myotis

a) High Frequency includes: *Myotis lucifugus*, *Myotis septentrionalis*, and *Lasirurus borealis*;

Myotis includes: *Myotis lucifugus*, and *Myotis septentrionalis*.

Low frequency includes: *Eptesicus fuscus*, *Lasionycteris noctivagans*, and *Lasirurus cinereus*.