ENVIRONMENTAL ASSESSMENT REGISTRATION DOCUMENT

Setapuktuk Wind Project

Prepared for: EverWind NS Holdings Ltd.
& Membertou Development Corporation

strum
CONSULTING

September 2025

September 26, 2025

Mr. Mark McInnis
Nova Scotia Department of Environment & Climate Change
Environmental Assessment Branch
#2085 - 1903 Barrington Street
PO Box 442
Halifax, NS B3J 2P8

Dear Mr. McInnis,

Re: Environmental Assessment Registration Document
Setapuktuk Wind Project

Please find enclosed the Environmental Assessment Registration Document for the Setapuktuk Wind Project.

The undersigned approves and accepts the contents, as submitted to Nova Scotia Environment & Climate Change, Environmental Assessment Branch.

Sincerely,

Trent Vichie
Founder and CEO
EverWind Fuels
2101, 1969 Upper Water St
Halifax, NS
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EXECUTIVE SUMMARY

EverWind NS Holdings Ltd. (EverWind) and Membertou Development Corporation (together as the “Proponent”) are s proposing to construct and operate the Setapuktuk Wind Project (the Project) near the communities of Pirate Harbour, Middle Melford, Sand Point, Hadleyville, and Manchester, Guysborough County, Nova Scotia. The Project is an onshore wind farm consisting of 54 proposed wind turbines, access roads (44 km of new and 35 km of existing roads), a substation, electrical collection system, transmission line (6 km), an operations and maintenance building, and temporary laydown yards.

The renewable power generated from the Project will be transmitted through EverWind’s Strait Crossing Transmission Line Project (Environmental Assessment Approved in 2025) to EverWind’s Point Tupper Green Fuels Project (Environmental Assessment Approved in 2023) to support the production of certified green hydrogen and ammonia in Richmond County, Nova Scotia.

The Project is considered a Class I Undertaking under Schedule A of the Nova Scotia Environmental Assessment Regulations, N.S. Reg. 26/95, and therefore, requires the registration of an Environmental Assessment Registration Document. The Environmental Assessment Registration Document has been completed in accordance with the requirements outlined in A Proponent’s Guide to Environmental Assessment (NSECC, 2025a), the Nova Scotia Class I Environmental Assessment Checklist (NSECC, 2025d), and the Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c).

The following valued components were identified and evaluated as part of this environmental assessment based on provincial guidance, desktop analysis, and subsequent field studies:

- Atmosphere and air quality
- Climate change
- Sound
- Shadow Flicker
- Geophysical environment
- Surface water and fish & fish habitat
- Wetlands
- Terrestrial habitat
- Terrestrial flora
- Terrestrial fauna
- Bats
- Avifauna
- Economy
- Land use and value
- Recreation and tourism
- Archaeological resources

The results of the assessment indicated that the Project, with the implementation of mitigation and monitoring measures, will not result in significant adverse residual effects. The Project is being developed to support the production of a Certified Green hydrogen and ammonia project in Nova Scotia, supporting the reduction of greenhouse gas emissions (i.e., production of renewable energy) and economic prosperity within Nova Scotia.

EverWind has engaged and collaborated (and will continue to do so) with local communities, the Mi'kmaq of Nova Scotia, and government representatives to ensure that any potential concerns identified in association with the Project are addressed and mitigated.

TABLE OF CONTENTS

page

1.0 PROPONENT DESCRIPTION 1
2.0 PROJECT INFORMATION 2
2.1 Project Introduction 2
2.2 Purpose & Need for the Undertaking 3
2.3 Regulatory Framework 4
2.3.1 Federal 4
2.3.2 Provincial 5
2.3.3 Municipal 6
2.4 Funding 7
3.0 DESCRIPTION OF THE UNDERTAKING 7
3.1 Geographical Location 7
3.1.1 Siting Considerations 8
3.1.1.1 Residential Dwellings 11
3.2 Project Proximity to Other Areas 12
3.2.1 Towns or Cities 12
3.2.2 Mi'kmaq Communities 12
3.2.3 Other Known Wind Developments 12
3.2.4 Protected Watersheds and Water Areas 13
3.2.5 Nearest Parks and Protected Areas 13
3.2.6 Important Bird Areas 13
3.3 Physical Components 13
3.3.1 Turbines 13
3.3.2 Road Layout 13
3.3.3 Substation, Power Collection Systems, and Transmission 14
3.3.4 Operations and Maintenance Building 14
3.3.5 MET Towers 14
3.3.6 Concrete Batch Plant 14
3.3.7 Temporary Laydown Yards 14
3.3.8 Borrow Pits 15
3.4 Project Phases 15
3.4.1 Site Preparation and Construction 15
3.4.2 Operations & Maintenance 20
3.4.3 Decommissioning 21
3.5 Project Schedule 23
4.0 ENVIRONMENTAL ASSESSMENT METHODOLOGY 24
4.1 Assessment Scope & Approach 24
4.2 Identification of Valued Components 25
4.3 Spatial & Temporal Boundaries 25
4.3.1 Spatial Boundaries 25
4.3.2 Temporal Boundaries 26
4.4 Potential Project-Valued Component Interactions 26

4.5 Effects Assessment Criteria 26
4.6 Monitoring & Follow-Up 27
4.7 Biophysical Assessment Components 27
4.7.1 Assessment of Wild Species 27
4.7.2 Biophysical Assessment Components and Timing 28
5.0 MI'KMAQ OF NOVA SCOTIA 29
5.1 Engagement 30
5.1.1 Review of Concerns 34
5.1.2 Ongoing Engagement 34
5.2 MEKS 34
5.3 Mi'kmaq Partnerships 35
5.4 Commitments to the Mi'kmaq of Nova Scotia 36
6.0 ENGAGEMENT 36
6.1 Engagement with Government Departments, Agencies and Regulators 36
6.1.1 Regulatory Engagement 36
6.1.2 Review of Government Concerns 42
6.2 Public and Stakeholder Engagement 42
6.2.1 Project Naming Competition 46
6.2.2 Digital Communications 46
6.2.3 Newsletters 46
6.2.4 Public Open House Events 46
6.2.4.1 May 2023 Open Houses 47
6.2.4.2 May/June 2024 Open Houses 48
6.2.4.3 February 2025 Open Houses 49
6.2.4.4 June 2025 Public Information Session 50
6.2.5 Additional Engagement with Adjacent Businesses 50
6.2.6 Office 51
6.2.7 Community Liaison Committee (CLC) 52
6.2.8 Review of Concerns 54
6.2.9 Ongoing Engagement 58
6.3 Electromagnetic Interference Engagement 58
6.3.1 Assessment Guidelines 58
6.3.2 Assessment Methods 58
6.3.3 EMI Engagement Summary 60
7.0 BIOPHYSICAL ENVIRONMENT 68
7.1 Atmospheric Environment 68
7.1.1 Atmosphere and Air Quality 68
7.1.1.1 Overview 68
7.1.1.2 Regulatory Context 68
7.1.1.3 Assessment Methodology 68
7.1.1.4 Assessment Results 68
7.1.1.5 Effects Assessment 72
7.1.2 Climate Change 76
7.1.2.1 Overview 76

7.1.2.2 Regulatory Context 77
7.1.2.3 Assessment Methodology 77
7.1.2.4 Sources of Greenhouse Gas Emissions 77
7.1.2.5 Quantification of the GHG Baseline Conditions 79
7.1.2.6 Quantification of GHG Emissions – Construction Phase 81
7.1.2.7 Operations Phase 85
7.1.2.8 Effects Assessment 86
7.1.3 Sound 89
7.1.3.1 Overview 89
7.1.3.2 Regulatory Context 90
7.1.3.3 Existing Environment 90
7.1.3.4 Assessment Methodology 91
7.1.3.5 Sound Assessment Results 93
7.1.3.6 Effects Assessment 95
7.1.4 Shadow Flicker 98
7.1.4.1 Overview 98
7.1.4.2 Regulatory Context 99
7.1.4.3 Assessment Methodology 99
7.1.4.4 Assessment Results 100
7.1.4.5 Effects Assessment 101
7.2 Geophysical Environment 103
7.2.1 Overview 103
7.2.2 Regulatory Context 103
7.2.3 Assessment Methodology 103
7.2.4 Assessment Results 104
7.2.5 Effects Assessment 108
7.3 Aquatic Environment 112
7.3.1 Surface Water, Fish and Fish Habitat 112
7.3.1.1 Overview 112
7.3.1.2 Regulatory Context 112
7.3.1.3 Desktop Assessment Methods 113
7.3.1.4 Drone and GIS Model Methodology 114
7.3.1.5 Field Assessment Methodology 114
7.3.1.6 Desktop Assessment Results 117
7.3.1.7 Drone and GIS Model Results 121
7.3.1.8 Field Assessment Results 121
7.3.1.9 Effects Assessment 133
7.3.2 Wetlands 142
7.3.2.1 Overview 142
7.3.2.2 Regulatory Context 142
7.3.2.3 Desktop Review 143
7.3.2.4 Field Assessment Methodology 144
7.3.2.5 Field Assessment Results 149
7.3.2.6 Effects Assessment 162

7.4 Terrestrial Environment 171
7.4.1 Terrestrial Habitat 171
7.4.1.1 Overview 171
7.4.1.2 Regulatory Context 172
7.4.1.3 Desktop Review 172
7.4.1.4 Field Assessment Methodology 175
7.4.1.5 Field Assessment Results 176
7.4.1.6 Effects Assessment 183
7.4.2 Terrestrial Flora 187
7.4.2.1 Overview 187
7.4.2.2 Regulatory Context 188
7.4.2.3 Desktop Review 188
7.4.2.4 Sensitive Flora Habitat Modelling Methodology 189
7.4.2.5 Field Assessment Methodology 190
7.4.2.6 Sensitive Flora Habitat Modelling Results 191
7.4.2.7 Field Assessment Results 192
7.4.2.8 Effects Assessment 196
7.4.3 Terrestrial Fauna 201
7.4.3.1 Overview 201
7.4.3.2 Regulatory Context 201
7.4.3.3 Desktop Review 202
7.4.3.4 Desktop Review Results 202
7.4.3.5 Field Assessment Methodology 205
7.4.3.6 Field Assessment Results 209
7.4.3.7 Effects Assessment 211
7.4.4 Bats 218
7.4.4.1 Overview 218
7.4.4.2 Regulatory Context 218
7.4.4.3 Desktop Review 219
7.4.4.4 Field Assessment Methodology 222
7.4.4.5 Field Assessment Results 225
7.4.4.6 Effects Assessment 232
7.4.5 Avifauna 239
7.4.5.1 Overview 239
7.4.5.2 Regulatory Context 239
7.4.5.3 Desktop Review 240
7.4.5.4 Field Survey Methodology 243
7.4.5.5 SAR Habitat Modelling Methodology 245
7.4.5.6 Remote Sensing Methodology 247
7.4.5.7 Field Survey Results 252
7.4.5.8 SAR Habitat Modelling Results 258
7.4.5.9 Remote Sensing Results 258
7.4.5.10 SAR Detected in the Study Area 286
7.4.5.11 Effects Assessment 288

8.0 SOCIO-ECONOMIC ENVIRONMENT 297
8.1 Economy 297
8.1.1 Overview and Assessment Methodology 297
8.1.2 Existing Environment 298
8.1.3 Effects Assessment 301
8.2 Land Use and Value 305
8.2.1 Overview and Assessment Methodology 305
8.2.2 Existing Environment 306
8.2.3 Effects Assessment 307
8.3 Recreation and Tourism 311
8.3.1 Overview and Assessment Methodology 311
8.3.2 Existing Environment 311
8.3.2.1 Outdoor Recreation 311
8.3.2.2 Cultural Attractions 312
8.3.2.3 Recreation and Tourism Trends 312
8.3.3 Effects Assessment 313
9.0 ARCHAEOLOGICAL RESOURCES 316
9.1 Overview 316
9.2 Regulatory Context 316
9.3 Assessment Methodology 316
9.4 Assessment Results 318
9.5 Effects Assessment 318
10.0 EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT 320
10.1 Summary of Effects of the Undertaking on the Environment 320
11.0 EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING 324
11.1 Climate Change 324
11.1.1 Temperature 324
11.1.2 Sea Level Rise 325
11.1.3 Flooding 325
11.2 Natural Hazards 325
11.2.1 Severe Weather Events 325
11.2.2 Turbine Icing 326
11.2.3 Wildfire 327
11.3 Summary of Effects 328
12.0 ACCIDENTS AND MALFUNCTIONS 328
12.1 Erosion and Sediment Control Failures 329
12.2 Fires 329
12.3 General Hazardous Material Spills 330
12.4 Transportation-related Incidents 331
12.5 Structural Damage 332
13.0 CUMULATIVE EFFECTS 333
13.1 Overview 333
13.2 Cumulative Effects Assessment Methods 333
13.2.1 Selection of Boundaries 334

13.2.2 Other Undertakings in the Area 334
13.3 Selection of VCs for Evaluation in the CEA 337
13.4 Cumulative Effects Assessment 338
13.4.1 Terrestrial 338
13.4.2 Avian Mortality 340
14.0 CONCLUSION 341
15.0 CLOSURE 342
16.0 REFERENCES 343

LIST OF FIGURES

Figure 6.1: Open House 1 (Lincolnville) and 2 (Boylston) 48
Figure 6.2: Open House 3 (St. Francis Harbour) and 4 (Guysborough) 48
Figure 6.3: Open House 5 (Boylston) and 6 (Lincolnville) 49
Figure 6.4: Open House 7 (Guysborough) and 8 (St. Francis Harbour) 49
Figure 6.5: Open House 19 (Guysborough) 50
Figure 6.6: EverWind Guysborough Office BBQ 52
Figure 6.7: CLC Site Tour to EverWind's Facility in Point Tupper 53
Figure 7.1: Windrose Plot for Port Hawkesbury Meteorological Station (CYPD) – January 1, 2015, Through December 31, 2024 (ISU, 2025) 70
Figure 7.2: NS Power 2025 Energy Statistics 80
Figure 7.3: Bat Activity per Month by Species (2023/2024) 228
Figure 7.4: Bat Activity per Hour (2023/2024) 230
Figure 7.5: Wind Direction by Proportion of BTs Detected, Spring 2023 260
Figure 7.6: Wind Direction by Proportion of BTs Detected, Fall 2023 261
Figure 7.7: Number of Biological Targets Detected During the 2023 Monitoring Period Compared to Daily Temperatures (°C) 262
Figure 7.8: Number of Biological Targets Detected During the 2023 Monitoring Period Compared to Lunar Phases 263
Figure 7.9: Targets Detected and Target Density – Spring 2023 265
Figure 7.10: Targets Detected and Target Density – Fall 2023 266
Figure 7.11: Migratory Bird Interaction Index – Projected Daily for the Spring 2023 Monitoring Period 267
Figure 7.12: Migratory Bird Interaction Index – Projected Daily for the Fall 2023 Monitoring Period 268
Figure 7.13: Total Number of Detections made by BirdNET during the 2023 Acoustic Monitoring Season at Englands Lake 269
Figure 7.14: Confirmed BirdNET Detections from the 2023 Acoustic Monitoring Period at Englands Lake 271
Figure 7.15: BirdNET Species Richness (SAR and SOCI only) During the 2023 Acoustic Monitoring Period at Englands Lake 271
Figure 7.16: Total Number of Detections Made by Nighthawk During the 2023 Acoustic Monitoring Season at Goose Harbour Lake 272
Figure 7.17: Confirmed BirdNET Detections from the 2023 Acoustic Monitoring Period at Goose Harbour Lake 274

Figure 7.18: BirdNET Species Richness (SAR and SOCI only) During the 2023 Acoustic Monitoring Period at Goose Harbour Lake 275
Figure 7.19: Total Number of Detections Made by Nighthawk During the 2023 Acoustic Monitoring Period at Englands Lake 276
Figure 7.20: Confirmed Nighthawk Detections from the 2023 Acoustic Monitoring Period at Englands Lake 279
Figure 7.21: Nighthawk Species Richness During the 2023 Acoustic Monitoring Period for Englands Lake 281
Figure 7.22: Total Number of Detections Made by Nighthawk During the 2023 Acoustic Monitoring Period at Goose Harbour Lake 281
Figure 7.23: Confirmed Nighthawk Detections from the 2023 Acoustic Monitoring Period at Goose Harbour Lake 284
Figure 7.24: Nighthawk Species Richness During the 2023 Acoustic Monitoring Period for Goose Harbour Lake 286

LIST OF TABLES

Table 1.1: Proponent and Consultant Contact Information 2
Table 2.1: Federal Regulatory Requirements 5
Table 2.2: Provincial Regulatory Requirements 5
Table 2.3: Municipal Requirements 6
Table 3.1: Land Parcels within the Study Area 7
Table 3.2: Areas of Study 8
Table 3.3: Summary of Minimum Setbacks and Separation Distances 9
Table 3.4: Turbine Technical Specifications 13
Table 3.5: Project Schedule 23
Table 4.1: Temporal Boundaries 26
Table 4.2: Effects Assessment Criteria 26
Table 4.3: Definition of Significant Residual Environmental Effect 27
Table 4.4: Biophysical Assessment Components, Timing, and Surveyors 28
Table 4.5: Assessed Areas 29
Table 5.1: Engagement with the Mi'kmaq of Nova Scotia 31
Table 6.1: Government Meetings and Events 37
Table 6.2: Stakeholder Meetings and Events 43
Table 6.3: Summary of Open Houses 46
Table 6.4: CLC Summary 54
Table 6.5: Comments Received from the Public 54
Table 6.6: RABC Guidelines – Recommended Consultation Zones 59
Table 6.7: EMI Engagement Summary 60
Table 7.1: Climate Data from the Port Hawkesbury Meteorological Station (2015 to 2024) 68
Table 7.2: Wind Data from the Port Hawkesbury Meteorological Station (2015 to 2024) 69
Table 7.3: Summary of Regulations Pertaining to Ambient Air Quality in Nova Scotia 70
Table 7.4: Maximum Ambient Air Quality Conditions at Port Hawkesbury (2020 to 2024) 72
Table 7.5: Potential Project-Atmospheric Interactions 72

Table 7.6: Electricity Fuel Source Emission Factors 81
Table 7.7: Baseline Quantification Summary 81
Table 7.8: Concrete Manufacturing and Transportation Emission Factors 83
Table 7.9: Wind Turbine Transportation Distances 84
Table 7.10: Wind Turbine Transportation Emission Factors 85
Table 7.11: Potential Project-GHG Interactions 86
Table 7.12: Project GHG Emission Summary 87
Table 7.13: Summary of Sound Level Regulations and Guidelines 90
Table 7.14: Turbines Operating in Low Power Modes for the Sound Model 92
Table 7.15: Decibel Limits of Construction Equipment Required for the Project 93
Table 7.16: Attenuation of Construction Related Sounds 94
Table 7.17: Potential Project-Sound Interactions 95
Table 7.18: Sunshine Data Used for the Assessment Scenario B 100
Table 7.19: Potential Receptors Impacted by Shadow Flicker – Assessment Scenario B 100
Table 7.20: Potential Receptors Impacted by Shadow Flicker – Assessment Scenario B with Curtailment 101
Table 7.21: Potential Project-Shadow Flicker Interactions 101
Table 7.22: Summary of Water Well Records within 2 km of the Study Area 107
Table 7.23: Potential Project-Geophysical Interactions 108
Table 7.24: Named Waterbodies Within 5 km of Study Area 117
Table 7.25: Fish and Aquatic Invertebrate SAR/SOCI within a 100 km Radius of the Study Area 120
Table 7.26: Watercourses Characteristics within the Assessment Area 122
Table 7.27: Electrofishing Survey Results 128
Table 7.28: Results of the In-situ Water Chemistry Analysis Complete for Electrofishing Watercourses within the Study Area 132
Table 7.29: Potential Project-Surface Water, Fish and Fish Habitat Interactions 134
Table 7.30: Direct Effect Summary 135
Table 7.31: Classification of Wetland-Associated Plant Species 145
Table 7.32: Indicators of Wetland Hydrology 146
Table 7.33: WESP-AC Version 2 Function Parameters 147
Table 7.34: WESP-AC Version 3.3 Function Parameters 147
Table 7.35: Summary of Drone-Identified Wetlands 151
Table 7.36: Summary of WESP-AC Assessments Using Version 2.0 for Wetlands within the Assessment Area 153
Table 7.37: Summary of WESP-AC Assessments Using Version 3.3 for Wetlands within the Assessment Area 160
Table 7.38: Summary of Field-Identified Potential WSS, as Determined by the Presence of Avifauna SAR 162
Table 7.39: Potential Project-Wetland Interactions 162
Table 7.40: Habitat Alteration Potential for Field-Delineated Wetlands 164
Table 7.41: Habitat Alteration Potential for Drone-Delineated Wetlands within the Assessment Area 167
Table 7.42: Predicted Land Cover Types and their Respective Percent Cover 173
Table 7.43: Vegetation Types Observed within the Study Area 176
Table 7.44: Old-Growth Survey Results 177

Table 7.45: Potential Project-Terrestrial Habitat Interactions 183
Table 7.46: Predicted Land Cover Types and Impacts within the Study Area 185
Table 7.47: ACCDC Plant and Lichen SAR/SOCI Identified within the Study Area 188
Table 7.48: Sensitive Flora Habitat Modelling Results 191
Table 7.49: Plant and Lichen SOCI and SAR Encountered during Field Surveys 192
Table 7.50: Potential Project-Flora Interactions 196
Table 7.51: Terrestrial Mammal Species Recorded within a 100 km Radius of the Study Area 202
Table 7.52: Mainland Moose Habitat Suitability Model Weighting Scheme 204
Table 7.53: Herpetofauna Species Recorded by ACCDC within a 100 km Radius of the Centre of the Study Area 204
Table 7.54: Invertebrate Species Recorded by ACCDC within a 25 km Radius of the Center of the Study Area 205
Table 7.55: Mammal Assessment Survey Information 206
Table 7.56: Summary Results of the Mammal Field Assessments 209
Table 7.57: Summary of Trail Camera Results 210
Table 7.58: Potential Project-Terrestrial Fauna Interactions 212
Table 7.59: Known Bat Hibernacula within 100 km of the Study Area 220
Table 7.60: AMOs with Potential to Support Overwintering 221
Table 7.61: Bat Species Recorded within a 100 km Radius of the Study Area 221
Table 7.62: Monitoring Periods for Detectors (2023) 222
Table 7.63: Monitoring Periods for Detectors (2024) 223
Table 7.64: Results of the Passive Acoustic Bat Survey (2023) 225
Table 7.65: Results of the Passive Acoustic Bat Survey (2024) 226
Table 7.66: Monthly Bat Passes at Detectors with Greater than 100 Total Bat Passes (2023) 229
Table 7.67: Monthly Bat Passes at Detectors with Greater than 100 Total Bat Passes (2024) 229
Table 7.68: Potential Project-Bat Interactions 232
Table 7.69: Avian SAR Recorded within a 7 km Radius of the Study Area 241
Table 7.70: 2023 Avifauna Field Survey Overview 243
Table 7.71: Airspace Scanned (km^3) within the ARS' Height Bins 249
Table 7.72: Turbine – Avifauna Interaction Volume Calculation Information 250
Table 7.73: Total Observations by Bird Group – 2023 Winter Bird Surveys 253
Table 7.74: Total Observations by Bird Group – 2023 Spring Migration Point Count Surveys 253
Table 7.75: Total Observations by Bird Group – 2023 Spring Migration Diurnal Watch Surveys 254
Table 7.76: Total Observations by Bird Group – 2023 Breeding Bird Point Count Surveys 255
Table 7.77: Total Observations by Bird Group – 2023 Nocturnal Bird Survey 255
Table 7.78: Total Observations by Bird Group – 2023 Fall Migration Point Count Surveys 256
Table 7.79: Total Observations by Bird Group – 2021 Fall Migration Diurnal Watch Surveys 256
Table 7.80: Avian Incidental Observations 257
Table 7.81: Avian SAR Potential Habitat – Assessment Area, Study Area, and LAA 258
Table 7.82: Target Density – Englands Lake – Spring 2023 263
Table 7.83: Target Density - Goose Harbour Lake – Spring 2023 264
Table 7.84: Target Density – Englands Lake – Fall 2023 264
Table 7.85: Target Density - Goose Harbour Lake – Fall 2023 264
Table 7.86: Summary of 2023 Englands Lake BirdNET Results 269

Table 7.87: Confirmed SAR and SOCI Vocalizations detected by BirdNET during the 2023 Acoustic Monitoring Period at Englands Lake 272
Table 7.88: Summary of 2023 Goose Harbour Lake BirdNET Results 273
Table 7.89: Confirmed SAR and SOCI Vocalizations detected by BirdNET during the 2023 Acoustic Monitoring Period at Goose Harbour Lake 275
Table 7.90: Summary of 2023 Englands Lake Nighthawk Results 277
Table 7.91: Summary of Species Confirmed at Englands Lake During the 2023 Nighthawk Acoustic Analysis 279
Table 7.92: Summary of the 2023 Spring Monitoring Period Detected at Goose Harbour Lake 282
Table 7.93: Summary of Species Confirmed at Goose Harbour Lake During the 2023 Nighthawk Acoustic Analysis 284
Table 7.94: SAR Detected Near or Within the Study Area from Field and Acoustic Results 286
Table 7.95: Potential Project-Avifauna Interactions 288
Table 8.1: Population Characteristics in 2016 and 2021 for Nova Scotia, MODG, and Mulgrave 298
Table 8.2: Age Distribution in 2021 in Nova Scotia, MODG, and Mulgrave 299
Table 8.3: Housing Costs (2021) and Median Individual Income (2020) for Canada, Nova Scotia, MODG, and Mulgrave 299
Table 8.4: Employment Statistics for Canada, Nova Scotia, MODG, and Mulgrave 300
Table 8.5: Top Industries for the Employed Labour Force in 2017 in MODG and Mulgrave Compared to the Province of Nova Scotia 300
Table 8.6: Local Businesses and Proximity to the Project 300
Table 8.7: Potential Project-Economy Interactions 301
Table 8.8: Potential Project-Land Use and Value Interactions 307
Table 8.9: Potential Project-Recreation and Tourism Interactions 313
Table 9.1: Potential Project-Archaeological Resources Interactions 318
Table 10.1: Effects of the Undertaking on the Environment Summary 321
Table 13.1: Nearby Industrial Activities and Developments 335
Table 13.2: Potential for Cumulative Effects on Identified VCs 337

LIST OF ACRONYMS

%	Percent
°	Degree
°C	Degrees Celsius
µg/m^3	Micrograms per cubic meter
µm	Micrometres
µS/cm	Microsiemens per centimeter
AAQMS	Ambient air quality monitoring stations
ACCDC	Atlantic Canada Conservation Data Centre
AI	Artificial intelligence
AMO	Abandoned mine opening
AQHI	Air Quality Health Index
ARD	Acid rock drainage
ARIA	Archaeological Resource Impact Assessment
ARS	Avian radar system

ARU	Autonomous recording units
AS	White ash
ATV	All-terrain vehicle
BF	Balsam fir
BMPs	Best management practices
BS	Black spruce
BT	Biological targets
BT/km^3	Biological targets per cubic kilometre
CAAQS	Canadian Ambient Air Quality Standards
CBA	Community Benefits Agreement
CCG	Canadian Coast Guard
CCME	Canadian Council of Ministers of the Environment
CEA	Cumulative Effects Assessment
CEO	Chief Executive Officer
CEPA	*Canadian Environmental Protection Act*, 1999
CH_4	Methane
CLC	Community Liaison Committee
cm	Centimetres
CNWI	Canadian Wetland Inventory
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRM Group	Cultural Resource Management Group Ltd
CWS	Canadian Wildlife Service
dBA	A-weighted decibels
DBH	Diameter at breast height
DEM	Digital elevation model
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
DO	Dissolved oxygen
DWL	Drone-delineated wetland segments
EA	Environmental Assessment
EARD	Environmental Assessment Registration Document
ECCC	Environment and Climate Change Canada
EH	Eastern hemlock
EMI	Electromagnetic interference
EPFU	Big brown bat
ERT	Emergency Response Team
ESA	*Endangered Species Act*, S.N.S. 1998, c. 11
ESRI	Environmental Systems Research Institute
FAC	Facultative
FACU	Facultative upland
FACW	Facultative wetland
FTE	Full-time equivalent
FWAL	Freshwater aquatic life
gCO_2e/kWh	Grams of CO_2 equivalent per kilowatt-hour of energy produced

GDP	Gross domestic product
GHG	Greenhouse gas
GIS	Geographic information system
GPS	Global positioning system
GW	Gigawatts
H_2S	Hydrogen sulfide
ha	Hectare
HADD	Harmful alteration, disruption, and destruction
HSI	Habitat suitability index
Hz	Hertz
IBA	Important bird areas
ID	Identification
IH	Intolerant hardwood
IPCC	Intergovernmental Panel on Climate Change
JP	Jack pine
kg	kilograms
kHz	Kilohertz
km	Kilometre
km/h	Kilometres per hour
km^2	Square kilometre
km^3	Cubic kilometre
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
kPa	kilopascal
kV	Kilovolt
kWh/year	Kilowatt-hours per year
LAA	Local Assessment Area
LABO	Eastern red bat
LACI	Hoary bat
LANO	Silver-haired bat
LCA	Lifecycle assessment
m	Metre
M&NP	Maritimes & Northeast Pipeline
m/s	Metres per second
m^2	Square metres
m^3	Cubic metres
MARI	Maritime Archaeological Resource Inventory
masl	Metres above sea level
MBA	Mi'kmaq Benefits Agreement
MBBA	Maritimes Bird Breeding Atlas
MBCA	*Migratory Bird Conservation Act, 1994*
MBII	Migratory Bird Interaction Index
MD	Municipal district
MEKS	Mi'kmaq Ecological Knowledge Study
MET	Meteorological
mg/L	Milligrams per litre
MHz	Megahertz
MLA	Member of the Legislative Assembly

mm	Millimetre
MODG	Municipality of the District of Guysborough
MOU	Memorandum of Understanding
MP	Member of Parliament
MPRR	Minimum Planning Requirements Regulations
MW	Megawatts
MW	Mixedwood
MYOT	Myotis species
N_2O	Nitrous oxide
N/A	Not Applicable
nBTs	Number of biological targets
NFC	Nocturnal flight call
NI	No indicator
NL	Not listed
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxide
NS	Norway spruce
NS AAQS	Nova Scotia Ambient Air Quality Standards
NS Power	Nova Scotia Power Incorporated
NSAQR	Nova Scotia Air Quality Regulations
NSCCTH	NS Communities, Culture, Tourism and Heritage
NSECC	Nova Scotia Environment and Climate Change
NSNR	Nova Scotia Natural Resources
NSPW	Nova Scotia Public Works
NSSU	Nova Scotia Southern Upland
O&M	Operations and maintenance
O_3	Ozone
OBL	Obligate
OHV	Off-highway vehicle
OLA	Office of L'nu Affairs
PESU	Tri-colored bat
pH	Potential of hydrogen
PHP	Port Hawkesbury Paper
PID	Property identification
PM	Particulate matter
PM_{10}	Particulate matter 10 micrometres or less in diameter
$PM_{2.5}$	Particulate matter 2.5 micrometres or less in diameter
ppb	Parts per billion
PPE	Personal protective equipment
Q&A	Question and answer
QA/QC	Quality Assurance/Quality Control
RAA	Regional Assessment Area
RABC	Radio Advisor Board of Canada
RM	Red maple
ROW	Right of way
rpm	Revolutions per minute

RS	Red spruce
SAR	Species at risk
SARA	*Species at Risk Act*
SCADA	Supervisory control and data acquisition
SGEM	Nova Scotia Silvicultural Guide for the Ecological Matrix
SH	Spruce hemlock
SM	Sugar maple
SMP	Special management practices
SO_2	Sulphur dioxide
SOCI	Species of conservation interest
SP	Spruce pine
S-Rank	Subnational rank
SRM	Sound-reducing operating mode
TC	Transport Canada
tCO_2	Tonnes of carbon dioxide
tCO_2e	Tonnes of carbon dioxide equivalent
tCO_2e/kg	Tonnes of carbon dioxide equivalent per kilogram
tCO_2e/km	Tonnes of carbon dioxide equivalent per kilometer
$tCO_2e/tonne$	Tonnes of carbon dioxide equivalent per tonnes
$tCO_2e/tonne{\cdot}km$	Tonnes of carbon dioxide equivalent per tonnes by kilometer
$tCO_2e/year$	Tonnes of carbon dioxide equivalent per year
TH	Tolerant hardwood
TL	Trembling aspen and large tooth aspen
TL	Larch
TRS	Total reduced sulphur
TSP	Total suspended particulate
UNHI	Unknown high
UNKW	Unknown
UNLO	Unknown low
UPL	Upland
UTM	Universal Transverse Mercator
V	volt
VCs	Valued Components
VP	Vice President
WAM	Wet area mapping
WC	Wet coniferous
WD	Wet deciduous
WESP-AC	Wetland Ecosystem Services Protocol – Atlantic Canada
WS	White spruce
WSS	Wetland of special significance
YB	Yellow birch

LIST OF DRAWINGS

2.1	Site Overview
3.1	Protected Areas
3.5	Previously Assessed Areas
3.3	Mi'kmaq of Nova Scotia Communities
3.4 A-H	Infrastructure
4.1	Remaining Areas to be Assessed
6.1	Engagement
7.1	Ecodistricts and Ecoregions
7.2	Receptors
7.3	Noise
7.4	Shadow Flicker Real Case – Assessment Scenario B
7.5	Geomorphology
7.6	Surficial Geology
7.7	Bedrock Geology
7.8	Karst Risk
7.9	Radon Potential
7.10	Arsenic Risk in Bedrock Water Wells
7.11	Manganese Risk
7.12	Uranium Risk
7.13	Groundwater Wells
7.14	Geophysical LAA
7.15	Desktop Freshwater
7.16 A-N	Field Assessments
7.17	Wet Area Mapping
7.18	Surface Water, Fish and Fish Habitat Results
7.19	Surface Water, Fish and Fish Habitat Effects
7.20	NSNR Wetlands
7.21 A-H	Terrestrial Habitat
7.22 A-H	Old Growth Results
7.23	Desktop Flora Results
7.24	Sensitive Flora Habitat Model
7.25	Fauna Methodology
7.26	Fauna LAA
7.27	Abandoned Mine Openings
7.28	Bat Assessment
7.29	Avian Desktop Results
7.30 A-G	Avian Point Count Drawings
7.31 A	Potential Canada Warbler Habitat
7.31 B	Potential Common Nighthawk Habitat
7.31 C	Potential Evening Grosbeak Habitat
7.31 D	Potential Olive-Sided Flycatcher Habitat
7.31 E	Potential Rusty Blackbird Habitat
13.1	Cumulative Effects

LIST OF APPENDICES

Appendix A: Engagement
Appendix B: GHG Calculations
Appendix C: Sound
Appendix D: Shadow Flicker
Appendix E: Groundwater Wells
Appendix F: ACCDC Report
Appendix G: Surface Water and Fish & Fish Habitat Photo Log
Appendix H: Wetlands Characteristics & Photo Log
Appendix I: Old Growth Photo Log
Appendix J: Flora Inventory
Appendix K: Terrestrial Fauna Photo Log
Appendix L: Avifauna
Appendix M: Visual Simulations
Appendix N: ARIA Confirmation
Appendix O: Project Team CVs

1.0 PROPONENT DESCRIPTION

EverWind NS Holdings Ltd. (EverWind) and Membertou Development Corporation (together as the “Proponent”) are proposing to construct and operate the Setapuktuk Wind Project (the "Project"), an onshore wind farm with 54 wind turbines. Pronounced “seh-duh-BOOK-took”, which is the Mi’kmaw word for Guysborough, the Project was previously known as “Wind Farm 1”. The Project is being developed to support the production of Certified Green hydrogen and ammonia in Nova Scotia.

EverWind is a Nova Scotia-based private developer of green hydrogen and ammonia production that has extensive energy storage facilities and associated transportation assets. The EverWind team includes experienced Canadian wind farm developers, constructors, and operators who have designed, financed, constructed, and operated wind and solar energy projects in Nova Scotia, Atlantic Canada, Western Canada, and across North America over the past 20 years.

Membertou is a Mi’kmaw community located in Unama’ki-Cape Breton Island. Just 3 km from downtown Sydney, Membertou’s urban location, in addition to its prioritization of community development, has enabled it to grow into one of Canada’s most economically flourishing Indigenous communities.

With nearly 1,800 total members, Membertou’s approach to business and community starts with its people. Chief Terry Paul, who is the elected Chief in Membertou for the last 41 years, often remarks that, “at the forefront of everything we do, is who we do it for; the people of Membertou.”

Membertou Development Corporation was established in 1989 and over the last three decades has grown into a thriving organization that focuses on real estate, fisheries, gaming, trade and convention, and retail development. Through strategic acquisitions, Membertou has become not only a business leader, but an example of economic reconciliation. Membertou is a Canada’s Best Managed Company and has ownership in companies such as Clearwater Seafoods and NewDock-St. John’s Dockyard. Membertou holds strong partnerships in projects with Novaporte, EverWind Fuels, and others.

With a goal to provide opportunities, employment, and prosperity for the community, Membertou’s Chief and Council are keen to see continued growth, while always using the lens of environmental and cultural stewardship.

The Proponent retained Strum Consulting to undertake the required technical studies, manage technical subconsultants, and undertake regulatory consultations which have all contributed to the preparation of the Project’s Environmental Assessment (EA) Registration Document. Strum Consulting is an independent multi-disciplinary team of consultants with extensive experience undertaking EAs throughout Atlantic Canada.

Contact information for the Proponent and their consultant is included in Table 1.1.

Table 1.1: Proponent and Consultant Contact Information

Proponent Information	
Project Name	Setapuktuk Wind Project
Proponent Name	EverWind NS Holdings Ltd. and Membertou Development Corporation
Chief Executive Officer(s) / Principal(s)	Trent Vichie – Chief Executive Officer (CEO) and Founder, EverWind Fuels
Proponent Contact Information for the EA Registration	Jeff Bonazza, Director, Environment and Permitting, EverWind Fuels 902-292-7010 jeff.bonazza@everwindfuels.com
Mailing and Street Address	1969 Upper Water Street – Suite 2101 Purdy's Wharf II B3J 2V1 Halifax, NS
Consultant Information	
Name of Consultant	Strum Consulting
Mailing and Street Address	211 Horseshoe Lake Road, Unit #210 Halifax, NS B3S 0B9
EA Contact	Melanie Smith – Vice President (VP) Environmental Assessment and Approvals 902-835-5560 msmith@strum.com

2.0 PROJECT INFORMATION

2.1 Project Introduction

The Proponent's overall vision is to develop an Atlantic Canada green energy hub in Point Tupper, Nova Scotia. The Project aims to utilize renewable energy sources, such as wind energy, to produce green hydrogen and ammonia for both local use and export. The portfolio of projects is divided into two phases in Nova Scotia:

- Phase 1 includes the construction of the Point Tupper Hydrogen and Ammonia Production Facility (the "Facility"), powered by onshore wind and solar energy that will generate approximately 650 megawatts (MW) of clean energy. EA Approvals have been received for the Facility and three wind projects (Bear Lake, Kmtnuk, and Windy Ridge Wind Power Projects). A fourth wind power project (Upper Afton) is also under development. Phase 1 wind power projects use the existing Nova Scotia Power Inc. (NS Power) grid to transmit renewable energy to the Facility.
- Phase 2 includes the development of approximately 2 gigawatts (GW) of clean energy from up to three additional onshore wind projects, the associated transmission line, and the portion of the transmission line that crosses the Strait of Canso to provide a connection directly to the facility (EA Approval received). Phase 2 wind power projects

are not planned to be interconnected to the NS Power grid; renewable energy will be transmitted from Phase 2 wind projects to the Facility via EverWind constructed, owned, and operated transmission lines.

This Project is for one of the Phase 2 onshore wind projects, with 54 wind turbines near the communities of Pirate Harbour, Middle Melford, Sand Point, Hadleyville, and Manchester in the Municipality of the District of Guysborough, in Guysborough County, Nova Scotia (Drawing 2.1). The approximate center of the Project is located at 45.506764°N, 61.356097°W.

The Project turbines will have a nominal nameplate capacity of approximately 8.0 MW, which represents the range of turbine models being considered for the Project. For the purposes of this EA's visual simulations, noise and shadow flicker modelling, and effects assessment, the Goldwind GWH182-8.0 wind turbine generator was selected. The Project also consists of access roads, laydown areas, medium-voltage electrical collection lines, an interconnecting transmission line, a substation, and an Operations & Maintenance (O&M) building.

The Project lies primarily within the Clam Harbour River / St. Francis River (1ER), which is located near the communities of St. Francis Harbour, Steep Creek, and Manchester, in Nova Scotia. The majority of the Study Area is Crown land [8,367.77 hectares (ha); 94.23 percent (%)], with 151.82 (1.71%) ha of private land in the western portion. The Crown land is currently utilized for forestry and some recreational use.

Upon approval of the EA, construction activities are tentatively proposed to begin in Q4 2026 and once constructed, the Project is expected to be operational for a minimum of 35 years.

2.2 Purpose & Need for the Undertaking

As part of the Clean Power Plan released in fall 2023, the Government of Nova Scotia set targets for producing 80% renewable energy by 2030 and cutting greenhouse gas (GHG) emissions produced from electricity by 90%. The development of wind energy is expected to be a significant part of achieving these goals. The Project has been proposed in support of this renewable energy target. Dependence on fossil fuels increases the vulnerability of Nova Scotians to rising international energy prices, weakens energy security, and takes valuable revenue out of the province, further leading Nova Scotia towards a preference for renewable energy (Nova Scotia, 2015). Negative impacts on human health (particularly in developing countries) and the environment, mainly in the form of climate change, are among the widely cited challenges associated with fossil fuel consumption around the world.

In its assessment report, Climate Change 2022 - Impacts, Adaptation and Vulnerability, the United Nations Intergovernmental Panel on Climate Change (IPCC) provides a detailed synopsis of the impacts associated with climate change on both global and regional scales. Evidence from all continents indicates that many biological systems and habitats are currently being affected by regional climate change. Ecological changes include changes to the thermal dynamics and quality of aquatic habitats, shifts in migratory timing and ranges of fauna and flora, changes in fish abundance, and increased risk of extinction and loss of forest habitat

(IPCC, 2022). In North America specifically, the increase in ground, water, and atmospheric temperatures has resulted in direct mortality and redistribution of flora and fauna species. In addition, coastal flooding along with an increase in the frequency and intensity of extreme weather events will continue to impact the socioeconomic environment through displacement and/or damage to communities and economies (IPCC, 2022). Impacts of climate change are, and will increasingly be, felt across environmental, social, human health, and economic sectors (IPCC, 2022).

Canadian climate experts acknowledge that the debate has largely evolved from questions about the reality and causes of climate change, to what actions can be taken to adapt to the realities of a changing climate. As the second most important and fastest growing source of electricity in Canada (along with solar) (NRCan, 2024), wind energy is a critical component of Canada's renewable energy strategy. Wind energy is emission-free; with every megawatt of wind energy generated, GHG emissions are reduced in comparison to previous levels associated with coal-related production (NSNR, n.d.). Numerous benefits can be expected from the transition to renewable energy, including:

- Long-term stability in energy prices.
- Long-term security in locally-sourced energy supply and decreased dependence on international markets.
- Creation of jobs and economic opportunities throughout the province.
- Community investment and economic return.
- Protection of human health and the environment.
- Educational opportunities for youth and the broader community about renewable energy technology, its benefits, and the role it will play in Nova Scotia's energy future.

The Proponent is committed to sharing economic opportunities with the local community throughout the development and lifespan of the Project via the use of local skills and labour where possible, municipal tax revenue, and ongoing energy literacy/education. Engagement with local groups has been ongoing to support both community and Project development.

2.3 Regulatory Framework

2.3.1 Federal

A federal impact assessment is not required for the Project as it is not located on federal lands or listed as a physical activity that constitutes a designated project as listed in the Physical Activities Regulations, S.O.R./2019-285 under the *Impact Assessment Act*.

Federal approval, permit, notification, and compliance requirements for the Project are provided in Table 2.1. Electromagnetic interference (EMI) and radio communication stakeholders have been contacted. The EMI consultation process and status is described further in Section 6.

Table 2.1: Federal Regulatory Requirements

Requirement	Regulatory Body	Status/Comments
Fisheries Act	Fisheries and Oceans Canada (DFO)	Compliance legislation - there is currently no expectation that an authorization under the *Fisheries Act* will be required. If, during the detail design phase, the Project is determined to have potential to cause a harmful alteration, disruption or destruction of fish habitat or accidental death of fish, the Proponent will submit a Request for Project Review to DFO.
Species at Risk Act (SARA)	Environment and Climate Change Canada (ECCC), and DFO	No SARA permits were acquired for studies within the Study Area and none are expected based on Project design.
Migratory Bird Convention Act, 1994 (MBCA)	ECCC	Compliance legislation – the requirement to obtain a MBCA permit is not anticipated.

2.3.2 Provincial

The Project is subject to a Class I EA as defined by the Environmental Assessment Regulations, N.S. Reg. 26/95 under the *Environment Act*, S.N.S. 1994-95, c. 1. As such, this submission has been prepared in accordance with:

- A Proponent's Guide to Environmental Assessment (NSECC, 2025a).
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a)
- Nova Scotia Class I Environmental Assessment Checklist (NSECC, 2025d)
- Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c)

Other potentially applicable regulatory requirements including provincial approvals, permits, notification, and compliance for the Project along with their status are provided in Table 2.2.

Table 2.2: Provincial Regulatory Requirements

Requirement	Regulatory Body	Status/Comments
Watercourse Alteration Permit Wetland Alteration Permit	Nova Scotia Environment and Climate Change (NSECC)	Alteration applications will be submitted to NSECC in accordance with the Activities Designation Regulations following EA Approval. Locations requiring alteration are described in Section 7.3.
Endangered Species Act, S.N.S 1998, c. 11 (ESA)	Nova Scotia Natural Resources (NSNR)	Compliance legislation – the requirement to obtain an ESA permit is not anticipated.

Requirement	Regulatory Body	Status/Comments
Use of Crown lands	NSNR	In 2022, EverWind was granted exclusivity on Crown Lands – the Setapuktuk Wind Project falls within the awarded Crown lands. Crown land lease application submitted May 2023 (NSNR File 5447937).
Notification of blasting (if required)	NSECC, Nova Scotia Health and Safety	To be confirmed following the geotechnical investigations.
Overweight/Special move permit Access permit Work within highway right-of-way (ROW)	Nova Scotia Public Works (NSPW)	Permits to be applied for before mobilizing oversize vehicles on public roads or commencing within a highway ROW.
Elevator lift license	Nova Scotia Labour Skills and Immigration	Application to be filed prior to erection of the wind turbines.
Archaeology Field Research Permit	Nova Scotia Communities, Culture, Tourism and Heritage (NSCCTH)	NSCCTH Permits A2023NS229, A2024NS010, and A2025NS144 obtained to complete the archaeology assessment (Section 9).
Nova Scotia Temporary Workplace Traffic Control Manual	NSPW	Compliance for the use of provincial roads during the construction, operation, and decommissioning phases of the Project.

2.3.3 Municipal

Municipal approval, permit, notification, and compliance requirements for the Project are provided in Table 2.3.

Table 2.3: Municipal Requirements

Requirement	Regulatory Body	Status/Comments
Building and Development Permits	Municipality of the District of Guysborough (MODG)	Proponent will obtain all required municipal building and development permits prior to construction.
Noise Control By-Law	MODG	Compliance with schedule restrictions for construction activities. By-law includes provisions to permit construction activities during specific hours if a Building Permit has been issued.

2.4 Funding

The Proponent is arranging equity and debt project financing for the Project. Leading investment banks are engaged to lead the financing of the Project. Commercial banks have been approached to participate in the Project as a lender, and various financing support letters have been received for the funding.

3.0 DESCRIPTION OF THE UNDERTAKING

3.1 Geographical Location

The Project is located within Guysborough County, near the communities of Pirate Harbour, Middle Melford, Sandpoint, Hadleyville, and Manchester, Nova Scotia (Drawing 2.1). The Project is situated almost entirely on Crown-owned, managed forestry land. The Project is centered at approximately 45.506764°N, 61.356096°W.

In 2022, EverWind was granted exclusivity under the Crown Lands for Wind Generation Component of Green Hydrogen Development Memorandum of Understanding (MOU) throughout Municipality of the District of Guysborough (MODG). The Project falls within the awarded Crown lands.

A Study Area (Drawing 2.1) was established as a large assessment area based on land parcels [i.e., Property Identification (PIDs)] that are included in the development area (Table 3.1, Drawing 2.1) and represents the boundaries of where field data collection was completed.

Table 3.1: Land Parcels within the Study Area

Property Identification (PID)	Landowner
35048917	Crown Land
35050491	Crown Land
35050798	Crown Land
35052133	Crown Land
35052158	Crown Land
35052240	Crown Land
35172220	Crown Land
35172246	Crown Land
35172253	Crown Land
35172261	Crown Land
35172279	Crown Land
35172287	Crown Land
35174416	Crown Land
35174424	Crown Land
35174432	Crown Land
35174440	Crown Land
35174457	Crown Land
35174465	Crown Land

Property Identification (PID)	Landowner
35003987	Private Land
35005669	Private Land
35005883	Private Land
35005990	Private Land
35016245	Private Land
35048925	Private Land
35048974	Private Land
35049584	Private Land

The Assessment Area (Drawing 2.1) represents the physical footprint of the Project where the direct physical disturbance is expected to occur (i.e., the Project Footprint), plus a buffer to allow design flexibility. For this Project, the buffer included a 150 metre (m) radius area for each turbine, a minimum 25 m buffer on either side of the centerline for the road layout, and an approximate 90 m corridor for transmission lines. The Assessment Area also includes temporary laydown areas and the substation/O&M building location.

A Clearing Footprint was established, which includes the areas where vegetation clearing may be required to facilitate construction activities, including temporary laydown areas, transmission line corridors, and increased area at turns along roads to facilitate blade transportation during construction. Many of these areas will be allowed to revegetate during operations. This includes the full width of the Assessment Area along roads and the transmission line, as well as a 100 m by 100 m area surrounding turbine locations.

The Project Footprint includes the physical footprint where direct disturbance is expected to occur throughout the operation of the Project. This includes a 30 m wide corridor for road construction/widening, the substation and O&M building, and a 100 m by 100 m area surrounding turbine locations.

The areas of the Study Area, Assessment Area, Clearing Footprint and Project Footprint are provided in Table 3.2.

Table 3.2: Areas of Study

Area of Study	Area in Hectares (ha)
Study Area	8,880
Assessment Area	905
Clearing Footprint[(1)]	623
Project Footprint[(2)]	273

[(1)]Area is a conservative estimate of the footprint where vegetation clearing will take place during construction.
[(2)]Area is a conservative estimate of the permanent footprint of the Project. Temporary Project Footprint components are shown on Drawing 2.1 but not included in this calculation. Following the detailed design, the area will be refined.

3.1.1 Siting Considerations

As part of the Project planning process, a constraints analysis was undertaken that considered potential effects to the environment, nearby residents, and sociocultural resource early in the

EA process, prior to field studies being completed. The analysis incorporated the following:

- Results of a detailed wetland artificial intelligence (AI) model to minimize interactions with wetlands and watercourses.
- Results of a topographic mapping and an aerial imagery manual search for potential receptors.
- Locations of known (or having the high potential for) species at risk (SAR), sensitive habitat, and old growth policy forest to maximize avoidance.
- Areas known to have been previously disturbed by forestry, road construction, or other uses to minimize new areas of disturbance.
- Locations of known protected areas; field identified archaeological, cultural, and heritage resources; significant habitats; and wildlife sites, provincial parks, or reserves to ensure avoidance.
- Compliance with setbacks and separation distances (Table 3.3).

Table 3.3: Summary of Minimum Setbacks and Separation Distances

Setback Category	Distance	Relevant Regulators / Stakeholders
Watercourses	30 m from watercourses, where possible or otherwise where authorized by NSECC	NSECC
Wetlands	30 m from wetlands, where possible or otherwise where authorized by NSECC	NSECC, NSNR
Wetlands of Special Significance (WSS)	30 m from WSS, to be determined in consultation with NSECC or otherwise where authorized by NSECC	NSECC, NSNR
Old Growth Forests	100 m limited development buffer where possible on Crown land	NSNR
Protected Areas	To be determined in consultation with NSECC, as appropriate	NSECC, NSNR
Rare Plants and Lichens	Species-specific (Section 7.4.2)	NSNR
Residential Dwellings	4.0 x Turbine Height[(1)]	Minimum Planning Requirements Regulations (MPRR)
Camps	550 m	Proponent Commitment (See Section 3.1.1.1)
External Property Boundaries	1.5 x Turbine Height[(2)]	MODG
Public Roads	1.0 x Turbine Height	Proponent Commitment
Melford Terminal Railway	1.5 x Turbine Height	Proponent Commitment
Powerlines	1.0 x Turbine Height from non-Project-related powerlines	Proponent Commitment

Setback Category	Distance	Relevant Regulators / Stakeholders
Shadow Flicker	As necessary to meet shadow flicker guidelines at residential dwellings based on shadow flicker modelling	MPRR
Sound/Noise	As necessary to meet sound / noise guidance at residential dwellings based on sound modelling	MPRR

(1) As per 14(1)(a) of the MPRR; effective March 7, 2025, a municipal planning strategy must not require a minimum setback larger than four times the wind turbine height from a residential dwelling. Four times wind turbine height for the Goldwind GWH182-8.0 is 886.4 m, and EverWind has committed to a setback distance of 1,000 m for the Project, exceeding this requirement.
(2) Note that there may be instances where the resolution and accuracy of mapping shows turbines as being slightly closer than this value. Once detail design is completed, micrositing and/or survey confirmation will be completed, as necessary, to ensure appropriate setbacks are maintained.

Note that the Mulgrave Hills Nature Reserve falls within the Study Area and is approximately 270 m north and west of the Assessment Area (Drawing 3.1). The nature reserve was designated in 2023 (Nova Scotia, 2023) after the lands it was established upon were provided to EverWind as an option for development. EverWind respects the integrity and importance of protected areas and has engaged with Nova Scotia Environment and Climate Change (NSECC) Protected Areas regarding appropriate precautions for the nature reserve (Section 6). No activities are planned within 272 m of the nature reserve, and the nearest turbine is located approximately 420 m from the nature reserve (T32).

The Project Footprint offers considerable development opportunities that were incorporated into the Project design to minimize potential effects to surrounding land uses, local residents, and environmental features. Project development opportunities include the following:

- Use of Crown land which has been subject to previous and ongoing disturbance from forestry activities, that includes road use (including recreational traffic), new road construction, tree clearing, silviculture, and other recreational uses.
- Use of existing roads and cleared areas to the extent possible, to minimize habitat fragmentation and impacts to wetlands, watercourses, and their riparian buffers from new road construction and clearing of mature vegetation stands.

The constraints analysis was updated with the results of Project-specific technical studies which included: field investigations, environmental resource/potential effects modeling, as well as information collected through engagement with the Mi'kmaq of Nova Scotia, government agencies, stakeholders, and local communities. Through this process several iterations of the Project layout were considered (Drawing 3.2) for development before a Project Footprint was finalized for the purposes of this EA.

Specific adjustments included relocation of Project infrastructure, and an overall reduction in turbine numbers from 84 to 54, to:

- Avoid the private aerodrome located between Sand Point and Hadleyville, east of Marine Drive.

- Avoid the Melford Terminal Railway.
- Avoid and minimize potential interference with Canadian Coast Guard radar in Eddy Point.
- Comply with sound and shadow flicker guidelines.
- Avoid and minimize interactions with old growth forests, SAR, wetlands, and watercourses.
- Avoid the Maritimes and Northeast Pipeline.
- Avoid the water pipeline from Englands lake.
- Comply with setbacks from Nature Reserves.

3.1.1.1 Residential Dwellings

Turbine setbacks have been applied to all residential dwellings as defined in the Minimum Planning Requirements Regulations, N.S. Reg. 51/2025 (MPRR), which was created to harmonize turbine setback requirements across Nova Scotia and promote wind development.

The MPRR limits municipal planning setbacks between residential dwellings and wind turbines to a **maximum** of:

a) Four times the wind turbine height.
b) The distance required to ensure that:
    i. Sound levels from the wind turbine do not exceed 40 A-weighted decibels (dBA) at the exterior of a residential dwelling.
    ii. A residential dwelling receives less than 30 minutes per day or 30 hours per year of shadow flicker.

and whereas “residential dwelling” means a permanent structure used for human habitation and includes a house, condominium, apartment building, cottage, mobile home, or trailer.

The Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c) requires:

a) Modeling to show that operational noise at permanent and seasonal receptors [within 2 kilometres (km)] will not exceed 40 dBA.
b) Modelling to show that shadow flicker will not exceed 30 minutes per day or 30 hours per year at any permanent or seasonal receptor within 2 km of the project.

To avoid conflict between the MPRR and the Environmental Assessment Supplemental Checklist: Wind Energy Projects, the Proponent has equated “permanent receptors” to “house, condominium, apartment buildings, mobile home, or trailer” and “seasonal receptors” to “cottage”. The Proponent has specifically excluded “camps” as “seasonal receptors” as this would conflict with the MPRR.

In lieu of a clear definition of cottage and camp by the Province of Nova Scotia, the Proponent has formulated the following definitions:

- "Cottage" means a seasonal home which is equipped to accommodate an extended period of stay of regular human occupation and living that substantially meets the following criteria:
    a) Running water (potable) and onsite sewage disposal.
    b) Has permanent electrical service that is connected to the provincial grid or supplied by an onsite power generation system operating to a standard typical of other residential dwellings.
    c) Is assessed as a Residential Property by the Property Valuation Services Corporation under the *Assessment Act,* R.S.N.S. 1989, c. 23*.*
    d) Is constructed to meet applicable building code and municipal bylaw requirements for residential occupancy.

- "Camp" means a recreational shelter typically used for weekend or short-term activities such as hunting, fishing, or snowmobiling, which is not intended for regular human occupation or living.

As required by the NSECC, all residential dwellings and camps within a 2 km radius of any wind turbine are included in the sound and shadow flicker studies. Consistent with the MRPP, compliance with sound and shadow thresholds are only considered a requirement for residential dwellings.

3.2 Project Proximity to Other Areas

3.2.1 Towns or Cities

The Project is situated approximately 10 km northeast of the community of Guysborough, and 4.2 km south of the Town of Port Hawkesbury (Drawing 3.3).

3.2.2 Mi'kmaq Communities

The nearest Mi'kmaq communities are Paqtnkek-Niktuek Indian Reserve No. 23 (Paq'tnkek) which is 30 km northwest of the Project, and Chapel Island Indian Reserve No. 5 (Potlotek) which is 42 km northeast of the Project (Drawing 3.3). Refer to Section 5 for additional details on the Mi'kmaq of Nova Scotia.

3.2.3 Other Known Wind Developments

Other wind developments within proximity to the Project include the Goose Harbour Lake Wind Farm (under development), adjacent to the northwest of the Project, and the Point Tupper Wind Farm directly across the Strait of Canso in Richmond County. The Goose Harbour Lake Wind Farm is a 168 MW project that includes 24 turbines, the nearest of which is sited 2.9 km west of one of the Project's proposed turbine locations. EverWind has engaged with Port Hawkesbury Paper (PHP), the proponent of this project (see section 6.2.4). The Point Tupper Wind Farm is a 24 MW Project that includes 12 turbines, the nearest of which is 3.7 km northeast, and across the Strait of Canso.

3.2.4 Protected Watersheds and Water Areas

Landrie Lake Watershed Protected Water Area is the nearest protected water area to the Project. It is located northeast of the Project, across the Strait of Canso, in Richmond County, Cape Breton (Drawing 3.1).

3.2.5 Nearest Parks and Protected Areas

The Mulgrave Hills Nature Reserve is situated directly adjacent to the Project Footprint boundary (Drawing 3.1). This Nature Reserve totals 242 ha and protects a small tract of hardwood dominated forest that is typical of the natural landscape of the Mulgrave Hills. (NSECC, n.d.). The closest turbine is approximately 420 m southeast of this nature reserve. The closest turbine is approximately 2.2 km north of the nearest provincial park, Port Shoreham Beach Provincial Park (Drawing 3.1). Cape Breton Highlands National Park, the nearest national park to the Project, is 130 km to the northeast.

3.2.6 Important Bird Areas

The nearest Important Bird Area (IBA), Country Island Complex (NS028), is 22 km south of the Project on the eastern shore of Guysborough County, Nova Scotia.

3.3 Physical Components

3.3.1 Turbines

The Proponent is proposing the construction of 54 turbines. For the purposes of the EA, the Proponent has selected the Goldwind GWH182-8.0 wind turbine generator as it represents the general range of turbine options that are being considered for noise and shadow flicker modelling. Table 3.4 shows the range of turbine characteristics that are being considered and the specific characteristics of the Goldwind GWH182-8.0.

Table 3.4: Turbine Technical Specifications

Turbine Component	Turbine Specifications for Goldwind GWH182-8.0
Rated capacity	8.0 megawatt (MW)
Rotor diameter	183.4 m
Blade length	91.7 m
Hub height	130 m
Total turbine (tip) height	221.7 m
Cut-out wind speed	24.0 metres per second (m/s)
Number of blades	Three
Swept area	26,417 square metres (m^2)
Rated revolution speed	9.5 revolutions per minute (rpm)

3.3.2 Road Layout

A comprehensive road network currently exists in the Study Area and is associated with ongoing forestry activities. The proposed access roads consist of 44 km (55%) of new and 35 km (45%) of existing roads (Drawing 3.4A to 3.4H). All roads will be constructed or

upgraded, as required to safely transport turbine components, provide appropriate turning radii, and support construction activities in compliance with local and provincial guidelines/requirements. During the civil design process, consideration will be made to minimize adverse impacts to sensitive habitats, such as wetlands and watercourses, as well as rare species. In some cases, the construction of new roads will be required to access proposed turbine locations; however, the Proponent is planning to leverage the network of existing roads to the greatest extent feasible.

Highway 344 (Marine Drive; between the communities of Pirate Harbour and Port Shoreham) is the main arterial road that grants access to most of the Project Footprint. A vast network of smaller spur roads and trails suited for all-terrain vehicles (ATVs) and/or snowmobile use are present throughout much of the Study Area and may require upgrades to facilitate the transportation of turbine components.

3.3.3 Substation, Power Collection Systems, and Transmission

The Project will include a new medium-voltage electrical cabling from each turbine, a substation to gather the produced energy, and a 6 km transmission line from the substation to the approved EverWind Strait Crossing Transmission Line Project (https://novascotia.ca/nse/ea/everwind-strait-crossing-transmission-line/) (Drawing 3.4A to 3.4H). The medium-voltage electrical cabling will be overhead with the exception of the first approximately 100 m from each turbine, which will run underground.

3.3.4 Operations and Maintenance Building

The Project will require an O&M building, which will mainly consist of an electrical room, workshop, supervisory control and data acquisition (SCADA) room, parts room, conference room, and office spaces. The O&M building will occupy an area of no more than 0.5 ha (Drawing 3.4B and 3.4C).

3.3.5 MET Towers

Four meteorological (MET) towers, operational since 2023, have been constructed within the Study Area to monitor atmospheric conditions relevant to the Project (wind speed and direction, atmospheric pressure, relative humidity, and temperature).

3.3.6 Concrete Batch Plant

A mobile concrete batch plant may be used during construction. Concrete batch plants allow for high output and quality concrete to be produced at site and reduce trucking costs and impacts to local communities.

3.3.7 Temporary Laydown Yards

Nine temporary laydown yards, between 6 ha and 16 ha in size, are under consideration for the Project. These areas will be used to temporarily store equipment and assemble Project infrastructure.

3.3.8 Borrow Pits

During construction, aggregate material for road construction may be produced from borrow pits located within the Assessment Area. All borrow pits are expected to be under 4 ha and not require an EA. Should any borrow pit be over 2 ha, an industrial approval would be obtained, as required. On-site borrow pits allow for aggregate to be sourced at the site and reduce trucking costs and impacts to local communities. If borrow pits are not utilized, aggregate will be sourced from local quarries.

3.4 Project Phases

The Project will include three phases:

- Site preparation and construction (approximately 36 months, tentatively starting Q4 2026)
- Operations and maintenance (approximately 35 years, tentatively starting 2029)
- Decommissioning (18 months, at Project end of life)

Activities and requirements associated with each phase are discussed in the following sections.

3.4.1 Site Preparation and Construction

Site preparation activities include:

- Completing land surveys for placement of roads, turbines, and associated infrastructure.
- Completing geotechnical investigations.
- Demarcating boundaries of environmentally sensitive features and applying appropriate buffers.
- Installing erosion and sedimentation control measures
- Clearing of trees, grubbing, excavating, grading, and compacting local and potentially imported materials for construction.

General construction activities include:

- Access road construction.
- Laydown area and turbine pad construction.
    - Completion of foundation excavation and construction, including blasting, if required.
    - Preparation of materials and storage (e.g., aggregate crusher and storage areas).
- Transportation of turbine components, equipment, and materials.
    - Establishment of site traffic control measures.
- Turbine assembly.
- Management of site waste and dust.
- Construction and connection of collection system, substation, and transmission lines.

- Removal of temporary works and site restoration.
- Commissioning.

Clearing activities are anticipated to occur between the months of October and April (i.e., outside of the bird nesting window, where possible). General construction is anticipated to occur year-round.

Access Road Construction

Approximately 35 km (45%) of the existing road network will be re-used as part of the Project. Existing roads will require upgrades (widening, ditching, capping etc.). Approximately 44 km (55%) of new road construction is required to provide direct access to the turbines. Access roads will have a 6 m to 12 m wide road surface and including ditching and grading will be 17 m to 20 m wide.

During construction, roads will be maintained with additional gravel or periodic grading. Aggregate material for road construction will be produced from borrow pits on the site or transported from local off-site quarries and stored temporarily until used. Any material removed for road construction will be stored or disposed of in accordance with regulations and best practices for road construction. Any material stored on-site will be managed with appropriate erosion and sedimentation control measures or re-used.

The following equipment is typically used during road upgrading and construction:

- Excavators
- Dump trucks
- Bull dozers
- Rollers
- Graders
- Crusher
- Light trucks

Laydown Area and Turbine Pad Construction

Laydown and turbine pad construction may include:

- Installation of erosion and sedimentation control measures.
- Removal of vegetation and site grading.
- Removal of overburden and soils.
- Blasting/chipping of bedrock (to be determined, based on geotechnical conditions and foundation design).
- Pouring and curing of concrete pads (complete with reinforcing steel).
- Placement of competent soils to bring area to grade.
- Compaction of soils.
- Excavation for electrical conduits and fibre optic communication trenches.

The turbine tower foundations will be up to 30 m in diameter and extend to a depth of 3 m to 7 m below grade. Foundations will be backfilled (underground) with the exception of the concrete pedestal which will extend up to 1 m above ground to support the wind turbine tower structure.

Each turbine pad and laydown area is expected to be approximately 100 m by 100 m. The exact arrangement of each turbine pad and crane pad will be designed to suit the specific requirements of the turbine and the surrounding topography during the detailed design process.

Temporary wind turbine laydown yards may be up 16 ha, which includes clearing limits and any overburden. There are currently nine temporary turbine laydown areas under consideration.

Construction of a typical turbine pad (from clearing to final preparation for erecting of the turbine) can take between one to four months, depending on weather, soil, and construction vehicle availability/access. The following equipment may be used for the laydown areas and turbine pad construction:

- Excavators
- Dump trucks
- Bull dozers
- Rollers
- Graders
- Crusher (not required if a local quarry can supply gravel sizes)
- Concrete trucks and pumper trucks
- Light cranes
- Light trucks

Transportation of Turbine Components, Equipment and Materials

The center of the Project is located approximately 5 km southwest of Highway 344. The primary road running northeast to southwest through the Study Area is Middletown Road, which begins in Middle Melford at Highway 344 and ends at the southern end of Highway 344 in Boylston. Middletown Road also intersects Riggin's Dam Road near the center of the Project, which runs south before ending. Pirate Harbour Road, beginning at Highway 344, intersects Goose Harbour Lake Road which provides access to the northern part of the Study Area, eventually connecting to an access road leading into the Project. Old Welsh Road, beginning at Highway 344, approximately 9 km south from the Project center, provides access to the southern part of the Study Area. Macpherson Lake Road also provides access to the southern part of the Study Area, beginning at Highway 344 and eventually intersects an access road running north into the Study Area (Drawing 2.1). The network of roads and trails throughout the Study Area provides optionality for detailed design, including the potential delivery of components through the road network of the Goose Harbour Lake Wind Farm and Hayden Road to the north of the Project.

Throughout the Study Area, the roads are accessible by truck/sport utility vehicles as well as other vehicles designed for rough dirt roads and tracks. The Study Area is frequented by both commercial users, primarily related to forestry activities, as well as recreational users year-round, including snowmobiling and ATV use, and hunting during the fall.

The transportation route to deliver turbine components to the Project is subject to the final turbine technology provider, who will undertake a comprehensive logistics study to determine the transportation route from the receiving and unloading port. Primary access routes during the operational lifespan of the Project are expected to be Middletown Road, Pirate Harbour Road, Goose Harbour Lake Road, and Old Welsh Road, and the existing network of smaller access roads.

The following permits and considerations are anticipated to be required for the transportation of tower components:

- Work Within Highway Right of Way Permit [Nova Scotia Public Works (NSPW)]
    - Required if installing access to sites from the roadway, erecting structures within 100 m of the highway or removing access signs and guard rails.
- Over-Weight Moves Special Move Permit (Service Nova Scotia and Internal Services)
    - Required to transport oversized and overweight components. In some cases, due to the size and weight of the components, some may only be transported on Sundays.
- Provincial road weight restrictions will also need to be considered, especially spring weight restrictions, for heavier equipment and materials that will be transported to the Project.
- Access points will be designed with proper height and width to accommodate large trucks and will adhere to commercial stopping sight distances.

Different volumes and types of traffic will be generated throughout the Project's lifecycle. During the construction phase, trucks and other vehicles will be frequently visiting the area resulting in increased vehicular sound and air emissions (see Sections 7.1.1 and 7.1.3 for assessment and mitigation related to air quality and sound). During construction, most days will have 100 trucks per day, with a few days potentially requiring up to 200 trucks. Outside of the construction phase, the Project will only require technicians to access the site to perform regular maintenance/equipment checks. Provincial road weight restrictions will be considered, especially spring weight restrictions, for heavier equipment and materials that will be transported to the Project. Decommissioning will require a similar amount of traffic to the tower component delivery and construction.

The public road portion of the transportation route is expected to require road modifications to provide access to the Study Area. In Guysborough County, this is limited to modifications and upgrades to existing unpaved roads that exit from Highway 344 to allow larger truck traffic to turn off the main road and to travel on the Project's gravel access roads.

The transportation route is expected to require road modifications, including the removal of signage and guardrails. Upgrades will also be made to roads and overhead wires, branches, and signs if conflicts arise. Bridges may be upgraded to increase allowable weight limits or temporary bridges built over existing bridges. Notices will be installed in public areas to inform residents of signage removal or road infrastructure alterations, as well as notify relevant municipal government staff of construction scheduling and safety measures.

The Proponent has committed to not restricting public access to roads and trails in the area with the exception of fencing surrounding the substation and temporary restrictions at active construction sites such as excavations or lift sites where restrictions are necessary due to safety considerations. In such circumstances, signs will be posted and physical barriers such as cones, candle sticks, t-posts and rope will be erected. In addition, transportation will avoid travel through urban areas, to the extent possible, during high traffic times.

Turbine Assembly

The wind turbine assembly includes tower sections, the nacelle, the hub, and three-blade rotors. The tower sections will be erected in sequence on the turbine foundation, followed by the nacelle, hub, and blades. All sections will be delivered by specialized transportation equipment and the pieces will require a crane for removal from the vehicle at each of the prepared turbine pads or staging areas as required. Turbine erection will depend on weather, specifically wind and lighting conditions. Typical assembly duration per turbine is expected to be between two and five days, and turbine components will be delivered as turbines are being assembled and erected. The following equipment is expected to be used for turbine assembly:

- Main crane unit
- Assembly cranes
- Manufacturer’s support vehicles

Construction and Connection of Power Collector System, Substation, and Transmission Lines

The Project turbines will generate power that will flow via its 34.5 kilovolt (kV) collection circuit (that primarily follows the proposed roads) to a 34.5 kV to 345 kV Project substation. Power will be transmitted via a dedicated overhead 345 kV transmission interconnection line to the EverWind Strait Crossing Transmission Line Project, which will connect to the EverWind Point Tupper Green Hydrogen/Ammonia Project in Point Tupper, Nova Scotia. The transmission line will be constructed, owned, and operated by EverWind and is not connected to the provincial grid.

The following equipment is expected to be used during the grid connection process:

- Excavators and/or back hoes
- Concrete trucks and pumper trucks
- Assembly cranes
- Bucket trucks
- Light cranes
- Light trucks

Removal of Temporary Works and Site Restoration

Once construction has been completed, all temporary works will be removed, and the site will be appropriately graded. The following equipment is expected to be used in this process:

- Excavator and/or backhoe
- Grader
- Hydroseeder
- Light trucks

Commissioning

The turbines will undergo a series of tests for mechanical, electrical, and operational controls prior to unit start-up sequence. Once the start-up sequence has been initiated, another series of performance checks for safety systems will be completed. When the turbines have cleared all tests, the commissioning of the units can begin.

Commissioning includes performance testing. These performance tests will be completed by qualified wind turbine technicians. Additional testing may also be required for transformers, power lines, and substation components; all of which will be performed by qualified engineers and technical personnel.

3.4.2 Operations & Maintenance

The lifespan of the Project is estimated to be a minimum of 35 years. During this time, roads will be used to access the turbines by staff and maintenance personnel. The roads will be maintained with additional gravel and grading, as required. During the winter months, roads will be plowed, sanded, and/or salted as necessary to allow for safe access to project facilities for operations and maintenance.

A vegetation management plan will be initiated to ensure that access roads and turbine locations remain clear of vegetation. Timing of vegetation management will depend on site specific conditions and requirements by the Proponent and/or their operations and maintenance contractors. In addition to mechanical clearing (mowing, brush cutting, and trimming), selective and localized application of approved herbicides may be required to manage vegetation along the transmission line.

Due to the potential for public access to the wind farm, signage will be affixed and maintained on all access roads to provide essential safety information such as emergency contacts and telephone numbers, speed limits, and the hazards associated with being in close proximity to the turbines (i.e., ice throw). These signs will be maintained during the life of the Project. No gates to restrict access are proposed; however, fencing will be required around the substation for the safety of the public.

Maintenance will conform to manufacturer equipment specifications, industry best management practices (BMPs), and standard operating procedures. Scheduled maintenance work will be carried out on a periodic basis. Maintenance work may require the use of a variety

of cranes for brief periods of time for replacement of blades or other turbine repairs. The most common vehicle during maintenance work will be light/medium pickup trucks.

An O&M building will be constructed on approximately 0.5 ha of land next to the Project substation (Drawing 3.4B and 3.4C). Detailed design will determine the precise size and location of the building; however, it will be within the Assessment Area.

3.4.3 Decommissioning

A decommissioning bond will be put in place within five years of the commercial operation date of the first turbine to cover costs of decommissioning.

Prior to decommissioning, NSECC and MODG will be provided with decommissioning plans for review and compliance with the Project's EA conditions. Opportunities for repowering will be considered prior to entering the decommissioning phase.

Generally, the decommissioning phase will follow the same steps as the construction phase:

- Dismantling and removal of the turbines.
- Decommissioning the turbine foundations as per the conditions of the land lease agreement.
- Removal, recycling (where possible), and disposal of power collection system, conductor, and poles.
- Removal of all other equipment and reinstatement and stabilization of land.
- Access roads will either be removed or remain in place as per lease agreements with the landowner.

According to the Canadian Renewable Energy Association (CanREA, n.d.), up to 90% of wind turbine blades can be recycled. Additional components, such as steel from the towers, copper cables, and electrical equipment, can also be recycled or reused. Materials that cannot be recycled can sometimes be reused in other applications, such as filler in construction materials. Recent innovations in fibreglass recycling have used various chemical and mechanical means to prepare the material for reuse in other applications (Power Technology, 2024). At the time of decommissioning, it is anticipated that newer technologies will allow for a greater amount of recycling or reuse of the end-of-life turbine materials. Any material that cannot be recycled or reused, will be sent for final disposal at an approval disposal facility.

Decommissioning is anticipated to take 18 months to complete.

Procedures for Dismantling

If the Project is to be decommissioned and the turbines are to be removed at the end of their service life or during construction, the procedures will be similar to the construction phase, but in reverse sequence. The general dismantling procedure will proceed as follows:

- The Project will first be de-energized and isolated from all external electrical lines.
- Temporary staging areas will be created to provide sufficient area for the laydown of

the disassembled wind turbine components and loading onto trucks. An area of approximately 1 ha around each wind turbine must be cleared, levelled and made accessible. After completion of the decommissioning, temporary staging areas and any associated temporary decommissioning facilities or components used throughout the decommissioning phase will be removed. The temporary staging areas will be located within the Assessment Area and used during the construction phase of the Project.

- Crane pads will be installed (estimated 30 m x 70 m) within the temporary staging area around each wind turbine. The topsoil at the crane pad will be removed and approximately 600 millimetres (mm) of compacted crushed gravel will be added. Once the turbine disassembly has been completed, the gravel area around each turbine will be removed and the area will be restored to prior use using stockpiled topsoil.
- Wind turbines (blades, hub, nacelle and tower segments) will be removed using cranes. The components and associated equipment will be hauled off using trucks and heavy-loaders, and components will be recycled, where possible, or disposed of off-site at an approved and appropriate facility.
- The top of the concrete foundations will be removed to approximately 1 m below the surface at that time. Excavated foundation areas will be backfilled with clean fill and stockpiled topsoil to match the original elevations. These areas will also be graded, contoured, and restored to a land use similar to what was present prior to foundation installation to allow for prior activities to resume.
- Overhead electrical lines are expected to be removed at the end of the Project's life. Poles will be cut to a depth of approximately 1 m below original grade or may be completely removed from the ground, where feasible.
- The Proponent is responsible for decommissioning the electrical connector line from the substation up to the Strait Crossing Transmission Line.
- The substation and associated infrastructure will be dismantled and removed in accordance with the legal requirements at the time. Any concrete foundations associated with these facilities will be removed to at least 1 m below the original grade. The area will be graded, contoured, and restored to land use similar to what was present prior to foundation installation to allow for prior activities to resume. All materials will be recycled, where possible, or disposed of off-site at an approved and appropriate facility.
- Removal of access roads will depend on the requirements and agreements in accordance with the Crown. Impacted lands will be restored to the land use in place prior to the construction of the access road, at the discretion of landowners.
- The meteorological towers will be removed unless otherwise requested by the municipality or other stakeholders (and agreed to by the Proponent and the property owner) for them to remain in place. Any concrete foundation would be removed to at least 1 m below original grade or to the depth originally installed if less than 1 m below original grade. The area will be graded, contoured, and restored to land use similar to what was present prior to foundation installation to allow for prior activities to resume.

Restoration of Land

All affected lands will be restored once the dismantling procedures have been completed and the turbines and other ancillary facilities have been removed.

After the dismantling process has been completed, the land will be returned to previous conditions in consultation with the landowner, local municipality and NSECC. This will be accomplished by removing the foundations (or part of foundation), granular material from roadways and culverts. The natural environment will be restored by re-vegetation. If there is insufficient material on-site, topsoil and/or subsoil will be imported from a source acceptable to the landowner, local municipality and local NSECC office, as applicable.

Strict spill prevention procedures will be in place; therefore, the potential for small spills is very low. In the unlikely event that a spill occurs during decommissioning, the soil conditions of the areas will be surveyed per standards at the time of occurrence to determine if any impacts have occurred. Should soil impacts be noted, the impacted soils will be immediately delineated, excavated and removed from the site, per applicable standards, for disposal at an approved and appropriate facility.

Waste Generated

Waste and debris generated during the decommissioning activities will be collected and disposed of at an approved facility. All reasonable efforts will be made to minimize waste generated throughout the decommissioning phase. Materials used and generated throughout decommissioning will be recycled, as practicable.

Industry best practices for spill prevention will be employed. In the unlikely event of a minor spill, it will be cleaned up immediately and any impacted soils will be removed from the site and disposed of at an appropriate facility in accordance with the applicable regulations.
After decommissioning, vehicles and construction equipment will be removed from the site.

3.5 Project Schedule

Table 3.5 presents the Project schedule from EA registration to Project decommissioning.

Table 3.5: Project Schedule

Project Activity	Timeline
EA Registration	October 2025
Post-EA Environmental Monitoring Programs	Prior to appropriate project phase
Geotechnical Assessment	2026
Detailed Engineering Design	2026
Municipal Decision on Development Agreement	2026
Clearing	Q4 2026, 2027
Construction	2027 to 2029
Commissioning	2029
Operation	+35 years
Decommissioning	1.5 years post-operation

4.0 ENVIRONMENTAL ASSESSMENT METHODOLOGY

As a Class 1 EA, this Registration Document and supporting studies have been developed to meet all requirements under Section 9(1A) of the Environmental Assessment Regulations, N.S. Reg. 93/2025. As such, this submission has been prepared in accordance with:

- A Proponent's Guide to Environmental Assessment (NSECC, 2025a)
- Nova Scotia Class I Environmental Assessment Checklist (NSECC, 2025d)
- Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c)
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a)

Over the past several years, Project team members have engaged with the following regulatory bodies to provide input and advice into the EA scope and planning for the proposed Project, as well as for several other similar proposed wind project developments in Nova Scotia:

- Environment and Climate Change Canada (ECCC) – Canadian Wildlife Service (CWS)
- Nova Scotia Communities, Culture, Tourism and Heritage (NSCCTH)
- NSECC
- Nova Scotia Natural Resources (NSNR)
- Nova Scotia Office of L'nu Affairs (OLA)

4.1 Assessment Scope & Approach

EA is a planning tool used to predict the environmental effects of a proposed project, identify measures to mitigate adverse environmental effects, and predict the significance of any effects after the application of mitigation measures.

The EA focuses on Valued Components (VCs). VCs are specific components of the biophysical and human environments that, if altered by the Project, may be of concern to the Mi'kmaq of Nova Scotia, regulators, stakeholders, and/or the public. The scope of the EA for this Project includes:

- Identify VCs that the Project may interact with (by activity and phase) within established spatial and temporal boundaries.
- Establish the existing conditions for VCs.
- Identify potential interactions between the Project and the VCs.
- Assess the potential effects that could occur from the interaction.
- Identify mitigation measures to reduce or eliminate those effects.
- Evaluate the significance of the environmental effects after the implementation of mitigation measures using VC-specific criteria.
- Identify monitoring or follow-up programs to verify predictions and/or evaluate the need to implement adaptive management.

4.2 Identification of Valued Components

The following VCs were identified based on the experience of the Project Team and through engagement with the Mi'kmaq of Nova Scotia, regulators, stakeholders and the public:

- Biophysical environment
  - Weather, climate, air quality; GHGs; sound; shadow flicker
  - Geology, hydrogeology/groundwater
  - Surface water, fish and fish habitat
  - Wetlands
  - Terrestrial habitat, flora, fauna (including mainland moose)
  - Bats
  - Avifauna
  - SAR (considered in the appropriate VC chapter, as necessary)

- Socioeconomic environment
  - Economy, land use, recreation, and tourism
  - Archaeological resources

4.3 Spatial & Temporal Boundaries

4.3.1 Spatial Boundaries

Spatial boundaries are considered separately for each VC and are typically based on natural system boundaries or administrative/political boundaries, as appropriate. The following spatial boundaries have been established for the effects assessment:

- Local Assessment Area (LAA): The area which represents the maximum extent of predicted or measurable direct and/or indirect effects of the Project. The LAA is VC-specific and defined in each VC chapter.
- Regional Assessment Area (RAA): The area encompasses all Project-related effects including diffuse or long-range effects. This area is larger than direct and indirect effects and will be used to support the assessment of cumulative effects, and accidents and malfunctions. The RAA varies between VCs and will be defined (where necessary) in each VC chapter.

Additional boundaries were also identified for the purpose of field data collection and to describe the area containing Project infrastructure. As detailed in Section 3.1, a Study Area was established based on land parcels (i.e., PIDs) that are included in the development area (Table 3.1, Drawing 2.1). The intent of the Study Area was to first survey a broad area at a high-level to allow flexibility in the design to move infrastructure and minimize effects to VCs. Based on the resulting Study Area analyses, an Assessment Area was established for more detailed field investigations. The Assessment Area represents the physical footprint of the Project where the direct physical disturbance is expected to occur (i.e., the Project Footprint), plus a buffer to allow design flexibility. For this Project, the buffer included a 150 m radius area for each turbine, a minimum 25 m buffer on either side of the centerline for the road layout, and

an approximate 90 m corridor for transmission lines. The Assessment Area also includes temporary laydown areas and the substation/O&M building location.

Where appropriate, the Study Area and Assessment Area are identified as the LAA and RAA for specific VCs in the individual VC chapters.

4.3.2 Temporal Boundaries

The temporal boundaries in Table 4.1 apply to all VCs unless otherwise stated in the individual chapters.

Table 4.1: Temporal Boundaries

Project Phase	Temporal Boundary
Site Preparation and Construction	36 months
Operation and Maintenance	35 years
Decommissioning	+35 years (18 months in duration)

4.4 Potential Project-Valued Component Interactions

The potential interactions between the Project and the VCs, by phase, are presented in the individual VC chapters (Sections 7 to 9), following a description of existing conditions. Where an adverse effect on a VC is identified, strategies for avoidance, mitigation, or compensation are proposed. Where possible, mitigation measures are incorporated into Project design to eliminate or reduce potential adverse effects.

4.5 Effects Assessment Criteria

The significance of the effects after mitigation is determined using defined criteria. Most criteria will be the same for all VCs (Table 4.2); however, the magnitude criteria are VC-specific and are provided in the individual chapters.

Table 4.2: Effects Assessment Criteria

Rating Criteria	Rating
Magnitude The amount of change in measurable parameters or the VC relative to existing conditions	**VC-specific as outlined in individual chapters.**
Geographic Extent[(1)] The geographic area in which an effect occurs	**LAA –** the area where direct and/or indirect Project-related effects can be predicted or measured for assessment unless impacts are widespread. **RAA –** the area where widespread Project-related effects can be predicted or measured for assessment (if/where applicable)
Frequency Identifies how often the residual effect occurs and how often in a specific phase	**Single event –** occurs once **Intermittent –** occurs occasionally or intermittently during one or more phase of the Project **Continuous –** occurs continuously

Rating Criteria	Rating
Duration The time required until the measurable parameter or VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short term –** residual effect restricted to no more than the duration of the construction phase **Medium term –** residual effect extends through the operation and maintenance phase **Long term –** residual effect extends beyond the decommissioning phase
Reversibility Describes whether a measurable parameter or the VC can return to its existing condition after the activity ceases	**Reversible –** the residual effect is likely to be reversed after the activity is completed **Irreversible –** the residual effect is unlikely to be reversed **Partially Reversible –** the residual effect is likely to be partially reversible after the activity is completed.

(1) Criteria used for describing context of the effect; however, do not factor directly into the significance definition.

If, based on the criteria in Table 4.2, a residual effect is identified, its significance is then evaluated based on the criteria in Table 4.3.

Table 4.3: Definition of Significant Residual Environmental Effect

Magnitude	Duration	Frequency	Reversibility	Significance
Negligible	All	All	All	Not significant
Low	All	All	All	Not significant
Moderate	Short term Medium term	Single event Intermittent	Reversible Partially reversible	Not Significant
	Long Term	**Continuous**	**Irreversible**	**Significant**
High	Short term Medium term	Single event Intermittent	Reversible Partially Reversible	Not significant
	Medium term Long term	**All**	**Irreversible**	**Significant**

4.6 Monitoring & Follow-Up

Follow-up programs and monitoring, in some cases developed in conjunction with regulators, may be recommended to verify predictions and/or assess effectiveness of mitigation measures and the need to implement adaptive management. Follow-up programs and monitoring are presented, as necessary, in individual VC chapters.

4.7 Biophysical Assessment Components

4.7.1 Assessment of Wild Species

The assessment of wild species (e.g. birds, mammals, fish, plants, etc.) was conducted in accordance with the Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2005). Special consideration of SAR, listed under the *Species at Risk Act* (SARA) and/or the *Endangered Species Act*, S.N.S. 1998, c. 11 (ESA), along with species of conservation interest (SOCI), which, for the EA Registration Document, includes species that are:

- Assessed as “Endangered”, “Threatened”, or “Special Concern” by the Committee on the Status of Endangered Wildlife in Canda (COSEWIC) that are not already listed under SARA.
- Have a subnational rank (S-Rank) or “S3”, “S2”, or “S1” from the Atlantic Canada Conservation Data Centre (ACCDC).

For SAR, select species and their dwellings are provided protection under SARA, ESA, and the *Biodiversity Act,* 2021, c. 3, s. 1. Priority species were developed based on the SAR and SOCI identified through desktop review or field assessments that have the potential to interact with the Project through their presence, or the potential for presence, in the Study Area.

4.7.2 Biophysical Assessment Components and Timing

The biophysical field components of the EA were initiated in Winter 2023 and continued until June 2025. The field components, survey timing, and surveyors that completed the assessments are outlined in Table 4.4.

Table 4.4: Biophysical Assessment Components, Timing, and Surveyors

Survey		Date	Surveyor(s)
Vegetation Community and Classification (i.e., habitat)		June, July, and September 2023 and 2024, May and June 2025.	Strum botanists
Vascular Plant Surveys	Rare Plant Surveys	June, July, and September 2023 and 2024, May and June 2025.	Strum botanists
Lichen Survey		2024 and 2025 growing seasons	Strum lichenologist
Old-Growth Forest Surveys		2023 various seasons	Strum biologists
Wildlife Surveys	Incidental Observations	Opportunistically throughout all biophysical surveys	All surveyors
	Bat Acoustic Monitoring	Fall 2023 and spring 2024	Strum
	Winter Moose surveys	January to March 2023 and 2024	Strum biologists
	Spring Pellet Group Inventory Surveys	April and May 2023	Strum biologists
Avian Surveys	Spring Migration (three)	April 1 to May 31, 2023	Chris Pepper
	Breeding Bird (two)	June 1 to July 15, 2023	
	Nightjar (two)	June 2023	
	Fall Migration (three)	August 15 to November 15, 2023	
	Acoustic & Radar Monitoring	April to November 2023	Strum
Wetland and Watercourse Surveys		June to November 2023, September 2024, May and June 2025.	Strum biologists
Fish and Fish Habitat Surveys		July 2023	
Species at Risk	Incidental Observations	All seasons	All surveyors

As the Project has continuously undergone design changes and refining, some portions of the Assessment Area have not yet been field-assessed. Areas to be assessed during future surveys are primarily related to minor shifts in turbine and road placement, as well as the addition of temporary laydown areas (Drawing 4.1). Table 4.5 provides a breakdown of the area remaining to be assessed.

Table 4.5: Assessed Areas

Area of Study	Area (ha)	Percentage (%)
Assessment Area (total)	905	-
Assessed as part of this EA	757	84
Remaining to be assessed	149	16

The Proponent commits to the completion of assessments in the remaining areas prior to the commencement of Project activities in those areas.

5.0 MI'KMAQ OF NOVA SCOTIA

The Mi'kmaq are the founding people of Nova Scotia and currently live throughout the province, including 13 Mi'kmaq communities (OLA, 2015). The Project is located within the Mi'kmaq territory called Eskikewa'kik, which means "skindresser's territory" (MDCC, 2025b).

The Mi'kmaq in the provinces of Nova Scotia, New Brunswick, and Prince Edward Island, and the Gaspé Peninsula in Quebec, are founded on land historically occupied by the ancestors of the Mi'kmaq. The earliest evidence of the Mi'kmaq of Nova Scotia in the Maritimes Region indicates that the ancestors of the Mi'kmaq have existed on the land for more than 11,000 years (MDCC, 2025a).

The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights, including the right to fish for a "moderate livelihood" which flows from the Peace and Friendship Treaties, and Aboriginal rights to hunt, fish, and gather for food, social, and ceremonial purposes, more broadly referred to as "traditional" purposes. Mi'kmaq rights are communal rights and therefore shared amongst all members of the Mi'kmaq Nation in Nova Scotia.

The Crown has a duty to consult with the Mi'kmaq of Nova Scotia, which is achieved in accordance with the Mi'kmaq-Canada-Nova Scotia Consultation Terms of Reference. As per Supreme Court of Canada instruction and subsequent guidance from governments, [such as the Updated Guidelines for Federal Officials to Fulfill the Duty to Consult (INAC, 2011) and the Proponents' Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia (OLA, 2012)], the Crown may delegate procedural aspects of consultation to proponents. However, the duty to consult, and ultimate decision-making authority, remains with the Crown. The results of the Proponent's Mi'kmaq of Nova Scotia engagement program and EA development is expected to be considered by the provincial government in the EA decision-making process.

For the purposes of consultation, 11 of the 13 Mi'kmaq communities are represented by the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO), which reports to the Assembly of Nova Scotia Mi'kmaq Chiefs. At this time, Millbrook First Nation and Sipekne'katik First Nation represent their own communities in consultation through their elected Chiefs and Councils.

The nearest Mi'kmaq community to the Project is the Paq'tnkek Mi'kmaw Nation community on the Paqtnkek-Niktuek Reserve (No. 23) with a population of 614 individuals (2023, Paq'tnkek). Paq'tnkek is located approximately 30 km west of the Project. Other, further communities include Potlotek First Nation on the Chapel Island (No. 5) Reserve (population 405; 50 km northeast), and the We'koqma'q First Nation on the Whycocomagh Reserve (No. 2) (population 877; 55 km northeast).

The nearest known Mi'kmaq placenames to the Project are Sa'n Miso'ek which means "at Jean Michaud's place", Ki'taqne'kati which means "Steep Creek", and Kwesawamkiaq which means "where sand piles" (T'an Weji-sqalia'tiek, n.d.). These placenames correspond to the areas of Middle Melford, Steep Creek, and Sand Point along Highway 344.

5.1 Engagement

As an integral component of any project development activity in Nova Scotia, EverWind prioritized engagement with Nova Scotia Mi'kmaq communities.

EverWind initiated engagement with OLA in May 2024 and followed up with additional Project information in October 2024.

EverWind notified the Mi'kmaq of Nova Scotia of the Project, extended an offer to meet, provided Project information, met with the KMKNO, completed a Mi'kmaq Ecological Knowledge Study (MEKS) with Membertou Geomatics, and documented the engagement process (Table 5.1) per steps one through six of the Proponents' Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia (OLA, 2012).

On June 6, 2024, Project introduction letters, which included an offer to meet, were sent to the 13 Mi'kmaq of Nova Scotia communities. Additionally, on January 23, 2025, Project introduction letters, which included an offer to meet and an invitation to the February 5 and 6, 2025 Information Sessions were provided via email to Membertou First Nation, Potlotek First Nation, Paq'tnkek First Nation, Pictou Landing First Nation, Eskasoni First Nation, L'stikuk First Nation, Wagmatcook First Nation, We'koqma'q First Nation, Sipekne'katik First Nation, and Millbrook First Nation. This letter was also provided to the KMKNO.

Millbrook First Nation responded with a question on capacity funding for consultation and EverWind offered to meet to discuss the Project and to better understand what capacity funding is required to assess the Project. EverWind and Millbrook First Nation are in the process of organizing this meeting.

EverWind is also initiating the community-based consultation process, Sipekne'katik Governance Initiative, with Sipekne'katik First Nation for all EverWind Projects, including the Setapuktuk Wind Project.

On February 4, 2025, a meeting was held between KMKNO (Patrick Butler; Senior Mi'kmaq Energy & Mines Advisor) and EverWind (Jeff Bonazza; Director of Environment and Permitting and Mark Stewart; Director of Engagement). The main focus of this meeting was the Strait Crossing Transmission Line Project; however, a presentation was provided by EverWind that provided details for the Setapuktuk Wind Project (formerly known as Wind Farm 1), and EA registration timing. Mr. Butler inquired about the MOU and whether it considers all EverWind's project phases.

Table 5.1: Engagement with the Mi'kmaq of Nova Scotia

First Nation / Organization	Representative(s)	Communication Details
First Nations		
Eskasoni First Nation	Chief Leroy Denny Michael Denny Steve Parsons	June 6, 2024 – email sent providing Project description, map, and offer to meet. January 23, 2025 – email sent providing Project description, map, and offer to meet. July 3, 2025 – email sent providing Project description, map, and offer to meet.
L'sitkuk First Nation	Chief Carol Dee Potter	June 6, 2024 – email sent providing Project description, map, and offer to meet. January 23, 2025 – email sent providing Project description, map, and offer to meet.
Membertou First Nation	Chief Terrance Paul	June 6, 2024 – email sent providing Project description, map, and offer to meet. January 23, 2025 – email sent providing Project description, map, and offer to meet. July 3, 2025 – email sent providing Project description, map, and offer to meet.
Millbrook First Nation	Chief Robert Gloade Claire Marshall Gerald Gloade	June 6, 2024 – email sent providing Project description, map, and offer to meet. January 23, 2025 – email sent providing Project description, map, and offer to meet. Ms. Marshall responded with a question regarding capacity funding for consultation. EverWind requested a meeting to discuss the portfolio of projects.

First Nation / Organization	Representative(s)	Communication Details
		July 3, 2025 – email sent providing Project description, map, and offer to meet.
Paq'tnkek First Nation	Chief Cory Julian	June 6, 2024 – email sent providing Project description, map, and offer to meet. January 23, 2025 – email sent providing Project description, map, and offer to meet. July 3, 2025 – email sent providing Project description, map, and offer to meet.
Pictou Landing First Nation	Chief Tamara Young	June 6, 2024 – email sent providing Project description, map, and offer to meet. January 23, 2025 – email sent providing Project description, map, and offer to meet. July 3, 2025 – email sent providing Project description, map, and offer to meet.
Potlotek First Nation	Chief Wilbert Marshall	June 6, 2024 – email sent providing Project description, map, and offer to meet. January 23, 2025 – email sent providing Project description, map, and offer to meet. May 8, 2025 – EverWind attended Potlotek Career Fair. July 3, 2025 – email sent providing Project description, map, and offer to meet.
Sipekne’katik First Nation	Chief Michelle Glasgow Cheryl Maloney	June 6, 2024 – email sent providing Project description, map, and offer to meet. January 23, 2025 – email sent providing Project description, map, and offer to meet. February 27, 2025 – Meeting held with Sipekne'katik Governance Initiative to discuss the portfolio of EverWind projects (focus on Strait Crossing Transmission Line). Project update to Chief and Council was scheduled for June 19, 2025, and July 3, 2025; however, both updates were cancelled by council due to unforeseen circumstances. Meeting to be rescheduled.
Wagmatcook First Nation	Chief Norman Bernard Donald Hanson	June 6, 2024 – email sent providing Project description, map, and offer to meet.

First Nation / Organization	Representative(s)	Communication Details
		January 23, 2025 – email sent providing Project description, map, and offer to meet.
We'koqma'q First Nation	Chief John Leonard Bernard	January 23, 2025 – email sent providing Project description, map, and offer to meet. July 3, 2025 – email sent providing Project description, map, and offer to meet.
Annapolis Valley First Nation	Gerald B. Toney	June 6, 2024 – email sent providing Project description, map, and offer to meet.
Acadia First Nation	Deborah Robinson	June 6, 2024 – email sent providing Project description, map, and offer to meet.
Glooscap First Nation	Chief Sidney Peters	June 6, 2024 – email sent providing Project description, map, and offer to meet.
Organizations		
Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO)	Tracy Menge Patrick Butler Twila Gaudet	KMKNO was copied by EverWind on all emails to respective Mi'kmaq of Nova Scotia communities (see above). Virtual meeting held on February 4, 2024 – presentation provided to KMKNO providing a Project overview and EA timing. September 10, 2025 – email sent offering the opportunity to meet and notifying KMKNO of EA registration timing.
Maritime Aboriginal Peoples Council	Christina Davis Vanessa Mitchell	March 21, 2025 – email providing Project update sent and offer to meet extended.
The Native Council of Nova Scotia	Chief Lorraine Augustine	March 21, 2025 – email providing Project update sent and offer to meet extended.
Nova Scotia Mi'kmaq Summer Games	Chief Norman Bernard Samantha Young	July 3, 2025 – email providing Project information sent. August 22 and 23, 2025 – Information booth at the Nova Scotia Mi'kmaq Summer Games in Wagmatcook with staff on-site discussing the Project.
Mukk Nqa'ltultik Community Connections Symposium	Tracy Menge Noelle MacLean	May 22, 2025 – EverWind presented with First Nation equity partner at a conference in Truro to discuss the Project and potential career and procurement opportunities.

5.1.1 Review of Concerns

Key areas of interest identified through engagement were related to the following:

- Capacity funding

EverWind is committed to ensuring the Mi'kmaq of Nova Scota can meaningfully engage and supports capacity funding. EverWind responded on January 29, 2025, to the request for capacity funding with an invitation to meet to discuss EverWind's projects and better understand the capacity funding that is required.

5.1.2 Ongoing Engagement

EverWind is committed to on-going, meaningful engagement and economic reconciliation with the Mi'kmaq of Nova Scotia and will continue to provide regular updates and seek feedback throughout the life of the Project. Additionally, EverWind is developing a Mi'kmaq Benefits Agreement (MBA) with the Assembly of First Nations and KMKNO. A MOU was signed with the Assembly in 2022, and a binding Memorandum of Agreement was signed in 2025. EverWind will continue to engage with KMKNO and the Sipekne'katik Governance Initiative specifically.

EverWind is also committed to minimizing footprint disturbance and impacts to the Mi'kmaq of Nova Scotia while generating positive economic and environmental benefits. EverWind will develop a Mi'kmaq Communication Plan that outlines an ongoing two-way communication process throughout the life of the Project.

5.2 MEKS

A MEKS presents a thorough and accurate understanding of the Mi'kmaq of Nova Scotia's use of the land and resources within an area. It is a report of gathered, identified, and documented ecological knowledge which is held by individual Mi'kmaq people. In addition, the MEKS report provides information on proposed Project activities that may impact the traditional land and resources of the Mi'kmaq. The MEKS for this Project was developed by Membertou Geomatics Solutions and was geographically scoped to include an evaluation of the Project Site (the "Study Area" as defined throughout the rest of this document) along with a 5 km buffer surrounding the Project Site (referred to as the "Study Area" in the MEKS report).

MEKS considers the land and water areas in which the proposed Project is located to identify what Mi'kmaq traditional use activities have occurred or are currently occurring within the "Study Area"; and what Mi'kmaq ecological knowledge presently exists with respect to the area. This process is done in accordance with the Mi'kmaq Ecological Knowledge Protocol, 2nd Edition ("Protocol"), which was established by the Assembly of Nova Scotia Mi'kmaq Chiefs and speaks to the process, procedures, and results that are expected of a MEKS. Per the Protocol, a copy of the MEKS has been provided to KMKNO for review. All MEKS' must be reviewed by KMKNO on behalf of the Assembly to ensure consistency with the Protocol. KMKNO will review the MEKS and advise if the requirements have been met, or if the MEKS must be amended. When this review is completed by KMKNO, a copy of the MEKS will be provided directly to the required reviewers under separate cover.

The MEKS consists of two major components:

- Mi'kmaq Traditional Land and Resource Use Activities
  - Considers both past and present uses of the area.
  - Uses interviews as the key source of information regarding Mi'kmaq use.

- A Mi'kmaq Significance Species Analysis
  - Identifies species in the area and considers resources that are important to Mi'kmaq use (food/sustenance resources, medicinal/ceremonial plant resources, and art/tools resources).
  - Considers resource availability/abundance in the area (along with adjacent areas or in other areas outside), their use, and their importance, with regards to the Mi'kmaq.

Interviews were undertaken by the MEKS Team with Mi'kmaq knowledge holders from the communities nearest the Project and beyond. The interviews took place between June and December 2024. A summary of the MEKS findings is provided below.

Traditional Use in the Study Area

- There is current, recent and historic Mi'kmaq use within the Study Area.
- Trout fishing and rabbit hunting were reported with the highest frequency in the Study Area.

Traditional Use in the Project Site

- There is no reported current, recent, or historical Mi'kmaq use within the Project Site.

Historic Review

- There are very few known archaeological finds/sites within the vicinity of the Study Area, and none within the Project Site.
- There are known sources of black ash within proximity to the Study Area. Black ash was and is a valuable resource for tool handles and craft-basket making to early peoples then and to the Mi'kmaq today.
- There is sparse suitable stone for making tools found within the Study Area.
- A review of Specific Claims shows no current and active First Nation Claims within the Project Study Area.

No recommendations were provided in the MEKS.

5.3 Mi'kmaq Partnerships

The Proponent has equity partnerships with First Nation communities for various aspects in a portfolio of projects, including majority Mi'kmaq ownership on several projects. An MOU was entered with Membertou Development Corporation which included equity participation in the Project. The Proponent is committed to partnering with First Nation communities for all projects.

5.4 Commitments to the Mi'kmaq of Nova Scotia

EverWind is committed to the following mitigation measures to reduce the Project's impact on traditional practices and Mi'kmaq archaeological features (if identified), as follows:

- Provide the Mi'kmaq of Nova Scotia an opportunity to walk the site prior to clearing to document sensitive sites and harvest traditional plants.
- Halt work during construction if archaeological deposits or human remains are encountered. EverWind will immediately contact NSCCTH and the KMKNO Archaeological Division.
- Provide a tour of the Project to the Mi'kmaq of Nova Scotia, once constructed.
- Develop a Mi'kmaq Communication Plan.
- Develop a Complaint Resolution Plan.
- Continue to work with the Assembly of First Nations to develop a MBA that will enable the Mi'kmaq of Nova Scotia to actively participate in the Project through education, training, mentorship, employment, and procurement opportunities.
- Continue to engage with the Mi'kmaq of Nova Scotia for the life of the Project.
- Include the Project as a component of the MBA which includes training, education, mentoring, employment and procurement opportunities for the Mi'kmaq of Nova Scotia implemented through the Assembly of Nova Scotia.

6.0 ENGAGEMENT

EverWind is committed to meaningful engagement with government, the public, stakeholders, and the Mi'kmaq of Nova Scotia. To date, the Project Team has participated in meetings, delivered presentations, established a Community Liaison Committee (CLC), hosted several open house sessions, and one community presentation which included a question-and-answer (Q&A) session in Guysborough.

Associated presentations, posters, and meeting agendas/minutes are provided in Appendix A.

Engagement related to EMI is described in Section 6.3.

6.1 Engagement with Government Departments, Agencies and Regulators

6.1.1 Regulatory Engagement

The Project Team has met with government entities and officials representing federal, provincial, and municipal jurisdictions (Table 6.1) to open lines of communication about the Project and ensure all regulatory requirements are met.

Table 6.1: Government Meetings and Events

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
Federal Government		
Transport Canada (TC)	Jason Flanagan Carl Ripley Allison Baker	November 19, 2024 – Presentation provided to TC providing overview of EverWind's portfolio of Projects, including the Setapuktuk Wind Project (main focus of discussion was the Strait Crossing Transmission Line).
	Jason Flanagan Cindy Poirier Gabby Aseneault Melanie Leblanc	July 2, 2025 – Presentation provided to TC providing an overview of EverWind's portfolio of Projects, including the Setapuktuk Wind Project (main focus of discussion was Strait Crossing Transmission Line permitting).
Minister, Member of Parliament (MP), and Federal Atlantic Canada Opportunities Agency staff	Gudie Hutchings Mike Kelloway Neil MacIssac Kevin Lemkay Connor Poirier Chuck Maillet Joe Cashin	February 11, 2025 – Site tour of the Point Tupper facility and briefing on the Project.
Provincial Government		
NSECC – EA Branch	EA Branch Staff	May 12, 2023 –Provided an update on the Project status, studies in progress, and timing of submission. June 8, 2023 – Reviewed methodology for baseline wetland data collection. October 11, 2023 – Provided an update on the Project status, studies in progress/completed, and timing of submission.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		January 25, 2024 – Provided an update on the Project status, studies in progress/completed, and timing of submission. July 7, 2024 –Meeting to provide Project updates, overview, and proposed EA registration timing. September 25, 2024 – Update on EA registration timing provided. January 2, 2025 – Provided an updated on the submission timing. June 4, 2025 – Provided an update on the Project via email including details on the reduction in turbine numbers and timing of EA registration.
NSECC – Protected Areas and Ecosystems Branch	Kermit deGooyer Craig Smith Oliver Maass Lynda Weatherby	July 18, 2024 – EverWind representatives met with NSECC to provide a broad project update and discuss specific conservation measures being proposed for EverWind's Windy Ridge Wind Project. August 16, 2024 – EverWind met with NSECC to provide a Project update, discuss the Project's proximity to the Mulgrave Hills Nature Reserve and inquire about areas to avoid to potentially allow for protected area expansion. August 19, 2024 – NSECC provided EverWind with GIS files of portions of Crown lands adjacent the Setapuktuk Wind Project that appear to be of high conservation value.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		June 30, 2025 – Meeting requested for EverWind to provide overview of layout updates and setback distances from Mulgrave Hills Nature Reserve. July 16, 2025 – Presentation provided to NSECC in advance of the meeting. July 17, 2025 – Presentation provided on EverWind and the Setapuktuk Wind Project The closest turbine is 420 m southeast of the Mulgrave Hills Nature Reserve. EverWind was able to avoid siting turbines within the high conservation area surrounding St. Francis Harbour River, but five turbines and associated access roads are within the high conservation area connecting directly to the Mulgrave Hills Nature Reserve.
NSECC	Wetland Specialist	June 8, 2023 – Reviewed methodology for baseline wetland data collection. This included the proposed use of drone surveys in currently inaccessible areas to supplement wetland delineation ground surveys.
NSECC	Surface Water Quality Specialist	July 13, 2023 – Reviewed methodology for baseline watercourse data collection. This included the proposed use of drone surveys in currently inaccessible areas to supplement watercourse assessments.
NSNR	Donna Hurlburt	June 4, 2025 –Provided an update on the Project via email including details on the biophysical surveys conducted from 2023 to 2025, and timing of EA registration.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		July 24, 2025 –Reached out to wildlifeEA@novascotia.ca regarding the Atlantic Canada Conservation Data Centre (ACCDC) results to clarify positioning of location sensitive species.
Office of L'nu Affairs	Senior Consultation Advisor	May 17, 2024 –Provided an update on the Project and the status of the archaeology assessment and engagement with the Mi'kmaq of Nova Scotia. June 4, 2025 – Provided an update via email on EA registration timing and a summary of engagement with the Mi'kmaq of Nova Scotia completed to date.
Member of the Legislative Assembly (MLA) – Guysborough Tracadie Minister of Agriculture	Greg Morrow	May 17, 2024 – Invitation to attend upcoming open houses. October 10, 2024 – Project update and note to address resident concern. December 9, 2024 – Email follow up regarding the Project and specifically a case study highlighting a reduction of greenhouse gas (GHG) emissions when compared to use of fossil fuels. June 10, 2025 – Email invitation to join our community presentation on June 19, 2025. The Minister joined the event in person on June 19, 2025.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
Municipal Government		
MODG Staff	Gordon MacDonald Sean O'Connor	October 17, 2023 – Meeting held with Director of Economic Development to update on Project and community engagement. Regular meetings held with planning staff from 2023 to 2025.
MODG Council	MODG Council and staff	January 24, 2024 – Project introduction presentation to MODG Council and staff. May 17, 2024 – Invitation to join the May and June community open houses. October 2, 2024 – Invitation for councillors and staff to join the Community Liaison Committee (CLC) for the Setapuktuk Wind Project. June 10, 2025 – Invitation for councillors and staff to join a community presentation for the Project on June 19, 2025, in Guysborough at the Chedabucto Lifestyle Complex.

6.1.2 Review of Government Concerns

Discussions with federal regulators focused on Project infrastructure location and potential impact to federally managed lands or infrastructure (i.e., Nav Canada radars). Discussions with provincial regulators focused on environmental impacts, survey approach, Mi'kmaq of Nova Scotia and public engagement, Project timelines, as well as infrastructure siting and design. All regulators highlighted the importance of sharing Project information early and in as much detail as possible.

The Project Team has had engagements with the municipal planner, economic development staff, councillors, and the Warden throughout the development of the Project. No concerns were brought forward to date from planning staff. Municipal councillors voiced community concerns related to land use, general environmental impact, and health concerns related to noise. EverWind has negotiated and executed a Community Benefits Agreement (CBA) with MODG. EverWind is committed to continuing to engage with municipal staff, councillors, and community members on an ongoing basis.

Engagement with government officials will continue through development, construction, and operational phases of the Project.

6.2 Public and Stakeholder Engagement

The Project Team has been involved in formal engagement activities with the public and stakeholders to ensure the community was made aware of the Project and given ample opportunity to receive information, ask questions, and share local knowledge.

Engagement with the public and stakeholders will continue through development, construction, and operational phases of the Project. Table 6.2 summarizes engagement with stakeholders.

Table 6.2: Stakeholder Meetings and Events

Community/Stakeholder Organization	Engagement
Antigonish Chamber of Commerce Speaker Series	March 19, 2024 – This event brought together business leaders, entrepreneurs, and community members for a discussion on EverWind and the Project. Attendees had the opportunity to gain insights and engage in conversations surrounding the future of green hydrogen and ammonia production in Nova Scotia and wind development in Guysborough.
Strait Area Chamber of Commerce	April 11, 2024 – VISION 2024 Business Update and Trade Fair Director of Public Affairs presented on the panel with a focus on transformative industry. August 13 and 14, 2024 – Hosted two Summer Networking Socials, which included Project updates and a discussion of green hydrogen and ammonia production.
Strait Regional School Board	October 18, 2023 – School event to discuss potential career opportunities.
Nova Scotia Community Services	October 20, 2023 – Meeting with Nova Scotia Community Services Guysborough District Office and met with staff regarding employment opportunities and Project update for the Phase 2 developments in MODG.
Chedabucto Multi-Use Trails Association within the All-Terrain Vehicle Association of Nova Scotia	May 27, 2024 – Email invitation to May and June 2024 open houses with opportunity to meet regarding the Project.
Chedabucto Snowmobilers Club within the Snowmobilers Association of Nova Scotia	May 27, 2024 –Email invitation to May and June 2024 open houses with opportunity to meet regarding the Project.
Private Aerodrome	May 31, 2024 – Concerns raised regarding proximity of turbines near their air strip, contacted via open house and email. February 11, 2025 – Meeting held with air-strip owners at their hanger to discuss specific concerns and solutions. June 19, 2025 –Meeting held with air-strip owners to discuss changes to the layout. New layout maintains a minimum of 2,500 m setback from nearest turbine. See 6.2.4 for more information.

Community/Stakeholder Organization	Engagement
Strait Area Education Recreation Centre	October 18, 2024 – Site tour and presentation to the Point Tupper Terminal for 32 high school students studying chemistry and physics to discuss the Project, green energy transition, and future opportunities.
Guysborough Academy	November 7, 2024 – Proponent contacted Vice Principal and guidance councillor regarding a site tours and extended an invitation to teachers/students to join the CLC and to discuss future employment opportunities. May 7 and 8, 2025 – Presented to all grade 9 to 11 students regarding the Project, renewable energy and future opportunities. Opportunity for questions and discussion at the end. May 23, 2025 – Site tour at the Point Tupper Terminal for 45 students and staff from Guysborough Academy to discuss the Project, existing infrastructure, transition to green fuels and tour the facility.
Antigonish East Education Centre	October 18, 2024 – Site tour and presentation to the Point Tupper Terminal for 30 high school students studying to discuss the Project, green energy transition, and future opportunities.
Strait Area of Commerce	December 4, 2024 – Proponent hosted a site tour at Point Tupper Terminal, which included a 50-minute presentation, and a 20-minute question and answer (Q&A)/discussion period for Strait Area Chamber of Commerce and Chamber Past Presidents to discuss the Project, current operations and upcoming plans.
Dr. John Hugh Gillis Regional High School Community Career Connect Event	May 2, 2025 –Proponent presented on the Project to highlight potential career opportunities.
St. Francis Xavier University Site Tour	May 16, 2025 – Proponent presented and conducted a guided site tour in Point Tupper for chemistry and engineering students and faculty
Dalhousie Roundtable Community Meeting	May 27, 2025 – EverWind hosted in the Guysborough Project Office a delegation from Dalhousie University including the Dean of Science, VP of Strategic Engagement and Government Relations, Chair of Department of Chemistry, Director of the Clean Technologies Research Institute, Associate Dean Research, Department Of Industrial Engineering as well as

Community/Stakeholder Organization	Engagement
	representatives from local municipalities, community organizations and business groups to discuss the Project and industry in the Strait Area.
Auld's Cove Volunteer Fire Department	July 25, 2024 – Update on the Project provided via email.
Seven Communities Fire Department	July 25, 2024– Update on the Project provided via email.
Tracadie & District Fire Department	July 25, 2024 – Update on the Project provided via email.

6.2.1 Project Naming Competition

Following a community naming competition with local students from grades 2 to 12 and engagement with our Mi'kmaw equity partners, EverWind selected the name Setapuktuk Wind Project. "Setapuktuk" is a Mi'kmaw term for Guysborough, grounding the Project in the language and geography of the area. On the CLC's recommendation, shortlisted names were returned to partners for cultural review and alignment. While no student entry matched the final name exactly, several were closely aligned, demonstrating strong local resonance. The name was chosen to reflect respectful partnership, place-based identity, and the Project's connection to the region.

6.2.2 Digital Communications

EverWind has maintained a website since July 4, 2024 (https://guysboroughwind.ca/home). It includes information about the Project, Proponent, and the CLC. This publicly accessible website continues to be updated regularly.

A dedicated email inbox was set up on July 14, 2023, (guysboroughwind@everwind.ca) to address all aspects of the EverWind Portfolio of Projects in Guysborough. The email inbox is actively monitored by EverWind. EverWind has invited the public to reach out and engage with the lead contact through the Project social media channels, including LinkedIn and Facebook. The public was specifically invited to provide feedback and questions.

6.2.3 Newsletters

The Proponent publishes a newsletter to their social media (LinkedIn, Facebook) and mailing lists, which provides updates on the EverWind Portfolio of Projects. Sign-up for this newsletter is available on both the Project website, as well as at the open houses, as detailed below.

6.2.4 Public Open House Events

In total, 19 open houses were held from May 2023 to June 2025 (Table 6.3). Open houses nine to 15 were conducted in close proximity to the Wind Farm 2 and Wind Farm 3 Projects but are shown for context.

Table 6.3: Summary of Open Houses

Open House Number	Open House Date	Location	Number of Public Attendees[(1)]	Exit Surveys Completed
1	May 15, 2023	Lincolnville Community Hall	19	9
2	May 15, 2023	Boylston Community Centre	12	6
3	May 16, 2023	St. Francis Harbour Hall	11	5
4	May 17, 2023	Chedabucto Lifestyle Complex, Guysborough	29	13
5	May 28, 2024	Boylston Community Centre	10	5
6	May 28, 2024	Lincolnville Community Hall	11	5
7	May 29, 2024	Chedabucto Lifestyle Complex, Guysborough	29	11

Open House Number	Open House Date	Location	Number of Public Attendees[1]	Exit Surveys Completed
8	May 30, 2024	St. Francis Harbour Hall	27	14
9	June 4, 2024	Erinville Fire Hall	6	4
10	June 4, 2024	Larrys' River Communities Along the Bay multi use Facility	7	5
11	June 5, 2024	Harbourview Community Centre, New Harbour	6	7
12	June 5, 2024	Goldboro Interpretive Centre	14	11
13	June 10, 2024	District of St. Mary's Lions Club, Sherbrooke	35	19
14	June 11, 2024	Country Harbour Community Centre	9	8
15	June 11, 2024	Port Bickerton Fire Department and Community Centre	13	12
16	February 5, 2025	Mulgrave Fire Hall	33	3
17	February 6, 2025	Port Hawkesbury Civic Centre	22	2
18	February 6, 2025	Acadiaville Community Center, West Arichat	8	0
19	June 19, 2025	Chedabucto Lifestyle Complex, Guysborough	32	0
Total	**19**		**301**	**139**

[1] Only those attendees who sign-in when entering the venue are counted; however, most open houses had more attendees who were not counted.

6.2.4.1 May 2023 Open Houses

Four public open houses (open houses 1 to 4) took place in May 2023. The objective of these engagement sessions was to update the community about fieldwork findings, present Crown land allocation, and gather community feedback to inform the Project design. The Project Team presented 10 posters, answered questions, and took feedback from the local community and various stakeholders.

Sign-in sheets were available for participants to provide their contact information and enable follow-up. Exit surveys were also available for participants to provide anonymous feedback.

Open houses 1 to 4 were advertised in the Upper Big Tracadie Seniors Action Club Newsletter (May 2023 edition) and the Guysborough Journal (May 10, 2023, edition), 5 to 7 days prior to the events.

Figure 6.1: Open House 1 (Lincolnville) and 2 (Boylston)

Figure 6.2: Open House 3 (St. Francis Harbour) and 4 (Guysborough)

6.2.4.2 May/June 2024 Open Houses

There were 11 public open houses that took place throughout Guysborough County from St. Francis Harbour to Sherbrooke in May and June 2024 (open houses 5 to 15). The objective of these early engagement sessions was to introduce the community to the EverWind Phase 2 Projects, present the general Project location, and gather community feedback to inform the Projects' design. The Project Team presented 38 posters detailing the full scope of the EverWind Portfolio of Projects, answered questions, and took feedback from the local community and various stakeholders in each of the different communities where open houses were held. The open houses were publicized in the local paper, on local radio and delivered to all residents via a Canada Post mail drop.

Sign-in sheets were available for participants to provide their contact information and enable follow up. Exit surveys were also available for participants to provide anonymous feedback.

Open Houses 5 to 15 were advertised in the Guysborough Journal (May 15, 2024, and May 29, 2024, editions) and via Canada Post Neighbourhood Mail.

Figure 6.3: Open House 5 (Boylston) and 6 (Lincolnville)

Figure 6.4: Open House 7 (Guysborough) and 8 (St. Francis Harbour)

6.2.4.3 February 2025 Open Houses

Three additional open houses were held on February 5 and 6, 2025 in Mulgrave, Port Hawkesbury, and West Arichat (Open Houses 16 to 18). These three open houses were specific to the Strait Crossing Transmission Line, but the Setapuktuk Wind Project was also discussed due to its direct connection to the Strait Crossing Transmission Line.

Sign-in sheets were available for participants to provide their contact information and enable follow up. Exit surveys were also available for participants to provide anonymous feedback.

Notices for open houses 16 to 18 were published on January 22 and January 29, 2025, in the Guysbourough Journal and the Port Hawkesbury Reporter. Two weeks in advance of the open houses, notices were posted at EverWind's Guysborough Project Office, the Guysborough Post Office, the Mulgrave Post Office, the Independent Grocer (Guysborough), the entrance of

the MODG office (Guysborough), the Port Hawkesbury Civic Centre, the Arichat Post Office (Richmond County) and at the Acadiaville Community Centre (Richmond County). Additionally, EverWind representatives visited 17 residences in proximity to the Steep Creek side of the Strait Crossing Transmission Line Project and spoke with the homeowners to invite them to the open houses, or left an invitation at the door if the homeowner was not present

6.2.4.4 June 2025 Public Information Session

Additionally, on June 19, 2025, EverWind provided a presentation about the Setapuktuk Wind Project to the public at the Chedabucto Lifestyle Complex (open house 19). Maps of the Project layout, noise assessment, and shadow flicker assessment were also provided. This presentation was followed by 90-minute Q&A period. The presentations and Q&A structure of the event were selected based on direct result of feedback from the community and the request of a member of the CLC.

Sign-in sheets were available for participants to provide their contact information and enable follow up. Exit surveys were also available for participants to provide anonymous feedback.

Open house 19 was advertised via paid advertisements in the Guysborough Journal for two weeks leading up to the events and on the local radio station. Additional notices were circulated to the CLC members to post on community social media sites.

Figure 6.5: Open House 19 (Guysborough)

6.2.5 Additional Engagement with Adjacent Businesses

EverWind has engaged directly with four adjacent businesses including PHP, M&NP, an adjacent private aerodrome, and Melford International Terminal Inc. (Drawing 6.1).

Port Hawkesbury Paper (PHP)

PHP is currently developing the Goose Harbour Lake Wind Farm, a 29 turbine wind farm that will supply renewable energy to PHP's facility (NSECC, 2023a). Goose Harbour Lake Wind Farm is located approximately 2.8 km west and north of the Project. EverWind has held regular meetings with PHP representatives to ensure continued feedback and updates on the layout of the project and sufficient setback distances are implemented.

Maritimes & Northeast Pipeline (M&NP)

M&NP owns and operates a natural gas pipeline by the same name, which includes a trenched and buried segment from Goldboro to Point Tupper known as the Point Tupper Lateral. The Point Tupper Lateral intersects the Study Area in the north.

EverWind has designed the project to minimize interaction with the pipeline. Turbines setbacks have been designed in excess of the 130 m hub height and turbine construction will not infringe on the pipeline easement area. EverWind has engaged with M&NP with respect to turbine locations, road crossings, medium voltage power line crossings and high voltage transmission line crossing, and discussions are ongoing at the time of EA submission.

Aerodrome

A private aerodrome is located between Sand Point and Hadleyville, east of Marine Drive.

EverWind met with the aerodrome owners on February 11, 2025, to discuss setback distances. The three nearest turbines to the aerodrome were removed such that the nearest turbine is 2,575 m from the aerodrome. An additional in-person meeting was held with the owners on June 19, 2025, to present the new layout and discuss setback distances, and a map was provided on June 25, 2025.

Melford International Terminal Inc.

Melford international Terminal Inc. is proposing to construct and operate the Melford International Terminal, a container terminal located approximately 1 km north of the Project.

A meeting was held between EverWind and Melford International Terminals Inc. on October 21, 2024, to introduce them to the Project. During this meeting, setback distances to the railway and locations of turbines were discussed. Follow up meetings were held on December 17, 2024, January 14, 2025, and June 19, 2025, to discuss the preliminary Project layout. Three turbines were removed from the Project to maintain a minimum setback distance of 1.5x tip height to the rail easement and new road crossings were minimized to a single occurrence. Melford International Terminal Inc. confirmed acceptability of the proposed setbacks/ Project layout on August 6, 2025, and provided a letter of support for the Project. (Appendix A)

6.2.6 Office

A publicly accessible EverWind office is open in Guysborough. Office hours were advertised in the EverWind e-newsletter beginning in May 2024. Community members are encouraged to drop by the office to ask questions or discuss concerns with a Project representative.

Several office barbeques also took place in June and July 2024 to encourage community members to visit the office who may not otherwise do so. Over 40 people attended these events (Figure 6.6). Standard office hours of Tuesday and Wednesday from 10:00 am until 4:00 pm have been maintained since May 2024.

Figure 6.6: EverWind Guysborough Office BBQ

6.2.7 Community Liaison Committee (CLC)

A CLC was established for the Project on November 12, 2024. The CLC was established to serve as a bridge between EverWind and the local community. The purpose of the CLC is an advisory body which provides:

- An on-going mechanism for communication between EverWind and the community on the design, construction and operation of the Project, and on any impacts or perceived impacts on the environment.

- A means for EverWind to provide information and obtain advice from a body representative of the community.
- A forum whereby the residents can bring any issue of public concern related to Project activities to the attention of EverWind.
- A mechanism to inform and establish the community benefits program(s) and recommend allocation of funds.

The CLC members have been selected to represent the communities surrounding the Project and include the following (Figure 6.7):

- Neil Decoff: MODG District Three Councillor
- Mary Desmond: MODG District Two Councillor
- Alonzo Reddick: Lincolnville
- Tori Evans: Manassette Lake
- Dawn Grant: Manchester/Boylston
- Doug Halfpenny: Sand Point/Hadleyville
- Shaunna Scott: Pirate Harbour
- Sean O'Connor: Municipality of the District of Guysborough
- Blair Brymer: Manchester
- Sean Reid: Mulgrave
- Lance Peters: St. Francis Harbour

Figure 6.7: CLC Site Tour to EverWind's Facility in Point Tupper

A summary of the CLC can be found in Table 6.4.

Table 6.4: CLC Summary

CLC Meeting Date	Agenda
August 2024	Public notification posted in the Guysborough Journal soliciting involvement in the CLC for the project.
October 1, 2024	CLC members notified of their selection to the Setapuktuk Wind Project CLC.
October 2, 2024	Proponent sent email to MODG representatives regarding the selection of the CLC for the Setapuktuk Wind Project.
October 11, 2024	Proponent sent emails to hold a meeting with CLC members and provide some key information regarding our upcoming CLC activities for the Setapuktuk Wind Project in Guysborough County and to attend an optional site visit in Point Tupper.
November 8, 2024	Proponent held a site tour at the Point Tupper Terminal for interested CLC members to learn more about the Project and broad operations. The event was well attended.
November 12, 2024	First CLC meeting held in the Guysborough office with focus on Project update, CLC expectations and community feedback.
February 11, 2025	Second CLC meeting held in Boylston Community Hall with Project updates.
June 10, 2025	Third CLC meeting held in the Guysborough Project Office to give specific Project update, including proposed turbine locations and discuss next steps for community engagement including the community presentation.

The next CLC meeting is anticipated to occur after EA registration.

6.2.8 Review of Concerns

Issues and concerns raised by the public have been grouped into broader categories and reference to the relevant section of the EA in which the concern is addressed have been noted (Table 6.5).

Table 6.5: Comments Received from the Public

Key Issues	Proponent Response	Section of EA
Socioeconomic Impacts		
Will there be a Community Liaison Committee for this Project?	Yes, a CLC has already been established.	Section 6.2.7

Key Issues	Proponent Response	Section of EA
What kind of investments/ programs are planned for local communities?	EverWind will create a Community Benefits Fund to provide direct payments to communities, starting at the end of the first year of operations. The payments for the Phase 2 portfolio of projects are expected to be 2 million dollars each year or 70 million dollars over the life of the projects. A committee of volunteers will determine how the fund is distributed. EverWind has signed a Community Benefits Agreement (CBA) with MODG and is actively working to secure one with the Municipality of the District of St. Mary's. .	Section 8.1
Will jobs created by the Project be given to local workers?	EverWind is committed to sharing economic opportunities with the local community throughout the development and lifespan of the Project via the use of local skills and labour where possible. EverWind will maximize local content where appropriate. To this end, EverWind will hold a job fair prior to the start of construction to engage with local community members and service providers and identify suitable candidates and/or businesses to support the construction phase employment and service providers.	Section 8.1
What agreements are in place with private landowners?	EverWind has engaged private landowners within and adjacent to the Project Footprint for current and future development opportunities. Each agreement is drafted in consultation with individual landowners.	Not Applicable (NA)
Will wind turbines be noisy?	NSECC requires sound levels of no more than 40 A-weighted decibels (dBA) outside of a home. For context, 40 dBA is equivalent to the sound of a quiet library. Sound modelling results of the Project indicate that all residences will fall below the 40 dBA threshold. EverWind will implement a Complaint Resolution Plan to investigate and mitigate (if required) noise-related complaints.	Section 7.1.3
Concerns visual impact of turbines.	Photo renderings of what the Project will look like from specific vantage points and viewsheds have been prepared for this EA.	Section 8.2

Key Issues	Proponent Response	Section of EA
Environmental Impacts		
How will this impact wildlife and wildlife habitat, vegetation communities, SAR, waterbodies, and areas of scientific or natural interest?	A full desktop review and extensive field surveys have been completed to identify the presence of wildlife and wildlife habitat, vegetation communities, SAR, waterbodies, and areas of scientific or natural interest. Project infrastructure has been sited to avoid sensitive features. EverWind has minimized the Project Footprint through the reduction of turbines (from 84 to 54 turbines), siting turbines in disturbed habitat when possible, and using existing access to the extent possible. Impacts to watercourses/waterbodies have been reduced by minimizing watercourse crossings and maintaining setbacks, where possible. Additional permitting will be required to support watercourse crossings and best management practices will be followed during culvert installations. EverWind has also committed to the development and implementation of a Terrestrial Habitat and Wildlife Management Plan, Erosion and Sediment Control Plan, Surface Water Management Plan, Contingency Plan, and Complaint Resolution Plan.	Sections 7.3.2 7.4.1 7.4.2 7.4.3 7.4.4 7.4.5
How much area is required to be cleared for the Project?	The Clearing Footprint estimated for the purposes of this EA is 623 ha. The exact area of clearing will be determined once detailed design is completed.	Section 3.1
Will herbicides be used?	Selective and localized application of approved herbicides may be required to manage vegetation along the transmission line. If required, use will be minimized to the extent practicable.	Section 7.4.2
General		
Which wind turbine model will be used?	EverWind has selected Goldwind GWH182-8.0 wind turbines for this Project.	Section 3.3.1

Key Issues	Proponent Response	Section of EA
Questions about wind turbine layout	The Project layout is designed to incorporate public feedback and mitigate environmental impact as much as possible (e.g. avoiding areas where protected species have been identified). Because of the capacity of the turbines proposed to be used (8 MW), EverWind was able to reduce the number of turbines within the layout from 84 to 54.	Section 3.1.1
How will power cables cross the causeway?	A separate EA was completed for the EverWind Strait Crossing Transmission Line Project, which consists of a 345 kilovolt (kV) overhead transmission line that will span the Strait of Canso from Steep Creek, Guysborough County, to the Point Tupper Hydrogen and Ammonia Production Facility in Richmond County. The Project will allow for the transmission of renewable energy generated from EverWind's Phase 2 wind farms (including Setapuktuk Wind Project) to the Point Tupper Hydrogen and Ammonia Production Facility.	NA
Will there be enough housing capacity to support new and local workers?	EverWind is committed to continued engagement with MODG on current and future resourcing needs including housing.	NA
Will EverWind have to create new access roads to support turbine development, or will they use existing ones?	EverWind has utilized existing access roads to the extent possible. Approximately 35 km (45%) of Project roads are existing road networks that will be used as part of the and approximately 44 km (55%) of Project roads will be new roads. Existing roads may require upgrades.	3.3.2
How is the wind being measured and what models are measuring the wind?	Four meteorological (MET) towers, operational since 2023, have been constructed within the Study Area to monitor atmospheric conditions relevant to the Project (wind speed and direction, atmospheric pressure, relative humidity, and temperature).	3.3.5
Can residents continue to use Crown land?	Yes, EverWind is not proposing to install gates or restrict access. For public safety, temporary restrictions may be required during active construction and the substation will be fenced.	3.4.2
How will the Project be decommissioned?	A decommissioning bond will be put in place within five years of the commercial operation date of the first turbine to cover costs of decommissioning.	3.4.3

Key Issues	Proponent Response	Section of EA
	Prior to decommissioning, NSECC and MODG will be provided with decommissioning plans for review and compliance with the Project's EA conditions. Opportunities for repowering will be considered prior to entering the decommissioning phase.	

6.2.9 Ongoing Engagement

EverWind is committed to continuing to work to address any concerns raised by stakeholders and members of the public over the duration of the Project's life. Additionally, the CLC will continue to meet at regular intervals throughout the lifespan of the Project, until such a time that it is deemed unnecessary.

6.3 Electromagnetic Interference Engagement

The rotating blades and support structures of wind turbines can interfere with various types of electromagnetic signals emitted from telecommunication and radar systems (RABC & CanWEA, 2020).

EMI created by a wind turbine can be classified into two categories: obstruction and reflection. Obstruction occurs when a wind turbine is placed between a receiver and a transmitter, creating an area where the signal is weakened and/or blocked. Reflection is caused by the distortion between a raw signal and a reflection of the signal from an object. Scatter is a sub-category of reflection caused by the rotor blade movement.

The EMI assessment identified point-to-point, broadcast systems, radar, navigation, and communications systems susceptible to the effects of windfarm interference. The specific characteristics of a wind turbine will influence the type and magnitude of the interference. Other factors that influence interference include blade dimension and design, tower height, diameter of the supporting tower, as well as the material used for blade and tower construction.

6.3.1 Assessment Guidelines

The Radio Advisory Board of Canada (RABC) and Canadian Renewable Energy Association (CanREA) developed guidelines for assessing the EMI potential from a wind turbine development: Technical Information and Coordination between Wind Turbines and Radiocommunication and Radar Systems; hereafter referred to as the RABC Guidelines (RABC & CanWEA, 2020). These guidelines outline a consultation-based assessment protocol that establishes areas, called "consultation zones", around transmission systems, based on the type and function of the system.

6.3.2 Assessment Methods

Consultation is generally the best method of notification, and this process typically begins with a letter distribution to those parties affected by the development. A summary of the RABC Guidelines for determining consultation zones can be found in Table 6.6.

Table 6.6: RABC Guidelines – Recommended Consultation Zones

Systems	Consultation Zone
Point-to-Point Systems above 890 megahertz (MHz)	**1 km**
Broadcast Transmitters (AM, FM, and TV stations)	AM station: **5 km** for omnidirectional (single tower) antenna system **15 km** for directional (multiple towers) antenna system FM station: **2 km** TV station: **2 km**
Over-the-Air Reception (TV off-air pickup, consumer TV receivers)	Analog TV Station (NTSC): **15 km** Digital TV (DTV) station (ATSC): **10 km**
Cellular Type Networks, Land Mobile Radio Networks, and Point-to-Point Systems below 890 MHz	**1 km**
Satellite Systems (Direct to Home, Satellite Ground Stations)	**500 m**
Air Defence Radars, Vessel Traffic Radars, Air Traffic Control Radars, and Weather Radars	Department of National Defence (DND) Air Defence Radar: **100 km** DND or NAV Canada Air Traffic Control Primary Surveillance Radar: **80 km** DND or NAV Can Air Traffic Control Secondary Surveillance Radar: **10 km** DND Precision Approach Radar: **40 km** Canadian Coast Guard Vessel Traffic Radar System: **60 km** Military or Civilian airfield: **10 km** Environment Canada Weather Radar: **50 km**
Very High Frequency OmniRange	**15 km**

To conduct an EMI assessment, the following information regarding turbine design and placement is generally required to complete notifications:

- Turbine Universal Transverse Mercator (UTM) coordinates
- Number of turbines
- Ground elevation
- Tower/hub height of each turbine
- Nacelle height
- Rotor diameter
- Turbine blade sweep diameter (or length of blades)
- Turbine base diameter
- Substation/converter location coordinates and height(s) along with new transmission line(s) to connect to a grid.

Response time and feedback from the various organizations vary and can take several weeks. If turbine type, layout or design changes, many organizations will need to be re-consulted prior to proceeding.

6.3.3 EMI Engagement Summary

Engagement with relevant government and community stakeholders was completed and results are provided in Table 6.7. Responses are provided in Appendix A.

Table 6.7: EMI Engagement Summary

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
Federal Government		
Canadian Coast Guard (CCG)	Wind Farm Coordinator	February 14, 2024 – EMI notification letter sent via email. February 15, 2024 – Request for KMZ file received via email. February 16, 2024 – KMZ file sent via email. June 17, 2024 – Results of analysis received identifying seven turbines at the eastern extent of the Project that may cause interference to the CCG's Eddy Point radar. October 23, 2024 – Clarification from CCG provided noting that they have identified four of the seven turbines as being most critical.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		December 2, 2204 – CCG is waiting on feedback from radar manufacturer. April 8 to 16, 2025 – EverWind informed CCG that the Project layout has been revised based on feedback from CCG. These layout changes have resulted in the removal of six of the seven turbines identified by CCG as having the potential to interference, including the four most critical turbines. July 2, 2025 – Follow up from EverWind to inform CCG of a change in turbine identification (ID) numbering and requesting confirmation that CCG is satisfied with the layout changes. July 11, 2025 – EverWind provided updated waypoint for T48. July 11, 2025 – CCG stated that T48, in its updated location, is not expected to cause any radar interference issues, so it is no longer a concern. CCG has no more worries about this Project. August 1, 2025 – Updated EMI notification letter sent via email with layout changes. CCG requested updated KMZ file, EverWind provided. August 6, 2025 – Letter of non-objection received.
DND	Military Air Defence and Air Traffic Control; Military Radio communication users	February 14, 2024 – EMI notification letter sent via email. February 15, 2024 – Request for NAV Canada land use file number received. February 16, 2024 – NAV Canada land use file number sent. March 13, 2024 – Letter of non-objection received.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		April 25, 2025 – Updated EMI notification letter sent via email with layout changes. May 14, 2025 – Request for NAV Canada land use file number received. August 1, 2025 – Updated EMI notification letter sent via email with layout changes. September 3 and 17, 2025 – Check in emails sent by Project Team.
ECCC	Weather Radar Coordinator	February 14, 2024 – EMI notification letter sent via email. February 15, 2024 – Acknowledgement email received. February 22, 2024 – Letter of non-objection received. April 25, 2025 – Updated EMI notification letter sent via email with layout changes. May 6, 2025 – Letter of non-objection received. August 1, 2025 - Updated EMI notification letter sent via email with layout changes. August 18, 2025 – Letter of non-objection received.
Innovation, Science, and Economic Development Canada	Nova Scotia District Office	February 14, 2024 – EMI notification letter sent via email. February 14, 2024 – Acknowledgement email received. March 25, 2024 – Comments received identifying analog TV station in Port Hawkesbury and recommending a reception analysis.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		April 25, 2025 – Updated EMI notification letter sent via email with layout changes. April 30, 2025 – Letter of non-objection received. August 1, 2025 - Updated EMI notification letter sent via email with layout changes. September 3, 2025 – Check in email sent by Project Team. September 9, 2025 – Letter of non-objection received.
NAV Canada	Land Use Specialist	February 14, 2024 – EMI notification letter sent via email. February 15, 2024 – Land use file number received. March 28, 2024 – Letter of non-objection received. April 25, 2025 – Updated EMI notification letter sent via email with layout changes. June 24, 2025 – Letter of non-objection received. August 1, 2025 - Updated EMI notification letter sent via email with layout changes. September 3, 2025 – Check in email sent by Project Team. NAV Canada confirmed receipt and provided updated land use file number. September 16, 2025 – Check in email sent by Project Team. September 16 and 17, 2025 – NAV Canada confirmed review in progress.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
Royal Canadian Mounted Police	Wind Farm Coordinator	February 14, 2024 – EMI notification letter sent via email. February 23, 2024 – Email response received requesting coordination with Bell. April 25, 2025 – Updated EMI notification letter sent via email with layout changes. May 5, 2025 – Letter of non-objection received. August 1, 2025 - Updated EMI notification letter sent via email with layout changes. August 5, 2025 – Letter of non-objection received.
Community Stakeholders		
Bell Canada	Wireless Network Core and Engineering Team	February 14, 2024 – EMI notification letter sent via email. February 20, 2024 – Request for KML file of turbine locations requested. February 21, 2024 – KML file sent via email. June 18, 2024 – Check in email sent by Project Team. July 22, 2024 – Letter of non-objection received. April 25, 2025 – Updated EMI notification letter sent via email with layout changes. April 25, 2025 – Letter of non-objection received. August 1, 2025 - Updated EMI notification letter sent via email with layout changes.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		August 5, 2025 – Letter of non-objection received.
Eastlink	Manager Customer Experience	February 14, 2024 – EMI notification letter sent via email. February 14, 2024 – Acknowledgement email received. April 25, 2025 – Updated EMI notification letter sent via email with layout changes. April 28, 2025 – Acknowledgement email received. August 1, 2025 - Updated EMI notification letter sent via email with layout changes. September 3, 2025 – Check in email sent by Project Team. September 3, 2025 – Acknowledgement email received.
Fire Service Association of Guysborough	Deputy Chief Administrative Officer, MODG	February 14, 2024 – EMI notification letter sent via email. March 28, 2024 – Acknowledgement email received. April 25, 2025 – Updated EMI notification letter sent via email with layout changes. April 25, 2025 – Acknowledgement email received. August 1, 2025 - Updated EMI notification letter sent via email with layout changes. September 3, 2025 – Check in email sent by Project Team. Acknowledgement email received.
Milford Haven Fire Guysborough/Boylston	Milford Haven Fire Guysborough/Boylston	February 16, 2024 – EMI notification letter sent via registered mail.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		February 20, 2024 – Letter delivered by Canada Post. April 28 2025 – Updated EMI notification letter sent via registered mail with layout changes. August 1, 2025 – Updated EMI notification letter sent via registered mail with layout changes.
Mulgrave Fire Department	Mulgrave Fire Department	February 16, 2024 – EMI notification letter sent via registered mail. March 1, 2024 – Letter delivered by Canada Post. April 28, 2025 – Updated EMI notification letter sent via registered mail with layout changes. August 1, 2025 – Updated EMI notification letter sent via registered mail with layout changes.
Port Hawkesbury Fire Department	Fire Chief	February 14, 2024 – EMI notification letter sent via email. March 25, 2024 – Check in email sent by Project Team. April 25, 2025 – Updated EMI notification letter sent via email with layout changes. April 27, 2025 – Acknowledgement email received. August 1, 2025 - Updated EMI notification letter sent via email with layout changes. September 3, 2025 – Check in email sent by Project Team.
NCS Managed Services Inc.	Chief Operating Officer	February 14, 2024 – EMI notification letter sent via email.

Government Departments, Agencies, & Regulators	Representative	Dates, Activities, Comments
		March 25, 2024 – Check in email sent by Project Team. March 26, 2024 – Acknowledgement email received. April 25, 2025 – Updated EMI notification letter sent via email with layout changes. May 22, 2025 – Check in email sent by Project Team. August 1, 2025 - Updated EMI notification letter sent via email with layout changes. September 3, 2025 – Check in email sent by Project Team.
Rogers Communications Canada Inc.	Rogers Communications Canada Inc.	February 16, 2024 – EMI notification letter sent via registered mail. March 22, 2024 – Letter delivered by Canada Post. April 25, 2024 – Updated EMI notification letter sent via registered mail. August 1, 2025 – Updated EMI notification letter sent via registered mail.
Seaside Communications	Customer Support	February 14, 2024 – EMI notification letter sent via email. February 15, 2024 – Acknowledgement email received. April 25, 2025 – Updated EMI notification letter sent via email with layout changes. Acknowledgement email received. August 1, 2025 - Updated EMI notification letter sent via email with layout changes. Acknowledgement email received.

7.0 BIOPHYSICAL ENVIRONMENT

7.1 Atmospheric Environment

7.1.1 Atmosphere and Air Quality

7.1.1.1 Overview

The assessment of the atmospheric environment included a review of weather, climate, and air quality data.

7.1.1.2 Regulatory Context

Relevant legislation includes:

- *Environment Act*, S.N.S. 1994-95, c. 1
- Air Quality Regulations, N.S. Reg. 8/2020

7.1.1.3 Assessment Methodology

The assessment was completed through a review of the following resources:

- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- ECCC Weather and Climate (ECCC, 2025b)
- NSECC Ambient Air Quality Data (NSECC, n.d.)

7.1.1.4 Assessment Results

Weather and Climate

Nova Scotia's climate is quite varied and is largely governed by coastal influences and elevation (Davis & Browne, 1996). The Study Area is located primarily within the Mulgrave Plateau Ecodistrict (360), with the southeastern section of the Study Area within the Cape Breton Coastal (810) Ecodistrict (Drawing 7.1). These ecodistricts are typically cooler and more humid with strong coastal winds (Neily et al., 2017).

To assess the local climate, weather data (2015 to 2024) were obtained from the Port Hawkesbury meteorological station (Climate ID 8204495) (Table 7.1), the station closest to the Project (approximately 17 km). While the meteorological station is near the Project, this data may not exactly represent the conditions observed within the Study Area.

Table 7.1: Climate Data from the Port Hawkesbury Meteorological Station (2015 to 2024)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Temperature in degrees Celsius (°C)													
Daily Average	-4.0	-4.9	-2.1	3.0	8.0	13.8	18.4	18.8	14.9	9.4	4.2	-0.6	6.6
Daily Maximum	0.0	-0.6	2.1	7.4	13.3	18.9	23.5	24.1	20.2	14.2	8.0	2.9	11.2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Minimum	-7.9	-9.2	-6.2	-1.6	2.6	8.6	13.2	13.5	9.6	4.6	0.3	-4.0	2.0
Extreme Maximum	12.9	13.6	17.2	20.0	31.0	33.9	33.3	33.6	30.0	23.1	23.2	15.2	23.9
Extreme Minimum	-20.0	-27.4	-21.7	-11.1	-5.4	-1.5	4.6	5.3	-1.1	-5.3	-13.1	-18.5	-9.6
Precipitation in millimetres (mm)													
Precipitation	114.4	100.1	93.9	119.9	77.2	120.8	103.3	91.3	83.4	126.6	154.0	132.3	1,317.2

Source: (ECCC, 2025b)

Between 2015 and 2024, the mean annual temperature was 6.6 degrees Celsius (°C), with a mean daily maximum of 11.2°C and a mean minimum of 2.0°C. The coldest months were January and February, with mean daily averages of -4.0°C and -4.9°C, respectively. July and August were the warmest, averaging 18.4°C and 18.8°C, respectively. Over this period, the meteorological station did not record mean annual snowfall or mean annual rainfall but recorded monthly average precipitation, with the highest occurring in November and December (154.0 mm and 132.3 mm, respectively) (ECCC, 2025b).

Wind speed and direction data were also obtained from the Port Hawkesbury meteorological station (Table 7.2).

Table 7.2: Wind Data from the Port Hawkesbury Meteorological Station (2015 to 2024)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum Hourly Speed (km/h)	98	98	93	94	78	74	76	74	91	98	98	94
Most Frequent Direction[(1)]	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW

Source: (ECCC, 2025b)

[(1)] NW = Northwest

From 2015 to 2024, the maximum hourly wind speeds recorded at the Port Hawkesbury meteorological station ranged from 74 kilometres per hour (km/h) in June to 98 km/h in January, February, October, and November. The prevailing wind direction recorded is from the northwest. The direction during calm wind flows is not recorded at the meteorological station (ECCC, 2025b).

The windrose plot for Port Hawkesbury meteorological station (CYPD) illustrates the wind directions from 2015 to 2024 (Figure 7.1). Wind speeds above 12 metres per second (m/s) (43.2 km/h) occurred most frequently from the northwest (ISU, 2025).

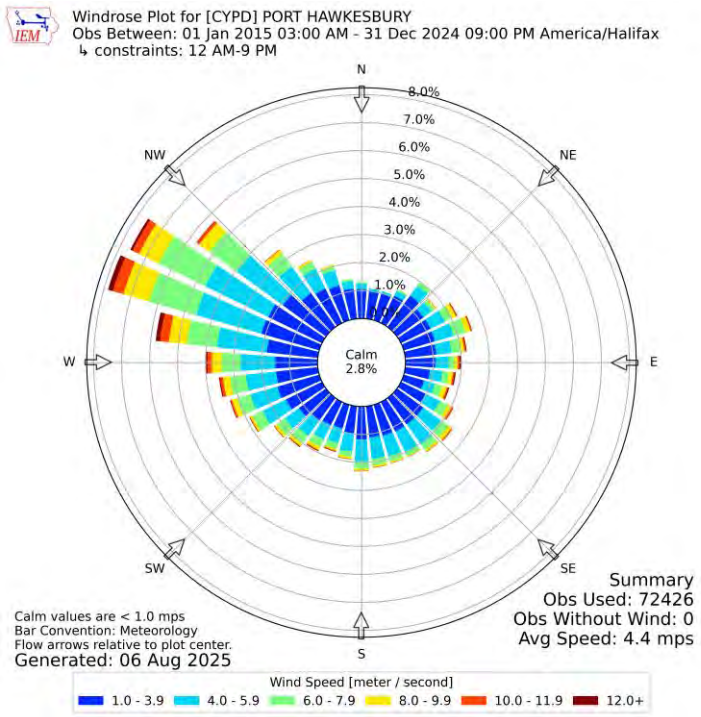

Figure 7.1: Windrose Plot for Port Hawkesbury Meteorological Station (CYPD) – January 1, 2015, Through December 31, 2024 (ISU, 2025)

The Proponent has been monitoring atmospheric conditions (wind speed and direction, atmospheric pressure, relative humidity, and temperature) at four meteorological towers in the Study Area that have been in operation since 2023.

Air Quality

The Canadian Council of Ministers of the Environment (CCME) has established Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter [≤2.5 micrometres (µm) ($PM_{2.5}$) or ≤10 µm (PM_{10}) in size], ozone (O_3), sulphur dioxide (SO_2), and nitrogen dioxide (NO_2) over select averaging time periods (CCME, n.d.); while the Government of Nova Scotia has legislated Air Quality Regulations, N.S. Reg. 28/2005 (NSAQR) under the *Environment Act,* S.N.S 1994-95, c. 1.

The ambient air quality standards published in the NSAQR set the maximum permissible ground-level concentration limits (Table 7.3).

Table 7.3: Summary of Regulations Pertaining to Ambient Air Quality in Nova Scotia

Contaminant	Averaging Period	Regulatory Threshold (µg/m³)
		Provincial [(1)]
Carbon Monoxide (CO)	1-hour	34,600
	8-hour	12,700
Nitrogen Dioxide (NO_2)	1-hour	400
	24-hour	-
	Annual	100

Contaminant	Averaging Period	Regulatory Threshold (µg/m^3)
		Provincial [1]
Ozone (O_3)	1-hour	160
$PM_{2.5}$	24-hour	-
	Annual	-
PM_{10}	24-hour	-
	Annual	-
Sulphur Dioxide (SO_2)	1-hour	900
	24-hour	300
	Annual	60
Total Suspended Particulate (TSP)	24-hour	120
	Annual	70[2]

[1]Ambient Air Quality Standards (NS AAQS) (Air Quality Regulations, N.S. Reg. 8/2020)
[2]Geometric mean
µg/m^3 = Micrograms per cubic meter

Nova Scotia monitors air quality at eight ambient air quality monitoring stations (AAQMSs) located throughout the province (NSECC, n.d.). Measured parameters at these locations may include the following:

- Sulphur dioxide (SO_2)
- Carbon monoxide (CO)
- Nitrogen oxides (NO_x)
- Nitric oxide (NO)
- Nitrogen dioxide (NO_2)
- Particulate matter ($PM_{2.5}$)
- Ground-level ozone (O_3)
- Total reduced sulphur (TRS)

The NO_2, O_3, and $PM_{2.5}$ values from seven of the eight AAQMSs are used to calculate a score on the Air Quality Health Index (AQHI) (ECCC, 2025a; NSECC, n.d.). The AQHI is a scale from 1 to 10+, in which scores represent the following health risk categories: Low (1 to 3), Moderate (4 to 6), High (7 to 10), and Very High (10+) (ECCC, 2025a).

The closest AAQMS with available data is the Port Hawkesbury station, approximately 12 km north of the centre of the Study Area at 45.614028° N, 61.362122° W.

Table 7.4 summarizes the current (baseline) maximum ambient air quality conditions observed at the Port Hawkesbury AAQMS from 2020 to 2024. The monitored parameters are compared to the current NSAQR.

Table 7.4: Maximum Ambient Air Quality Conditions at Port Hawkesbury (2020 to 2024)

Parameter	Averaging Period	O_3 (ppb)	SO_2 (ppb)	NO_X (ppb)	NO (ppb)	NO_2 (ppb)	$PM_{2.5}$ ($\mu g/m^3$)	TSP ($\mu g/m^3$)	CO (ppb)	H_2S (ppb)
Port Hawkesbury AAQMS 2020 to 2024	1-hour	92.5	89.7	139.1	93.9	49.3	64.6	-	-	-
	24-hour	47.6	15.0	41.0	21.2	19.7	20.1	-	-	-
	Annual	28.9	0.5	3.5	1.2	2.2	5.1	-	-	-
NS AAQS Schedule A[(1)]	1-hour	82	340	-	-	210	-	-	30,000	30
	24-hours	-	110	-	-	-	-	120	-	6
	Annual	-	20	-	-	50	-	70[(2)]	-	-
Fraction of NS AAQS Schedule A	1-hour	113%	26%	-	-	23%	-	-	-	-
	24-hours	-	14%	-	-	-	-	-	-	-
	Annual	-	3%	-	-	4%	-	-	-	-

Source: (NSECC, n.d.)
[(1)]Current Ambient Air Quality Standards (NS AAQS) (Air Quality Regulations, N.S. Reg. 8/2020)
[(2)]Geometric mean
ppb = Parts per billion
H_2S = Hydrogen sulfide

Existing air quality conditions (i.e., baseline data; 2020 to 2024) indicate that most of the measured contaminants are well below their respective NS AAQS Schedule A limits. The maximum hourly concentration of O_3 exceeded AAQS on four occasions (hours) during the 5-year period (113% of maximum). The reported AQHI typically scores “low” for risk at all times of the year (ECCC, 2025a).

7.1.1.5 Effects Assessment

Project-Atmospheric Interactions

Project activities will interact with the atmospheric environment through fugitive dust and exhaust emissions from construction equipment (Table 7.5), primarily during the construction phase. There are no air emissions associated with the operation of the wind turbines as the generation of wind power will offset power production that would have otherwise been generated from fossil fuels.

Table 7.5: Potential Project-Atmospheric Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X

Project Phase	Potential for Interaction
Transportation of Turbine Components	X
Turbine Assembly	X
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for the atmospheric environment is the Study Area (Drawing 2.1). The RAA for atmospheric is not applicable.

Assessment Criteria

The assessment criteria provided in Section 4.5 apply to the atmospheric environment. The VC-specific definition for magnitude is as follows:

- Low: Air quality is expected to remain less than or equal to the maximum permissible ground-level concentrations as defined by the NSAQR.
- High: Air quality is expected to exceed the maximum permissible ground-level concentrations as defined by the NSAQR.

Effects

Fugitive dust emissions consist of PM and may be generated from open-air activities (e.g., moving earth/disturbing soil, wind erosion, increase in traffic). Fugitive dust emissions are composed mainly of soil minerals, but can also contain salt, pollen, spores, and tire particles. There are two forms of PM which pose the greatest concern for human health: PM with a diameter of 10 µm or less (PM_{10}) and PM with a diameter of 2.5 µm or less ($PM_{2.5}$). PM is measured by total suspended particulate (TSP) and is defined as the mass of airborne particles having a diameter of less than 44 µm.

Depending on its composition, concentration, and proximity to a human receptor, fugitive dust has the potential to affect lung and heart functions when it enters the atmosphere. Particulate matter has been linked to premature death (people with lung and heart disease), non-fatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms such as irritation of the airways, coughing, or difficulty breathing. People with underlying lung and heart disease, children, and the elderly are the most susceptible to particulate pollution exposure (US EPA, 2024b).

Fugitive dust may also affect the environment through visibility impairment and environmental damage. Fine particles are the leading cause of reduced visibility in many cities, national parks, and wilderness areas. In addition, fugitive dust particles can be carried over long distances (via wind), deposited in other locations, and within surface water features. Some of the potential effects of particulate deposition may include the following (US EPA, 2024b):

- Increasing lake and stream acidity.
- Altering the nutrient balance in coastal waters and large river basins.
- Depleting the nutrients in the soil.
- Damaging sensitive forests and farm crops.
- Altering rates of gas exchange and nutrient cycling in plant species (described further in Section 7.4.2).
- Affecting the diversity of ecosystems.
- Contributing to acid rain effects.

Anticipated sources of fugitive dust emissions from the Project will be primarily associated with the construction of the Project and may include the following activities:

- Soil disturbance during site preparation (i.e., clearing/grubbing, grading, blasting).
- Wind erosion from soil or rock stockpiles during grading.
- Increase in traffic on roadways from travel by Project personnel (to/from the site).
- Management of on-site materials transfers (i.e., loading/unloading).

The travel distance of fugitive dust is influenced by several factors, including the height at which the dust is released, wind conditions, and particle size. Under most standard conditions, fugitive dust above 30 µm settles out within 100 m of the emission source. Other finer particles have a slower settling velocity and may travel further (US EPA, 1995). The LAA is well vegetated, which will likely help to reduce the travel distance of fugitive dust emissions from the Project Footprint (US EPA, 2014).

To assess the potential effects of fugitive dust emissions, potential receptors were identified using Geographic Information System (GIS) data from the Nova Scotia Geomatics Centre and aerial imagery, with supporting field data used where available. Depending on the exact nature and location of the upgrades, up to three residential dwellings and one church may be within 100 m of the public portion of Middletown Road, near its intersection with Highway 344 (Drawing 7.2). An additional residential dwelling is within 250 m and all other potential receptors are located at least 500 m from the nearest point of the Assessment Area. Though this is a public road, some upgrades to this portion of the road are expected to accommodate Project activities during construction, which may result in a temporary increase in dust levels from baseline conditions. During Project operations, this road is expected to be used as an access point for maintenance vehicles and contractors, with low levels of traffic expected.

In addition to fugitive dust, construction may increase combustion residuals and/or exhaust tailpipe emissions, primarily PM, NO_x, SO_2, and CO from vehicles (i.e., travel by Project

personnel, transport/delivery activities) and heavy equipment. Exhaust emissions are primarily anticipated to be associated with road construction and upgrades within the Project Footprint. The United States Environmental Protection Agency (2014) determined that most roadway emissions are contained within the first 200 m from the emission source. Four residential dwellings and one church are located along Highway 344 and are within 250 m of the public portion of Middletown Road, which may require upgrades. All other potential receptors are located at least 500 m from the nearest point of the Assessment Area. As a provincial highway, Highway 344 is regularly used for residential, commercial, and industrial traffic. While there may be a temporary increase in traffic, and therefore exhaust related to construction, traffic levels are expected to be low once the Project is in the operations phase.

Overall, dust and exhaust emissions are considered short-term, intermittent, and within the LAA.

Mitigation

Measures to minimize and mitigate the creation and emission of pollutants, including fugitive dust and exhaust emissions, will be implemented for the Project (particularly for the construction phase). General mitigation measures for fugitive (dust) emissions include:

- Minimize the footprint of disturbance to the extent practicable.
- Conduct grading and site preparation in phases to minimize disturbed soil areas until just prior to construction activities.
- Stabilize exposed soil surfaces by sloping or using vegetation, stone, soil, or geotextiles to prevent dust and airborne particles.
- Compact and/or ridge disturbed soil to prevent dust formation.
- Consider ceasing dust-generating construction activities during dry periods (i.e. summer) when winds are high, where practical.
- Wet (with water or other approved dust suppression technologies) aggregate and soil stockpiles to control dust, as required.
- Design storage areas and material stockpiles with prevailing wind directions in mind.
- Wet roadways and heavy traffic areas with water or other approved dust suppressant technologies to minimize airborne emissions, as required.
- Tie down, cover, and/or store loose site materials and/or products prior to inclement weather and wind events to prevent materials from becoming airborne.
- Wash down vehicles and equipment using hoses and water to remove accumulated mud/dirt on undercarriages, tracks, or wheel wells.
- Require that Project personnel adhere to all safety protocols and wear appropriate personal protective equipment (PPE) in the event of significant fugitive emissions events (i.e., windstorms, dust storms).

General mitigation measures for exhaust emissions include:

- Require that equipment meets all applicable provincial and air quality regulations and emissions standards.

- Maintain engines and exhaust systems according to the manufacturer's specifications and the recommended maintenance schedule.
- Remove from service malfunctioning equipment and/or equipment generating excess amounts of smoke, odour, or noise until an assessment and necessary repairs can be completed.
- Remove from service construction equipment with improperly functioning emissions control systems.
- Restrict the idling of equipment where feasible.

Monitoring

Given the low to negligible impacts, no monitoring is required.

Conclusion

After mitigations, residual effects on atmosphere and ambient air quality are characterized as follows:

- Magnitude: Low magnitude, as air quality is expected to remain less than or equal to the maximum permissible ground-level concentrations as defined by NSECC within the NSAQR.
- Geographic extent: Within the LAA.
- Frequency: Intermittent frequency.
- Duration: Short term duration, as effects are mainly confined to the construction phase and decommissioning phases.
- Reversibility: Reversible, as air quality levels will return to baseline following construction (and decommissioning).
- Significance: Not significant.

7.1.2 Climate Change

The effects of the Project on climate change are addressed in terms of GHG emissions per NSECC's A Proponent's Guide to Environmental Assessment (2025a) and the Guide to Considering Climate Change in Project Development in Nova Scotia (2011d).

7.1.2.1 Overview

Climate change is a long-term alteration of weather patterns and conditions strongly impacted by changes in temperature and precipitation. Climate change typically involves changes in average conditions, as well as changes in variability. The main contributor to climate change is GHGs from anthropogenic sources. Since GHGs disrupt the natural heat transfer processes within the Earth's atmosphere, a build-up of these gases has enhanced the natural greenhouse effect. These human-induced enhancements are especially of concern since ongoing GHG emissions have the potential to warm the planet to levels that have yet to be experienced (ECCC, 2019b).

The impacts of climate change on the Project are assessed separately under Section 11.1.

7.1.2.2 Regulatory Context

The climate change assessment considered the following Acts and Regulations:

- *Environment Act*, S.N.S. 1994-95, c. 1
- Greenhouse Gas Emissions Regulations, N.S. Reg. 305/2013
- *Environmental Goals and Sustainable Prosperity Act,* S.N.S. 2007, c. 7
- *Canadian Environmental Protection Act*, *1999* (CEPA)
    - Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations, S.O.R./2010-201
    - Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations, S.O.R./2013-24
    - Ozone-depleting Substances and Halocarbon Alternatives Regulations, S.O.R./2016-137

Regulatory guidance was used to determine the appropriate assessment methodologies, mitigation controls, best management practices, and emissions targets.

7.1.2.3 Assessment Methodology

The objectives of this assessment include the following:

- Establish the sources of GHG contributions from the Project.
- Quantify baseline and Project-generated GHG emissions.
- Mitigate and minimize GHG generation from Project-related activities.

Sources of GHG emissions were identified through a review of Project phases, components, and equipment.

Project-generated GHGs were quantified in accordance with the specifications described in the International Standard ISO 14064 (2019), and using published values found in the literature (sources provided in applicable sections that follow) and emission factors published in the NSECC Standards for Quantification, Reporting, and Verification of Greenhouse Gas Emissions (2018).

7.1.2.4 Sources of Greenhouse Gas Emissions

The main GHGs of concern include:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Halocarbons
- Water vapour

GHGs may be natural or anthropogenic in origin, except halocarbons, which are human-made (ECCC, 2019a). The following subsections describe the GHGs and their contributors (sources) as anticipated during each Project phase. However, during the operations phase, GHG emissions will be limited to maintenance activities (e.g., transportation and materials). Where these activities are intermittent and short-term, the GHG contributions from operations are negligible and are not considered further.

Carbon Dioxide

The primary source of atmospheric CO_2 is burning carbon-containing fossil fuels (i.e., coal, oil, and natural gas) and deforestation/land clearing activities.

Site preparation and construction for the Project will include several activities that are likely to produce CO_2; including, but not limited to:

- Use of heavy equipment (excavators, dozers, cranes, etc.).
- Use of light-duty vehicles and equipment (pick-up trucks, light plants, generators, etc.).
- Land clearing, including the decay of cut foliage (which releases CO_2 slowly).
- Cement production results in the heating of limestone, which releases CO_2 (ECCC, 2019a).

Methane

CH_4 is produced when fossil fuels are burned with insufficient oxygen to complete combustion (ECCC, 2019a). The Project's construction phase requires different heavy- and light-duty equipment, contributing to methane emissions.

Nitrous Oxide

The primary sources of N_2O are related to the use of nitrogen-based synthetic fertilizers and manure. These sources have added significant amounts of reactive nitrogen to Earth's ecosystems. Other contributors include the release of N_2O into the atmosphere during the combustion of fossil fuels and biomass (e.g., trees or wood-based fuels) and from some industrial sources (ECCC, 2019a).

The Project's construction phase requires heavy- and light-duty equipment, which can contribute to nitrous oxide emissions. Land restoration activities (i.e., soil amendments and reclamation) following construction will also contribute to nitrous oxide emissions. Overall, the production of N_2O in association with this Project is anticipated to be minimal.

Halocarbons

Halocarbons are a group of synthetic chemicals containing a halogen group (e.g., fluorine, chlorine, and bromine) and carbon (ECCC, 2019a). They are typically used in refrigerants, fire-extinguishing agents, and solvents (ECCC, 2013). There are various industrial sources, but the main contributor is aluminum production (US EPA, 2024a).

During the construction phase, the primary source of halocarbon emissions will be associated with coolants in air conditioning units found in vehicles, portable construction buildings (i.e., trailers), and equipment. Fire-extinguishing agents (containing halocarbons) may also be used in the event of an emergency which requires a fire-fighting response. Overall, halocarbon use is anticipated to be minimal and not considered further.

Water Vapour

Water vapour is the most important naturally occurring GHG. Human activities do not directly influence the amount of water vapour in the atmosphere, as it is a function of the atmosphere's temperature. The atmosphere can hold about 7% more water vapour for every additional degree Celsius in air temperature. When the air becomes saturated with water vapour, the water vapour condenses and falls as rain or snow, leading to climate change effects (i.e., variances in weather patterns).

As climate-warming gases (i.e., CO_2, CH_4, N_2O) increase in the atmosphere, the temperature rise increases water evaporation from the Earth's surface and increases the atmospheric water vapour concentrations. This increased water vapour, in turn, amplifies the warming from the initial GHGs, causing the cycle to repeat and temperatures to keep rising (ECCC, 2019a).

Project activities contributing to GHG emissions are not anticipated to impact water vapour concentrations in the atmosphere.

7.1.2.5 Quantification of the GHG Baseline Conditions

The GHG baseline is a reference of sources, sinks (removing), and reservoirs (storing) occurring in the absence of the Project and is used to compare pre- and post-Project conditions. That said, the baseline determines the quantity of carbon dioxide equivalent (CO_2e) emitted from current electricity production methods for the same electrical capacity of the Project.

The baseline sources are related to emissions generated from electricity currently produced in Nova Scotia from coal, oil, natural gas, and wind. There are no sinks and reservoirs attributed to the baseline scenario.

The Project consists of 54 turbines capable of generating 432 MW of renewable energy. Based on the wind turbine design capacity and an anticipated net capacity factor of 35% (provided by the Proponent), the Project will be capable of producing approximately 1,324,512,000 kilowatt-hours per year (kWh/year). The Project’s lifespan is estimated at a minimum of 35 years.

Quantifying GHGs in terms of tCO_2e requires using emission factors from the NSECC Standards for Quantification, Reporting, and Verification of Greenhouse Gas Emissions (2018) and current electricity-generating practices (Figure 7.2).

Figure 7.2: NS Power 2025 Energy Statistics

For the first quarter of the year 2025 (latest available data), electricity generated in Nova Scotia by NS Power (the leading producer) was produced from the following fuel sources (NSPI, 2025):

- Coal (41%)
- Natural Gas (9%)
- Wind (15%)
- Renewable Imports (16%)
- Hydro (7%)
- Non-Renewable Imports (3%)
- Biomass (3%)
- Oil (5%)
- Other Renewables (1%)

A large amount of the electricity generated comes from coal, natural gas, and oil, accounting for 55%. Renewable sources (biomass, wind, renewable imports, hydro) account for 42%, and the remaining 3% consists of non-renewable imports.

For the purpose of this assessment, the non-renewable energy imports are distributed amongst coal (+1%), natural gas (+1%), and oil (+1%). Therefore, the fractions used for this assessment

were coal at 42%, natural gas at 10%, and oil at 6%. Renewable energy (locally sourced and imported) was lumped together, and for this assessment, renewables were considered as wind energy at 42%.

Table 7.6 summarizes the GHG emission factors for the different types of electricity generated in Nova Scotia.

Table 7.6: Electricity Fuel Source Emission Factors

Electricity Fuel Source	Emission Factor (tCO_2e/year)
Coal	0.00105
Natural Gas	0.00044
Oil	0.00111
Wind	0

Source: (EIA, 2022)

tCO2e/year = tonnes of carbon dioxide equivalent per year

Given the current electricity generation methods and the fuel source emission factors (Table 7.6), Table 7.7 summarizes the baseline GHG emissions.

Table 7.7: Baseline Quantification Summary

Electricity Fuel Source	Electricity Generation (kWh/year)	Emissions (tCO_2e)
Coal	556,295,040	584,216.04
Natural Gas	132,451,200	57,936.21
Oil	79,470,720	88,121.29
Wind	556,295,040	0
Total	**1,324,512,000**	**730,273.55**

kWh/year = Kilowatt hours per year

tCO2e = tonnes of carbon dioxide equivalent

The total calculated annual GHG emissions generated in Nova Scotia for the same electrical capacity as the Project (based on Q1 2025 data) is **730,273.55 tonnes of carbon dioxide equivalent (tCO_2e).**

Detailed CO_2e calculations are provided in Table 1 (Appendix B).

7.1.2.6 Quantification of GHG Emissions – Construction Phase

Access Roads

Many turbines will be located adjacent to existing roadways. The construction of new roads and the upgrading of existing roads will require the removal of vegetation and overburden, which will create fugitive dust and GHG emissions. However, where fugitive dust and GHG contributions for these activities are temporary, short-term, and represent a small incremental addition compared to the overall Project emissions, they were not quantified.

Section 7.1.1 (Atmosphere and Air Quality) discusses fugitive dust and air emissions as they relate to the Project.

Laydown Areas

Laydown areas (ranging from 6 ha to 16 ha) are intended to store equipment temporarily, the turbine pad foundation, and the crane pad. These areas will be prepared by removing vegetation and overburden and placing competent soils. Construction activities and equipment associated with the laydown areas are anticipated to create fugitive dust and GHG emissions. However, where fugitive dust and GHG contributions for these activities are temporary, short-term, and represent a small incremental addition compared to the overall Project emissions, they were not quantified. Additionally, a vegetation management plan (as part of the Terrestrial Habitat and Wildlife Management Plan) will be initiated to recover the lost flora and reduce dust resuspension while maintaining access and clearances to the turbine.

Turbine Foundation

A concrete tower foundation and pedestal will be required for each wind turbine. As such, the Project will require a large quantity of concrete to be produced and delivered to each wind turbine location.

The Proponent provided the anticipated materials to construct each tower foundation, which include 905 cubic metres (m^3) of concrete and 81 tonnes of steel (rebar), per turbine foundation. Note that these suppliers have not been procured at this stage of the Project; as such, for the purpose of this assessment, transportation distances are based on the nearest known concrete and steel suppliers, which are both located approximately 3 km from the Study Area. The quantification of the GHG emissions requires the following inputs:

- The vehicle size and fuel type used to transport the concrete.
- The distance travelled to and from the concrete manufacturer to the wind turbine sites.
- The freight and weight associated with each trip (to and from each turbine location).
- The quantity of concrete and steel produced for the wind turbine bases.

Heavy-duty diesel concrete trucks and heavy-duty haulers will be required to transport concrete and steel to the Study Area. Given that the turbine locations are scattered across the Study Area, transportation distances range from approximately 32 km to 50 km.

The total distance between each wind turbine and the nearest concrete and steel supplier is 2,145.32 km. Assuming 93 truckloads of concrete and three truckloads of steel per wind turbine, the total one-way distance travelled is 199,514.76 km and 6,435.96 km, respectively. GHG quantification considered travel to and from the nearest concrete and steel suppliers to the wind turbine locations. It is assumed that each concrete truck will carry approximately 22 tonnes[(1)] of concrete per delivery for a total of 2,036 tonnes of concrete per wind turbine.

[1] $2{,}036 \frac{Tonnes\ of\ Concrete}{Turbine} \div 93 \frac{Trucks}{Turbine} = 22 \frac{Tonnes\ of\ Concrete}{Truck}$

Similarly, it is assumed that each heavy hauler would carry no more than 38 tonnes of steel per truck, for a total of three trucks per turbine pad.

Table 7.8 summarizes the GHG emission factors for the different components used for concrete- and steel-related activities.

Table 7.8: Concrete Manufacturing and Transportation Emission Factors

Component	Emission Factor
Concrete Production	$3x10^{-4}$ tCO_2e/kg
Concrete Truck (Diesel) with Freight	$1.35x10^{-4}$ $tCO_2e/tonne{\cdot}km$
Concrete Truck (Diesel) without Freight	$1.106x10^{-3}$ tCO_2e/km
General Steel Production	1.5 $tCO_2e/tonne$
Heavy Duty Truck (Diesel) (freight)	$1.32x10^{-4}$ $tCO_2e/tonne{\cdot}km$
Heavy Duty Truck (Diesel) (no freight)	$8.37x10^{-4}$ tCO_2e/km

Source: (Squared Consultants Inc, 2025; US EPA, 2025)
tCO2e/kg = Tonnes of carbon dioxide equivalent per kilogram
tCO2e/km = Tonnes of carbon dioxide equivalent per kilometer
tCO2e/tonne·km = Tonnes of carbon dioxide equivalent per tonnes by kilometer
tCO2e/tonne = Tonnes of carbon dioxide equivalent per tonnes

Given the travelling distances, the quantity of concrete and steel required for the Project, and the emission factors (Table 7.8), the CO_2e emissions for constructing all the tower foundations and pedestals are expected to be approximately **40,399.19 tCO2e**.

Detailed CO_2e calculations are provided in Table 2 (Appendix B).

Turbine Production

For the purposes of this EA, the Proponent has selected the Goldwind GWH182-8.0 MW turbine.

Goldwind completed a life cycle assessment (LCA) of the GWH182-8.0 MW. The LCA was based on a construction scenario in Miombo, Tanzania, and included construction, transportation, and the baseline energy utility mixture from Tanzania. As such, only the upstream module of the LCA was used for this assessment, which focused on the production of the turbines within the Goldwind assembly factory, including waste material transport, recycling, and disposal.

The LCA determined that the production of the GWH182-8.0 MW turbines accounted for **2.35 grams of CO2 equivalent per kilowatt-hour (gCO_2e/kWh)** (EPDItaly, 2025). Based on the anticipated net production capacity of the Project, the construction emissions for the turbines are anticipated to be **108,941 tCO_2e**[2] over the Project's life. Although there are some uncertainties regarding the assumptions used for the LCA and their applicability to this Project, it is expected that the larger size of the Project, compared to the LCA scenario, would lead to a conservative estimate of GHG emissions in this assessment.

[2] $1{,}324{,}512{,}000\ \text{kWh} * 2.35\ \frac{\text{gCO2e}}{\text{kWh}} * \frac{1.0\times10^{-6} tonnes}{g} * 35\ years = 108{,}941.12\ tCO2e$

To quantify GHG contributions from the transportation of these turbines from the Goldwind factory to the Project Footprint, the following items were assessed:

- The turbine transportation distances from the manufacturer to the intended wind turbine laydown.
- The vehicle size and fuel type used to transport the wind turbines.

For quantification purposes, the assessment assumed the following:

- Manufacturing Location: Goldwind, Dafeng District, Yancheng, Jiangsu Province, China
- Nearest Shipping Port: Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China
- Nearest Nova Scotia Shipping Port: Strait of Canso Superport, Mulgrave, Nova Scotia

Wind turbines are typically made up of 12 principal components (Electrical Academia, 2018):

- Blade (three)
- Drive Train
- Gearbox
- Generator
- Hub
- Nacelle
- Rotor
- Speed Shafts (low and high)
- Tower

Project turbines are assumed to be manufactured at the Goldwind manufacturing facility in Dafeng District, Yancheng, Jiangsu Province, China. The turbines will travel to the Dafeng port in Dafeng District, Yancheng, Jiangsu Province, China, by heavy diesel hauler (transport), where they will be shipped via diesel cargo vessel to the Strait of Canso Superport, Mulgrave, Nova Scotia. Table 7.9 summarizes the transportation distances from the manufacturer to the Project.

Table 7.9: Wind Turbine Transportation Distances

Originating Destination	Final Destination	Distance (km)
Manufacturing Facility Dafeng District, Yancheng, Jiangsu Province, China	Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China	63 (Land)
Dafeng Port, Dafeng District, Yancheng, Jiangsu Province, China	Strait of Canso Superport, Mulgrave, Nova Scotia	23,200 (Marine)
Strait of Canso Superport, Mulgrave, Nova Scotia	Setapuktuk Wind Project	Varied (Land)

To determine the travel distance for a wind turbine, the following assumptions were made:

- Each component will be individually transported via a single diesel heavy hauler.
  - 12 components per turbine to travel from the manufacturing facility in Dafeng District, Yancheng, Jiangsu Province, China, to the Dafeng Port in Dafeng.
  - 12 components per turbine to travel from the Strait of Canso Superport, Mulgrave Port, Nova Scotia, to the turbine location (distance will vary from one turbine location to another).
- Each wind turbine (in its entirety) will be transported via a single diesel cargo vessel (marine)

Based on the land distance from the manufacturer to the individual wind turbine location, the total land transportation distance (not including marine transportation) is **54,050.79 km**. The total marine transportation distance associated with getting the wind turbines from China to the Straight of Canso Superport, Mulgrave, Nova Scotia, is **1,252,800 km**. The distances travelled consider travel from the manufacturer to the Assessment Area only; an equivalent return distance is not considered, as the hauling companies would have commitments with other clients, and those GHG emissions would not be attributable to the Project.

GHG emission factors for the different components of wind turbine transportation are provided in Table 7.10.

Table 7.10: Wind Turbine Transportation Emission Factors

Component	Emission Factor (tCO_2e/tonne·km)
Heavy Duty Truck (Diesel) with freight	$1.32x10^{-4}$
Marine Cargo and Container Vessel (Diesel) with Freight	$1.51x10^{-5}$

Source: (Squared Consultants Inc, 2025; US EPA, 2025)

Given the land transportation distances required to deliver the wind turbines to the Project and the emission factors (Table 7.10), the CO_2e emissions from land transportation of the wind turbines are expected to be approximately **571.62 tCO_2e**. In addition, the marine transportation distances required to deliver the wind turbines from China to Canada will contribute **18,160.59 tCO_2e.**

Detailed CO_2e calculations are provided in Table 2 (Appendix B).

7.1.2.7 Operations Phase

Following the construction phase, the turbine will be operational, and the sinking of GHG emissions will begin. Based on the wind turbine design capacity, the Project will be capable of producing approximately 1,324,512,000 kWh/year. Therefore, the renewable energy produced will replace power production from fossil fuels and more intense generation methods described under baseline conditions (Section 7.1.2.5).

According to Padey et al. (2012), maintenance activities are the only contributors of GHGs during the operations phase. The maintenance typically includes replacing approximately 15% of the nacelle components and one blade during the wind turbine's lifetime. According to a submission by Number Three Wind LLC (2018) to the New York State Department of Public Services, a wind turbine blade weighs 18,688 kilograms (kg), while the nacelle weighs 76,204 kg. This replacement rate is equivalent to approximately 18,688 kg of blade material and 11,431 kg of nacelle material. Assuming these components are fabricated of steel, the total emission from the replacement material for all the Project's wind turbines is **2,439.64 tCO_2e** (Appendix B).

7.1.2.8 Effects Assessment

Project-GHG Interactions

Project activities will emit GHGs during all phases of the Project (Table 7.11).

Table 7.11: Potential Project-GHG Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

GHGs are considered in a global context; therefore, the LAA for GHG emissions is the global environment. The RAA for GHG emissions is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply to Project-related GHG contributions. The VC-specific definition for magnitude is as follows:

- Positive – Project is expected to have a positive effect on GHG emissions.
- Negative – Project is expected to have a negative effect on GHG emissions.

Effects

The Project is intended to have a net positive effect on the GHG environment (Table 7.12).

Table 7.12: Project GHG Emission Summary

Component	Emissions (tCO_2e)
Baseline	
Electricity Generated from Coal	584,216.04
Electricity Generated from Natural Gas	57,936.21
Electricity Generated from Oil	88,121.29
Electricity Generated from Wind	0
Total	**730,273.55**
Construction Phase	
Foundation Production and Transportation	40,399.19
Wind Turbine Manufacturing	108,941.00
Wind Turbine Transportation	18,732.21
Total	**168,072.40**
Operations Phase	
Electricity Generated from Wind	0
Wind Turbine Maintenance	2,439.64[(1)]
Total	**2,439.64**

[(1)] Project lifespan emissions (single event)
The values in this table may differ from the values presented in Appendix B as a result of rounding errors; however, the rounding errors are negligible and do not change their representation.

As mentioned, the current GHG emissions for the quantity of electricity required by the Project using NS Power's conventional generation methods contribute to **730,273.55 tCO_2e**.

The Project's construction phase will generate the most GHGs from the manufacturing and transportation of the wind turbine, as well as the production and transport of the concrete and steel for the tower foundation and pedestal. The total GHG emission contributions from the construction phase are **168,072.40 tCO2e**.

The operations phase will generate GHGs from the wind turbines' maintenance (i.e., part replacements) as a one-time (Project lifespan) occurrence of **2,439.64 tCO_2e**.

Following the commissioning of the Project, the annual GHG emission reduction is expected to be **730,273.55 tCO2e**. A one-time **2,439.64 tCO2e** may be subtracted from any annual reduction; however, the annual reduction rate will be applied for the Project's lifespan (35+

years). The Project is anticipating a 0.23-year[2] payback period to offset the construction-related GHG emissions. Following this period, the Project will positively offset GHG emissions that would typically be emitted from conventional production methods employed by NS Power. The GHG emission reduction over the Project's lifespan (35 years) could be **25,393,091.09 tCO_2e**. Annual Project emissions reduction defaults to the same value for each year the Project is in operation (0% change in baseline and Project emissions). Emissions reductions are anticipated to change in any given year due to externalities such as changes to energy fuel sources, grid emissions factors, or others which may affect reductions resulting from the Project. The emission projections described in this assessment (annual and Project lifespan) do not consider the provincial commitment to removing coal from the energy grid by 2030 and for the provincial GHG emissions (including the grid) to be net-zero by 2050 (NSECC, 2022a). As such, this lifespan emissions reduction is a rough estimate of a best-case GHG reduction scenario over the lifetime of the Project.

The assumptions considered in this assessment propose a conservative estimate of GHG emissions, which may be lower if turbine and concrete manufacturer locations are closer to the Project and manufacturing materials are less than assumed. Where assumptions may change the values provided in this assessment, the results remain constant; the Project will offset GHG emissions.

Mitigation

Mitigation measures to reduce the Project's contributions to GHG emissions, reducing the overall impact on climate change, include:

- Use of locally sourced materials, where possible, to reduce CO_2, CH_4, and NO_x emissions associated with transport.
- Incorporate the shortest construction/transport routes where possible to minimize the use of fossil fuels during construction.
- Recover and recycle construction and demolition waste, where possible.
- Minimize deforestation during land clearing by only clearing the area that will be needed and by siting infrastructure in previously disturbed areas.
- Plan construction activities to reduce the double handling of materials, reducing GHG emissions associated with heavy equipment operations.
- Require Project equipment to meet all applicable provincial and air quality regulations and emissions standards.
- Require that engine and exhaust systems are maintained according to the manufacturer's specifications and applicable maintenance schedule.
- Remove from service malfunctioning equipment or equipment generating excess amounts of smoke, odour, or noise until an assessment and necessary repairs can be completed.
- Require construction equipment with an improperly functioning emission control system to not be operated.

2 $\frac{Construction\ Emissions}{Offset\ Emissions} = \frac{\mathbf{168{,}072.40}\ tCO2e}{\mathbf{730{,}273.55}\ tCO2e/year} = 0.23\ years$

- Require regular equipment maintenance to be undertaken to maintain good operations and fuel efficiency.
- Require equipment containing coolant (i.e., air conditioning units) to undergo preventative maintenance and inspections (i.e., leak testing).
- Train Project personnel (as appropriate) in the proper disposal of halocarbon-containing substances.
- Dispose of halocarbon-containing substances at an approved hazardous waste facility per applicable regulations and in compliance with local requirements.
- Require that trucks removing waste from or bringing materials to the Project are filled to the maximum allowable capacity where practical (dependent on the truck size and load weight) to reduce transportation requirements and limit the number of trips.
- Implement an anti-idling policy to limit GHG emissions from vehicles and equipment and limit the use of fossil fuels.

Monitoring

No monitoring programs are proposed.

Conclusion

The impacts on climate change are characterized as follows:

- Magnitude: Project is expected to have a positive impact on climate change.
- Geographic extent: Positive impacts expected to extend within the LAA.
- Frequency: Occur continuously during the Project lifespan.
- Duration: Long-term duration as the effects will last beyond the decommissioning phase.
- Reversibility: Irreversible, as the effects are unlikely to be reversed.
- Significance: No significant negative impacts. Positive impacts expected (significance not evaluated) due to net GHG emission reduction.

7.1.3 Sound

7.1.3.1 Overview

The assessment of sound considered both construction and operational noise generated from the Project.

During construction, heavy equipment, machinery, and light vehicles will emit sound to the surrounding environment from activities associated with the development of wind turbine pads, roads, the connection to the Strait Crossing, along with the subsequent assembly and commissioning of wind turbines. To quantify potential impacts, noise levels of equipment anticipated for the Project's construction were used to calculate noise levels at set distances from the Project Footprint in consideration of nearby receptors.

During the Project's operational phase, wind turbines will emit sound to the surrounding environment from mechanical equipment operation and the turbines' interaction with the surrounding air (aerodynamic sound). Detailed sound modelling was completed to quantify the potential impacts of turbine-generated noise on nearby receptors.

7.1.3.2 Regulatory Context

Table 7.13 summarizes sound level thresholds presented in various municipal and provincial sources. Limits identified in the Guidelines for Environmental Noise Measurement and Assessment (NSECC, 2023b) are not listed as they apply to activities that are regulated under the Activities Designation Regulations, for which this Project is not.

Municipal by-laws are generally established to protect the peace and tranquility of communities. For those referenced in Table 7.13, provisions are in place to permit construction activities during specific hours if a Building Permit has been issued.

Table 7.13: Summary of Sound Level Regulations and Guidelines

Regulated By	Regulation/Guidance	Sound Level (dBA)	Hours / Duration
For Residential Receptors			
NSECC	Guidelines for Environmental Noise Measurement and Assessment (NSECC, 2023b)	Not Applicable	Not Applicable
NSECC	Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c); and MPRR	≤ 40	During the operation of wind turbines at the exterior of a receptor
Municipality of the District of Guysborough	Municipality of the District of Guysborough Noise Control By-Law (MODG, 2011)	≤ 65	0600 to 2300
		≤ 55	2300 to 0600
For Occupational Safety			
Workplace Health and Safety Regulations & Canadian Centre for Occupational Health and Safety	Noise – Occupational Exposure Limits in Canada (CCOHS, 2024)	85	8-hour maximum

7.1.3.3 Existing Environment

Aerial imagery and field observations were used to identify nearby sources of sound and characterize the ambient sound within the Study Area.

The Study Area falls mostly within a rural/residential area. Sources of sound levels include those associated with residential activities, vehicle traffic along nearby highways and secondary roads, and the natural environment. Highway 344 directly abuts the Study Area. This roadway is travelled daily by vehicular traffic emitting different levels of sound. Health Canada estimates quiet rural communities as having baseline sound levels of approximately 45 dBA (2017). However, several developments in/near the Study Area also contribute to ambient sound levels, including those that may increase sound levels above what is defined by Health Canada:

- Porcupine Mountain Aggregate Quarry and Bulk Coal Handling Facility (5.2 km away from Study Area)

- Strait of Canso Commercial Port (3.1 km away from Study Area)
- Active forestry (throughout and surrounding the Study Area)

Sounds associated with these activities include operation of heavy machinery, tree felling, logging trucks, etc. Recreational and local traffic also exists within the Study Area, increasing ambient sound levels from cars, ATV, dirt bikes, etc. Lastly, in addition to anthropogenic sources, there are also natural sources of sounds originating from wildlife, wind, water, and vegetation.

7.1.3.4 Assessment Methodology

Construction Sound

The assessment of construction sound includes a discussion of expected noise sources and a qualitative assessment of potential effects to receptors.

Potential receptors (including sensitive receptors such as schools, daycares, and senior residences) located within 2 km of the Assessment Area were identified using GIS data from the Nova Scotia Geomatics Centre and aerial imagery, with supporting field data used where available. As a conservative measure, no distinction was initially made between residential dwellings and camps, barns, sheds, or outbuildings, unless in-person visits in the field determined the structure to not be a receptor.

Sound levels and impacts from blasting activities are not included in this assessment as blasting requirements have not been confirmed. If blasting is determined to be required during construction, the Proponent will apply for any required permits and approvals. Any potential impacts, mitigation, and subsequent required monitoring will be described in a Project-specific Blasting Plan.

Operational Sound

The operational sound assessment was completed through a combination of desktop studies and modelling with the following objectives in mind, per NSECC Guidelines:

- Identify potential receptors within 2 km of turbines.
- Identify existing operational turbines within 3 km of the Project.
- Identify and assess comprehensive sound levels at the exterior of identified potential receptors, including cumulative effects from neighbouring turbines (within 3 km), if present.
- Propose mitigation of Project generated sound on nearby receptors, if required.

A review of pending and completed EAs for wind projects was conducted to identify any existing operational turbines within 3 km of the Project. At the time of the production of this report, there are no existing operational turbines within 3 km of the Project. However, the neighbouring Goose Harbour Lake Wind Farm to the west of the Project is projected to have two operational turbines constructed in 2026 within 3 km of a turbine for this Project. As such,

all proposed turbines from the Goose Harbour Lake Wind Farm were included in operational sound modelling.

Environmental noise modelling was completed using the DECIBEL module of WindPRO v 4.0.424 software package by EMD International A/S, which utilizes the ISO 9613-2 calculation methods in modeling environmental noise exposure of the wind turbine model proposed for the development (in this case, the Goldwind GHW182-8.0 machine). The model calculated an energy sum between the background noise level (35 dBA recommended from Health Canada), and the modeled noise exposure level for each non-participating receptor identified from the receptor identification process detailed below.

The standard power mode for the Goldwind GHW182-8.0 machine produces a maximum noise level of 112.0 dBA. To reduce the noise levels at certain receptors, sound-reduced operating modes (SRM1, 2, 3, and 4) were applied to 16 turbines where receptors may experience noise levels approaching the 40.0 dBA (Table 7.14).

Table 7.14: Turbines Operating in Low Power Modes for the Sound Model

SRM1 (109.5 dBA)	SRM2 (108.5 dBA)	SRM4 (106.5 (dBA)
T1	T23	T2
T30	T25	T3
-	-	T4
-	-	T5
-	-	T6
-	-	T10
		T12
-	-	T16
-	-	T20
-	-	T21
-	-	T52
-	-	T53

SRM = sound-reducing operating mode

Potential receptors located within 2 km of turbine locations were identified using GIS data from the Nova Scotia Geomatics Centre, the provincial civic address layer, aerial imagery analysis, and field confirmation via site visits (Drawing 7.2). Further assessment is required to determine if all potential receptors meet the definition of residential dwellings (Section 3.1.1.1).

The model followed ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method and calculations, and was based on the following input information:

- UTM coordinates for the wind turbines.
- 1/1 Octave band sound power level data, provided by the manufacturer for the wind turbines.

- UTM coordinates for potential receptors (all structures within a 2 km radius of the turbines were evaluated via the receptor identification process detailed above).
- A wind speed of 8.0 m/s at the hub height of 130 m, the loudest speed up to 95% rated power (based on test data from the manufacturer).
- Ambient sound level of 35.0 dBA (Health Canada recommended ambient noise level).
- Topographic data for the surrounding area.

The ISO 9613-2 calculation method assumes meteorological conditions ideal for noise propagation, including a ground temperature of 10°C and 70% relative atmospheric humidity. A ground attenuation factor of 0.7 was selected for sound modeling as this value is conservatively representative of the existing ground conditions (e.g., capable of vegetative growth). The Study Area is comprised of mixed wood and softwood forest. The Project is located on mostly forested land, and turbines are surrounded by large buffers of vegetated cover (porous surface, i.e., softwood, hardwood, mixed wood, harvests, bogs/wetlands, clearcuts with woody debris, utility corridors). The location of T23 was adjusted approximately 100 m southwest after modelling was completed, as shown on all drawings. Modelling was not updated to reflect this change. It is expected that sounds levels will be lower than modelled at any potential receptor in proximity to T23.

7.1.3.5 Sound Assessment Results

Construction Sound

During construction activities, sound will be generated by the operation of equipment and heavy machinery such as cranes, backhoes, excavators, dump trucks, graders, and transportation vehicles. A summary of sources and anticipated volumes of sound produced during the Project's construction is found in Table 7.15.

Table 7.15: Decibel Limits of Construction Equipment Required for the Project

Equipment	Average Noise Level Ranges (in dBA)
Road, Transmission Line, Strait Crossing Connection, Substation and Turbine Pad Development	
Backhoe	85 to 104[(1)]
Concrete Truck/Pump	103 to 108[(2)]
Dozer	89 to 103[(1)]
Dump Truck	84 to 88[(1)]
Excavator	97 to 106[(2)]
Harvesting Equipment (log truck, manual faller, etc.)	85 to 103[(3)]
Roller	95 to 108[(2)]
ATV	97[(4)]
Loaders	88[(3)]
Pickup Trucks	95[(4)]
Tracked Drilling Units	91 to 107[(5)]
Tracked Dump Truck/Decks	91[(6)]
Tracked Man Lift/Bucket Machines	85[(6)]
Tracked Radial Boom Derricks/Cranes	93 to 98[(2/6)]

Equipment	Average Noise Level Ranges (in dBA)
Turbine Assembly	
Crane	78 to 103[1]
Handheld Air Tools	115[2]
Compressor (drilling, pneumatic tools, etc.)	85 to 104[7]

[1](WorkSafe BC, 2019)
[2] (Transport Scotland, 2018)
[3] (WorkSafe BC, 2016)
[4] (Oregon State Parks, n.d.)
[5] (The Driller, 2005)
[6] (SCE, 2015)
[7] (IHSAO, 2022)
Measurements shown are relevant to the decibel level ranges within close proximity (i.e., less than 15 m)

The range of decibels anticipated for the Project's construction activities will be between 78 dBA to 115 dBA (from a single piece of equipment within 15 m from the source).

If sound attenuates at the standard rate of 6 dBA per doubling in distance from a given point source, approximate sound levels experienced at incremental distances during construction activities for the Project are shown in Table 7.16 (WKC Group, 2024). The attenuation rate of sound does not consider local landscape/topography or buildings, and therefore, is considered a "worst-case" scenario for sound levels produced by a single piece of equipment.

Table 7.16: Attenuation of Construction Related Sounds

Case	Example Equipment Type	Sound Level @ 15 m (dBA)[1]	Point Source Sound Levels (dBA) at Incremental Distances					
			50 m	100 m	200 m	500 m	1,000 m	2,000 m
Minimum	Crane	78	67.5	61.5	55.5	47.5	41.5	35.5
Median	Pickup/ATV	96	85.5	79.5	73.5	65.5	59.5	53.5
Maximum	Handheld Air Tools	115	104.5	98.5	92.5	84.5	78.5	72.5

[1] Approximate point source sound levels, based on data collected in Table 7.15. Combined sound levels produced by multiple pieces of equipment operating simultaneously is not included in the assessment.

Operational Sound

A total of 171 potential receptors were identified within 2 km of a proposed turbine location. No potential receptors exceed 40 dBA when applying turbine low power modes. The highest predicted sound level at a potential receptor is 38.2 dBA without modelling ambient sound, and 39.9 dBA when ambient sound levels are included. Results of the sound modelling are shown on Drawing 7.3 and detailed results are found in Appendix C.

Low Frequency Sound

Low frequency sound is used to refer to sound that occurs at frequencies less than 200 hertz (Hz). According to Health Canada communications, during operation of large industrial objects such as wind turbines, low frequency sound may cause vibrations in buildings. Health Canada

recommended using Finland low frequency model to conduct the analysis. A generic 1/3 octave low frequency noise curve was used to model power levels at a 130 m hub height. The power levels were entered into a Finland low frequency model in WindPRO software to produce the maximum dBA at each receptor. The results of the analysis indicated that low frequency noise at 50 Hz was lower than 49 dBA, the Finland low frequency noise limit, at all potential receptor locations; therefore, low frequency sound is not expected to be a concern. The Finland low frequency model along with a literature review of low frequency/infrasound is provided in Appendix C.

7.1.3.6 Effects Assessment

Project-Sound Interactions

Project activities will interact with the acoustic environment during all phases of the Project. Sound related to the decommissioning phase is not specifically addressed because sound levels are expected to be comparable to construction levels (Table 7.17).

Table 7.17: Potential Project-Sound Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Strait Crossing Connection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for sound includes a 2 km area around turbine locations (Drawing 7.3).

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for sound. The VC-specific definition for magnitude is provided for operational sound as follows:

Construction Sound

- Low: Project activities to be completed in accordance with relevant MODG bylaws and permitting.
- High: Project activities predicted to exceed relevant MODG bylaws and permitting.

Operational Sound

- Low: Measurable sound levels predicted at the exterior of a residential dwelling are below the Environmental Assessment Supplemental Checklist: Wind Energy Projects/MPRR (i.e., ≤40 dBA).
- High: Sound levels predicted to exceed the Environmental Assessment Supplemental Checklist: Wind Energy Projects/MPRR at the exterior of a residential dwelling (i.e., >40 dBA).

Effects

Construction Sound

The median sound level from construction is comparable to sound produced by pick-up trucks (96 dBA), which is already a common source of sound along Highway 344, which abuts the Study Area. The nearest non-participating receptor is near the corner of Middletown Road and Highway 344, within the Assessment Area along an access road.

During construction of the Project, decibel limits above 55 dBA at residential receptors can result in disruptions of sleep during nighttime hours, while sounds above 65 dBA may cause annoyance and disturbance during daytime hours. Sounds produced during construction can exceed these thresholds at receptors located within proximity to activities at some locations within the Project Footprint. The majority of construction activities are expected to occur between 7:00 am and 9:00 pm (generically referred to as ‘daytime hours’) and are considered a temporary source of noise generated by the Project. Based on the desktop review, a total of:

- Four residential dwellings and one church are located within 500 m of construction activities, which may result in median/continuous sound levels above 65 dBA during daytime hours. All five are near the intersection of Middletown Road and Highway 344, where construction activities may be required to upgrade Middletown Road to facilitate the Project. Construction activities for this section of road will be temporary and for a short duration. A Building Permit with MODG is expected to be issued for the Project, which will contain provisions to permit construction activities during specific hours that may result in noise levels above the MODG bylaw. The Proponent will complete construction in accordance with the requirements outlined in the Building Permit.

- 78 potential receptors are located within 1.0 km of construction activities, which may result in median/continuous sounds between 55 dBA and 65 dBA during daytime hours.

Sound levels within the Study Area are a collection of anthropogenic and natural sources, as described in Section 7.1.3.3. This location was selected for its high wind speeds, contributing to baseline sound levels due to moving air and vegetation. Furthermore, the median sound level from construction is comparable to sound produced from an ATV or pick-up truck, which is already a common source of sound within the Study Area, as are logging trucks and harvesting equipment. Therefore, most Project-related construction sound will be consistent with existing sound levels. Activities producing higher levels of sound, such as blasting (if required), or handheld air tools, will be less frequent and last for short durations.

Operational Sound

Modelled sound levels (ambient and generated sound) do not exceed 40 dBA at any potential receptor when running select turbines in low power mode. Therefore, all potential receptors comply with the NSECC guidance and the MPRR for operational sound. Further assessment is required to determine if all potential receptors meet the definition of residential dwellings (Section 3.1.1.1) to determine if sound mitigation is required.

Mitigation

To minimize construction sound and the potential disturbance of receptors during construction, the following general mitigation measures will be implemented, as required:

- Use noise suppressants (e.g., mufflers) on vehicles/equipment, where possible.
- Limit unnecessary vehicle idling.
- Maximize construction activities within the recommended daytime hours of 7:00 am to 9:00 pm.
- Follow the guidelines and requirements in the Blasting Safety Regulations, if determined necessary based on geotechnical studies. Mitigation and monitoring for potential blasting will be included in a Project-specific Blasting Plan, as required.
- Maintain equipment in good working order as recommended by the manufacturer.
- Develop and implement a Complaint Resolution Plan.

To minimize disturbance from sound during operation, the following mitigations will be implemented:

- Run turbines in low power modes as necessary to ensure sound levels (ambient and turbine generated sound) do not exceed 40 dBA at residential dwellings.
- Complete regular maintenance of turbines to ensure they are in good working order and continue to comply with sound level standards.
- Update modelling if the turbine model or layout changes prior to construction to ensure compliance with the Environmental Assessment Supplemental Checklist: Wind Energy Projects/MPRR.
- Develop and implement a Complaint Resolution Plan.

The Project's Complaint Resolution Plan will consider complaints related to sound and outline a process to investigate complaints. Mitigation to resolve complaints, if determined to be necessary, will be completed on a case-by-case basis in consultation with the affected complainant. If necessary, noise monitoring will be included as part of this process to evaluate ambient and operational noise in areas of concern.

Monitoring

No monitoring programs are proposed.

Conclusion

After mitigations, residual effects on noise are characterized as follows:

- Magnitude: Low magnitude, as construction activities are anticipated to comply with municipal by-laws and permitting and operational sound is predicted to comply with the Environmental Assessment Supplemental Checklist: Wind Energy Projects/MPRR.
- Geographic extent: Constrained to the LAA.
- Frequency: Continuous and intermittent duration (depending on the source).
- Duration: Medium-term duration.
- Reversibility: Reversible as the noise will cease upon decommissioning of Project
- Significance: Not significant.

7.1.4 Shadow Flicker

7.1.4.1 Overview

Shadow flicker can occur when rotating blades cast flickering shadows during times of direct sunlight. The magnitude of shadow flicker is determined by the position and height of the sun, wind speed and direction, geographical location, time of year, cloud cover, turbine hub height and rotor diameter, and proximity to the turbine.

For shadow flicker to occur, the following criteria must be met:

- The sun must be shining and not be obscured by clouds/fog.
- The source turbine must be operating.
- The wind turbine must be situated between the sun and the shadow receptor.
- The wind turbine must be facing directly towards, or away from, the sun such that the rotational plane of the blades (i.e., rotor plane) is perpendicular to the azimuth of incident sun rays. For this to occur, the wind direction would have to be parallel to the azimuth of the incident sun rays throughout the day.
- The line of sight between the turbine and the shadow receptor must be clear. Light-impermeable obstacles, such as vegetation, tall structures, etc., will prevent shadow flicker from occurring at the receptor.
- The shadow receptor has to be close enough to the turbine to be in the shadow.

7.1.4.2 Regulatory Context

The Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c) and the MPRR require that a receptor or residential dwelling, respectively, receive less than 30 hours of shadow flicker per year or 30 minutes of shadow flicker per day.

7.1.4.3 Assessment Methodology

The shadow flicker assessment was completed through modelling to achieve the following objectives:

- Identify potential receptors that may experience shadow flicker from the Project's operation.
- Quantify the expected duration and frequency of shadow flicker for potential receptors over a calendar year and during the modelled worst day.
- Assess if applicable guidelines are expected to be met.
- Propose mitigation should shadow flicker levels exceed the guideline levels.

Potential receptors (including sensitive receptors such as schools, daycares, and senior residences) located within 2 km of the Assessment Area were identified using GIS data from the Nova Scotia Geomatics Centre and aerial imagery, with supporting field data used where available. As a conservative measure, no distinction was initially made between residential dwellings and camps, barns, sheds, or outbuildings, unless in-person visits in the field determined the structure to not be a receptor. The location of T23 was adjusted approximately 100 m southwest after modelling was completed, as shown on all drawings. Modelling was not updated to reflect this change. It is expected that shadow flicker levels will be lower than modelled at any potential receptor in proximity to T23.

A review of pending and completed EAs for wind projects was conducted to identify any existing operational turbines within 3 km of the Project. At the time of the production of this report, there are no existing operational turbines within 3 km of the Project. However, the neighbouring Goose Harbour Lake Wind Farm to the west of the Project is projected to have two operational turbines constructed in 2026 within 3 km of a turbine for this Project. As such, all proposed turbines from the Goose Harbour Lake Wind Farm were included in shadow flicker modelling.

An analysis was conducted using the WindPRO version 4.0.547 software package under 'worst-case' modelling or Assessment Scenario A, which is the most conservative approach and assumes that all the criteria listed in Section 7.1.4.1 are always met. Worst-case modelling assumes conditions that are impossible to occur in practice but provides a starting point for assessing potential shadow flicker issues. For clarity, worst-case modelling assumes the following conditions are met:

- The sun is shining from sunrise to sunset (i.e., no cloud obstruction).
- The rotor plane is always perpendicular to the line from the turbine to the sun.
- The turbine is always operating.
- The receptor building is a 'greenhouse', having windows on all exterior surfaces.

As Assessment Scenario A uses highly conservative assumptions, resulting in modelled conditions that are not possible to occur in practice, a second scenario was developed to better represent site characteristics. Unlike Assessment Scenario A, which assumed continuous sunshine, Assessment Scenario B used the average daily sunshine hours recorded at the Charlottetown weather station (Table 7.18).

Assessment Scenario B is still conservative as it includes the remaining criteria listed in Section 7.1.4.1. For example, no line-of-sight obstacles (e.g., trees, vegetation) were considered and the model assumes that the turbines are always in operation and located between the sun and receptor, which is not the case.

Table 7.18: Sunshine Data Used for the Assessment Scenario B

Month	Average Daily Sunshine (Hours)
January	3.37
February	4.18
March	4.42
April	5.04
May	6.34
June	7.54
July	7.95
August	7.19
September	5.76
October	3.98
November	2.63
December	2.31

Source: Charlottetown Weather Station (Available WindPRO weather station closest to the Study Area)

7.1.4.4 Assessment Results

A total of 171 potential receptors were identified within 2 km of a proposed turbine. Under Assessment Scenario A conditions (meeting criteria described in Section 7.1.4.1), 78 potential receptors exceed 30 hours of shadow flicker per year and/or 30 minutes of shadow flicker on the worst day. Appendix D provides detailed results for all potential receptors located within 2 km of the turbines. Since Assessment Scenario A is based on highly conservative assumptions, the modelled conditions are unlikely to occur in real-world situations.

Following the completion of Assessment Scenario B, one potential receptor (FH) was identified as exceeding 30 hours of shadow flicker annually (Table 7.19).

Table 7.19: Potential Receptors Impacted by Shadow Flicker – Assessment Scenario B

Receptor ID[(1)]	Hours of Shadow Flicker per Year
FH	40:14

[(1)] Receptor ID corresponds to labelling in Appendix D.
WindPRO is unable to calculate minutes of shadow flicker per day for Assessment Scenario B; therefore, only hours per year are presented.

Compliance for annual shadow flicker exposure at potential receptor FH can be achieved by applying curtailment to T4 between 0550 and 0700 throughout the month of July (Table 7.20). Detailed results are provided in Appendix D and shown on Drawing 7.4. Further assessment is required to determine if potential receptor FH meets the definition of a residential dwelling (Section 3.1.1.1) to determine if curtailment is required.

Table 7.20: Potential Receptors Impacted by Shadow Flicker – Assessment Scenario B with Curtailment

Receptor ID[(1)]	Hours of Shadow Flicker per Year with curtailment
FH	29:20

[(1)] Receptor ID corresponds to labelling in Appendix D.
WindPRO is unable to calculate minutes of shadow flicker per day for Assessment Scenario B; therefore, only hours per year are presented.

7.1.4.5 Effects Assessment

Project-Shadow Flicker Interactions

Project activities only interact with shadow flicker during wind turbine operations (Table 7.21).

Table 7.21: Potential Project-Shadow Flicker Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	-
Access Road Upgrading and Construction	-
Laydown Area and Turbine Pad Construction	-
Transportation of Turbine Components	-
Turbine Assembly	-
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	-
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	-
Decommissioning	
Infrastructure Removal	-
Site Reclamation	-

Assessment Boundaries

The LAA for shadow flicker includes a 2 km area around turbine locations (Drawing 7.4). The RAA is not applicable for shadow flicker.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for shadow flicker. The VC-specific definition for magnitude is as follows:

- Low: Measurable shadow flicker levels predicted at the exterior of a residential dwelling are below the Environmental Assessment Supplemental Checklist: Wind Energy Projects/MPRR.
- High: Measurable shadow flicker levels predicted to exceed the Environmental Assessment Supplemental Checklist: Wind Energy Projects/MPRR.

Effects

Assessment Scenario B predicts that all potential receptors will experience less than 30 hours of shadow flicker per year when curtailment is incorporated into the model for T4 between 0550 and 0700 during the month of July. This is still considered a conservative assessment because the scenario still assumes the following:

- Wind turbines are always in operation (i.e., rotors always spinning) vs estimated operation of the turbines 30% to 40% of the time.
- A clear line of sight, with no screening by trees, outbuildings, or other local structures.
- The wind turbines are always situated between the sun and the potential receptor.
- The rotational plane of the blades is always perpendicular to the azimuth of the sun rays.

Further assessment is required to determine if potential receptor FH meets the definition of residential dwelling (Section 3.1.1.1) to determine if curtailment is required.

Mitigation

Modelling will be updated if the turbine model or layout changes prior to construction to ensure compliance with the Environmental Assessment Supplemental Checklist: Wind Energy Projects/MPRR

The Project will develop a Complaint Resolution Plan, which will consider complaints related to shadow flicker and outline a process to investigate complaints. Mitigation to resolve complaints, if determined to be necessary, will be completed on a case-by-case basis in consultation with the affected complainant.

Monitoring

No monitoring programs are proposed.

Conclusion

After mitigations, residual effects of shadow flicker are characterized as follows:

- Magnitude: Low magnitude, as modelling indicates that all potential receptors are within the threshold of shadow guidelines of no more than 30 hours of shadow flicker per year based on Assessment Scenario B.
- Geographic extent: Constrained to the LAA.
- Frequency: Intermittent as shadow flicker only occurs when climatic conditions align.
- Duration: Medium-term duration.
- Reversibility: Reversible as shadow flicker will cease upon decommissioning of Project.
- Significance: Not significant.

7.2 Geophysical Environment

7.2.1 Overview

The assessment of the geophysical environment included a review of topography, surficial geology, bedrock geology, and hydrogeology/groundwater.

7.2.2 Regulatory Context

Relevant legislation includes:

- Sulphide Bearing Material Disposal Regulations, N.S. Reg. 57/95
- *Environment Act,* S.N.S. 1994-95, c. 1 (protected water/watershed areas)

If blasting is required for construction, groundwater wells within 800 m must undergo an assessment in accordance with NSECC's Procedure for Conducting a Pre-Blast Survey (NSECC, 1993).

7.2.3 Assessment Methodology

The desktop assessment was completed through a review of the following resources:

- Aerial imagery and topography
- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- Nova Scotia Geoscience Atlas (NSNR, 2021f)
- Mineral Resource Land-Use Atlas (NSNR, 2021b)
- Nova Scotia Groundwater Atlas (NSNR, 2024c)
- Karst Risk Map (NSNR, 2019)
- Manganese in Well Water Risk Map (Kennedy, 2021)
- Well Logs Database (NSECC & NSNR, 2022)
- Nova Scotia Pumping Test Database (NSNR, 2022c)
- Nova Scotia Groundwater Observation Well Network (NSECC, 2015a)
- Potential for Radon in Indoor Air (NSNR, 2009a)

7.2.4 Assessment Results

Topography

The Study Area lies primarily within the Mulgrave Plateau (360) Ecodistrict, with the southeastern section of the Study Area extending into the Cape Breton Coastal (810) Ecodistrict (Drawing 7.1) (Neily et al., 2017).

The Mulgrave Plateau is located west of the Strait of Canso and northwest of Chedabucto Bay in Antigonish and Guysborough counties. The ecodistrict consists of a till plain with gentle to moderate elevation changes, having a mean elevation of 130 m above sea level (masl). The Mulgrave Plateau is separated into two by the Chedabucto Fault, but both sides have a similar level to hummocky terrain with extensive pockets of imperfectly drained soils. Steep slopes are also found within this ecodistrict along the edges of elevated plateaus (which rise to approximately 200 masl) (Neily et al., 2017). The topography within the Study Area is inclined, decreasing in gradient to the northeast.

The Cape Breton Coastal Ecodistrict covers an area of 1,178 square kilometres (km^2), extending along the entire eastern coast of Cape Breton from Scateries Island to Chedabucto Bay. The ecodistrict consists of a narrow, generally low-lying coastal landscape which gently rises further inland to approximately 130 masl at its highest point. Topography is variable, from flat to rolling hills with few surface boulders and deep till which masks bedrock undulations, except along coastal areas of exposed bedrock (Neily et al., 2017).

Within the Study Area specifically, elevations range from approximately 15 masl to 170 masl (Drawing 7.5).

Surficial Geology

Surface geology of the Mulgrave Plateau consists predominately of near-surface/exposed bedrock with thin overlying deposits of glacial till. Scattered areas of thicker till are also found within the Mulgrave Plateau Ecodistrict but are primarily associated with drumlin formations. Within the Cape Breton Coastal Ecodistrict, surficial geology is dominated by up to 30 m deposits of stony glacial till that are interspersed with drumlin formations. Soils within both ecodistricts vary depending on the parent material and underlying bedrock present, but generally range from stony to gravelly to clay loams (Neily et al., 2017).

Within the Study Area specifically, surficial geology predominantly consists of a silty till plain dating back to the Quaternary period (concentrated in the southern half of the Study Area) (Drawing 7.6). The plain is 3 m to 30 m of compact material derived from distant and local sources that was deposited at the base of melting ice sheets. Silty till plains provide moderate drainage due to stoniness and have calcareous bedrock components which provide good acid rain buffering capacity. Other surficial features present within the Study Area include:

- Exposed bedrock
- Silty drumlin

- Stony till plain
- Hummocky ground moraine
- Alluvial deposits
- Organic deposits

Areas of exposed bedrock and/or bedrock overlain by a thin discontinuous layer of till were formed from glacial scouring, erosion, and/or non-deposition. These features are composed of various ages and types of bedrock and result in exposed ridges of hard rock (NSNR, 2021f).

Silty drumlins comprise of silty till with a thickness of 4 m to 30 m that is derived from distance sources (including red clay). These features formed from material deposition at the base of melting ice sheets and provide moderate drainage due to stoniness. In addition, silty drumlins have calcareous bedrock components, which provide good acid rain buffering capacity (NSNR, 2021f).

Stony till plains are composed of a stony, sandy material (with a thickness of 2 m to 20 m) derived from local sources that were deposited at the base of receding/melting ice sheets. These surficial features have high erodibility, rapid drainage, high water tables, and are shallow/stony which can pose limitations for construction (NSNR, 2021f).

Hummocky ground moraines are deposits of loose stony and sandy till that vary in thickness between 2 m and 25 m. These deposits are formed by the melting of stagnant ice sheets and result in irregular topography characterized by local ridges and depressions (NSNR, 2021f).

Alluvial deposits are accumulations of gravelly sand material deposited by flowing water (i.e., streams and rivers) following receding/melting glaciers. These deposits range in thickness between <1 m to 20 m from gently sloping/flat floodplains to sloping alluvial fans (NSNR, 2021f).

Organic deposits (i.e., wetlands/peatlands) develop because of topographic depressions collecting and/or storing surface water along with the infilling of ponds/watercourses with vegetation. Within the Study Area, the organic deposits range in depth from 1 m to 5 m (NSNR, 2021f).

Soils across the Study Area are reflective of sedimentary rock presence. In the Mulgrave Plateau Ecodistrict, soils are characterized as poor-very poorly drained to rapid-imperfectly drained, and fine-medium to medium-coarse texture. Soils in the Cape Breton Coastal Ecodistrict are characterized as poor-very poorly drained to well drained, and fine-medium to coarse texture (Neily et al., 2017).

Colluvial deposits (also known as talus slopes) are loose deposits of surficial material at the base of steep slopes. These geologic features can pose significant hazards as they are subject to sudden and rapid slides/failures. No records of colluvial deposits were identified within the Study Area (NSNR, 2021f).

Bedrock Geology

Bedrock within the Study Area primarily consists of the Horton Group ($D\text{-}_{E}C_{H}$) formation with a small section of the Mabou Group ($_{E}\text{-}_{L}C_{M}$) in the eastern portion of the Study Area (Drawing 7.7). The Horton Group was formed between the Devonian to early Carboniferous period and is generally composed of sandstone, siltstone, conglomerate, and shale. The Mabou Group includes rocks formed between the early to late Carboniferous period and is generally composed of sandstone, siltstone, and shale (NSNR, 2021f).

In addition, two fault lines exist within proximity of the Study Area that are associated with the contact of the Horton and Mabou groups: one within the eastern extent of the Study Area and the other south of the Study Area. Eastern Canada, however, has a relatively low rate/risk of earthquake activity (NSNR, 2021f).

According to the Mineral Resource Land-Use Atlas, there are no occurrences of sulphide-bearing slates within the Study Area (NSNR, 2021e). In addition, a review of the Nova Scotia Karst Risk Map (Drawing 7.8; based on provincial geology maps, sinkhole occurrence data, lidar data, and hydrogeological databases) indicated that the Study Area is mostly within a "Medium Risk" region with “High Risk” regions along the coast (NSNR, 2019).

The radon potential mapping (Drawing 7.9) shows the northern and eastern sections of the Study Area (in the vicinity of Goose Harbour Lake) categorized as “Medium Risk” area for radon. The southeastern section of the Study Area is within a “Low Risk” area (NSNR, 2009a). There is no indoor air pathway for radon gas associated with the Project; radon gas is not considered a risk for outdoor inhalation. Furthermore, radon is not a concern in drinking water, and there are no Canadian guidelines for radon in drinking water (NSECC, 2009b).

Groundwater Quality and Quantity

The Study Area is underlain by sedimentary bedrock (NSNR, 2021f). Wells located in sedimentary bedrock typically have higher dissolved solids, hardness, and well water yields as groundwater can flow through the rock itself and along fractures. Naturally occurring trace metals such as iron, arsenic, and manganese can be found in all groundwater regions; however, are more often associated with plutonic and metamorphic groundwater regions (NSNR, 2009b).

A review of the groundwater risk mapping indicated that the majority of Study Area is located in a “High Risk” zone for arsenic, with the southeastern section of the Study Area categorized as “Medium Risk” (Drawing 7.10) (NSNR, 2021e). The Study Area is in a “High Risk” zone for manganese in well water (Drawing 7.11) (Kennedy, 2021). In addition, the Study Area is considered a “Low Risk” for uranium in the groundwater (Drawing 7.12) (NSNR, 2021e).

Groundwater Wells

An assessment of nearby groundwater wells was conducted using the NSECC Well Logs Database (NSECC & NSNR, 2022). This database contains records of well locations and characteristics within the province, dating back until approximately 1920. The database was

reviewed to identify groundwater wells that may exist within proximity of the Study Area; however, there are significant limitations associated with the spatial accuracy of this database. For the purposes of this assessment, any groundwater wells that had a spatial uncertainty of greater than 1,000 m were not considered/assessed.

A total of 63 water wells were identified within 2 km of the Study Area using the NSECC Well Logs Database (NSECC & NSNR, 2022) (Drawing 7.13; Appendix E). Most wells identified are located along the Strait of Canso between Pirate Harbour and Sand Point, Nova Scotia. A summary of well statistics is provided in Table 7.22.

Table 7.22: Summary of Water Well Records within 2 km of the Study Area

	Drilled Date (year)	Well Depth (m)	Bedrock Depth (m)	Static (m)	Yield (litres per minute)	Elevation (masl)
Minimum	1961	3.65	0.91	-0.03[(1)]	0.00	2
Maximum	2009	90.44	31.97	33.50	454.00	124
Average	n/a	43.41	10.54	5.08	43.19	31

Source: (NSECC & NSNR, 2022)
[(1)] Negative values represent overflowing wells or static water level at ground level.

No groundwater wells were identified within the Assessment Area; however, 15 wells (13 drilled, two dug) are located within 800 m of the Assessment Area. These wells are predominantly located along Marine Drive and are either for domestic usage or unspecified usage (three). If blasting is required within 800 m of a well, the Proponent will conduct pre-blast surveys as per requirements under NSECC's Procedure for Conducting a Pre-Blast Survey (NSECC, 1993).

The NSNR Pumping Test Database provides long term yields for select wells throughout the province and includes details about the well construction and pumping test, and the interpreted hydrogeological properties. The nearest pumping test well (ID: 730326) is in Middle Melford along Route 344, approximately 86 m east of the Study Area and was completed in 1973 for NSNR. This well was drilled to a depth of 90.5 m below surface and had a static water level of 2.9 m and safe long-term yield of 43.6 litres per minute (NSECC & NSNR, 2022).

NSECC maintains the Nova Scotia Groundwater Observation Well Network (NSECC, 2015a) to monitor groundwater level, water quality, evaluate impacts of human activities and evaluate long-term water trends. The nearest active provincial observation well to the Study Area is Monastery (#028) located approximately 24 km northeast of the Study Area, near Monastery and within the sedimentary groundwater region which also underlies the Project. This well was drilled in 1976 to a depth of 158.4 m through the Canso Group bedrock formation and is currently active. In 2021, the average annual water level was 12.8 masl and the annual water level fluctuation was approximately 3.12 m between January and March 2022 the average water level was 13.03 masl. The average depth to water in this well is 23.1 m below the top of casing (NSECC, 2015a).

7.2.5 Effects Assessment

Project-Geophysical Interactions

Project activities will primarily interact with the geophysical environment during earth moving activities (Table 7.23).

Table 7.23: Potential Project-Geophysical Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	-
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for the geophysical environment is a radius of 800 m around the Project Footprint (Drawing 7.14). The RAA is not applicable.

Assessment Criteria

The assessment criteria provided in Section 4.5 apply to the geophysical environment. The VC-specific definition for magnitude is as follows:

- Negligible: No expected changes to local topography or geology; no anticipated impacts to the quality/quantity of groundwater wells (no wells located within 2 km of the Assessment Area).
- Low: Changes to local topography/geology are possible but not anticipated as no geologic hazards are present within the Study Area; impacts to the quality/quantity of groundwater wells are not anticipated (wells exist within 2 km of the Assessment Area).

- Moderate: Changes to local topography/geology are possible as geologic hazards exist within proximity to the Assessment Area but can be mitigated with routine measures; impacts to the quality/quantity of groundwater wells are possible if blasting is required (wells are located within the LAA).
- High: Changes to local topography or geology are anticipated due to the presence of geologic hazards within the Assessment Area that cannot be mitigated with routine measures; impacts to the quality/quantity of groundwater wells are anticipated if blasting is required (wells are located within the Project Footprint).

Effects

The geophysical environment will be disturbed within the Assessment Area during the site preparation and construction phase, and again during infrastructure removal and site reinstatement. During these phases, potential impacts related to the geologic environment are primarily due to the presence and subsequent disturbance of geologic hazards including:

- Sulphide bearing slates (i.e., acid generating rock)
- Karst topography
- Arsenic, manganese and/or uranium containing bedrock

In Nova Scotia, several bedrock formations are known to contain acid generating rock (sulphide minerals such as pyrite, pyrrhotite) that, when disturbed, can result in the production of acid rock drainage (ARD). ARD occurs when sulphide-bearing rocks are disrupted and exposed to air or water, producing sulphuric acid and metal oxides that are subsequently mobilized/leached through freshwater systems (NSNR, 2021a). Based on provincial risk mapping, there are no sulfide-bearing slates or formations recorded within the Assessment Area or the larger Study Area (NSNR, 2021b). The presence/absence of sulphide-bearing minerals and the likelihood of ARD will be confirmed following the results of the geotechnical evaluation.

Karst topography is characterized by naturally occurring sinkholes, underground drainage systems, and caves which are formed by the dissolution of soluble bedrock (e.g., limestone). The presence of karst terrain has the potential to cause extensive damage to infrastructure and the local landscape due to the risk of sudden collapse/subsidence. A review of the Karst Risk Map (Drawing 7.8) identified that majority of the Study Area is primarily categorized as “Medium Risk”. Sections of the Study Area and Assessment Area, primarily along the coast and in the southwestern extent extended into “High Risk” zones (NSNR, 2019). As part of geotechnical investigations completed for the Project, turbine pads (and other permanent infrastructure) will be assessed; where/if karst topography or other constructability limitations are encountered, infrastructure will be relocated/adjusted to avoid.

Construction activities, primarily blasting (if required), have the potential to impact the quality and quantity of surrounding groundwater supply depending on the proximity to drinking water wells and extent of disturbance caused by construction activities. Disturbance of arsenic, manganese and/or uranium containing bedrock can mobilize these metals within groundwater

and subsequently degrade nearby groundwater well quality. Risk mapping shows the Study Area is primarily situated in a region that has a “High Risk” of arsenic containing bedrock; with areas of “Low Risk” and Medium Risk” along sections of the coastline and in the southeastern extent of the Study Area (Drawing 7.10). Risk mapping showed that the Study Area is “High Risk” for manganese in bedrock wells (Drawing 7.11). Risk mapping also showed that the Study Area is entirely within a "Low Risk" area for uranium containing bedrock (Drawing 7.12) (Kennedy, 2021; Kennedy & Drage, 2020, 2017). In addition to water quality, groundwater quantity can also potentially be impacted if blasting activities (as required) alter local hydrogeological flow regimes, resulting in groundwater draining from or flowing towards existing wells. As a result of potential impacts to groundwater quality and quantity, wells located within 800 m of blasting activities require monitoring per NSECC’s Procedure for Conducting a Pre-Blast Survey (NSECC, 1993). Based on the results of the desktop review, 15 wells are located within 800 m of the Assessment Area. Detailed characteristics of water wells identified within 2 km of the Study Area and wells located within 800 m of the Assessment Area are provided in Appendix E. The requirement for blasting and pre-blast surveys will be confirmed and assessed further during geotechnical investigations and during detailed engineering design.

Potential impacts to nearby groundwater well quality because of arsenic, manganese, and uranium are not anticipated based on:

- Construction activities will primarily consist of clearing, grubbing, and grading within the surficial layer. Contact with/disturbance of groundwater is not anticipated from these activities.
- If blasting is required, blasting monitoring and mitigation plans will be developed, and regulatory guidelines will be adhered to.

Mitigation

The use of existing road networks and siting in previously disturbed areas contributed to minimizing the Project’s impact to the geologic environment.

The following mitigation measures are also recommended to minimize impacts to the geologic environment:

- Develop and implement a Blasting Plan, if blasting is required.
- Conduct blasting, if required, in accordance with provincial legislation and subject to terms and conditions of applicable permits.
    - Conduct pre-blast surveys for wells within 800 m of blasting activities, which may include ground-truthing for nearby well locations.
        - If demonstrable changes in groundwater quantity or quality to a well are detected due to Project activities, an alternative water supply, of equal or better quantity/quality than that impacted, will be provided to the landowner.
    - Require that all blasts are conducted and monitored by certified professionals.

  - Notify landowners in advance of any blasting activities within 800 m.
  - Recover and revegetate exposed soils or bedrock as required to minimize any exposure following blasting.
- Assess for elevated sulphide potential in bedrock during pre-construction geotechnical surveys. If identified, develop a site-specific mitigation plan for sulphide bearing materials in accordance with the Sulphide Bearing Material Disposal Regulations, N.S. Reg. 57/95 and in consultation with relevant regulatory departments.
- Store any soil needed for backfilling, after foundations have been poured, temporarily adjacent to the excavations until needed. Any remaining excavated material will be used on-site or removed and sent to an approved facility.
- Limit the Project Footprint and disturbed areas to the extent practical.
- Develop and implement a site-specific Erosion and Sediment Control Plan.
- Develop and implement a Complaint Resolution Plan.

Monitoring

If blasting activities are required to construct the Project (to be confirmed during geotechnical investigations), groundwater wells within 800 m of blasting activities will be monitored as per the Procedure for Conducting a Pre-Blast Survey (NSECC, 1993).

If geologic hazards (ARD, etc.) are identified within the Assessment Area (and/or Study Area) during geotechnical investigations, a site-specific mitigation plan will be developed.

No additional monitoring programs are proposed at this time in relation to the geophysical environment.

Conclusion

After mitigations, residual effects on the geophysical environment are characterized as follows:

- Magnitude: Moderate magnitude as there are 15 privately-owned water wells within 800 m of the Project Footprint (i.e., the LAA).
- Geographic extent: Within the LAA.
- Frequency: Intermittent as disturbance of the geophysical environment will only occur occasionally or intermittently during the construction phase.
- Duration: Short-term duration as the residual effects will not extend beyond the duration of the construction phase.
- Reversibility: Partially reversible.
- Significance: Not significant.

7.3 Aquatic Environment

7.3.1 Surface Water, Fish and Fish Habitat

7.3.1.1 Overview

The objective of the aquatic assessment was to inform the Project's design and collect the information necessary to assess baseline biophysical data and potential impacts to surface water and fish and fish habitat, resulting from the Project. This was accomplished using the following approach:

- Identify surface water and fish and fish habitat within watercourses within the Study Area using desktop resources (Drawing 7.15).
- Traverse the entirety of the Assessment Area to ground truth and delineate surface water features and provide characterization of any identified features (Drawing 7.16A to 7.16N).
- Use the information collected to inform Project design (e.g., avoid/minimize impacts to surface water).
- Assess the quality of fish habitat within the Assessment Area via field surveys.
- Use the information collected to identify potential impacts and inform mitigation and management practices.

7.3.1.2 Regulatory Context

Under the provincial *Environment Act,* S.N.S. 1994-95, c. 1, NSECC has the authority to promote the sustainable management of water resources in Nova Scotia. More specifically, as per Section 5A of the Activities Designation Regulations, N.S. Reg. 47/95, the alteration of a watercourse or the flow of water within a watercourse is an activity that requires an approval from NSECC, or a notification to NSECC if the work will be completed in accordance with the Nova Scotia Watercourse Alterations Standards (NSECC, 2015c).

The *Environment Act,* S.N.S. 1994-95, c. 1, s. 3be defines a watercourse as:

(i) the bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not, and
(ii) all groundwater

Using this guidance, watercourses were identified and described throughout the Assessment Area to support the description of fish habitat, and effects to regulated watercourses which may require provincial approval. While groundwater is included in the regulatory definition of a watercourse under the *Environment Act,* S.N.S. 1994-95, c. 1, this section focuses on surface water features in the context of fish habitat provision. In addition to the above-mentioned definition, the watercourse parameters listed in the Guide to Altering Watercourses (NSECC, 2015b) were used to aid in determining the presence of a watercourse.

The *Fisheries Act* is the primary federal legislation governing the conservation and protection of fish and fish habitat in Canada. The *Fisheries Act* prohibits any work, undertaking, or activity that results in harmful alteration, disruption, or destruction (HADD) of fish or fish habitat, unless such activities are authorized through appropriate regulatory approvals.

The *Fisheries Act* defines the following:

Fish:

> "(a) parts of fish, (b) shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals, and (c) the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals"

Fish Habitat:

> "waters frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas"

Section 34.4(1) of the *Fisheries Act* states that "No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish", and Section 35(1) states that "No person shall carry on a work undertaking or activity that results in the harmful alteration, disruption or destruction of fish or fish habitat". Under Section 35(2) of the *Fisheries Act*, authorization may be granted for a proposed work, undertaking or activity that may, respectively, result in the death of fish or the harmful alteration, disruption, or destruction of fish habitat.

If an alteration to a watercourse or waterbody is required, or impacts to fish and fish habitat are expected, a review under the Fisheries and Oceans Canada (DFO) Request for Review process may be required. DFO review typically occurs through the provincial watercourse alteration application process.

Federally, SARA provides federal protection for species listed as "Endangered" or "Threatened". These species are determined through the COSEWIC (ECCC, 2022).

Provincially, the ESA provides protection for species listed as "Endangered" or "Threatened". These species also have a subnational (provincial) rank (S-Rank) of "S1", "S2", or "S3" (ACCDC, 2025a) to further define their status.

7.3.1.3 Desktop Assessment Methods

The objective of the desktop review for surface water and fish and fish habitat was to identify potential fish communities, as well as watercourses and waterbodies located within the Study Area. The evaluation also aimed to determine the Assessment Area's location within primary and secondary watershed boundaries.

The desktop review included a query of the following resources and databases:

- CanVec Database – Hydrographic Features (NRCan, 2023)
- Significant Species and Habitats Database (NSNR, 2024f)
- Nova Scotia Topographic Database – Water Features (GeoNOVA, 2024d)
- Wet Areas Mapping (WAM) (NSECC, 2022b)
- Nova Scotia 1:10,000 Primary Watersheds (NSECC, 2011a)
- 1:10,000 Secondary and Shore Direct Watershed of Nova Scotia (NSECC, 2011b)
- Aquatic Species at Risk Map (DFO, 2025)
- ACCDC Data Report (ACCDC, 2025a)
- Canadian Rivers Institute distribution (Gautreau & Curry, 2020)

7.3.1.4 Drone and GIS Model Methodology

Drone technology was used to survey and characterize watercourses that were inaccessible by foot or presented safety challenges. Drones were employed to provide a safe and efficient means of data collection, offering high-resolution imagery and facilitating the analysis of otherwise challenging terrain. Strum met with NSECC's surface water quality specialist on June 13, 2023, to present this approach.

Prior to conducting field surveys, a comprehensive flight plan was created using drone navigation software. This included defining the survey area, establishing optimal flight paths, and specifying the altitude for data acquisition to ensure full coverage of the watercourse and minimize the risk of missing critical data points. Once the data was collected, orthomosaic maps were created with photogrammetry techniques, with an emphasis on correcting distortions and enhancing the overall quality of the dataset for subsequent analysis. Several indices were derived to assist with the analysis in addition to a canopy height model. The analysis with the drone data focuses on vegetation change, canopy height, inundated ground, and surface water detection to help identify watercourse features in the landscape.

Drone-derived data was then combined with other geospatial derivatives from hydrology workflows in GIS, including the integration of airborne LiDAR and terrain analysis, high resolution satellite imagery and ground-based measurements, to enhance overall understanding of the watercourse dynamics, ensuring a comprehensive characterization of the surveyed area. Once all the data was integrated, high-level characterizations and boundaries were inferred, providing a nuanced perspective on the features and connectivity of otherwise inaccessible wet areas.

7.3.1.5 Field Assessment Methodology

The results of the desktop review were used to inform Project design (e.g., avoid/minimize impacts to waterbodies and watercourses). Given that the Project will avoid all waterbodies, field assessment efforts were focused on potential Project-watercourse interactions (i.e., intersections of access roads and watercourses where existing crossing structures may need replacement or new structures installed).

Watercourse Assessment

Watercourse delineations were completed in conjunction with wetland delineation between the months of May and October in 2023, 2024, and 2025.

Desktop-identified watercourses, along with WAM data and predicted flow data, were provided to field staff to guide the identification and assessment of watercourses within the Assessment Area. Confirmed watercourses were delineated to their termination point or to the boundary of the Assessment Area. The watercourses were characterized using Strum's Baseline Delineation Form during initial identification. Information collected included:

- Date and time
- Weather
- Watercourse type
- Flow characteristics (direction, velocity, etc.)
- Physical characteristics (width, length, etc.)
- Substrate composition
- Instream cover
- Riparian habitat
- Bank stability and siltation presence
- Photos, global positioning system (GPS) location, etc.
- Fish presence/habitat potential

This information was collected and georeferenced using Survey123, an Environmental Systems Research Institute (ESRI) application for creating, sharing, and analyzing data. As a result of identified environmental constraints, including watercourses, the Project's turbine layout underwent several iterations to minimize potential interactions and limit the number of required watercourse crossings. Information collected on watercourses was also used to guide further freshwater species assessments (i.e., fish and herpetofauna).

Watercourses were classified into the following main types, consistent with the definitions provided by Buttle et al. (2012):

1. Large permanent
    - Average channel width is approximately >5 m
    - Defined channel
    - Defined bed and banks
    - Year-round flow
2. Small permanent
    - Average channel width is approximately 2 m to 5 m
    - Defined channel
    - Defined bed and banks
    - Year-round flow
3. Intermittent
    - Average channel width is approximately <2 m
    - Defined channel
    - Defined bed and banks
    - Seasonal water flow

4. Ephemeral
    - No defined channel
    - No defined bed or banks
    - Seasonal water flow

In accordance with current regulatory guidelines, fish habitat was identified as any aquatic feature contiguous with a fish-bearing system, whether it is located within a watercourse, wetland, or waterbody. Where habitat was present within a channelized watercourse flowing through a wetland, it was assessed in the context of the watercourse. If habitat was located outside a defined channel, it was assessed in the context of the wetland, based on fish accessibility, or the presence of open water features. No waterbodies were assessed as none are present within the Assessment Area.

Electrofishing Survey

Electrofishing is a standard fish capture technique used to collect juvenile and adult fish from watercourses and waterbodies. The method involves submerging an anode and cathode in the water and passing an electrical current through the water to attract and immobilize fish for capture. Prior to sampling, water temperature (<22°C), potential of hydrogen (pH), and conductivity were measured using a water quality pen to confirm suitable conditions and minimize stress on captured fish.

Electrofishing surveys were conducted in the summer of 2023 to assess fish species' presence and relative abundance. All surveys were conducted under DFO Scientific License # 360444.

Electrofishing was conducted concurrently with fish habitat assessments using a presence-absence approach. Surveys were completed along 200 m reaches of selected watercourses within the Study Area. These reaches were selected as representative watercourses for each secondary watershed present within the Study Area. Target watercourses were identified based on field observations made in summer 2023, watercourse delineation results, and a desktop assessment. The desktop assessment was conducted on predicted Project intersections with watercourses on existing roads.

Fish sampling was conducted using a Smith-Root LR-20B electrofisher (or similar model) with un-pulsed direct current. A crew member walked alongside the electrofisher operator to net any stunned fish using a D-frame landing net (1/8" mesh). Captured fish were held in a live well containing ambient stream water, shaded from the sun, and regularly monitored for signs of stress. At the conclusion of each pass, fish in the live well were identified (species confirmation), photographed, and measured for length. After recuperating, all fish were released back into the watercourse. As part of the assessment, field staff made note of any fish observed but not caught, along with any points of concern such as obstructions to fish passage (e.g., elevated culverts, waterfalls, etc.).

The electrofishing surveys followed an open-site, single-pass methodology over the study reach, without the use of barrier nets. This approach aligns with methods described in The

Salmonid Field Protocols Handbook (D. H. Johnson et al., 2007), which cites multiple studies supporting the effectiveness of single-pass electrofishing for assessing species richness (Simonson & Lyons, 1995) and relative abundance (Kruse et al., 1998).

In-Situ Water Quality

Water quality parameters were measured in-situ during the 2023 electrofishing surveys. In addition, water quality measurements were recorded opportunistically during wetland and watercourse delineation. These water quality measurements were collected using a calibrated YSI Multi-Probe water quality instrument or a combination of a Myron Ultrapen DO Pen Probe and Hannah Combo pH/Conductivity/TDS Probe at the time of the sampling event/survey.

7.3.1.6 Desktop Assessment Results

Surface Water

A review of the federal CanVec Database – Hydrographic Features (NRCan, 2023) identified 15 named and 12 unnamed waterbodies within the Study Area, along with 34 named and 89 unnamed waterbodies within 5 km. Englands Lake, the largest waterbody in the Study Area (124.4 ha), is located in the central northern portion of the Study Area. A complete list of named waterbodies within 5 km of the Study Area is provided in Table 7.24.

Table 7.24: Named Waterbodies Within 5 km of Study Area

Name of Waterbody	Distance
Waterbodies Within the Study Area	
Back Pond	N/A
Carters Lake	N/A
Chisholms Lake	N/A
Chisholms Long Lake	N/A
Cranberry Lake	N/A
Critchetts Lake	N/A
Doreys Lake	N/A
Englands Lake	N/A
Half Moon Lake	N/A
Haydens Lake	N/A
Mundells Lake	N/A
Reeves Lake	N/A
Walsh Lake	N/A
West Lake	N/A
Wheatons Lake	N/A
Waterbodies Within 5 km of Study Area[(1)]	
Birchtown Lake	2.41
Black Pond	3.57

Name of Waterbody	Distance
Butlers Lake	0.80
Carr Pond	1.94
Clam Pond	2.76
Collins Pond	1.94
Dead Raven Pond	3.74
Embrees Pond	4.67
Front Pond	0.26
Goose Harbour Lake	0.24
Halfmoon Lake	1.29
Hart Lake	4.73
Hopes Lake	2.27
Hunsons Lake	0.28
Landrie Lake	3.38
Levi Harts Pond	2.24
Long Pond	4.1
MacPhersons Lake	1.66
Manassette Lake	2.67
Mundells Pond	0.80
Murdoch Pond	3.1
Neds Lake	4.46
Nerissa Round Lake	0.43
Oyster Ponds	1.19
Porper Lake	0.51
Porper Pond	3.78
Ragged Head Pond	1.78
Red Head Lake	0.66
Simpsons Lake	4.31
St. Francis Harbour River	0.18
Stewart Pond	4.67
Sundown Lake	4.77
Sunset Lake	1.84
West Lakes	3.39

(1) Measurement from the nearest point of the Assessment Area.

A review of the Nova Scotia Topographic Database – Water Features (GeoNOVA, 2024d) identified 364 watercourse feature segments within the Study Area and 1,840 feature segments within 5 km of the Study Area. Of the 364 watercourse features within the Study

Area, nine are named: Carey Brook, East Brook, King Creek, Meadow Brook, St. Francis Harbour River, Melford Brook, Mile Brook, Two Mile Brook, and Three Mile Brook (Drawing 7.15).

Watercourses in the Study Area drain to the Clam Harbour/St. Francis Watershed, which comprises of two secondary watersheds: Melford Brook (1ER-2) and St. Francis Harbour River (1ER-3) near Mulgrave, Nova Scotia. Notable, large permanent watercourses in these watersheds include Melford Brook, St. Francis Harbour River, and Meadow Brook, all of which are partially located within the Study Area.

Melford Brook, located in the north-central Study Area, originates in several wetlands, flows through Englands Lake, and ultimately drains to the Strait of Canso. Its tributaries include Mile Brook, which flows from Critchetts Lake, and Three Mile Brook, which flows from Carters Lake; both lakes in the northwest of the Study Area.

St. Francis Harbour River flows through a small section of the southern Study Area, originating from Goose Harbour Lake and adjacent wetlands. Meadow Brook, in the southeast, originates from Doreys Lake and surrounding wetlands.

Throughout the Study Area, WAM data indicates that groundwater ranges from 0 to 100 centimetres (cm) for all sites (Drawing 7.17). WAM results generally aligned with the locations of watercourses identified using topographic mapping and highlighted the potential for additional watercourses throughout the Assessment Area (NSECC, 2022b).

Fish

The NSNR Significant Species and Habitat Database available on the Provincial Landscape Viewer (NSNR, 2024f) does not contain any polygons within the Study Area pertaining to aquatic freshwater and marine species.

The Aquatic Species at Risk Map (DFO, 2025) is a federal database showing the distribution of SAR and their associated critical habitat within Canadian waters. Within the Study Area, the database identified no records of critical habitat; however, it did identify one coastal watercourse section along Melford Creek containing records of seven endangered or threatened marine species within a 1 km buffer. The species found include fin whale (*Balaenoptera physalus*, S2S3), blue whale (*Balaenoptera musculus*, S1N), North Atlantic right whale (*Eubalaena glacialis*, S1), leatherback sea turtle (*Dermochelys coriacea*, S1,S2N), white shark (*Carcharodon carcharias*, SNRM), and Northern wolffish (*Anarhichas lupus*, SNR). As the species are outside of the inland Study Area, they would not interact with the Project and are only found within the marine environment. Therefore, they are not discussed further in this report.

ACCDC Records

The ACCDC database identified one SAR [brook floater (*Alasmidonta varicosa*)] and 41 fish and aquatic invertebrate SOCI within 100 km of the Study Area (Table 7.25; Appendix F). No

fish, aquatic mammal or aquatic invertebrate SAR or SOCI had ACCDC-documented observations within 5 km of the Study Area (ACCDC, 2025a).

Table 7.25: Fish and Aquatic Invertebrate SAR/SOCI within a 100 km Radius of the Study Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Fish					
Alewife / Gaspereau	*Alosa pseudoharengus*	-	-	-	S3B
American eel	*Anguilla rostrata*	Threatened	-	-	S3N
Atlantic salmon	*Salmo salar*	Endangered, Threatened, Special Concern	-	-	S1B, S1N
Atlantic salmon - Eastern Cape Breton population	*Salmo salar pop. 4*	Endangered	-	-	S1
Atlantic salmon - Gaspe-Southern Gulf of St Lawrence pop.	*Salmo salar pop. 12*	Special Concern	-	-	S1
Atlantic salmon - NS Southern Upland pop.	*Salmo salar pop. 6*	Endangered	-	-	S1
Atlantic sturgeon – Maritimes population	*Acipenser oxyrinchus*	Threatened	-	-	S2S3N
Brook trout	*Salvelinus fontinalis*	-	-	-	S3
Striped bass	*Morone saxatilis*	-	-	-	S2S3B, S2S3N
Striped bass - Southern Gulf of St. Lawrence population	*Morone saxatilis pop. 1*	Special Concern	-	-	S2S3N
Aquatic Invertebrates[(1)]					
Black meadowhawk	*Sympetrum danae*	-	-	-	S3S4
Broad-tailed shadowdragon	*Neurocordulia michaeli*	-	-	-	S2
Brook floater	*Alasmidonta varicosa*	Special Concern	Special Concern	Threatened	S3
Brook snaketail	*Ophiogomphus aspersus*	-	-	-	S3
Eastern pearlshell	*Margaritifera margaritifera*	-	-	-	S2
Eastern red damsel	*Amphiagrion saucium*	-	-	-	S3S4
Elfin skimmer	*Nannothemis bella*	-	-	-	S3S4
Forcipate emerald	*Somatochlora forcipata*	-	-	-	S3
Harlequin darner	*Gomphaeschna furcillata*	-	-	-	S3S4
Harpoon clubtail	*Phanogomphus descriptus*	-	-	-	S3

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Herrick's water penny beetle	*Psephenus herricki*	-	-	-	S3
Lance-tipped darner	*Aeshna constricta*	-	-	-	S3S4
Maine snaketail	*Ophiogomphus mainensis*	-	-	-	S3
Mottled darner	*Aeshna clepsydra*	-	-	-	S3S4
Muskeg emerald	*Somatochlora septentrionalis*	-	-	-	S2
Ocellated darner	*Boyeria grafiana*	-	-	-	S3S4
Rusty snaketail	*Ophiogomphus rupinsulensis*	-	-	-	S3
Seaside dragonlet	*Erythrodiplax berenice*	-	-	-	S3S4
Southern pygmy clubtail	*Lanthus vernalis*	-	-	-	S3S4
Spot-winged glider	*Pantala hymenaea*	-	-	-	S2?B
Tidewater mucket	*Atlanticoncha ochracea*	-	-	-	S1
Triangle floater	*Alasmidonta undulata*	-	-	-	S2S3
Vernal bluet	*Enallagma vernale*	-	-	-	S3
Williamson's emerald	*Somatochlora williamsoni*	-	-	-	S2S3

Source: (ACCDC, 2025a)
(1) Invertebrates with at least one aquatic life stage brought forward (i.e., larvae, etc.)

7.3.1.7 Drone and GIS Model Results

Eight watercourses were identified within the Assessment Area via the GIS model and droning (Drawing 7.16 A to 7.16N; Appendix G) including, intermittent (two), small permanent (five), and large permanent (one) watercourses. Due to the different methodologies and results in delineation, drone watercourses and modelled watercourses were later separated from the field assessed watercourses. Many of the modelled watercourses were extensions of those delineated by field staff and therefore were associated with the in-situ water parameters from the field delineated portion of the watercourses.

7.3.1.8 Field Assessment Results

Watercourse Assessment

A total of 69 watercourses were identified and verified within the Assessment Area (Drawing 7.16A to 7.16N; Appendix G) including, intermittent (19), small permanent (37), and large permanent (13) features ranging in channel width from 0.86 m to 12 m (Table 7.26). Two additional large permanent watercourses were delineated based on aerial imagery. There were no incidental observations of aquatic SAR identified during the watercourse assessment. The potential turtle habitat is described in Section 7.4.3.

Table 7.26: Watercourses Characteristics within the Assessment Area

WC ID	Flow	Velocity (m/s)[1]	Length (m)	Average Channel Width (m)[2]	Depth (m) Range	Substrate	Habitat Types	Bank Stability
WC1	Intermittent	0.00	72	0.86	0.06-0.14	Dominant: Cobble Sub-dominant: Sand	Pool, Run	Low
WC2	Small Perennial	0.32	221	1.43	0.18-0.26	Dominant: Boulder Sub-dominant: Cobble	Riffle, Pool, Run	High
WC3	Small Perennial	0.30	223	1.02	0.15-0.26	Dominant: Fines/Muck Sub-dominant: Gravel	Pool, Riffle, Run	Moderate
WC4	Intermittent	0.00-0.15	357	0.99-2.07	0.05-0.09	Dominant: Cobbles, Gravel Sub-dominant: Bedrock, Boulder, Cobbles, Gravel, Sand, Silt, Muck	Run	Moderate
WC5	Small Perennial	0.15-0.29	122	3.40-3.90	0.09-0.22	Dominant: Bedrock Sub-dominant: Boulder, Rubble, Cobbles, Gravel	Riffle-run, Pool, No Defined Channel	Moderate
WC6	Small Perennial	0.13	201	1.64	0.28-0.40	Dominant: Cobble Sub-dominant: Gravel	Riffle, Run	High
WC7	Small Perennial	0.35	182	1.85	0.08-0.27	Dominant: Gravel Sub-dominant: Cobble	Pool, Run, Riffle	Moderate
WC8	Small Perennial	0.50-1.00	42	1.50-2.50	0.10-0.30	Dominant: Muck Sub-dominant: Rubble, Cobbles, Clay/Mud	Riffle, Run, Pool	Moderate
WC9	Small Perennial	0.05	477	3.10-4.00	0.26-0.43	Dominant: Cobbles Sub-dominant: Boulder, Rubble, Gravel, Muck	Flat, Pool	Moderate
WC10	Small Perennial	1.63	71	3.00	0.35-1.15	Dominant: Fines/Muck Sub-dominant: Cobble	Pool, Run	Moderate
WC11	Small Perennial	0.05-0.12	129	1.20-2.10	0.19-0.25	Dominant: Cobbles, Gravel Sub-dominant: Boulder, Rubble	Riffle-run, Pool	Moderate
WC12	Intermittent	0.50-0.75	175	0.50-2.50	0.15-0.35	Dominant: Muck Sub-dominant: Rubble, Cobbles, Clay/Mud	Step-pool	Moderate
WC13	Small Perennial	0.15	168	1.90	0.09-0.24	Dominant: Fines/Muck Sub-dominant: boulder	Riffle	Moderate
WC14	Intermittent	0.05	194	1.20-1.80	0.06-0.26	Dominant: Muck Sub-dominant: Rubble, Cobbles	Flat, Riffle	Moderate

WC ID	Flow	Velocity (m/s)[1]	Length (m)	Average Channel Width (m)[2]	Depth (m) Range	Substrate	Habitat Types	Bank Stability
WC15	Intermittent	0.01-0.06	185	1.55-3.20	0.12-0.31	Dominant: Gravel Sub-dominant: Bedrock, Boulder, Rubble, Cobbles, Sand, Silt, Clay/Mud, Muck	Riffle, Run, Flat	Moderate
WC16	Small Perennial	0.50-1.00	137	1.50-3.00	0.10-0.20	Dominant: Rubble Sub-dominant: Boulder, Cobbles, Grave, Muck	Riffle-run, Cascade	High
WC17	Intermittent	0.01	298	1.30-3.12	0.11-0.63	Dominant: Silt, Muck	Flat, Pool, No Defined Channel	Moderate
WC18	Small Perennial	0.02-0.10	145	1.20-2.56	0.06-0.35	Dominant: Bedrock Sub-dominant: Boulder, Rubble, Cobbles, Gravel, Sand, Silt, Clay/Mud, Muck	Riffle, Run, Flat	Moderate
WC19	Large Perennial	0.05-0.53	198	2.50-6.00	0.15-1.50	Dominant: Boulder Sub-dominant: Bedrock, Rubble, Cobbles, Gravel, Sand, Muck	Riffle-run, Pool, Braided Channel	High
WC20	Intermittent	0.05-1.00	210	2.50-3.00	0.10-0.25	Dominant: Muck Sub-dominant: Gravel, Clay/Mud	No Defined Channel, Pool	Moderate
WC21	Large Perennial	0.61	117	1.87	0.32-0.35	Dominant: Cobble Sub-dominant: Boulder	Run	Low
WC22	Large Perennial	0.00	291	7.00	0.90-1.20	Dominant: Fines/Muck	Riffle, Pool, Run	Low
WC23	Large Perennial	4.00	86	10.00	0.20-0.45	Dominant: Cobbles Sub-dominant: Boulder, Rubble, Muck	Run, Riffle	Moderate
WC24	Small Perennial	0.19	117	4.65	0.11-0.41	Dominant: Boulder Sub-dominant: Cobble	Riffle	Moderate
WC25	Large Perennial	~1.0	284	11.00	0.18-0.70	Dominant: Boulders Sub-dominant: Fines/Muck	Rapids, Run, Riffle	High
WC26	Small Perennial	0.57	327	4.27	0.12-0.26	Dominant: Cobble Sub-dominant: Boulder	Pool, Riffle, Run	High
WC27	Intermittent	0.00-0.14	172	0.70-3.00	0.25-0.70	Dominant: Muck	Flat, Run	Low

WC ID	Flow	Velocity (m/s)[1]	Length (m)	Average Channel Width (m)[2]	Depth (m) Range	Substrate	Habitat Types	Bank Stability
WC28	Large Perennial	0.05-1.00	190	5.00-12.00	0.45-0.75	Dominant: Rubble/Cobbles Sub-dominant: Boulder, Clay/Mud, Muck	Riffle, Pool	Moderate
WC29	Small Perennial	0.05	296	2.00-3.00	0.08-0.19	Dominant: Gravel Sub-dominant: Rubble, Cobbles, Sand, Muck	Flat, Pool, Run	Moderate
WC30	Small Perennial	0.16	128	1.06	0.03-0.15	Dominant: Cobble Sub-dominant: Fines/Muck	Pool, Run	Moderate
WC31	Large Perennial	0.00	32	6.67	0.10-0.46	Dominant: Fines/Muck Sub-dominant: Boulder	Flat	Moderate
WC32	Intermittent	0.50-1.00	145	1.50-3.00	0.10-0.20	Dominant: Muck Sub-dominant: Rubble, Cobbles, Gravel, Clay/Mud	Riffle-run, Pool	Moderate
WC33	Small Perennial	3.94	69	1.32	0.01-0.02	Dominant: Gravel Sub-dominant: Sand	Riffle	Moderate
WC34	Large Perennial	0.05	240	20.00+	1.00+	Dominant: Muck	Flat	Moderate
WC35[3]	Small Perennial	N/A	126	N/A	<5.00	N/A	N/A	N/A
WC36	Intermittent	0.05-0.06	265	1.2-1.75	0.06-0.45	Dominant: Rubble, Cobbles Sub-dominant: Gravel, Muck	Flat, Pool, Riffle	Moderate
WC37	Intermittent	0.00-0.02	197	1.10-1.65	0.07-0.13	Dominant: Clay/Mud Sub-dominant: Cobbles, Muck	Flat, Run	Low
WC38	Large Perennial	0.03-0.10	291	10.00-20.00	1.00+	Dominant: Muck Sub-dominant: Boulder	Flat	Moderate
WC39	Small Perennial	0.00	142	3.00	0.48-0.91	Dominant: Fines/Muck Sub-dominant: Boulder	Run, Pool	Moderate
WC40	Small Perennial	0.00	206	0.89	0.08-0.19	Dominant: Fines/Muck Sub-dominant: Cobble	Run	Moderate
WC41	Intermittent	0.05	21	1.00-1.10	0.07-0.11	Dominant: Cobbles Sub-dominant: Rubble, Sand, Muck	Run	Moderate
WC42	Intermittent	0.00	110	0.57	0.15-0.28	Dominant: Fines/Muck Sub-dominant: Gravel	Flat, Run, Riffle	High

WC ID	Flow	Velocity (m/s)[1]	Length (m)	Average Channel Width (m)[2]	Depth (m) Range	Substrate	Habitat Types	Bank Stability
WC43	Small Perennial	0.70	147	2.80	0.07-0.24	Dominant: Gravel Sub-dominant: Cobble	Pool, Riffle, Run	Moderate
WC44	Small Perennial	0.06	79	2.00	0.00-0.13	Dominant: Cobble Sub-dominant: Gravel	Pool, Run, Riffle	High
WC45	Small Perennial	0.25	131	2.20	0.06-0.20	Dominant: Cobble Sub-dominant: Boulder	Run	Moderate
WC46	Intermittent	0.00	194	1.50-1.85	0.10-0.20	Dominant: Muck Sub-dominant: Cobbles	Flat	High
WC47	Small Perennial	0.00	68	1.38	0.05-0.16	Dominant: Cobble Sub-dominant: Gravel	Run	Moderate
WC48	Small Perennial	0.88	117	2.00	0.07-0.25	Dominant: Gravel Sub-dominant: Cobble	Riffle, Run	High
WC49	Small Perennial	0.09	115	3.50	0.22-0.42	Dominant: Gravel Sub-dominant: Sand	Run	High
WC50	Small Perennial	0.25-0.50	128	2.95-4.48	0.50-1.25	Dominant: Rubble Sub-dominant: Boulder, Cobbles, Gravel	Riffle-run	High
WC51	Small Perennial	0.45-0.6	202	3.10-4.15	0.15-0.60	Dominant: Rubble Sub-dominant: Boulder, Cobbles, Gravel	Riffle-run	Moderate
WC52	Large Perennial	0.24	127	5.00	0.11	Dominant: Bedrock Sub-dominant: Boulder	Pool, Riffle, Run	High
WC53	Small Perennial	0.51	109	1.91	0.04-0.15	Dominant: Gravel Sub-dominant: Sand	Pool, Riffle, Run	Moderate
WC54	Large Perennial	0.22	106	12.00	0.39	Dominant: Sub-dominant:	Pool, Riffle, Run	High
WC55	Intermittent	0.04-0.20	191	1.34-3.51	0.12-0.25	Dominant: Muck Sub-dominant: Cobbles, Sand	Riffle-run, Run	High
WC56	Intermittent	0.06	207	1.14	0.18-0.23	Dominant: Fines/Muck Sub-dominant: Sand	Run, Riffle	Low

WC ID	Flow	Velocity (m/s)[1]	Length (m)	Average Channel Width (m)[2]	Depth (m) Range	Substrate	Habitat Types	Bank Stability
WC57	Intermittent	0.00	133	0.30-0.80	0.01-0.09	Dominant: Muck Sub-dominant: Cobbles	Flat, No Defined Channel	Low
WC58	Small Perennial	0.50-1.50	71	1.50-3.00	0.10-0.40	Dominant: Gravel Sub-dominant: Rubble, Cobbles, Clay/Mud, Muck	Riffle-run, Pool, No Defined Channel	Moderate
WC59	Intermittent	0.10	116	1.86	0.16-0.23	Dominant: Fines/Muck Sub-dominant: Sand	Riffle	Moderate
WC60	Small Perennial	1.50-2.00	228	1.20-2.50	0.08-0.10	Dominant: Cobbles/Gravel Sub-dominant: Rubble, Muck	Riffle-run, Pool, No Defined Channel	Moderate
WC61	Small Perennial	0.24	202	1.42	0.15-0.45	Dominant: Gravel Sub-dominant: Cobble	Riffle, Run	Moderate
WC62	Small Perennial	0.36	190	2.14	0.02-0.09	Dominant: Bedrock Sub-dominant: Gravel	Riffle, Pool	High
WC63	Intermittent	0.00	127	0.45-0.60	0.09-0.11	Dominant: Muck	Flat	Moderate
WC64	Small Perennial	1.09	213	3.40	0.15-0.64	Dominant: Cobble Sub-dominant: Gravel	Rapids, Run, Pool	High
WC65	Small Perennial	0.20	172	4.80	0.00-0.32	Dominant: Sand Sub-dominant: Gravel	Riffle, Pool	High
WC66	Small Perennial	0.06	548	0.92	0.31-0.39	Dominant: Gravel Sub-dominant: Cobble	Pool, Run	High
WC67	Small Perennial	0.13	204	0.69	0.06-0.17	Dominant: Cobble Sub-dominant: Gravel	Pool, Riffle, Run	Moderate
WC68[3]	Large Perennial	-	-	-	-	-	-	-
WC69[3]	Large Perennial	-	-	-	-	-	-	-

[1] Watercourses assessed in 2023 only had one velocity measurement recorded, in 2025 more measurements collected providing a velocity range.
[2] Watercourses assessed in 2023 only had one bankfull measurement recorded, in 2025 more measurements collected providing a bankfull range.
[3] Watercourse was modelled using GIS

Perennial, or permanent, features see flow for the vast majority, if not the entirety of the year. Their continuous flow is often attributed to their direct connection to stable sources of water, including lakes and groundwater springs (US EPA, 2013). Small permanent features include streams, brooks, and creeks. These features are often first- and second-order streams fed by springs, groundwater, and run-off, and often act as tributaries to larger features, creating larger permanent features at their confluence. Large permanent features often exhibit lower flow path gradients, larger channel dimensions, and an increased flow (US EPA, 2013).

Intermittent watercourses observe variances in consistent flow throughout the year, either due to changes in their water source in other abiotic factors such as temperature or geological properties (Buttle et al., 2012). Intermittent watercourses are often first and second order streams fed by lakes, wetlands, springs, groundwater, and run-off. They are often episodic and flow more prominently following rainfall events and snowmelt conditions. Intermittent flow can occur underground as well as above the water table, along the surface. These features also differ in that they can observe partial channelization but will often enter below the surface (Buttle et al., 2012).

Ephemeral features are often surface water flows and only present following snowmelt periods or rainfall events. These conditions are the sole sources of stream flow present in many of these features and as a result, their flow is always observed above the water table near the surface. In Nova Scotia, and within the Study Area, ephemeral conditions can also be observed between and within wetlands which are sometimes referred to as “wetland corridors.”

Several of the identified watercourses within the Assessment Area showed evidence of alteration resulting from anthropogenic development activities throughout the last century. For example, many watercourses have been disrupted through the installation of culverts or bridges to facilitate forestry activities and other land uses within the Study Area. Further, forestry activities have also indirectly impacted watercourses through a decrease in evapotranspiration, a decrease in shaded areas, and an increased displacement of organic material and sediment through surface erosion and overland flow.

Electrofishing Surveys

Qualitative electrofishing was conducted during summer 2023 along nine different watercourses within the St. Francis watershed and Melford Brook by certified Strum field staff. All watercourses were selected to provide a better understanding of the general species found within the Study Area. The electrofishing site along Marine Drive was the only watercourse of the nine to be outside of the Study Area but was selected based on similar habitat types and its hydrological connection to watercourses within and in proximity to the Study Area boundary. WC76 and Melford Brook are outside the Assessment Area but within the Study Area.

The electrofishing site near Middletown Road yielded no fish observances and had poor water quality characteristics. Field crews later identified the stream as wetland drainage from one of the larger wetlands further upstream in the Study Area. All in-situ water chemistry results acquired during the electrofishing surveys are shown in Table 7.28. Electrofishing survey results are provided in Table 7.27.

Table 7.27: Electrofishing Survey Results

Site	Secondary Watershed	Survey Date	Coordinates (UTM)		Fish Species Collected		Catch Per Species	Total Catch
			Easting	Northing	Common Name	Scientific Name		
WC16	Melford Brook (1ER-2)	July 7, 2023	631347	5043225	Brook trout	*Salvelinus fontinalis*	10	11
					American eel	*Anguilla rostrata*	1	
WC45 (Meadow Brook)	Shore Direct (1ER-SD5)	July 18, 2023	629057	5039234	American eel	*Anguilla rostrata*	8	15
					Brook trout	*Salvelinus fontinalis*	7	
WC52 (St. Francis Harbour River)	St. Francis Harbour River (1ER-3)	July 20, 2023	624038	5038590	American eel	*Anguilla rostrata*	9	10
					Brown trout	*Salmo trutta*	1	
WC64	St. Francis Harbour River (1ER-3)	July 18, 2023	627204	5038090	American eel	*Anguilla rostrata*	6	11
					Brook trout	*Salvelinus fontinalis*	5	
WC65[(1)]	St. Francis Harbour River (1ER-3)	July 5, 2023	623559	5037966	Brown trout	*Salmo trutta*	1	1
		July 17, 2023			American eel	*Anguilla rostrata*	5	8
					Brook trout	*Salvelinus fontinalis*	3	
WC66	St. Francis Harbour River (1ER-3)	July 6, 2023	626418	5038071	Brook trout	*Salvelinus fontinalis*	10	10
Marine Drive	Shore Direct (1ER-SD2)	July 5, 2023	630584	5044603	American eel	*Anguilla rostrata*	1	12
					Brown trout	*Salmo trutta*	11	

Site	Secondary Watershed	Survey Date	Coordinates (UTM)		Fish Species Collected		Catch Per Species	Total Catch
			Easting	Northing	Common Name	Scientific Name		
Middletown Road	Melford Brook (1ER-2)	July 7, 2023	530045	5042811	-	-	0	0
Melford Brook	Melford Brook (1ER-2)	July 6, 2023	531958	5043694	American eel	*Anguilla rostrata*	7	30
					Brook trout	*Salvelinus fontinalis*	7	
					Brown trout	*Salmo trutta*	11	
					Ninespine stickleback	*Pungitius pungitius*	5	

(1) Due to hazardous conditions following a significant rainfall event in early July 2023, the water velocity was too high to carry out electrofishing safely and efficiently at WC65. The field crew retrieved one brown trout through two passes and elected to return later in the field season when water levels would be at a more manageable level, as the watercourse displayed great potential habitat and good in-situ water chemistry.

The electrofishing surveys resulted in 43 brook trout (*Salvelinus fontinalis*), 28 American eel (*Anguilla rostrata*), 24 brown trout (*Salmo trutta*), and five ninespine stickleback (*Pungitius pungitius*) being caught across the nine assessed watercourses (Table 7.27, Drawing 7.18). American eel and brook trout were the only two SAR/SOCI physically identified throughout the Study Area during the electrofishing surveys. American eel were present in seven of the nine assessed watercourses and brook trout were confirmed in eight of the nine assessed watercourses. Individuals of each species were representative of various life stages and sizes. Suitable habitat within the various stream orders was provided throughout the Study Area, with fish being caught both further inland in the higher-order freshwater systems, as well as near the coast in almost estuarine environments. These results aligned with observations made during the watercourse characterization (Table 7.26).

Priority Species

The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a) was utilized to identify any priority species and habitat associated with the Project. SAR and SOCI within 5 km of the Study Area and those observed during field surveys and their respective habitat associations were compared to the habitat present within the Study Area. Only those aquatic SAR or SOCI, and their respective habitats, with potential to interact with the Project have been designated as Project-specific priority species. Interactions may include removal or disturbance of a SAR or SOCI and/or their associated habitat. Priority species include:

- American eel
- Atlantic salmon (Southern Upland Population)
- Brook trout

American Eel

The American eel is listed as ‘Threatened’ under COSEWIC and ‘S3N’ by ACCDC (ACCDC, 2025a). American eel are not listed by SARA or ESA. American eel are a migratory species with life stages in freshwater, estuary, and marine environments (COSEWIC, 2012). Though much is still unknown about the American eel, several studies have shown a temperature preference of around 16.7°C (Blakeslee et al., 2018). American eel spawning occurs in the marine environment at the Sargasso Sea and only once during their lifespan. American eel larvae, known as leptocephali, drift westward towards the coast, where they grow into glass eels and begin to migrate inland to freshwater habitats for maturation (COSEWIC, 2012). Within freshwater habitats, this species of eel is typically found in rivers and lakes, and will readily burrow into mud, sand, fine gravel, cobble, and woody debris. Within marine environments, American eels are commonly associated with protected shallow waters containing submerged vegetation (e.g., eelgrass) and woody debris (COSEWIC, 2012).

American eel was captured within the Study Area during the 2023 electrofishing surveys (Drawing 7.18).

Atlantic Salmon

The Atlantic salmon – Nova Scotia southern upland (NSSU) population is listed as 'Endangered' by COSEWIC and as "S1" by ACCDC (ACCDC, 2025a). NSSU Atlantic salmon are not currently listed under SARA or ESA. NSSU Atlantic salmon are a genetically distinct population of Atlantic salmon that occupy rivers in both the Eastern Shore and South Shore, draining into the Atlantic, as well as Bay of Fundy Rivers south of Cape Split (DFO, 2013).

In general, the freshwater habitat preference of Atlantic salmon includes clear, well-oxygenated waters in streams with bottoms of gravel, cobble, and boulder. Atlantic salmon prefer cool waters, with spawning typically observed in the 4.4°C to 10°C range, and growth typically observed in the 5°C to 19°C range (US Fish and Wildlife Service, 2021a). As temperatures rise above 23°C, habitat potential decreases, and Atlantic salmon will search for deeper and cooler waters. Riffles, rapids, and pools are also necessary components for various life stages, with the preferred depth being in the 10 cm to 40 cm range (US FWS, n.d.). Furthermore, Atlantic salmon prefer a circumneutral pH ranging from 6.5 to 7.5 (MDEP, 2022).

Atlantic salmon species undertake long feeding migrations to the ocean as older juveniles and adults and return to freshwater streams to reproduce. Marine habitat features for NSSU Atlantic salmon have not been identified due to the vast spatial and temporal variations (DFO, 2013). NSSU Atlantic salmon smolts migrate seaward from rivers during May-July and adults return to the rivers in the late fall to spawn (COSEWIC, 2011).

The closest ACCDC observation of Atlantic salmon NSSU subspecies is 11.5 ± 1.0 km from the Study Area (ACCDC, 2025a). No Atlantic salmon were observed or caught within the Study Area; however, they are known to be in the St. Francis Harbour Watershed which intersects with the southwestern portion of the Study Area.

Brook Trout

Brook trout are not listed under federal (SARA) or provincial (ESA) legislation as a SAR; however, they are listed as 'S3' by ACCDC (ACCDC, 2025a). This species of trout is typically found in cold, clear, and well oxygenated rivers and lakes with plenty of shade and gravel substrate (US FWS, 2009). They prefer water temperatures that do not exceed 20°C, though adult fish can tolerate temperatures of up to 25°C for short periods of time. Furthermore, despite being able to reproduce in waters with a pH as low as 4.5, they do best in a pH range of 5.0 to 7.5 (MDNR, 2012).

Brook trout are a migratory species that migrate further inland to rivers and lakes during the fall months to spawn. Sea-run brook trout may spend April to June in marine environments, but migration to marine habitat does not always occur year to year, with some brook trout never entering marine environments (DFO, 1988). In Nova Scotia, brook trout are considered the number one sportfish, with approximately 2 million trout stocked within the province on an annual basis (NSFA, 2005).

Brook trout were captured within the Study Area during the 2023 electrofishing surveys (Drawing 7.18).

In Situ Water Quality

Water quality results are reported and discussed as it relates to the chemical characteristics required for suitable fish habitat. Where applicable, water quality sampling results are measured against the CCME Guidelines for the Protection of Freshwater Aquatic Life (FWAL). Summaries of water quality measurements are presented in Table 7.28. Water quality measurement locations coincide with fish collection locations (Drawing 7.18). The results shown in the tables above generally provide a snapshot of in-situ water quality from select aquatic features in July 2023.

Table 7.28: Results of the In-situ Water Chemistry Analysis Complete for Electrofishing Watercourses within the Study Area

Sampling Locations	Sampling Dates	Water Temperature (ºC)	pH	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)
WC16	July 7, 2023	13.8	3.78	8.49	0.04
WC45 (Meadow Brook)	July 18, 2023	14.0	5.72	12.30	0.03
WC52 (St. Francis Harbour River)	July 20, 2023	16.0	6.05	8.20	0.03
WC64	July 18, 2023	16.2	5.92	9.87	0.03
WC65	July 5, 2023	17.0	5.10	7.57	0.02
	July 17, 2023	18.0	6.10	8.83	0.04
WC66	July 6, 2023	13.7	5.77	8.69	0.03
Marine Drive	July 5, 2023	14.6	5.92	7.68	0.09
Middletown Rd	July 7, 2023	14.0	3.89	4.45	0.04
Melford Brook	July 6, 2023	18.0	5.94	8.60	0.03

mg/L = milligrams per litre

µS/cm = microsiemens per centimeter

Surface water features within the Study Area were found to be temperate. Nova Scotia typically has more acidic freshwater systems with pH ranging from 5 to 9. Two sites, WC 16 and Middletown Road were found to be slightly more acidic with pH ranging from 3.78 to 3.89.

Water temperature affects the metabolic rates and biological activity of aquatic organisms, thus influencing the use of habitat by aquatic biota. There are no CCME guidelines related to temperature and aquatic biota. Temperature preferences of fish vary between species, as well as with size, age, and season. All temperatures recorded are considered within the suitable temperature range for cold-water fish species (<20ºC).

The CCME FWAL guidelines suggest a range of pH from 6.5 to 9.0 is suitable within freshwater habitat to support aquatic health. Kalff (2002) indicates that the loss of fish populations is gradual and depends on fish species, but decline is evident when pH is <6.5. Kalff (2002) further states that a 10% to 20% species loss is apparent when pH <5.5. The pH range for aquatic features sampled within the Study Area was 3.78 to 6.10, with an average pH of 5.42. All of the sampled sites exhibited pH levels below the recommended CCME range for FWAL (6.5 to 9) and four sites exhibited pH so low to expect species loss (<5.5).

The CCME FWAL guidelines establish a minimum recommended concentration of dissolved oxygen (DO) of 9.5 milligrams per litre (mg/L) for early life stages of cold-water biota and 6.5 mg/L for other life stages. For warm-water biota, the CCME guidelines recommend 6.0 mg/L for early life stages, and 5.5 mg/L for all other life stages. DO was recorded in summer of 2023 and ranged from 4.45 to 12.30 mg/L. DO can vary daily and seasonally, as the concentration of oxygen in water is affected by several independent variables including water temperature, atmospheric and hydrostatic pressure, microbial respiration, and growth of aquatic vegetation. It is anticipated that DO levels would likely increase outside of summer low-flow periods as temperatures cool and flows increase.

Conductivity is often used as the baseline for detecting potential sources of pollution and changes in water quality. Significant changes in these parameters could indicate that a discharge or some other source of pollution has entered the aquatic resource. Conductivity level measured within the Study Area are considered typical for Nova Scotia (NSSA, 2014).

7.3.1.9 Effects Assessment

A GIS suitability analysis was conducted to design a Project Footprint that would optimize the placement of Project infrastructure to avoid waterbodies and minimize impacts to watercourses, to the greatest extent possible. The design considered multiple options/configurations of infrastructure components such as roads, transmission lines, a substation, and laydown areas. Further, the Project design utilizes as many pre-existing roads as possible (45%), with 35 km of existing road being used. The Project's detailed design phase may see additional refinements to the Project Footprint and placement of infrastructure which could further reduce interactions with field-identified watercourses within the Assessment Area.

Project-Surface Water and Fish and Fish Habitat Interactions

Project activities, primarily those that involve earth moving, vegetation removal, and road construction have the potential to impact watercourses, and fish and fish habitat (Table 7.29). These potential impacts could include habitat loss, changes to hydrology, and/or displacement of sediment.

Table 7.29: Potential Project-Surface Water, Fish and Fish Habitat Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	-
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	X
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for watercourses includes the Study Area (Drawing 2.1). The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 also apply to watercourses. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of aquatic or fish habitat. No expectation for altered hydrology or impact to fish.
- Low: Small loss of aquatic and fish habitat, with minimal potential for altered hydrology or impact to fish.
- Moderate: Moderate loss of aquatic and fish habitat. Altered hydrology expected but can be managed with routine measures. Impacts to fish will only be experienced by individuals rather than entire populations and can be managed with routine measures.
- High: High loss of aquatic and fish habitat. Altered hydrology expected that would be challenging to manage with routine measures. Impacts to fish will be experienced by entire populations and cannot be managed with routine measures; the population's life history is permanently altered.

Direct Effects

Direct effects to surface water and fish and fish habitat, such as habitat loss and altered hydrology are likely to be most prominent during the construction phase. Effect-specific active management, mitigation, and monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects.

Habitat Loss

The Project design has been optimized to minimize interactions between the Project and watercourses and wetlands that may support fish and fish habitat. However, in areas where watercourse/wetland interactions are unavoidable, there is a potential for habitat loss.

Watercourse alterations (e.g., culvert installations) required for the Project have the potential to impact aquatic habitat. The removal of overhanging vegetation from stream banks decreases shade/cover for fish resulting in increased vulnerability to predators. Likewise, the removal of instream cover, such as coarse woody debris or edge habitat (e.g., undercut banks) can have a negative effect on both fish and aquatic invertebrate habitat (MTO, 2009). Furthermore, alterations to channel morphology including altered substrate composition and interference with sediment transport can also result in aquatic habitat degradation.

A total of 69 watercourses were identified within the Assessment Area. To be conservative, all watercourses identified are presumed to be accessible to fish, even though there may be seasonal restrictions to the intermittent watercourses or permanent barriers downstream preventing fish passage.

Watercourses and waterbodies were identified as a constraint to be avoided in the planning process for the Project layout. As a result, potential interactions with these features and associated fish habitat were avoided to the greatest extent practicable. Therefore, the only predicted direct impact to fish habitat involves road crossings at 40 of the 69 watercourses (58%) within the Assessment Area. Half of these watercourses, 20 out of 40 (50%), contain pre-existing crossings that have declined in efficiency since being installed. Therefore, some areas will see improved hydrology and fish passage with the upgraded crossings.

A summary of the watercourses identified to be directly affected by the Project (i.e., new road crossing or upgrading in existing crossing) is provided in Table 7.30 and Drawing 7.19.

Table 7.30: Direct Effect Summary

Watercourse	Watercourse Type	Existing Alteration Present?	Forecasted Alteration
WC1	Intermittent	Yes, wooden bridge installation for road crossing.	Bridge to be assessed and potentially repaired during road upgrades.
WC2	Small Perennial	None observed.	Structure to be installed for road crossing.

Watercourse	Watercourse Type	Existing Alteration Present?	Forecasted Alteration
WC3	Small Perennial	None observed.	Structure to be installed for road crossing.
WC6	Small Perennial	Yes, metal culvert at road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC7	Small Perennial	Yes, metal culvert at road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC9	Small Perennial	Yes, metal culvert at road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC10	Small Perennial	None observed.	Structure to be installed for road crossing.
WC12	Intermittent	None observed.	Structure to be installed for road crossing. Road to be microsited to avoid multiple crossings.
WC14	Intermittent	None observed.	Structure to be installed for road crossing.
WC16	Small Perennial	Yes, metal culvert at road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC20	Intermittent	None observed.	Structure to be installed for road crossing.
WC21	Large Perennial	None observed.	Structure to be installed for road crossing.
WC23	Large Perennial	Yes, metal culvert at road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC24	Small Perennial	Yes, metal culvert installation for road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC25	Large Perennial	Yes, concrete culvert installation for road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC27	Intermittent	None observed.	Structure to be installed for road crossing.
WC30	Small Perennial	None observed.	Structure to be installed for road crossing.
WC33	Small Perennial	Yes, metal culvert installation for road crossing.	Culvert to be assessed and potentially replaced during road upgrades.

Watercourse	Watercourse Type	Existing Alteration Present?	Forecasted Alteration
WC35	Perennial	This watercourse has not been field assessed. It is assumed to have no existing alteration based on aerial imagery.	Structure to be installed for road crossing.
WC39	Small Perennial	None observed.	Structure to be installed for road crossing.
WC40	Small Perennial	None observed.	Structure to be installed for road crossing.
WC42	Intermittent	None observed.	Structure to be installed for road crossing.
WC43	Small Perennial	None observed.	Structure to be installed for road crossing.
WC44	Small Perennial	Yes, metal culvert installation for road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC45	Small Perennial	Yes, metal culvert installation for road crossing	Culvert to be assessed and potentially replaced during road upgrades.
WC46	Intermittent	None observed.	Structure to be installed for road crossing.
WC47	Small Perennial	Yes, metal culvert installation for road crossing	Culvert to be assessed and potentially replaced during road upgrades.
WC49	Small Perennial	Yes, metal culvert installation for road crossing	Culvert to be assessed and potentially replaced during road upgrades.
WC52	Large Perennial	Yes, wooden bridge installation for road crossing.	Bridge to be assessed and potentially replaced during road upgrades.
WC53	Small Perennial	None observed.	Structure to be installed for road crossing.
WC54	Large Perennial	None observed.	Structure to be installed for road crossing.
WC59	Intermittent	Yes, metal culvert installation for road crossing	Culvert to be assessed and potentially replaced during road upgrades.
WC61	Small Perennial	Yes, metal culvert installation for road crossing	Culvert to be assessed and potentially replaced during road upgrades.

Watercourse	Watercourse Type	Existing Alteration Present?	Forecasted Alteration
WC62	Small Perennial	Yes, metal culvert installation for road crossing	Culvert to be assessed and potentially replaced during road upgrades.
WC64	Small Perennial	Yes, metal culvert installation for road crossing	Culvert to be assessed and potentially replaced during road upgrades.
WC65	Small Perennial	Yes, wooden bridge installation for road crossing.	Bridge to be assessed and potentially repaired during road upgrades.
WC66	Small Perennial	Yes, metal culvert installation for road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC67	Small Perennial	Yes, metal culvert installation for road crossing.	Culvert to be assessed and potentially replaced during road upgrades.
WC68	Large Perennial	None observed.	Structure to be installed for road crossing.
WC69	Large Perennial	None observed.	Structure to be installed for road crossing.

If required, the 40 forecasted alterations would involve upgrades to existing watercourse crossings associated with road upgrades and installation of new crossings associated with new roads. The Proponent will obtain approval under the NSECC watercourse alteration process, as required (NSECC, 2015a). DFO will review the application to determine whether the crossing will result in a HADD of fish habitat. Based on Strum's experience with culvert design, crossing construction, monitoring, and mitigation implementation, it is anticipated that standard design and construction practices can be applied to avoid a HADD determination. No additional direct impacts to watercourses, waterbodies, or wetlands supporting fish habitat are expected.

Indirect Effects

Indirect effects such as erosion and sedimentation or changes in water quantity and quality can be farther reaching, extending outside of the LAA. These effects are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes, and the magnitude at which they are felt. Maintaining 30 m vegetated buffers surrounding any watercourse or wetland, where possible, will assist with mitigating indirect effects on these systems.

Blasting

If required, blasting may result in sensory disturbance to fish, impacting fish behaviour, spawning grounds, and migration patterns. The detonation of explosives near watercourses can produce post-detonation shock waves which involves a rise to a high peak pressure and then a subsequent fall to below ambient hydrostatic pressure. This pressure deficit can cause

impacts in fish (Wright & Hopky, 1998). An overpressure in excess of 100 kilopascals (kPa) can result in effects on fish including damage to the swim bladder in finfish, and potential rupture and hemorrhage to the kidney, liver, spleen and sinus venous. It is also possible that fish eggs and larvae can be damaged (Wright & Hopky, 1998). The degree of damage is related to the type of explosive, size, and pattern of the charges and the distance to the watercourse, depth of water within the watercourse, and species, size and life stage of the fish. Sublethal effects have also been observed including changes in fish behaviour as a result of noise produced during blasting (Wright & Hopky, 1998). Should blasting be required, guidance outlined by Wright and Hopky (1998) will be used to develop a Blast Management Plan. The Blasting Management Plan will be designed to ensure that appropriate setback distances are maintained or mitigations are implemented to protect fish and fish habitat from the potential impacts of blasting.

Erosion and Sedimentation

The mobilization of sediment within aquatic environments can cause shifts in ecological integrity, including changes to the plant species composition, the distribution of primary and secondary producers, and the habitat suitability for vulnerable species (Tilman et al., 1997). Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, routine road maintenance, and daily traffic. However, the highest potential for these effects is related to the construction and upgrading of access roads, and the installation or upgrading of crossing structures. The alteration or removal of riparian vegetation can also result in bank instability and erosion, further exasperating these effects (MTO, 2009).

Changes in Surface Water Quantity

Changes to the amount of flow can alter channel morphology, increase flood potential, cause erosion, and disrupt habitat characteristics that support vulnerable species (MTO, 2009). These impacts could result from the alteration of bank or channel grades for road development, new or upgraded watercourse crossings, the compaction of soil from the heavy machinery required for turbine assembly, or the alteration of channel beds to facilitate the removal and replacement of preexisting infrastructure (e.g., collapsed culverts).

Changes in Surface Water Quality

Changes in the quality of surface water can arise from alterations to the surrounding environment and can include an increase in water temperature from decreased shade, an increase in pollutants from machinery and infrastructure, and the mobilization of sediments (MTO, 2009). Given the dynamic nature of channeling water, effects upon water quality can quickly spread throughout different reaches of the respective watershed.

Mitigation

The following mitigative measures will be implemented to avoid and mitigate any potential effects on watercourses. In addition, the Proponent will develop and implement a Surface Water Management Plan, Erosion and Sediment Control Plan, Blasting Plan, and a site-specific Contingency Plan.

As required, all work completed under the provincial watercourse alteration notification process will be done in accordance with the Nova Scotia Watercourse Alterations Standards and will be executed by a certified Watercourse Alteration Installer/Sizer. For work requiring a watercourse alteration approval, specific and detailed mitigation will be developed and submitted to NSECC as part of the application process.

The following mitigation measures will be implemented:

Habitat Loss

- Educate Project personnel on the sensitivity of aquatic habitat.
- Flag watercourses and avoid impacts to the watercourse and adjacent riparian habitat to the extent possible.
- Obtain watercourse alteration approval from NSECC and adhere to the terms and conditions of the approval, as required.
- Require that the crossing is installed by a certified Watercourse Alteration Installer/Sizer, and designed to avoid any permanent diversion, restriction or blockage of natural flow, such that the hydrologic function of the watercourse is maintained.
    - Follow best management practices during culvert installation (e.g., installation in the dry and following appropriate timing windows, where possible).
- Require that Project activities (fueling included) or removal of vegetation not be conducted within 30 m of any delineated or mapped watercourse, without authorization from NSECC.
- Allow for natural vegetation along the watercourse edge and above the ordinary high-water mark to facilitate the stabilization of the area, and restoration of fish habitat.
- Conduct any work within the bed of a watercourse between June 1 and September 30 to avoid sensitive periods in the life cycles of fish, to better control water flow, and to allow for a faster vegetation period (NSECC, 2015b).
    - Consult with NSECC and DFO if work is required outside of appropriate timing windows.
- Complete a fish rescue, as required, during instream work requiring isolation of flow.

Altered Hydrology

- Plan any construction activities that may impact stream banks and substrate to align with low-flow periods.
- Design necessary alterations in a way that maintains the natural grade of the watercourse, to ensure the hydroperiod remains as it was pre-alteration.

Blasting

- Develop a Blasting Plan, if blasting is required, that is informed by the guidance provided in Wright and Hopky (1998).

Erosion and Sedimentation

- Develop a site-specific Erosion and Sediment Control Plan during the detailed design phase.
    - The plan will target the disturbance to banks (as required) and adjacent land, and will address the type of control structures, proper installation techniques, grading, maintenance and inspection, timing of installation, and vegetation.
- Properly install, monitor, and maintain erosion and sediment control devices.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover).
- Limit the slope and gradient of disturbed areas to minimize the velocity of surface water runoff.
- Minimize surface run-off containing suspended materials or other harmful substances.
- Direct run-off from construction activities away from wetlands and watercourses.

Changes in Surface Water Quantity

- Develop and implement a Surface Water Management Plan.
- Integrate water management systems including diversion and collection ditches, roadside drainage channels, vegetated swales, and stormwater retention ponds.
- Design any necessary alterations in a way that maintains the natural grade of the watercourse, to ensure the hydroperiod remains as it was pre-alteration.
- Fit any watercourse crossings with appropriately sized infrastructure, as prescribed by a certified Watercourse Alteration Installer/Sizer.

Changes in Surface Water Quality

- Maintain 30 m vegetated buffers around watercourses, to the extent possible.
- Integrate outlet protection features to dissipate flow velocities and decrease erosion at the outflow.
- Require that if concrete is to be used, it is pre-cast and cured for at least one week prior to use at a crossing site (NSECC, 2015b).
- Use rock material that is clean, coarse granular, non-ore-bearing, non-watercourse-derived, and non-toxic to aquatic life (NSECC, 2015b).

Monitoring

For crossings subject to provincial notification requirements, visual monitoring will be completed during the installation process to ensure the work is conducted in accordance with the Nova Scotia Watercourse Alteration Activity Standards (NSECC, 2015c). If the crossing requires an approval, monitoring will be determined as part of the permitting process.

A watercourse monitoring plan, if required as part of the permitting phase, may include hydrological, sediment, and stability assessments upstream, downstream, and at the crossing of the watercourse.

Conclusion

After mitigations, residual effects on surface water and fish and fish habitat are characterized as follows:

- Magnitude: Low magnitude as a small loss of fish habitat or impacts to fish behaviour, with minimal potential for altered hydrology may occur as a result of alterations to potential or confirmed fish-bearing watercourses and wetlands.
- Geographic extent: Within the LAA, as direct impacts will occur only within the LAA and indirect impacts are expected to be minimized through the implementation of effect-specific active management and mitigation measures.
- Frequency: A single event, as the direct impacts will occur once, during the construction phase.
- Duration: Short term as the residual effects will be restricted to the construction phase.
- Reversibility: Partially reversible.
- Significance: Not significant.

7.3.2 Wetlands

7.3.2.1 Overview

Wetland assessments were conducted to identify and delineate wetland habitat so that impacts to wetland area and function could be avoided and minimized, to the extent possible. This was achieved by using the following approach:

- Identify wetland habitat in the Study Area using desktop resources.
- Ground-truth and delineate wetland habitat within the Assessment Area.
- Complete functional assessments for delineated wetlands within the Assessment Area.
- Identify the potential for and confirm the presence of Wetlands of Special Significance (WSS) within the Assessment Area.
- Use the results to refine the Project design to avoid/minimize impacts to wetlands, to the extent possible.

7.3.2.2 Regulatory Context

The Nova Scotia Wetland Conservation Policy (NSECC, 2019) outlines a policy goal of no loss of WSS and no net loss in area and function for other wetlands. Wetlands are considered WSS based on the wetland having significant species or species assemblages, high levels of biodiversity, significant hydrological value, or high social or cultural importance. Under this policy, the following wetlands are considered WSS:

- All salt marshes.
- Wetlands that are within or partially within a designated Ramsar site, Provincial Wildlife Management Area (Crown and Provincial lands only), Provincial Park, Nature Reserve, Wilderness Area or lands owned or legally protected by non-government charitable conservation land trusts.

- Intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through the Nova Scotia Eastern Habitat Joint Venture program.
- Wetlands known to support at-risk species as designated under SARA or ESA.
    - This applies only to the portion of the wetland directly supporting species designated as 'Threatened' and/or 'Endangered' (M. Gorman, 2023)
- Wetlands in designated protected water areas as described within Section 106 of the *Environment Act,* S.N.S. 1994-95, c. 1.

Per Section 5 of the *Environment Act,* S.N.S. 1994-95, c. 1, approval from NSECC is required to alter a wetland. Nova Scotia considers a wetland alteration to be any activity that may affect wetland function and habitat. Such activities include, but are not limited to, excavating, flooding, infilling, or draining (Nova Scotia, 1995).

7.3.2.3 Desktop Review

A desktop review for the location and extent of potential wetlands across the Study Area was completed using the following information sources:

- Wetlands Inventory (ECCC, 2024a)
- WSS Database (NSECC, 2020b)
- Nova Scotia Hydrographic Network (ODNS, 2024)
- WAM Database (NSECC, 2022b)
- Nova Scotia Digital Elevation Model (DEM) (GeoNOVA, 2024b)
- Provincial Landscape Viewer (NSNR, 2024e)
- Satellite and aerial imagery

The Wetland Inventory (ECCC, 2024a) identified 234 wetlands within the Study Area, which are classified as: swamp (176), bog or fen (36), unknown (16), marsh (four), and water (two). The wetlands range in size from 0.2 ha to 232 ha (Drawing 7.20).

According to the NSNR WSS database (2020b), there are 13 WSS located within the Study Area. These WSS all overlap with the Mulgrave Hills Nature Reserve and will not be altered by the Project.

The Nova Scotia Hydrographic Network (ODNS, 2024) was used in conjunction with the WAM database (NSECC, 2022b) and DEM layer to further assess the distribution of confirmed and potential wetland habitat within the Study Area. These sources identified potential wet areas and predicted flow based on the assumed depth-to-water generated from digital elevation data (Drawing 7.17). The depth-to-water ranged from 0 m to >10 m from the surface across the Study Area, with the majority of the Study Area being well to moderately-well drained.

The Provincial Landscape Viewer (NSNR, 2024e) was reviewed to confirm the presence of both wetlands and WSS. The results show that the Study Area includes the Mulgrave Hills Nature Reserve (discussed further in Section 7.4.1). According to the Significant Species and Habitats Database layer, there are polygons related to southern upland Atlantic salmon and

several avifauna species (discussed in Sections 7.3.1 and 7.4.5, respectively) but no wetland related polygons (NSNR, 2024f). The results showed no additional wetlands beyond the polygons identified in the NSNR Wetland Inventory.

Wet Area Modelling

Wet area modelling was conducted prior to field surveys to identify target areas with a high likelihood of containing wetlands and guide field surveys. To create the model, an artificial intelligence method known as Deep Learning was used in tandem with GIS to create an improved wet area map of the Study Area.

To train the model, sample wetland data sourced from NSNR was used to create image chips of the predictor variables. These image chips were also able to incorporate the results of the field assessments, thus allowing for further fine tuning of the model. During this process, training loss, validation loss, accuracy, and dice were calculated, all crucial to strengthening the accuracy and validity of the Deep Learning process. That is, once the model was created, it was assessed to ensure reasonable predictions were computed, and field assessment results were utilized to cross check for validation.

The predictor variables used were multiband imagery from a high-resolution satellite, and elevation-based data products derived from the provincial LiDAR. Additionally, terrain preprocessing and elevation surface analysis were completed and conditioned to enhance the output.

The elevation derived data products comprise three groups: hydrology, geomorphometry, and visualization products. These datasets offer unique inputs to the model, incorporating topography and vegetation into the classification while focusing on principal components. Furthermore, these data products inform the model and the Quality Assurance/Quality Control (QA/QC) process.

The results of the desktop review assisted in scoping field studies and were ultimately used to conduct a constraints analysis thus refining turbine/road siting locations to avoid known wetland features to the extent possible.

7.3.2.4 Field Assessment Methodology

General

Wetland field assessments were completed within the Assessment Area between June and September in 2023, 2024, and 2025 due to various changes to the Project layout. Surveys included high-level assessments for hydrology, complemented by in-depth wetland delineations and functional assessments. Wetland surveys were done in conjunction with watercourse assessment surveys (Section 7.3.1).

To accompany wetland field surveys, a list of SAR and SOCI known to occur within the region of the Project was compiled to help with incidental identification. Details of any incidental SAR

or SOCI observations are captured under their respective reporting sections, as applicable to the species observed.

Field Delineations

Strum ecologists surveyed the Assessment Area, delineating and characterizing each wetland identified in accordance with the U.S. Army Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987). Wetland boundaries were determined by confirming the following:

- Presence of hydrophytic (water loving) vegetation.
- Presence of hydrologic conditions which result in periods of flooding, ponding, or saturation during the growing season.
- Presence of hydric soils.

A positive indicator must typically be present for all three parameters to definitively identify any given site as a wetland (Environmental Laboratory, 1987). Field staff walked meandering transects throughout the landscape to look for wet areas. When wetlands were identified, the boundary was flagged, and the spatial boundaries were recorded on iPads using the ESRI software Survey 123.

Identification of Hydrophytic Vegetation

Hydrophytic vegetation is defined as the sum of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produces permanent or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present (Environmental Laboratory, 1987). Hydrophytic vegetation should be the dominant plant type observed in wetland habitat (Environmental Laboratory, 1987).

Dominant plant species observed in each wetland were classified according to indicator status (probability of occurrence in wetlands), in accordance with the U.S. Fish and Wildlife Service National List of Vascular Plant Species that Occur in Wetlands: NE Region (Region 1) (US FWS, 1988) (Table 7.31). These indicators are used as this region most closely resembles the flora and climate regime of Nova Scotia.

Table 7.31: Classification of Wetland-Associated Plant Species

Plant Species Classification	Abbreviation[1]	Probability of Occurring in Wetland
Obligate	OBL	>99%
Facultative Wetland	FACW	66% to 99%
Facultative	FAC	33% to 66%
Facultative Upland	FACU	1% to 33%
Upland	UPL	<1%
No indicator status	NI	Insufficient information to determine status
Plants That Are Not Listed (assumed upland species)	NL	Does not occur in wetlands in any region

Source: (US FWS, 1988)
[1] A '+' or '-' symbol can be added to the classification to indicate greater or lesser probability, respectively, of occurrence in a wetland.

If the majority (greater than 50%) of the dominant vegetation at a data point is classified as obligate (OBL), facultative wetland (FACW), or facultative (FAC), then the location of the data point is considered to be dominated by hydrophytic vegetation.

Identification of Hydric Soils

A hydric soil is formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper layer (USDA, NRCS, 2003). Indicators of the presence of hydric soils include soil colour (gleyed soils and soils with bright mottles and/or low matrix chroma), aquic or preaquic moisture regimes, reducing soil conditions, sulfidic material (odour), soils listed on the hydric soils list, iron and manganese concretions, organic soils (histosols), histic epipedons, high organic content in the surface layer of sandy soils, and organic streaking in sandy soils.

During field surveys, soil pits were excavated to a minimum depth of 40 cm or until (auger) refusal. The soil in each pit was then examined for hydric soil indicators. The matrix colour and mottle colour (if present) of the soil were determined using Munsell Soil Colour Charts.

Determination of Wetland Hydrology

Wetland habitat, by definition, either periodically or permanently has a water table at, near, or above the land surface. To be classified as a wetland, a site should have at least one primary indicator or two secondary indicators of wetland hydrology (Table 7.32). Wetland habitat is assessed for signs of hydrology via visual observations across the area and through the assessment of soil pits.

Table 7.32: Indicators of Wetland Hydrology

Examples of Primary Indicators	Examples of Secondary Indicators
Surface Water	Oxidized Root Channels in the Upper 30 cm
Saturation	Local Soil Survey Data
Sediment Deposition	Dry Season Water Table
Drainage Patterns	Stunted or Stressed Plants
Water-stained Leaves	Drainage Patterns
Sparsely Vegetated Concave Surfaces	Surface Soil Cracks
Hydrogen Sulfide Odor	Moss Trim Lines

Source: As identified in the Nova Scotia Wetland Delineation Data Form (NSECC, 2011c) which has been adapted from the U.S. Army Corps of Engineers form for Northeast-North Central Supplement for use in Nova Scotia (Environmental Laboratory, 1987)

Functional Assessments

Wetland functional assessments were completed for all field-delineated wetlands identified in-season within the Assessment Area. Functional assessments were completed using the Wetland Ecosystems Services Protocol – Atlantic Canada (WESP-AC) evaluation technique Version 2 in 2023 and 2024, and Version 3.3 in 2025 (Adamus, 2021, 2025). The WESP-AC process involves the completion of three forms: a desktop review portion (Office Form) that examines the landscape level aerial conditions to which the wetland is situated, and two field forms identifying biophysical characteristics of the wetland (Field Form) and stressors to the

wetland (Stressors Form), if any. The process serves as a rapid method for assessing individual wetland functions and values. WESP-AC addresses multiple specific functions that wetlands may provide, presented in Table 7.33 (WESP-AC Version 2.0) and Table 7.34 (WESP-AC Version 3.3).

Table 7.33: WESP-AC Version 2 Function Parameters

Grouped Wetland Function	Specific Wetland Functions
Hydrologic Function	Surface Water Storage
Aquatic Support	Aquatic Invertebrate Habitat
	Stream Flow Support
	Organic Nutrient Export
	Water Cooling
Water Quality Support	Sediment Retention & Stabilization
	Phosphorus Retention
	Nitrate Removal & Retention
	Carbon Sequestration
Aquatic Habitat	Anadromous Fish Habitat
	Resident Fish Habitat
	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian and Turtle Habitat
Transition Habitat	Songbird, Raptor, & Mammal Habitat
	Pollinator Habitat
	Native Plant Habitat

Source: (Adamus, 2021)

Table 7.34: WESP-AC Version 3.3 Function Parameters

Grouped Wetland Function	Specific Wetland Functions
Hydrologic Function	Surface Water Storage
Water and Climate Protection	Sediment and Toxicant Retention and Stabilization
	Phosphorus Retention
	Nitrate Removal and Retention
	Carbon Stock Preservation
Aquatic Support	Stream Flow and Temperature Support
	Organic Nutrient Export
	Aquatic Primary Productivity
Aquatic Habitat	Anadromous Fish Habitat
	Resident and Other Fish Habitat
	Waterbird Feeding Habitat
	Waterbird Nesting Habitat
	Amphibian Habitat
Transition Habitat	Raptor and Wetland Songbird Habitat
	Pollinator Habitat
	Native Plant Habitat

Source: (Adamus, 2025)

The specific wetland functions are individually allocated into grouped wetland functions and measured for “functional” and “benefit” scores. Wetland function relates the wetland’s natural ability (i.e., water storage), whereas wetland benefits are benefits of these functions, whether it is ecological, social, or economic. The highest functioning wetlands are those that have both high ‘function’ and ‘benefit’ scores for a given function. WESP-AC enables a comparison to be made between individual wetlands within a province to gain a sense of the importance each has in providing ecosystem services.

In addition to the grouped wetland functions above, WESP-AC Version 2 also measures the following specific wetland functions, however, these are only evaluated by their benefit scores:

- Wetland Condition
- Wetland Risk (i.e., sensitivity to potential impacts)

For each wetland evaluated, the WESP-AC process calculates the overall score for the grouped wetland functions and the specific wetland functions listed in Table 7.34 and Table 7.35. One score each is provided for function and benefit. Scores are ranked as ‘Lower,’ ‘Moderate,’ or ‘Higher’ allowing for analysis of the wetland as compared to calibrated baseline wetland scores in Nova Scotia to date. A ‘Higher’ WESP-AC score means that wetland has a greater capacity to support those processes as compared to other wetlands in the province. A ‘Higher’ WESP-AC score in both the function and benefits category means the wetland supports the natural ecosystem functions and provides services with potentially societal importance.

Additionally, the WESP-AC process assesses the wetland for a determination of WSS based on the functional results. The grouped functions outlined in Table 7.34 and Table 7.35 are further combined into “supergroups” for habitat (Aquatic Habitat and Transition Habitat) and support [Hydrologic, Water Quality Support (Version 2)/Water & Climate Protection (Version 3.3) and Aquatic Support] functions. WSS designation is dependent on a certain combination of ‘moderate’ and ‘high’ scores within these groups.

The WESP-AC functional evaluation technique recognizes that, in many cases, delineation of entire wetlands where they extend beyond a Study Area is not always feasible (e.g., property ownership) or required to complete an appropriate assessment using this tool (NBDELG, 2021). Instead, WESP-AC permits the delimitation of an assessed area, defined as the wetland or portion of wetland physically assessed in the field, while the Office Form considers the broader landscape characteristics and functions that extend beyond the assessed area and/or Study Area.

Drone Surveys

Drone technology was used to survey and characterize wetlands that were inaccessible by foot or presented safety challenges. Drones were employed to provide a cost-effective and efficient means of data collection, offering high-resolution imagery and facilitating the analysis of

otherwise challenging terrain. Strum met with NSECC's wetland specialists on June 8, 2023, to present this approach.

Prior to conducting field surveys, a comprehensive flight plan was created using drone navigation software. This included defining the survey area, establishing optimal flight paths, and specifying the altitude for data acquisition to ensure full coverage of the wetland and minimize the risk of missing critical data points. Once the data was collected, orthomosaic maps were created by stitching together individual images, with an emphasis on correcting for distortions and enhancing the overall quality of the dataset for subsequent analysis.

Drone-derived data was then combined with other geospatial information, including satellite imagery and ground-based measurements, to enhance the overall understanding of the wetland dynamics, ensuring a comprehensive characterization of the surveyed area. Once all the data was integrated, high-level characterizations and boundaries were inferred, providing a nuanced perspective on the features and connectivity of otherwise inaccessible wetlands.

Across various projects, Strum has observed drone surveys carried out using the methodology above to be a conservative assessment approach, typically yielding a slightly larger delineated area than what would be ground-truthed.

7.3.2.5 Field Assessment Results

General

Field surveys completed during 2023, 2024, and 2025 identified 153 field-delineated wetlands, either partially or fully within the final iteration of the Assessment Area (Drawings 7.16A to 7.16N). For coherence, wetlands were given a numerical ID based on the order of their occurrence from north to south. If a wetland was segmented, but segments remained hydrologically connected, the wetland was given the same numeric ID. Detailed results and a photograph log of each wetland are found in Appendix H. As functional assessments were completed across three field seasons, results for those completed using WESP-AC version 2 and WESP-AC version 3.3 are presented separately.

Of the 153 identified wetlands, the most prominent wetland type was swamp (117). The Canadian Wetland Classification System (NWWG, 1997) defines a swamp as a wetland characterized by the dominance of woody vegetation in which the water table is typically at or near the surface or inundates the soil for a significant portion of the growing season. Swamps are often associated with poorly drained or saturated soils, and they provide important habitat for various plant and animal species adapted to wet conditions. Swamps can be further sub-divided into treed swamps or shrub swamps, depending on their physiological makeup.

Of the identified swamps, 74 were classified as treed swamps. Treed swamps are characterized by the presence of trees as the dominant vegetation [>7.5 cm diameter at breast height (DBH)] and an environment that is not as waterlogged as other wetland types, such as shrub swamps or marshes. These wetlands typically experience their highest hydroperiod

during spring and fall precipitation events (NSNR, 2018b). As a result, treed swamps provide deciduous trees [e.g., red maple (*Acer rubrum*) and yellow birch (*Betula alleghaniensis*)] and coniferous trees [e.g., black spruce (*Picea mariana*) and balsam fir (*Abies balsamea*)] the opportunity to establish themselves and adapt to the inconsistent inundation periods (NSNR, 2018b). Typical species composition of the identified treed swamps consisted of cinnamon fern (*Osmundastrum cinnamomeum*), New York fern (*Thelypteris noveboracensis*), two-seeded sedge (*Carex disperma*), bunchberry (*Cornus canadensis*), red spruce (*Picea rubens*), and balsam fir. Surface water was typically not observed, though saturation was often present as identified through the excavation of small soil pits.

An additional 21 identified swamps were classified as shrub swamps. Shrub swamps are dominated by shrubs and smaller woody plants (<7.5 cm DBH, >1 m tall) with a denser understory and tend to form in permanently or seasonally flooded areas where the surface is moist from ground saturation. Trees may be present but are less dominant than in treed swamps. In many cases, shrub swamps eventually transition into treed swamps via succession (NSNR, 2018b). The typical species composition of shrub swamps identified within the Assessment Area included mountain holly (*Ilex mucronatus*), northern wild raisin (*Viburnum nudum var. cassinoides*), sheep laurel (*Kalmia angustifolia*), speckled alder (*Alnus incana*), red maple, and balsam fir. Surface water was more common than within treed swamps, though the temporal extent of the surficial hydroperiod is expected to be seasonal.

The shrub swamps observed throughout the Assessment Area were of both natural origin and the product of extensive forestry activity in the area. In areas of previous harvest, the impacts of reduced interception and evapotranspiration were visible in the form of an increased water yield, including increased soil moisture and increased instances of overland flow and/or water pooling. In such situations, vegetation was often dominated by the dense regeneration of tree species in the early- to mid-successional stage. Typical species included balsam fir, red maple, and yellow birch in the shrub layer, along with bunchberry, three-seeded sedge, and creeping snowberry in the herbaceous layer. Furthermore, in areas where forestry machinery had resulted in soil compaction/displacement, the herbaceous layer was often dominated by ruderal graminoid species such as common wooly bulrush and soft rush.

The remaining 22 swamps were classified as treed/shrub swamp complexes, in which areas containing treed swamp and areas containing shrub swamp were present in one contiguous wetland.

Eight bogs were observed within the Assessment Area. These wetlands are characterized by their poor drainage, accumulation of peat, and dense coverage of either *Sphagnum* moss or graminoids (NSNR, 2018b). Bogs typically have a high water table and receive most of their water from precipitation, resulting in nutrient-poor, acidic environments (NWWG, 1997). This acidity is further compounded due to the release of organic acids that result from the decomposition of *Sphagnum spp.* Typical species composition observed included tawny cottongrass (*Eriophorum virginicum*), small cranberry (*Vaccinium oxycoccos*), dwarf dogberry, northern wild raisin, and black spruce. Trees, when present, were often stunted and scattered throughout.

Four fens were identified within the Assessment Area. Fens typically exhibit more open water than bogs, often with a connection to a watercourse or abutting a lakeshore. They may also receive hydrology from neighbouring uplands. Ultimately, this inundation of water from outside sources facilitates a transfer of nutrients that allow fens to support a wider variety of flora and fauna than bogs (NSNR, 2018b). Typical species assemblages included flat-topped white aster (*Doellingeria umbellate*), soft rush (*Juncus effusus*), yellow birch, and red maple.

Three marshes were observed within the Assessment Area. These wetlands often display more persistent surface water areas that tend to shrink as the growing season progresses. Hydrology can be influenced by various external sources, including precipitation, surface runoff, surface water connections, and groundwater. This diversity of hydrological sources typically fosters a nutrient-rich environment which, when paired with the lack of canopy cover, often facilitates the vigorous growth of herbaceous vegetation (NSNR, 2018b). In many cases, this vigorous growth can lead to the full engulfment of any open water areas, resulting in meadow-like marshes that may be partially or fully inundated. Vegetation composition included sensitive fern (*Onoclea sensibilis*), common woolly bulrush (*Scirpus cyperinus*), broad-leaf cattail (*Typha latifolia*), fringed sedge (*Carex crinita*), and balsam fir.

The remaining two wetlands identified within the Assessment Area were wetland complexes, including bog-swamp, fen-marsh, fen-swamp, and marsh-swamp complexes. These wetlands contained defined areas of each wetland type in one, contiguous wetland.

Drone Surveys

Drone surveys completed during 2023 identified 34 drone-delineated wetlands/wetland segments (DWL) either partially or fully within various iterations of the Assessment Area. Note that five of these DWLs overlap with field-identified wetlands. This was done to strengthen the validity of the drone surveys, allowing field-collected data to be used as a tool for QA/QC. As such, drone surveys identified an additional 29 wetlands/wetland segments (Drawings 7.16A to 7.16N). As the Assessment Area was refined and the number of turbines reduced from 84 to 54, 19 of the 29 identified DWL are outside the final Assessment Area. Detailed characterization and functional assessment results were not collected for the DWL. However, any DWL determined to be impacted by the Project will be ground-truthed for boundaries, characteristics, and functionality prior to any alterations. A summary of the results is provided in Table 7.35.

Table 7.35: Summary of Drone-Identified Wetlands

Wetland ID	Wetland Type(s)	Rationale for Drone Survey
DWL1	Treed Swamp	To QA/QC drone data Overlaps with WL3
DWL2	Treed Swamp	To QA/QC drone data Overlaps with WL6
DWL3	Treed Swamp	Safety concerns associated with unknown ground stability and peat depths Overlaps with WL10

Wetland ID	Wetland Type(s)	Rationale for Drone Survey
DWL4	Treed Swamp, Fen	Safety concerns associated with required watercourse crossing Overlaps with WL57
DWL5	Treed Swamp	Safety concerns associated with required watercourse crossing
DWL6	Fen, Treed Swamp	Safety concerns associated with required hiking distance Overlaps with WL 60
DWL7	Fen, Treed Swamp	Safety concerns associated with required hiking distance
DWL8	Bog, Treed Swamp	To facilitate coverage/Inability to safely access all portions of the wetland Overlaps with WL 75
DWL9	Treed Swamp, Shrub Swamp	Safety concerns associated with treacherous terrain Overlaps with WL 83
DWL10	Treed Swamp	Safety concerns associated with required hiking distance

Functional Assessments – Version 2

Functional assessments using WESP-AC Version 2.0 were completed in 2023 and 2024 by Strum wetland specialists for 113 wetlands located within the Assessment Area. A summary is provided in Table 7.36.

Table 7.36: Summary of WESP-AC Assessments Using Version 2.0 for Wetlands within the Assessment Area

WL ID	WL ID	Hydrologic Group		Water Quality Group		Aquatic Support Group		Aquatic Habitat Group		Transitional Habitat Group		Wetland Condition		Wetland Risk		Average Function	Average Benefits	WSS[1]
		Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL2	251PHJAPN5_FWL-2	6.21	8.23	8.49	3.97	5.56	3.36	6.03	7.69	7.18	8.14	N/A	3.62	N/A	8.10	6.69	6.16	**No**
WL3	1143HPNJA3_FWL-4A	1.23	9.08	2.67	4.03	6.61	6.75	5.06	7.65	7.55	8.16	N/A	7.10	N/A	8.10	4.62	7.27	**No**
WL4	845MMJD1_FWL-3	7.76	8.06	8.98	2.29	4.02	2.76	6.25	7.55	5.17	7.94	N/A	3.04	N/A	6.24	6.44	5.41	**No**
WL5	100PHPNJA2_FWL-4B	7.36	7.78	9.14	4.03	5.11	2.91	4.34	7.66	7.60	8.19	N/A	8.26	N/A	8.10	6.71	6.70	**No**
WL6	1237PHPNJA4_FWL-4C	7.71	8.23	9.11	5.70	4.50	2.82	4.28	7.65	7.43	8.17	N/A	6.52	N/A	7.90	6.61	6.71	**No**
WL7	1416IBPM03	1.52	4.68	3.26	2.01	7.29	6.23	6.02	7.77	8.78	8.29	N/A	3.62	N/A	6.65	5.37	5.61	**No**
WL12	1224JABF02	1.20	3.50	3.84	1.75	6.27	5.16	3.94	1.62	8.49	3.54	N/A	8.26	N/A	5.09	4.75	4.13	**No**
WL13	1555JABF05	3.24	5.30	4.86	1.75	7.47	6.76	4.80	7.79	7.76	8.91	N/A	4.78	N/A	6.72	5.63	6.00	**No**
WL14	1516JABF04	0.49	5.36	4.24	1.94	8.53	7.22	3.82	7.59	8.61	9.69	N/A	8.26	N/A	6.57	5.14	6.66	**No**
WL18	1100JDPN1_FWL-9	4.23	5.53	4.63	3.12	7.08	6.89	5.10	7.67	7.52	8.92	N/A	8.26	N/A	6.52	5.71	6.70	**No**
WL21	1052PHJA_FWL-12A	0.07	8.29	3.26	5.55	6.86	7.00	6.15	7.64	7.48	9.60	N/A	7.10	N/A	6.01	4.76	7.31	**No**
WL22	1300IBPM03	7.47	5.41	7.14	1.93	5.78	0.97	2.09	2.09	8.38	6.98	N/A	10.00	N/A	7.11	6.17	4.93	**No**
WL23	1103mmjd2_FWL-14A	8.28	4.85	7.48	1.96	4.90	0.64	1.87	0.93	7.17	4.63	N/A	6.52	N/A	6.06	5.94	3.66	**No**
WL27	1017BFJAPORA1-FWL-12B	7.12	7.44	8.01	3.98	4.14	3.30	5.42	7.73	8.26	9.73	N/A	7.10	N/A	7.00	6.59	6.61	**No**
WL28	1100IBPM02	8.95	5.36	7.69	1.93	4.51	0.86	2.90	1.39	7.29	5.01	N/A	4.78	N/A	4.80	6.27	3.45	**No**
WL29	303PHJA3_FWL-16	1.11	5.30	3.09	3.92	5.73	6.70	5.46	7.66	7.94	9.67	N/A	8.26	N/A	7.58	4.67	7.01	**No**
WL33	930MMPN9_FWL-18	7.69	4.17	9.10	2.57	3.87	2.87	4.44	7.67	7.79	9.72	N/A	4.78	N/A	7.59	6.58	5.62	**No**
WL34	322MGTRGS1_FWL-19	2.36	4.79	6.25	1.78	7.25	5.45	2.10	2.83	7.87	9.67	N/A	4.78	N/A	6.64	5.17	5.13	**No**
WL35	217MGTRGS3_FWL-22	1.06	4.79	3.18	1.78	7.13	6.21	5.76	7.69	8.41	9.71	N/A	4.78	N/A	6.06	5.11	5.86	**No**
WL39	208DKKM4_FWL-21B	1.85	10.00	2.66	5.50	5.72	8.11	6.52	8.74	8.34	9.75	N/A	7.10	N/A	8.09	5.02	8.18	**No**
WL42	1256JHDCJN1_FWL-25	2.58	4.81	3.21	7.24	5.66	5.92	5.62	7.42	1.57	2.22	N/A	4.78	N/A	4.66	3.73	5.29	**No**
WL43	1501JHDJCN2_FWL-26	6.88	5.04	9.44	2.69	5.89	3.22	5.76	5.20	7.12	6.65	N/A	4.78	N/A	6.51	7.02	4.87	**No**
WL44	225RGMGT7_FWL-27	5.49	4.17	9.21	3.43	5.49	3.24	5.24	7.73	8.90	9.81	N/A	5.94	N/A	8.19	6.87	6.07	**No**
WL46	144MGTRGS6_FWL-28	5.37	4.17	9.23	3.99	5.16	2.72	4.97	7.73	7.88	9.72	N/A	4.78	N/A	7.02	6.52	5.73	**No**
WL47	1049MGTMJMRGS001_FWL-29	2.00	10.00	2.96	5.50	6.14	7.71	6.31	8.73	7.80	9.71	N/A	8.26	N/A	8.09	5.04	8.29	**No**
WL49	950DKKM5_FWL-30	2.40	7.50	4.09	9.69	7.44	8.85	7.08	6.01	9.13	9.77	N/A	8.26	N/A	5.66	6.03	7.96	**No**
WL50	0909DSCNJA1_FWL-31	1.77	3.38	3.06	1.75	5.93	4.82	4.98	5.18	7.49	6.74	N/A	6.52	N/A	3.86	4.65	4.61	**No**
WL51	1128DSCNJA2_FWL-32	1.51	3.38	3.37	1.83	8.92	5.93	6.24	5.28	8.38	7.10	N/A	8.26	N/A	5.15	5.68	5.28	**No**
WL52	1137JHDCJN1_FWL-35	2.14	7.38	3.32	9.62	7.33	9.12	8.14	4.44	2.39	0.74	N/A	3.04	N/A	7.21	4.66	5.94	**No**
WL53	1100RC2	8.92	5.13	8.05	1.78	4.48	0.56	1.60	2.52	6.44	9.53	N/A	6.52	N/A	7.18	5.90	4.75	**No**
WL55	1015RC1	7.91	4.46	7.41	1.96	4.75	0.76	1.99	0.85	8.16	3.51	N/A	5.36	N/A	7.18	6.04	3.44	**No**
WL56	1222JAMMRM_FWL-36	3.51	2.59	3.86	2.02	5.55	3.79	4.93	7.71	7.49	9.70	N/A	4.78	N/A	6.94	5.07	5.36	**No**
WL57	0924JABF01	2.77	4.69	4.09	9.22	8.39	8.90	6.87	5.99	8.98	10.00	N/A	6.52	N/A	7.10	6.22	7.49	**No**
WL58	904MJMRLMJSA_FWL-37	8.07	3.16	8.20	2.08	5.03	0.43	1.61	2.36	5.37	9.45	N/A	6.52	N/A	6.73	5.66	4.39	**No**
WL61	1013RGSMGT4_FWL-40	0.13	8.52	3.25	1.92	6.96	6.61	7.45	5.22	6.52	6.55	N/A	8.26	N/A	6.97	4.86	6.29	**No**
WL62	1109BFSL1_FWL-41A	8.81	6.32	8.17	3.11	5.40	0.53	0.94	2.62	6.37	9.55	N/A	6.52	N/A	5.98	5.94	4.95	**No**

WL ID	WL ID	Hydrologic Group		Water Quality Group		Aquatic Support Group		Aquatic Habitat Group		Transitional Habitat Group		Wetland Condition		Wetland Risk		Average Function	Average Benefits	WSS[1]
		Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL63	1135RGSMGT5_FWL-46	1.17	4.51	3.31	1.78	6.26	5.90	5.65	5.25	7.91	6.99	N/A	3.62	N/A	6.38	4.86	4.92	**No**
WL64	1030MMPN2_FWL-47	7.87	8.29	9.40	4.05	4.09	2.56	4.75	5.30	6.87	9.61	N/A	3.48	N/A	3.71	6.60	5.29	**No**
WL65	1432JHDCJN1_FWL-48A	7.33	3.83	9.26	3.90	4.21	3.75	6.24	5.63	6.44	6.55	N/A	3.04	N/A	4.47	6.70	4.45	**No**
WL66	925MMPN1_FWL-49	8.95	8.06	8.52	4.04	5.83	0.72	2.22	2.57	6.95	9.59	N/A	4.78	N/A	6.47	6.49	5.18	**No**
WL67	1442BMKM01_FWL-50A	7.05	5.30	6.90	7.47	5.33	0.56	1.67	2.50	7.28	9.59	N/A	8.84	N/A	9.35	5.65	6.23	**No**
WL68	333MJMJSARLM003_FWL-51	8.07	4.00	9.38	2.66	3.86	2.03	3.89	7.61	6.63	9.59	N/A	4.78	N/A	5.90	6.37	5.22	**No**
WL70	1125BFSL1_FWL-55	8.95	8.06	8.52	4.04	5.83	0.72	2.22	2.57	6.95	9.59	N/A	4.78	N/A	6.47	6.49	5.18	**No**
WL71	0911JACNDS4_FWL-56	8.53	5.24	7.74	2.66	4.97	0.72	1.85	2.65	7.23	9.61	N/A	4.78	N/A	8.28	6.06	4.85	**No**
WL72	126BFSL2_FWL-57	7.19	6.99	7.36	3.85	6.18	0.77	2.17	2.64	6.52	9.56	N/A	8.26	N/A	5.98	5.88	5.44	**No**
WL73	1100DSJACN4_FWL-50B	1.39	5.30	2.16	2.63	5.82	6.68	4.99	5.58	8.25	9.73	N/A	10.00	N/A	4.45	4.52	6.34	**No**
WL74	1051BFSL1_FWL-59	6.33	6.99	8.78	3.06	7.57	3.49	4.90	5.70	8.91	9.74	N/A	8.26	N/A	5.96	7.30	6.17	**No**
WL76	1513DSMT2_FWL-62	4.73	9.31	5.42	3.95	6.17	5.77	1.78	1.87	6.74	6.58	N/A	4.78	N/A	7.83	4.97	5.73	**No**
WL78	1155BFSL2_FWL-65	0.15	3.55	3.35	9.39	8.73	5.55	4.98	7.71	8.24	9.71	N/A	10.00	N/A	7.58	5.09	7.64	**No**
WL79	1236RLMGJRJHDCJN2_FWL-67	8.16	7.67	9.04	2.50	5.26	4.95	7.43	5.56	7.80	6.92	N/A	3.04	N/A	3.69	7.54	4.90	**No**
WL80	1549JDCN5_FWL-68	3.89	2.48	4.02	2.43	5.12	3.70	5.04	7.70	6.85	9.65	N/A	4.78	N/A	6.52	4.98	5.32	**No**
WL81	1423JDCN4_FWL-69A	7.34	2.37	9.11	5.35	4.63	2.70	5.03	7.62	6.55	9.57	N/A	4.78	N/A	6.59	6.53	5.57	**No**
WL82	1706DSMT3_FWL-70	9.20	9.31	8.03	2.41	5.00	0.62	1.77	1.74	5.96	6.51	N/A	4.78	N/A	6.93	5.99	4.61	**No**
WL83	1133JDCN1_FWL-71	8.71	4.91	8.26	1.56	4.29	0.29	1.37	2.25	5.68	9.46	N/A	4.78	N/A	7.72	5.66	4.42	**No**
WL85	1240RC2	2.57	4.34	4.97	9.22	8.92	7.36	6.03	2.08	9.27	3.60	N/A	6.52	N/A	7.18	6.35	5.76	**No**
WL86	1439JHDCJN2_FWL-48D	7.92	7.38	9.39	4.73	3.68	3.79	6.19	3.37	6.56	4.38	N/A	3.04	N/A	7.55	6.75	4.89	**No**
WL87	1149BMKM01_FWL-73B	10.00	4.17	8.50	7.07	5.57	0.73	2.64	2.50	6.54	9.54	N/A	6.52	N/A	7.71	6.65	5.46	**No**
WL88	1518JABF01	8.53	7.33	7.96	3.11	4.92	0.65	1.72	0.98	6.46	4.49	N/A	3.04	N/A	6.68	5.92	3.75	**No**
WL90	1533RMKM03_FWL-77	9.22	4.06	8.18	2.29	7.22	0.79	2.59	2.57	9.35	9.72	N/A	10.00	N/A	7.59	7.31	5.29	**No**
WL91	223BFSL3_FWL-78	2.57	4.23	4.08	1.80	8.20	5.81	4.78	3.96	8.15	4.20	N/A	8.26	N/A	5.88	5.56	4.88	**No**
WL92	942JHDCJNRLMGJR6_FWL-73C	6.75	4.17	9.32	2.59	4.90	3.87	6.22	5.11	8.87	9.78	N/A	10.00	N/A	6.09	7.21	5.94	**No**
WL93	1209BFSL2_FWL-80	7.76	3.83	9.27	1.88	8.89	5.91	4.75	3.98	8.14	4.16	N/A	8.26	N/A	6.30	7.76	4.90	**No**
WL94	332MGTMJMRGS001_FWL-81A	2.37	4.06	3.49	2.55	5.64	6.65	6.62	3.52	6.83	4.74	N/A	4.78	N/A	3.35	4.99	4.24	**No**
WL96	1058JABF_FWL-82A	2.74	4.77	3.85	2.70	7.72	6.50	5.25	3.02	8.43	5.02	N/A	10.00	N/A	6.33	5.60	5.48	**No**
WL97	0244BMRM04_FWL-85	8.95	4.85	8.54	1.78	6.23	0.75	2.28	1.79	6.32	6.57	N/A	8.26	N/A	6.80	6.46	4.40	**No**
WL99	1250CNPN2_FWL-82B	7.47	6.99	9.08	5.80	4.42	3.50	7.28	7.65	7.14	9.61	N/A	7.10	N/A	5.95	7.08	6.66	**No**
WL100	952RSRK03_FWL-81B	6.35	4.51	9.12	2.01	4.18	4.35	6.26	3.90	8.11	5.12	N/A	6.52	N/A	5.54	6.80	4.56	**No**
WL102	1035CNPN1_FWL-82C	2.70	7.11	4.08	5.57	5.43	5.49	5.63	7.68	7.99	9.74	N/A	8.26	N/A	5.96	5.17	7.12	**No**
WL103	1410RKC2	8.95	4.40	8.14	1.78	4.69	0.37	0.51	1.71	6.19	6.55	N/A	8.26	N/A	7.18	5.70	4.32	**No**
WL105	1426RMKM01_FWL-84B	4.73	7.67	5.12	2.95	5.18	4.25	1.82	1.84	6.67	6.57	N/A	3.62	N/A	7.61	4.70	4.93	**No**
WL106	1335RKC1	7.94	4.06	7.55	2.76	5.40	0.58	1.55	2.55	7.22	8.86	N/A	4.78	N/A	7.83	5.93	4.49	**No**
WL107	1415DSMT5_FWL-89	7.63	6.88	7.92	4.00	3.80	0.44	0.58	1.78	6.43	6.59	N/A	4.78	N/A	6.19	5.27	4.38	**No**
WL109	1525DSMT6_FWL-95	7.63	6.71	7.63	4.00	4.97	0.72	1.97	1.82	6.32	6.58	N/A	4.78	N/A	5.22	5.70	4.26	**No**

WL ID	WL ID	Hydrologic Group		Water Quality Group		Aquatic Support Group		Aquatic Habitat Group		Transitional Habitat Group		Wetland Condition		Wetland Risk		Average Function	Average Benefits	WSS[1]
		Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL110	0951JHDGJRCJNRLM3_FWL-97	7.91	4.57	7.89	3.19	4.30	0.93	3.47	2.56	6.15	9.53	N/A	3.04	N/A	7.23	5.94	4.44	**No**
WL111	1436JHDCJNGJRRLM5_FWL-99A	6.30	4.17	9.35	3.15	4.20	3.90	5.58	8.09	7.67	9.68	N/A	3.04	N/A	5.82	6.62	5.41	**No**
WL112	1035RKCCV1	8.61	3.38	7.80	1.81	4.68	0.63	1.32	0.23	8.08	3.04	N/A	4.78	N/A	7.21	6.10	3.01	**No**
WL114	1149SLJAAM	9.89	5.92	8.60	3.73	6.11	0.68	1.90	0.98	6.32	4.45	N/A	10.00	N/A	7.86	6.56	4.80	**No**
WL115	1412RSPN3_FWL-108A	1.35	3.33	3.19	3.88	7.05	5.18	4.49	5.30	8.00	9.66	N/A	7.10	N/A	8.79	4.82	6.18	**No**
WL116	947RMBM02_FWL-106	1.31	3.67	4.01	9.22	9.28	5.51	5.12	7.65	7.76	9.64	N/A	5.36	N/A	6.84	5.50	6.84	**No**
WL117	1117BFJA1_FWL-109	0.45	3.85	1.78	1.96	7.98	5.04	1.41	2.87	8.74	8.23	N/A	10.00	N/A	6.13	4.07	5.44	**No**
WL118	1059JHDBGMT31_FWL-110	8.36	3.95	9.38	2.48	4.41	3.27	4.69	7.98	8.04	9.70	N/A	8.26	N/A	7.16	6.98	6.11	**No**
WL119	1329RMBM01_FWL-111	2.72	3.67	3.23	1.88	6.45	5.10	4.87	7.64	7.73	9.65	N/A	7.10	N/A	6.59	5.00	5.95	**No**
WL120	1255JADS1_FWL-108B	1.63	3.33	1.75	9.18	6.13	4.61	4.01	5.32	8.48	9.74	N/A	8.26	N/A	8.17	4.40	6.94	**No**
WL121	1448SLPN1_FWL-108C	0.56	3.33	2.35	3.99	6.33	4.86	4.78	5.28	6.42	9.53	N/A	8.26	N/A	9.47	4.09	6.39	**No**
WL122	1512RMBM06_FWL-112	6.35	3.50	9.23	2.36	4.85	2.86	4.68	5.32	7.73	9.69	N/A	6.52	N/A	7.27	6.57	5.36	**No**
WL123	1002PNSL1_FWL-115	3.02	4.23	2.82	3.22	5.15	5.69	6.72	7.58	6.47	9.52	N/A	7.10	N/A	5.77	4.84	6.16	**No**
WL124	1115PNSL2_FWL-114	4.90	4.23	3.84	3.63	5.67	5.28	5.05	7.62	8.00	9.66	N/A	5.94	N/A	8.77	5.49	6.45	**No**
WL125	950MGTMJMRGS002_FWL-119	3.04	4.00	2.95	2.62	6.06	5.11	4.62	7.60	7.26	9.61	N/A	6.52	N/A	6.92	4.79	6.05	**No**
WL127	0943RSLR_FWL-120A	1.49	3.72	4.27	1.94	8.15	5.15	3.94	7.59	8.52	9.72	N/A	8.26	N/A	6.07	5.27	6.06	**No**
WL128	1326RMBM02_FWL-117	1.76	4.23	5.06	9.22	8.30	6.21	6.40	7.76	9.19	9.75	N/A	6.52	N/A	6.07	6.14	7.11	**No**
WL129	1450PNSL3_FWL-124	2.21	3.21	3.57	4.15	6.07	4.65	5.57	5.28	7.23	9.62	N/A	8.26	N/A	8.89	4.93	6.29	**No**
WL130	1534RSLR3_FWL-120B	1.20	4.12	3.12	5.36	7.91	5.57	3.94	7.60	7.60	9.66	N/A	8.26	N/A	6.20	4.75	6.68	**No**
WL131	0929RSLR13_FWL-125	6.69	3.21	9.49	2.66	5.40	3.56	5.72	5.69	8.01	9.72	N/A	8.26	N/A	7.69	7.06	5.83	**No**
WL132	1507RSLR12_FWL-120C	1.07	3.61	3.61	5.46	9.02	5.69	5.10	5.32	8.21	9.68	N/A	7.10	N/A	8.16	5.40	6.43	**No**
WL134	1422PNSL1_FWL-126	8.18	3.21	8.92	3.63	2.66	3.09	7.00	5.25	6.05	9.50	N/A	5.36	N/A	6.08	6.56	5.16	**No**
WL135	1123RMBM05_FWL-121A	5.97	3.33	9.14	1.75	4.63	2.68	4.35	5.30	7.62	9.71	N/A	6.52	N/A	6.09	6.34	5.05	**No**
WL136	1130RSLR10_FWL-130	5.33	7.67	7.92	3.70	4.69	2.69	4.38	7.68	7.73	9.73	N/A	7.10	N/A	7.51	6.01	6.58	**No**
WL137	1245BFJA1_FWL-131	2.81	6.63	4.66	2.26	7.55	5.56	6.05	4.03	9.09	7.06	N/A	10.00	N/A	5.60	6.03	5.88	**No**
WL138	1040PNSL2_FWL-132	2.36	3.21	2.81	5.34	6.66	6.16	6.65	6.26	7.64	9.60	N/A	7.10	N/A	7.60	5.22	6.47	**No**
WL139	0959RSLR1_FWL-133A	8.61	3.27	8.34	2.52	6.04	0.86	2.45	2.70	7.46	9.64	N/A	8.26	N/A	6.81	6.58	4.87	**No**
WL140	1312RSLR11_FWL-134	5.60	5.92	9.27	3.76	5.60	2.71	4.24	7.65	8.69	9.77	N/A	5.94	N/A	7.78	6.68	6.22	**No**
WL141	0944RSLR9_FWL-133B	5.74	2.88	9.30	2.72	5.08	2.25	3.57	7.66	7.90	8.25	N/A	5.36	N/A	6.44	6.32	5.08	**No**
WL143	1333MMJD3_FWL-140A	8.28	3.50	7.83	2.65	4.62	0.59	2.00	1.66	6.90	6.61	N/A	6.52	N/A	5.96	5.93	3.93	**No**
WL144	1227DKAM2_FWL-138B	6.11	9.70	8.28	3.74	4.91	3.01	4.53	7.68	8.25	8.97	N/A	8.26	N/A	8.37	6.42	7.10	**No**
WL145	344BFJA2_FWL-143	6.97	9.25	8.73	2.09	8.06	3.37	5.52	7.74	8.71	9.00	N/A	6.52	N/A	6.33	7.60	6.33	**No**
WL146	1248BMRM03_FWL-140B	0.00	3.27	3.32	2.73	8.71	6.70	5.45	4.68	7.66	6.86	N/A	4.78	N/A	7.53	5.03	5.22	**No**
WL147	415MTLR7	7.74	6.43	6.99	10.00	3.79	0.76	3.01	1.65	6.02	6.55	N/A	1.88	N/A	6.72	5.51	4.86	**No**
WL148	938CNPN1_FWL-151	6.72	2.93	9.28	3.22	7.25	3.41	5.37	5.59	7.56	9.66	N/A	8.26	N/A	7.89	7.24	5.85	**No**
WL149	1146CNPN2_FWL-156	5.77	2.93	8.93	2.76	4.39	3.07	5.98	5.30	7.58	9.68	N/A	7.10	N/A	6.44	6.53	5.33	**No**
WL150	1510RKCCV3	7.77	4.34	7.50	1.78	6.52	0.56	1.86	0.85	6.60	8.89	N/A	3.04	N/A	6.35	6.05	3.69	**No**

WL ID	WL ID	Hydrologic Group		Water Quality Group		Aquatic Support Group		Aquatic Habitat Group		Transitional Habitat Group		Wetland Condition		Wetland Risk		Average Function	Average Benefits	WSS[1]
		Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL151	254DKAM3_FWL-165	1.78	4.96	3.03	2.04	7.04	6.08	4.53	5.54	8.14	9.70	N/A	8.26	N/A	7.82	4.90	6.34	**No**
WL152	1645DSKM8_FWL-168	8.94	2.88	7.79	2.76	5.85	0.86	2.63	2.65	6.71	9.58	N/A	8.26	N/A	6.63	6.38	4.80	**No**
WL153	1417DSKM4_FWL-171A	6.23	2.54	9.24	4.33	4.80	3.12	4.84	5.22	8.11	7.01	N/A	8.26	N/A	8.96	6.64	5.63	**No**
Average Score		**5.19**	**5.21**	**6.38**	**3.67**	**5.91**	**3.78**	**4.36**	**5.05**	**7.43**	**8.18**	**-**	**6.45**	**-**	**6.77**	**5.85**	**5.79**	**0**
Average Rating[2]		**Moderate**	**Moderate**	**Higher**	**Moderate**	**Higher**	**Lower**	**Moderate**	**Higher**	**Higher**	**Moderate**	**-**	**Moderate**	**-**	**Higher**			

[1] Wetlands of Special Significance determination as dictated by the Functional WSS Interpretation Results within the WESP-AC spreadsheet calculator.
[2] Ratings are represented by colours, where red corresponded to a 'lower' rating, yellow corresponds to a 'moderate' rating, and green corresponds to a 'higher' rating.

Hydrological Group

The hydrologic group evaluates the effectiveness of a wetland to store or delay the downslope movement of surface water. However, the model does not account for wetland size, and in turn, the ability of larger wetlands to store more water than smaller wetlands. Wetlands that have the highest benefit scores within this group tend to be located within developed areas, where water storage is more valuable to reduce flood risks.

Wetlands had a mix of lower (39%), moderate (28%), and high (33%) hydrologic function score, and lower (27%), moderate (46%), and high (27%) hydrologic benefit score.

Water Quality Group

The water quality group is compiled from four different functions: sediment retention and stabilization; phosphorus retention; nitrate removal; carbon sequestration. The main function of this group is to evaluate the wetland's potential to intercept, retain, and filter sediments, particulates, and organic matter. Similar to the hydrologic group, the wetlands that have the higher benefit score in this regard include those that do not have a surface water outlet and instead are isolated from flowing surface water. This model also does not account for wetland size and as such, larger wetlands do not necessarily score higher than small wetlands, although size may factor into this function.

A slight majority of wetlands had a high (58%) functional water quality score, and a lower (54%) water quality benefit score.

Aquatic Support Group

The aquatic support group comprises four individual functions: stream flow support; aquatic invertebrate habitat; organic nutrient export; and water cooling. The main function of this group is to determine the wetland's ability to support ecological stream functions that promote habitat health. Wetlands lying adjacent to or containing flowing water score higher than those that do not (e.g., isolated wetlands). Additionally, headwater wetlands are crucial for supporting stream flow during the dry season by contributing to water flow via groundwater input and storage capacity. Headwater wetlands provide stream flow and cooling functions due to their typically limited exposed surface water, insulating properties and groundwater water storage and retention time. Treed swamps can also provide aquatic support through groundwater discharge (e.g., seeps) and vegetation shading.

The majority of wetlands had a moderate (43%) or high (56%) score for the aquatic support functional group, and a slight majority of wetlands had a lower (56%) aquatic support group benefit score.

Aquatic Habitat Group

The aquatic habitat group is compiled from five different functions: anadromous fish habitat, resident fish habitat, amphibian and turtle habitat, waterbird feeding habitat, and waterbird nesting habitat. Wetlands that have the higher functions within this group include those that are adjacent to or contain water features with potential habitat characteristics (e.g., in-stream

cover, aquatic vegetation, etc.). The majority of wetlands (61%) received moderate aquatic habitat functional scores, while aquatic habitat group benefit scores were mostly high (60%).

Transition Habitat Group

The transition habitat group comprises three different functions: songbird, raptor, and mammal habitat, native plant habitat and pollinator habitat. The main function of the collective group is to evaluate the wetland's ability to support healthy habitat for birds, mammals, and native plants. The Study Area has a mix of remote habitat and fragmented or disturbed habitat. The majority of wetlands (74%) scored high on transition habitat function, and (61%) scored high on transition habitat group benefit.

Wetland Condition

Wetland condition refers to the integrity or health of a wetland as defined by its vegetative composition and richness of native species. Scores are derived from the similarity between the wetland being evaluated and reference wetlands of the same type and landscape setting (Adamus, 2021). The wetlands in the Study Area had a range of wetland condition scores with 13% lower scores, 27% moderate scores, and 60% higher scores. The wetlands with moderate to higher ranks contain a relatively good level of ecological integrity and species diversity. Lower ranked wetlands are typically smaller wetlands associated with historic disturbances such as roads, trails, timber harvesting etc., which may be more susceptible to changes in their surroundings.

Wetland Risk

Wetland risk takes sensitivity and stressors into account by averaging the two. Sensitivity is the lack of intrinsic resistance and resilience of the wetland to human or naturally caused stress (Niemi et al., 1990). Stress relates to the degree to which the wetland is or has recently been anthropogenically altered in a way that degrades natural condition and/or function. The functional assessment tool uses five metrics to measure sensitivity: abiotic resistance, biotic resistance, site fertility, availability of colonizers, and growth rate. The model applies four stress groups: hydrologic stress, water quality stress, fragmentation stress, and general disturbance stress. Wetlands that are highly resilient may have lower risk scores despite their exposure to multiple stressors. Additionally, wetlands exposed to fewer threats, but with low resilience may have higher risk scores. Wetland resilience is tied to multiple factors, such as size, proximity to natural land cover, and presence of invasive species.

Most of the wetlands in the Study Area scored moderate (45% of wetlands) or high (51% of wetlands) for wetland risk, meaning they have a reasonable resilience and are not highly susceptible to change. Four wetlands scored lower, indicating a greater risk and susceptibility to anthropological impacts.

Functional Assessments – Version 3.3

Functional assessments using WESP-AC Version 3.3 were completed in 2025 by Strum wetland specialists for 28 wetlands located within the Assessment Area. Nine wetlands were delineated prior to the onset of the 2025 growing season, and therefore functional

assessments will be completed if these wetlands require future alteration. A summary is provided in Table 7.37.

Table 7.37: Summary of WESP-AC Assessments Using Version 3.3 for Wetlands within the Assessment Area

WL ID	WL ID	Hydrologic Group		Water & Climate Protection Group		Aquatic Support Group		Aquatic Habitat Group		Transitional Habitat Group		Average Function	Average Benefits	WSS[1]
		Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits	Function	Benefits			
WL1	1317DSSM01	-1.66	0.00	-2.06	0.28	-0.25	3.91	0.38	0.41	1.59	3.11	-0.40	1.54	**No**
WL8	156DSSM07	9.41	6.14	9.54	1.93	1.34	5.06	2.81	1.31	7.82	3.84	6.18	3.66	**No**
WL9	104RCOF04	6.09	4.91	9.22	0.58	1.13	5.02	1.37	1.72	8.12	3.85	5.19	3.22	
WL10	920RCOF02	5.31	5.24	4.82	1.21	7.51	6.86	3.26	1.21	8.44	3.67	5.87	3.64	**No**
WL16	1135RCOF02	2.90	5.53	8.79	11.73	2.13	5.71	1.67	1.80	7.67	3.94	4.63	5.74	**No**
WL24	1056DSSM02	10.00	6.41	9.54	1.26	2.52	5.53	3.37	1.31	8.54	3.74	6.79	3.65	**No**
WL26	1130RCOF02	2.94	7.44	4.52	1.38	6.61	6.27	2.50	2.76	8.27	9.06	4.97	5.38	**No**
WL30	124RCOF03	0.63	7.16	3.38	1.39	7.94	6.75	5.58	1.33	8.94	2.90	5.29	3.91	**No**
WL32	257RCOF05	5.31	2.75	3.64	2.87	7.59	5.40	1.28	1.97	7.28	5.81	5.02	3.76	**No**
WL37	1044DSSM06	9.01	10.08	9.66	1.11	0.51	4.95	2.90	1.32	7.62	3.82	5.94	4.26	**No**
WL38	251DSSM04	4.38	6.00	5.30	1.75	6.29	6.80	5.98	6.49	8.83	4.03	6.16	5.01	**No**
WL41	1133RCOF02	7.44	6.20	9.16	2.24	1.03	3.29	1.07	3.00	6.90	9.19	5.12	4.78	**No**
WL45	1019RCOF01	4.66	6.99	9.74	2.52	2.85	3.36	2.45	2.27	8.17	5.81	5.57	4.19	**No**
WL48	316DSSM03	1.79	7.62	3.39	5.25	8.10	7.29	7.46	6.58	8.79	5.58	5.91	6.46	**No**
WL54	525PNUM5	0.76	7.53	4.08	11.73	8.26	5.92	5.47	6.44	7.83	5.53	5.28	7.43	**No**
WL59	217RCOF03	7.44	5.02	9.16	1.22	1.72	5.27	2.83	2.37	8.00	9.00	5.83	4.58	**No**
WL60	922RCOF01	6.09	5.13	9.12	0.57	0.48	5.49	3.85	2.83	8.09	3.74	5.53	3.55	**No**
WL69	900ONUM1	3.93	4.74	3.70	1.23	6.54	7.77	7.06	8.10	8.31	9.00	5.91	6.17	**No**
WL75	1045PNUM2	7.28	4.33	9.22	2.35	2.18	2.56	1.40	1.77	7.92	3.75	5.60	2.95	**No**
WL84	240PNUM4	7.29	4.56	9.75	2.34	5.29	3.77	5.84	6.33	8.78	3.76	7.39	4.15	**No**
WL89	145PNUM3	7.29	4.56	9.75	2.34	5.29	3.75	5.75	6.49	8.77	3.76	7.37	4.18	**No**
WL95	230PNUM4	3.91	7.58	3.83	2.08	6.61	6.53	6.17	6.27	8.21	2.78	5.75	5.05	**No**
WL98	1205PNUM3	7.09	8.12	9.82	2.06	3.92	5.52	5.48	6.23	8.63	3.73	6.99	5.13	**No**
WL104	850PNUM1	7.20	5.91	9.81	2.59	2.31	5.60	5.13	6.48	8.88	2.86	6.67	4.69	**No**
WL108	519PNUM2	4.06	5.82	4.15	2.72	5.11	6.45	4.30	8.13	7.74	3.98	5.07	5.42	**No**
WL113	1150PNUM2	7.55	3.72	9.90	1.27	3.57	4.40	4.46	6.40	8.73	2.75	6.84	3.71	**No**
WL126	222PNUM1	6.55	5.19	9.59	2.29	2.21	5.27	5.83	6.94	8.76	2.80	6.59	4.50	**No**
WL133	1122RCOF02	0.69	4.96	3.49	1.48	8.21	5.11	5.53	3.00	8.93	9.10	5.37	4.73	**No**
Average Score		**5.19**	**5.70**	**6.93**	**2.56**	**4.18**	**5.34**	**3.97**	**3.97**	**8.02**	**4.82**	**5.66**	**4.48**	**0**
Average Rating[2]		**Moderate**	**Moderate**	**Higher**	**Lower**	**Moderate**	**Moderate**	**Moderate**	**Moderate**	**Higher**	**Lower**			

[1] Wetlands of Special Significance determination as dictated by the Functional WSS Interpretation Results within the WESP-AC spreadsheet calculator
[2] Ratings are represented by colours, where red corresponds to a 'lower' rating, yellow corresponds to a 'moderate' rating, and green corresponds to a 'higher' rating.

Hydrologic Group

The hydrologic group evaluates the effectiveness of a wetland to store or delay the downslope movement of surface water. However, the model does not account for wetland size, and in turn, the ability of larger wetlands to store more water than smaller wetlands. Wetlands that have the highest benefit scores within this group tend to be located within developed areas, where water storage is more valuable to reduce flood risks. The majority of the wetlands had a moderate hydrologic function score (64%), and a moderate hydrologic benefit score (61%).

Water and Climate Protection Group

The water quality group is compiled from four different functions: sediment and toxicant retention and stabilization; phosphorus retention; nitrogen removal and retention; and carbon stock preservation. The main function of this group is to evaluate the wetland's potential to intercept, retain, and filter sediments, particulates, and organic matter. Similar to the hydrologic group, the wetlands that have the higher benefit score in this regard include those that do not have a surface water outlet and instead are isolated from flowing surface water. This model also does not account for wetland size and as such, larger wetlands do not necessarily score higher than small wetlands, although size may factor into this function.

The wetlands had a mix of lower (4%) to higher (57%) functional water and climate protection scores, and the majority (89%) had a lower water and climate protection benefit score.

Aquatic Support Group

The aquatic support group comprises four individual functions: stream flow and temperature support; aquatic primary productivity; and organic nutrient export. The main function of this group is to determine the wetland's ability to support ecological stream functions that promote habitat health. Wetlands lying adjacent to or containing flowing water score higher than those that do not (e.g., isolated wetlands). Additionally, headwater wetlands are crucial for supporting stream flow during the dry season by contributing to water flow via groundwater input and storage capacity. Headwater wetlands provide stream flow and cooling functions due to their typically limited exposed surface water, insulating properties and groundwater water storage and retention time. Treed swamps can also provide aquatic support through groundwater discharge (e.g., seeps) and vegetation shading.

Wetlands were mostly split between lower (46%) and higher (36%) scores for the aquatic support functional group, and a majority of wetlands (75%) had a moderate aquatic support group benefit score.

Aquatic Habitat Group

The aquatic habitat group is compiled from five different functions: anadromous fish habitat; resident and other fish habitat; amphibian habitat; waterbird feeding habitat, and waterbird nesting habitat. Wetlands that have the higher functions within this group include those that are adjacent to or contain water features with potential habitat characteristics (e.g., in-stream cover, aquatic vegetation, etc.). The majority of wetlands received a moderate aquatic habitat functional score (54%), while aquatic habitat group benefit scores were mostly lower and higher (29% each).

Transition Habitat Group

The transition habitat group comprises three different functions: songbird, raptor, and mammal habitat, native plant habitat and pollinator habitat. The main function of the collective group is to evaluate the wetland's ability to support healthy habitat for birds, mammals, and native plants. The Study Area has a mix of remote habitat and fragmented or disturbed habitat. All but one wetland scored higher on transition habitat function, while the majority of wetlands (68%) scored lower on transition habitat group benefit.

Wetlands of Special Significance

None of the field-delineated wetlands met the criteria for WSS, as dictated by the Functional WSS Interpretation Results within the WESP-AC spreadsheet calculator. The results of the wetland field assessments were also cross-referenced with breeding bird, vegetation, and lichen survey results, specifically for SAR (listed as endangered or threatened) with habitat requirements tied to wetlands. As a result, nine wetlands were later determined to be potential WSS based on the confirmed presence of SAR (Table 7.38). Official WSS designation will be made by NSECC. Due to the location-sensitive nature of the SAR observed, wetland IDs will be provided to NSECC directly.

Table 7.38: Summary of Field-Identified Potential WSS, as Determined by the Presence of Avifauna SAR

Wetland Type(s)	Rationale for Potential WSS Designation
Treed Swamp	Canada warbler (*Cardellina canadensis*) breeding pair observed in wetland
Treed Swamp	Olive-sided flycatcher (*Contopus cooperi*) heard in wetland
Treed Swamp	Canada warbler heard in wetland
Shrub Swamp, Treed Swamp	Canada warbler heard in wetland
Shrub Swamp	Olive-sided flycatcher heard in wetland
Treed Swamp	Canada warbler heard in wetland
Treed Swamp	Canada warbler (at least two individuals) heard in wetland
Fen, Treed Swamp	Canada warbler heard in wetland
Treed Swamp	Olive-side flycatcher heard in wetland

7.3.2.6 Effects Assessment

Project-Wetland Interactions

Project activities, primarily those that involve earth moving or vegetation removal, have the potential to impact wetlands through habitat removal, disruptions to hydrology, and/or displacement of sediment (Table 7.39).

Table 7.39: Potential Project-Wetland Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X

Project Phase	Potential for Interaction
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Strait Crossing Connection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	X
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for wetlands is the Assessment Area. The RAA for wetlands is the Study Area (Drawing 2.1).

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for wetlands. The VC-specific definition for magnitude is as follows:

- Negligible: No direct loss of wetland habitat or alteration to wetland functions expected.
- Low: Direct loss of wetland habitat, but overall wetland functions remain intact.
- Moderate: Direct loss of wetland habitat and impact to wetland functions, but wetland area loss will not impact the hydrology of the watershed. Where WSS are impacted, adequate general SAR habitat is prevalent elsewhere within the RAA.
- High: Direct loss of wetland habitat and impact to wetland functions; and wetland area loss will affect the hydrology of the watershed and the impacted wetland areas are part of a WSS that provides unique SAR habitat within the RAA.

Direct Effects

Direct effects on wetland habitat and functionality such as habitat loss and changes to hydrology can occur throughout the life of the Project but are likely to be most prominent during construction. Effect-specific active management, mitigation, and monitoring are required to eliminate, mitigate, or otherwise manage the magnitude of these direct effects.

Hydrological Effects

The hydrology of a wetland is one of the most important aspects of its overall structure and function. Project infrastructure within or near a wetland can result in changes in the timing and quantity of flow, potentially impacting species composition, water treatment capabilities, and nutrient export

(Mitsch & Gosselink, 2000). Further, disruption to the hydrology of one area may hinder the hydrological connectivity to other areas, thus resulting in impacts being felt in neighbouring wet areas.

Habitat Loss

Habitat loss can occur both directly (i.e., excavation or infilling) and indirectly (i.e., altered hydrology or canopy cover) from the Project (Trombulak & Frissell, 2000). Loss of habitat can fragment wildlife corridors, potentially isolating species and lowering species richness. Habitat loss can also disrupt vital habitat characteristics that support vulnerable species. Further, the removal or infilling of wetland habitat can impact the hydroperiod of neighbouring wet areas, resulting in farther reaching impacts on habitat quality (Mitsch & Gosselink, 2000).

A GIS suitability analysis was conducted to design a Project Footprint that would optimize the placement of Project infrastructure to avoid and minimize loss of wetland area and function, to the greatest extent possible. A summary of field-delineated and drone-delineated wetlands identified within the Assessment Area (Drawing 7.16A to 7.16N) that are expected to overlap with the Project Footprint are provided in Table 7.40 and 7.41, respectively.

Table 7.40: Habitat Alteration Potential for Field-Delineated Wetlands

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m^2)	Estimated Area of Potential Impact (m^2)	Activity
WL1	Treed Swamp	Partial	12,763	4,946	Road construction
WL2	Treed Swamp	Partial	1,270	538	Road construction
WL3	Treed Swamp	Partial	8,795	436	Road upgrades
WL5	Treed Swamp	Partial	337	17	Road upgrades
WL6	Shrub Swamp, Treed Swamp	Partial	1,805	498	Road upgrades
WL8	Treed Swamp	Full	6,316	67	Road construction
WL12	Bog	Partial	391	355	Road construction
WL13	Treed Swamp	Partial	3,311	868	Road construction
WL17	Treed Swamp	Partial	56,471	2,045	Road construction, transmission line
WL20	Fen	Partial	7,723	444	Road upgrades
WL21	Treed Swamp	Partial	21,848	807	Road upgrades
WL22	Shrub Swamp	Partial	1,561	1,052	Road construction
WL23	Shrub Swamp, Treed Swamp	Partial	4,858	1,749	Road upgrades
WL26	Treed Swamp	Partial	3,499	1,725	Road construction
WL27	Shrub Swamp	Partial	21,268	2,165	Road upgrades, turbine pad construction
WL29	Treed Swamp	Partial	2,727	580	Road upgrades
WL30	Treed Swamp	Partial	1,092	177	Road construction
WL32	Shrub swamp	Partial	514	14	Road upgrades
WL33	Shrub Swamp, Treed Swamp	Partial	1,378	364	Road upgrades
WL35	Treed Swamp	Partial	3,758	684	Road construction
WL38	Treed swamp	Partial	9,174	4,628	Road upgrades

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m^2)	Estimated Area of Potential Impact (m^2)	Activity
WL39	Shrub Swamp, Treed Swamp	Partial	18,420	9,812	Road construction
WL42	Shrub Swamp	Partial	24,605	859	Road construction
WL43	Treed Swamp	Partial	3,292	415	Road construction, turbine pad construction
WL45	Treed Swamp	Partial	2,236	466	Road construction
WL46	Shrub Swamp	Full	185	8	Road construction, turbine pad construction
WL49	Fen, Treed Swamp	Partial	28,771	3,049	Road construction, turbine pad construction
WL52	Treed Swamp	Partial	4,023	1,453	Road construction
WL53	Bog	Partial	822	458	Road construction
WL54	Fen, Marsh	Partial	766	573	Road construction
WL55	Treed Swamp	Full	485	390	Road construction
WL58	Treed Swamp	Full	2,075	494	Road construction, turbine pad construction
WL59	Shrub swamp	Partial	19,774	2,610	Road construction, turbine pad construction
WL62	Bog, Treed Swamp	Partial	1,309	254	Road construction
WL64	Bog, Shrub Swamp	Partial	2,679	638	Road construction
WL65	Bog	Partial	3,015	1,338	Road construction
WL66	Treed Swamp	Partial	435	293	Road construction
WL67	Shrub Swamp	Partial	3,398	1,673	Road upgrades
WL69	Treed swamp	Partial	5,575	176	Road construction, turbine pad construction
WL70	Treed Swamp	Partial	1,835	865	Road construction
WL71	Bog, Treed Swamp	Full	4,914	828	Road construction
WL72	Treed Swamp	Partial	748	204	Road construction
WL74	Shrub Swamp, Treed Swamp	Partial	843	56	Road construction
WL75	Treed Swamp	Partial	12,017	5,953	Road construction
WL77	Treed Swamp; Fen	Partial	25,160	129	Road construction, turbine pad construction
WL78	Shrub Swamp, Treed Swamp	Partial	2,483	1,103	Road construction
WL80	Treed Swamp	Partial	1,210	237	Road upgrades
WL82	Shrub Swamp	Partial	2,497	903	Road construction
WL84	Shrub Swamp	Partial	6,217	3,044	Road construction
WL85	Treed Swamp; Bog	Partial	31,932	3,920	Road construction, turbine pad

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m^2)	Estimated Area of Potential Impact (m^2)	Activity
					construction
WL86	Treed Swamp	Partial	913	350	Road upgrades
WL87	Shrub Swamp	Partial	1,781	838	Road upgrades
WL89	Shrub swamp	Partial	2,058	846	Road construction
WL90	Treed Swamp	Partial	3,102	1,648	Road construction
WL91	Shrub Swamp, Treed Swamp	Partial	565	325	Road construction
WL93	Shrub Swamp, Treed Swamp	Partial	1,734	798	Road construction
WL98	Treed Swamp	Partial	3,646	1,703	Road construction
WL99	Fen, Shrub Swamp	Partial	1,040	556	Road construction
WL100	Fen, Shrub Swamp	Partial	13,017	5,171	Road construction
WL101	Fen	Partial	5,480	2,714	Road construction
WL104	Treed swamp, shrub swamp	Full	843	659	Road construction
WL105	Treed Swamp	Partial	1,813	1,171	Road construction
WL108	Shrub swamp	Partial	964	483	Road upgrades
WL109	Shrub Swamp, Treed Swamp	Partial	8,365	2,723	Road construction
WL110	Treed Swamp	Full	586	79	Road construction
WL113	Treed Swamp	Partial	2,541	1,215	Road construction
WL114	Shrub Swamp, Treed Swamp	Partial	1,729	901	Road construction
WL115	Shrub Swamp, Treed Swamp	Partial	493	54	Road upgrades
WL119	Treed Swamp	Partial	7,250	3,435	Road upgrades
WL121	Shrub Swamp	Partial	1,097	600	Road upgrades
WL122	Treed Swamp	Partial	5,350	1,681	Road upgrades
WL123	Shrub Swamp	Partial	118	118	Road upgrades
WL124	Shrub Swamp, Treed Swamp	Partial	668	309	Road upgrades
WL126	Treed swamp	Partial	3,071	1,564	Road construction
WL128	Fen	Partial	3,488	1,623	Road construction
WL129	Marsh, Treed Swamp	Partial	5,568	2,027	Road upgrades
WL130	Shrub Swamp, Treed Swamp	Partial	2,730	753	Road upgrades
WL131	Fen, Shrub Swamp, Treed Swamp	Partial	2,675	1,166	Road upgrades
WL132	Treed Swamp	Partial	684	335	Road upgrades
WL134	Marsh, Shrub Swamp	Full	220	155	Road upgrades
WL135	Treed Swamp	Partial	12,969	4,966	Road construction
WL136	Treed Swamp	Partial	304	12	Road upgrades
WL138	Shrub Swamp, Treed Swamp	Partial	1,160	310	Road upgrades
WL139	Shrub Swamp, Treed Swamp	Partial	3,495	1,245	Road upgrades
WL140	Fen, Treed Swamp	Partial	8,402	3,455	Road upgrades
WL141	Fen, Treed Swamp	Partial	2,233	649	Road upgrades
WL143	Shrub Swamp, Treed Swamp	Partial	533	190	Road upgrades
WL145	Fen, Treed Swamp	Partial	14,212	1,586	Road upgrades
WL146	Treed Swamp	Partial	464	185	Road upgrades
WL147	Marsh	Partial	177	43	Road upgrades
WL148	Treed Swamp	Partial	164	39	Road upgrades

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m^2)	Estimated Area of Potential Impact (m^2)	Activity
WL149	Shrub Swamp	Full	1,245	474	Road upgrades
WL151	Bog, Treed Swamp	Partial	9,076	542	Road construction
WL153	Treed Swamp	Partial	3,788	1,940	Road construction
Total Estimated Area with Potential Impact				**118,001 m^2**	

Table 7.41: Habitat Alteration Potential for Drone-Delineated Wetlands within the Assessment Area

Wetland ID	Wetland Type	Delineation Extent	Delineated Area (m^2)	Area of Potential Impact (m^2)	Activity
DWL1	Treed Swamp	Partial	2,705	822	Road upgrades
DWL2	Treed Swamp	Partial	1,720	142	Road upgrades
DWL3	Fen, Treed Swamp, Shrub Swamp	Partial	35,859	2,531	Road construction, turbine pad construction
DWL5	Treed Swamp	Partial	2,568	529	Road construction
DWL8	Bog, Treed Swamp	Full	8,068	585	Road construction
Total Estimated Area with Potential Impact				**4,610 m^2**	

The results of the field assessments indicate that there is potential for 82 field delineated Project-wetland interactions and five drone delineated project-wetland interactions comprising partial or complete infills to facilitate Project development. The Proponent prioritized the use of existing disturbed areas, with approximately 44 km of new road being constructed and approximately 35 km of previously existing road being utilized. As such, 31 of the potential alterations would be associated with upgrades to existing roads (if determined to be required during the detailed design phase) and 52 of the potential alterations are associated with the construction of new roads. The remaining four potential alterations stem from the turbine pad, laydown area, and transmission line corridor construction. While most wetlands occurring along the proposed transmission line corridor will not require alteration, one wetland (WL17) may require a small alteration to install a transmission line structure due to the position of the wetland along a bend in the corridor. Many wetlands within the Assessment Area around turbines are expected to be completely avoided through the micrositing of turbines and turbine pads during the detailed design phase.

During the detailed design phase, efforts will be made to microsite turbines further away from wetlands to avoid impacts. Based on approval conditions for other wind farms, approval from NSECC is required to work within 30 m of a wetland, and alteration approval is needed for alterations. In areas where wetland alteration is unavoidable, the detailed design phase, where possible, will refine the layout so that wetland crossings will occur along wetland edges or narrow portions of the wetland and will configure infrastructure in a way to impact as little of the wetland as possible. Furthermore, any necessary wetland crossings will be designed to avoid any permanent diversion, restriction or blockage of natural flow, such that the hydrologic function of the wetland is maintained. Specific details of the crossings will be finalized during the detailed design phase and will be included in the application for wetland alteration.
Provincial wetland data obtained from the Canadian Wetland Inventory (CNWI) (ECCC, 2024a) was

used to estimate the total amount of wetland habitat within the 8,880 ha RAA. An estimated 802 ha of wetland habitat was identified, which equates to approximately 9% of the RAA. Field delineated wetland habitat that may be directly impacted by the Project comprises approximately 12 ha, or 0.14% of the total area within the RAA, which is approximately 1.5% of the potential wetland habitat within the RAA and approximately 1.3% of the wetland habitat in the LAA. Mitigations for loss of wetlands will ensure that the provincial wetland policy of no net loss of wetland habitat and function will be upheld.

Nine wetlands were identified as potential WSS due to the presence of SAR bird species. Of the three potential WSS identified due to the presence of olive-sided flycatcher, two are not expected to require alteration, while the third is adjacent to an existing road that will require upgrades. There is an abundance of modelled suitable habitat for the olive-sided flycatcher identified near the potential WSS, including a large wetland complex. While the SAR bird was observed within this wetland, it is expected that the adjacent area would provide more suitable habitat based on the SAR bird habitat modelling (Section 7.4.5.8)

Of the six potential WSS identified due to the presence of Canada warbler, two are not expected to be altered, two are expected to be altered adjacent to existing roads, and two are expected to be altered to facilitate new road construction. In the locations adjacent to existing roads, road widening is likely to require alteration of the potential WSS in both instances. Abundant modelled habitat is present directly adjacent to the Assessment Area that is part of larger wetland complexes. In those locations where new roads are expected to require alteration of a potential WSS, large wetland complexes and abundant modelled Canada warbler habitat is present adjacent to the Assessment Area.

Where practical, a potential WSS will be avoided through the detailed design process. If the detailed design process requires unavoidable impacts to WSS, the proposed impacts will be minimized and consider, where practical, avoiding portions of the wetlands that provided suitable habitat for the respective SAR bird species.

Indirect Effects

The temporal and spatial extent of indirect effects such as erosion and sedimentation, dust, invasive species, and compaction can be far reaching, but are often foreseeable, and research based, standardized BMPs can be implemented to mitigate the resulting outcomes. Indirect impacts are mitigated by maintaining a vegetated buffer between Project activities and unaltered wetlands.

Erosion and Sedimentation

Erosion and sedimentation can occur throughout the lifecycle of the Project, including during construction efforts, daily traffic, routine road and transmission line right of way (ROW) maintenance. The accumulation of sediment within wetland environments can cause shifts in ecological integrity, including the plant species composition and subsequent nutrient retention potential, hydrological storage capabilities, and habitat suitability for vulnerable species (Tilman et al., 1997). Additionally, the use of road salt for winter maintenance may result in indirect adverse effects on microbial and vegetative wetland communities, including detrimental salinity levels and increased soil erosion due to salt-damaged vegetation (Jones et al., 2017).

Dust

The potential for dust deposition will likely be highest during the construction phase, though the risk will be present throughout the Project's lifecycle. Dust primarily impacts vegetative health, with particle size influencing the scale of the impact (Farmer, 1993). Smaller particulate can result in clogged pores, hindering vital biochemical processes including photosynthesis, respiration, and transpiration; and larger particulate can result in lacerations in plant tissues, thus jeopardizing the health of the plant (Farmer, 1993).

Invasive Species

The colonization of invasive species can result in detrimental impacts on wetland environments, including alterations to evapotranspiration rates, infilling from reduced decomposition rates, and ultimately a reduction in the complexity of the wetland and its subsequent species richness (Zedler & Kercher, 2004). The creation of roadways can act as a vector for invasive species, with the potential for seed dispersal increasing with both vehicular and animal traffic. Further, because many invasive species thrive in disturbed soils, routine maintenance of roadways can provide ideal conditions for their establishment (Trombulak & Frissell, 2000).

Compaction

Compaction can hinder both the vegetative and hydrological structure of a wetland, with a loss of pore space restricting root growth and groundwater infiltration (Duiker, 2004). This impacts the absorption of moisture and nutrients, thus impacting the ecological integrity of the wetland and the ecosystem services it provides. Further, compaction can decrease percolation rates, resulting in prolonged periods of saturation, and increasing the potential for flooding (Duiker, 2004).

Mitigation Measures

The following specific mitigative measures will be implemented to avoid and mitigate any potential effects on wetlands.

Habitat Loss

- Mark wetlands clearly to avoid interference with wetland habitat to the extent possible.
- Avoid impacts to wetlands to the extent possible.
    - Where wetland impacts are unavoidable, wetland alterations will be completed in accordance with the NSECC Wetland Conservation Policy (2019). The wetland alteration process will occur during the permitting stage, which includes a requirement to compensate for lost wetland habitat and functions.
        - Adhere to the terms and conditions of the wetland alteration approval.
    - For wetlands along the transmission line corridor, orient placement of structures in dry areas adjacent to wetlands thus allowing transmission cables to span wetlands, to the extent possible.
    - If temporary access roads are required within wetlands, appropriate mitigations, including the use of swamp mats, will be implemented to prevent disturbance.
    - Design wetland crossings to occur at the narrow portion of the wetland or the wetland's edges, to the extent possible.

Hydrology

- Design wetland crossings to avoid permanent diversion, restriction or blockage of natural flow, such that hydrologic function of wetlands will be maintained.

Erosion and Sedimentation

- Develop a site-specific Erosion and Sediment Control Plan during the detailed design phase.
    - The plan will address the type of control structures, proper installation techniques, grading, maintenance and inspection, timing of installation, and revegetation.
- Limit the area of exposed soil and the length of time soil is exposed without mitigation (e.g., mulching, seeding, rock cover).
- Use the existing roads and access routes to the extent feasible.
- Avoid travel through wetlands.
    - If travel through wetlands is required, use swamp mats and if possible, time work to occur during frozen ground conditions and/or travel through the drier portions of the wetland.
- Direct run-off from construction activities away from wetlands.
- Maintain existing vegetation cover, where possible.

Dust Deposition

- Use water or an approved dust suppressant to control dust on roads as required.
- Establish site speed limits to minimize dust generation.

Invasive Species

- Use quarried, crushed materials for road construction to reduce the introduction of invasive vascular plant species.
- Clean and inspect work vehicles prior to use to prevent the introduction of invasive/non-native species.

Compaction

- Require that wetland delineation tape is in place and visible to avoid unnecessary compaction within wetlands.
- Hold pre-construction site meetings to educate staff on the sensitivity of wetlands.
- Avoid travel through wetlands.
    - If travel through wetlands is required, use geotextile matting and time work to occur during frozen ground conditions, or travel through the drier portions of the wetland, to the extent practicable.

Monitoring

A site-specific post-construction wetland monitoring plan will be developed to facilitate adaptive management and contribute to the safeguarding of ecological integrity and environmental stability. The plan will be provided to NSECC as part of the permitting process and will likely consist of

detailed monitoring and general spot checks. Detailed monitoring typically includes vegetative, hydrological, and soil assessments within the wetland habitat adjacent to the infill site. Spot checks typically involve a general overview of vegetative, hydrological, and soil conditions, focusing on evidence of significant hydrologic alterations and sedimentation.

Conclusion

Following mitigation, residual effects to wetland habitat and functionality are characterized as follows:

- Magnitude: Moderate magnitude as there will be direct loss of wetland habitat and impact to wetland functions, but wetland area loss will not impact the hydrology of the watershed. Where WSS are impacted, adequate general SAR habitat is prevalent elsewhere within the RAA.
- Geographic extent: Within the LAA.
- Frequency: Occur as a single event during construction.
- Duration: Short-term as impacts will be restricted to the construction phase.
- Reversibility: Partially reversible as any loss will be compensated for through the permitting process.
- Significance: Not significant.

7.4 Terrestrial Environment

7.4.1 Terrestrial Habitat

7.4.1.1 Overview

The terrestrial habitat assessment focused on identifying sensitive and important habitats through a combination of desktop review and field surveys. The goals of the assessment were to inform the biophysical surveys, and to avoid or mitigate Project impacts to sensitive and important habitats. Wetland habitats are addressed in Section 7.3.2, and habitat assessments related to specific fish, fauna, bats, and bird species are addressed in Sections 7.3.1, and 7.4.3 to 7.4.5.

Sensitive habitats are variably defined in the literature, but herein refer to:

- Habitats that are known to support or are capable of supporting SAR and SOCI.
- Old-growth forest stands, as defined in the Old-Growth Forest Policy (NSNR, 2022a).
- Lands that have legal protection such as parks, conservations areas, conservation easements, and restricted land use.

To assess terrestrial habitat within the Study Area, a desktop review was conducted prior to field surveys to identify different habitats and key areas of interest. The extent and diversity of habitat types were then confirmed during field surveys. Results of the desktop and field studies informed the siting of turbine pads, roads, laydown areas, the transmission line, and other infrastructure. This was an iterative process, with the layout being refined through ground-truthing sensitive and important habitats. The results were also used to develop targeted mitigations and best management practices.

7.4.1.2 Regulatory Context

Applicable laws and regulations relevant to terrestrial habitat are within the *Environment Act*, S.N.S. 1994-95, c. 1 as well as the Old-Growth Forest Policy for Nova Scotia (NSNR, 2022a), and the Nova Scotia Silvicultural Guide for the Ecological Matrix (SGEM) (McGrath et al., 2021).

The *Environment Act*, S.N.S. 1994-95, c. 1 supports and promotes the protection, enhancement, and use of the provincial environment while maintaining ecosystem integrity and sustainable development. The Old-Growth Forest Policy (NSNR, 2022a) and SGEM regulate forestry and forest management practices on Crown land in Nova Scotia and inform best practices for the management of forested areas on private lands. These policies provide requirements and/or guidance on how best to maintain ecological integrity and allow for the determination of whether old-growth forests exist. These requirements include no net loss of old-growth forests on Crown land, and guidance for avoiding development within 100 m of a confirmed old-growth stand. The province defines old-growth forest as “an area where 20% or more of the basal area is in trees greater than or equal to the reference age for that forest (ecosystem classification vegetation) type” (NSNR, 2022a).

Species that are listed as “Endangered” or “Threatened” receive individual protection from harm and destruction under SARA and/or ESA, including protection of habitually occupied spaces. The *Biodiversity Act,* 2021, c. 3, s. 1 provides a framework for the creation of Biodiversity Management Zones used for conservation and sustainable biodiversity values. The potential Project impacts to rare and at-risk species are further discussed in Section 7.4.2 to 7.4.5.

7.4.1.3 Desktop Review

To assess terrestrial habitat, a desktop review was undertaken prior to any field activities, and a land cover classification was developed. The following resources were reviewed:

- Ecological Land Classification for Nova Scotia (Neily et al., 2017)
- Provincial Landscape Viewer (NSNR, 2024e)
- Nova Scotia Forest Inventory (NSNR, 2021g)
- Provincial Canopy Height Model (GeoNOVA, 2024a)
- WAM Database (NSECC, 2022b)
- NSNR Significant Species and Habitat Database (NSNR, 2024f)
- Nova Scotia Parks and Protected Areas Map (NSECC, 2020a)
- IBAs (IBA Canada, 2025)
- Government records of Abandoned Mine Openings (AMOs; NSNR, 2024b) as a proxy for potential bat habitat
- Old-Growth Policy Layer (NSNR, 2024d)

The Study Area falls within the Nova Scotia Uplands Ecoregion and the Atlantic Coastal Ecoregion (Drawing 7.1). The Nova Scotia Uplands Ecoregions covers 19.8% of the province, and is characterized by summits and plateaus, an abundance of river and streams, and uneven-aged forests exhibiting old-growth features. The Atlantic Coastal Ecoregion is a thin stretch of land covering 8.5% of the province. This ecoregion is highly influenced by its proximity to the cold Atlantic Ocean, leading to a moderate climate, abundant brackish lakes and ponds, and Maritime Boreal ecosites dominated by balsam fir, black spruce, and white spruce (*Picea glauca*) (Neily et al., 2017).

Most of the Study Area lies within the Mulgrave Plateau Ecodistrict (360) (Drawing 7.1). The Mulgrave Plateau Ecodistrict is the most easterly physiographic feature in mainland Nova Scotia, with non-coastal areas characterized by relatively level to hummocky, imperfectly drained soils. The eastern portion of this ecodistrict is generally much wetter than the western portion. This ecodistrict contains a variety of forest types, including red spruce and eastern hemlock (*Tsuga canadensis)* dominated riparian zones, mixed wood forests growing in deep, rich soils, and open woodlands occurring on shallow soils (Neily et al., 2017). There are also many large, treeless wetlands across the ecodistrict. Forested areas on imperfectly drained soils are likely within the Spruce Pine Forest Group, and are subject to frequent disturbances from wind, fire, and senescence which limits the potential for the development of old-growth conditions. Tolerant hardwood forests, however, experience gap dynamics and are more likely to become uneven-aged stands with old-growth forest characteristics.

The southeastern and southwestern extent of the Study Area lies within the Cape Breton Coastal Ecodistrict. This ecodistrict flanks the eastern shore of Nova Scotia from the north shore of Chedabucto Bay to Scatarie Island. This narrow ecological landscape comprises both coastal and low lying, inland features with generally low elevations throughout. Along Chedabucto Bay, well to imperfectly drained soils with a fine texture are common. Strong coastal influences extend further inland than any other ecodistrict, creating a characteristically cool climate within this ecodistrict. Coastal winds and storms are the most common source of disturbance in this ecodistrict, creating opportunities for advanced tree regeneration and limiting the potential for old forest development (Neily et al., 2017). Maritime Boreal coastal forests dominate this ecodistrict, composed of white spruce, black spruce, and balsam fir and topographic features including hummocks, drumlins, flats, ridges, and low level hills. Red maple and white birch may reach into the canopy of inland and sheltered sites, forming mixed wood forests with balsam fir and white pine (*Pinus strobus)* as a minor component. On low slopes and flats where soil drainage is poorer, wet forests of red maple, black spruce, alders, and ericaceous shrubs may occur.

Land cover within the Study Area is varied, including built infrastructure, clear cuts, and mixed wood forest and softwood forest. To better understand habitat types on the site, a desktop land cover classification was developed by merging the Nova Scotia Forest Inventory, the provincial canopy height model (GeoNOVA, 2024a), and the WAM Database (NSECC, 2022b), and then reclassifying the resulting polygons into 13 categories. The resulting categories and their estimated percent cover within the Study Area are presented in Table 7.42 and Drawing 7.21A to 7.21H.

Table 7.42: Predicted Land Cover Types and their Respective Percent Cover

Land Cover Type	Study Area (ha)	Percentage of Study Area (%)	Assessment Area (ha)	Percentage of the Assessment Area	Clearing Footprint (ha)	Percentage of the Clearing Footprint (%)
Mixedwood Forest	2,421.54	27.27	268.78	29.69	177.08	28.42
Mixedwood Wet Forest(1)	181.79	2.05	11.99	1.32	7.8	1.25
Softwood Forest	1,975.98	22.25	188.72	20.85	131.14	21.05
Softwood Wet Forest(1)	530.09	5.97	33.08	3.65	20.21	3.24

Land Cover Type	Study Area (ha)	Percentage of Study Area (%)	Assessment Area (ha)	Percentage of the Assessment Area	Clearing Footprint (ha)	Percentage of the Clearing Footprint (%)
Hardwood Forest	630.69	7.10	68.45	7.56	49.57	7.96
Hardwood Wet Forest[(1)]	23.28	0.26	3.01	0.33	1.57	0.25
Urban/developed	43.97	0.50	14.40	1.59	13.99	2.25
Cutover Upland	1,284.17	14.46	181.08	20.00	134.73	21.62
Cutover Wetland[(1)]	66.60	0.75	7.94	0.88	6.5	1.04
Open Wetland[(1)]	784.76	8.84	47.38	5.23	26.38	4.23
Shrubs and Alders	41.30	0.47	1.54	0.17	0.88	0.14
Open Areas	608.04	6.85	76.95	8.50	53.05	8.51
Water	288.03	3.24	1.90	0.21	0.22	0.04
Total	**8,880**	**100**	**905**	**100**	**623**	**100**

[(1)]Wetland data is from the land cover classification and does not include field delineated wetlands.

The land cover classification indicates that mixedwood (29%) and softwood (28%) forest are the dominant cover types within the Assessment Area. The classification shows that the majority of the Study Area is composed of untreated (i.e., not treated silviculturally) natural forest stands (5,763 ha or 65% of the Study Area); however, due to technical limitations in the forestry data used for the land cover classification (e.g., accuracy, precision, and time since classification) the proportion of area classified as untreated is likely smaller than can be determined through desktop review. The land cover classification indicates that cutover areas and urban/developed areas total 1,395 ha, or 16%, of the Study Area. Open areas, which include barrens, old field/agricultural areas, and other open cover types, consist of 7% of the Study Area. A review of open areas against satellite imagery suggests that much of the open area class within the Study Area consists of cutovers, forestry trails, and secondary roads. Similar to the Study Area, the largest portions of the Assessment Area and Clearing Footprint are attributed to mixedwood and softwood. Conversely, the percentage of the Study Area classified as either cutover or urban/developed is 16%, while this rises to 25% within the Clearing Footprint, highlighting the Project's use of previously disturbed areas for the siting of infrastructure.

The Project is made up of a road network, along with turbines, transmission lines, operations and maintenance facilities, laydown areas and the substation. Within the Study Area, there are approximately 68 km of existing roads, of which 35 km will be used for the Project. In addition to those 35 km of existing roads that will be used, 44 km will be constructed.

A review of the NSNR Significant Species and Habitat Database (NSNR, 2024f) within 100 km of the Study Area identified 25 feature records:

- 15 records classified as 'Species of Concern' which relate to 14 caves and one Ecological Monitoring and Assessment Network site.

- Nine records classified as ‘Other Habitat’ which relate to one cove, four caves, three islands, and one ledge.
- One record classified as ‘Species at Risk’ which relates to dunes.

All features are found over 20 km away from the Study Area and will not interact with the Project.

The Nova Scotia Parks and Protected Areas Map (NSECC, 2023d) was screened to identify any protected areas in or near the Study Area. The nearest protected area is the Mulgrave Hills Nature Reserve, located approximately 420 m from the nearest proposed turbine (Drawing 3.1). The Tracadie River Wilderness Area and Boylston Provincial Park are both located more than 8 km west of the nearest Project infrastructure. The Proponent has consulted with the Protected Areas Branch of NSECC, with the most recent meeting on July 17, 2025, discussing protected area avoidance and setbacks for the Project (Table 6.1).

The desktop review showed that several sensitive locations for flora and fauna were located well outside the Study Area. The closest IBAs are more than 20 km from the Study Area (IBA Canada, 2025). There are no AMO locations within the Study Area (NSNR, 2024a). See Section 7.4.4.3 for further details on AMOs and the potential for bat habitat.

The Old-Growth Policy layer (NSNR, 2024d) and an Old-Growth Potential Index layer provided by NSNR through a data sharing agreement (2025a) were also reviewed. There are 11 forested areas protected under the Old-Growth Forest Policy within the Study Area. None of these areas will directly interact with the Project.

The Old-Growth Potential Index is a desktop tool, used to rank forest stands and determine where there is high potential for high-ranking old-growth forests to occur (i.e., a score of >7). Several high ranking potential old-growth stands were identified as occurring on Crown parcels within the Study Area, with numerous stands (rank ≥ 10) intersecting the Assessment Area or within 100 m of current and previously proposed infrastructure (i.e., previous versions of the Assessment Area). There were 45 stands selected for further investigation through field assessments, as described in Section 7.4.1.4.

7.4.1.4 Field Assessment Methodology

The findings of the desktop review guided the field survey design, ensuring that all habitat types, including both natural habitats and those affected by anthropogenic disturbance, were assessed.

Forested terrestrial communities found within the Study Area were classified according to the Forest Ecosystem Classification for Nova Scotia (NSNR, 2011) during field surveys in 2023 and 2024 (e.g., concurrent with old-growth assessments, plant and lichen surveys). Specific surveys were conducted to assess wetland and watercourse habitats (Sections 7.3.1 and 7.3.2), as well as targeted assessments for specific species, including vascular plants, lichens, terrestrial fauna, and avifauna (Sections 7.4.2 to 7.4.5).

Forest stands on Crown land with a potential old-growth rank of ≥ 9 that overlapped with, or were within close proximity to, the Assessment Area, along with stands of undisturbed, forested habitat

were selected for targeted old-growth surveys. In total, 45 forest stands were surveyed in 2023 and 2024. Field biologists with demonstrated experience in conducting old-growth forest assessments travelled to pre-determined sample plot locations within each selected stand. At each plot, a rapid assessment for old-growth conditions was conducted. This rapid assessment included identification of the presence and abundance of long-lived intermediate-tolerant or late-successional tree species, evidence of previous harvest activity or other human-related disturbances, or evidence of any natural disturbances that resulted in drastically altered stand composition.

Where the rapid assessment was inconclusive or indicated potential for old-growth, Part 1 of the old-growth scoring procedure was employed (NSNR, 2025b). At each plot, a tree core was collected and analyzed under microscope to determine the average stand age. Relevant photos were also taken to accompany the surveys.

Sensitive or important terrestrial habitat features identified through field investigations were used to further refine siting of proposed Project infrastructure components (e.g., wind turbines and roads) with the objective of avoiding or minimizing interactions with these habitat features.

7.4.1.5 Field Assessment Results

As predicted in the desktop habitat model, the Study Area is comprised of a range of forest types, shrublands, wetlands, and anthropogenic disturbance. Historic and ongoing forestry operations in the Study Area have resulted in extensive modification to the natural habitat conditions. Given the extent and intensity of forestry activities in the Assessment Area, there are relatively few areas that have gone untouched by industrial forestry operations. Within the Assessment Area, disturbed habitat was largely composed of young, dense monocultural hardwood and softwood stands, regenerating roadside brush, and clearcut areas.

Over the courses of terrestrial field surveys in 2023 and 2024, five upland forest groups were identified within the Study Area, comprised of 24 different upland vegetation types (Table 7.43). Additionally, two wet forest groups were identified, comprised of four wet coniferous vegetation types and six wet deciduous vegetation types. Specific terrestrial habitat found to support flora, fauna, avifauna, and bat SAR/SOCI within the Study Area are discussed in the respective sections, if applicable.

Table 7.43: Vegetation Types Observed within the Study Area

Community Type	Forest Group	Vegetation Type(s)
Upland Forest Groups	Intolerant Hardwood (IH)	IH6
	Mixedwood (MW)	MW1, MW2, MW3, MW4, MW5
	Spruce Hemlock (SH)	SH4, SH5, SH5a, SH5b, SH6, SH8, SH9
	Spruce Pine (SP)	SP4, SP5
	Tolerant Hardwood (TH)	TH1, TH1a, TH1b, TH2, TH2a, TH3, TH7, TH8, TH8a
Wetland Forest Groups	Wet Coniferous (WC)	WC1, WC2, WC5, WC6
	Wet Deciduous (WD)	WD1, WD2, WD3, WD6, WD7, WD8

Source: (NSNR, 2011)

Of the 45 stands selected for old-growth assessments, five were either previously harvested or were composed of early successional vegetation types (Mapstand IDs C025-01090, C025-01541, C025-01984, C025-01130, C025-00705). Old-growth scoring procedures were not carried out at these stands, resulting in 40 stands being assessed using old-growth scoring procedures (including 30 stands with a potential old-growth rank of 10, and 10 stands with a potential old-growth rank of 11; Table 7.44; Appendix I). The results of the old-growth assessments confirmed old-growth status for 23 stands within the Study Area, 12 of which overlap with the Assessment Area (Drawing 7.22A to 7.22H).

Table 7.44: Old-Growth Survey Results

Stand ID	Stand Size (ha)	Potential Old Growth Rank	Plot #	Species Cored[1]	DBH[2] (cm)	Height (m)	Age (years)	Old Growth Reference Age (years)	Average Age of Cores	Old Growth Status
C025-01986	53.1	10	1	RS	29.5	17.0	55	125	135	Old Growth
			2	SM	65.3	21.5	142			
			3	YB	49.5	19.0	126			
			4	YB	49.1	21.0	224			
			5	RS	26.4	16.0	63			
			6	YB	47.1	22.0	177			
			7	YB	41.4	15.5	196			
			8	YB	34.0	22.5	132			
			9	YB	41.2	19.5	127			
			10	YB	48.9	24.0	107			
C025-02004	5.3	10	1	YB	36.3	19.0	255	100	143	Old Growth
			2	YB	43.5	24.0	184			
			3	RS	36.8	23.0	72			
			4	YB	40.7	24.5	143			
			5	BS	20.2	16.5	61			
C025-01424	8.8	10	1	RM	46.9	22.0	139	125	140	Old Growth
			2	YB	50.9	20.5	128			
			3	YB	52.3	24.5	151			
			4	YB	36.3	17.5	144			
			5	YB	38.3	21.0	138			
C025-01963	9.7	10	1	YB	42.9	18.5	117	125	158	Old Growth
			2	YB	58.8	22.0	148			
			3	YB	44.2	20.5	154			
			4	YB	54.3	19.0	236			
			5	RM	46.9	17.5	135			
C025-01982	14.8	10	1	YB	29.9	17.0	116	125	109	Not Old Growth
			2	YB	26.9	16.0	86			
			3	SM	42.1	17.0	125			
			4	YB	34.0	17.5	119			
			5	SM	25.9	18.0	103			

Stand ID	Stand Size (ha)	Potential Old Growth Rank	Plot #	Species Cored[1]	DBH[2] (cm)	Height (m)	Age (years)	Old Growth Reference Age (years)	Average Age of Cores	Old Growth Status
			6	YB	23.8	11.5	105			
			7	YB	34.3	15.0	108			
C025-03208	7.8	10	1	YB	42.3	17.0	216	125	141	Old Growth
			2	RS	41.6	21.0	75			
			3	RM	34.6	15.5	167			
			4	YB	44.7	18.0	184			
			5	RS	32.4	19.0	63			
C025-01509	7.1	10	1	RS	29.4	17.5	55	125	75	Not Old Growth
			2	RM	33.6	14.5	104			
			3	RS	31.8	18.5	70			
			4	SM	28.2	16.5	62			
			5	RS	23.9	13.5	83			
C025-01948	43.6	10	1	RS	21.6	13.5	75	140	121	Not Old Growth
			2	YB	42.2	23.0	168			
			3	YB	43.2	19.5	97			
			4	YB	37.9	17.5	147			
			5	YB	42.9	22.5	137			
			6	YB	28.9	17.5	41			
			7	YB	49.1	20.0	145			
			8	YB	49.5	24.0	101			
			9	YB	41.1	25.5	133			
			10	YB	56.9	20.0	166			
C025-01944	5.7	10	1	SM	54.6	20.5	162	125	158	Old Growth
			2	YB	44.4	18.0	106			
			3	YB	59.3	18.5	163			
			4	YB	51.1	20.5	219			
			5	YB	43.1	16.5	142			
C025-00220	12.1	10	1	RS	34.2	15.0	51	125	130	Old Growth
			2	RM	34.7	14.0	136			
			3	RM	28.9	10.0	109			
			4	YB	52.3	16.0	252			
			5	RM	38.9	14.0	140			
			6	RS	30.0	15.0	90			
C025-02544	16.4	10	1	SM	35.6	19.5	113	125	129	Old Growth
			2	SM	45.6	24.5	135			
			3	YB	36.6	17.0	113			
			4	RS	28.6	17.5	68			
			5	YB	48.1	20.0	209			
			6	YB	36.8	15.5	141			

Stand ID	Stand Size (ha)	Potential Old Growth Rank	Plot #	Species Cored[1]	DBH[2] (cm)	Height (m)	Age (years)	Old Growth Reference Age (years)	Average Age of Cores	Old Growth Status
			7	YB	43.3	16.5	102			
			8	YB	48.6	20.5	147			
C025-00187	7.6	11	1	YB	38.7	12.0	167	125	119	Not Old Growth
			2	RS	32.2	16.2	70			
			3	YB	35.2	16.5	137			
			4	RS	30.4	14.5	76			
			5	YB	42.3	13.5	147			
C025-02543	3.5	10	1	YB	42.4	21.5	85	125	101	Not Old Growth
			2	RM	26.4	16.5	89			
			3	YB	44.5	22.0	130			
C025-02558	3.6	10	1	YB	39.8	22.0	115	140	149	Old Growth
			2	YB	34.7	20.5	176			
			3	YB	36.0	19.0	156			
C025-01431	6.6	11	1	YB	29.8	18.0	92	125	138	Old Growth
			2	YB	32.3	15.0	140			
			3	YB	44.9	18.0	181			
C025-00826	25.4	10	1	SM	49.8	25.5	116	125	144	Old Growth
			2	SM	44.0	17.8	145			
			3	SM	42.6	18.8	226			
			4	YB	38.3	17.5	114			
			5	YB	43.6	18.6	124			
			6	YB	54.5	25.0	144			
			7	SM	49.3	26.5	152			
			8	YB	59.3	24.0	145			
			9	YB	57.4	16.5	90			
			10	YB	69.1	25.0	180			
C025-00157	10.1	11	1	YB	40.1	16.5	325	125	147	Old Growth
			2	YB	43.3	14.5	181			
			3	YB	28.9	15.8	65			
			4	RM	20.4	20.0	37			
			5	RM	34.2	12.0	125			
C025-02049	8.0	10	1	BS	29.8	18.0	115	100	115	Old Growth
			2	BS	26.6	14.0	137			
			3	RS	22.5	15.0	67			
			4	RS	26.1	17.0	181			
			5	RS	25.9	16.5	77			
C025-01953	18.5	11	1	RS	34.4	18.0	76	125	115	Not Old Growth
			2	YB	42.3	17.5	96			
			3	RM	33.6	16.0	129			
			4	YB	62.2	23.5	163			

Stand ID	Stand Size (ha)	Potential Old Growth Rank	Plot #	Species Cored[1]	DBH[2] (cm)	Height (m)	Age (years)	Old Growth Reference Age (years)	Average Age of Cores	Old Growth Status
			5	YB	54.4	18.5	114			
			6	RS	27.1	17.5	86			
			7	YB	66.2	24.0	119			
			8	RS	44.1	21.5	61			
			9	RM	35.2	15.5	190			
C025-01580	9.0	10	1	YB	23.1	13.0	88	125	88	Not Old Growth
			2	YB	26.9	14.0	108			
			3	RS	37.3	16.0	67			
			4	RS	31.4	18.5	82			
			5	RS	31.6	19.5	94			
C025-01353	10.9	11	1	YB	54.7	20.5	200	140	183	Old Growth
			2	YB	54.1	18.0	217			
			3	YB	57.5	17.5	145			
			4	YB	45.7	17.0	212			
			5	YB	44.9	21.5	142			
C025-00892	18.8	10	1	RS	25.3	16.5	91	125	126	Old Growth*
			2	RM	28.8	13.5	101			
			3	AS	30.0	15.5	149			
			4	YB	54.0	14.5	139			
			5	RS	29.5	15.0	80			
			6	YB	34.0	14.5	76			
			7	YB	34.0	15.0	197			
			8	RM	24.2	13.0	121			
			9	YB	48.6	17.0	130			
C021-03205	9.9	10	1	YB	49.8	20.0	137	125	131	Old Growth
			2	YB	36.4	18.0	129			
			3	RM	33.1	20.0	142			
			4	YB	33.8	21.0	116			
			5	YB	43.4	19.0	131			
C025-02581	5.5	10	1	RS	33.8	22.0	112	125	111	Not Old Growth
			2	YB	36.4	18.0	151			
			3	YB	33.0	20.0	147			
			4	RS	29.1	19.6	67			
			5	RS	20.5	27.8	80			
C025-00857	4.8	11	1	RS	22.4	14.0	83	100	66	Not Old Growth
			2	RM	28.3	15.0	63			
			3	RM	21.1	12.5	53			
C021-03570	7.6	10	1	YB	37.2	19.0	168	125	128	Old Growth[3]
			2	YB	50.2	20.0	119			

Stand ID	Stand Size (ha)	Potential Old Growth Rank	Plot #	Species Cored[1]	DBH[2] (cm)	Height (m)	Age (years)	Old Growth Reference Age (years)	Average Age of Cores	Old Growth Status
			3	SM	36.1	19.0	135			
			4	SM	47.5	19.0	117			
			5	BS	12.9	10.5	72			
C025-01368	9.4	11	1	YB	35.1	16.5	148	125	146	Old Growth
			2	SM	47.1	19.0	187			
			3	YB	45.7	22.0	78			
			4	SM	53.9	23.5	169			
			5	YB	65.3	26.0	146			
C025-01915	8.0	11	1	YB	53.2	19.0	172	140	150	Old Growth
			2	YB	48.1	17.5	126			
			3	YB	60.4	20.0	159			
			4	YB	43.3	17.0	176			
			5	AS	34.5	15.5	116			
C025-02503	38.6	10	1	YB	41.4	22.0	114	125	127	Old Growth
			2	YB	36.9	14.0	153			
			3	YB	38.6	20.0	163			
			4	YB	44.1	21.0	127			
			5	YB	67.3	21.5	132			
			6	YB	44.4	19.0	118			
			7	RM	42.8	19.5	142			
			8	RS	33.3	19.5	85			
			9	RS	32.5	24.5	80			
			10	RM	36.2	17.0	157			
C025-02556	8.3	10	1	YB	30.2	16.5	90	140	121	Not Old Growth
			2	YB	57.0	20.5	179			
			3	YB	56.0	21.5	85			
			4	YB	45.6	15.5	127			
			5	YB	39.7	15.5	126			
C025-03153	2.7	11	1	RM	34.2	17.5	90	115	98	Not Old Growth
			2	YB	28.3	13.0	95			
			3	YB	41.9	26.0	111			
C025-01373	2.2	10	1	YB	50.9	22.0	125	125	111	Not Old Growth
			2	RS	32.1	17.5	76			
			3	YB	64.8	25.0	131			
C025-01574	56.0	10	1	RM	32.8	16.0	125	125	94	Not Old Growth
			2	RS	33.2	18.5	63			
			3	RS	29.9	19.0	62			
			4	RM	31.7	15.5	112			
			5	YB	29.6	20.0	106			

Stand ID	Stand Size (ha)	Potential Old Growth Rank	Plot #	Species Cored[1]	DBH[2] (cm)	Height (m)	Age (years)	Old Growth Reference Age (years)	Average Age of Cores	Old Growth Status
			6	RS	28.6	18.5	66			
			7	YB	35.5	21.0	116			
			8	RM	31.0	16.5	96			
			9	YB	33.3	18.5	111			
			10	YB	31.4	17.0	81			
C025-01594	5.3	10	1	RM	30.8	17.5	68	125	76	Not Old Growth
			2	RM	36.9	19.0	81			
			3	RM	37.0	22.5	66			
			4	YB	38.0	16.5	114			
			5	RS	32.8	22.0	52			
C025-01328	8.3	11	1	RS	32.5	16.5	61	125	106	Not Old Growth
			2	RM	22.8	16.0	85			
			3	RM	30.4	15.0	71			
			4	AS	50.4	15.0	113			
			5	YB	44.1	17.0	198			
C025-01613	5.5	10	1	SM	36.0	23.0	111	100	100	Old Growth
			2	BS	19.9	15.5	108			
			3	BS	14.5	11.0	38			
			4	RM	42.1	11.0	130			
			5	YB	30.1	17.0	113			
C025-01327	2.6	10	1	RS	26.7	18.0	72	125	102	Not Old Growth
			2	RS	29.5	16.5	76			
			3	YB	41.5	19.0	159			
C025-02130	7.8	10	1	RS	24.1	18.0	75	125	115	Not Old Growth
			2	YB	36.4	18.0	163			
			3	RS	13.2	13.0	53			
			4	RM	25.2	17.0	93			
			5	RM	42.4	10.0	190			
C025-00470	26.0	10	1	YB	45.5	19.25	172	140	140	Old Growth
			2	YB	46.1	14.75	145			
			3	YB	46.3	19.25	138			
			4	YB	38.6	20.25	126			
			5	YB	29.7	19.5	139			
			6	YB	46.0	14.25	160			
			7	YB	42.9	15.75	114			
			8	RM	40.2	17.25	149			
			9	YB	38.1	13.25	120			
C025-01559	8.1	10	1	RM	50.2	19.0	156	115	128	Old Growth
			2	YB	41.7	20.0	123			

Stand ID	Stand Size (ha)	Potential Old Growth Rank	Plot #	Species Cored[1]	DBH[2] (cm)	Height (m)	Age (years)	Old Growth Reference Age (years)	Average Age of Cores	Old Growth Status
			3	YB	33.3	18.0	165			
			4	RS	26.3	18.0	65			
			5	YB	36.1	31.0	129			

[1]RS = red spruce, SM = sugar maple, YB = yellow birch, BS = black spruce, RM = red maple, AS = white ash
[2]DBH = Diameter at Breast Height
[3]Because the average age was within 5 years short of the reference age when originally counted, a recount was conducted. The average age on the recount was higher than the reference age, and therefore the stand was determined to be old growth to account for margin of error.

7.4.1.6 Effects Assessment

Project-Terrestrial Habitat Interactions

Project activities, primarily those that involve earth moving or vegetation removal, have the potential to impact terrestrial habitat (Table 7.45). These activities could result in habitat removal or alteration.

Table 7.45: Potential Project-Terrestrial Habitat Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	X
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for the terrestrial habitat includes the Study Area (Drawing 2.1). The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for terrestrial habitat. The VC-specific definition for magnitude is as follows:

- Low: Small to moderate loss of terrestrial habitat, but overall habitat functions remain intact.
- Moderate: Small to moderate loss of sensitive terrestrial habitat (as defined in Section 7.4.1.1) or loss of key habitat functions.
- High: High loss of sensitive terrestrial habitat or key habitat functions.

Effects

Habitat Loss and Fragmentation

The loss or conversion of undisturbed habitat to construct roads, transmission line corridors, and turbine pads can impact the terrestrial habitat. Habitat included for consideration includes old-growth forest, habitat for flora and fauna SAR or SOCI, priority habitat features, areas of special concern for conservation or protection, and unfragmented, undisturbed areas.

Old-growth forest stands provide suitable habitat to many SAR and SOCI, including vascular and non-vascular plants, terrestrial fauna, and avifauna. High ranking potential old-growth stands were identified in the Study Area during the desktop review, and 23 stands within the Study Area were confirmed to be old-growth during field assessments. The Project has been designed to avoid a large proportion of these old growth stands, with 12 stands overlapping the Assessment Area. The remaining 11 old-growth stands no longer overlap with the Assessment Area as a result of modifications to the Project layout intended to avoid these stands.

Overall, it is expected that areas of overlap between the Assessment Area and confirmed old-growth forest stands will either be avoided or are associated with pre-existing impacts (i.e., existing roads or cleared areas). Of the 12 confirmed old-growth stands that overlap the Assessment Area, seven stands (Mapstand IDs C025-00892, C025-01986, C025-02504, C025-01431, C025-00157, C025-01944, and C021-03205) coincide with existing roads and therefore, exiting disturbance. Two stands (C025-00470 and C025-02544) overlap the Assessment Area in areas that were observed during field assessments to have been previously harvested (since 1990) and are therefore ineligible for protection. Two stands (C021-03570 and C025-01559) overlap with the Assessment Area where turbine pads are proposed. In both cases, the turbine pad will occur within previously disturbed areas and will not require new impacts adjacent to these stands. One additional stand, C025-00220, overlaps with a turbine pad but is outside the expected limit of disturbance and will therefore not be impacted. The Proponent will engage with NSNR as part of the Crown land permitting process during detail design should impacts to old-growth forests be identified.

No pending or designated conservation areas or wilderness areas are found within the Assessment Area. No terrestrial habitat for SAR or SOCI was identified within the Assessment Area according to the Significant Species and Habitat Database (NSNR, 2024f), and no AMOs or IBAs were located within the Study Area (IBA Canada, 2025; NSNR, 2024b).

Habitat loss and fragmentation will occur within previously unfragmented or undisturbed terrestrial habitat within the Study Area. Fragmentation will be caused by vegetation clearing for roads, turbine pads, and supporting Project components. None of the Project Footprint will be fenced apart from the substation, which is required for safety. Most of the land cover within the Assessment Area,

where impacts will occur, is softwood and mixedwood dominated, including natural and treated stands, as determined by desktop review and confirmed through field surveys. During field assessments, the extent of treated and cleared areas was found to be greater than the Forest Inventory database designations suggested.

Table 7.46 summarizes habitat types identified within the Study Area and Clearing Footprint and quantifies the maximum extent of potential habitat loss of the Project (i.e., removal of habitat within the Clearing Footprint). Note that the actual area impacted will be less than what has been identified for the Clearing Footprint, as not all areas will be cleared for the Project infrastructure. For example, although there are 44 km of proposed new roads included in the Clearing Footprint, there are an additional 35 km of proposed roads which are existing roads/trails. Therefore, some level of disturbance is already present, which may not be captured by the land cover mapping. Placing the turbines in areas accessible by existing main roads will also minimize fragmentation.

This assessment has used a conservative estimate of clearing required to evaluate habitat impacts. However, much of the area cleared represents a temporary impact that will be allowed to revegetate following construction. For example, vegetation under the proposed transmission line will be cleared during the construction phase, and a transmission line ROW buffer will be maintained throughout the Project's lifespan. The transmission line ROW area may shift vegetation community type; however, this does not represent a total loss of terrestrial habitat.

Table 7.46: Predicted Land Cover Types and Impacts within the Study Area

Land Cover Type	Area (ha) within the Study Area	Area (ha) Directly Impacted by the Project (within the Clearing Footprint)[1]	Percentage (%) Impact of the Landcover Type Available in the Study Area[2]
Mixedwood Forest	2421.54	177.08	7.31
Mixedwood Wet Forest	181.79	7.8	4.29
Softwood Forest	1975.98	131.14	6.64
Softwood Wet Forest	530.09	20.21	3.81
Hardwood Forest	630.69	49.57	7.86
Hardwood Wet Forest	23.28	1.57	6.74
Urban/ developed	43.97	13.99	31.82
Cutover Upland	1284.17	134.73	10.49
Cutover Wetland	66.6	6.5	9.76
Open Wetland	784.76	26.38	3.36
Shrubs and Alders	41.3	0.88	2.13
Open Areas	608.04	53.05	8.72
Water	288.03	0.22[3]	0.08
Total	**8,880**	**623**	**7**

[1] The Clearing Footprint is used as a conservative estimate of the area of terrestrial flora that will be impacted by the Project.
[2] Determined by dividing the number of hectares in the Clearing Footprint by the number of hectares in the Study Area, for each land cover type.
[3] Includes where water overlaps the Clearing Footprint due to water crossings.

Based on Table 7.46, the Project Footprint has prioritized the use of previously disturbed areas to minimize habitat loss. Land cover types representing disturbed areas (i.e., urban/develop, cutover upland and cutover wetland) are the largest land cover types impacted within the Clearing Footprint,

as a percentage of available land within the Study Area. In addition, the largest, by area, land cover type that will be impacted by the Project is to cutover uplands, which when combined with the urban/developed and cutover wetland categories, represent 25% of the total impact area in the Clearing Footprint. A portion of the open area land cover class was determined to also include disturbed areas such as harvests, secondary roads, and trails, suggesting that actual Project impacts to this class will be lower (and impacts to “disturbed” areas is higher). Further, based on aerial imagery and field observations, there is evidence of historic and ongoing forestry activity throughout habitats within the Study Area (e.g., center, northern, and southwestern portions) that suggest the land cover types may underestimate the amount of disturbed area present, and therefore used by the Project.

Impacts to undisturbed and unfragmented habitat will be low and although there will be small losses to terrestrial habitat associated with the Project, habitat functionality will remain intact relative to pre-construction conditions. Upon Project completion and reclamation, the habitat types may differ from baseline conditions. Although succession will be induced by anthropogenic factors, the natural process will, in time, persist, and this new habitat will be used by a variety of species. Mitigation measures will be designed to ensure the process can proceed as naturally as possible.

Habitat Creation

Although there will be marginal terrestrial habitat modification and loss, there is also an opportunity for new habitat to be created within the Assessment Area. New gravel roads may become preferred nesting habitat for herpetofauna, and the new and widened roads may become basking habitat for snakes and wildlife corridors for terrestrial mammals. The introduction of road salt may attract ungulates. New and widened roads may provide added habitat for nesting birds who prefer rocky or grassy surfaces to nest in. Roadside ditches and cleared rights-of-way will be revegetated through mitigation measures and naturally over time. This process may lead to the creation of different habitat types than were previously present, including wetlands and early successional forests. Although succession will be induced by anthropogenic factors, the natural process will, in time, persist, and this new habitat may be used by a variety of species. Mitigation measures will be designed to ensure the process can proceed as naturally as possible, and that any new habitat created has a low magnitude of adverse effects on the terrestrial environment.

Indirect Effects

Removal of vegetation and habitat loss during the construction phase of the Project can result in edge effects for vegetation communities that are not directly impacted. The effects include changes in microclimate, increased light availability, and changes in vegetation communities. Clearing of habitats could also create conditions for non-native and/or invasive plant species to establish an area. The Project is not expected to impact surface water flows (Section 7.3.1) and, thus, is not anticipated to impact vegetation communities or species changes from changes in access to water.

Mitigation

To address effects on terrestrial habitat, the following mitigation measures will be implemented:

- Minimize overall area to be cleared, fragmentation of habitats, and isolation of existing habitats by utilizing pre-existing roads and previously altered areas (i.e., clearcuts), where possible.
- Avoid disturbance to important habitat features identified during desktop and field assessments (e.g. wetlands and old growth) by micrositing where possible.
- Reduce permanent habitat loss by allowing impacted areas, including road ROWs, to be restored through natural revegetation.

Monitoring

No monitoring programs specific to the terrestrial habitat are proposed.

Conclusion

Following mitigation, the residual effects to terrestrial habitat are characterized as follows:

- Magnitude: Habitat loss and creation are expected to be of low magnitude as there will be a small to moderate loss of habitat but overall habitat functions will remain intact relative to pre-construction functionality.
- Geographic extent: Within the LAA.
- Frequency: Single event for construction impacts (habitat loss) and intermittent frequency for operations impacts, as vegetation management will be ongoing until decommissioning.
- Duration: Medium-term duration as habitat loss will remain until the Project is decommissioned.
- Reversibility: Partially reversible upon decommissioning of the Project as vegetative communities may have changed.
- Significance: Not significant.

7.4.2 Terrestrial Flora

7.4.2.1 Overview

The terrestrial flora assessment included both desktop and field studies components. The objectives of the terrestrial flora assessment included the following:

- Classify habitat that supports terrestrial flora SAR/SOCI in the Study Area using available desktop resources.
- Identify important and sensitive habitat features that support terrestrial flora SAR/SOCI within/near the Assessment Area.
- Design a field program to document the diversity of terrestrial flora within the Study Area and identify terrestrial flora SAR/SOCI.
- Use the information collected through field studies to update the Project design to avoid or minimize interactions between Project infrastructure and confirmed locations of terrestrial flora SAR/SOCI or the habitats that are known to support terrestrial flora SAR/SOCI.
- Apply mitigation, construction, and operational management practices to minimize effects to terrestrial flora (i.e., apply setbacks to lichen SAR/SOCI).

7.4.2.2 Regulatory Context

Plant and lichen SAR receive protection under SARA and/or ESA which prohibits their disturbance and destruction. Special management practices are required on Crown land around occurrences of certain rare lichen, as prescribed in the At-Risk Lichens – Special Management Practices (NSNR, 2018a). Additional regulations discussed in Section 7.4.1 aim to protect important habitat features, such as old-growth forests or wetlands, that support many plant and lichen SAR/SOCI in Nova Scotia.

7.4.2.3 Desktop Review

The desktop review included a review of the following databases for terrestrial flora:

- ACCDC Data Report (ACCDC, 2025a)
- NSNR Significant Species and Habitat Database (NSNR, 2024f).
- Boreal Felt Lichen Habitat Layer (NSNR, 2012)
- Nova Scotia Forest Inventory (NSNR, 2021g).

ACCDC records (2025a) identified 367 flora species within 100 km of the Study Area (Appendix F). Of the 367 species, 232 are vascular plants and 135 are non-vascular plants. A summary of plant and lichen SAR and SOCI identified by the ACCDC records as being known to occur within the Study Area is provided in Table 7.47 (Drawing 7.23). Apart from American beech (*Fagus grandifolia*), all species noted in Table 7.47 are found outside the Assessment Area. Of note, black ash (*Fraxinus nigra*) is listed as a location sensitive species, so its location is not provided in the ACCDC report. The report indicates that it is documented within 5 km of the Study Area. Communication with NSNR confirmed that the observation of black ash is in proximity to Wheaton's Lake. Project infrastructure in the vicinity of Wheaton's Lake is based exclusively on existing roads.

Table 7.47: ACCDC Plant and Lichen SAR/SOCI Identified within the Study Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Plants (Vascular)					
American beech	*Fagus grandifolia*	---	---	---	S3S4
Black ash	*Fraxinus nigra*	Threatened	---	Threatened	S1S2
Northern comandra	*Geocaulon lividum*	---	---	---	S3S4
Pale green orchid	*Platanthera flava var. herbiola*				S2
Running serviceberry	*Amelanchier spicata*	---	---	---	S3S4
Sitka ground-cedar	*Diphasiastrum sitchense*				S3S4
Lichens (Non-vascular)					
A lichen	*Fuscopannaria sorediata*	---	---	---	S2S3
Blue felt lichen	*Pectenia plumbea*	Special Concern	Special Concern	Vulnerable	S3
Blue-gray moss shingle lichen	*Moelleropsis nebulosa*				S2S3

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Roughened shingle lichen	*Fuscopannaria ahlneri*	---	---	---	S3
Eyed mossthorns wollybear lichen	*Polychidium muscicola*	---	---	---	S1
Fringe lichen	*Heterodermia neglecta*	---	---	---	S3S4
Tree pelt lichen	*Peltigera collina*	---	---	---	S3

Source: (ACCDC, 2025a)

The NSNR Significant Habitat Database available on the Provincial Landscape Viewer (NSNR, 2024f) does not contain any polygons within the Study Area pertaining to terrestrial flora.

The Boreal Felt Lichen Predictive Habitat Layer (provided to Strum by NSNR) was reviewed to identify potential habitat for boreal felt lichen (*Erioderma pedicellatum*) within 100 m of the Assessment Area (Drawing 7.23). The habitat model is based on the known distribution of boreal felt lichen, which is known to grow on the trunks of balsam fir trees in peatland and in close proximity (<30 km) to the Atlantic Ocean (NSNR, 2012). Boreal felt lichen – Atlantic population is a rare species listed as “Endangered” under Schedule 1 of SARA and ESA and is also listed as “S1” by ACCDC. The Boreal Felt Lichen Predictive Habitat Layer identified 298 potential habitat features, encompassing 494 ha of land. This represents 5.6% of the total Study Area. The area within each polygon was reviewed using aerial imagery, and each polygon was also cross-checked with recent forest harvest data to confirm the current conditions. Upon completing this review, 86 polygons encompassing 181 ha of land were included in the survey area (representing 2% of the Study Area).

The Nova Scotia Forest Inventory (NSNR, 2021g) provides information pertaining to forest characteristics, including forest compositions and maturity, determining suitable lichen habitat. The specific habitat requirements of each SAR/SOCI lichen vary, though many require mature to old growth forest; for example, blue felt lichen (*Pectenia plumbea*), or the calicioid frosted glass-whiskers (*Sclerophora peronella*) prefer mature forests, often associated with wetlands, lakes and watercourses. Therefore, stand age is one of the major determinants of the presence of many rare epiphytic lichens (McMullin et al., 2008). Species composition and moisture regime are also determinants of lichen habitat suitability.

As described in Section 7.4.1, the Study Area consists of both disturbed and intact habitats. Intact natural habitat constitutes 81% of the Study Area, and is dominated by softwood and mixedwood stands, shrub and alder areas, and some wetland areas. The remaining 19% of the Study Area is disturbed area including urban/developed land, as well as water and cutover wetlands and upland (Drawings 7.21A to 7.21H). Within the Assessment Area, 23% of the land cover is considered disturbed as described above, while 25% of the Clearing Footprint is considered disturbed.

7.4.2.4 Sensitive Flora Habitat Modelling Methodology

Several landscape features representing habitat suitable for rare flora were mapped to identify sensitive habitats within the Study Area and inform high priority areas for the field assessment. These features include specific habitat types that are known to support rare vascular plant species in Nova Scotia. This started with narrowing down the potential species of rare plants that may be

present within the Study Area to create a priority plant species list. The habitats preferred by species identified in Table 7.47 were selected for the modeling of habitats given their presence within the Study Area.

Though plants vary greatly in their distribution and are rarely bound to a quantifiable set of criteria, some notable landscape characteristics are strongly associated with certain rare flora. Alluvial floodplains are a subset of wetlands that have rich, moist soils suitable for several rare plant species, including black ash. Calcareous surficial geology, commonly characterized by limestone and/or barrens creates more alkaline soil conditions preferred by rare flora such as orchid species. Specifically, exposed volcanic bedrock including talus slopes are known to be important for rare flora as well. Thus, these habitats, along with the preferred south-facing slopes were the primary targets of the modelling exercise.

Given the differing habitat preferences of the known rare species, several spatial layers were created to represent sensitive habitats for those species of flora. The habitat characteristics observed to be preferred by several rare species were considered. Some species, however, are generalists and it is therefore challenging to predict the habitats where they will occur.
Modelling was completed using LiDAR and surficial geology. LiDAR was used to identify canopy height (more mature forests), surface water (floodplains), and directional exposure, while surficial geology was referenced to identify talus slopes, barrens, and calcareous soils.

7.4.2.5 Field Assessment Methodology

Vascular plant surveys were conducted in 2023, 2024, and 2025 (June to September) in habitat types such as wetlands, clear-cuts, riparian areas, mature forest stands, and regenerating softwood stands. Surveys focused on examining habitats considered highly suitable for containing vascular plant SAR and SOCI and examining general vascular plant diversity and community composition within the Assessment Area. The search pattern used in the field was a random meander, an accepted method for detecting presence of plant species, including rare flora. Field staff conducting wetland and watercourse surveys were briefed on a short list of plant SAR and SOCI prior to conducting surveys and used a plant guide paired with photographs and/or voucher specimens to aid in incidental observations.

For each species sighting, the plant was identified and tabulated on an overall species inventory. Photos were taken for initial sightings where identification confirmation was required. When necessary, specimens were collected for immediate identification (assuming the plant in question appeared abundant). In addition to the prior knowledge of the surveyors, the study team used keys and descriptions from various print and electronic resources. Non-vascular flora (primarily mosses) and mushrooms were recorded incidentally during vascular flora surveys

Lichen surveys were conducted in 2023, 2024, and 2025. These surveys targeted suitable habitat for boreal felt lichen found within 100 m of the Assessment Area, as identified by the Boreal Felt Lichen Predictive Habitat Layer, as well as other suitable habitat for SAR/SOCI lichens within the Assessment Area. Meandering transects were completed on foot and targeted mature trees appropriate for hosting lichen SAR/SOCI. Host trees were visually inspected, focusing on tree trunks, branches, and twigs. A Survey 123 form was completed for any SAR/SOCI lichen species

identified during field surveys, which captures relevant information and the location of the observation. The following information, along with photos of the species and the surrounding habitat, was recorded:

- Surveyor name
- Weather conditions
- Survey conditions
- General site location
- Date
- Scientific name
- Count (number of thalli)
- Size of thallus or thalli
- Habitat (host substrate and general habitat – including whether the thalli presented within wetland or upland)
- Height of the organism
- Direction the species was facing
- Relevant comments

If a lichen specimen could not be readily identified in-situ, photos and/or specimens were collected and identified ex-situ in laboratory conditions via microscopy and standard chemical spot tests in accordance with Brodo et al. (2001) and using a variety of literature resources to aid in identification. Specimens were only collected if they were abundant on the site. Specimens were not collected if less than three individuals were observed.

Throughout the lichen surveys, a list of lichen species observed was recorded, with a focus on macrolichens (i.e., foliose, fruticose, and some squamulose species). Observations of vascular and non-vascular SAR/SOCI within the Assessment Area were also recorded by Strum staff during other biophysical surveys conducted between 2023 and 2025.

7.4.2.6 Sensitive Flora Habitat Modelling Results

Modelling was conducted to identify areas within the Assessment Area presenting high-value habitat for rare and/or sensitive flora species, based on preferred habitat types, to guide field surveys (Drawing 7.24). Table 7.48 identifies the abundance of those habitat types likely to support a variety of different vegetation communities that are most likely to support rare and/or sensitive flora species.

Table 7.48: Sensitive Flora Habitat Modelling Results

Flora Habitat[(1)]	Study Area		Assessment Area		Clearing Footprint	
	ha	ha	%		ha	%
Slope facing SW, S, or SE	844.03	9.50	115.17	12.70	77.74	12.48
Calcareous surficial slope facing SW, S, or SE	2,165.33	24.38	230.43	25.42	166.60	26.74
Calcareous surficial sloped floodplain facing SW, S, or SE	50.68	0.57	1.47	0.16	0.96	0.15
Mature forest on SW, S, or SE facing slope	17.37	0.20	1.27	0.14	0.61	0.10

Flora Habitat[1]	Study Area		Assessment Area		Clearing Footprint	
	ha	ha	%		ha	%
Floodplain mature forest on SW, S, SE facing slope	1.76	0.02	0.00	0.00	0.00	0.00
Calcareous surficial with mature forest on SW, S, SE facing slope	120.40	1.36	5.98	0.66	3.93	0.63
Calcareous surficial floodplain with mature forest on SW, S, SE facing slope	21.83	0.25	0.23	0.03	0.40	0.06
Total	**3,221.4**	**36.28**	**354.55**	**39.11**	**250.24**	**40.16**

[1]S = south; SE = southeast; SW = southwest.

A slightly higher percentage of the Assessment Area (39%) than the Study Area (36%) was identified as sensitive flora habitat amongst the various categories, representing different species varieties.

7.4.2.7 Field Assessment Results

During vascular plant surveys, 297 species, including six SOCI and one SAR, were identified (Drawings 7.17A to 7.17N) within the Assessment Area. Mosses and mushrooms were recorded incidentally during flora surveys; 47 species were identified, none of which are SAR or SOCI. There were 67 lichen species identified during lichen surveys, including 18 SOCI and two SAR. A complete list of flora species identified during all field surveys is provided in Appendix J. All plant and lichen SAR/SOCI identified during field assessments are summarized in Table 7.49. During lichen surveys, 86 boreal felt lichen polygons were surveyed. No evidence of boreal felt lichen was observed during these assessments.

Table 7.49: Plant and Lichen SOCI and SAR Encountered during Field Surveys

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Number of Observations in Study Area	Number of Observations in Assessment Area
Plants (Vascular)							
American beech	*Fagus grandifolia*	-	-	-	S3S4	N/A[1]	N/A[1]
Black ash	*Fraxinus nigra*	Threatened	-	Threatened	S1S2	3	0
Lesser pyrola	*Pyrola minor*	-	-	-	S3	2	0
Loesel's twayblade	*Liparis loeselii*	-	-	-	S3S4	1	0
Southern rein-orchid	*Platanthera flava*	-	-	-	S3	1	0
Southern twayblade	*Neottia bifolia*	-	-	-	S3	7	2
Yellow lady's-slipper	*Cypripedium parviflorum*	-	-	-	S3	1	0

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Number of Observations in Study Area	Number of Observations in Assessment Area
Lichens (Non-vascular)							
A lichen	*Fuscopannaria sorediata*	S2S3	-	-	-	10	0
A stubble lichen	*Chaenotheca brachypoda*	S3S4	-	-	-	5	1
Birdnest jellyskin lichen	*Scytinium tenuissimum*	S2S3	-	-	-	1	0
Blue felt lichen	*Pectenia plumbea*	S3	Special Concern	Vulnerable	S3	83	11
Blue-gray moss shingle lichen	*Moelleropsis nebulosa*	S2S3	-	-	-	1	0
Button jelly lichen	*Collema nigrescens*	S3	-	-	-	1	0
Collared glass-whiskers lichen	*Sclerophora amabilis*	S1S2	-	-	-	4	0
Corrugated shingles lichen	*Fuscopannaria ahlneri*	S3	-	-	-	11	2
Curly jellyskin lichen	*Scytinium teretiusculum*	S23S4	-	-	-	1	0
Fringe lichen	*Heterodermia neglecta*	S3S4	-	-	-	9	1
Frosted glass-whiskers lichen (Atlantic population)	*Sclerophora peronella (Atlantic pop.)*	S3S4	Special Concern	Special Concern	-	17	0
Naked kidney lichen	*Nephroma bellum*	S3	-	-	-	2	2
Powdered fringe lichen	*Heterodermia speciosa*	S3S4	-	-	-	8	2
Powdered honeycomb lichen	*Hypogymnia hultenii*	S1	-	-	-	1	0
Powdered ruffle lichen	*Parmotrema perlatum*	S3S4	-	-	-	1	0
Scaly fringe lichen	*Heterodermia squamulosa*	S3	Threatened	-	-	1	0
Shaggy fringed lichen	*Anaptychia palmulata*	S3S4	-	-	-	22	4
Stretched jellyskin lichen	*Leptogium milligranum*	S3	-	-	-	1	0

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Number of Observations in Study Area	Number of Observations in Assessment Area
Tree pelt lichen	*Peltigera collina*	S3	-	-	-	42	4

Source: (ACCDC, 2025b)
(1) As the species is relatively widespread throughout the Study Area, each observation was not recorded.

There were 39 non-native plants (13% of all plants identified) also encountered during field surveys (Appendix J). One of these non-native plants is considered an invasive species in Nova Scotia, rugosa rose (*Rosa rugosa*) (MTRI, 2022).

The results of flora studies have been incorporated into the design phase of the Project. Protection of flora SAR/SOCI will continue to be employed throughout operation and decommissioning phases through the use of targeted mitigation and best management practices.

Priority Species

The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a) was used to identify any priority species and habitat associated with this Project. All terrestrial flora SAR/SOCI and their respective habitat associations identified within the Study Area through desktop review and field inventory were considered. Only those terrestrial flora SAR/SOCI, and their respective habitats, with potential to interact with the Project have been designated as Project-specific priority species. Interactions may include removal or disturbance of a SAR/SOCI and/or their associated habitat.

These priority species include the following SAR identified within the Study Area:

- Black ash
- Blue felt lichen
- Frosted-glass whiskers (*Sclerophora peronella*)

As well as the following SOCI identified within the Assessment Area:

- American beech
- Southern twayblade (*Neottia bifolia*)
- A stubble lichen (*Chaenotheca brachypoda*)
- Corrugated shingles lichen (*Fuscopannaria ahlneri*)
- Fringe lichen (*Heterodermia neglecta*)
- Naked kidney lichen (*Nephroma bellum*)
- Powdered fringe lichen (*Heterodermia speciosa*)
- Shaggy fringed lichen (*Anaptychia palmulata*)
- Tree pelt lichen (*Peltigera collina*)

Lichen SOCI (the last seven species in the bulleted list above) are not discussed further due to the lack of specific habitat requirements associated with each, and their general abundance throughout the Study Area.

American Beech

American beech was assigned an S-Rank of 'S3S4' in March 2022. Although historically a common tree species in Nova Scotia, American beech trees health has been affected by beech bark disease throughout the province, affecting their ability to mature to an overstory species. As such, their ecological role has shifted to an intermediate or understory species (NSNR, 2021d). As the species is still relatively widespread throughout the Study Area, each observation was not recorded.

Black Ash

Black ash is a slow-growing, broad-leaved deciduous tree found primarily in moist habitats, including riparian areas adjacent to watercourses and within wetlands that have poorly drained peat or muck soils. This species was found in three locations in the northern section of the Study Area. A key threat to this species is habitat loss and the alteration of wet habitats resulting in hydrological changes. Research and data in Nova Scotia shows that the decline in black ash in the province can be partially attributed to habitat destruction, disease, and changes in environmental conditions (e.g., climate change and storms causing excessive flooding conditions) and moisture levels (COSEWIC, 2018; NSNR, 2015; Zinck, 1998). The species was designated as "Threatened" under the ESA in 2013. The black ash recovery plan recommends a 200 m setback around seed-bearing trees to not restrict long distance seed dispersal and minimize impacts to recruitment (NSNR, 2021c). None of the occurrences of black ash in the Study Area are within the Assessment Area. While there is slight overlap between the black ash buffer and the Assessment Area for all occurrences, the Clearing Footprint only overlaps with the black ash buffer for one occurrence. Further, there is already an existing road closer to this occurrence than the expected limits of the Clearing Footprint.

Southern Twayblade

Southern twayblade was observed in shrub swamps and open wetlands throughout the Study Area (Drawing 7.16A to 7.16N), including specimens within the Assessment Area both on private and Crown land. This species is found throughout eastern Canada (national rank of N3) and the eastern United States (N5), ranging from eastern Texas to Florida in the south, and Ontario to Nova Scotia in the north (NatureServe, 2024a). The most secure populations of the species are found in the eastern to southeastern United States, though Nova Scotia has the most apparently secure population in Canada with a conservation status of vulnerable (S3). Southern twayblade is most likely to be found in undisturbed swamps and may serve as an indicator species for ecosystem integrity (Hill et al., 2018). Southern twayblade was observed in two locations within the Assessment Area; both observations are along proposed new roads leading to turbine pads. This species will be avoided during detailed design to the greatest extent possible.

Blue Felt Lichen

Blue felt lichen was one of two SAR lichen ("Special Concern" under SARA, "Vulnerable" under ESA – no legal protection status) observed during field surveys with observations in both the Assessment Area and the greater Study Area. Blue felt lichen was designated as Nova Scotia's provincial lichen

in 2022 (CBC News, 2022). The species is limited to Atlantic Canada and northeastern Maine (NatureServe, 2024b), and just under half of the North American population of the lichen occurs in Nova Scotia. Blue felt lichen requires mature hardwood or mixed wood forests with high humidity, where several successional stages are present. Air pollution and acid rain are major threats to the survival of this species, and many areas of Nova Scotia currently receive acid deposition greater than the critical load for blue felt lichen. The construction of roads and logging associated with wind farm construction are also considered threats to this species, for the potential to remove the lichen itself, to remove the availability of host trees, and to alter hydrology and therefore impose edge effects such as drying and blow down (COSEWIC, 2010).

Multiple specimens of blue felt lichen (83) were found throughout the Study Area in a variety of landscapes including wetland and riparian areas, mixedwood, wet mixedwood, and wet coniferous forests. A total of 38 occurrences overlap with the 100 m buffer in the At-Risk Lichens – Special Management Practices for blue felt lichen (NSNR, 2018a) on Crown land (one occurrence is on private land). Of these 38, 11 locations are within the Assessment Area. Most locations with the Assessment Area are associated with turbine locations and are therefore expected to be avoided during detailed design. Two locations are along existing roads, and another is along the transmission line.

Frosted Glass-whiskers

The second SAR-listed lichen, frosted glass-whiskers (‘Special Concern’ under SARA), was observed in 17 locations within the Study Area. These specimens were found growing on the heartwood of red maple and yellow birch in both wetlands and mature hardwood forest and were verified under microscope. The Atlantic population of frosted glass-whiskers is a COSEWIC and SARA listed species of “Special Concern”, and Nova Scotia has the most substantial population of this subset of the species (COSEWIC, 2014). The At-Risk Lichens – Special Management Practices for frosted glass-whiskers lichen (NSNR, 2018a) outlines a 100 m buffer for the species on Crown land. Two occurrences are within the Assessment Area both of which are associated with turbine locations and are expected to be avoided, though there may be an overlap with the buffer. An additional four occurrences are located outside the Assessment Area but overlap the 100 m buffer.

7.4.2.8 Effects Assessment

Project-Terrestrial Flora Interactions

Project activities, primarily those that involve earth moving or vegetation removal, have the potential to impact terrestrial flora (Table 7.50). These activities could result in changes to, or loss of, habitat and plants, or the introduction of non-native species that may become invasive in the environment.

Table 7.50: Potential Project-Flora Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X

Project Phase	Potential for Interaction
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	X
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	X
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

The LAA for the terrestrial flora includes the Assessment Area (Drawing 2.1). The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for terrestrial habitat. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of terrestrial flora SAR/SOCI individuals or alteration to habitat known to support terrestrial flora SAR/SOCI expected.
- Low: Small loss of habitat supporting terrestrial flora SAR/SOCI, but no terrestrial flora SAR/SOCI individuals lost.
- Moderate: Small loss of terrestrial flora SOCI or SAR individuals (and associated habitat) that do not have legislated protection status, but their populations remain largely intact.
- High: High loss of the habitat that supports terrestrial flora SOCI or SAR individuals that do have legislated protection status and/or loss of an entire population of terrestrial flora SOCI/SAR.

Effects

Loss of SAR/SOCI

Two SAR lichen, seven SOCI lichen, and two vascular flora SOCI were identified within the Assessment Area. Additionally, black ash, a SAR, was identified within 200 m of the Assessment Area. The Project has undergone various layout changes, including several changes to the access roads and turbine placements to avoid SAR flora, and plant and lichen SOCI identified to the extent feasible.

Blue felt lichen was observed in 11 locations across the Assessment Area. One observation was found along the proposed transmission line corridor. Two of the observations are adjacent to existing roads. The remaining eight observations were all found along the outer edges of turbine pads and are expected to be avoided. A portion of the remaining blue felt lichen observations within the Study

Area were made outside the Assessment Area but within 100 m of the Assessment Area boundary. The Project will avoid these specimens and Project-related disturbance is not expected to reduce the distance of the existing buffered area beyond what is already disturbed through existing and historical activities.

The Proponent will maximize opportunities to avoid these occurrences and the associated buffer for specimens on Crown land during detailed design. For example, it may be possible to avoid specimens adjacent to existing roads by focusing work on the opposite sides of each road, where possible. It is expected that the one individual along the transmission line may not be avoidable, as clearing of the ROW is required for safety and reliability. In instances where avoidance is not possible, the Proponent will work with NSNR through its variance process on a case-by-case basis.

Two occurrences of frosted-glass whiskers were observed within the Assessment Area; however, both were observed near the outside of the edge of turbine pads. Avoidance of these specimens and opportunities to maximize the buffer of the additional four occurrences will be incorporated into the detailed design. A portion of the remaining frosted glass-whiskers observations within the Study Area were made outside the Assessment Area but within 100 m of the Assessment Area boundary. The Project will avoid these specimens and Project-related disturbance is not expected to reduce the distance of the existing buffered area beyond what is already disturbed through existing and historical activities. In instances where avoidance is not possible, the Proponent will work with NSNR through its variance process on a case-by-case basis.

Black ash was observed in three locations within the Study Area; however, none of these observations are within the Assessment Area. There is slight overlap between the black ash 200 m buffer and the Assessment Area. The Project Footprint will be adjusted during detailed design to limit impact to the 200 m buffer to the greatest extent possible.

Additional plant and lichen SOCI observed within the Assessment Area are anticipated to be lost at this time, including American beech, corrugated shingles lichen (n=2), fringe lichen (n=1), naked kidney lichen (n=2), powdered fringe lichen (n=2), shaggy fringed lichen (n=4), southern twayblade (n=2), a stubble lichen (n=1) and tree pelt lichen (n=4).

Based on the findings of the targeted surveys, modifications to the layout to avoid SAR and SOCI, and future opportunities to maximize buffers and avoid SAR/SOCI, only one loss of non-vascular plant SAR (blue felt lichen, no legislative protection status) and a small loss of SOCI individuals are expected.

Habitat Loss

Rare plants often become rare because they require specialized habitats (BCMECCS, 2018; ECCC, n.d.). The Project will require 44 km new roads. In addition to new road construction, road upgrades (e.g., widening) will be required along 35 km of pre-existing roads. A targeted approach was used when conducting field assessments for terrestrial flora to survey habitat that may host rare flora.

Project design has avoided habitat that is known to support plant and lichen SAR/SOCI within the Assessment Area to the extent possible. For example, impacts to moist wooded areas with mature

hardwood trees have been minimized by avoiding impacts to wetlands and wet deciduous type old-growth forests, as these are habitat types known to support rare plants and lichens. Detailed Project design will incorporate relevant buffers to the extent possible for known locations of SAR and SOCI flora. Based on these findings, effects to terrestrial flora from habitat loss are therefore expected to be negligible to low.

Of the habitat types observed in the sensitive flora habitat modelling, only the two most abundant habitat types (general south-sloped and calcareous south-sloped) showed a higher percentage of habitat within the Clearing Footprint. Given their relative abundance and the prevalence of all other types outside the Clearing Footprint (but within the Study Area), sensitive habitats will persist.

Indirect impact to flora through habitat loss includes habitat alteration through the pathway of dust deposition. Blasting, crushing, and road traffic may result in deposition of dust on vegetation and lichens within close proximity to the Project Footprint, especially when conditions are dry. Dust deposition is expected to be highest during construction as traffic volumes will be heavier during this time compared to the operations phase. It is not expected that dust deposition will have a measurable impact beyond the Clearing Footprint.

Invasive species

Terrestrial flora, particularly rare flora, may be at risk due to threats from invasive species (BCMECCS, 2018). Non-native species, often introduced into a landscape accidentally by humans, can become invasive when they cause harm to the environment, economy, or human health through rapid reproduction and out-competing native species (Rutledge et al., 2024). Industrial projects can lead to the introduction of invasive species in two main ways:

- Revegetation of cleared land with non-native seed mixes.
- Increased access to remote areas with equipment carrying seeds, spores, or other reproductive materials from non-native species.

There were 39 non-native plants identified within the Study Area, as much of the Study Area is already disturbed. One of those species, rugosa rose (SNA), is considered to be invasive in Nova Scotia (NSECC, 2012). Although the magnitude of effects is expected to be negligible to low, mitigation strategies to minimize the risk of introducing and/or spreading invasive species across the Study Area are provided.

Mitigation

To address effects to terrestrial flora, the following mitigation measures will be implemented:

Loss of SAR/SOCI Species

- Minimize overall area to be cleared by using pre-existing roads and previously altered areas (i.e., clearcuts).
- Avoid areas with known flora SAR and SOCI occurrences during the design phase to the extent possible.

- Educate Project personnel about the potential for plant or lichen SAR/SOCI during construction.
- Consult with NSNR if an unexpected flora SAR/SOCI with applicable species management requirements is encountered during construction activities on Crown land. If encountered, additional mitigations may be implemented as a contingency.

Habitat Loss

- Minimize overall area to be altered by using pre-existing roads and previously disturbed areas (i.e., clearcuts).
- Restore as much habitat as possible through natural revegetation to promote continued growth of terrestrial flora across the Study Area.
- Expand existing roads away from SAR species buffers in locations where the existing road falls within those buffers, to the extent possible.
- Implement the Erosion and Sediment Control Plan.
- Implement speed limits to reduce dust emissions.
- Use dust suppressants (i.e. water trucks) when required.

Invasive Species

- If seed mixes are used to aid in revegetation, only use native seed mixes.
- Ensure equipment is as clean as possible to prevent the introduction of non-native species into previously untouched areas.
    - Because non-native and invasive species are already present within the Study Area, care will be taken when travelling from developed areas to intact areas so that plant material is not transferred between locations.
- Minimize the application of herbicides to only being used in locations where conventional brushing and clearing is not practical.

Monitoring

No monitoring programs specific to terrestrial vegetation communities and flora are proposed.

Conclusion

After mitigations, residual effects to terrestrial flora associated with the Project have been assessed, including the potential for SAR/SOCI loss, habitat loss, and the introduction of invasive species. Based on this assessment and the implementation of proposed mitigation, residual effects on terrestrial flora are characterized as follows:

- Magnitude: Moderate magnitude as a small loss of terrestrial flora SAR and SOCI individuals (and associated habitat) that do not have legislated protection status may occur, but their populations are expected to remain largely intact.
- Geographic extent: Within the LAA.
- Frequency: Once during construction phase, and intermittent vegetation maintenance through the operations phase as vegetation clearing will continue to prevent interference with infrastructure (frequency not applicable for individual SAR/SOCI).

- Duration: Long-term from initial clearing during construction until after decommissioning.
- Reversibility: Partially reversible, as the cleared areas will be allowed to revegetate following decommissioning though communities may have changed.
- Significance: Not significant.

7.4.3 Terrestrial Fauna

7.4.3.1 Overview

The terrestrial fauna assessment was completed using a combination of desktop and field assessments to achieve the following objectives:

- Identify significant species and habitat supporting SAR/SOCI within/near the Study Area using desktop resources.
- Determine the likelihood of SAR/SOCI occurring in the Study Area.
- Use data from targeted surveys as well as incidental observations for different groups of terrestrial fauna to document the presence of species within the Study Area, particularly SAR/SOCI.
- Use the information collected through field studies to update the Project design, as necessary, to avoid or minimize interactions between Project infrastructure and confirmed locations of terrestrial fauna SAR/SOCI or the habitats that are known to support terrestrial fauna SAR/SOCI.
- Apply mitigation, construction, and operational management practices to minimize effects to terrestrial fauna.

7.4.3.2 Regulatory Context

Applicable laws and regulations relating to the protection of fauna (i.e., mammals and herpetofauna, lepidopterans, and odonates), including the following:

- SARA
- CEPA
- *Canada Wildlife Act*
- ESA
- *Wildlife Act,* R.S.N.S. 1989, c. 504
- *Biodiversity Act,* 2021, c. 3, s. 1
- *Environment Act,* S.N.S. 1994-95, c. 1

The ESA and SARA prohibit harm to SAR listed as “Endangered” and “Threatened” along with their habitually occupied spaces and core/critical habitat (respectively). The *Canada Wildlife Act* provides a framework for the creation of protected wildlife areas, and the Nova Scotia *Wildlife Act,* R.S.N.S. 1989, c. 504 provides policies and programs for wildlife to maintain diversity of species at levels of abundance to meet specific management objectives. The *Wildlife Act,* R.S.N.S. 1989, c. 504 includes a clause for the protection of den/habitation of a furbearer [48(3)] and prohibits harm to the nest of a (bird or) turtle [51(a)]. The Nova Scotia *Biodiversity Act,* 2021, c. 3, s. 1 provides a framework for the creation of Biodiversity Management Zones used for conservation and sustainable biodiversity values. Lastly, CEPA and the *Environment Act,* S.N.S. 1994-95, c. 1 both provide measures for the protection of the environment and pollution prevention.

7.4.3.3 Desktop Review

Prior to undertaking the terrestrial field assessment, a detailed desktop review of known fauna observations and potential habitat for terrestrial fauna was completed to support the survey design. The following databases were reviewed:

- ACCDC Report (ACCDC, 2025a)
- NSNR Significant Species and Habitat Database
- SARA and ESA recovery strategies
- Special Management Practices (SMP) Layers (i.e. wood turtle SMP layer)

7.4.3.4 Desktop Review Results

Mammals

The ACCDC Data Report (Appendix F) indicates that six terrestrial mammal SAR/SOCI (excluding birds and bats, and aquatic mammals; see Sections 7.4.4, 7.4.5, and 7.3.2.5, respectively) have been recorded within a 100 km radius of the Study Area (Table 7.51). None of the identified SAR/SOCI have records within 5 km of the Study Area.

Table 7.51: Terrestrial Mammal Species Recorded within a 100 km Radius of the Study Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Distance (km)
American marten	*Martes americana*	---	---	Endangered	S2S3	59.5 ± 0.01
Canada lynx(1)	*Lynx canadensis*	---	---	Endangered	S2S3	27.3 ± 1.0
Fisher	*Pekania pennanti*	---	---	---	S3	12.7 ± 0.01
Mainland moose(2)	*Alces alces americana*	---	---	Endangered	S1	23.2 ± 0.01
Rock vole	*Microtus chrotorrhinus*	---	---	---	S2	60.4 ± 0.5
Southern bog lemming	*Synaptomys cooperi*	---	---	---	S3	60.4 ± 0.5

Source: (ACCDC, 2025a)
(1) Cape Breton population. Not present on Mainland NS.
(2) Reported by ACCDC as 'Moose – *Alces alces americanus*', which has been changed to reflect most up to date nomenclature.

Of note, Canada lynx is listed within 100 km of the Study Area; however, according to the status report (Parker, 2001) Canada lynx distribution within Nova Scotia is limited to Cape Breton. ACCDC lists the mainland moose as a location sensitive species and indicates that this species was not documented within 5 km of the Study Area. The ACCDC also records marine mammals within 100 km radius of the center of the Study Area, but there are no foreseeable impacts from the Project to the marine environment.

The NSNR Significant Species and Habitat Database available on the Provincial Landscape Viewer (NSNR, 2024f) does not contain any polygons within the Study Area pertaining to terrestrial fauna. One record pertaining to a deer wintering area is approximately 1 km from the Study Area, and four additional records of deer wintering areas are within 7 km of the Study Area.

Mainland Moose Habitat Suitability Modelling

To support the effects assessment, a modelling exercise was completed to describe and quantify the habitat for mainland moose based on a habitat suitability index (HSI), advised by the Mainland

Moose Recovery Strategy (NSNR, 2021h), using ArcGIS Pro software, and the following data sources:

- Provincial Forest Inventory database (NSNR, 2021h)
- Provincial Roads and Railroads database (GeoNOVA, 2024c)
- Provincial WAM database (NSECC, 2022b)

The data contained within the forest inventory database was reclassified for the purposes of this analysis based on land cover types (e.g., forest types, management history, and wet areas) to determine suitability for the different habitat needs of mainland moose. Wetland environments were a required component in the creation of this model as mainland moose use wetlands for thermal refuge in summer, and aquatic plants such as pondweed (*Potamogeton spp*.) and yellow pond lily (*Nuphar lutea*) provide important nutritional foraging options. Wetlands, particularly isolated areas surrounded by water, are also important calving areas as they provide protection and nutrients for calves and cows. For the purposes of the model, wetlands were determined from the wet areas database which was used to find areas where the depth to water of 50 cm or less, indicating a high probability of wet conditions favourable to mainland moose.

Land was classified based on its suitability for the various requirements of mainland moose to establish favourable attributes for habitat suitability. Habitat types assessed through land cover and landscape features which are counted in a positive criteria layer include:

- Summer forage
- Summer cover
- Winter forage
- Winter cover
- Calving areas

For more information on the criteria and characteristics of the above habitat types, refer to the Recovery Plan for the Moose in Mainland Nova Scotia (NSNR, 2021h), Section 8.2 Attributes of Core Habitat. From the above datasets, features that detract from suitability of mainland moose habitat are incorporated into a negative criteria layer to include:

- Urban areas
- Landfill
- Quarry
- Road density
- Harvested areas

Using Raster Calculator in ArcGIS Pro, the negative criteria raster's values are subtracted from positive criteria raster values to determine the overall suitability of habitat for mainland moose. To allow for some generalization of the habitat, zonal statistics were calculated based on 5 ha hexagons. A grid of hexagons was generated over the LAA as an HSI which ranges from -3 to 5 (the lowest and highest possible scores), in which a -3 is highly unsuitable, and 5 is ideal mainland

moose habitat. For descriptive purposes, this range is divided into discrete bins that describe habitat suitability on a scale from poor to best (Table 7.52). The LAA consists of contiguous mainland within a 5 km buffer of the Study Area (i.e. ocean, offshore islands, and Cape Breton Island are excluded from this area).

In this index, any area classified as at least "fair" provides at least one habitat type requirement for the mainland moose. Habitat designated as "best" is providing multiple habitat types for the species while being minimally impacted by negative factors such as roads or conflicting land-uses. Note that scores greater than 4.01, while mathematically possible, are ecologically infeasible due to the unique characteristics of different mainland moose habitat types.

Table 7.52: Mainland Moose Habitat Suitability Model Weighting Scheme

Score Range	Label	LAA (ha)	LAA (%)	Study Area (ha)	Study Area (%)	Clearing Footprint (ha)	Clearing Footprint (%)
<0	Poor	8866.48	31.38	1869.73	21.06	198.24	31.81
0	Neutral	2564.71	9.08	720.13	8.11	54.57	8.76
0 to 1.35	Fair	12,625.82	44.68	4,860.25	54.73	304.31	48.84
1.36 to 2.68	Better	3,894.09	13.78	1,357.29	15.28	65.99	10.59
2.69 to 4.01	Best	304.56	1.08	72.76	0.82	0.00	0.00

This model identified that the habitat suitability of the Study Area is not highly dissimilar to the 5 km buffer around the Study Area (i.e., the LAA) in terms of proportional distribution of habitat suitability. The most common classification of habitat across all spatial boundaries are both 'poor' and 'fair', with no habitat classified as 'best' within the Clearing Footprint.

Herpetofauna

Data from the ACCDC report indicates that three herpetofauna SAR/SOCI have been recorded within a 100 km radius of the Study Area (Table 7.53). One marine herpetofauna species was also recorded, but there are no foreseeable impacts to marine species from the Project.

Table 7.53: Herpetofauna Species Recorded by ACCDC within a 100 km Radius of the Centre of the Study Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Distance (km)
Eastern painted turtle	*Chrysemys picta picta*	Special Concern	Special Concern	-	S4	55.0 ± 1.0
Snapping turtle	*Chelydra serpentina*	Special Concern	Special Concern	Vulnerable	S3	24.6 ± 0.01
Wood turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened	S2	15.7 ± 10.0

Source: (ACCDC, 2025a)

No SAR/SOCI herpetofauna were recorded within the Study Area. The closest record pertained to the wood turtle (*Glyptemys insculpta*), which was recorded 15.7 km from a central point within the Study Area. The ACCDC report indicated that location sensitive herpetofauna species [snake hibernaculum, wood turtle, and blandings turtle (*Emydoidea blandingii)*] were not recorded within 5

km of the Study Area. There are no Significant Species and Habitat Database polygons on the Provincial Landscape Viewer related to herpetofauna within the Study Area.

The wood turtle SMP secondary watersheds (NSNR, 2020a) layers were reviewed to identify watersheds where habitat may be more suitable. No watersheds intersecting the Study Area were identified within the SMP layers.

Invertebrates

Data from the ACCDC report contains records of eight SAR and SOCI invertebrates within a 25 km radius of the Study Area (56 species were observed within 100 km of the Study Area, as outlined in the ACCDC report, Appendix F). None are within the Study Area. There are no location sensitive invertebrate species that are excluded from the ACCDC report. There are no Significant Species and Habitat Database Polygons on the Provincial Landscape Viewer relevant to invertebrates within the Study Area (Table 7.54).

Table 7.54: Invertebrate Species Recorded by ACCDC within a 25 km Radius of the Center of the Study Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Distance (km)
Mottled darner	*Aeshna clepsydra*	---	---	---	S3S4	19.2 ± 0.05
Brook floater	*Alasmidonta varicosa*	Special Concern	Special Concern	Threatened	S3	21.1 ± 0.1
Yellow-banded bumble bee	*Bombus terricola*	Special Concern	Special Concern	Vulnerable	S3	13.4 ± 0.2
Monarch	*Danaus plexippus*	Endangered	Endangered	Endangered	S2?B, S3M	7.2 ± 0.01
Harlequin darner	*Gomphaeschna furcillata*	---	---	---	S3S4	18.4 ± 0.05
Eastern pearlshell	*Margaritifera margaritifera*	---	---	---	S2	18.9 ± 0.5
Elfin skimmer	*Nannothemis bella*	---	---	---	S3S4	18.4 ± 0.05
Spot-winged glider	*Pantala hymenaea*	---	---	---	S2?B	22.7 ± 0.01

Source: (ACCDC, 2025a)

The nearest record is the Monarch, found 7.2 km from the Study Area. Brook floater are known to inhabit Salmon River in Guysborough County , which is approximately 20 km from the Study Area (ECCC, 2018c).

7.4.3.5 Field Assessment Methodology

Mammals

Targeted mainland moose winter tracking and pellet surveys were conducted to assess the presence and distribution of mainland moose and other mammals across the Study Area. Trail cameras were also established across the Study Area to capture the presence of wildlife without any interference from human disturbance (Drawing 7.25; Table 7.55). The goal of the surveys was to cover all relevant habitat types present across the Study Area, including roadways, wetlands, various forested habitats, riparian areas along watercourses and waterbodies, and previously

disturbed areas (e.g., clearcuts). These surveys provided a broader perspective of terrestrial mammal activity within and around the Study Area.

Table 7.55: Mammal Assessment Survey Information

Survey Type	Transect/Trail Camera ID	Dates Completed/Deployed (2024)	Transect Length (km)
Winter Tracking	1	January 3 and 31	1.55
	2	January 4 and 23	1.41
	3	January 4 and 24	1.11
	4	January 3 and 31	1.50
	5	January 4 and 24	1.54
	6	January 5 and 23	1.28
	7	January 4 and 23	1.08
	8	January 4 and 23	1.27
	9	January 3 and 23	1.06
	10	January 3 and 23	1.02
	11	January 3 and 23	1.12
	12	January 5 and 24	1.06
	13	January 3 and 30	0.78
	14	January 3 and 24	1.20
	15	January 4 and 30	1.15
	16	January 4 and 24	1.39
	17	January 4 and 30	1.01
Pellet Surveys	1	April 10	1.69
	2	April 10	1.06
	3	April 10	1.32
	4	April 10	1.64
	5	April 9	1.45
	6	April 9	1.69
	7	April 9	1.60
	8	April 9	1.67
	9	April 9	1.40
	10	April 9	1.08
	11	April 9	0.90
	12	April 10	1.37
	13	April 10	1.30
	14	April 10	2.08
	15	April 8	1.93
Trail Cameras	TC-09	November 2022 to March 2024	N/A
	TC-13	November 2022 to March 2024	N/A
	TC-53	February 2023 to March 2024	N/A
	TC-57	February 2023 to March 2024	N/A

Survey Type	Transect/Trail Camera ID	Dates Completed/Deployed (2024)	Transect Length (km)
	TC-59	February 2023 to March 2024	N/A
	TC-72	February 2023 to March 2024	N/A

Methods were adapted from those recommended by the NSNR Wildlife Division (NSNR, 2022d). Winter wildlife tracking surveys were completed over two rounds, in early and late January 2024. Surveys are completed within seven days of the most recent snowfall of 10 cm or more, and when possible, within two to three days of the most recent snowfall. This timeline allowed sufficient time for animals to leave their tracks, and limited opportunities for tracks to deteriorate or disappear as a result of excessive snowfall, melting, or rain. Care was also taken to ensure surveys were not completed during rain or snow events. Recent, intact, tracks in fresh snow allow for the most accurate track identification. Pellet surveys were completed once in April 2024, after snow had melted completely, revealing animal droppings that had been preserved in the snow over the winter.

Surveys were conducted along pre-determined transects (17 in winter, 15 in spring) covering a range of representative habitats within the Study Area, with priority given to habitat where mainland moose were expected to be active during the winter, if present. Transects ranged from 0.78 km to 2.08 km. The transect layout was designed in consideration of safe access, topography, and by aerial interpretation of habitats to ensure representative habitats within the Study Area were assessed. Transect lengths and locations were altered between winter tracking and pellet surveys to account for information gained during winter tracking to ensure as many habitat types as possible could be covered across surveys, and to maximize coverage across the Study Area. Sections of trails and roads were also surveyed opportunistically, and any observations of interest were recorded. All survey tracks were recorded using ArcGIS Field Maps, and any changes to transects were made such that the new course was similar in length to the planned transect and covered similar or improved habitat types.

Transects were travelled by foot. While slowly travelling along a transect, an approximately 4 m area centered on the transect line was scanned for any sign of animal activity, including tracks, pellets/scat, browse, dens, or animal sightings. When suspected activity from white-tailed deer (*Odocoileus virginianus*) and any terrestrial mammal SAR/SOCI, including mainland moose, was observed, detailed notes and photos relating to habitat and animal sign were recorded. Additional observations of interest, such as evidence of predator and prey interactions, were also recorded. Any other activity from non-SAR/SOCI mammals was recorded only if the observation was found to be particularly unusual or interesting. All observations were recorded and georeferenced in the field using an ArcGIS Survey123 form. Upon completion of each transect, a general description of the transect including overall tracking conditions, different habitats encountered, and abundance of each species was recorded. Abundance of each species includes all SAR/SOCI and non-SAR/SOCI mammals. If observations of terrestrial mammal SAR/SOCI activity were made during other survey types (i.e., wetland assessments), these observations were also recorded.

Concurrently, and in addition to wildlife surveys, trail cameras were deployed at various locations across the Study Area from November 2022 to March 2024 (Table 7.57). Locations were selected to

include various habitat types, and to capture more information from locations previously found to have signs of wildlife. Large mammals commonly use old roads, trails, or natural corridors such as riparian zones to travel throughout a landscape, and thus cameras were placed in these areas to capture their movements. Riparian areas are often preferred by these mammals as this habitat represents some of the only remaining intact forest within the Study Area. Trail cameras were visited regularly to replace storage cards and batteries, and occasionally the trail camera itself was removed from one location and relocated to increase site coverage. All photos/videos were then assessed for signs of wildlife.

Herpetofauna

A desktop review of the Study Area was undertaken before conducting field surveys to identify areas of preferred turtle habitat. According to their Recovery Strategy, wood turtles require water with sufficient flow and sufficient depth to provide them with ice-free, well-oxygenated water throughout the winter (ECCC, 2020). Wood turtles tend to hibernate wherever instream structures such as boulders or root-wads provide some cover and rarely hibernate outside of the main channel of a watercourse, as they require well oxygenated water throughout the winter (pers. comm., M. Pulsifer, January 2021).

Wood turtles nest in well-drained gravelly soil on the banks of inhabited watercourses. While some may be attracted to gravelly roadsides for nesting, this habitat is considered unsuitable due to the danger presented to emerging hatchlings. To support egg incubation, soils need to be well-drained, with a southern aspect, and free of vegetation. This habitat is typically present as sand or gravel bars in depositional areas of dynamic, natural watercourses (ECCC, 2020).

Targeted wood turtle surveys occurred in spring 2023 when the ambient air temperature was higher than the water temperature (at least 10°C target) but not higher than 25°C. Surveys were conducted on May 16, 17, 18, and 30, 2024 along 15 pre-determined watercourse transects, each approximately 500 m long. Transect lines were walked approximately 10 m from the water's bank along both sides of each watercourse, surveyed simultaneously by two field biologists (Drawing 7.25). The transect line served as a center point, and surveyors scanned the ground, the banks, and the water up to 10 m on either side for a total search area of 20 m on both sides of the watercourse. Search efforts focused on bank areas with high sun exposure or other adequate basking areas such as instream rocks or logs. Turtles may also be found under or near deadfall, grasses, leaf litter, or woody shrubs, particularly alder trees, and so these areas were searched with greater intensity as they may be more inconspicuous. All survey tracks were recorded using ArcGIS Field Maps, and any changes to transects were made such that the new course was similar in length to the planned transect and covered similar or improved habitat types.

Any observations of turtles, snakes, or salamanders were recorded and georeferenced in the field using an ArcGIS Survey123 form. Upon completion of each transect, a general description of the transect, including the presence of any notable habitat features, was recorded. Any additional observations of herpetofauna made during other survey types such as wetland or watercourse surveys, as well as observations of suitable turtle habitat, were also recorded.

Invertebrates

Targeted surveys for invertebrate species were not conducted; however, any incidental observations of invertebrate SAR or SOCI during other field surveys were documented. Obligate habitats for SAR invertebrates were recorded if observed incidentally as well or through botany surveys – specifically referring to observations of milkweed (*Asclepias spp.*) as an obligatory food source for the monarch butterfly.

7.4.3.6 Field Assessment Results

Mammals

There were 14 species identified during field assessments either by sighting individuals or signs thereof, including both targeted surveys and incidental observations conducted within the Study Area (Table 7.56). Piles of white-tailed deer pellets ranged from one pile per transect to 18 piles per transect, at T13 and T14, respectively. The average number of piles per transect was 10 piles. Observations are detailed in the Priority Species Section.

Table 7.56: Summary Results of the Mammal Field Assessments

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
American black bear	*Ursus americanus*	-	-	-	S5
American porcupine	*Erethizon dorsatum*	-	-	-	S5
Bobcat	*Lynx rufus*	-	-	-	S5
Eastern coyote	*Canis latrans*	-	-	-	S5
Fisher	*Pekania pennanti*	-	-	-	S3
Mainland moose	*Acles alces americanus*	-	-	Endangered	S1
North American beaver	*Castor canadensis*	-	-	-	S5
Raccoon	*Procyon lotor*	-	-	-	S5
Red squirrel	*Tamiasciurus hudsonicus*	-	-	-	S5
Snowshoe hare	*Lepus americanus*	-	-	-	S5
Unknown rodent	N/A	N/A	N/A	N/A	N/A
Weasel	*Mustela sp.*	N/A	N/A	N/A	N/A
White-footed deermouse	*Peromyscus leucopus*	-	-	-	S5
White-tailed deer	*Odocoileus virginianus*	-	-	-	S5

Source: (ACCDC, 2025a)

Three mammal species were recorded by trail cameras (Table 7.57, photograph log provided in Appendix K).

Table 7.57: Summary of Trail Camera Results

Trail Camera Location	Animals Observed	Number of Observations (1)
TC-09	White-tailed deer	28
	Eastern coyote	99
	White-tailed deer	1
	American Black Bear	2
	Porcupine	1
	Racoon	1
TC-13	White-tailed deer	22
	American Black Bear	1
	Eastern coyote	1
TC-53	Eastern coyote	2
	White-tailed deer	8
TC-57	White-tailed deer	3
	Snowshoe hare	2
TC-59	White-tailed deer	36
	Eastern Coyote	2
TC-72	White-tailed deer	6

(1) Number of observations adjusted based on likelihood of photos belonging to the same animal; a general rule of one hour between photos was applied to consider photos of the same species to be separate observations.

Results of the trail cameras indicate that white-tailed deer are the most frequently detected across the Study Area, having been documented at all six cameras. The highest activity was recorded at TC-09, where six species were recorded (Drawing 7.25).

Herpetofauna

No herpetofauna SAR or SOCI were identified in the Study Area during 2023 targeted field studies, or incidentally during other studies (e.g., wetland delineation) in 2023, 2024, and 2025. Additional non-SAR/SOCI common species such as frogs (e.g., wood frog) and snakes (e.g., garter snake) were observed across the Study Area in various habitats. Many of the watercourses surveyed had limited turtle habitat available. These watercourses were characterized as fen complexes or beaver ponds; steep, cascading streams with high flow; or deep, stagnant streams with murky substrates. Turtle habitat was noted along various watercourses through the Study Area, characterized by sandy/gravelly shores, clear, flowing water, and adequate sun exposure. Several of these areas overlap with the Assessment Area. Although habitat for wood turtles was noted during the desktop review, this habitat was searched during ideal conditions and no wood turtles were observed during targeted surveys. Additionally, all ACCDC records for wood turtles occurred outside the Study Area and the Study Area is not within wood turtle SMP secondary watersheds (NSNR, 2020a).

Invertebrates

There were no observations of invertebrate SAR/SOCI during the field assessments within the Study Area. No milkweed was observed to support monarch butterflies.

Priority Species

Based on the desktop review and field survey results, terrestrial species that have been recorded or are likely to occur within the Study Area were screened against the criteria outlined in the Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009) to develop a list of priority species, as detailed in the sections that follow.

Mammals

- Mainland moose – Endangered (ESA), "S1" (S-Rank)
- Fisher – "S3" (S-Rank)

Mainland moose are a SAR listed as "Endangered" under the ESA with a subnational ranking of S1 (highest priority). They are not listed under SARA. Threats to mainland moose include habitat loss and fragmentation, particularly resulting from industrial activities; and loss of habitat connectivity due to the increased placement and density of roads (NSNR, 2021h). The Study Area has previously been and continues to be subject to the abovementioned threats as a result of historical and current land-uses, including forestry activities and recreation. Renewable energy projects were described as a medium level threat, as the nature of wind projects usually requires the construction or expansion of road networks and loss of forested habitat.

No evidence of mainland moose was observed during winter tracking surveys; however, potential evidence of mainland moose browse was observed during pellet surveys and summer botany surveys, as well as fresh mainland moose tracks observed in October 2024 (Appendix K). Locations for the observations of potential and confirmed mainland moose sign will be provided directly to regulators.

Fishers prefer dense, mature to old-growth forests with continuous overhead cover (Allen, 1983). Generally considered forest-interior species (OMNR, 2000) fishers require large tracts of well-connected habitat (Meyer, 2007). Fishers are distributed throughout mainland Nova Scotia, and trapping data suggests the population is concentrated in Cumberland, Colchester, and Pictou counties. A total of 37 fishers have been harvested from Guysborough County since 2010, representing just 2.36% of the provincial total during that time (NSNR, 2024a). Mature and old-growth forest stands nearby the Project may provide suitable canopy closure and coarse woody debris of sufficient diameter for fishers on the site. Fisher tracks were observed near a trail camera in March 2024, and additional fisher tracks were recorded during winter tracking in a mature hardwood forest stand within the Study Area (Appendix K).

7.4.3.7 Effects Assessment

Project-Terrestrial Fauna Interactions

Project activities, primarily those that involve earth moving or vegetation removal, have the potential to impact terrestrial fauna (Table 7.58). These activities could result in habitat removal, alterations to wildlife corridors, and reductions in food availability. Other Project-related activities, including during construction and operation, may impact terrestrial fauna behaviours, such as increased traffic and noise.

Table 7.58: Potential Project-Terrestrial Fauna Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Strait Crossing Connection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

For the purposes of this assessment, the LAA for terrestrial fauna is a 5 km buffer of the Study Area, including only contiguous mainland (Drawing 7.26).

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for terrestrial fauna. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of fauna habitat or impact to fauna behaviours expected.
- Low: Small loss of habitat supporting fauna and low impacts to fauna behaviours expected.
- Moderate: Moderate loss of fauna habitat or moderate impacts to fauna behaviours, but these impacts will only be experienced by individuals rather than entire populations.
- High: High loss of fauna habitat or high impact to fauna behaviours on a population scale.

Effects to Terrestrial Mammals

As a keystone species, mainland moose has been chosen as an example for several of the analyses below, given its historical prevalence as the primary native megafauna. The Project's impacts to the population of mainland moose within the LAA has been used as a proxy for the impact to all terrestrial fauna.

Road Traffic

The Project will result in increased road traffic within the LAA. Both small and large terrestrial mammals are known to use the roadways within the Study Area, as evidenced by first-hand

accounts by field staff and winter tracking/pellet survey results. An increase in road traffic will increase the chances of collision and mortality for those animals using the roadways. Most roads within the Study Area are currently used for recreation by ATV, snowmobile, and dirt bike users and for forestry activities. Outside of the construction phase, the Project will only require a small number of technicians to access the site to perform regular maintenance/equipment checks. Considering the pre-existing traffic load and the minimal traffic to be associated with the Project, road traffic is expected to have a negligible to low effect on terrestrial mammals in the LAA.

Habitat Loss and Fragmentation

The Mainland Moose Recovery Plan identifies three localized groups of mainland moose within the province (within concentration areas) and scattered pockets along the Atlantic coast, one of which overlaps the Study Area (NSNR, 2021h). This pocket is described in the Recovery Plan as “core habitat” (though not legislatively protected under section 16 or 18 of the ESA), is noted as important for connectivity between concentration areas, and is part of an approximate 8,900 km^2 of similarly defined territory across the Nova Scotia mainland. The Recovery Plan also ranked “core habitat” as having high or low suitability based on combined HSI and road density scores. Scores of three or below were not considered to meet the criteria. Scores of 4 to 9 meet the criteria, with higher scores reflecting higher suitability. While the majority of the Study Area overlaps this “core habitat”, only a small portion of the Study Area and the LAA overlap areas with a combined HSI/roads criteria value of 4 to 6. The majority of the Study Area and LAA do not have an associated combined HSI/roads criteria score. As shown in Figure 5 of the Recovery Plan, high (i.e., 7 to 9) combined HSI/roads criteria values are more than 10 km southwest of the LAA, south of the Milford Haven River and Guysborough Intervale.

A mainland moose habitat analysis was developed for the Project to also assess the quality of mainland moose habitat within the LAA. The results of this analysis will be provided directly to NSNR for review. Of the 4,199 ha of habitat determined to be suitable for mainland moose within the LAA (receiving a ”better” or “best” score), 1,430 ha lie within the Study Area (34%) and 66 ha (1.6%) lie within the Clearing Footprint. Qualitatively, while potential habitat with the highest HSI scores are found within the Study Area, the largest portions of this habitat with a ‘better’ score are outside of the Clearing Footprint and no ‘best’ habitat was identified within the Clearing Footprint. This not only protects potential habitat but also reduces habitat connectivity degradation, which is furthered by the extensive use of existing roadways within the Study Area.

The Recovery Plan identifies habitat fragmentation as another key threat to mainland moose (NSNR, 2021h). Habitat fragmentation is directly related to habitat connectivity which is a major concern for the longevity of mainland moose in Nova Scotia, where communities are already highly localized to three areas of the province. Road placement and road density are the main drivers of reduced habitat connectivity and road construction is defined as one of the main activities likely to result in destruction of important moose habitat (NSNR, 2021h). Wildlife corridors are often cited as a mitigation strategy for improving habitat connectivity; however, effective maintenance of these corridors requires an understanding of natural wildlife corridors and mainland moose movement patterns on the landscape. Habitat loss and reduced habitat quality may result in behavioural changes, including from reduced opportunities for thermoregulation, loss of overwintering areas, loss of adequate sources of food, reduced space for mating, and reduced protection for calves.

Renewable energy is included as a potential threat to mainland moose in the Recovery Plan due to potential habitat loss, conversion, and degradation caused by vegetation clearing for infrastructure associated with wind farms. Current and historical land-use in the Study Area (i.e., forestry activities and recreational off-road vehicle use) has altered the landscape within the Study Area to its current state, where road networks are abundant and forested habitat has been altered and degraded. The Project is using these pre-existing disturbed areas to the greatest extent possible to reduce habitat loss (Section 7.4.1).

Approximately 35 km of the 68 km of existing roads within the Study Area have been incorporated into the Project design, while 44 km of new road construction will be required. Areas requiring upgrading to facilitate Project activities (e.g., the widening of a turn to accommodate a radius sufficient for turbine blade transport) are likely to see more impact, whereas areas with roadways large enough to accommodate forestry equipment will generally remain as true to their current state as Project developments will allow. The creation of wider road ROWs will increase the space for early successional vegetation, creating new foraging opportunities for terrestrial mammals adjacent to this built infrastructure that may eventually become suitable habitat.

The design has maximized the use of existing infrastructure and disturbed areas such that the overall area of habitat loss is small and the direct impacts to moose habitat are expected to be low.

Life History

Direct effects to terrestrial mammals from wind farms may include sensory disturbance and stress from anthropogenic light sources or human presence resulting in behavioural changes. Mitigation strategies to avoid direct impacts resulting in behavioural changes during sensitive windows and in important habitat are described below. Indirect effects may include removal of adequate breeding/calving habitat through conversion of the landscape to support new project-related infrastructure and reducing areas with enough seclusion or cover to protect young from predators. mainland moose breeding season takes place between September and October, with calving generally occurring in late May to early June, where one to two calves are born. Cows may require specific habitat types for calving, such as secluded islands, peninsulas, and shorelines. Seclusion is an important factor for protecting calves from predators. The cow and calf/calves remain together for one year until the calf/calves become mature enough for independence (NSNR, 2021h).

With limited desktop or field data supporting mainland moose activity within the Study Area, neither age nor sex diversity can be confirmed. An analysis of mainland moose habitat quality within the LAA has shown that large areas of suitable habitat exist around the Assessment Area that will not be directly impacted by the Project. Mitigation measures will be implemented to minimize impacts; however, the amount of “best” quality habitat remaining within the LAA outside the Study Area (232 ha; 76% of total) and the extent of pre-existing linear features across the landscape indicate that the magnitude of Project-related impacts to mainland moose life history will be low.

Sensory Disturbance

Reproduction and survival strategies of terrestrial mammals may be directly or indirectly impacted by sensory disturbances caused by Project construction and operation. Many species have sensitive

windows for breeding and birthing, and any small disruption to these activities may reduce reproductive success in the population. Sensory disruptions may result from sound/vibration or excess light. Lovich and Ennen (2013) stress the importance of turbine siting relative to the needs of wildlife to minimize effects. The iterative Project design process has prioritized avoidance and minimization of interactions with important wildlife habitat such as wetlands and mature forest, which will minimize sensory disturbances in these areas.

Project-related noise may impact habitat use, patterns of activity, stress levels, immune response, reproductive success, risk of predation, communication with conspecifics and antipredator predator behaviours, and hearing damage (Lovich & Ennen, 2013; Rabin et al., 2006). The extent that noise associated with wind farms may impact terrestrial mammals is not well studied, and results have been inconclusive thus far (Lovich & Ennen, 2013). The Study Area is, however, already subject to noise from forestry activities and recreation vehicles (snowmobiles, ATVs) and despite the pre-existing noise, different mammal species were still observed across the Study Area so impacts from sensory disruptions caused by the Project within the LAA are anticipated to be low.

Disease

Problematic native species have been identified as a pervasive threat to mainland moose due to their potential to spread debilitating disease. Specifically, white-tailed deer are hosts for brainworm (*Parelaphostrongylus tenuis*) and winter tick (*Dermacentor albipictus*), both of which cause mortality in moose and are thought to be regulators of population abundance and distribution (NSNR, 2021h). A possible concern associated with developments is their potential to cause indirect effects on mainland moose by increasing access to the site by white-tailed deer and therefore, increasing the chances of disease spreading to mainland moose.

There are no records of deer over-wintering within the immediate vicinity of the Study Area in NSNR Significant Habitat Database (NSNR, 2024f); however, signs of white-tailed deer were observed throughout the Study Area during field assessments. Despite this, it is unlikely that the new and upgraded roads will increase access for white-tailed deer as they already have existing access to the Study Area. As such, effects to mainland moose from disease due to the Project are expected to be negligible.

Poaching

Poaching has been identified as a potential threat facing mainland moose in the Recovery Plan (NSNR, 2021h), and is a threat to all terrestrial mammal populations, especially those with unstable populations. Increased human access may increase the risk of poaching for rare, sought-after animals. The Study Area is already highly accessible to the public, including local hunters and recreational users. Due to the pre-existing access to the Study Area, effects to mainland moose from poaching due to the Project are expected to be negligible. Furthermore, the increased presence of staff within the Project may act as a deterrent to poaching.

Climate Change

Climate change has been identified as a potential threat facing mainland moose in the Recovery Plan; however, the details of how moose will be impacted by climate change are not yet well

understood (NSNR, 2021h). The development of wind farms is one of the province's strategies to transition to renewable energy to reduce provincial emissions. It is expected that this Project will have a net positive impact on climate change (for further details see Section 7.1.2), thus this potential threat is not expected to negatively affect mainland moose within the LAA.

Effects to Herpetofauna

Habitat Loss

Terrestrial habitat utilized by herpetofauna includes riparian areas along wetlands and watercourses, forested areas near watercourses, and rocky or gravelly areas such as roadsides. These different habitat types support different biological needs of species and relate directly to life history strategies. The Project Footprint aims to reduce impacts to intact habitat and has been specifically designed to minimize interactions with riparian areas and intact forest. With approximately 44 km of new road being constructed, a small area of new habitat may be created in the form of gravel roadsides and this new habitat may serve as a potential benefit to herpetofauna species. No significant impacts resulting from habitat loss within the LAA are expected.

Habitat Fragmentation

Terrestrial herpetofauna utilize the terrestrial environment to move across the landscape, particularly between wetlands and watercourses. The alteration of these habitats and conversion of intact forest to roads may result in a fragmented landscape, preventing natural patterns of movement across the landscape. Alternatively, these roads can act as corridors for some herpetofauna. Habitat fragmentation has been minimized through the Project design, which prioritized the use of pre-existing roads (45% of roads being used are pre-existing) or otherwise disturbed habitats. Effects to herpetofauna related to habitat fragmentation are expected to be low within the LAA.

Disruption of Life History

Sensitive windows for herpetofauna may relate to migration or nesting periods, and interference with these animals' activities during these windows may disrupt their natural life history. Interference may be both temporal and spatial. Project related activities occurring during sensitive windows may impact migratory or breeding behaviours, and habitat removal or fragmentation may create a physical barrier to herpetofauna species from reaching important habitat. Low impacts to life history are expected due to the small Project Footprint and minimized interactions with important habitat features such as wetlands and watercourses.

Road Traffic

Increased road traffic may affect herpetofauna within the Project Footprint due to the potential for an increase in risk of traffic collisions with herpetofauna species. Turtles, salamanders, and snakes, if present, may cross roads daily in search of food, or seasonally during migration to find nesting habitat or to escape uninhabitable climatic conditions (Wills, 2021). The pre-existing traffic load and the minimal traffic to be associated with the Project both indicate that road traffic is not expected to have a significant effect on terrestrial herpetofauna in the LAA.

Sensory Disturbance

Given the pre-existing traffic load and the minimal traffic across the life of the Project, sound, and light impacts are expected to be low.

Effects to Invertebrates

Turbine Collision-Induced Mortality

Swarming and migrating insects are susceptible to mortality from collisions with wind turbines. There are a number of hypotheses as to whether, or why, these insects are attracted to wind turbines (Jansson et al., 2020; Long et al., 2010; Rydell et al., 2010). Questions remain in the literature concerning how this potential attraction affects mortality rates; whether insect fatalities at wind turbines are contributing to population declines; and how these fatalities are impacting ecological functions (Voigt, 2021). No significant effects to invertebrate SAR are expected as a result of this Project based on current insect population and ecology research and a lack of confirmed invertebrate SAR within the Study Area.

Mitigation

To address the abovementioned effects to terrestrial fauna, the Proponent will develop and implement a Terrestrial Habitat and Wildlife Management Plan. Additionally, the following mitigation measures will be implemented:

Habitat Loss

- Minimize overall area to be cleared by using previously altered areas (i.e., clearcuts) and existing roads.
- Continue to review habitat modelling results, field survey results, and guidance from NSNR through the detail design phase. This continual review will be used to further reduce impacts.
- Allow for natural revegetation of roadsides to minimize lost habitat as much as possible.

Habitat Fragmentation

- Minimize fragmentation and habitat isolation by using pre-existing roads and previously altered areas during the design phase.
- Support connectivity by maintaining vegetated buffers around wetlands and watercourses, where possible.
- Allow for natural revegetation in as much cleared area as possible to limit the effects of fragmentation (note: maintenance of vegetation will be required within the transmission line ROW).

Road Traffic

- Design the Project Footprint to minimize road density and use pre-existing roads to the greatest extent possible.

- Install traffic signs to alert road users of speed limits and the presence of wildlife in the area.
    - Inform all Project-related staff working on the site of dangers to wildlife and create awareness around wildlife hotspots.
- Minimize Project-related traffic to reduce chances of wildlife collisions and traffic-related stress to wildlife.
- Maintain all equipment and machinery on the site to reduce noise and vibration emissions associated with malfunctions. Where practical, install vehicles and machinery with noise muffling equipment to limit disturbance.
- Prohibit harassment and feeding of wildlife by Project personnel.

Monitoring

Project-specific monitoring activities for terrestrial fauna are not being proposed.

Conclusion

Following mitigation, residual effects on terrestrial fauna are characterized as follows:

- Magnitude: Low magnitude, as the Project has been designed to minimize the number of newly created roads and habitat loss and fragmentation within the Study Area, avoidance of wetlands, and low changes in animal behaviour is expected.
- Geographic extent: Within the LAA.
- Frequency: Continuous during construction and decommissioning, intermittent during operations.
- Duration: Long-term for habitat loss and fragmentation residual effects will extend through the operational and maintenance phase until after decommissioning, and short-term for traffic as it is limited to the construction and decommission phases.
- Reversibility: Partially reversible as the effects will be mitigated through reclamation.
- Significance: Not significant.

7.4.4 Bats

7.4.4.1 Overview

A desktop review and field studies were undertaken to gather information on bat species and associated habitat in the Study Area. Objectives were as follows:

- Assess observations, species diversity, and habitat utilization of bats within the Study Area during the active bat period (spring to fall).
- Use the information collected to inform and refine the Project design (i.e., avoid impacts to SAR/SOCI and their habitats).
- Use the information collected to inform mitigation and management practices.

7.4.4.2 Regulatory Context

There are seven species of bats documented in Nova Scotia, of which four are year-round resident species and three are migratory species that overwinter in the southern United States. Resident species include the little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*), tri-colored bat (*Perimyotis subflavus*), and big brown bat (*Eptesicus fuscus*). Migratory species include

the eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*).

Three resident species (the little brown myotis, northern myotis, and tri-colored bat) are protected federally and provincially under SARA and the ESA. These three species were added to the ESA as "Endangered" on July 11, 2013, and were declared "Endangered" under Schedule 1 of SARA on November 26, 2014. The designation under SARA and the ESA was driven by the emergence of white-nose syndrome (a disease caused by the fungus *Geomyces destructans*), which was first detected in Canada in 2010 and led to a 90% population decline in Nova Scotia by 2013 (COSEWIC, 2013). All three migratory bat species were listed by COSEWIC in May 2023 as "Endangered" (COSEWIC, 2023). The big brown bat is not listed under SARA or the ESA.

7.4.4.3 Desktop Review

Databases and online resources referenced as part of this desktop review include:

- Terrestrial Habitat Mapping (Section 7.4.1)
- Locations of Known Bat Hibernacula in Nova Scotia (Moseley, 2007)
- Nova Scotia Geoscience Atlas – Abandoned Mine Openings (NSNR, 2024b)
- Nova Scotia Significant Species and Habitats Database (NSNR, 2024f)
- ACCDC Data Report (ACCDC, 2025a)

Terrestrial Habitat Mapping

Terrestrial habitat mapping from Section 7.4.1 was used to identify locations of ideal bat foraging and over-day habitat (i.e., day roosts) within the Study Area (Drawing 7.21A to 7.21H). Ideal habitats for bat foraging and over-day habitat include lakes, wetlands, watercourses, forest edges, cliffs, rock outcrops, talus slopes, and mature hardwood forests (Broders & Forbes, 2004; Burgar et al., 2015; Loeb & O'Keefe, 2006). Identification of ideal habitats from terrestrial mapping was subsequently used to guide field surveys for bats.

There are three habitat features considered to be significant for bats: hibernacula for overwintering, maternity roosts for birthing and raising young, and migratory stopovers for rest periods during spring and fall migration. Hibernacula are overwintering sites that are typically located in abandoned mines or caves and can support hundreds of bats.

Maternity colonies are poorly documented in Nova Scotia, with limited desktop information regarding these sites' location and use (ECCC, 2015; NSNR, 2020b). Females may prefer to roost together in anthropogenic structures or in cavities or under the bark of mature trees (Betts, 1998; L. N. L. Johnson et al., 2015). Mature forests which may provide roosting habitat were identified during terrestrial habitat mapping and used to guide field studies.

Migration is one of the most poorly understood components of bat biology, at both a regional (<200 km) and long distance (>1,000 km) scale. Migratory stopovers utilized for short term rest or sanctuary are thought to be located on islands or shorelines of large bodies of water and along linear geographic features such as riparian zones or mountain ranges (McGuire et al., 2012). During terrestrial habitat mapping, riparian and shoreline habitats were identified and used to guide field studies.

Locations of Known Bat Hibernacula

Moseley (2007) provides an overview of known and recorded bat hibernacula located within Nova Scotia. This research indicates two known hibernacula within a 100 km radius of the Study Area (Table 7.59).

Table 7.59: Known Bat Hibernacula within 100 km of the Study Area

Hibernaculum	Approximate Distance to Study Area[1]	Direction[2]
Hirschfield Galena Prospect	57 km	SW
McLellan's Brook Cave	92 km	W

Source: (Moseley, 2007)
[1] Distance measured to the nearest point of the Study Area.
[2] SW = Southwest; W = West.

No known hibernacula are located within 25 km of the Study Area as per the recommended buffer provided in the NSECC Guide to Preparing an EA Registration Document for Wind Power Projects in Nova Scotia (NSECC, 2021).

The nearest recorded hibernaculum to the Study Area is Hirschfield Galena Prospect, located 57 km to the southwest near Glenelg, Nova Scotia. This hibernaculum is an abandoned mine adit with a surveyed length of 215 m suspected to support approximately 200 to 300 bats. The only other hibernaculum within 100 km of the Study Area is McLellan's Brook Cave, located 92 km to the west near McLellans Brook, Nova Scotia. This is an 85 m long dissolutional stream cave with associated observations of *Myotis* species around the cave but no records of underground bat activity (Moseley, 2007). It should be noted that these hibernacula were assessed prior to the onset of white-nose syndrome in Nova Scotia, therefore, populations of bats using these habitats may vary from original estimates.

Abandoned Mine Openings

According to the British Columbia Ministry of Environment and Climate Change Strategy, Ecosystems Branch (2019), AMOs may serve as overwintering bat habitat if they have a depth greater than 30 m. Mine openings must also be of a suitable type (i.e., shafts, slopes, adits, or pits) and remain accessible to bats (i.e. not flooded, filled, capped, or plugged) to provide suitable habitat. Based on a review of the Abandoned Mine Openings Database (NSNR, 2024b), there are no recorded AMOs located within the Study Area.

A total of 58 AMOs are documented within 25 km of the Study Area (NSNR, 2024b). Of these, two are open/dry mine shafts, slopes, or adits with an original depth that could potentially support overwintering habitat for resident bat species (Drawing 7.27, Table 7.60). These features were not visited in the field to assess for bat use due to their distance from the Study Area. The remainder are not considered potential bat overwintering habitat as they were characterized as pits, trenches, shallow in depth, infilled, capped, plugged, or flooded.

Table 7.60: AMOs with Potential to Support Overwintering

Name	Location	Commodity	Opening Type	Original Depth	Approximate Distance to Study Area[(1)]
Tidewater Fuel & Navigation Company Basin Slope	Whiteside (Coal Brook)	Coal	Slope	160 m	12 km
Tidewater Fuel & Navigation Company No. 2 Slope	Whiteside (Coal Brook)	Coal	Slope	35 m	12 km

Source: (NSNR, 2024b)
(1) Distance Measured to the nearest point of the Study Area

Significant Species and Habitat Records

The Significant Species and Habitats Database (NSNR, 2024f) contains 127 unique species/habitat records pertaining to bats and associated habitat within 100 km radius of the Study Area:

- 14 “Species of Concern” records relating to caves.
- Six “Other Habitat” records relating to caves (two) and unclassified bats (four).
- 107 “Species at Risk” records relating to tri-colored bat (two), silver-haired bat (two), eastern red bat (three), hoary bat (seven), northern myotis (eight), little brown myotis (13), *Myotis* species (22), and unclassified bat species (50).

None of the aforementioned records are located within the Study Area.

ACCDC Records

The ACCDC Data Report (2025a) indicates six bat species and two genera of concern recorded within 100 km of the Study Area (Table 7.61). According the ACCDC Report, a “bat hibernaculum or bat species occurrence” is not known to exist within the Study Area. Additionally, personal communications with NSNR (2025) indicate no known hibernacula are present within 5 km of the Study Area.

Table 7.61: Bat Species Recorded within a 100 km Radius of the Study Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Little brown myotis	*Myotis lucifugus*	Endangered	Endangered	Endangered	S1
Northern myotis	*Myotis septentrionalis*	Endangered	Endangered	Endangered	S1
Tri-colored bat	*Perimyotis subflavus*	Endangered	Endangered	Endangered	S1
Silver-haired bat	*Lasionycteris noctivagans*	Endangered	-	-	SUB,S1M
Eastern red bat	*Lasiurus borealis*	Endangered	-	-	SUB,S1M
Hoary bat	*Lasiurus cinereus*	Endangered	-	-	SUB,S1M
Bat species	*Vespertilionidae* sp.	-	-	-	S1S2
Bat species not big brown bat	*Vespertilionidae* sp. *not Eptesicus*	-	-	-	S1S2

Source: (ACCDC, 2025a)

7.4.4.4 Field Assessment Methodology

Monitoring conducted within the Study Area consisted of passive acoustic monitoring during the 2023 and 2024 active bat seasons. Monitoring locations targeted a combination of turbine locations and ideal bat habitat features such as wetlands, mature hardwood forest, riparian river valleys, and forest edges using habitat mapping and accumulated knowledge from field studies. Monitoring locations were also adjusted between 2023 and 2024 to provide additional coverage within the Study Area (Drawing 7.28).

Acoustic monitoring was conducted using Song Meter Mini detectors from Wildlife Acoustics. The detectors were programed to monitor from 30 minutes before sunset to 30 minutes after sunrise to correspond with peak bat activity. GPS points and supplementary information (i.e., habitat descriptions) for each monitor location and detector set up were recorded using QuickCapture and Survey123 (Esri, 2024).

Passive acoustic monitoring in 2023 included 15 detectors for 105 consecutive days within the Study Area between August 23 and December 6, encompassing the late summer and fall active bat seasons (Table 7.62; Drawing 7.28). Not all detectors were deployed and retrieved on the same day, resulting in varied numbers of monitoring nights at different detectors.

Table 7.62: Monitoring Periods for Detectors (2023)

Detector ID	Detector Location	Within 500 m of Turbine[(1)]	Habitat Description	Monitoring Duration (2023)	Number of Monitoring Nights	Number of Recordings
BM1-23	45.537254, -61.373544	Yes	Forest edge within strip cut habitat.	August 23 to December 1	78	825
BM2-23	45.486169, -61.374387	No	Clear cut.	August 23 to December 2	78	5,996
BM3-23	45.491667, -61.258927	No	Opening at the edge of a young softwood forest.	August 23 to December 4	89	3,689
BM4-23	45.476168, -61.417005	Yes	Edge of open wetland surrounded by mixed wood forest.	August 23 to December 6	91	699
BM5-23	45.537259, -61.354218	Yes	Clear cut forest in the early stages of regeneration.	August 23 to December 5	66[(2)]	49
BM6-23	45.508326, -61.365592	No	Wetland with multiple snags.	August 23 to December 6	93	657
BM7-23	45.506666, -61.334492	Yes	Clear cut forest in the early stages of regeneration.	August 23 to December 5	86	613
BM8-23	45.509267, -61.294715	No	Cut forest in the early stages of regeneration at the edge of a wetland.	August 23 to December 5	90	1,304
BM9-23	45.537254, -61.416299	Yes	Riparian habitat.	August 24 to December 2	82	5,481

Detector ID	Detector Location	Within 500 m of Turbine[1]	Habitat Description	Monitoring Duration (2023)	Number of Monitoring Nights	Number of Recordings
BM10-23	45.568481, -61.380846	Yes	Roadside wetland.	August 23 to December 5	88	561
BM11-23	45.488847, -61.357855	No	Clear cut, near small ponded area.	August 23 to December 2	85	60
BM12-23	45.485178, -61.416213	No	Edge of mixed wood forest along wetland dominated by softwoods.	August 24 to November 29	78	169
BM13-23	45.488957, -61.329334	Yes	Edge of small pond near riparian habitat.	August 23 to November 29	74	2,095
BM14-23	45.511368, -61.27166	No	Roadside wetland.	August 24 to December 2	80	3,418
BM15-23	45.524749, -61.317971	Yes	Clear cut forest in the early stages of regeneration, vernal pools throughout.	September 4 to December 3	51[2]	3,140
Survey Total					**1,176**	**28,756**

[1] Distance is measured from the nearest turbine point location.
[2] Denotes detectors with missing data files due to technological malfunction.

Passive acoustic monitoring in 2024 included 18 detectors for 137 consecutive days within the Study Area between April 1 and August 16, encompassing the spring and early summer active bat seasons (Table 7.63; Drawing 7.28). Not all detectors were deployed and retrieved on the same day, resulting in varied numbers of monitoring nights at different detectors.

Table 7.63: Monitoring Periods for Detectors (2024)

Detector ID	Detector Location	Within 500 m of Turbine[1]	Habitat Description	Monitoring Duration (2024)	Number of Monitoring Nights	Number of Recordings
BM16-24	45.475367, -61.409040	No	Young, regenerating mixed wood forest near riparian habitat.	April 2 to August 16	86	1,587
BM17-24	45.520694, -61.359483	Yes	Mature mixed wood forest.	April 1 to August 13	38	1,400
BM18-24	45.489223, -61.275897	No	Mature mixed wood forest.	April 3 to August 13	95	2,577
BM19-24	45.466543, -61.380319	No	Uneven age riparian softwood forest.	April 3 to August 13	116	3,891
BM20-24	45.449795, -61.396443	No	Mature hardwood forest.	April 3 to August 13	67	7,768
BM21-24	45.491235, -61.322200	Yes	Young mixed wood forest along an old road.	April 2 to August 16	119	863

Detector ID	Detector Location	Within 500 m of Turbine[(1)]	Habitat Description	Monitoring Duration (2024)	Number of Monitoring Nights	Number of Recordings
BM22-24	45.489328, -61.412795	No	Riparian softwood forest adjacent to a wide, flowing watercourse.	April 2 to August 13	126	11
BM23-24	45.503625, -61.288748	Yes	Roadside shrub wetland.	April 2 to August 13	117	10
BM24-24	45.504729, -61.266986	No	Young mixed wood forest near a harvest.	April 2 to August 13	129	411
BM25-24	45.491719, -61.258893	No	Young softwood forest adjacent to open habitat at the end of an old road.	April 3 to August 13	109	1,803
BM26-24	45.545283, -61.355814	No	Uneven age mixed wood wetland near an old road.	April 1 to August 12	77	8,397
BM27-24	45.512034, -61.366710	Yes	Edge of a large shrub bog at the toe of a steep slope near a clear cut.	April 2 to August 13	119	24
BM28-24	45.515765, -61.330891	No	Open, bare habitat at the edge of a large water body.	April 2 to August 12	113	40
BM29-24	45.524568, -61.318184	No	Roadside harvested area with patches of young softwoods.	April 1 to August 12	111	145
BM30-24	45.482699, -61.385123	No	Mature hardwood forest.	April 2 to August 13	117	2
BM31-24	45.568585, -61.392695	Yes	Edge of young mixed wood forest along an old road.	April 2 to August 12	96	1,408
BM32-24	45.538137, -61.374692	Yes	Mature mixed wood forest.	April 1 to August 12	86	2,925
BM33-24	45.483209, -61.360722	No	Mature hardwood forest with a young softwood understory.	April 2 to June 25	61	3,419
Survey Total					**1,639**	**36, 654**

[(1)] Distance is measured from the nearest turbine point location.

The Nova Scotia Guidance for Bird and Bat Surveys Pre- and Post-Construction Surveys and Monitoring – Wind Energy (NSNR, 2022b) recommends a minimum of two to three detectors for sites of 10 or fewer turbines, with an additional detector for every additional five turbines. This Project proposes 54 turbines and employed the use of 15 and 18 detectors in 2023 and 2024,

respectively. Note that, as Nova Scotia guidance would recommend the minimum use of 11 to 12 detectors for a Project of this size, monitoring efforts were more extensive and thorough than minimum expectations.

Acoustic monitoring data (i.e., sonograms) was processed using Kaleidoscope Pro software from Wildlife Acoustics, complementary to the detectors used. Sonograms were analyzed for potential bat generated ultrasonic vocalizations and speciated when possible, first by the automatic identification feature of Kaleidoscope Pro and then manually by a trained biologist.

Due to their similarity, the calls of Nova Scotia's two resident *Myotis* species (little brown myotis and northern myotis) can be difficult to reliably distinguish from one another (O'Farrell & Gannon, 1999), so these calls were not identified to the species level. In addition, bat generated calls were identified as Unknown (UNKW) if the recording was within the correct frequency range for bats but was unable to be speciated based on the quality or length of the recording. Unknown calls between 20 kilohertz (kHz) and 35 kHz were labelled as unknown low frequency bats (UNLO) and unknown calls between 35 kHz and 120 kHz were labelled as unknown high frequency bats (UNHI) when possible.

7.4.4.5 Field Assessment Results

2023

In 2023, 28,756 files were recorded by acoustic detectors, of which 1,362 were determined to be bat generated ultrasound (Table 7.64). The remaining files were determined to be caused by extraneous noise from sources such as vegetation, wind, or precipitation. The following species were recorded during the acoustic survey:

- *Myotis* species (MYOT)
- Eastern red bat (LABO)
- Hoary bat (LACI)
- Silver-haired bat (LANO)
- Unknown bat (UNKW)

Table 7.64: Results of the Passive Acoustic Bat Survey (2023)

Detector ID	MYOT	LABO	LACI	LANO	UNKW[(1)]	Bat Passes per Detector
BM1-23	0	0	0	0	0	0
BM2-23	1	1	5	2	5	14
BM3-23	4	0	384	6	182	576
BM4-23	0	0	0	0	0	0
BM5-23	0	0	2	2	0	4
BM6-23	1	0	1	0	0	2
BM7-23	2	0	17	2	0	21
BM8-23	3	2	1	0	1	7
BM9-23	5	0	33	0	2	40
BM10-23	1	0	4	0	1	6

Detector ID	MYOT	LABO	LACI	LANO	UNKW[(1)]	Bat Passes per Detector
BM11-23	0	0	0	0	0	0
BM12-23	5	0	228	1	23	257
BM13-23	1	0	131	0	3	135
BM14-23	1	3	277	0	12	293
BM15-23	0	2	0	0	5	7
Calls per Species	**24**	**8**	**1,083**	**13**	**234**	**Survey Total 1,362**

(1) Unknown low-frequency vs. high-frequency was not distinguished for the 2023 period.

In 2023, migratory species accounted for 81% of recorded bat passes while resident species accounted for 2% of bat passes. The remaining 17% of bat passes consisted of unknown bats.

Detector BM3-23 recorded the most bat passes during the 2023 monitoring period at 576, accounting for 42% of the survey total. This detector was in a clearing at the edge of a softwood forest approximately 1.4 km from the Atlantic coast and is over 1.9 km from the nearest wind turbine. Detectors BM12-23, BM13-23, and BM14-23 were all deployed within riparian or wetland habitat along the southern and eastern edges of the Study Area and recorded over 100 bat passes each (257, 135, and 293 calls respectively, collectively representing 50% of total calls). Of the three detectors, only BM13-23 (with 135 calls recorded) is located within 500 m of the nearest wind turbine. The other 11 detectors recorded a combined total of 101 bat passes, representing 7% of the 2023 survey total. Of these, three detectors did not record any bat passes. These three detectors were deployed in a variety of habitat types along the western edge of the Study Area.

2024

In 2024, 36,654 files were recorded by acoustic detectors, of which 1,186 were determined to be bat generated ultrasound (Table 7.65). The remaining files were determined to be caused by extraneous noise from sources such as vegetation, wind, or precipitation. The following species were recorded during the acoustic survey:

- *Myotis* species (MYOT)
- Hoary bat (LACI)
- Unknown bats [including low-frequency (UNLO) and high-frequency bats (UNHI)] (UNKW)

Table 7.65: Results of the Passive Acoustic Bat Survey (2024)

Detector ID	MYOT	LACI	LANO	UNLO	UNHI	UNKW	Bat Passes per Detector
BM16-24	3	19	0	27	1	0	50
BM17-24	0	8	0	0	0	0	8
BM18-24	5	158	0	64	0	1	228
BM19-24	5	68	0	8	0	1	82
BM20-24	1	291	0	8	0	2	302
BM21-24	5	20	0	78	0	1	104

Detector ID	MYOT	LACI	LANO	UNLO	UNHI	UNKW	Bat Passes per Detector
BM22-24	0	0	0	0	0	0	0
BM23-24	0	0	0	0	0	0	0
BM24-24	0	0	0	0	0	0	0
BM25-24	8	204	0	8	0	0	220
BM26-24	1	57	0	2	0	0	60
BM27-24	0	0	0	0	0	0	0
BM28-24	0	0	0	0	0	0	0
BM29-24	0	0	0	0	0	0	0
BM30-24	0	0	0	0	0	0	0
BM31-24	7	7	0	1	0	0	15
BM32-24	0	46	0	2	0	1	49
BM33-24	0	68	0	0	0	0	68
Calls per Species	**35**	**946**	**0**	**198**	**1**	**6**	**Survey Total 1,186**

In 2024, migratory species accounted for 80% of detected bat passes while resident species accounted for 3% of bat passes. The remaining 17% of bat passes consisted of unknown species (UNLO, UNHI, and UKWN), with 97% of those bat passes being attributed to unknown low-frequency species. Given the high volume of recorded hoary bat passes and the absence of bat passes attributed to other low-frequency bat species (i.e., silver-haired bats and big brown bats), it is likely that most calls labeled UNLO were generated by hoary bats.

Detector BM20-24 recorded the most bat passes of the 18 detectors, with 302 bat passes representing 25% of the survey total. This detector was deployed in a mature hardwood forest near the southern edge of the Study Area and is over 500 m from the nearest wind turbine. Detectors BM18-24, BM21-24, and BM25-24 also recorded more than 100 bat passes (with 228, 104, and 220 calls respectively). Detectors BM18-24 and BM25-24 are both over 500 m from the nearest wind turbine and were deployed approximately 1.6 km apart in or near mature mixed wood forest along the southeastern edge of the Study Area. Detector BM21-24 is within 500 m of the nearest turbine and was deployed along a small watercourse near a clear cut toward the center of the Study Area. The other 14 detectors recorded a total of 332 bat passes, representing 28% of the survey total. Seven of these detectors, most of which were deployed in or near harvested areas, did not record any bat passes.

2023 & 2024 Analysis

Throughout the entirety of passive acoustic monitoring (2023 and 2024), 2,548 bat calls were detected, resulting in an average of 14.4 bat passes per night across the entire Study Area. The 2023 and 2024 acoustic monitoring periods recorded a similar number of bat passes (1,362 and 1,186 passes respectively) and the proportion of bat passes attributed to migratory species was consistent between monitoring periods (81% and 80% respectively). Hoary bats were the most frequently recorded bat species during every month of both monitoring periods. It should be noted

that the recorded bat calls may belong to the same or a different individual bat; for example, a bat foraging near a detector may be recorded several times throughout the night and/or over multiple nights.

Bat activity was analyzed monthly for the 2023 and 2024 monitoring periods (Figure 7.3).

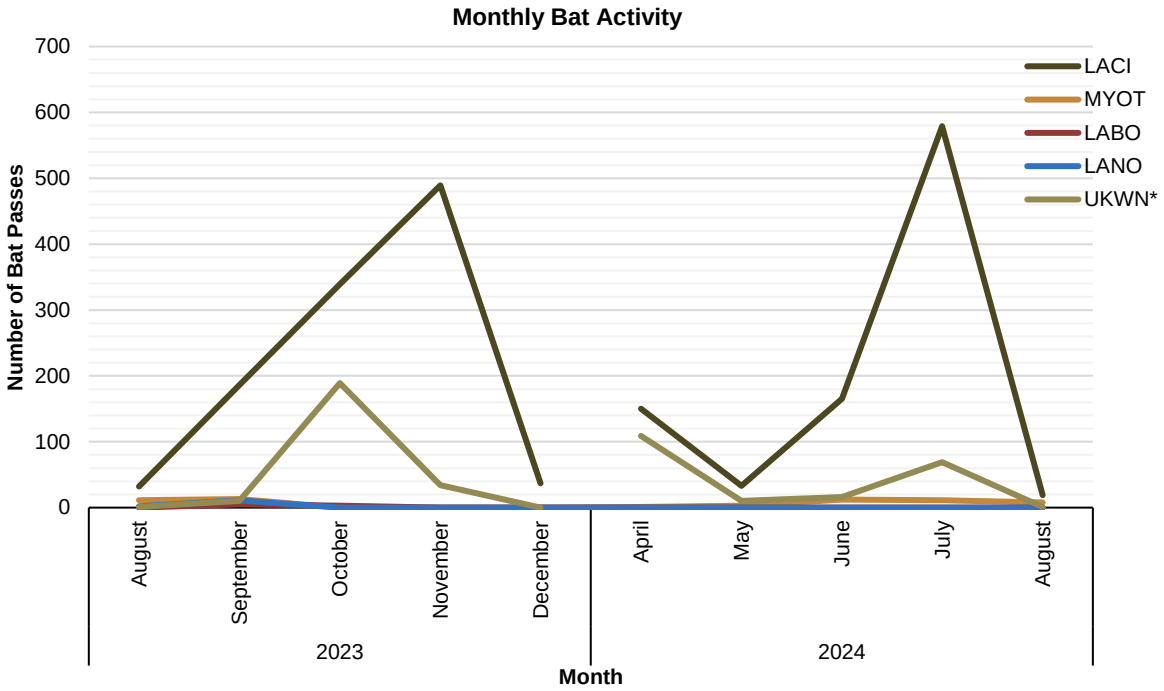

Figure 7.3: Bat Activity per Month by Species (2023/2024)
Note: While some data loss occurred at certain monitors due to equipment malfunction [mid-September to mid-October (2023), late April to early May (2024), mid-June to late June (2024), and late July to mid-August (2024)], the data collected supports a representative spatial and temporal analysis of bat species presence and relative activity levels associated with the Project. Activity levels are reflected in Tables 7.64 and 7.65.
*UKWN includes bat passes labeled as UNHI, UNLO, and UKWN.

Recorded bat activity peaked in October/November 2023 and July 2024, with significantly less activity recorded during other months. Elevated bat activity levels in October and November are likely related to migration, as this falls within the fall migration window for bats and the most common species detected was the migratory hoary bat. Similarly, the less pronounced increase in bat passes during April is within the spring migration window for bats.

The increase in activity during June and July is likely due to bats feeding and utilizing over-day roosts within the Study Area and may be related to maternity roosting and emergence of young. Hoary bats typically give birth between early May and mid-July, with young beginning to fly and forage about one month after birth (Shump & Shump, 1982). Detectors BM18-24, BM20-24, and BM25-24 all detected relatively high bat activity (more than 100 bat passes) in July 2024. Two of these detectors were deployed in mature forest, and one was deployed in a young softwood forest approximately 1.4 km from the Atlantic coast. None of these detectors are within 500 m of a proposed turbine location.

During both monitoring periods, bat activity was generally low with the exception of select detector locations which are detailed in Table 7.66 and 7.67. These eight detectors represent a wide range of habitat types, including mature and young forests; hardwood, softwood, and mixed wood forests; forest edges; riparian areas; and wetlands.

Table 7.66: Monthly Bat Passes at Detectors with Greater than 100 Total Bat Passes (2023)

Detector ID	Location in Study Area	Bat Passes per Month					
		August	September	October	November	December	Total
BM3-23	Southeastern corner	12	81	271	185	27	576
BM12-23	Southern edge	12	45	42	158	No data	257
BM13-23	Southeastern corner[(1)]	0	4	90	41	No data	135
BM14-23	Eastern edge	1	34	119	137	2	293

[(1)] Denotes detectors located within 500 m of a turbine point location.

Table 7.67: Monthly Bat Passes at Detectors with Greater than 100 Total Bat Passes (2024)

Detector ID	Location in Study Area	Bat Passes per Month					
		April	May	June	July	August	Total
BM18-24	Southeastern corner	92	0	9	127	0	228
BM20-24	Southwestern corner	0	0	37	264	1	302
BM21-24	Southern edge[(1)]	80	7	7	5	5	104
BM25-24	Southeastern corner	8	17	72	123	0	220

[(1)] Denotes detectors located within 500 m of a turbine point location.

Every detector that recorded concentrated bat activity (Table 7.66 and 7.67) was deployed near the southern or eastern edge of the Study Area. In 2023, detector BM3-23 recorded the most bat passes (576). In 2024, detector BM25-24 was deployed in the same location and recorded 220 bat passes. This monitoring location showed peaks in bat activity occurring in October/ November and July. In 2024, detector BM20-24 recorded the most bat passes (302), with the majority of recordings occurring during July. Detectors BM12-23 and BM21-24 were deployed approximately 600 m apart along the southern edge of the Study Area. Of the eight detectors with bat passes over 100 (Table 7.66 and 7.67), only the two detectors recording the least number of bat passes are within 500 m of a proposed turbine.

Since the vast majority of bat passes recorded were migratory hoary bats, it is likely that this species is using the Study Area for summer habitat and migrating along the southern and eastern edges of the Study Area. A study by Gorman et al., (2021) found that hoary bats likely used the area they were monitoring to move southward in late summer and fall but did not utilize it to the same extent during northward spring migration. It is possible that hoary bats use this site similarly, as the peak in bat activity in the spring is much smaller than the peak occurring during fall.

Bat calls were also analyzed by hour throughout the night for both monitoring periods (Figure 7.4).

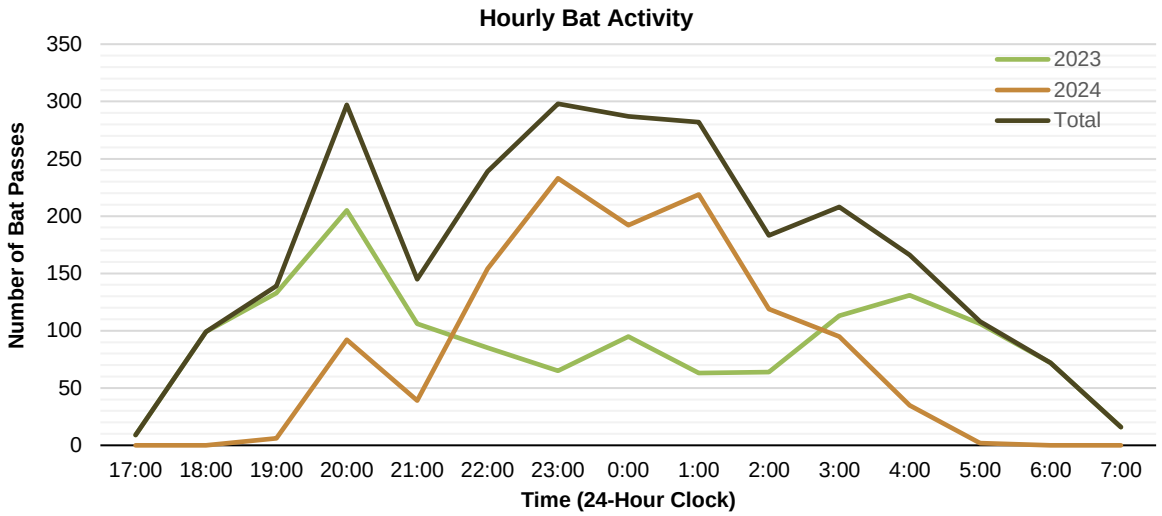

Figure 7.4: Bat Activity per Hour (2023/2024)

Peak hourly bat activity in 2023 was observed to increase steadily to a peak at 20:00, decrease gradually with a small increase at midnight (0:00), increase again to a small peak at 4:00, then steadily decrease to an end in activity before 8:00. Peak hourly bat activity in 2024 was observed to increase to a peak at 23:00 and remain relatively high until 1:00, followed by a steady decrease with activity ending before 5:00. Collectively, the multi-season trend shows a peak in activity at 20:00 and an immediate decrease and increase to another peak of nearly identical activity level at 23:00, followed by a gradual decrease in activity until the final calls were recorded around 7:00.

There is limited literature available for species specific levels of bat activity throughout the night. Factors that may influence the distribution of nightly bat activity include species presence and abundance, environmental conditions, foraging location, time of year, competition and resource partitioning, and/or diet (Fern et al., 2018; K. M. Gorman et al., 2021). However, the results of the passive acoustic monitoring show a peak in activity approximately two to three hours after sunset (assuming an average sunset time of 18:00 for 2023 monitoring and 20:00 for 2024 monitoring) and a return to roosts approximately 5 to 10 hours after sunset. This is consistent with research conducted by Agosta et al. (2005).

Priority Species

The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a) was utilized to identify any priority species and habitat associated with this Project. All bat SAR and SOCI, and their respective habitat associations identified within the Study Area through desktop review and field assessments were considered. Only those bat SAR and SOCI, and their respective habitats, with potential to interact with the Project have been designated as Project-specific priority species. Interactions may include removal or disturbance of a SAR/SOCI and/or their associated habitat. These priority species include:

- Little brown myotis
- Northern myotis
- Hoary bat

- Eastern red bat
- Silver-haired bat

Little brown myotis

The little brown myotis is the most common species in Nova Scotia and is likely ubiquitous in the province (Broders et al., 2003). During the day, the little brown myotis will roost under rocks or in buildings, trees, wood piles, and caves, often congregating in tight spaces (Fenton & Barclay, 1980). As a non-migratory species, the little brown myotis hibernates from September to early or mid-May in abandoned mines or caves (Fenton & Barclay, 1980; Moseley, 2007). The ACCDC data report indicates that the nearest record of little brown myotis is 100.0 ± 0.1 km from the Study Area. *Myotis* species were recorded during the monitoring program; however, little brown myotis calls are indistinguishable from the northern myotis. Little brown myotis are assumed to be present within the Study Area.

Northern myotis

The northern myotis, once considered uncommon throughout Nova Scotia (Moseley, 2007), is likely ubiquitous in forested regions of the province (Broders et al., 2003). This species is widely distributed in the eastern United States and Canada and is commonly encountered during swarming and hibernation (Caceres & Barclay, 2000). During the day, northern myotis shows a preference for roosting in trees; however, the habitat preferences of females may vary according to their reproductive status (Garroway & Broders, 2008). Females appear to prefer shade tolerant deciduous trees over coniferous trees, whereas males tend to roost alone in coniferous or mixed-stands in mid-decay stages (Broders & Forbes, 2004). The northern myotis is also non-migratory and typically associated with the little brown myotis during hibernation, being found in caves or abandoned mines alongside this species (Moseley, 2007). Hibernation of the northern myotis is thought to begin as early as September and can last until May (Caceres & Barclay, 2000). The ACCDC data report indicates that the nearest record of northern myotis is 41.0 ± 0.01 km from the Study Area. *Myotis* species were recorded during the monitoring program; however, northern myotis calls are indistinguishable from the little brown myotis. Northern myotis are assumed to be present within the Study Area.

Hoary bat

Hoary bats have the widest range among all native terrestrial mammals within the Western Hemisphere and are found across Canada and the United States (COSEWIC, 2023). As a result, hoary bats travel long distances (i.e., across the continent) during migratory periods, residing in coastal regions of Mexico and the United States during winter and migrating north in the spring. Hoary bats can be found roosting in the foliage of trees or shrubs in coniferous or deciduous forests of any age, but they prefer mature stands with abundant canopy cover and open flight space below. During lactation, females prefer to roost within the sheltered side of coniferous trees in mature forests (Klug et al., 2012). Foraging habitat for hoary bats is associated with open areas containing patches of trees such as fields, grasslands, or wetlands, though they tend to avoid heavily disturbed habitats such as transportation corridors, urban developments, and mines. Migration is thought to occur across coastal and/or large open areas (COSEWIC, 2023). The ACCDC data report indicates that the nearest record of hoary bat is 46.6 ± 0.01 km from the Study Area. Hoary bats were recorded during the monitoring program within the Study Area.

Eastern red bat

Eastern red bats are typically found east of the Rocky Mountains in Canada and the United States and in northeastern Mexico (COSEWIC, 2023). This species can travel thousands of kilometres north during spring and fall migrations. Eastern red bats roost in similar habitat to hoary bats (described above), often roosting alone or with pups. Maternity roosts for this species are typically found in large diameter trees that reach or exceed the height of the surrounding canopy. Foraging habitat for eastern red bats includes both open and forested habitats as well as forest edges. Heavily disturbed habitats such as transportation corridors, urban developments, or mines are typically avoided by this species. Migration is thought to occur across coastal and/or large open areas (COSEWIC, 2023). The ACCDC data report indicates that the nearest record of eastern red bat is 92.5 ± 0.1 km from the Study Area. Eastern red bats were recorded during the monitoring program within the Study Area.

Silver-haired bat

The silver-haired bat is also widely distributed across Canada and the United States, extending from southern portions of the Northwest Territories and British Columbia east to Nova Scotia (COSEWIC, 2023). The silver-haired bat undertakes long distance migrations, residing in coastal regions of British Columbia and throughout the United States and Mexico during the winter and travelling north in the spring. Silver-haired bats typically roost in cavities or under the bark of large, decaying trees. Maternity roosts are usually small and found in decaying deciduous trees or in buildings. Foraging habitat is not well characterized, but is usually associated with forests, including forest edges and openings. Little is known about migration requirements for this species (COSEWIC, 2023). The ACCDC data report indicates that the nearest record of silver-haired bat is 49.5 ± 0.01 km from the Study Area. Silver-haired bats were recorded during the monitoring program within the Study Area.

7.4.4.6 Effects Assessment

Project-Bat Interactions

Project activities, primarily those involving vegetation clearing and turbine operation, have the potential to impact bats and bat habitat (Table 7.68). These activities could result in habitat loss and accidental injury or mortality. Other Project activities during construction and operation may impact bat behaviors such as increased noise and lighting.

Table 7.68: Potential Project-Bat Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-

Project Phase	Potential for Interaction
Turbine Assembly	-
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	-
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	-
Decommissioning	
Infrastructure Removal	-
Site Reclamation	-

Assessment Boundaries

The LAA for bats includes the Study Area (Drawing 2.1). The RAA for bats is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 applies to bats. The VC-specific definition for magnitude is as follows:

- Negligible: No measurable loss of bat habitat or impact to bat behaviours is expected.
- Low: Small loss of habitat supporting bats, but loss of individuals is not expected.
- Moderate: Loss of habitat supporting bats and minimal loss of individuals or impacts to bat behaviours, and these impacts will only be experienced by individuals rather than entire populations.
- High: High loss of habitat that supports bats and/or loss of individuals or impacts to bat behaviours on a population scale.

Effects

Potential impacts to bat species from the Project's construction and operation include:

- Habitat fragmentation and/or removal.
- Direct and/or indirect mortality.
- Sensory disturbance (i.e., lighting, noise, human activity, etc.).

Habitat Fragmentation and/or Removal

Habitat fragmentation and removal will be associated with newly constructed roads (totaling 44 km in length) and clearing for turbine pads and the transmission line within the Assessment Area. As discussed in Section 7.4.1, the Study Area is comprised of a range of forest types, shrublands, wetlands, and anthropogenic disturbance. Historic and ongoing forestry operations in the Study Area have resulted in modification to the natural habitat conditions. Based on terrestrial habitat assessments completed in Section 7.4.1, proportionally, the largest overall direct impacts from the Project are expected to be urban/developed areas (32%) and cutover upland (10%). The Project Footprint has prioritized the use of previously disturbed areas to minimize new impacts to terrestrial habitat. Impacts to undisturbed and unfragmented habitat will be low and although there will be small

losses to terrestrial habitat associated with the Project, habitat functionality will remain intact relative to pre-construction conditions.

Vegetation clearing required for construction can result in the removal of bat habitat or disrupt corridors between important habitat features, such as foraging and roosting habitat (Reusch et al., 2022; Segers & Broders, 2014). This may impede movement, foraging, flight activity, and habitat use (ECCC, 2015). Harvesting and the creation of cleared areas can also reduce landscape-level habitat quality as well as result in increased predation risk as bats travel across open areas (Slough et al., 2023).

One study by Segers & Broders (2014) found that different species of bats respond differently to landscape alteration for wind farm development. Some bat species prefer edge habitat over both open clearcuts and intact interior forest as it can provide good foraging habitat (Hein et al., 2008). Little brown myotis has been shown to benefit from edge habitat created during harvesting and road construction, preferring to forage in cut blocks and road rights-of-way over intact forest (Segers & Broders, 2014; Slough et al., 2023). Harvesting can also create foraging habitat suitable for hoary bats and eastern red bats (COSEWIC, 2023). Alternatively, suitable habitat for northern myotis may decrease following construction due to this species' preference to forage in forested areas and around canopy covered streams (Segers & Broders, 2014). Silver-haired bats (a cavity-roosting species) can also experience a reduction in roosting habitat due to some forestry practices (COSEWIC, 2023). Pregnant and lactating female bats have been shown to be particularly sensitive to habitat degradation as their foraging ranges are more constricted due to decreased energy and caring for young (Henry et al., 2002; Segers & Broders, 2014).

The results of passive acoustic monitoring within the Study Area showed a high proportion of bat passes to be from migratory species. Hoary bats accounted for 80% of bat passes recorded collectively between the 2023 and 2024 acoustic monitoring. According to a study by Perry & Thill, (2007), hoary bats prefer to roost in unmanaged mixedwood stands with an overstory age of more than 50 years. During the old-growth surveys (Section 7.4.1), 23 of the 45 surveyed potential old-growth forest stands were confirmed as old-growth, ranging from 100 to 183 years of average stand age (Table 7.44, Section 7.4.1.5). The minimum average stand age for a forest to be considered old growth is 100 years, which is older than the minimum age preferences for general over-day roosting of some bat species (Perry & Thill, 2007). Of the potential old-growth stands assessed, the youngest stand surveyed (not including stands with significant blowdown or harvested stands) was found to have an average age of 66 years (Table 7.44, Section 7.4.1.5). This indicates that good quality over-day roosting habitat exists within the Study Area. During lactation, females tend to establish maternity roosts (i.e., significant habitat features) in large coniferous trees of old growth forests (Klug et al., 2012). Old-growth stands will not be impacted by the construction of new infrastructure. Avoidance measures for old-growth stands are outlined in Section 7.4.1.5.

While the Project has prioritized the use of existing roads in its design (45% of roads are existing), habitat fragmentation may occur with the construction of 44 km of new roads. Some bats, especially migratory species, may avoid high-traffic roads due to an increase in noise pollution (COSEWIC, 2023). A study by Fensome & Mathews (2016) found that 79% of bats crossed a two-lane rural road through forested habitat when vehicles were absent, but this decreased to 59% when vehicles were

present. Crossings decreased to 14% without traffic and 3.5% with traffic in areas that lacked a tree line (Fensome & Mathews, 2016). Road density is expected to increase in the Study Area following construction, with 44 km of new roads being built in association with the Project; however, traffic is expected to be low within the Study Area at night (when bats are active) and during the operations phase. These factors should reduce the barrier effect of roads within the Study Area.

Impacts to bats from habitat fragmentation and removal are anticipated to be minimal based on the existing disturbance and habitat fragmentation within the Study Area, the Project's maximized use of existing roadways and cleared areas, and avoidance of features such as wetlands and mature forests that may provide bat habitat.

Injury/Mortality

Wind project related bat injuries/mortalities are increasingly becoming a concern, as some researchers have highlighted that turbines could have a greater impact on bats than birds (Barclay et al., 2007). Bats have a slower life cycle than birds resulting in impacts to population dynamics when mortalities occur (Wellig et al., 2018). This is especially prominent where populations are already small, either naturally or due to the impacts of white-nose syndrome (ECCC, 2018a).

Bat injuries/mortalities can result either from direct collision with turbine blades or from barotrauma, which is caused by the sudden decrease in air pressure following rotating blades (ECCC, 2015). Bats tend to collide with spinning turbine blades, and do not typically collide with stationary blades or towers (Arnett et al., 2008). Bats may collide with blades due to their inability to detect or avoid blades moving at high speeds, which can be up to 300 km/h at the tip of the blade (Wellig et al., 2018).

Research suggests that bats are attracted to wind turbines because wind turbines attract insects due to their light colour and because they are often built in high places that coincide with insect hilltopping behaviours (Guest et al., 2022). Swarms of insects that occur alongside wind turbines provide an excellent foraging opportunity for bats, especially migratory species that rely on stopover sites to feed during their migrations (Arnett et al., 2008; Guest et al., 2022). Wind turbines may also attract bats because they can be perceived as potential mating sites or roost trees or because of their movement and the sounds they create (Guest et al., 2022; Wellig et al., 2018). One study found that bats actively forage near turbines during operation (Horn et al., 2008). During this study, researchers observed bats approaching non-rotating and rotating blades, repeatedly investigating turbine elements, following or becoming trapped by blade-tip vortices, and colliding with turbine blades (Horn et al., 2008). Some research suggests that bats may exhibit attraction to or avoidance of wind turbines depending on inter-individual and interspecific variation (Reusch et al., 2022).

Long distance migrating bats, including the eastern red bat, hoary bat, and silver-haired bat, comprise most of the reported mortalities from wind turbines due to their higher flight elevations and long migration distances (Arnett et al., 2008; ECCC, 2015; Parisé & Walker, 2017). In the COSEWIC Assessment and Status Report on the hoary bat, eastern red bat, and silver-haired bat (2023), wind energy development was determined to have a high to very high impact, with these three species comprising approximately 75% to 80% of bat fatalities associated with wind turbines. A review of mortality studies at wind farms between 1996 and 2006 found that mortality consistently peaked

between mid-summer and autumn [during fall migration (Arnett et al., 2008)]. *Myotis* species have relatively low fatality rates compared to other species due to their lower flight elevations and short migration distances (ECCC, 2015); nevertheless, in the Recovery Strategy for little brown myotis, northern myotis, and tri-colored bat, collisions and barotrauma from wind turbines were listed as a high level of concern in areas impacted by white-nose syndrome (like Nova Scotia), with localized seasonal impacts in the spring, summer, and fall (ECCC, 2015).

Bat activity and use of habitat within the Study Area was assessed through passive acoustic monitoring. Bat species identified during monitoring studies include *Myotis* species (i.e., little brown myotis and/or northern myotis), hoary bat, silver-haired bat, and eastern red bat. Migratory hoary bats accounted for 80% of recorded bat passes within the Study Area, mainly occurring near the southern and southeastern coastal edges of the Study Area with fewer bat passes being detected towards the interior and northern portion of the Study Area. Long distance migration paths and patterns are poorly understood/documented within Nova Scotia; however, coastal areas are often used for migration by bats, as they provide linear navigational aids (COSEWIC, 2023; Gaultier et al., 2020; Reusch et al., 2022). Given this information, the coastal southern/southeastern extents of the Study Area may be used as a migration pathway for hoary bat based on the density and seasonality of recorded bat passes.

To reduce the potential for bat mortality with wind turbines, scientific literature recommends that wind turbines be strategically sited away from bat habitats such as mature forests, wetlands, and waterbodies (Reusch et al., 2022; Roeleke et al., 2016). Turbine locations have been selected to maximize the use of previously disturbed habitat and avoid features such as lakes, wetlands, watercourses, and old growth forests to the extent possible. Additional opportunities to increase avoidance and minimization of interactions with these features will be reviewed during the detail design phase. The Project turbine layout has also been specifically designed and modified in response to bat survey findings. For example:

- Removal of 30 turbines across the Project (reducing the total number of turbines from 84 to 54).
    - The removal of eight turbines in the southeastern corner of the Study Area (which was found to be an area of high activity relative to the rest of the Study Area in both 2023 and 2024).
    - The removal of a proposed turbine within 20 m of detector BM20-24, which recorded more bat passes than any other detector in 2024.
    - Reduction in the Project's total rotor swept area by 792,519.3 m^2.
    - Reduction in overall turbine density within the Study Area from 84 turbines to 54 turbines, allowing more room for bats to move around turbines.
- Maintenance of no turbines within 1 km of the coastline.

Potential exists for bats to be harmed during vegetation clearing if they are roosting in vegetation as it is being cleared. This risk can be mitigated by targeting vegetation clearing between November 1 and April 30 while bats remain in hibernation underground. Injury and/or mortality is possible if a hibernaculum is heavily disturbed while occupied. Construction activities, such as blasting or the use of heavy machinery, could potentially cause a hibernaculum to collapse (ECCC, 2015). According to

Moseley (2007), no known hibernacula are located within 50 km of the Study Area. Additionally, the ACCDC report and personal communications with NSNR (2025) indicate no known hibernacula are present within 5 km of the Study Area.

Increased traffic associated with the construction of new roads and the upgrading of existing roads within the Study Area also poses a risk to bats. Low-flying species, such as *Myotis* species, account for the majority of recorded vehicle-related mortality events, with juveniles being particularly vulnerable due to their reduced maneuverability and preference to forage in open, low-clutter habitats (Fensome & Mathews, 2016; Lesiński, 2007). Mortality is also likely to be higher in areas where roads intersect good habitat, such as watercourses or forest edges (Fensome & Mathews, 2016; Lesiński, 2007; Medinas et al., 2013). Traffic volumes on most roads within the Study Area are not expected to be high at night and *Myotis* species represented a very small portion of recorded bat activity (~2%); therefore, the risk of mortality associated with traffic volumes is anticipated to be low.

Sensory Disturbance

Noise and light will be generated during all phases of the Project. During construction, decommissioning, and reclamation, noise and lighting will be generated by heavy equipment. During operations, noise and light will be generated by wind turbines. During construction and reclamation, noise will typically occur during daylight hours, therefore, sensory disturbance should be limited to roosting bats.

Construction noise (e.g., heavy equipment, blasting, and pile-driving) could potentially affect bats, particularly those species that roost nearby, potentially causing roost abandonment. However, bats are well adapted morphologically, physiologically, and behaviourally to avoid acoustic trauma (California Department of Transportation, 2016). Because they are often exposed to the exceptionally loud sounds of their own echolocation signals (approximately 110 dB) they have evolved protective mechanisms to prevent sensory overload and damage to the auditory system (California Department of Transportation, 2016). These mechanisms include behavioural avoidance, changing the shape and orientation of the pinnae, closing the cartilaginous fold in the outer ear canal, the tympanic reflex, and resonance absorption (Wever & Vernon, 1961). While these mechanisms are very effective in achieving the needed protection from constant noise exposure (i.e., in the case of wind turbines), it is speculated that these mechanisms also can prevent over-exposure from sudden, unexpected anthropogenic noise shocks (e.g., blasting).

For bats, echolocation calls are in the ultrasonic range beyond the upper frequency limits of construction noise (California Department of Transportation, 2016) meaning there is effectively no echolocation masking effect from construction noise. Additionally, the typical lack of construction activity during the nightly active bat period (30 minutes before sunset to 30 minutes after sunrise) further limits any potential masking effects in the ultrasonic ranges.

Sensory disturbance associated with lighting during the construction, operation, and decommissioning phases of the Project may also impact bat behaviour. During construction and decommissioning, lighting will be a temporary source of sensory disturbance. A study by Seewagen et al. (2023) found that, while white floodlights had no significant impact on migratory species

(including the eastern red bat and hoary bat), little brown myotis was impacted within at least a 75 m radius and experienced a loss of foraging habitat. This risk can be mitigated by utilizing motion activated lights whenever possible. During operation, turbine lighting will be restricted to the minimums required by Transport Canada for safety.

The impacts of necessary noise and light associated with the Project on bat behaviour and movements are anticipated to be low based on the morphological adaptations and behavioural patterns of bats, as well as the timing of activities that have potential to cause sensory disturbances outside of active bat periods (i.e., when bats are roosting or hibernating). Impacts will be limited to the Study Area, as only those bats roosting or foraging within areas undergoing construction will be exposed to sensory disturbance caused by the Project.

Mitigation

To address the abovementioned effects to bat and bat habitat, the following mitigation measures will be implemented:

- Minimize overall area to be cleared by utilizing pre-existing roads and previously altered areas (i.e., clearcuts) when possible.
- Maintain 30 m vegetated buffers around wetlands and watercourses, where possible, to support connectivity and foraging habitat for bats.
- Target clearing activities outside of April 15 to August 31 (encompasses the active bat window and bird breeding/nesting window) where possible.
    - If clearing is required within this window, conduct pre-clearing surveys for nesting birds and roosting bats.
- Allow for natural revegetation of roadsides and other temporary works after construction to the greatest extent possible.
- Install motion activated lights on site infrastructure to reduce insect attraction and subsequent attraction by bats. Motion activated lighting is only applicable to the ground-based infrastructure (i.e., at doorways and substations) as turbine lighting at the top of individual turbines is regulated by Transport Canada.
- Utilize noise controls (e.g., mufflers) on machinery, equipment, etc. during the construction phase.
- Maintain avoidance of potential bat habitat (i.e., mature forests, riparian areas, and wetlands) to the greatest extent possible.
- Develop and implement a Surface Water Management Plan to support appropriate drainage around turbines and limit standing water, which will limit insect breeding near turbines and thus reduce the potential for the attraction of bats.
- Develop and implement a Wildlife Management Plan.

Monitoring

The Proponent is committed to completing a second year of the baseline bat monitoring program, prior to operations, as per requirements under the Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c).

A detailed Post Construction Bat Monitoring Plan will be developed and submitted to NSECC and NSNR for review. Monitoring activities may include:

- Post-construction bat mortality monitoring.
- Adaptive management if post-construction monitoring identifies significant bat mortality, developed in consultation with NSNR.

Conclusion

After mitigations, residual effects to bats are characterized as follows:

- Magnitude: Moderate magnitude, as some loss of habitat and individuals will occur. Although monitoring and mitigations are expected to minimize any impacts to species, it is inherent that wind projects will result in some bat mortality.
- Geographic extent: Within the LAA.
- Frequency: Continuous frequency throughout the operations and maintenance phase of the Project (which encompasses most of the Project lifespan).
- Duration: Medium-term duration, as effects extend though operation and maintenance phase.
- Reversibility: Partially reversible.
- Significance: Not significant.

7.4.5 Avifauna

7.4.5.1 Overview

A desktop review, field program, and habitat modelling were undertaken to gather information on avian species and associated habitat in the Study Area. Objectives were as follows:

- Assess observations, trends, species diversity, and habitat utilization of avian species within the Study Area during all seasons.
- Use the information collected to inform and refine the Project design (i.e., avoid and minimize impacts to avifauna species and their habitats, with a focus on SAR and SOCI.
- Assess migratory bird activity and assess the risk that the Project poses to migratory birds.
- Use the information collected to inform mitigation and management practices.

7.4.5.2 Regulatory Context

Applicable laws and regulations relating to the protection of avian species include the following:

- *Migratory Bird Convention Act, 1994* (MBCA)
- SARA
- ESA
- *Wildlife Act*, R.S.N.S. 1989, c. 504

The MBCA protects all migratory birds while they are present in Canadian jurisdiction, including on land, in the air, and on the water. The ESA and SARA prohibit harm to species listed as “Endangered” or “Threatened”, along with their habitually occupied spaces and core/critical habitat.

The Project also considered the following policies, guidelines, and standards that provide guidance on the development of the Project and the survey design:

- Environment and Climate Change Canada's Canadian Wildlife Service (Atlantic Region) – Wind Energy & Birds Environmental Assessment Guidance Update (ECCC-CWS, 2022).
- Wind Turbines and Birds - Updated Guidance for Environmental Assessment and Monitoring, Canadian Wildlife Service – Atlantic Region (ECCC, 2018b).
- Wind Turbines and Birds - A Guidance Document for Environmental Assessment, Canadian Wildlife Service (ECCC, 2007b)
- Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC, 2007a).
- The Guide to Addressing Wildlife Species and Habitat in an EA Registration Document (NSECC, 2009a).
- Various NSNR SMPs and ECCC Species at Risk Management Plans.

7.4.5.3 Desktop Review

Desktop information was reviewed and, if applicable, utilized to gain insight into protected avifauna habitats, species utilization of the area, and to identify avian SAR and SOCI potentially occurring near or within the Study Area using the following sources:

- Maritimes Breeding Bird Atlas (MBBA) (Birds Canada, 2024)
- ACCDC (ACCDC, 2025a)
- Terrestrial Habitat Mapping (Section 7.4.1)
- NSNR Significant Species and Habitats Database (NSNR, 2024f)
- IBAs (IBA Canada, 2025)
- CWS Waterbird Colony Database (Atlantic Region) (Wilhelm & Mahoney, 2021)
- Public databases such as eBird and iNaturalist, or other public avian data sources.

The majority of the Study Area is contained within map square 20PR24 of the MBBA by Bird Studies Canada. The Study Area also intersects squares 20PR23, 20PR33, and 20PR34. In the most recent edition of the MBBA (2006 to 2010), 72 species were identified as possible, probable, or confirmed breeders in square 20PR24, including three SAR and 11 SOCI.

The three SAR identified consist of:

- Canada warbler (*Cardellina canadensis*) – "Threatened" (SARA), "Special Concern" (COSEWIC), "Endangered" (ESA), "S3B" (ACCDC).
- Common nighthawk (*Chordeiles minor*) – "Special Concern" (SARA), "Special Concern" (COSEWIC), "Threatened" (ESA), "S3B" (ACCDC).
- Olive-sided flycatcher (*Contopus cooperi*) – "Special Concern" (SARA), "Special Concern" (COSEWIC), "Threatened" (ESA), "S3B" (ACCDC).

The 11 SOCI identified consist of:

- Red-breasted merganser (*Mergus serrator*) – "S3B,S4S5N,S5M" (ACCDC).
- Spotted sandpiper (*Actitis macularius*) – "S3S4B,S5M" (ACCDC).

- Wilson's snipe (*Gallinago delicata*) – "S3B,S5M" (ACCDC).
- Black-backed woodpecker (*Picoides arcticus*) – "S3S4" (ACCDC).
- American kestrel (*Falco sparverius*) – "S3B,S4S5M" (ACCDC).
- Canada jay (*Perisoreus canadensis*) – "S3" (ACCDC).
- Boreal chickadee (*Poecile hudsonicus*) – "S3" (ACCDC).
- American robin (*Turdus migratorius*) – "S5B,S3N" (ACCDC).
- Bay-breasted warbler (*Setophaga castanea*) – "S3S4B,S4S5M" (ACCDC).
- Purple finch (*Haemorhous purpureus*) – "S4S5B,S3S4N,S5M" (ACCDC).
- Pine siskin (*Spinus pinus*) – "S3" (ACCDC).

The ACCDC database contains records of seven avian SAR (Table 7.69) and 14 avian SOCI within a 7 km radius of the Study Area. Avian SAR and SOCI within 100 km of the Study Area can be referred to within the ACCDC report.

Table 7.69: Avian SAR Recorded within a 7 km Radius of the Study Area

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank	Distance from the Study Area (km)
Barn swallow	*Hirundo rustica*	Special Concern	Threatened	Endangered	S3B	6.8 ± 7.07
Bobolink	*Dolichonyx oryzivorus*	Special Concern	Threatened	Vulnerable	S3B	6.8 ± 7.07
Canada warbler	*Cardellina canadensis*	Special Concern	Threatened	Endangered	S3B	6.8 ± 0.15
Common nighthawk	*Chordeiles minor*	Special Concern	Special Concern	Threatened	S3B	0.8 ± 0.2
Eastern wood-pewee	*Contopus virens*	Special Concern	Special Concern	Vulnerable	S3S4B	6.8 ± 7.07
Olive-sided flycatcher	*Contopus cooperi*	Special Concern	Special Concern	Threatened	S3B	5.3 ± 0.15
Rusty blackbird	*Euphagus carolinus*	Special Concern	Special Concern	Endangered	S2B	6.8 ± 7.07

Source: (ACCDC, 2025a)

The Government of Nova Scotia Provincial Landscape Viewer and Parks and Protected Areas interactive online maps were also reviewed to determine whether the Study Area is within, or adjacent to special features, such as protected area/parks or ecologically sensitive regions (i.e., wildlife management areas, nature reserves, wilderness areas, and provincial parks).

Based on habitat modelling from Section 7.4.1, the majority of the Study Area is mixedwood forest, softwood forest, and cutover upland habitat. Other habitats include hardwood forest, clear-cuts (i.e., forestry activity), wetlands, barrens, and other habitat habitats (e.g., fields and shrubby areas). There are multiple lakes present within the Study Area, the largest being Englands Lake located near the middle of the Study Area. The northern edge of the Study Area borders the coastline of Nova Scotia,

with the closest turbine pads being approximately 1.2 km from the coast. The diversity of habitat types, in particular the occurrences of edge/transitional habitat and wetlands, provides for the foraging, breeding, and roosting requirements of a variety of resident and migratory bird species (e.g., passerines, waterfowl, shorebirds, owls, woodpeckers, etc.).

The Ragged Head coastline is identified as migratory bird significant habitat within the NSNR Significant Species and Habitats database, which is approximately 2.6 km south of the closest proposed turbine for the Project (Drawing 7.29). Based on the Atlantic Waterbird Colony Database (CWS, n.d.), there is a known common tern (*Sterna Hirundo*) colony along this coastline as well as another tern colony at Oyster Ponds, which is approximately 9.1 km farther northeast along the coastline and approximately 3.4 km southeast of the nearest proposed Project turbine. Other migratory bird habitats classified by the NSNR Significant Habitats Database within 10 km of the Study Area include Green Island (i.e., approximately 7.5 km northeast), Archies Pond (i.e., approximately 9.5 km northwest), and Milford Haven River (i.e., approximately 9.6 km southwest). These migratory bird habitats are coastal and, based on the database, offer habitats for cormorants, terns, herons, waterfowl (i.e., ducks and geese), and shorebirds (i.e., sandpipers, plovers, etc.).

The closest IBA in Nova Scotia is the Country Island Complex (NS028), approximately 23 km south of the Project and the nearest proposed turbine (Drawing 7.29). This complex is off the southeast coast of Nova Scotia and is made up of five island complexes located between Tor Bay and Drum Head. The island closest to the Study Area is Forster Island in Charlos Cove. The habitats known on the islands include open sea, coastal features, inlets, and native grassland. There are other smaller islands (some unnamed) within this IBA complex located in Charlos Cove and Tor Bay, including Inner West Bird Island, Cooks Island, Dorts Island, Hog Island, Forester Island, Sheep Island, and Sugar Harbour Islands. The entire IBA complex covers an area of approximately 40 km to 50 km (IBA Canada, 2025 - Site Summary: NS028).

The island complex is known to provide nesting habitat for Arctic tern (*Sterna paradisaea*), black guillemot (*Cepphus grille*), common eider (*Somateria mollissima*), common tern, great black-backed gull (*Larus marinus*), herring gull (*Larus argentatus*), Leach's storm-petrel (*Hydrobates leucorhous*), Manx shearwater (*Puffinus puffinus*), and roseate tern (*Sterna dougallii*). This IBA, with its various islands and coves, is also known to host large colonies of terns, cormorants, and gulls (IBA Canada, 2025).

Federally and provincially endangered roseate terns have been recorded nesting in the Country Island Complex since the late 1980s, and one island within the complex (Country Island) is considered by CWS Critical Habitat for the species (IBA Canada, 2025 - Site Summary: NS028). In 1996, the IBA supported approximately 37.5% of the national population and in 2000, the population reached a historic high of 53 breeding pairs. The roseate tern population has fluctuated drastically over the years (e.g., largely due to predation by gulls, crows, and ravens) and some colonies within the IBA are considered "intensely managed", with research programs and recovery efforts underway. Since 1996, roseate tern pairs reduced drastically to approximately one to two pairs a year on Country Island (IBA Canada, 2025 - Site Summary: NS028), which is confirmed by iNaturalist observations.

Other species recently (i.e., since 2020) observed within this IBA include Canada warbler, common nighthawk, bank swallow (*Riparia riparia*), barn swallow, Eastern wood-pewee, Harlequin ducks (*Histrionicus histrionicus*), olive-sided flycatcher, and peregrine falcon (*Falco peregrinus anatum*) (IBA Canada, 2025 - Site Summary: NS028). Due to the distance between this IBA and the Study Area, no interactions with the Project are expected.

Mulgrave Hills Nature Reserve (Drawing 7.29) is located within and along the western boundary of the Study Area, although outside of the Assessment Area. Designated in 2023, it features 99 ha of hardwood dominant forest, interspersed with bogs and wet coniferous forest (Government of Nova Scotia, 2020).

The Nova Scotia Parks and Protected Areas database identifies four additional records within 2.5 km to 10 km of the Study Area, three of which are coastal and one of which is inland. Port Shoreham Beach Provincial Park (Drawing 3.1), located south of the Study Area, is a 39 ha provincial park which features a sand and cobble beach. Janvrin Island Nature Reserve is a 121 ha nature reserve located in Richmond County, near Isle Madame. The nature reserve is a collection of small islands which feature barrier beaches, ponds, dunes, spits, low cliffs, tidal flats, and coastal softwood forest (Government of Nova Scotia, 2020). This nature reserve provides habitat for seabird colonies and for breeding and migrating shorebirds. Boylston Provincial Park is a 90 ha provincial park located along Guysborough Harbour and is a popular camping destination for visitors to the area. Hurlburt Brook Nature Reserve is a pending 162 ha nature reserve located northeast of Lincolnville and northwest of the Study Area, which features mature hardwood and mixedwood stands (Government of Nova Scotia, 2020).
Based on desktop review and habitat modelling, habitats within the Mulgrave Hills Nature Reserve would likely most closely resemble those in the Study Area due to its proximity and abundance of similar wetland and forest types.

7.4.5.4 Field Survey Methodology

Several survey methodologies were employed to assess the avian species using the Study Area throughout the year (Table 7.70). Survey methods were based on the protocols recommended in the documents Recommended Protocols for Monitoring Impacts of Wind Turbines on Birds (ECCC, 2007a) and Wind Energy and Birds Environmental Assessment Guidance Update (ECCC, 2007a), unless otherwise stated.

Table 7.70: 2023 Avifauna Field Survey Overview

Survey Type	Season	Dates Surveyed
Winter Point Counts (84 total point count surveys)	Winter	• January 8, 2023 • February 1, 2023 • March 8, 11, 28, and 29, 2023
Spring Migration Point Counts (89 total point count surveys)	Spring	• April 26 & 27, 2023 • May 11, 13, 20, and 24, 2023
Breeding Bird Point Counts (67 total point count surveys)	Summer	• June 8, 14, and 28, 2023 • July 14, and 15, 2023
Fall Migration Point Counts (87 total point count surveys)	Fall	• August 8, and 29 • September 18, 2023 • October 5, 13, 19, and 26, 2023

Survey Type	Season	Dates Surveyed
Nightjar (Seven locations)	Summer	• June 21, 2023
Diurnal Watch (Six total hours surveyed in spring, 13 total hours in fall)	Spring Fall	• April 26, and 27, 2023 • May 11, 2023 • August 29, 2023 • September 18, 2023 • October 13, 19, and 26, 2023

Due to the remoteness of the Study Area, the mobility of avian species, and dynamic nature of designing a large Project, a focus on habitat diversity was prioritized, as well as Assessment Area coverage where possible, during field surveys. Avian specialist and contractor Chris Pepper selected survey locations during preliminary site reconnaissance and using aerial imagery sources for support. The Project underwent several additional layout iterations (within the Study Area) over the next two field seasons as part of site optimization and to minimize interactions with other environmental features identified during footprint surveys. While the field survey locations do not completely overlap with the final Assessment Area, they do represent the diversity of habitat and species within the Study Area, and when combined with detailed habitat modelling and other habitat survey results, support a robust analysis. Survey locations are presented in Drawing 7.30A to 7.30E.

Bird species were identified based on the following functional bird groups to understand how each group uses the Study Area:

1. Waterfowl: Ducks, geese, or other large aquatic birds, especially when regarded as game.
2. Shorebirds: Waders, from the Order Charadriiformes.
3. Other Waterbirds: Includes seabirds (i.e., marine birds), grebes (Order Podicipediformes), loons (Order Gaviiformes), Ciconiiformes (i.e., storks, herons, egrets, ibises, spoonbills, etc.), pelicans (Order Pelicaniformes), flamingos (Order Phoenicopteriformes), Gruiformes (i.e., cranes and rails), kingfishers, and dippers (the only family of passerines considered waterbirds).
4. Diurnal Raptors: Birds within the families Accipitridae (i.e., hawks, eagles, buzzards, harriers, kites, and old-world vultures), Pandidonidae (i.e., osprey), Sagittariidae (i.e., secretary bird), Falconidae (i.e., falcons, caracaras, and forest falcons), Cathartidae (i.e., new world vultures), and one species from the Order Strigiformes (i.e., hawk owl).
5. Nocturnal Raptors: Birds of the Order Strigiformes (i.e., owls; with exception of the hawk owl, which is a diurnal species of owl).
6. Passerines: Any bird of the Order Passeriformes, which includes more than half of all bird species. This is with exception of the dippers, which are a passerine considered a waterbird.
7. Other Landbirds: Birds within the Orders Galliformes (i.e., quail, pheasant, and grouse), Columbiformes (i.e., pigeons and doves), Cuculiformes (i.e., cuckoos), Caprimulgiformes (i.e., nighthawks and whip-poorwills), Apodiformes (i.e., swifts and hummingbirds), and Piciformes (i.e., woodpeckers, flickers, and sapsuckers).

Point Counts – Spring/Fall Migration and Breeding Bird Surveys

Point count surveys were used as the primary means of identifying species in the Study Area through all seasons. Point counts were 10 minutes in duration and were completed at predetermined locations. All visual and auditory observations of birds were recorded at each point count location, along with relevant behavioural information such as breeding evidence. The estimated distance to target, direction, and number of species is recorded, while the observer remains still and silent for the duration of the survey interval. Surveys were completed 30 minutes before, through four hours after dawn in any given season to observe the most active time of day for passerine species. Survey opportunities were maximized for clear weather and minimal wind within the appropriate timeframe. Target species of point counts are primarily passerines, identified audibly.

Nightjar Surveys

Nightjar counts were six minutes in duration and completed at predetermined locations throughout the Study Area following the Canadian Nightjar Survey Protocol by Birds Canada. As the target species, all nightjars (nighthawks, etc.) were recorded with information on direction, behaviour (if applicable), and distance from the observer. Other diurnal or nocturnal species (e.g., owls) were also recorded. Surveys were conducted from dusk until two hours after dusk on clear nights with minimal wind and no precipitation. Survey locations were limited to roads or trails due to safety concerns with evening surveys.

Diurnal Watch Surveys – Spring/Fall Migration Surveys

Diurnal watch, also known as hawk watch, surveys were completed to assess the movement of birds within and flying over the Study Area during the day (e.g., potential migratory behaviour). These surveys were completed for 120 minutes, usually starting in the late morning, after morning point count surveys are completed. Observations on the movement of birds were recorded, including bearing from the observer, distance to the target, the direction that the target was moving, its passing height, and any other behaviour notes.

One location was surveyed during spring migration surveys. During fall migration diurnal/hawk watches, a lake point was added to survey for potential waterfowl and shorebird migration activity.

7.4.5.5 SAR Habitat Modelling Methodology

Avian SAR habitat modelling was completed to estimate the quality and quantity of habitat for the following species: Canada warbler, common nighthawk, evening grosbeak, olive-sided flycatcher, and rusty blackbird (Drawings 7.31A to 7.31E). SAR Species were selected based on desktop review (i.e., ACCDC data), field survey observations, acoustic observations, and potential for suitable habitat to be present. For example, bobolink and barn swallow were not included due to the lack of appropriate nesting habitat within the Study Area [i.e., grasslands, anthropogenic structures (i.e., buildings and bridges)]. Grasshopper sparrow (*Ammodramus savannarum*) also had lack of appropriate grassland habitat and only one individual was observed during fall migration season.

The potential habitat modelling is based on habitat descriptions within federal and provincial government recovery strategies and management plans, with a focus on breeding/nesting habitat.

Each species-specific model was developed using the following resources:

- Recovery Strategy for the Canada Warbler (*Cardellina canadensis*) in Canada (ECCC, 2016)
- Recovery Strategy for the Common Nighthawk (*Chordeiles minor*) in Canada (ECCC, 2016)
- Management Plan for the Evening Grosbeak (*Cocothraustes vespertinus*) in Canada [Proposed] (ECCC, 2022)
- Recovery Strategy for the Olive-sided Flycatcher (*Contopus cooperi*) in Canada [Proposed] (ECCC, 2015)
- Management Plan for the Rusty Blackbird (*Euphagus carolinus*) in Canada (ECCC, 2015)

Potential habitat modelling may overestimate available habitat based on limits and constraints regarding GIS data and aerial imagery. The model criterion for each species is summarized in the sections that follow.

Canada Warbler

To account for moist forests with a dense, deciduous shrub layer, complex understory, and available perch trees, the WAM was filtered to include values up to (0.5 m). Forest data was queried to include the FORNON code of 39 which is an area where in part Alders compose 75% or more crown closure. The leading species (SP1) attributes of TL (Larch), RM (Red Maple), BF (Balsam Fir), and BS (Black Spruce) were used. Stands including Larch as the second or third species were also included. To account for wetland features and their respective edge habitat, the CNWI data was included.

Common Nighthawk

Open ground/clearings for nesting (i.e., sandy areas, open forests, grasslands, wetlands, barrens, and other rocky areas) were considered from the land cover classification. A buffer of 10 m was included on the road network/unpaved forestry roads to account for push up features from past road construction. The CNWI was filtered to include only open wetland types (e.g., bog, bog or fen, fen, and marsh). The land cover types of 'Urban, Landfill, Quarry, Transport Corridor', 'Utility Corridor', or 'Blueberries or Barren' were queried.

Evening Grosbeak

The forest inventory was used where the leading species (SP1) matched the attribute of TA (Large Tooth Aspen and Trembling Aspen). Since nesting occurs in large mature mixedwood stands with a high percentage of fir, spruce, tamarack, pine, and aspen, these were filtered from SP1 to include all pine, fir, and spruce species in addition to tamarack that composed greater than 50% but less than 70% of a given stand. Species are listed below from query based on codes:

SP1 IN ('TL', 'AP', 'JP', 'RP', 'SP', 'WP', 'BF', 'DF', 'BS', 'NS', 'RS', 'SS', 'WS', 'XS').
SP2 IN ('TL', 'AP', 'JP', 'RP', 'SP', 'WP', 'BF', 'DF', 'BS', 'NS', 'RS', 'SS', 'WS', 'XS').
SP3 IN ('TL', 'AP', 'JP', 'RP', 'SP', 'WP', 'BF', 'DF', 'BS', 'NS', 'RS', 'SS', 'WS', 'XS').
SP4 IN ('TL', 'AP', 'JP', 'RP', 'SP', 'WP', 'BF', 'DF', 'BS', 'NS', 'RS', 'SS', 'WS', 'XS').

For further analysis, each layer was converted to its respective percentage values then summed and queried for greater than or equal to 50%, but less than 70% softwood composition.

Olive-sided Flycatcher

Forest data was queried to include the leading species (SP1) attribute of BS (black spruce), RS (red spruce), WS (white spruce), SP (Scots pine), RP (red pine), JP (jack pine), and EH (eastern hemlock), if present. The archived crown harvest plans and harvest land cover class received a 20 m internal buffer to include only edge habitat. All wetlands were included from the CNWI data. Burn data was also included as habitat in the analysis, however no burn areas have been recorded within the Study Area.

Limiting the SP1 tree to a height greater than 12 m results in significant habitat loss, therefore was not included in the filtering.

Rusty Blackbird

The forest inventory data was filtered based on potential wet softwood forests (e.g., fir and all spruce near waterbodies or wetlands). The codes used were BF (Balsam Fir), BS (Black Spruce), NS (Norway Spruce), RS (Red Spruce), and WS (White Spruce). To capture wet areas containing the specified softwood and potential softwood dominated treed swamps, the forestry data was intersected with wet areas mapping of 50 cm or less and the CNWI database.

7.4.5.6 Remote Sensing Methodology

Avian Radar Assessment

Avian radar assessments were undertaken during the spring and fall 2023 migratory periods. The objective of the avian radar assessment was to assess migratory bird activity in the airspace above the Study Area. Avian radar systems (ARS) were deployed at Englands Lake from April 12 to November 23, 2023, and at Goose Harbour Lake from April 18 to November 30, 2023 (Drawing 7.30F). Due to an internal hardware malfunction, the ARS at Goose Harbour Lake was not functional from August to early September.

The ARS at Englands Lake was a Simrad Halo 20+ pulse compression marine surveillance radar angled diagonally at 45 degrees (°) and the ARS at Goose Harbour Lake is a Simrad Halo 6 pulse compression marine surveillance radar mounted on a horizontal. The ARS consisted of two x-band pulse-compression surveillance radars oriented specifically to scan the airspace approximately 50 m to 600 m above the Study Area. The vertical orientation allowed for a 180° scan of the airspace above the radar, while the 180° below the radar is blanked.

Each ARS was deployed with an off grid 12 volt (V) system that was designed for optimal active monitoring and specificity in deployment. They were designed to charge and store energy using solar panels and a battery bank, while also powering the radar and associated equipment for data collection and remote communications. The systems in their entirety were designed to be mobile, so the movement of the ARS was possible throughout a season, if desired.

Two locations within the Study Area were chosen based on the following factors: a good line of site (relatively few trees in the immediate area) into the airspace above the Study Area, a southern exposure for solar charging, sufficient cellular and satellite coverage for remote communications, and accessibility for spot checks. Both locations were also close to the coastline. The ARS were mounted off the ground (approximately 3 m) to minimize ground noise interference and lessen the impacts of local microtopography on data collection and clarity.

Avian radar scans were processed using the radR platform – an open-source platform designed for the processing of radar data for biological applications – and outputs were analyzed using Microsoft Excel (P. Taylor et al., 2010). Standard settings for the identification of biological targets (BT), such as birds, and bats were used. Targets reflected by the radar generate blips in the image of the radar scan. radR helps filter sequential images of radar scans to identify blips that occur in the same area over at least four out of five scans. Should these constraints be met, a target is generated. BTs are most likely generated by birds, but could also be bats and insects, or even drones and planes. Weather occurrences, such as fogs, rain, and low cloud cover, may cause interference with the radar (similarly to weather radar), which lowers the effectiveness of the system and reduces the reliability of the system's ability to detect birds. As such, data was excluded from the analysis when the minimum hourly rainfall exceeds 0.5 mm. Rainfall data was obtained from ECCC's Port Hawkesbury Range Weather Station (ECCC, 2025b).

Discussion of Migration Cues in Migratory Birds

Migratory bird activity tends to be stochastic in nature, which is attributable in large part to weather, as it is well established that weather, atmospheric, and environmental conditions influence bird migration activity, especially wind speed and direction (La Sorte & Fink, 2017; Nussbaumer et al., 2022). Conditions when tailwinds assist the migration objective are often exploited by migrating birds to travel farther with less energy (Nussbaumer et al., 2022). As such, birds migrating into North Atlantic Canada during the spring likely proceed in a northeasterly direction and likely proceed in a south-westerly direction during the fall.

Migratory birds can also take advantage of favourable wind speed to expedite their migration or to fight against unfavourable headwinds (Nussbaumer et al., 2022). Other environmental and climatic cues are theorized to play a role in migratory bird activity (Brisson-Curadeau et al., 2020; Korpach et al., 2024). The list of cues that are theorized and studied to play a role in avian migration includes the following:

- Wind speed and direction (Gudmundsson et al., 2011; La Sorte & Fink, 2017; Nussbaumer et al., 2022).
- Photoperiod (Assadi & Fraser, 2021; Helm & Liedvogel, 2024; Robart et al., 2018; Sockman & Hurlbert, 2020).
- Temperature (Brisson-Curadeau et al., 2020; Burnside et al., 2021).
- Changes in migration cohort or population sizes (Miller-Rushing et al., 2008)
- Food Availability (Robart et al., 2019).
- Lunar cycle (Bonnet-Lebrun et al., 2021; Korpach et al., 2024; Norevik et al., 2019; Pyle et al., 1993).

These cues may affect internal avian migration clocks; hence, helping to determine the migration timing of birds traveling in and out of the province. Correlating the role of internal avian migration clocks with radar monitoring data can sometimes prove challenging (Helm & Liedvogel, 2024; Korpach et al., 2024).

Avian Interaction Model

The level of interaction between migratory birds and the Project turbines can be estimated using data collected from the radar monitoring in 2023. Interactions may include sensory disturbance to birds passing near the turbines, requiring birds to maneuver around the turbines and thus forcing migratory birds to expend additional energy; bird collisions with the turbine components; or blade strikes (for operating turbines).

The Migratory Bird Interaction Index (MBII, $\boldsymbol{M}$) is an estimate of the level of risk that aerial infrastructure for a Project poses to migratory birds. This index is calculated using the following expression.

Equation 1: $$\boldsymbol{M} = \boldsymbol{D} \div \boldsymbol{I}$$

Where $\boldsymbol{D}$ is the migratory bird density, and $\boldsymbol{I}$ is the volume of airspace that the infrastructure being assessed would occupy.

Migratory Bird Density

The Halo 20 radar emits a beam that is angled 12.5° upward and downward from the radar's antenna. The volume of airspace that the radar scans increase with range as the radar beam extends outwards; therefore, the number of BTs detected by the ARS generally increases with range, until such a point that the radar becomes limited by range and the number of BTs detected drops. To correct the distortions in BT detection counts at different ranges, it is necessary to correct the airspace volume scanned by the radar at each height bin.

Based on the geometry of the radar's beam angle, the volume of airspace scanned in each of the height bins was determined using CAD software. These volumes are shown for each height bin in Table 7.71 and were used to determine the target density (i.e., the number of targets detected per cubic km of airspace) based on number of BTs detected in each height bin (seen in Section 7.4.5.7). Birds per cubic kilometres (km^3) has been used as a metric of bird migration in avifauna for other studies (Farnsworth, 2013). Target density is representative of, and likely proportional to, the migratory bird activity in the airspace above the Project for the cumulative monitoring period (in this case, for the 2024 avian radar monitoring campaign).

Table 7.71: Airspace Scanned (km^3) within the ARS' Height Bins

Range Bin (m)	Airspace Scanned (km^3)
0 to 25	0
25 to 50	0.1015
50 to 100	0.2036
100 to 150	0.2043
150 to 200	0.2052

Range Bin (m)	Airspace Scanned (km^3)
200 to 250	0.2063
250 to 500	1.052
500 to 1000	2.226
1000 to 1500	2.337
1500 to 2000	2.426
2000 to 3000	3.774
Total	**12.8375**

Volume of Airspace

The volume of airspace where avifauna would interact with the turbines (I) was estimated using CAD software that is based on design of the proposed turbines. Table 7.72 shows the turbine dimensions for this Project and the parameters used to calculate the interaction airspace volume for the turbine model. It is noted that each ARS location has a different number of turbines provided, which is based on a conservative number of turbines within proximity to each ARS. The differences in turbines per ARS demonstrated the difference in interaction levels if, for instance, an ARS with a higher number of turbines nearby also projected higher interaction levels.

Table 7.72: Turbine – Avifauna Interaction Volume Calculation Information

Turbine Model Information	
Turbine Model	Goldwind GWH182 - 8.0MW[(1)]
Number of Turbines	54
Hub Height	130 m
Total Height	221.7 m
Rotor Diameter	183.4 m
Blade Length	91.7 m
Rotor Swept Area	26,417.31 m^2

[(1)] Numbers are estimates based on suggested turbine model. Numbers are subject to change.

Avian Acoustic Assessment

Two autonomous recording units (ARUs), Wildlife Acoustics SM3s, were deployed within the Study Area in tandem with the radar systems. The Goose Harbour Lake ARU was deployed from April 14 to November 11, 2023, and the Englands Lake ARU was deployed from May 25 to November 22, 2023. The ARUs were programmed to record from dusk until dawn, with the intention of recording the acoustic activity of birds migrating through or over the Study Area.

Avian Acoustic Data Analysis

The acoustic data collected by the ARUs was run through BirdNET and Nighthawk, machine learning models that specialize in the detection and classification of avian vocalizations. The output files from these models were then brought into Raven Pro, a computer program specializing in the visualization and analysis of sounds, for manual analysis.

BirdNET

BirdNET is a machine-learning model developed by the Cornell Lab of Ornithology. BirdNET is capable of detecting over 3,000 species globally and was programmed to use eBird as its occurrence mask; the occurrence mask serves as a filter which either includes or excludes species based on their likelihood to occur in a given area. (Cornell Lab of Ornithology, 2024; Kahl et al., 2021). The model detects and identifies avian vocalizations at the species-level, and assigns a confidence value to each detection, ranging from 0 to 1. The "confidence value" produced by BirdNET is not a true probability, but rather an expression of the model's own confidence in its prediction (Wood & Kahl, 2024). This model was designed for the analysis of daytime songs and calls and is not intended to be used for the analysis of avian nocturnal flight calls (NFCs). For the purposes of this analysis, BirdNET was programmed to only detect avian SAR and SOCI that may occur in Nova Scotia, filtering out non-SAR and SOCI species and those that are unlikely to occur in this region (Table 1, Appendix L). BirdNET was programmed with a confidence score floor of 0.3 to help reduce the likelihood of false positive detections. False detections may be attributed to a variety of factors, including an oversensitivity of the software in conjunction with environmental noise (i.e., wind, rain, ambient noise).

BirdNET results were handed off to environmental scientists with experience in birding to complete a manual verification process, during which spectrograms and audio clips were analyzed visually and by ear. Manual verification was completed using Cornell Lab of Ornithology's Raven Pro software (version 1.6). Each detected vocalization was annotated 'Y' if the species-level identification made by the model was correct, or 'N' if the identification was incorrect.

The manual verification results were then fed into a logistic regression model custom-built using Python programming language. This model was built following guidelines outlined on the Cornell Lab website (Symes et al., 2023). The model was able to generate probability scores (the likelihood of a correct identification being made by the model) for each species identified. This is useful because the previously mentioned "confidence value" produced by the BirdNET model is not a true probability (Wood & Kahl, 2024). It should be noted that in instances where all verified detections were correct (annotated 'Y') or all verified detections were incorrect (annotated 'N') the model was unable to run because it requires at least two correct and two incorrect verifications to generate a probability.

The BirdNET model was set using the following parameters:

- Frequency range: 250 to 12,000 Hz
- Length of detection: 3 seconds
- Minimum confidence score: 0.3

Nighthawk

The acoustic data was also run through Nighthawk, a deep learning model designed by researchers at Cornell Lab of Ornithology (Van Doren et al., 2023). The Nighthawk model was designed to detect and identify vocalizations made by nocturnally migrating birds and was trained using recordings from throughout the Americas. For the purposes of this analysis, Nighthawk was run in its own computer programming environment using Python programming language, and was set using the following default parameters:

- Model sample rate: 22,050 Hz
- Model input duration: 1 second
- Hop size: 20% (percentage of the model input duration)
- Length of detections: 0.2 seconds

Unlike BirdNET, Nighthawk is capable of assigning a probability score to each detection it makes, which represents the likelihood of the model making a correct prediction. For this analysis, only detections with a probability score of 0.8 (80%) or above were considered.

The Nighthawk model is capable of identifying 82 bird species (Table 2, Appendix L), although a species-level identification is not always possible (Van Doren et al., 2023). In instances where a species-level identification cannot be reached, the model may identify vocalizations to the order, family, or group level. The group level in this case refers to a subset of species with similar sounding NFCs. For example, the 'ZEEP' group consists of several similar-sounding warbler species that can be exceptionally difficult to separate. To limit false species-level identifications, Nighthawk was fed a list containing only species that are likely to occur in this region.

Like BirdNET, the output of Nighthawk is a series of text files containing all of its detections and predictions for a given audio file input. The text files and audio files were then brought into Raven Pro (version 1.6) for manual verification. For each species identified by Nighthawk, 30 vocalizations (or all vocalizations if fewer than 30 were detected) were manually listened to by environmental scientists with experience in bird identification. The vocalizations were annotated 'Y' if the species-level identification made by the model was correct, or 'N' if the identification was incorrect.

Raven Pro

Raven Pro is a software program that specializes in the visualization and analysis of sounds. Using this program, experienced birders were able to bring in the raw audio files recorded by the ARU, as well as the text files containing the detections made by BirdNET and Nighthawk. This allowed them to manually verify the detections by listening to sound clips and visually analyzing the spectrograms, and ultimately, allowed them to assess the accuracy of the BirdNET and Nighthawk results.

7.4.5.7 Field Survey Results

2023 Winter Bird Surveys

Winter bird surveys were completed on January 28, February 1, and March 8, 11, 28, and 29, 2023. The survey included 84 10-minute point counts across 42 locations (Drawing 7.30E). A total of 24 species, comprising 217 individual birds, were observed (Table 7.73; Tables 3 and 4, Appendix L). Common raven (*Corvus corax*), black-capped chickadee (*Poecile atricapilla*), herring gull, and American crow (*Corvus brachyrhynchos*) were the most abundant and commonly observed species. Resident passerines accounted for 68% of the individual birds, and 50% of species observed.

Table 7.73: Total Observations by Bird Group – 2023 Winter Bird Surveys

Bird Group	Number of Individuals	Number of Species
Waterfowl	1	1
Shorebirds	47	3
Other Waterbirds	0	0
Diurnal Raptors	3	3
Nocturnal Raptors	0	0
Passerines	148[(1)]	12[(1)]
Other Landbirds	18[(2)]	5[(2)]
Total	**217**	**24**

[(1)] One unidentified blackbird was observed (Passerines)
[(2)] Three unidentified woodpeckers were observed (Other Landbirds)

Five SOCI were observed during the 2023 winter surveys: American robin, boreal chickadee, Canada jay, northern goshawk, and pine grosbeak (*Pinicola enucleator*) (Table 5, Appendix L). No avian SAR were observed.

As expected, species diversity was observed to be low during the winter surveys relative to other seasons. SOCI observed are generally consistent with those observed during migration and breeding bird surveys and are not expected to be breeding during the winter months.

2023 Spring Migration Surveys

Spring migration surveys were completed within the Study Area on April 26 and 27; as well as May 11, 13, 20, and 24, 2023. In total, the surveys included 89, 10-minute point counts and six, 60-minute diurnal watches.

A total of 74 species, comprising 1.291 individual birds, were observed in the Study Area during spring migration point count surveys (Table 7.74; Tables 6 and 7, Appendix L) completed on April 26 and 27; and May 11, 13, 20, and 24, 2023 (Drawing 7.30B). American robin, ruby-crowned kinglet, white-throated sparrow (*Zonotrichia albicollis*), and yellow-rumped warbler (*Setophaga coronata*) were the most frequently and abundantly observed species. Migrant passerines accounted for 79% of the individual birds and 65% of the species observed.

Table 7.74: Total Observations by Bird Group – 2023 Spring Migration Point Count Surveys

Bird Group	Number of Individuals	Number of Species
Waterfowl	20	3
Shorebirds	42	5
Other Waterbirds	11	3
Diurnal Raptors	14	6
Nocturnal Raptors	0	0
Passerines	1,019[(1)]	48[(1)]
Other Landbirds	185[(2)]	9[(2)]
Total	**1,291**	**74**

[(1)] Two unidentified blackbirds were observed (Passerines)
[(2)] 16 unidentified woodpeckers were observed (Other Landbirds)

Avian SAR and SOCI encountered throughout the 2023 spring migration point counts included American kestrel, American robin, bay-breasted warbler (*Setophaga castanea*), blackpoll warbler (*Setophaga striata*), boreal chickadee, Canada jay, Canada warbler, fox sparrow (*Passerella iliaca*), greater yellowlegs (*Tringa melanoleuca*), olive-sided flycatcher, purple finch, rusty blackbird (*Euphagus carolinus*), and Wilson's snipe (Table 8, Appendix L). Canada warbler, olive-sided flycatcher, and rusty blackbird were the avian SAR observed.

A total of 12 species, comprising 125 individual birds, were observed in the Study Area during spring migration diurnal watch surveys (Table 7.75; Tables 9 and 10, Appendix L) completed on April 26 and 27, as well as May 11, 2023 (Drawing 7.30D). Herring gull was the most frequently and abundantly observed species followed by bald eagle. Several soaring species were observed, including five diurnal raptor species, though no large flocks of migrating waterfowl were observed. Shorebirds accounted for 46.4% of individual birds and 8% of species observed, and diurnal raptors accounted for 40.8% of individual birds, and 41.6% of species observed.

Table 7.75: Total Observations by Bird Group – 2023 Spring Migration Diurnal Watch Surveys

Bird Group	Number of Individuals	Number of Species
Waterfowl	0	0
Shorebirds	58	1
Other Waterbirds	1	1
Diurnal Raptors	51[(1)]	5[(1)]
Nocturnal Raptors	0	0
Passerines	15	5
Other Landbirds	0	0
Total	**125**	**12**

[(1)] Nine unidentified raptor species were observed (Diurnal Raptors)

SOCI observed during the 2023 spring migration diurnal watch surveys included American kestrel, boreal chickadee, and turkey vulture (*Cathartes aura*) (Table 11, Appendix L). No avian SAR were observed.

2023 Breeding Bird Surveys

Two breeding bird surveys were conducted within the Study Area in 2023 (June 8, 14 and 28, and July 14 and 15). In total, 67, 10-minute point counts were completed across the Study Area covering a wide range of habitat types and spatial distribution (Drawing 7.30A). A total of 1,089 individual birds, representing 67 species, were observed (Table 7.76; Tables 12 and 13, Appendix L). The most abundant and frequently observed species were common yellowthroat (*Geothlypis trichas*), magnolia warbler (*Setophaga magnolia*), and white-throated sparrow. Migrant passerines accounted for 74% of the species and 93% of the individual birds observed.

Table 7.76: Total Observations by Bird Group – 2023 Breeding Bird Point Count Surveys

Bird Group	Number of Individuals	Number of Species
Waterfowl	1	1
Shorebirds	10	6
Other Waterbirds	3	1
Diurnal Raptors	4	2
Nocturnal Raptors	0	0
Passerines	1,014	50
Other Landbirds	57(1)	7(1)
Total	**1,089**	**67**

(1) One unidentified woodpecker was observed (Other Landbirds)

Avian SAR and SOCI observed during the 2023 breeding bird point counts include American kestrel, American robin, barn swallow (*Hirundo rustica*), bay-breasted warbler, blackpoll warbler, boreal chickadee, Canada jay, Canada warbler, olive-sided flycatcher, purple finch, spotted sandpiper, and Wilson's snipe (Table 14, Appendix L). Barn swallow, Canada warbler, and olive-sided flycatcher were the avian SAR observed.

2023 Nightjar Bird Surveys

A nocturnal survey for nightjars was completed on June 21, 2023. Seven, 6-minute point counts were completed throughout the Study Area (Drawing 7.30D, with eight individual birds representing three species observed (Table 7.77; Tables 15 and 16, Appendix L). Common nighthawk was the most frequently observed species. Barred owls were also observed during nightjar surveys.

Table 7.77: Total Observations by Bird Group – 2023 Nocturnal Bird Survey

Bird Group	Number of Individuals	Number of Species
Waterfowl	0	0
Shorebirds	1	1
Other Waterbirds	0	0
Diurnal Raptors	0	0
Nocturnal Raptors	1	1
Passerines	6	1
Other Landbirds	0	0
Total	**8**	**3**

Common nighthawk was the only SAR and spotted sandpiper was the only SOCI observed during the nightjar surveys (Table 17, Appendix L).

2023 Fall Migration Surveys

Fall migration surveys were completed on August 8 and 29, September 18, and October 5, 13, 19, and 26, 2023. The surveys included 87, 10-minute point counts; 12, 60-minute diurnal watches; and two, 30-minute diurnal watches.

A total of 56 species, comprising 1,084 individual birds, were observed during the fall migration point count surveys (Table 7.78; Tables 18 and 19, Appendix L). Surveys were completed across a wide range of habitats, spatially distributed throughout the Study Area (Drawing 7.30C). American robin, golden-crowned kinglet (*Regulus satrapa*), pine siskin, and white-winged crossbill (*Loxia leucoptera*) were the most abundant and frequently observed species. Migrant passerines accounted for 93% of the individual birds, and 75% of the species observed.

Table 7.78: Total Observations by Bird Group – 2023 Fall Migration Point Count Surveys

Bird Group	Number of Individuals	Number of Species
Waterfowl	2	1
Shorebirds	9	1
Other Waterbirds	6	2
Diurnal Raptors	11	3
Nocturnal Raptors	0	0
Passerines	1,009[(1)]	42[(1)]
Other Landbirds	47	7
Total	**1,084**	**56**

[(1)] 40 unidentified warbler species were observed (Passerines)

Avian SAR and SOCI observed during the fall migratory point count surveys include American robin, bay-breasted warbler, blackpoll warbler, boreal chickadee, Canada jay, fox sparrow, pine siskin, purple finch, red crossbill (*Loxia curvirostra*), and rusty blackbird (Table 20, Appendix L). The only avian SAR observed was rusty blackbird.

A total of 25 species, comprising 313 individual birds, were observed during fall migration diurnal watch surveys (Table 7.79; Tables 21 and 22, Appendix L). The 12, 60-minute and two, 30-minute diurnal watch surveys were conducted on August 29, September 18, and October 13, 19, and 26, 2023 from elevated locations covering a wide range of habitats within the Study Area (Drawing 7.30D). White-winged crossbill, herring gull, American robin, and pine siskin were the most abundantly observed species. Migrant passerines accounted for 78% of the individual birds, and 64% of the species observed.

Table 7.79: Total Observations by Bird Group – 2021 Fall Migration Diurnal Watch Surveys

Bird Group	Number of Individuals	Number of Species
Waterfowl	0	0
Shorebirds	34	1
Other Waterbirds	10	1
Diurnal Raptors	19	4
Nocturnal Raptors	1	1
Passerines	244[(1)]	16[(1)]
Other Landbirds	5	2
Total	**313**	**25**

[(1)] Three unidentified passerines were observed (Passerines)

SOCI observed during the fall migratory diurnal watch surveys include American kestrel, American robin, black-backed woodpecker, boreal chickadee, Canada jay, pine siskin, purple finch, and red crossbill (Table 23, Appendix L). One SAR, a grasshopper sparrow foraging along a grassy road-side, was observed as a rare fall migrant within the Study Area.

No large migratory flocks were observed during diurnal watch surveys. Most observations consisted of passerine species flying in small groups just above the tree line. Observations of raptors and waterfowl mostly consisted of individual birds.

Avian Incidental Results

Incidental bird observations were recorded during non-avian related surveys (e.g., wetland/watercourse delineation, botany, lichens, etc.), which were not included in the field survey results analysis and sections above. These observations occurred during 2023 (i.e., June, July, August, and October), 2024 (i.e., August and October), and 2025 (i.e., June). All incidental observations within the months of June, July, and August can be described as the breeding bird season. The only species observed in October were Canada jay and black-backed woodpeckers, which are year-round resident species in the province.

Four avian SAR (i.e., Canada warbler, common nighthawk, Eastern wood-pewee, and olive-sided flycatcher) were observed. Common nighthawks were observed conducting wing-boom territorial displays during the breeding bird season in June (Table 7.80).

Table 7.80: Avian Incidental Observations

Species	Scientific Name	Number of Individuals	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Black-backed woodpecker	*Picoides arcticus*	1	-	-	-	S3S4
Canada jay	*Perisoreus canadensis*	5	-	-	-	S3
Canada warbler	*Cardellina canadensis*	8	Special Concern	Threatened	Endangered	S3B
Common nighthawk	*Chordeiles minor*	16	Special Concern	Special Concern	Threatened	S3B
Eastern wood-pewee	*Contopus virens*	1	Special Concern	Special Concern	Vulnerable	S3S4B
Northern goshawk (with nest)	*Astur atricapillus*	1	-	-	-	S3S4
Olive-sided flycatcher	*Contopus cooperi*	10	Special Concern	Special Concern	Threatened	S3B
Pileated woodpecker	*Dryocopus pileatus*	1	-	-	-	S5
White-winged crossbills	*Loxia leucoptera*	5	-	-	-	S4S5
Total		**48**				

Other species that were heard and recorded incidentally during non-avian related surveys without data on number of individuals include: American crow, American redstart, American robin, black-and-white warbler, black-throated green warbler, common yellowthroat, hermit thrush, least flycatcher, magnolia warbler, purple finch, red-eyed vireo, ruby-crowned kinglet, Swainson's thrush (*Catharus ustulatus*), winter wren, and yellow-rumped warbler.

7.4.5.8 SAR Habitat Modelling Results

Following a review of desktop resources and the completion of field assessments, habitat models for observed SAR were constructed as described in Section 7.4.5.5.

Table 7.81 lists the amount of habitat within the LAA (defined in Section 7.4.5.11), Study Area and Clearing Footprint that the model calculated as predictive habitat.

Table 7.81: Avian SAR Potential Habitat – Assessment Area, Study Area, and LAA

Avian SAR	Potential Habitat in Clearing Footprint (ha) [(1)]	Percentage (%) of Potential Habitat in the Clearing Footprint[(1)]	Potential Habitat in Study Area (ha) [(1)]	Percentage (%) of Potential Habitat in the Study Area[(1)]	Potential Habitat in LAA (ha) [(1)]
Canada warbler	69	11	1,748	20	4,520
Common nighthawk	197	32	15,010	17	3,407
Evening grosbeak	681	11	898	10	2,155
Olive-sided flycatcher	164	26	2,482	28	5,752
Rusty blackbird	24	4	608	7	1,518

[(1)] Clearing Footprint is 623 ha and Study Area is 8,880 ha. LAA percentages are not shown given large portions of the LAA are water.

Given the Clearing Footprint's composition, the proportions of suitable habitat for each species is expected, especially in the case of common nighthawk, which makes use of the disturbed habitats also being utilized for the Project. Differences in wetland preference and occurrence of each wetland type in the area are likely the reasoning for the different potential habitat calculations for Canada warbler (i.e., treed swamps) and rusty blackbird (i.e., open swamps, marshes, and ponds). Olive-sided flycatcher had the highest calculation of potential habitat at each scale, likely due to the prevalence of edge habitat associated with wetlands and forestry activity that they prefer (Drawing 7.31A to 7.31E).

7.4.5.9 Remote Sensing Results

Avian Radar Assessment

Data collected by the ARS for spring and fall 2023 radar monitoring campaigns (Drawing 7.30F) were analyzed to provide the number of BTs by date, wind direction and speed, and height bin (Tables 24 to 27, Appendix L). ARS data was divided into two monitoring periods: spring monitoring program (April 1 to July 15) and fall monitoring program (July 16 and November 30).

Englands Lake

The Englands Lake ARS identified 17,004 BTs during the spring 2023 monitoring period. The highest number of BTs detected occurred on May 13 (nBTs = 15,927) (Table 24, Appendix L. No BTs were detected prior to April 26 and no BTs were detected after May 13. The highest portion of BTs were detected at heights between 500 m to 1,000 m (nBTs = 8,194) and the 1,000 m and 1,500 m height bin (nBTs = 4,729).

The Englands Lake ARS detected 4,876 BTs during the fall 2023 monitoring period, with the highest numbers detected on August 1 (nBTs = 1,081) and August 13 (nBTs = 1,868) (Table 25, Appendix L. The highest portion of BTs were detected at 500 m to 1,000 m (nBTs = 1,960) and 1,000 m to 1,500 m (nBTs = 1,288).

The data indicates that avian migration activity was highest in early May and dropped later in the season. For fall migration, the activity was highest in August.

Goose Harbour Lake

The ARS located near Goose Harbour Lake identified 9,839 BTs during the spring 2023 monitoring campaign. The highest portion of BTs occurred on June 2, 2023 (nBTs = 7,935) (Table 26, Appendix L). During the monitoring campaign, the largest number of BTs were detected in the 500 m to 1,000 m (nBTs = 2,807) and the 1,000 m to 1,500 m (nBTs = 4,825).

The ARS identified 1,858 BTs during the fall 2023 monitoring period. Peak days for BT detections included September 14 (nBTs = 505), September 16 (nBTs = 225), and November 3 (nBTs = 260) (Table 27, Appendix L). The highest portion of BTs were detected within the 500 m to 1,000 m (nBTs = 388) and the 1,000 m to 1,500 m height bins (nBTs = 614). Due to an internal malfunction, the ARS was inactive from August to early September and no data was collected during this period.

Similar to the results from the ARS located near Englands Lake, the results of the 2023 ARS monitoring campaign for Goose Harbour Lake suggest that avian migration activity occurred stochastically throughout the monitoring period. Overall, the ARS detected a small number of large migration events that would occur over the course of three to five consecutive days in the spring and fall and little else for most of the days during the monitoring campaign. It is likely that migration conditions were optimal during these relatively short mass migration events.

Comparison Between the ARSs

The ARS located near Englands Lake and the ARS located near Goose Harbour Lake both detected significantly more BTs in spring 2023 than fall 2023. Both locations also detected the majority of BTs on one day, May 13 for Englands Lake and June 2 for Goose Harbour Lake.

During the fall monitoring campaign, migration patterns were similar for both radars with most BT detections occurring over the course of a few intense periods. This seasonal difference in migration patterns is not unexpected as spring migrations tend to be much faster and more intensive than fall migrations (Nilsson et al., 2013). The similarity between the timing and intensity of the migration movements detected by the ARS at both locations is also not unexpected as the radars are located close together, though not close enough for the radar scans to overlap.

Cues for Avian Migration

The list of environmental and climatic cues that were used to compare with the data collected by the avian radar systems included the following:

- Wind direction
- Temperature
- Lunar cycle

A variety of migration cues not discussed above (e.g., photoperiod, tidal phases) may have also affected bird migration timing. Data analysis was conducted to test the correlation between these cues and migration timing; however, the relationships were deemed too weak to support evidence of these cues affecting migration timing.

Wind Direction

Figure 7.5 shows during the spring 2023 monitoring season the majority of BTs detected by the ARS located at Englands Lake were when the winds were heading northwest (52%) and north (38%). In contrast, the ARS located at Goose Harbour detected the majority of BTs when the winds were heading east (87%). These results are expected, given the anticipated movement of birds in a northerly direction during the spring migration period. In addition, given Nova Scotia's location alongside the eastern seaboard and the province's coastlines oriented in a northeast/southwest direction, the detections at the Goose Harbour site further inland are not unexpected.

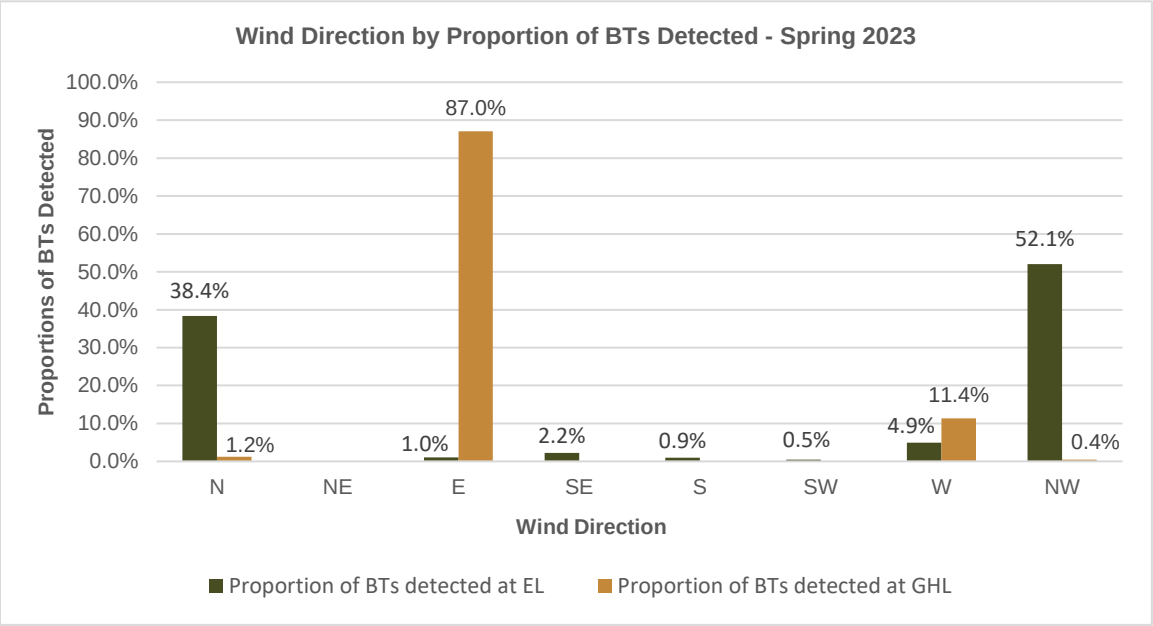

Figure 7.5: Wind Direction by Proportion of BTs Detected, Spring 2023

In contrast to the spring migration where the majority of BT detections at both ARS locations were associated with only one or two wind directions, BT detection during the fall migration was more spread out amongst a variety of wind directions. During the fall, the highest number of BTs detected

by the ARS at Englands Lake occurred when the wind was heading south (26%), west (25%) and southeast (22%). The highest number of BTs detected by the ARS at Goose Harbour occurred when the winds were heading south (26%), southeast (25%) and west (15%) (Figure 7.6). These results are also expected, given that the anticipated movement of birds in a southerly direction during the fall migration period.

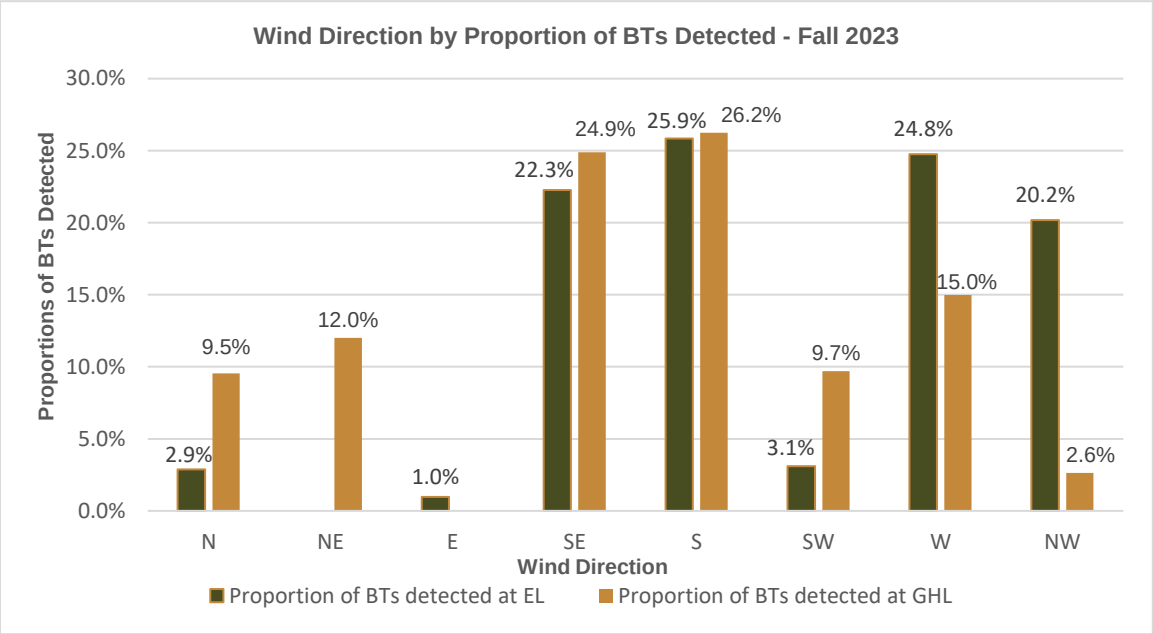

Figure 7.6: Wind Direction by Proportion of BTs Detected, Fall 2023

Migration during the 2023 spring monitoring season occurred under different wind directions between the two ARS locations although neither occurred in a wind direction that was expected. Spring migration is often seen as being fast and intensive with competition for breeding grounds and food availability forcing all the birds to arrive once migratory conditions become ideal, wind directions aside (Kokko, 2002). As fall migration is not as intensive and stressful, ideal migratory conditions are not as critical, and migration is more intermittent at both ARS and occurs at a greater diversity of wind directions.

These findings are consistent with the findings of other studies that examined the effects of weather and atmospheric conditions on bird migration (Liechti & Bruderer, 1998; Richardson, 1990).

Temperature

Figure 7.7 shows the number of BTs detected at Englands Lake and Goose Harbour Lake based on daily mean temperatures for the 2023 monitoring period. Bird migration can depend on consistent temperature cues to indicate migration departure, comparing daily mean temperatures with ARS data may provide guidance on predicting peak migration events (Burnside et al., 2021; Klinner & Schmaljohann, 2020).

During the 2023 spring monitoring period, most migration events observed at both Englands Lake and Goose Harbour Lake occurred when average temperatures were rising towards the seasonal high (Figure 7.7). Notably, peak detections at Englands Lake occurred just after temperatures began increasing above 5°C and peak detections at Goose Harbour Lake occurred just after a short period of warmer temperatures in late May.

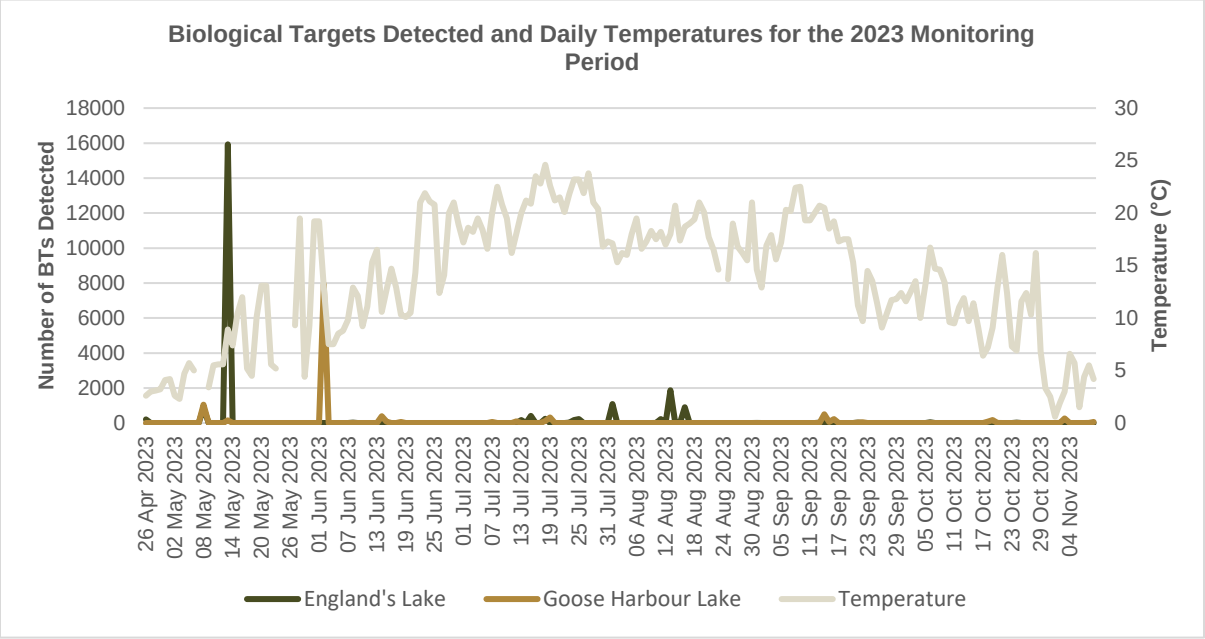

Figure 7.7: Number of Biological Targets Detected During the 2023 Monitoring Period Compared to Daily Temperatures (°C)

Lunar Cycle

The relationship between lunar cycles and daily number of BTs detected by each of the avian radars during the 2023 monitoring period was quantified according to the percentage of exposed moonlight during each of the moon's phases (i.e., new moon = 0%, first quarter = 50%, full moon = 100%, last quarter = 50%). During spring migration, peak BTs were mostly detected during phases where the percentage of the moon was more than 50% visible (Figure 7.8). Notably, the highest peak event in the spring at Englands Lake occurred just before the new moon in May and the highest peak event at Goose Harbour Lake occurred when lunar phase was leading towards a full moon (Figure 7.8). This suggests that nocturnal birds may have taken advantage of the visibility from the moon to forage in preparation for migration following periods of full moon (Norevik et al., 2019). In contrast, most of the detections in the fall occurred when the lunar phase was heading towards a new moon. While lunar cycle can influence avian nocturnal activity, other climate and environmental cues may have more influences during this period.

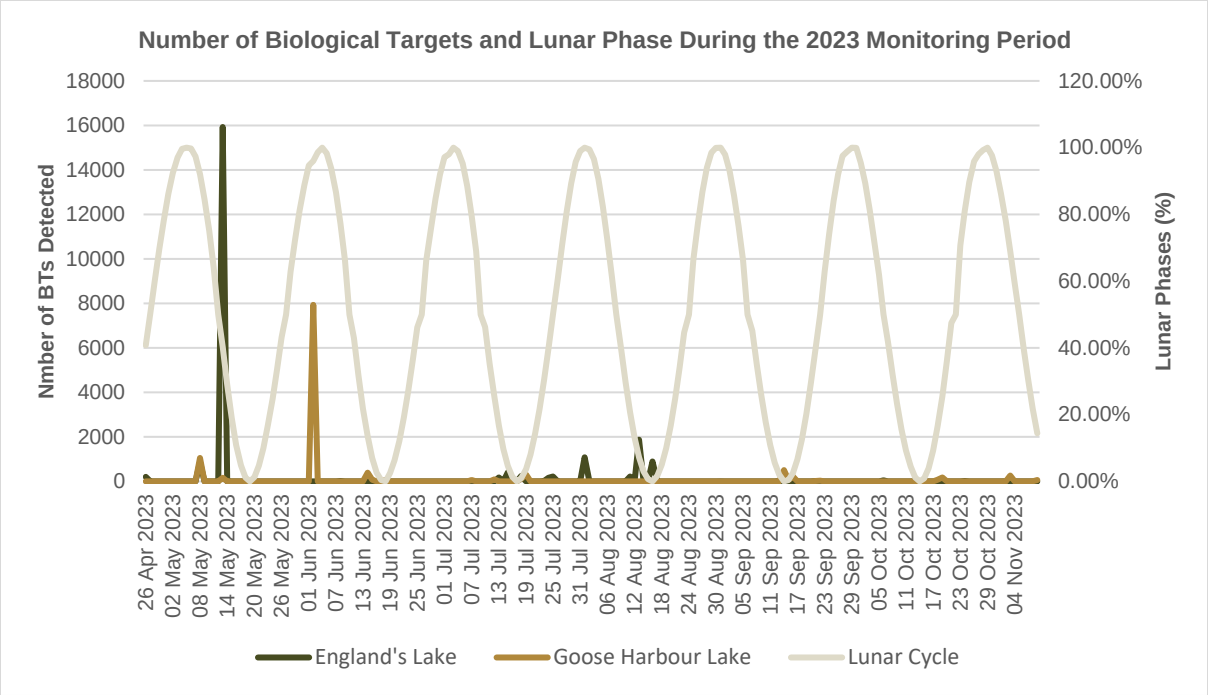

Figure 7.8: Number of Biological Targets Detected During the 2023 Monitoring Period Compared to Lunar Phases

Determining Migratory Bird Density

Tables 7.82, 7.83, 7.84, and 7.85 detail the target density [biological targets per cubic kilometre (BT/km^3)] of the ARS at Englands Lake and Goose Harbour Lake calculated using the volume of airspace scanned (seen in Table 7.71 in section 7.4.5.6) and the number of BTs detected at each height bin during the 2023 monitoring period.

Table 7.82: Target Density – Englands Lake – Spring 2023

Range Bin	Number of Targets Detected	Airspace Scanned (km^3)	Target Density (BT/km^3)
0 to 25	5	0.1015	49
25 to 50	4	0.1016	39
50 to 100	16	0.2036	79
100 to 150	77	0.2043	377
150 to 200	161	0.2052	785
200 to 250	187	0.2063	906
250 to 500	2,042	1.052	1,941
500 to 1,000	8,265	2.226	3,713
1,000 to 1,500	4,939	2.337	2,113
1,500 to 2,000	1,921	2.426	792
2,000 to 3,000	0	3.774	0
Total	**17,617**	**12.8375**	**1,372**

BT/km^3 = Biological targets per cubic kilometre

Table 7.83: Target Density - Goose Harbour Lake – Spring 2023

Range Bin	Number of Targets Detected	Airspace Scanned (km^3)	Target Density (BT/km^3)
0 to 25	0	0.1015	0
25 to 50	0	0.1016	0
50 to 100	0	0.2036	0
100 to 150	0	0.2043	0
150 to 200	1	0.2052	5
200 to 250	0	0.2063	0
250 to 500	15	1.052	14
500 to 1,000	2,807	2.226	1,261
1,000 to 1,500	4,825	2.337	2,065
1,500 to 2,000	2,191	2.426	903
2,000 to 3,000	0	3.774	0
Total	**9,839**	**12.8375**	**766**

Table 7.84: Target Density – Englands Lake – Fall 2023

Range Bin	Number of Targets Detected	Airspace Scanned (km^3)	Target Density (BT/km^3)
0 to 25	1	0.1015	10
25 to 50	0	0.1016	0
50 to 100	9	0.2036	44
100 to 150	37	0.2043	181
150 to 200	57	0.2052	278
200 to 250	60	0.2063	291
250 to 500	1,242	1.052	1,181
500 to 1,000	1,960	2.226	881
1,000 to 1,500	1,288	2.337	551
1,500 to 2,000	222	2.426	92
2,000 to 3,000	0	3.774	0
Total	**4876**	**12.8375**	**380**

Table 7.85: Target Density - Goose Harbour Lake – Fall 2023

Range Bin	Number of Targets Detected	Airspace Scanned (km^3)	Target Density (BT/km^3)
0 to 25	0	0.1015	0
25 to 50	0	0.1016	0
50 to 100	0	0.2036	0
100 to 150	1	0.2043	5
150 to 200	3	0.2052	15
200 to 250	2	0.2063	10
250 to 500	194	1.052	184

Range Bin	Number of Targets Detected	Airspace Scanned (km³)	Target Density (BT/km³)
500 to 1,000	510	2.226	229
1,000 to 1,500	805	2.337	344
1,500 to 2,000	343	2.426	141
2,000 to 3,000	0	3.774	0
Total	**1,858**	**12.8375**	**145**

During the spring 2023 monitoring period, the ARS at Englands Lake detected the most targets in the 500 m to 1,000 m range bin, whereas the Goose Harbour Lake ARS detected the most targets in the 1,000 m to 1,500 m range bin. This is associated with two large migration events on May 13, 2023, at Englands Lake, and on June 2, 2023, at Goose Harbour Lake. Approximately 75% of the BTs detected at the Englands Lake ARS and 78% of the BTs detected at the Goose Harbour Lake ARS were within the 500 m to 1,500 m range bin (Tables 24 and 26, Appendix L). In contrast, the target density for this range bin shows less variation than target counts, and target density detected at both ARS were concentrated above 250 m (Figure 7.9).

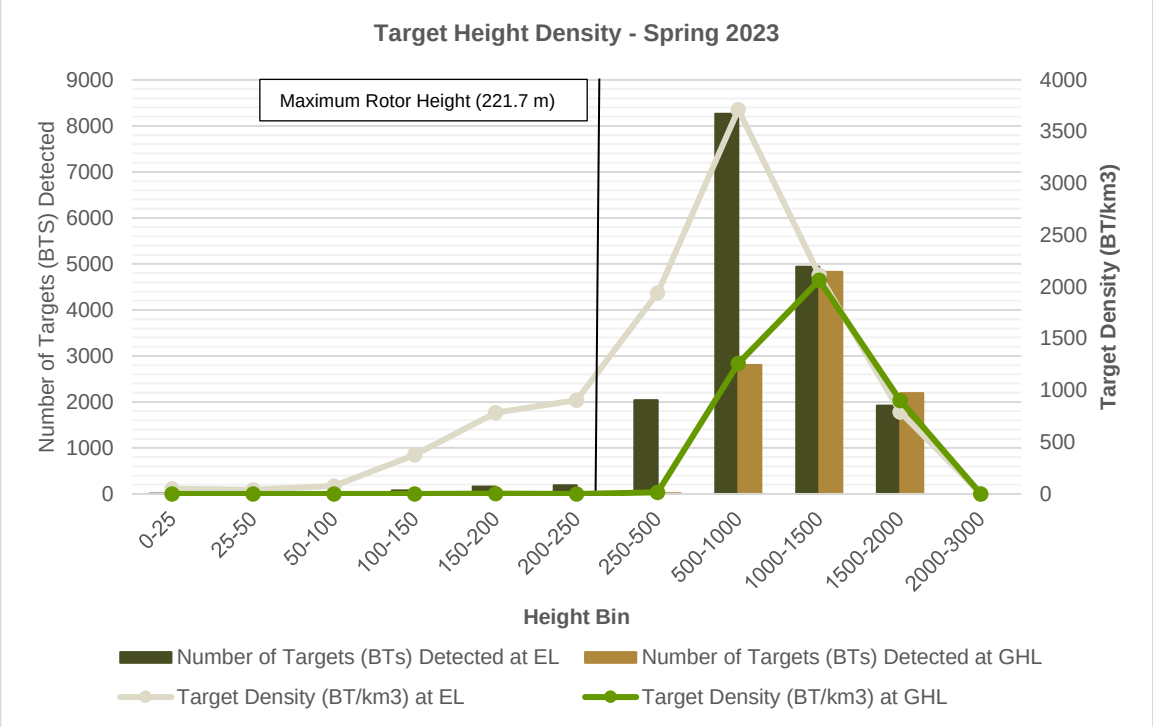

Figure 7.9: Targets Detected and Target Density – Spring 2023

Similar to the detections in the spring 2023 monitoring, the Englands Lake ARS and Goose Harbour Lake ARS saw peak detection within the 500 m to 1,000 m and within the 1,000 m to 1,500 m during fall 2023 monitoring period, respectively. Target density for the Englands Lake ARS saw an increase above 250 m and gradually drop above 500 m (Figure 7.9). In contrast, target density for the Goose Harbour Lake ARS gradually increased above 250 m and decreased above 1,500 m (Figure 7.10).

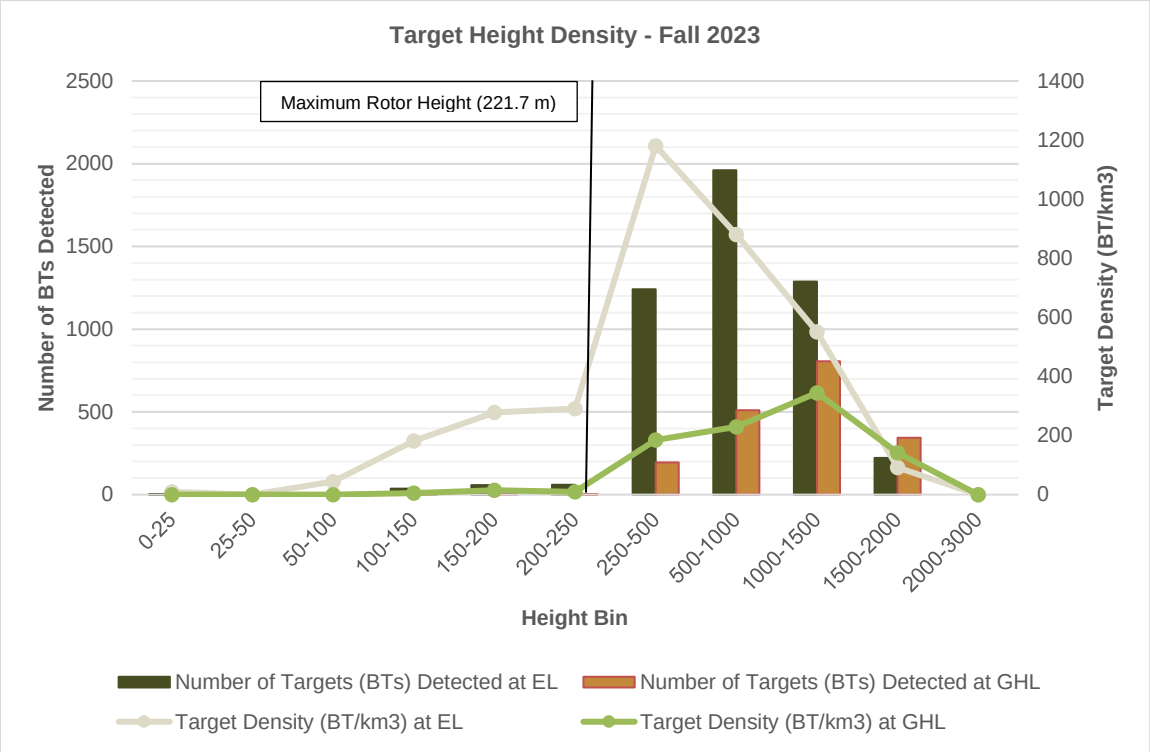

Figure 7.10: Targets Detected and Target Density – Fall 2023

Across both monitoring seasons, target density was observed to be highest above 250 m, with substantially lower density below the 200 m height bins. This indicates that migratory bird activity is somewhat even in the height bins above the airspace that the proposed turbines would occupy. Based on the height of the proposed airspace where the turbine will occupy, birds flying at height estimated between 35 m to 225 m would be at potential risk of interacting with the Project infrastructure. Approximately 2% of avian movement recorded at the Englands Lake ARS was detected within the interaction space and less than 1% of avian movement recorded at the Goose Harbour Lake ARS was detected within the interaction space, suggesting that little to no interaction between avian movement and Project infrastructure.

Avian Interaction Model

The ARS data was used to determine target density for each day of the monitoring program (calculated from values in Tables 24 to 27, Appendix L) and the interaction airspace volume (determined in Table 7.72) was used to calculate and project the MBII (Figures 7.11 and 7.12) over the spring and fall 2023 monitoring period.

The MBII values for the spring 2023 monitoring period showed two clear spikes for May 13 at Englands Lake and for June 2 at Goose Harbour Lake, corresponding to the large migratory movements on those dates (Figure 7.11). In contrast, fall 2023 monitoring period saw more interactions for both ARS locations, with the highest spikes occurring on August 15 at Englands Lake and September 14 at Goose Harbour Lake, but also occurred sporadically throughout the fall monitoring periods (Figure 7.12). These data suggest that while spring migration occurred rapidly

and in short duration to fight for foraging and breeding opportunities, fall migration is less competitive and as such less rapidly and in longer duration (Nilsson et al., 2013).

The MBII model represents a basic estimate of the level of interaction between migratory birds and the wind turbines infrastructure. The MBII values calculated for these dates are not representative of the number of interactions that would have occurred had the proposed Project been built and operating on that date. Rather, this MBII value is useful in comparing anticipated interaction levels between dates, to expose the frequency and intensity of migratory bird interaction events.

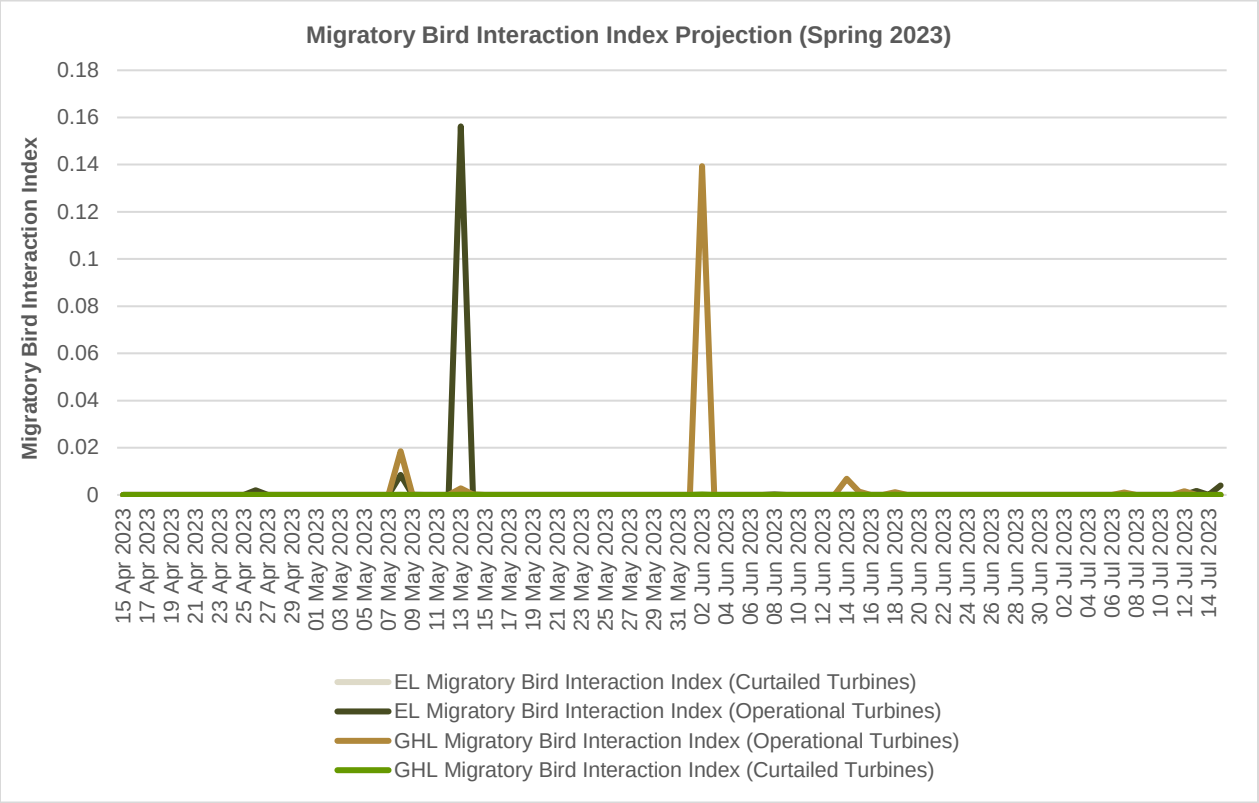

Figure 7.11: Migratory Bird Interaction Index – Projected Daily for the Spring 2023 Monitoring Period

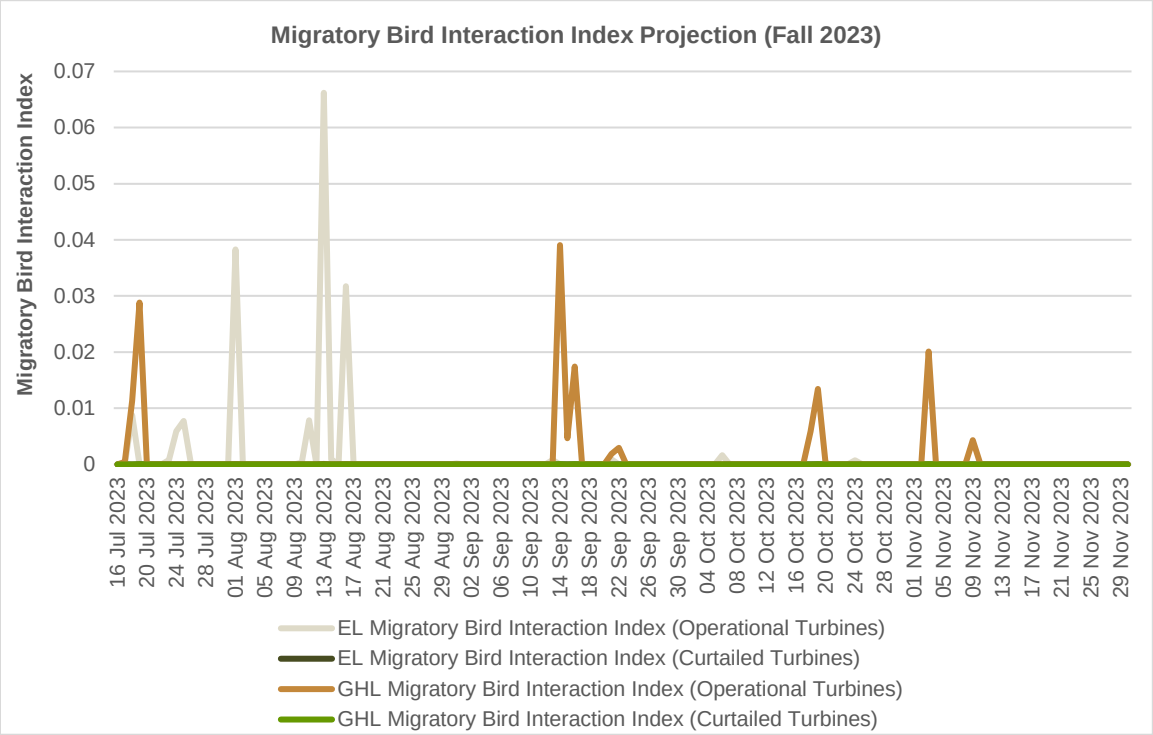

Figure 7.12: Migratory Bird Interaction Index – Projected Daily for the Fall 2023 Monitoring Period

Acoustic Monitoring Results

Data collected by the ARU at Englands Lake and Goose Harbour Lake were verified to provide a list of confirmed species utilizing the Study Area across seasons (Tables 28 to 31, Appendix L).

Results presented in this report and described below include avian data as follows:

- BirdNET: Detected SAR and SOCI species only (song and call)
- Nighthawk: All bird species detected (NFCs)

BirdNET Results: SAR and SOCI

Englands Lake BirdNET Results

BirdNET made a total of 742 detections from the Englands Lake audio data (Figure 7.13), primarily (77%) during the months of June and July. Small spikes in the number of detections were also observed in September and October.

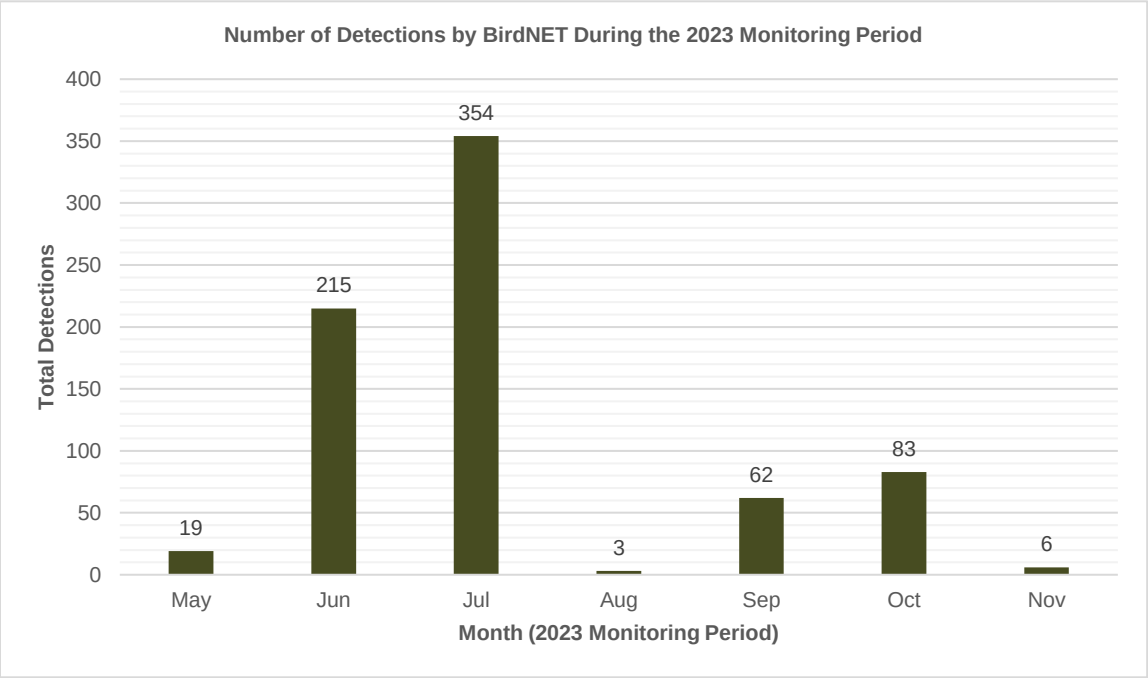

Figure 7.13: Total Number of Detections made by BirdNET during the 2023 Acoustic Monitoring Season at Englands Lake

A total of 660 detections were manually verified by Strum environmental scientists (Table 28, Appendix L). Of the manually verified detections, 310 (47%) were found to be correct. False positive detections can be attributed to an oversensitivity of the model in conjunction with noise interference from wind, vegetation, frogs, insects, and other environmental factors. Table 7.86 provides an overview of the results for each species detected by BirdNET during the 2023 acoustic monitoring period at Englands Lake. The model was most successful at identifying American robin, common nighthawk, common tern, greater yellowlegs, pine siskin, and spotted sandpiper, all of which had accuracy rates of 80% or higher. It should be noted that in instances where all verified detections were correct (annotated 'Y') or all verified detections were incorrect (annotated 'N') the model was unable to run because it requires at least two correct and two incorrect verifications to generate probability.

Table 7.86: Summary of 2023 Englands Lake BirdNET Results

Common Name	Total Detections	Number Manually Verified	Correct Detections (%)	Confidence (BirdNET)(1)
American bittern	81	81	0.0	0.48
American robin	300	221	100.0	0.51
Arctic tern	1	1	0.0	0.34
Atlantic puffin	10	10	0.0	0.38
Black-backed woodpecker	1	1	0.0	0.40
Black-bellied plover	8	8	0.0	0.46
Black-crowned night-heron	1	1	0.0	0.33
Black-headed gull	1	1	0.0	0.50

Common Name	Total Detections	Number Manually Verified	Correct Detections (%)	Confidence (BirdNET)[1]
Boreal owl	7	7	0.0	0.46
Common nighthawk	16	16	100.0	0.76
Common tern	19	19	94.7	0.68
Eastern bluebird	52	52	0.0	0.53
Evening grosbeak	3	3	0.0	0.64
Greater yellowlegs	18	18	83.3	0.65
Lapland longspur	1	1	0.0	0.50
Lesser yellowlegs	1	1	0.0	0.81
Long-eared owl	97	94	0.0	0.43
Manx shearwater	3	3	0.0	0.36
Pine grosbeak	1	1	0.0	0.31
Pine siskin	1	1	100.0	0.79
Pine warbler	1	1	0.0	0.30
Purple finch	1	1	0.0	0.31
Red crossbill	5	5	0.0	0.44
Red-breasted merganser	1	1	0.0	0.44
Rose-breasted grosbeak	1	1	0.0	0.30
Semipalmated plover	11	11	9.1	0.43
Spotted sandpiper	38	38	100.0	0.64
Surf scoter	43	43	0.0	0.40
Vesper sparrow	10	10	0.0	0.50
Willet	1	1	0.0	0.50
Wilson's snipe	8	8	0.0	0.46

[1] Represents the average “confidence value” generated by the BirdNET model for a given species. These values represent the model’s confidence in its predictions, but they are not true probabilities.

A majority (91%) of the confirmed positive detections occurred during the months of June and July (Figure 7.14), which represents the peak breeding season for many birds in Nova Scotia. The reduction in detections during spring and fall is not surprising, considering BirdNET was not designed to detect the nocturnal flight calls made by many species during spring and fall migration. Many of the detections made by BirdNET likely represent the summer movements of birds that breed in the area. In terms of seasonal species richness, July had the highest number of unique species detected in a given month, with one SAR (common nighthawk) and four SOCI (Figure 7.15).

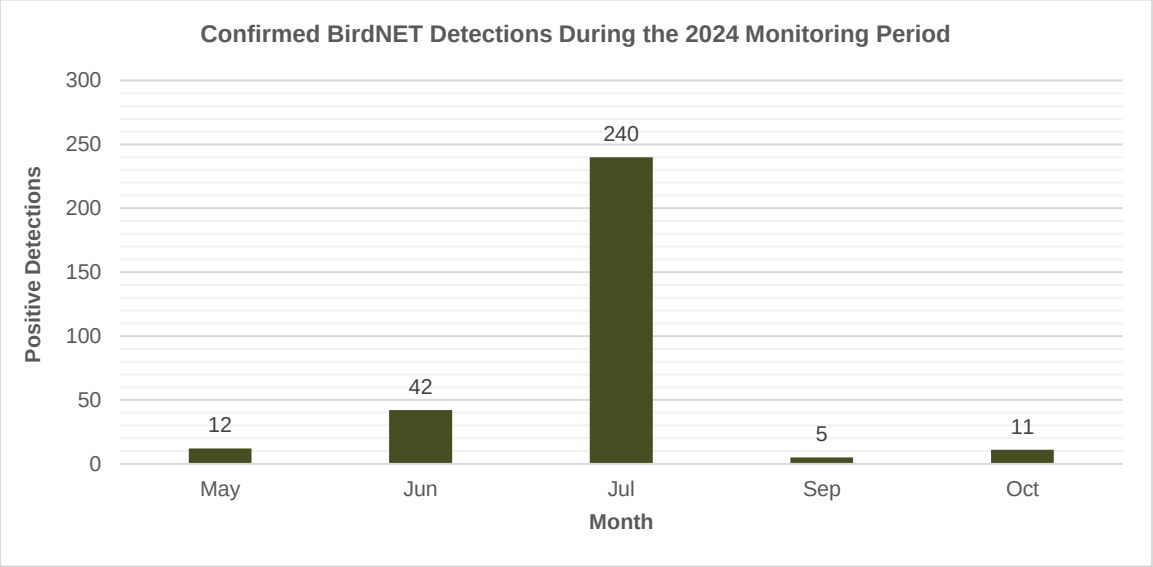

Figure 7.14: Confirmed BirdNET Detections from the 2023 Acoustic Monitoring Period at Englands Lake

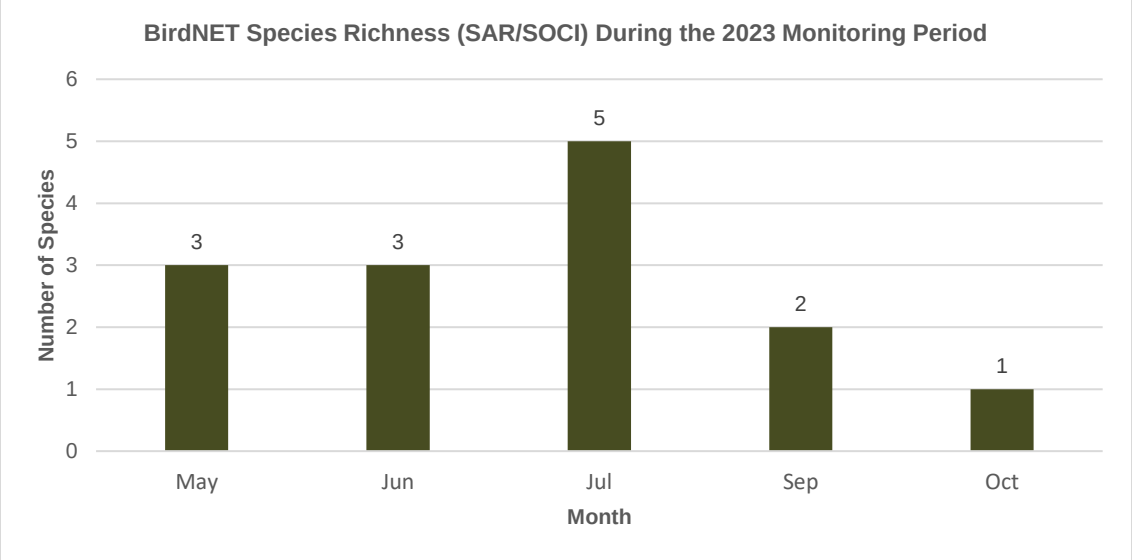

Figure 7.15: BirdNET Species Richness (SAR and SOCI only) During the 2023 Acoustic Monitoring Period at Englands Lake

Of the confirmed positive detections, eight different species were noted, consisting of two SAR and six SOCI. Common nighthawk was the only SAR detected, and they were primarily detected in July. This overlaps with the species' breeding season in Nova Scotia and may suggest breeding and/or foraging activity near the Project. American robin was the species with the highest number of positive detections (221), followed by spotted sandpiper (38), common tern (18), common nighthawk (16) and greater yellowlegs (15). One pine siskin and one semipalmated plover were also detected. American robin, spotted sandpiper and common tern were almost entirely detected during the summer months, suggesting possible breeding activity in the area. Greater yellowlegs and semipalmated plover were detected exclusively in the fall, suggesting that these species were migrating through the area (Table 7.87).

Table 7.87: Confirmed SAR and SOCI Vocalizations detected by BirdNET during the 2023 Acoustic Monitoring Period at Englands Lake

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
American robin	*Turdus migratorius*	-	-	-	S5B, S3N
Common nighthawk	*Chordeiles minor*	Special Concern	Special Concern	Threatened	S3B
Common tern	*Sterna Hirundo*	Not at Risk	-	-	S3B
Greater yellowlegs	*Tringa melanoleuca*	-	-	-	S3B, S4M
Pine siskin	*Spinus pinus*	-	-	-	S3
Semipalmated plover	*Charadrius semipalmatus*	-	-	-	S1B, S4M
Spotted sandpiper	*Actitis macularius*	-	-	-	S3S4B, S5M

Source: (ACCDC, 2025a)

Goose Harbour Lake BirdNET Results

BirdNET made a total of 2,660 detections from the Goose Harbour Lake audio data (Figure 7.16), primarily during the months of May (80%). Most of the detections occurred in the spring months before rapidly decreasing in the fall months.

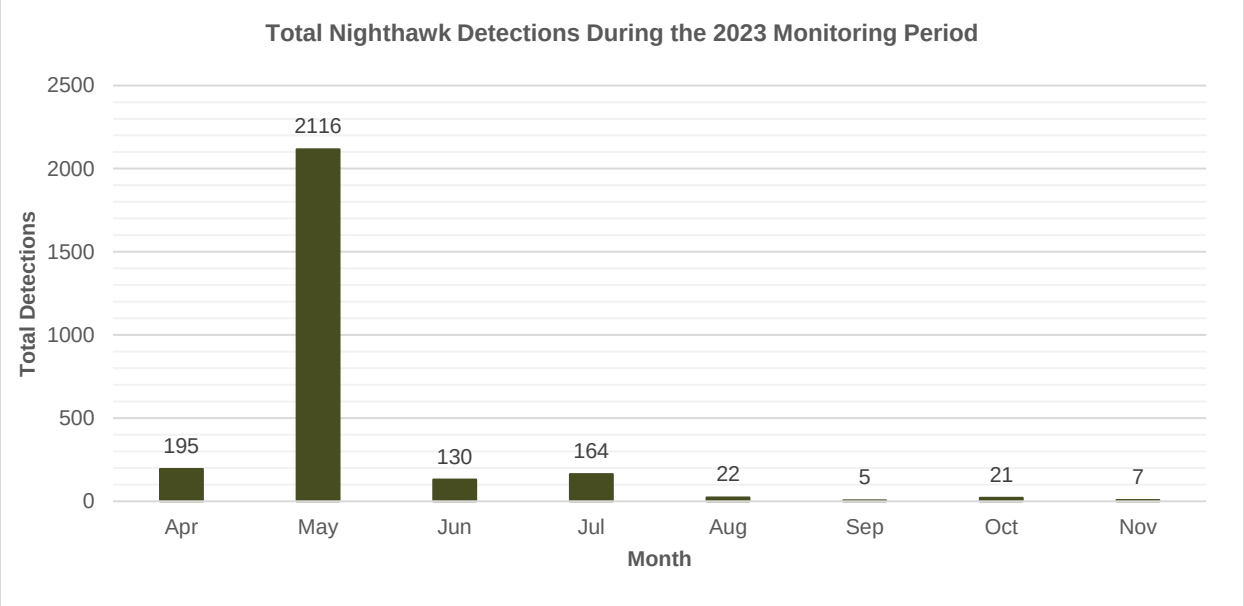

Figure 7.16: Total Number of Detections Made by Nighthawk During the 2023 Acoustic Monitoring Season at Goose Harbour Lake

A total of 2,392 detections were manually verified by Strum environmental scientists, and of those, 561 (23%) were correctly identified by BirdNET (Table 29, Appendix L). Table 7.88 provides an overview of the results for each species detected by BirdNET during the 2023 acoustic monitoring period at Goose Harbour Lake. The model was most successful at identifying American robin, black-billed cuckoo, chimney swift, common nighthawk, and spotted sandpiper; all of which had accuracy rates of 80% or higher.

Table 7.88: Summary of 2023 Goose Harbour Lake BirdNET Results

Common Name	Total Detections	Number Manually Verified	Correct Detections (%)	Confidence (BirdNET) (1)
American bittern	1783	1622	0	0.36
American kestrel	4	4	0	0.50
American robin	418	350	82	0.59
Atlantic puffin	2	2	0	0.35
Bicknell's thrush	2	2	0	0.35
Black scoter	2	2	0	0.78
Black-backed woodpecker	1	1	0	0.36
Black-bellied plover	26	26	8	0.43
Black-billed cuckoo	1	1	100	0.97
Black-crowned night-heron	2	2	0	0.56
Black-headed gull	3	3	0	0.50
Blackpoll warbler	1	1	0	0.75
Bobolink	1	1	0	0.34
Cape May warbler	2	2	0	0.35
Chimney swift	1	1	100	0.81
Common eider	1	1	0	0.52
Common nighthawk	42	42	100	0.83
Eastern bluebird	15	15	7	0.63
Gadwall	2	2	0	0.59
Great crested flycatcher	3	3	0	0.45
Greater yellowlegs	1	1	0	0.40
Lapland longspur	7	7	0	0.47
Leach's storm-petrel	8	8	0	0.35
Least Bittern	3	3	0	0.41
Long-eared owl	5	4	0	0.64
Manx shearwater	7	7	0	0.45
Olive-sided flycatcher	2	2	0	0.42
Peregrine falcon	6	6	33	0.56
Pileated woodpecker	8	7	0	0.63
Pine grosbeak	1	1	0	0.31
Purple finch	2	2	0	0.34
Red crossbill	1	1	0	0.46
Rose-breasted grosbeak	3	3	0	0.44
Rusty blackbird	7	7	0	0.35
Scarlet tanager	1	1	0	0.36
Semipalmated plover	2	2	50	0.84
Solitary sandpiper	5	4	0	0.57

Common Name	Total Detections	Number Manually Verified	Correct Detections (%)	Confidence (BirdNET) [1]
Spotted sandpiper	194	175	88	0.74
Tennessee warbler	2	2	0	0.57
Vesper sparrow	4	4	0	0.39
Willow flycatcher	8	8	0	0.63
Wilson's snipe	62	45	0	0.36
Yellow rail	9	8	0	0.58

[1] Represents the average "confidence value" generated by the BirdNET model for a given species. These values represent the model's confidence in its predictions, but they are not true probabilities.

A majority of the confirmed positive detections occurred during the months of April, May, June and July (95%), which represent the peak spring migration and breeding season for many birds in Nova Scotia (Figure 7.17). Birds often display their songs and calls after migration arrival and before peak breeding season, which supports the high detections seen in the Goose Harbour Lake dataset during the late spring and early summer months. Detections in the fall monitoring period are similar to those of the Englands Lake fall monitoring period, which suggests the reduction of songs and calls as fall migration season begins. In terms of seasonal species richness, June had the highest number of unique species detected in a given month, with one SAR (common nighthawk) and three SOCI (Figure 7.18).

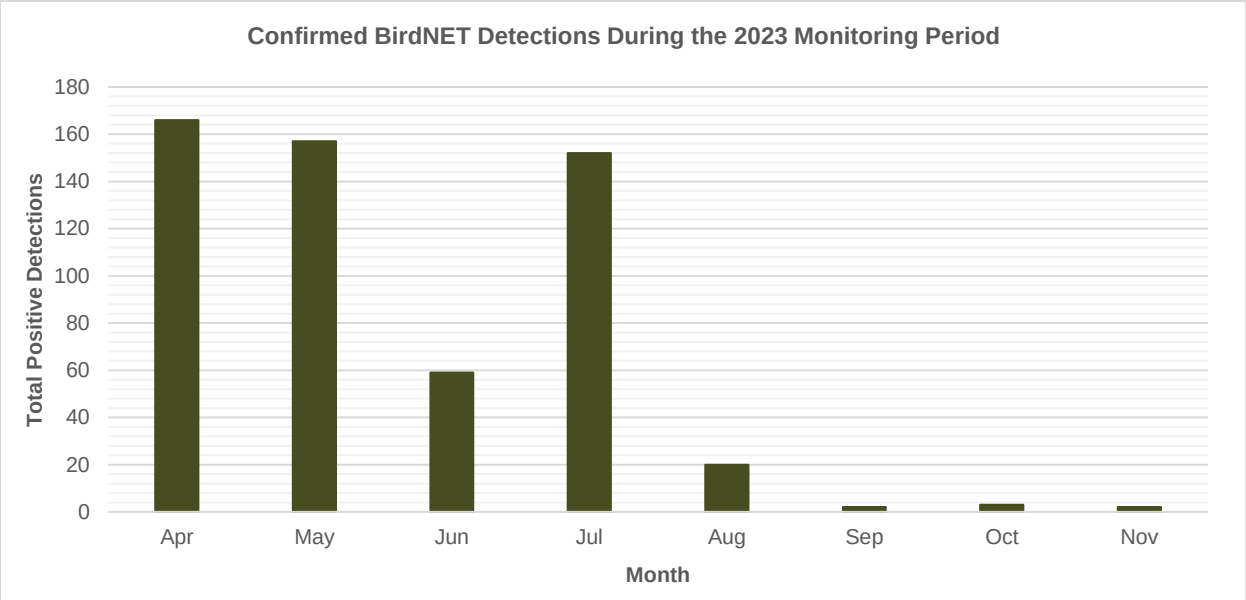

Figure 7.17: Confirmed BirdNET Detections from the 2023 Acoustic Monitoring Period at Goose Harbour Lake

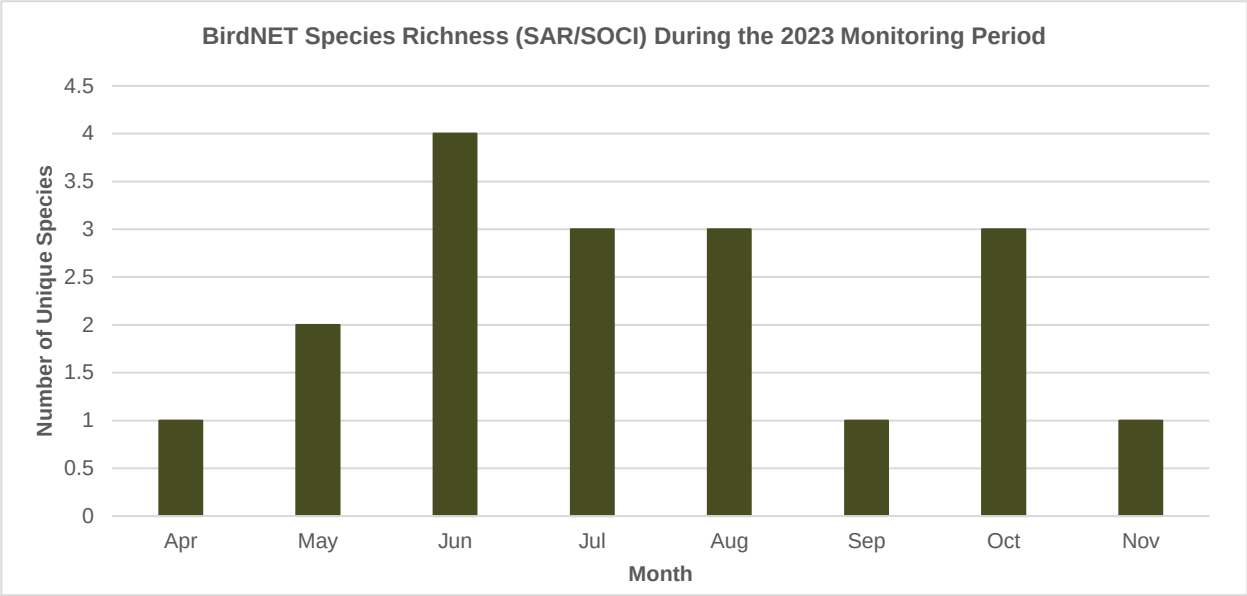

Figure 7.18: BirdNET Species Richness (SAR and SOCI only) During the 2023 Acoustic Monitoring Period at Goose Harbour Lake

Of the confirmed positive detections, nine different species were noted, consisting of two SAR and seven SOCI (Table 7.89). Common nighthawk was one of the two SAR detected, primarily detected in June, July, and August. This overlaps with the species' breeding season in Nova Scotia and may suggest breeding, foraging, and/or migrating activity near the Project. Chimney swift was the other SAR detected, with one detection in late October. As this was later in the season, it is assumed that the species was only migrating through the area. American robin was the species with the highest number of positive detections (341), followed by spotted sandpiper (170) and common nighthawk (42). It is noted that several species, including American robin and spotted sandpiper, were observed consistently throughout the monitoring period. This suggests the species were migrating through and breeding in the adjacent area near or within the Project.

Table 7.89: Confirmed SAR and SOCI Vocalizations detected by BirdNET during the 2023 Acoustic Monitoring Period at Goose Harbour Lake

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
American robin	*Turdus migratorius*	-	-	-	S5B, S3N
Black-bellied plover	*Pluvialis squatarola*	-	-	-	S3M
Black-billed cuckoo	*Coccyzus erythropthalmus*	-	-	-	S3B
Chimney swift	*Chaetura pelagica*	Threatened	Threatened	Endangered	S2S3B,S1M
Common nighthawk	*Chordeiles minor*	Special Concern	Special Concern	Threatened	S3B
Eastern bluebird	*Sialia sialis*	Not at Risk	-	-	S3B
Peregrine falcon	*Falco peregrinus*	-	-	Vulnerable	S1B,SUM

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Semipalmated plover	*Charadrius semipalmatus*	-	-	-	S1B,S4M
Spotted sandpiper	*Actitis macularius*	-	-	-	S3S4B,S5M

Source: (ACCDC, 2025a)

2023 Nighthawk Results

Englands Lake Nighthawk Results

The Nighthawk model made a total of 24,766 detections from the Englands Lake acoustic data (Figure 7.19), most of which occurred in June (54%), followed by September (20%).

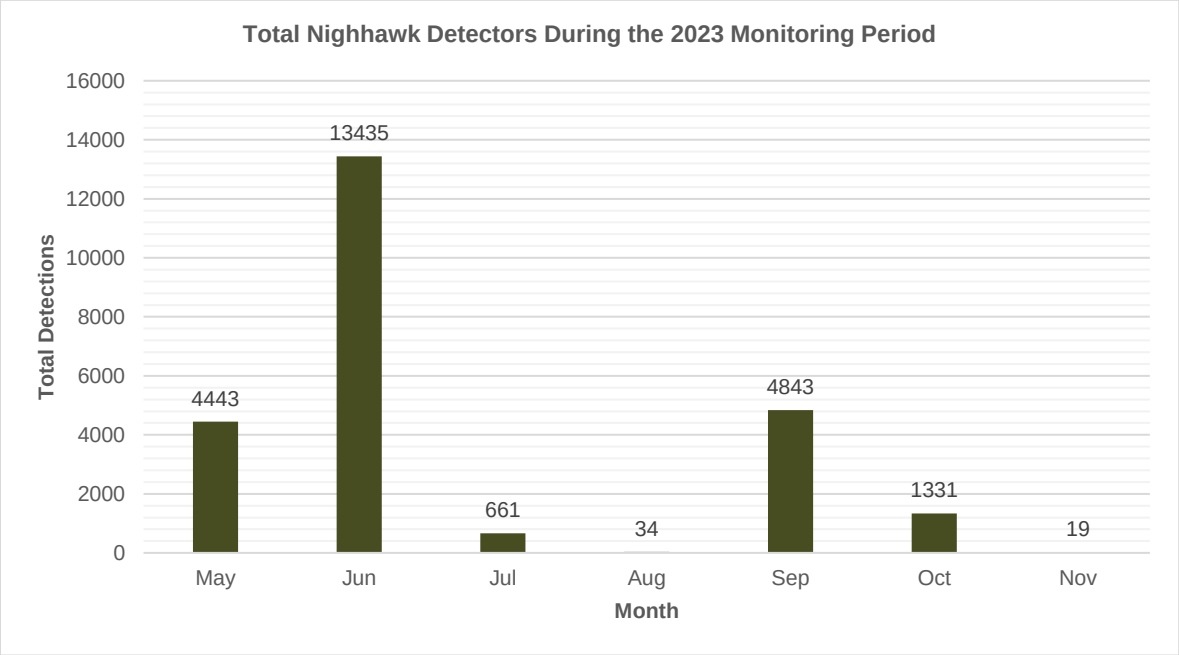

Figure 7.19: Total Number of Detections Made by Nighthawk During the 2023 Acoustic Monitoring Period at Englands Lake

A total of 2,480 detections were manually verified by Strum environmental scientists, and of those, 480 (19%) were correct (Table 7.90; Table 30, Appendix L). Nighthawk was most successful at detecting American robin, Cape May warbler (*Setophaga tigrine*), Canada warbler, dark-eyed junco (*Junco hyemalis*), hermit thrush (*Catharus guttatus),* mourning warbler (*Geothlypis philadelphia*), and Wilson's warbler, all of which had a success rate of 90% or higher when a sample of detections were manually verified. While species-level detections were the focus of the manual verification process, Nighthawk also made 5,225 detections at the group level, 4,176 detections at the family level, and 11,203 detections at the order level, which are included in Table 7.90. Each detection was identified to the highest taxonomic level possible, and detections were not double counted (i.e., if a detection was identified to species level, it was not also counted in the group, family, or order level categories).

Table 7.90: Summary of 2023 Englands Lake Nighthawk Results

Species Common Name	Total Detections	Number Manually Verified	Correct Detections (%)	Confidence
American pipit	12	12	25.0	0.94
American redstart	103	41	12.2	0.89
American robin	20	20	95.0	1.00
Black-and-white warbler	18	18	50.0	1.00
Black-billed cuckoo	12	11	0.0	0.98
Bobolink	1	1	0.0	1.00
Black-throated blue warbler	3	3	0.0	0.90
Cape May warbler	1	1	100.0	1.00
Canada warbler	1	1	100.0	0.94
Chipping sparrow	4	3	33.3	0.95
Chestnut-sided warbler	9	9	11.1	0.94
Comon yellowthroat	23	23	65.2	1.00
Dark-eyed junco	14	13	100.0	0.99
Grasshopper sparrow	3	3	0.0	0.99
Greater yellowlegs	38	32	87.5	0.99
Grey-cheeked thrush	5	5	20.0	1.00
Hermit thrush	10	10	90.0	1.00
Least sandpiper	4	4	25.0	1.00
Mourning warbler	2	2	100.0	0.99
Northern parula	8	8	87.5	0.99
Northern waterthrush	20	18	44.4	0.99
Ovenbird	22	22	63.6	0.97
Palm warbler	15	14	28.6	1.00
Red-breasted nuthatch	975	68	0.0	0.99
Savannah sparrow	166	57	80.7	0.99
Scarlet tanager	9	9	0.0	1.00
Semipalmated plover	5	5	40.0	0.93
Short-billed dowitcher	45	30	0.0	1.00
Solitary sandpiper	4	4	0.0	0.95
Spotted sandpiper	128	37	75.7	0.99
Swainson's thrush	2212	209	4.8	0.86
Upland sandpiper	6	6	0.0	0.99
White-crowned sparrow	4	4	0.0	1.00
White-throated sparrow	159	55	94.5	0.99
Wilson's warbler	2	2	100.0	0.99
Yellow-billed cuckoo	79	43	0.0	0.99

Nighthawk Group Name[2]	Total Detections	Number Manually Verified	Correct Detections (%)	Confidence
BZWA	62	15	26.7	0.96
CUPS	11	3	33.3	0.97
DBUP	108	16	50.0	0.92
DESP	28	7	57.1	0.98
DEWA	3	0	N/A	N/A
HSSP	8	0	N/A	N/A
MWAR	7	0	N/A	N/A
SBUF	121	15	40.0	0.91
SFHS	166	4	100.0	0.95
SWLI	26	1	100.0	1.00
THSH	3056	269	0.7	0.90
ZEEP	1629	120	75.0	0.95
Family Name	**Total Detections**	**Number Manually Verified**	**Correct Detections (%)**	**Confidence**
Ardeidae	17	1	0.0	0.88
Bombycillidae	7	0	N/A	0.00
Calcariidae	9	2	0.0	0.99
Charadriidae	104	1	100.0	1.00
Cuculidae	67	17	5.9	0.97
Haematopodidae	18	2	0.0	0.89
Icteridae	3	4	0.0	0.00
Laridae	2	0	N/A	0.00
Motacillidae	12	0	N/A	0.00
Parulidae	1487	81	23.5	0.92
Passerellidae	178	14	71.4	0.99
Scolopacidae	263	3	66.7	0.99
Sittidae	260	13	0.0	0.95
Turdidae	1749	168	1.2	0.89
Order Name	**Total Detections**	**Number Manually Verified**	**Correct Detections (%)**	**Confidence**
Charadriiformes	640	43	4.7	0.95
Passeriformes	10563	875	4.7	0.92

[1] Detections were identified to the highest taxonomic level possible using Nighthawk. Table 7.90 was organized so as to avoid counting any given detection in more than one category (i.e. if a detection was identified to species level, it was not also counted in the group, family, or order level categories).
[2] Groupings of birds with similar NFCs (Van Doren et al., 2023).

The majority (85%) of the confirmed positive vocalizations were detected in the months of September and October (Figure 7.20), which represent the peak fall migration season for many species that pass through Nova Scotia. This suggests that a large portion of the June detections

were likely false positives. Another source of error was the tendency for the Nighthawk model to misinterpret a single bird singing around dusk or dawn as multiple NFCs, essentially chopping a song up into smaller segments that resemble NFCs. This may explain the unexpectedly high number of detections in June, since this is the most active time of year for birdsong. The reduction in detections in spring can be attributed to a delay in ARU deployment, resulting in a lack of audio data being captured during that time period. The reduction in detections during the summer months is expected, as many birds have arrived on their breeding grounds and there is a reduction in migratory activity during that time.

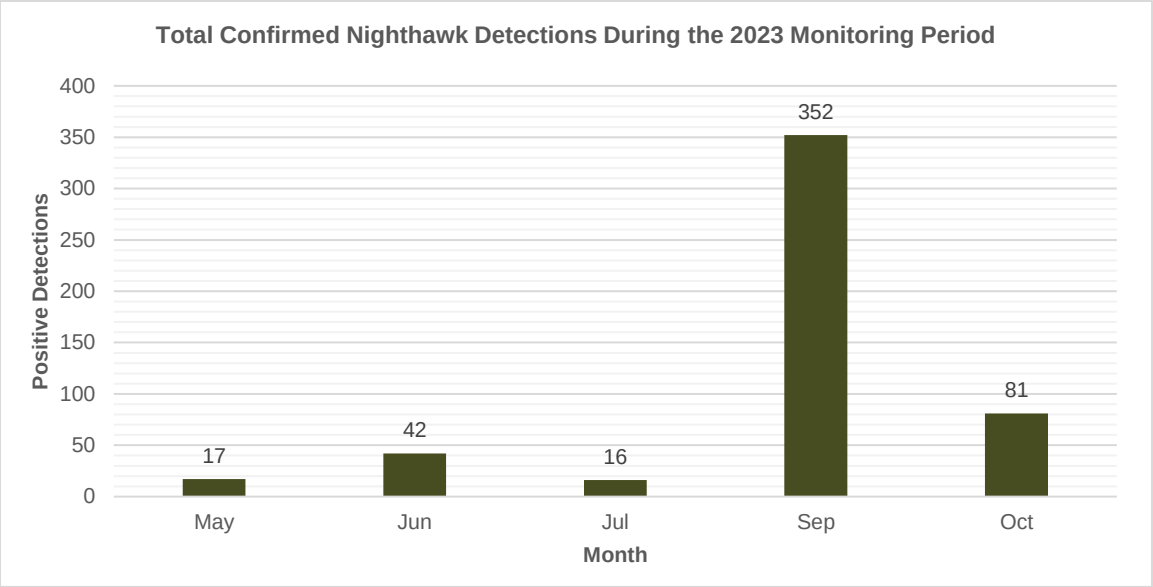

Figure 7.20: Confirmed Nighthawk Detections from the 2023 Acoustic Monitoring Period at Englands Lake

Across all seasons, 26 different species were confirmed to have been positively detected by the model (Table 7.91). Of those, the most commonly detected species were alder flycatcher (*Empidonax alnorum*) (184), savannah sparrow (*Passerculus sandwichensis*) (53), white-throated sparrow (*Zonotrichia albicollis*) (53), spotted sandpiper (30), and greater yellowlegs (28). One SAR, a Canada Warbler, was detected in mid-September, suggesting the bird was likely migrating through the area. Eight SOCI were also detected, which consisted of spotted sandpiper (30), greater yellowlegs (28), American robin (19), gray-cheeked thrush (*Catharus minimus*) (two), semipalmated plover (two), Cape May warbler (one), least sandpiper (*Calidris minutilla*) (one), and Wilson's warbler (one). Least sandpiper, semipalmated plover, and greater yellowlegs were detected almost entirely in the fall, suggesting the movement of migrating shorebirds through the area at that time.

Table 7.91: Summary of Species Confirmed at Englands Lake During the 2023 Nighthawk Acoustic Analysis

Common Name	Scientific Name	COSEWIC Status	*SARA* Status	*ESA* Status	NS S-Rank
Alder flycatcher	*Empidonax alnorum*	-	-	-	S5B
American pipit	*Anthus rubescens*	-	-	-	S4M
American redstart	*Setophaga ruticilla*	-	-	-	S5B

Common Name	Scientific Name	COSEWIC Status	*SARA* Status	*ESA* Status	NS S-Rank
American robin	*Turdus migratorius*	-	-	-	S5B, S3N
Black-and-white warbler	*Mniotilta varia*	-	-	-	S5B
Cape May warbler	*Setophaga tigrine*	-	-	-	S3B, SUM
Canada warbler	*Cardellina canadensis*	Special Concern	Threatened	Endangered	S3B
Chestnut-sided warbler	*Setophaga pensylvanica*	-	-	-	S5B
Chipping sparrow	*Spizella passerine*	-	-	-	S4B, S5M
Common yellowthroat	*Geothlypis trichas*	-	-	-	S5B
Dark-eyed junco	*Junco hyemalis*	-	-	-	S4S5
Greater yellowlegs	*Tringa melanoleuca*	-	-	-	S3B, S4M
Gray-cheeked thrush minimus subspecies	*Catharus minimus minimus*	Threatened	-	-	S1?B
Hermit thrush	*Catharus guttatus*	-	-	-	S5B
Least sandpiper	*Calidris minutilla*	-	-	-	S1B, S4M
Mourning warbler	*Geothlypis Philadelphia*	-	-	-	S4B, S5M
Nashville warbler	*Leiothlypis ruficapilla*	-	-	-	S4B, S5M
Northern parula	*Setophaga americana*	-	-	-	S5B
Northern waterthrush	*Parkesia noveboracensis*	-	-	-	S4B, S5M
Ovenbird	*Seiurus aurocapilla*	-	-	-	S5B
Palm warbler	*Setophaga palmarum*	-	-	-	S5B
Savannah sparrow	*Passerculus sandwichensis*	-	-	-	S4S5B, S5M
Semipalmated plover	*Charadrius semipalmatus*	-	-	-	S1B, S4M
Spotted sandpiper	*Actitis macularius*	-	-	-	S3S4B, S5M
Swainson thrush	*Catharus ustulatus*	-	-	-	S4B, S5M
White-throated sparrow	*Zonotrichia albicollis*	-	-	-	S4S5B, S5M
Wilson's warbler	*Cardellina pusilla*	-	-	-	S3B, S5M

Source: (ACCDC, 2025a)

In terms of seasonal species richness at the Englands Lake location, September and October had the highest number of unique species detected, with 22 species detected in September and 14 detected in October (Figure 7.21).

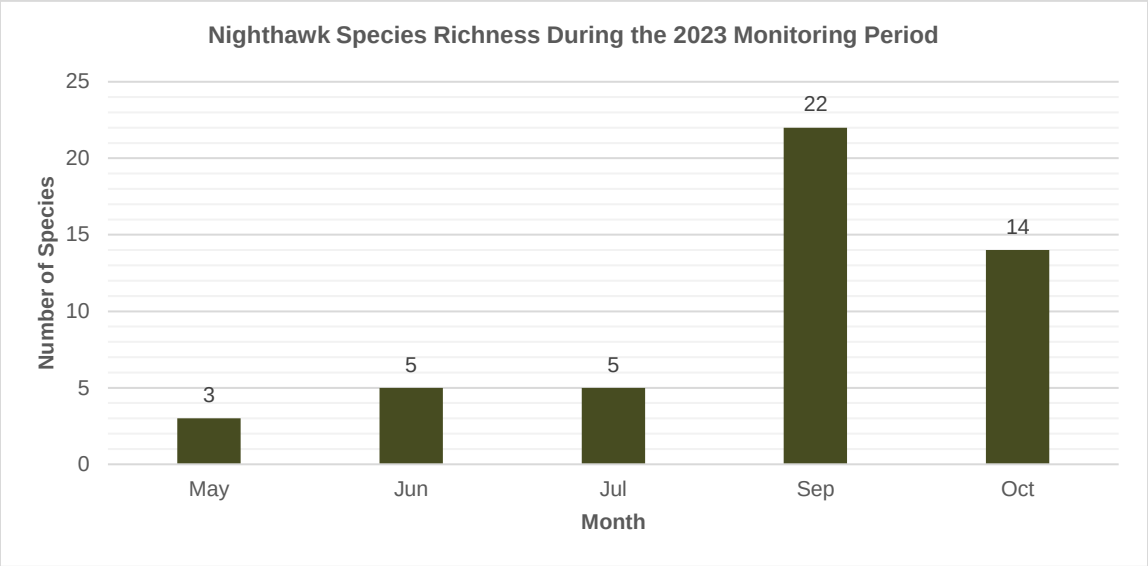

Figure 7.21: Nighthawk Species Richness During the 2023 Acoustic Monitoring Period for Englands Lake

Goose Harbour Lake Nighthawk Results

The Nighthawk model made a total of 8,749 detections during the 2023 monitoring period at the Goose Harbour Lake's ARU, the majority of which occurred in June, August, and September (Figure 7.22).

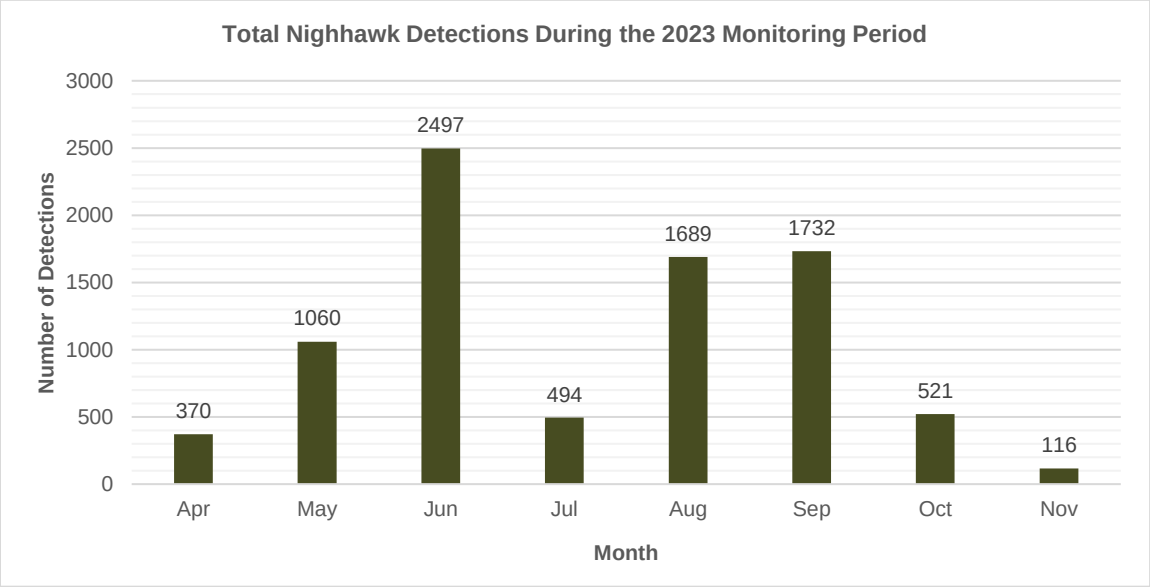

Figure 7.22: Total Number of Detections Made by Nighthawk During the 2023 Acoustic Monitoring Period at Goose Harbour Lake

A subset of 1,112 detections was manually verified by Strum environmental scientists, and of those, 482 (43%) were correctly identified by Nighthawk (Table 7.92; Table 31, Appendix L). Nighthawk was most successful at detecting American robin, black-and-white sparrow, common yellowthroat,

northern waterthrush, and spotted sandpiper; all of which had a success rate of 90% or higher when a sample of detections were manually verified. No detections at the family, group and order levels were identified, and detections were identified to the highest taxonomic level possible.

Table 7.92: Summary of the 2023 Spring Monitoring Period Detected at Goose Harbour Lake

Species Common Name	Total Detections	Number Manually Verified	Correct Detections (%)	Confidence
American pipit	42	28	0	0.93
American redstart	1051	30	60	0.89
American robin	72	36	97	1.00
American tree sparrow	27	26	0	1.00
Black-and-white sparrow	223	27	100	1.00
Black-billed cuckoo	1	1	0	0.99
Black oystercatcher	3	2	0	0.99
Bobolink	209	31	3	1.00
Black-throated blue warbler	68	31	3	0.89
Cape May warbler	44	34	44	1.00
Canada warbler	34	31	61	0.99
Chipping sparrow	13	11	0	0.90
Chestnut-sided warbler	150	33	88	0.95
Common yellowthroat	202	25	92	1.00
Dark-eyed junco	140	36	6	0.99
Grasshopper sparrow	24	29	0	0.99
Greater yellowlegs	7	7	43	0.99
Green heron	2	3	0	0.97
Grey-cheeked thrush	8	9	11	0.98
Hermit thrush	61	38	66	1.00
Hooded warbler	21	21	0	0.91
Indigo bunting	2	3	67	0.90
Killdeer	7	7	0	1.00
Lapland longspur	2	2	0	0.97
Least sandpiper	28	35	34	1.00
Lincoln's sparrow	22	21	14	0.96
MacGillivray's warbler	3	3	0	0.99
Mourning warbler	56	26	85	0.99
Nashville warbler	3	3	67	0.91
Northern parula	48	31	74	0.99
Northern waterthrush	144	33	94	1.00
Ovenbird	230	34	88	0.97
Palm warbler	83	28	14	1.00

Species Common Name	Total Detections	Number Manually Verified	Correct Detections (%)	Confidence
Red-breasted nuthatch	16	16	0	0.99
Rose-breasted grosbeak	10	10	0	0.99
Savannah sparrow	340	65	88	0.99
Scarlet tanager	7	6	0	1.00
Semipalmated plover	22	22	55	0.96
Short-billed dowitcher	44	32	28	0.99
Solitary sandpiper	126	36	3	0.95
Spotted sandpiper	587	31	97	0.99
Swainson thrush	1	36	31	0.85
Upland sandpiper	2794	40	0	0.99
Veery	133	11	45	0.98
Vesper's sparrow	11	4	0	1.00
White-crowned sparrow	4	13	0	0.98
White-throated sparrow	13	33	85	0.99
Wilson's warbler	1249	8	13	0.98
Yellow-billed cuckoo	8	34	0	0.99

The majority of the confirmed positive NFCs were detected in the months of May (22%) and August (41%) (Figure 7.23), which represent peak spring and fall migration seasons for many species that pass through Nova Scotia. Similarly high detections in April and September also corroborate the presence of high migration activity near and/or within the Study Area, which support assumptions of peak migration seasons for avian species migrating through Nova Scotia. The reduction in NFCs detections in the summer months (June and July) and the later fall months are expected as these are either peak breeding season or later fall migration season, to which birds present less NFCs as they either have arrived on their breeding grounds or have migrated out of the province.

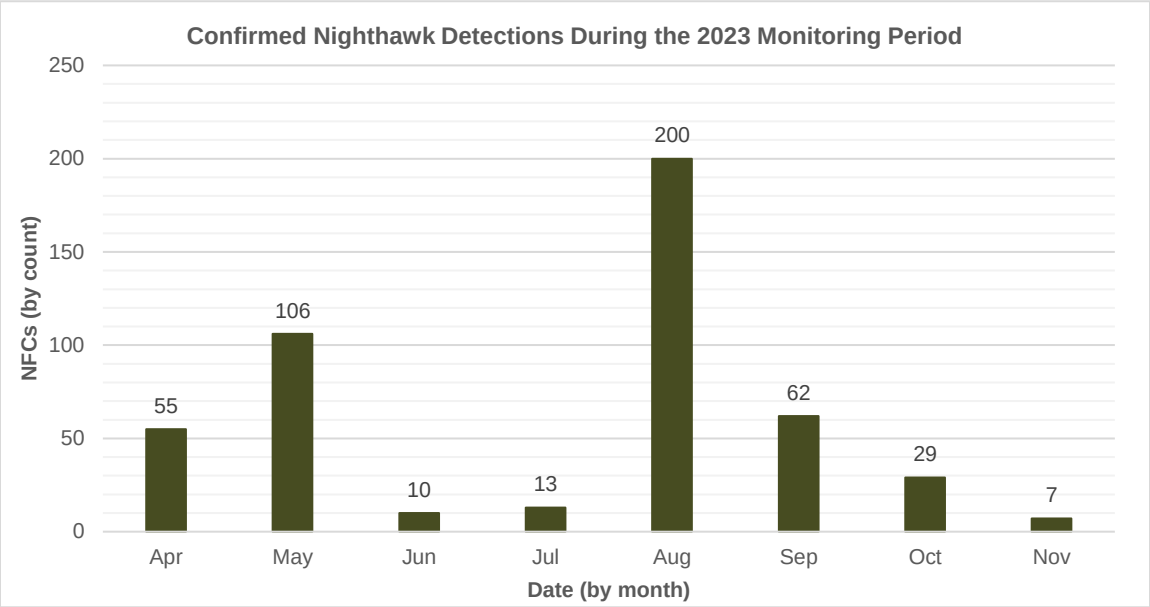

Figure 7.23: Confirmed Nighthawk Detections from the 2023 Acoustic Monitoring Period at Goose Harbour Lake

Across all seasons, 31 different species were confirmed to have been positively detected by the model (Table 7.93). The most detected species were savannah sparrow (57), American robin (35), northern waterthrush (31), ovenbird (30), and spotted sandpiper (30). Two SAR was identified, including Canada warbler and bobolink. The Canada warbler was detected in May and August, suggesting the species was migrating through the area. There were 11 SOCI also detected, which consisted of American robin, Cape May warbler, greater yellowlegs, grey-cheeked thrush, indigo bunting, least sandpiper, semipalmated plover, short-billed dowitcher, solitary sandpiper, and Wilson's warbler. Notably, shorebirds, such as least sandpiper, spotted sandpiper, semipalmated plover and short-billed dowitcher, were mostly detected in May and August into September, suggesting the movement of migrating shorebirds through the Project.

Table 7.93: Summary of Species Confirmed at Goose Harbour Lake During the 2023 Nighthawk Acoustic Analysis

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
American redstart	*Setophaga ruticilla*	-	-	-	S5B
American robin	*Turdus migratorius*	-	-	-	S5B,S3N
Black-and-white warbler	*Mniotilta varia*	-	-	-	S5B
Black-throated blue warbler	*Setophaga caerulescens*	-	-	-	S5B
Bobolink	*Dolichonyx oryzivorus*	Special Concern	Threatened	Vulnerable	S3B
Canada warbler	*Cardellina canadensis*	Special Concern	Threatened	Endangered	S3B

Common Name	Scientific Name	COSEWIC Status	SARA Status	ESA Status	NS S-Rank
Cape May warbler	*Setophaga tigrina*	-	-	-	S3B,SUM
Chestnut-sided warbler	*Setophaga pensylvanica*	-	-	-	S5B
Common yellowthroat	*Geothlypis trichas*	-	-	-	S5B
Dark-eyed junco	*Junco hyemalis*	-	-	-	S4S5
Greater yellowlegs	*Tringa melanoleuca*	-	-	-	S3B,S4M
Grey-cheeked thrush	*Catharus minimus minimus*	Threatened	-	-	S1?B
Hermit thrush	*Catharus guttatus*	-	-	-	S5B
Indigo bunting	*Passerina cyanea*	-	-	-	S1?B,SUM
Least sandpiper	*Calidris minutilla*	-	-	-	S1B, S4M
Lincoln's sparrow	*Melospiza lincolnii*	-	-	-	S4B,S5M
Mourning warbler	*Geothlypis philadelphia*	-	-	-	S4B, S5M
Nashville warbler	*Leiothlypis ruficapilla*	-	-	-	S4B,S5M
Northern parula	*Setophaga americana*	-	-	-	S5B
Northern waterthrush	*Parkesia noveboracensis*	-	-	-	S4B,S5M
Ovenbird	*Seiurus aurocapilla*	-	-	-	S5B
Palm warbler	*Setophaga palmarum*	-	-	-	S5B
Savannah sparrow	*Passerculus sandwichensis*	-	-	-	S4S5B,S5M
Semipalmated plover	*Charadrius semipalmatus*	-	-	-	S1B,S4M
Short-billed dowitcher	*Limnodromus griseus*	-	-	-	S3M
Solitary sandpiper	*Tringa solitaria*	-	-	-	SUB,S3S4M
Spotted sandpiper	*Actitis macularius*	-	-	-	S3S4B,S5M
Swainson's thrush	*Catharus ustulatus*	-	-	-	S4B,S5M
Veery	*Catharus fuscescens*	-	-	-	S4B
White-throated sparrow	*Zonotrichia albicollis*	-	-	-	S4S5B,S5M
Wilson's warbler	*Cardellina pusilla*	-	-	-	S3B,S5M

Source: (ACCDC, 2025a)

In terms of seasonal species richness at the Goose Harbour Lake location, May and August had the highest number of unique species detected, with 17 species detected in May and 22 detected in August (Figure 7.24).

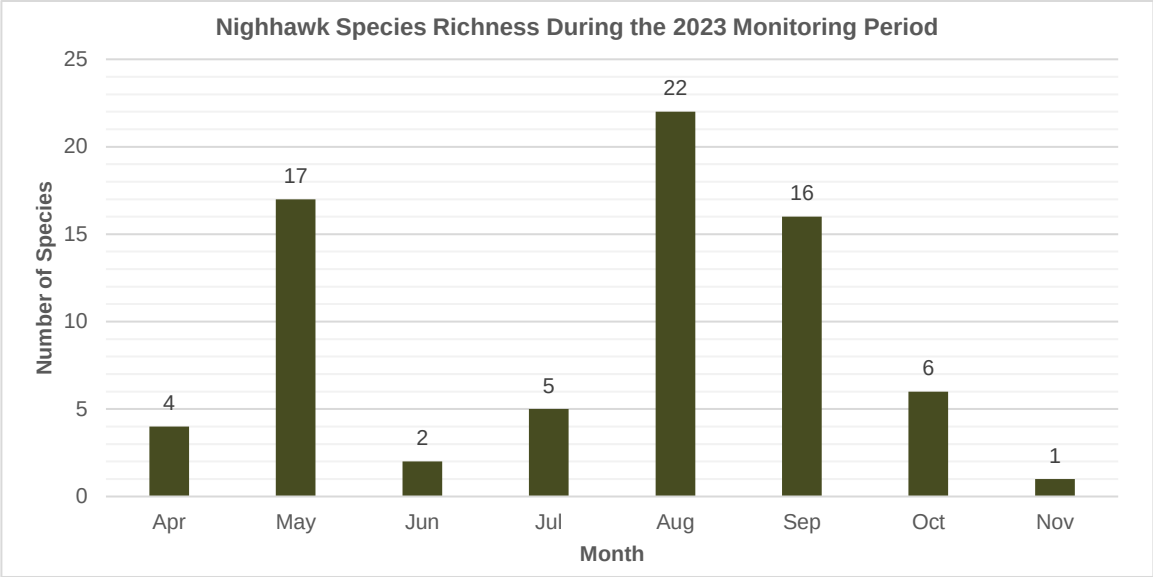

Figure 7.24: Nighthawk Species Richness During the 2023 Acoustic Monitoring Period for Goose Harbour Lake

7.4.5.10 SAR Detected in the Study Area

Nine SAR were detected near or within the Study Area during the 2023 field surveys and acoustic monitoring (Table 7.94), including incidental bird data during non-bird related surveys. Due to the sensitive nature of avian SAR observations, location data has been provided to regulators under separate cover.

Table 7.94: SAR Detected Near or Within the Study Area from Field and Acoustic Results

Common Name	SAR Status	2023 Season
Barn swallow	SARA: Threatened ESA: Endangered S-Rank: S3B	Summer
Canada warbler	SARA: Threatened ESA: Endangered S-Rank: S3B	Spring Summer Fall
Chimney swift(1)	SARA: Threatened ESA: Endangered S-Rank: S2S3B, S1M	Fall
Common nighthawk	SARA: Special Concern ESA: Threatened S-Rank: S3B	Summer Fall
Eastern wood-pewee	SARA: Special Concern ESA: Vulnerable S-Rank: S3S4B	Summer
Grasshopper sparrow	SARA: Special Concern ESA: N/A S-Rank: SNA	Fall

Common Name	SAR Status	2023 Season
Olive-sided flycatcher	SARA: Special Concern ESA: Threatened S-Rank: S3B	Spring Summer
Peregrine falcon*	SARA: N/A ESA: Vulnerable S-Rank: S1B	Fall
Rusty blackbird	SARA: Special Concern ESA: Endangered S-Rank: S2B	Spring Fall

(1) Observed with ARUs only, not during field surveys.

The Study Area provides foraging and migratory habitat for peregrine falcons, although suitable nesting habitats (primarily high cliffs with crevices) within the Study Area appears to be minimal. The peregrine falcon was observed near the Study Area in September with the Englands Lake ARU, which is the species' expected migration period, and it is likely that the individual was migrating through the area.

The grasshopper sparrow observed was one individual during a fall migration survey, foraging in grass along a road-side. This individual was likely moving through the area due to lack grassland habitat within the Study Area.

Wetlands and cleared areas in and around the Study Area may provide breeding, foraging, and/or migratory habitat for barn swallow, chimney swift, common nighthawk, eastern wood-pewee and olive-sided flycatcher; all of which were observed in or near the Study Area during their respective breeding and/or migration seasons. Lack of residential structures in the Study Area could indicate that barn swallows and chimney swifts are only foraging in the area, although chimney swifts may potentially nest in any old growth forest pockets within the Study Area. There may be appropriate anthropogenic structures outside the Study Area, near the coastline, that may support barn swallow or chimney swift nesting. Common nighthawks were observed during both the summer and fall, suggesting that there might be suitable habitats within the Study Area that supports the species' breeding and foraging needs (i.e., wetlands, waterbodies, and cleared areas from forestry activity). Both barn swallows and common nighthawks were also observed foraging at Englands Lake.

Wetland habitats in and around the Study Area (e.g., swamps, marshes, bogs, and riparian wetlands) may also provide breeding habitat for Canada warbler and rusty blackbird. Notably, Canada warbler was observed during all three seasons, suggesting that the species is actively using habitats within the Study Area for breeding, foraging, and migration. In contrast, rusty blackbird was only observed during the spring and fall seasons, which implied that the species might have been migrating through the Study Area.

As they are location sensitive, avian SAR associated with delineated wetlands (e.g., observed within wetland with appropriate habitat and displaying breeding behaviour such as singing, agitation from surveyor presence, breeding pairs observed, etc.) within the Assessment Area, including SAR observations from incidental data are discussed generally in Section 7.3.2. Official WSS designation will be made by NSECC.

7.4.5.11 Effects Assessment

Project-Avifauna Interactions

Project activities, primarily those that involve earth moving or vegetation removal, or turbine interactions with avifauna in the airspace have the potential to impact avifauna (Table 7.95). These activities could result in habitat removal, edge effects, reductions in food availability, and avifauna-turbine interactions (i.e., sensory disturbance, injury, or mortality). Other Project related activities, including during construction and operation, may impact avifauna behaviours, such as increased traffic and noise.

Table 7.95: Potential Project-Avifauna Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Strait Crossing Connection	X
Removal of Temporary Works and Site Restoration	-
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	-
Site Reclamation	X

Assessment Boundaries

For the purposes of this assessment, the LAA for avifauna includes a 3 km buffer on the Study Area as well as the airspace that is directly surrounding the turbines, as described above in the MBII (Drawing 7.32). The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 also apply for avifauna. The VC-specific definition for magnitude is as follows:

- Negligible: No loss of important avifauna habitat (e.g., breeding bird habitat) and no impacts to avifauna (i.e., behaviour and injuries/moralities) are expected.
- Low: Small loss of important habitat supporting avifauna and/or impacts to avifauna are expected to be low.
- Moderate: Moderate loss of important avifauna habitat and/or moderate impacts to avifauna on an individual level rather than entire populations.
- High: High loss of important avifauna habitat and/or high impact to avifauna that would be sufficient to impact species on a population scale.

Effects

Habitat Loss, Alteration/Fragmentation and Edge Effect

Avian habitat fragmentation and removal will be associated with newly constructed roads (totaling 44 km in length) and clearing for turbine pads and the transmission line within the Clearing Footprint. This assessment has used a conservative estimate of clearing (623 ha) required to evaluate habitat impacts. However, much of the area cleared represents a temporary impact that will be allowed to revegetate following construction. For example, vegetation under the proposed transmission line will be cleared during the construction phase, and a transmission line ROW buffer will be maintained throughout the Project's lifespan. The transmission line ROW area may shift vegetation community type; however, this does not represent a total loss of terrestrial habitat. The Project Footprint is considerably smaller, conservatively estimated at 273 ha.

The Project Footprint has prioritized the use of previously disturbed areas to minimize habitat loss. Based on Section 7.4.1 (Table 7.47), land cover types representing disturbed areas (i.e., urban/develop, cutover upland and cutover wetland) are the largest land cover types impacted within the Clearing Footprint, as a percentage of available land within the Study Area. In addition, the largest, by area, land cover type that will be impacted by the Project is to cutover uplands, which when combined with the urban/developed and cutover wetland categories, represent 25% of the total impact area in the Clearing Footprint. A portion of the open area land cover class was determined to also include disturbed areas such as harvests, secondary roads, and trails, suggesting that actual Project impacts to this class will be lower (and impacts to "disturbed" areas is higher). Further, based on aerial imagery and field observations, there is evidence of historic and ongoing forestry activity throughout habitats within the Study Area (e.g., center, northern, and southwestern portions) that suggest the land cover types may underestimate the amount of disturbed area present, and therefore used by the Project.

The Project Footprint has also maximized use of existing roads (45% of roads are existing) and reduced the overall number of turbines (from 84 to 54) to minimize new impacts to terrestrial habitat. In addition, the Project Footprint was optimized throughout the design phase to minimize disturbance to sensitive habitats known to support avian species including wetlands, mature forests, and the Nova Scotia coastline.

Within the Clearing Footprint, habitat removal/fragmentation and increased edge areas may have the following effects:

- Increase in the number of habitat generalist species
- Decrease in the number of habitat specialist species
- Increase in aerial insectivores/foraging habitat
- Increase in transitional and microhabitats
- Increase in suitable habitat for common nighthawk and olive-sided flycatcher (SAR)
- Decrease in suitable habitat for Canada warbler, evening grosbeak, and rusty blackbird (SAR)
- Increased avian predation

Habitat fragmentation has been shown to increase the number of habitat generalist species while also decreasing the number of habitat specialists. Habitat generalists have a higher likelihood of surviving in smaller habitat patches in a mosaic landscape (e.g., a road network associated with a wind project) due to their ability to utilize various habitat patch types (Andrén, 1994). Bird species with different characteristics, such as habitat specialization, reproductive rates, and trophic guilds, may respond differently to edge effects. Interior-forest birds that prefer larger tracts of undisturbed forest or habitat specialists can be impacted by habitat fragmentation due to the lack of habitat connectivity (Andrén, 1994).

Species that prefer low-light habitats (e.g., larger eyed birds like owls and thrushes) may be more sensitive to fragmentation, while other bird species such as insectivores (e.g., flycatchers, swallows, and nightjars) and understory foragers may thrive in fragmentated habitats (Andrén, 1994; Tittler et al., 2001). Examples of species that rely on interior-forest habitat, especially with regards to nesting, include certain thrush [e.g., swainson's thrush (*Catharus ustulatus*) and wood thrush (*Hylocichla mustelina*)] and warbler species [e.g., bay-breasted warbler (*Setophaga castanea*) and ovenbird (*Seiurus aurocapilla*)].

The creation of edge habitat and open areas has the potential to attract aerial insectivores. Some bird species benefit from forest edge habitat and have shown to return in subsequent years after an area is cleared due to the availability of foraging opportunities and other niche habitats (Tittler et al., 2001). Additionally, some species (e.g., blackbirds) can also tolerate forestry activities as long as their habitat of coniferous dominant trees of varied heights near waterbodies is maintained (C. Stacier, avian biologist and professor at Dalhousie University, personal communication 2018). Consequently, cleared areas create open spaces and edges within the forested environment, which may benefit certain bird species that favour edge or transitional habitats. These changes could potentially create favorable microhabitats within the Clearing Footprint, particularly for generalist bird species or those that readily adapt to disturbed environments.

For SAR identified, the construction of turbine pads and new roads may create or reduce suitable habitat within the Clearing Footprint. Suitable breeding habitat is anticipated to increase for common nighthawk due to their affinity for disturbed habitats. Similarly, foraging habitat for olive-sided flycatchers may also increase as this species utilizes edge habitat and clear-cuts for foraging. Alternatively, suitable habitat for Canada warbler, evening grosbeak, and rusty blackbird may decrease within the Clearing Footprint as a result of impacts to wetland and forested habitats. Although there is anticipated to be a decrease in suitable habitat within the Clearing Footprint for

these SAR, the avian SAR potential habitat modelling results (Table 7.81) indicate that sufficient habitat surrounding the Clearing Footprint to maintain habitat functionality and use within the larger Study Area and LAA is available.

Lastly, habitat fragmentation and increased edge areas may lead to increased predation on birds. A study by Manolis, et al. (2002) found that distance to the nearest clear-cut was the best predictor of nest predation in multiple ground laying birds.

Overall, undisturbed avian habitats present within the Study Area are not unique and are extensively present within the surrounding landscape and LAA. It is expected that any birds using habitat that will be disturbed by Project activities will move to similar habitats within and adjacent to the Study Area. Although there will be habitat loss as a result of the Project, habitat functionality across the LAA is expected to remain intact.

In conclusion, habitat loss and fragmentation within the Study Area are anticipated to be moderate to low due to the high level of disturbed habitat existing within the Clearing Footprint (i.e., historical forestry activity), and prevalence of adequate habitat nearby within the LAA. Additionally, the reduction in the number of total turbines from 84 to 54 will help to minimize the total area of disturbance due to roads and turbines across the LAA.

Sensory Disturbance

Construction and operation activities for the Project including increased traffic, noise, and lighting have the potential to disturb bird species within the LAA.

Sensory disturbance may occur during all Project phases, though will be more prevalent during construction (limited to daylight hours during construction), with limited disturbance through operations (i.e., consistent and sporadic noise and lighting generated by traffic and facility operations). The noise and light will be concentrated in the Study Area but could also extend into the portions of the LAA that are near the Project Footprint.

Increased movement of vehicles could lead to short-term displacement of birds, particularly ground-nesting or low-flying species within proximity to access routes. Traffic disturbance can be particularly stressful for species with established territories within the area, potentially prompting them to abandon nests or avoid otherwise suitable habitat. Overall, while these construction-related disturbances are temporary, they may cause localized changes in bird distribution and behaviour during the active phases of the Project.

Noise from heavy machinery and equipment can disrupt normal behaviours such as foraging, breeding, and resting, especially for sensitive species documented during breeding bird surveys.

Birds can exhibit greater susceptibility to noise impacts as many species rely on vocal communication (Blickley & Patricelli, 2010). Avifauna may be displaced from areas adjacent to the Project from construction related noise. Impacts can also differ between acute and chronic noise sources. Chronic exposure may degrade auditory cues, feedback, and vocal development over time,

which are important for predator/prey detection, communication, breeding, and orientation (Blickley & Patricelli, 2010; Marler et al., 1973; Shannon et al., 2016). A direct physiological impact causing a temporary decrease in auditory sensitivity can occur at acute noise levels above 93 dBA, while permanent damage to avian auditory systems is not recorded until 125 dBA to 140 dBA (Blickley & Patricelli, 2010). Some bird species may not be impacted by sensory disturbances. A study of the impact of logging truck traffic on bird reports no observed effects on nesting at noise levels of 53 dBA (Grubb et al., 1998). It was also found that noise tolerant species had increased nesting success through decreasing nest predation through higher awareness and less flushing (Francis et al., 2009). The median sound level produced by construction equipment at 15 m from point source is comparable to sound produced from an ATV or pick-up truck (96 dBA), which is already a common source of sound within the Study Area, as are logging trucks and harvesting equipment. Therefore, impacts to auditory sensitivity may occur from acute noise on a short term and intermittent frequency during the construction phase, but levels will be consistent with existing sound levels in parts of the Study Area. The decibel limits of construction equipment required for the Project are not expected to be greater than 115 dBA, indicating permanent damage to avian auditory systems is not likely to occur. Blasting noise may exceed this range but this activity will be sporadic in nature and only during the construction phase of the Project, with a blasting plan and mitigation measures in place.

A literature review conducted by Shannon et al. (2016) found that birds have the potential to exhibit changes in song characteristics, reproduction, abundance, stress levels, and species richness at levels greater than 45 dBA. Sensory disturbance from noise levels associated with construction activities during the avian breeding season could result in abandonment of nests. If adjacent suitable habitat is not available, birds that have been displaced are not likely to nest until habitat becomes available which may result in a higher non-breeding population. According to habitat modelling results, where breeding habitat may be impacted by the Project, adjacent breeding habitat will remain available for all SAR (Drawing 7.31A to 7.31E).

Lighting used during construction, particularly if activities extend into early morning or late evening hours, could also impact birds within the vicinity. Artificial lighting may disorient nocturnally active birds, increasing the likelihood of attracting them closer to construction areas. For species sensitive to light, especially migratory and nocturnal species, this could temporarily alter natural behaviours or increase the risk of collisions with equipment or structures. Given the frequency of foggy conditions regarding the portions of the Study Area that encroach on the coastline, light intensity may be amplified, further enhancing the potential for disturbance. Light sensory disturbance that can impact birds includes behavioural effects such as disorientation, avoidance, or attraction (Longcore & Rich, 2004).

Light attraction is a particular concern during nights with low visibility (e.g., low cloud cover or fog) and high winds. There are portions of the Assessment Area that are within approximately 1.2 km of the coastline. Lighting used during construction, particularly if activities extend into early morning or late evening hours, could also impact birds within the vicinity. Artificial lighting may disorient nocturnally active birds, increasing the likelihood of attracting them closer to construction areas. For species sensitive to light, especially migratory and nocturnal species, this could temporarily alter natural behaviours or increase the risk of collisions with equipment or structures. Given the

frequency of foggy conditions due to the coastal location, light intensity may be amplified, further enhancing the potential for disturbance. Light sensory disturbance that can impact birds includes behavioural effects such as disorientation, avoidance, or attraction (Longcore & Rich, 2004).

Disoriented migratory birds are prone to circling light sources, which increases the potential for death by exhaustion or predation when forced to land in high-risk areas. In turn, these behavioural changes can affect the success of foraging, reproduction, and communication of wildlife and can disrupt habitat connectivity (Bliss-Ketchum et al., 2016; Longcore & Rich, 2004). It has been known that exterior structures such as buildings and other floodlit structures can attract birds during the night and lead to mortality events. In addition, migratory birds during fall and spring are especially attracted to lighting on tall structures. Modifications and timing of use for lighting can be managed to limit impacts on birds.

At night, and especially during nights of cloudy skies and low ceiling, artificial lighting can attract birds during migration. Lights that are known to increase disorientation include consistent white or red lights. Strobe lights or intermittent/flashing lights have been shown to decrease avian mortality as it interrupts the zone of influence that lighting on birds can have (Longcore et al., 2008). While continuous lighting can attract or disorient birds, especially nocturnal migrants, the brief and low-frequency nature of these lights reduces the risk of such disruptions.

For nocturnally active species that may be more sensitive to artificial lighting, the risk of attraction or disorientation remains low due to the limited light exposure. In the event of foggy or low-visibility conditions (i.e., heavy rain), the short, infrequent flashes will also reduce the overall light presence, limiting the potential for enhanced attraction effects.

Lighting associated with the Project will be minimal, and the turbines will not be lit at night (apart from TC required navigation hazard lights mounted on the turbine's nacelle). As such, lighting is not expected to impact bird migration.

Upon completion of construction and throughout the lifespan of the Project, the lighting on-site will be minimized and mitigation measures will be applied to limit the effects of lighting on birds (e.g., motion-activated lighting, shielding, LEDs, etc.).

Avifauna-Project Infrastructure Interactions – Injury and Mortality Risk

The radar and acoustic monitoring program provided quantifiable insights into the volume, movement patterns, and flight heights of birds moving within the Study Area, enabling a more precise understanding of collision risk relative to the Project's infrastructure.

Bird strikes are a primary concern when considering the interactions of avifauna with the Project, as turbine blades spin at high speeds through the airspace frequented by a variety of species at all different altitudes within the rotor swept area. Bird strikes include instances when birds are struck by the rotating turbine blades, or birds collide with the turbine tower or nacelle structures, which can cause injury or mortality to birds. Collisions with transmission lines are also a concern for avian injury and mortality risk. Factors including species abundance, frequency of passage, species-specific

flight behaviour, avoidance behaviours, differential use of areas within the Study Area, weather, and topography may all influence collision risk (De Lucas et al., 2008). Estimated bird mortality as a result of wind turbine collisions varies across Canada, with Zimmerling et al. (2013) estimating mortalities at 8.2 per turbine per year. Bird Studies Canada (2016) conducted a study to review mortality across Atlantic Canada and Ontario, showing mortality estimates in Atlantic Canada to be lower, at approximately 1.17 birds per turbine per year. Strum has conducted avian mortality monitoring across a variety of wind projects in Nova Scotia and New Brunswick, with approximately 1 observable mortality per turbine per year.

Based on radar monitoring results, most detections were above 250 m and outside of the interaction risk zone (i.e., the total height of the turbine to the tip of blade; 221.7 m). As stated in the results section, approximately 2% of avian movement recorded at the Englands Lake ARS was detected within the interaction space and less than 1% of avian movement recorded at the Goose Harbour Lake ARS was detected within the interaction space, suggesting little interaction between avian movement and turbines. Based on the radar results showing a few peak detection nights, potential mortality events would likely be limited to a few events during the spring and fall migration periods. Both migration activity and flight heights will have an impact on potential collisions; however, it is important to note that migration and flight behaviour is influenced by weather (i.e., wind and temperature) as well as dependent on photoperiod and the lunar section, as discussed in the radar and acoustic baseline reporting.

Collisions with transmission lines are also a concern for avian injury and mortality risk. Based on studies, shield wires on transmission lines are most associated with bird collisions as they are the highest wires and are smaller in thickness which makes them more difficult to see (APLIC, 2012). Potential for collision increases when birds increase altitude to avoid more visible infrastructure (i.e., phase conductors), which can place them at the same elevation of shield wires (APLIC, 2012). Various studies of high collision rate transmission lines show that collision risk can reduce by 50% to 80% when these lines are marked, although this can vary based on location and environmental factors (Barrientos et al., 2011). Vibration dampers installed between line markers are also known to be effective on reducing bird collisions (APLIC, 2012).

Overall, bird studies on transmission lines have shown varying results. Rioux et al. (2013) noted that estimating bird mortality from collisions with powerlines is challenging due to a lack of studies and factors like carcass scavenging, which can limit survey results. The study estimates that in Canada, mortality rates due to transmission line collisions range from 1 million to 229.5 million birds per year, although rates may vary considerably depending on factors like habitat type and line type. The study notes that waterfowl, grebes, shorebirds, and cranes appear to be particularly vulnerable to collision. As the majority of transmission lines associated with the Project are inland and not near the coastline, this reduces concern of avian collisions. In addition, the interaction zone for transmission lines extends no higher than tall trees in the area - outside of the migratory pathway. Other studies have shown that individual bird losses from collisions are not biologically significant and are unlikely to impact species of birds that have large populations (APLIC, 2012).

Upon completion of construction and throughout the lifespan of the Project, the navigation hazard lights on the transmission towers, designed to flash only a few times per minute at night, are expected to have minimal sensory disturbance effects on birds due to their low intensity and infrequent flashes. At night, and especially during nights of cloudy skies and low ceiling, artificial lighting can attract birds during migration. Lights that are known to increase disorientation include consistent white or red lights. Strobe lights or intermittent/flashing lights have been shown to decrease avian mortality as it interrupts the zone of influence that lighting on birds can have (Longcore et al., 2008). While continuous lighting can attract or disorient birds, especially nocturnal migrants, the brief and low-frequency nature of these lights reduces the risk of such disruptions.

An increase in road traffic during construction and wind turbine maintenance will increase the chances of mortality to avifauna species that use roadways, especially grouse species and similar species, as they are known to use roadways for travel and nesting. Construction and increased road traffic, in particular, pose a risk to nests and unfledged nestlings. Outside of the construction phase, the Project will only require technicians to access the site to perform regular maintenance/equipment checks. Considering the pre-existing traffic load (i.e., forestry and off-roading vehicles) and the minimal traffic to be associated with the operation of the Project, along with road traffic mitigations (e.g., speed limits), road traffic is expected to have a negligible or low effect on avifauna in the LAA.

Migration Disruption

Birds moving through the Study Area during migration seasons may encounter turbines and transmission lines as a new structural barrier, potentially leading to alterations in their natural flight paths, which could result in additional energy expenditure to avoid this obstacle. This is particularly relevant for species traveling at altitudes within the infrastructure height range, as they may need to navigate around or above the structures.

The modified airspace could lead to temporary disorientation for birds unfamiliar with the infrastructure, especially during low visibility conditions such as fog or heavy rain, which are common in the region. Additionally, radar survey efforts have shown peaks in migration during fall and spring, with high-altitude movements in certain periods, indicating that while most birds seem to fly well above infrastructure height, there are episodic migration events where more birds could be affected. Thus, although overall disruption to migratory routes is likely minimal, specific conditions or migration events may increase the likelihood of navigational adjustments as birds cross this altered environment.

Mitigation

The primary mitigation for avifauna is avoidance in the siting of infrastructure, including:

- Minimizing impacts to the terrestrial environment (e.g., limiting infrastructure impact).
- Avoidance, to the extent possible, of important bird habitats, such as wetlands, mature forest stands, coastlines, etc. to reduce the impact of habitat changes. This includes siting Project infrastructure within areas with existing disturbances, such as existing roads and historically cleared areas.
- Avoidance of topographic funnels, such as within lake or river valleys, for turbine placement to reduce the likelihood of interactions with concentrated bird movements.

Mitigations to reduce effects on avifauna include:

- Adhere to ECCC guidelines on clearing windows for nesting migratory birds (i.e., outside of the April 15 to August 31 nesting window), where possible. If vegetation and tree clearing activities during the nesting/breeding season cannot be avoided, nest sweeps will be conducted by a qualified avian biologist to search for any confirmed activity which must be avoided (i.e., active nests and recently fledged juveniles).
- Avoid disturbance of any ground- or burrow-nesting species should they initiate breeding activities within stockpiles or exposed areas during construction or operations, until chicks can fly, and the nesting areas are no longer being used. Exposed stockpiles will be limited or covered as much as possible during construction and operation phases.
- Manage borrow pits, stockpiles, and exposed sedimentation banks to reduce the attraction of burrow-nesters such as bank swallows (e.g., maintain at least a 70 degree-slope) as per ECCC best management practices and recommendations.
- Minimize use of herbicides within the transmission line ROW.
- Maintain compatible vegetation within the transmission line ROW.
- Allow disturbed areas to naturally revegetate, where vegetation maintenance is not required during operations.
- Develop a site reclamation plan in accordance with engineering standards and in consultation with NSECC and NSNR.
- Minimize soil compaction along with the removal of hummocks, root masses, moss cover, ferns, and other ground vegetation that may provide good concealment of ground nests.
- Establish speed limits within construction areas for vehicles to mitigate the effect of vehicle-avifauna collisions. Traffic signs will be installed to alert road users of speed limits and the presence of wildlife in the area.
- Minimize, as much as possible, removal of large diameter decaying trees (>40 cm diameter at breast height).
- Minimize wetland alterations to the extent practicable.
- Have designated garbage cans and pack out all waste to avoid attracting avifauna to the construction site. Maintain good housekeeping practices during construction to avoid indirectly feeding birds and potentially attracting nuisance wildlife.
- Develop and implement a Terrestrial Habitat and Wildlife Management Plan.
- Develop a spill response plan (within the Contingency Plan) and equip site machinery with spill kits and instruct site personnel on their use.
- Temporary lighting during construction would be minimized to the extent practicable and focused on the intended work area and shielded to minimize spillage.
- Minimize lighting, to the extent possible, including the use of LED lights (i.e., as they are less prone to light trespass in the surrounding environment), strobe lights, downward-facing lights, shielding to prevent light escaping above the horizontal plane, and motion-activated lighting when applicable (i.e., for employee safety).
- Install line markers on the powerlines as required by NAV Canada to increase visibility.
- Follow TC requirements for navigational hazard markings and lighting on transmission lines, including the installation of strobe or intermittent/flashing lighting.

- Use large conductors and overhead shield wire diameters to improve visibility and reduce avian mortality risk.
- Install perch guards on poles and bird diverters/deflectors on lines to limit interactions with birds.

Monitoring

A site-specific post-construction Terrestrial Habitat and Wildlife Management Plan will be developed in consultation with government regulators and all other relevant parties. This plan will include mitigation measures, monitoring, and adaptive management frameworks for minimizing impacts to avifauna.

A second year of bird surveys will be completed, prior to operations, as per requirements under the Environmental Assessment Supplemental Checklist: Wind Energy Projects (NSECC, 2025c).

A detailed Post Construction Avian Monitoring Plan will be developed and submitted to NSECC and NSNR for review. Monitoring activities may include:

- Post-construction avian mortality monitoring.
- Adaptive management if post-construction monitoring identifies significant avian mortality, developed in consultation with NSNR.

Conclusion

Based on this assessment and through the implementation of proposed mitigation and monitoring activities, effects to avifauna are expected to be:

- Magnitude: Moderate magnitude, as the loss of important avifauna habitat is expected to be moderate and impacts to avifauna are on an individual level rather than entire populations.
- Geographic extent: Within the LAA.
- Frequency: Intermittent frequency during the construction and decommissioning phases, and continuous during operation. May vary based on seasonal differences (e.g., breeding season compared to migration seasons).
- Duration: Medium-term duration, as some effects will extend throughout the operation of the Project.
- Reversibility: Partially reversible.
- Significance: Not significant.

8.0 SOCIO-ECONOMIC ENVIRONMENT

8.1 Economy

8.1.1 Overview and Assessment Methodology

The assessment of the economy included consideration of local demographics, income, and businesses, as well as the economic contributions of the Project to the local economy through a review of the following resources:

- Census of Population – Statistics Canada (2023)
- Taxation legislation
- Public mapping resources
- Economic data from the Proponent
- Economic Impact Assessment – Deloitte LLP (2024)

8.1.2 Existing Environment

The Project is in Guysborough County, near the communities of:

- Middle Melford (3 km northeast of the Project's center point)
- Sand Point (6 km east)
- Hadleyville (7 km southeast)
- Pirate Harbour (8 km north)
- Town of Mulgrave (11 km north)

The Guysborough Municipal District (MD) census subdivision corresponds with the MODG, as it will be referred to here, and excludes Mulgrave. Population statistics for the province, the MODG, and Town of Mulgrave ("Mulgrave") were summarized using the 2016 and 2021 Census of Population (Table 8.1). The population of the largely rural MODG has declined slightly between 2016 and 2021, contrary to the provincial trend. MODG has a much lower population density than the provincial population. Mulgrave has experienced more rapid population decline within its much smaller and more densely populated area.

Table 8.1: Population Characteristics in 2016 and 2021 for Nova Scotia, MODG, and Mulgrave

Population Statistics	Nova Scotia	MODG	Mulgrave
Population in 2021	969,383	4,585	627
Population in 2016	923,598	4,670	722
Population change from 2016 to 2021	+5.0%	-1.8%	-13.2%
Total Private Dwellings in 2021	476,007	3,043	316
Land Area (km^2)	52,824.7	2,115.2	17.8
Population Density (per km^2)	18.4	2.2	35.2

Source: (Statistics Canada, 2023)

The age distribution in MODG reveals a median age of 58.4 years, over 10 years higher than the provincial median age of 45.6 (Statistics Canada, 2023). Further statistics on age distribution in 2021 were compared for the province and MODG (Table 8.2), revealing that MODG has proportionally fewer people in both 0 to 14 and 15 to 64 year age groups, indicating there are fewer people of working age or who will join the workforce within the next 1 to 2 decades. Mulgrave has proportionally fewer young people (0 to 14 years) than MODG, though a larger working-age population. Mulgrave's retirement-age population (65+ years) is proportionally larger than the provincial average, but smaller than MODG.

Table 8.2: Age Distribution in 2021 in Nova Scotia, MODG, and Mulgrave

Age Statistics	Nova Scotia	MODG	Mulgrave
0 to 14 years	136,710 (14.1%)	515 (11.2%)	60 (9.5%)
15 to 64 years	617,345 (63.7%)	2,455 (53.5%)	375 (59.5%)
65+ years	215,325 (22.2%)	1,615 (35.2%)	190 (30.2%)
Total Population	**969,380**	**4,585**	**630**

Source: (Statistics Canada, 2023)
Due to rounding, total percentage may be ±100%.

Median housing costs and median household total incomes in 2020 for MODG were compared to the provincial and national values (Table 8.3). This comparison shows that the median dwelling value in MODG was less than half of the provincial figure, which itself is less than half the national median. Examining the relative value of median total income and median dwelling value across these jurisdictions demonstrates that housing is much more affordable for those on a median income in MODG than in Nova Scotia or Canada as a whole. This is corroborated by the percent of owner and tenant households spending over 30% of their income on shelter costs, although this figure may be skewed by legacy homeowners or renters who either own their property outright or have longstanding leases lower than regional averages.

Table 8.3: Housing Costs (2021) and Median Individual Income (2020) for Canada, Nova Scotia, MODG, and Mulgrave

Housing and Income Statistics	Canada	Nova Scotia	MODG	Mulgrave
Median total income	$41,200	$38,000	$31,200	$32,400
Median dwelling value	$618,500	$250,000	$120,000	$120,000
Median total income as a % of median dwelling value	6.7%	15.2%	26.0%	27.0%
Median monthly shelter costs for owned dwellings	$1,498	$870	$400	$645
Percent of owner households spending 30% or more of its income on shelter costs	14.8%	9.7%	7.0%	0.0%
Median monthly shelter costs for rented dwellings	$1,209	$1,000	$552	$500
Percent of tenant households spending 30% or more of its income on shelter costs	33.2%	34.7%	22.0%	44.4%

Source: (Statistics Canada, 2023)

Most residents in MODG (98.6%) and all in Mulgrave (100%) use English as their first official spoken language (Statistics Canada, 2023). Because of this, all public outreach and communication for the Project has been and will continue to be in English. There is some knowledge of other languages, though no communication has been requested in other languages.

The nearest fire station to the Study Area is the Mulgrave Fire Hall, approximately 11 km northwest of the Study Area on Murray Street. Milford Haven Fire & Emergency Services is also nearby, approximately 15 km southwest of the Study Area on Marine Drive.

Health and emergency services also exist in the area and are accessible to Project workers if the need should arise. The closest location is the Guysborough Memorial Hospital, approximately 18 km southwest of the Study Area on Highway 16.

Statistics indicate that the unemployment rate in 2021 for MODG and Mulgrave were 18% and 19%, similar rates that are both higher than the provincial and national unemployment rates (Table 8.4). The employment rates for MODG and Mulgrave were 38% and 42%, both lower than the provincial employment rate of 52% (Statistics Canada, 2023).

Table 8.4: Employment Statistics for Canada, Nova Scotia, MODG, and Mulgrave

Unemployment Statistics	Canada	Nova Scotia	MODG	Mulgrave
Employment Rate	57.1%	51.9%	38.0%	41.6%
Unemployment Rate	10.3%	12.7%	18.1%	19.0%

Source: (Statistics Canada, 2023)

The top six industries in both MODG and Mulgrave in 2017 were compared with the top industries in the province (Table 8.5), as categorized under the North American Industry Classification System (Statistics Canada, 2023). The highest proportion of workers in MODG fall into the “agriculture, forestry, fishing and hunting” and “health care and social assistance” categories (21.6% and 12.5%, respectively). Other significant industries include “manufacturing,” “retail trade,” “educational services,” and “construction” (Statistics Canada, 2023).

Table 8.5: Top Industries for the Employed Labour Force in 2017 in MODG and Mulgrave Compared to the Province of Nova Scotia

Industry	MODG	Mulgrave	Nova Scotia
Accommodation and Food Services	50 (2.7%)	30 (10.3%)	30,010 (6.2%)
Agriculture, Forestry, Fishing, and Hunting	405 (21.6%)	10 (3.4%)	17,880 (3.7%)
Construction	145 (7.7%)	0 (0.0%)	35,720 (7.3%)
Educational Services	145 (7.7%)	20 (6.9%)	38,425 (7.9%)
Health Care and Social Assistance	235 (12.5%)	50 (17.2%)	70,595 (14.5%)
Manufacturing	165 (8.8%)	30 (10.3%)	31,210 (6.4%)
Mining, Quarrying, and Oil and Gas Extraction	20 (1.1%)	30 (10.3%)	3,065 (0.6%)
Retail Trade	150 (8.0%)	25 (8.6%)	58,985 (12.1%)
Transportation and Warehousing	90 (4.8%)	25 (8.6%)	19,930 (4.1%)
Total Employed Labour Force 15 Years +	**1,875**	**290**	**487,260**

Source: (Statistics Canada, 2023)

The community of Guysborough is the closest economic centre, located approximately 19 km southwest of the Project and offering a range of business services. A review of some of the businesses located near the Project, both within and near Guysborough, was completed and is shown in Table 8.6.

Table 8.6: Local Businesses and Proximity to the Project

Business	Nearest Community	Approximate Distance and Direction to the Project[1]
Grace’s Thrill Hill Farm	Boylston	13 km southwest, Highway 344
North Riverside Welding	Boylston	15 km southwest, North Riverside Road

Business	Nearest Community	Approximate Distance and Direction to the Project[1]
Hart Electric Motor Repairs	Boylston	15 km southwest, Highway 16
Hart's of Boylston General Store	Boylston	15 km southwest, Highway 16
Midcudlynn Refrigeration & Heat Pump Repair	Guysborough	18 km southwest, Old Riverside Road
Route 16 Auto Sales	Guysborough	18 km southwest, Highway 16
Authentic Seacoast Distillery & Brewhouse	Guysborough	18 km southwest, Ferry Road
The Canny Canine Bakery	Guysborough	18 km southwest, Church Street
DesBarres Manor Inn	Guysborough	19 km southwest, Church Street
Big G's Pizza & Restaurant	Guysborough	19 km southwest, Main Street
Mulgrave Mansion (house rental)	Mulgrave	19 km north, Hwy 344
Strait of Canso Superport	Mulgrave	19 km north, Main Street
The Front Porch Café & Ice-cream Bar	Mulgrave	20 km north, Loggie Street
DSM Nutritional Products	Mulgrave	21 km north, England Avenue
Mulgrave Machine Works Limited	Mulgrave	21 km north, England Avenue

[1] All distances measured from centre of the Study Area, using the most direct route by road.

Aside from the immediate area and associated businesses, the communities of Pirate Harbour, Middle Melford, Sand Point, Hadleyville, and others are all generally dependent on Guysborough for health care facilities, including emergency services and inpatient care. Port Hawkesbury, approximately 11 km north, offers many shops and services, including indoor recreation and big-box stores. Many residents of the communities surrounding the Study Area would commute daily within Guysborough or to Port Hawkesbury for employment purposes.

8.1.3 Effects Assessment

Project-Economy Interactions

Project activities have the potential to interact with the economy during all phases of the Project (Table 8.7).

Table 8.7: Potential Project-Economy Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	X
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X

Project Phase	Potential for Interaction
Strait Crossing Connection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for economy is the MODG and Mulgrave. The RAA for economy includes the entire province.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for the economy as well. The VC-specific definition for magnitude is as follows:

- Positive: Project is expected to have a positive effect on the economy.
- Negative: Project is expected to have a negative effect on the economy.

Effects

The Phase 2 portfolio of EverWind projects, of which this Project is a key component, will provide significant economic benefit and employment within the MODG, Municipality of the District of St. Mary's, and the Town of Mulgrave.

An economic analysis was conducted by Deloitte (2024) to estimate the economic contribution of the Phase 1 and 2 EverWind projects. The capital investments made by EverWind in Phase 2 are expected to contribute $7.1 billion in gross domestic product (GDP) and support 35,270 full time equivalent positions (FTEs) for Canada, and $3.9 billion in GDP and 16,880 FTEs for Nova Scotia. Once fully functional, Phase 2 is anticipated to annually contribute $1,137 million in GDP, $173 million in labour income, and $104 million in government revenue to Canada, and sustain 2,740 FTEs. Further, this phase will annually contribute $1,096 million in GDP, $151 million in labour income, $92 million in government revenue to Nova Scotia, and sustain 2,400 FTEs (Deloitte LLP, 2024).

The Proponent is committed to sharing economic opportunities with the local community throughout the development and lifespan of the Project via the use of local skills and labour where possible, municipal tax revenue, and on-going energy literacy/education (such as presentations about renewable energy at local schools, community meetings or for municipal councils, windfarm tours and visits, etc.). The Project Team has and will continue to engage the community, local businesses,

and municipal staff and leaders to help identify Project-related opportunities and benefits for the local community.

The Proponent understands the importance of supporting local communities and the Project Team is committed to using as many local skills as possible. In alignment with these commitments, the Proponent has entered into a CBA with the MODG to formalize long-term social and economic benefits for the community. Under the CBA, EverWind will establish a community fund based on operating wind capacity ($1,000/MW annually), supporting local initiatives such as low-income housing, healthcare, education, sports and recreation, and bursaries for students pursuing renewable energy-related post-secondary studies.

The CBA outlines a structured approach to workforce development, including commitments to publicize employment opportunities locally, collaborate on training programs, and reduce barriers to employment for MODG residents. Contractors and suppliers engaged in Project construction and operation will be encouraged to source locally and adhere to equitable employment practices.

Additionally, the CBA includes provisions for a Local Information/Project Office within MODG and the formation of a CBA Oversight Committee comprising representatives from both the Proponent and the Municipality to guide implementation and reporting.

This agreement reflects EverWind's intent to create enduring partnerships with local communities and ensure that the economic and social impacts of the Project are inclusive and community driven.

Potential work includes environmental studies, geotechnical investigation, engineering, land and snow clearing, surveying, worksite security, road construction and maintenance, turbine component transportation, turbine foundation construction, turbine installation, collector system construction, and substation construction. Specifically, elements of job creation throughout the lifespan of the Project may include:

- Project Development: During the development phase of the Project, Nova Scotian professionals have and will continue to deliver services in a variety of areas, including civil and electrical engineering, geotechnical engineering, legal, environmental and biological surveys, archaeological, land and community relations, and many others. Dozens of professionals within Nova Scotia will render their services as part of the development of the Project.
- Construction: Though the construction phase of the Project is relatively short, it will require a large workforce that will fluctuate throughout the construction period. Much of the construction employment will come through contracting and subcontracting of Canadian, and where possible, Nova Scotian construction firms and specialized service providers related to the balance of plant and installation and commissioning of the wind turbines. It is estimated that the Project will require approximately 350 to 400 jobs for varying scope and duration throughout the approximately two-year construction period. The largest construction scopes of work are anticipated to be:
    - Civil installation, that is, land clearing, grubbing, road construction, and foundation installation, which includes:

        - Excavating
        - Rebar supply and installation
        - Anchor bolt supply and installation
        - Forming
        - Concrete supply and pouring
        - Grouting
    - Electrical installation, that is, transmission line, collector line and substation infrastructure installation, and connection to the Strait Crossing, which includes:
        - Overhead installation
        - Cable terminations
        - Electrical testing
        - Instrument installation and testing
    - Turbine installation, that is, the offloading of turbine components, turbine erection, and commissioning, which includes:
        - Crane supply
        - Turbine offload and erection
        - Mechanical works inside turbines
        - Electrical work inside turbines
- EverWind will look to maximize local content where appropriate. To this end, EverWind will hold a job fair prior to the start of construction to engage with local community members and service providers and identify suitable candidates and/or businesses to support the construction phase employment and service providers.
- Operations and Maintenance: Operational wind projects require long-term operations and maintenance professionals to be located either on-site or within short driving distance of the Project. Up to 20 to 35 full-time and part-time jobs will be required for this Project during operations and maintenance. The employment associated with operations and maintenance is long-term, local, stable, and well-paying, requiring skillsets such as experience managing facilities, working on wind farms, or working with high-voltage systems. These jobs include:
    - MV/HV technicians/electricians
    - Wind technicians
    - Road maintenance workers
    - Vegetation management service providers
- In addition to operations and maintenance of the wind turbines, there will be a variety of wind farm activities that will require on-going resources such as snow removal and road surface maintenance, administrative support, inventory/materials management, shipping, scheduling, and coordination of maintenance inspections to accommodate the facility's operation (i.e., power collection system, electrical substation inspections, etc.).
- As part of the EverWind's Phase 2 projects (in Guysborough County), the Proponent will make available a Bursary Fund prior to commercial operations for community members who want to train in the renewables industry. This will support the additional use of local labour and skills both during the construction phase and operations phase of the Project. EverWind has been working directly with the Strait Area Campus of the Nova Scotia Community College to support the development of renewable energy programs to support the projects and communities in the Strait Area.

- EverWind will also create a Community Benefits Fund to provide direct payments to communities, starting at the end of the first year of operations. The payments for the Phase 2 portfolio of projects are expected to be 2 million dollars each year or 70 million dollars over the life of the projects. A committee of volunteers will determine how the fund is distributed.

In addition to the direct investments that the Project would bring to Nova Scotia's economy, the Project will result in indirect and induced economic benefits that will be realized by governments, local businesses, communities, and residents. Workers that are directly involved with the development, construction, and operations would contribute to the local economy by redistributing wealth to a variety of goods and services such as hotels, restaurants, and grocery stores (NREL, 2016).

As outlined in the *Wind Turbine Facilities Municipal Taxation Act*, Guysborough County will receive tax revenues per MW on an annual basis, and as such, the royalty will annually increase as the Consumer Price Index rises. The Project is expected to enhance the community's economic development by providing tax revenues of approximately $3.74 million annually to Guysborough County, increasing each year of operation.

Mitigation
The economic impact to the LAA and RAA is positive; therefore, no mitigation is proposed.

Monitoring
A specific monitoring program for the economy is not proposed.

Conclusion
The impacts to the economy are characterized as follows:

- Magnitude: Have a positive impact on the economy.
- Geographic extent: Extend to the RAA.
- Frequency: Occur continuously during the Project lifespan.
- Duration: Long-term as the effects will last through the decommissioning phase.
- Reversibility: Irreversible as the effects are unlikely to be reversed.
- Significance: No significant negative impacts. Positive impacts expected (significance not evaluated) due to economic stimulus.

8.2 Land Use and Value

8.2.1 Overview and Assessment Methodology

The assessment of land use and value was completed through a review of desktop resources and in consideration of feedback from public engagement to evaluate how the Project may interact with this VC. The following resources were reviewed:

- Nova Scotia property records
- Public mapping resources

- Literature review of property values and wind farms
- Visual renderings of the Project supplied to Strum, prepared by WSP

8.2.2 Existing Environment

The Study Area consists primarily of Crown land (94%). Land use around the Study Area is primarily used for forestry and recreational use; however, there is a mix of residential and agricultural land uses in the surrounding area (recreational land use is discussed in Section 8.3).

There are three proposed developments within the immediate vicinity of this Project including the Goose Harbour Lake Wind Farm Project, the EverWind Strait Crossing Transmission Line Project, and the Melford International Terminal. The Goose Harbour Lake Wind Farm Project is a wind development that received EA Approval in 2023 (NSECC, 2023a) and for which construction has begun. The EverWind Strait Crossing Transmission Line Project is a high voltage transmission line spanning the Strait of Canso that received EA Approval in 2024 (NSECC, 2024). The Melford International Terminal is a marine shipping terminal and rail line that received EA Approval in 2008 (NSECC, 2008).

Several public protected lands and parks are also located in the vicinity (Drawing 3.1, including (all distances measured from nearest point of the Assessment Area or Study Area, as indicated):

- Mulgrave Hills Nature Reserve, within the Study Area and approximately 270 m north and west of the Assessment Area.
- Boylston Provincial Park, approximately 7.7 km southwest of the Study Area.
- Hurlburt Brook Nature Reserve, approximately 10.8 km northwest of the Study Area and is pending approval.
- Janvrin Island Nature Reserve, approximately 5.5 km northeast of the Study Area.
- Port Shoreham Beach Provincial Park, approximately 2.2 km south of the Study Area.
- Tracadie River Wilderness Area, approximately 11.5 km west of the Study Area.
- Ogden Round Lake Wilderness Area, approximately 13.8 km southwest of the Study Area.

The nearest area receiving special protections is Mulgrave Hills Nature Reserve. This nature reserve was designated (Nova Scotia, 2023) after the lands it was established upon were provided to EverWind as an option for development. The plan to protect this area was not in the public realm (Bruce, 2024), so it was included in the Study Area at that time. EverWind respects the integrity and importance of protected areas and has engaged with NSECC Protected Areas regarding appropriate precautions for the Nature Reserve. No activities are planned within 272 m of the nature reserve, and the nearest turbine is located approximately 420 m from the nature reserve (T32).

There are no Mi'kmaq reserve lands within 10 km of the Study Area. Further consideration of Mi'kmaq resources and the results of the MEKS are included in Section 5.0.

Based on a review of NSNR's Mineral Resource Land Use Atlas (2021e), there are two mineral exploration licenses southwest of the Study Area.

8.2.3 Effects Assessment

Project-Land Use and Value Interactions

Project activities have the potential to interact with land use and value during all phases of the Project (Table 8.8).

Table 8.8: Potential Project-Land Use and Value Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	X
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	X
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Strait Crossing Connection	X
Removal of Temporary Works and Site Restoration	X
Commissioning	X
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	X
Decommissioning	
Infrastructure Removal	X
Site Reclamation	X

Assessment Boundaries

The LAA for land use and value includes MODG and Mulgrave. The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for land use and value as well. The VC-specific definition for magnitude is as follows:

- Negligible: No change in land value expected and surrounding land use can largely continue.
- Low: Small change in land value expected and/or minor limitations to surrounding land use.
- Moderate: Moderate change in land value and/or moderate limitations to surrounding land use.
- High: High change in land value and/or widespread limitation to surrounding land use.

Effects

Due to the nature of turbines being tall structures with small footprints, they are highly compatible with other land uses like agriculture, forestry, and ground-based recreation. The forestry activities that are ongoing in the area will not be disrupted by the Project. Upgraded roads and infrastructure will improve access, limit weather-related access disruptions, and improve the access road conditions, which will reduce wear on vehicles and other industrial equipment. None of the existing and permitted users of the Crown land are expected to be impacted by the Project.

A 2017 study mentions that given the traditional energy industry's impacts on conservation in both direct and indirect ways, wind energy can be seen as a complementary land use to conservation and protected areas in a broad way, as wind energy is not a carbon emitter (Wind Europe, 2017). Given the context of Nova Scotia where the traditional energy source has primarily been coal, land use for wind energy can be seen as a positive step.

Visual Aesthetics

People living and working in the vicinity of wind projects express a wide range of perspectives on the visual aesthetics and social acceptability of large turbines (Kirchhoff et al., 2022). While regulations in Nova Scotia do not require aesthetic impact assessment, visual simulation modelling was conducted to demonstrate expected Project visibility from several number of viewpoints (Appendix M). These visual simulations were shared at public information sessions (Section 6.2.3) to show members of surrounding communities what the Project will look like from several different viewpoints, once constructed.

The Project's visibility is often limited by the region's varied terrain. For instance, from many nearby communities and points of interest, such as Guysborough (Viewpoint 1), the Project is largely hidden by the terrain. While more of the Project's turbines are visible from farther away, such as along Highway 16 between Dorts Cove and Halfway Cove (Viewpoint 2), they appear very small due to the distance. When viewed more closely from along the coast immediately south of the Project, most of the turbines are masked by the hilly landscape (Viewpoint 4). There are viewpoints near populated areas from which, especially on the tops of hills, large portions of multiple turbines are visible, such as near Manassette Lake (Viewpoint 5). Overall, the area's hilly terrain helps to screen visibility of the turbines, especially up close where they would otherwise appear largest.

Property Value

Potential effects on property value are often a concern of neighbouring residents due largely to anecdotal reports from appraisers of drastic declines in property values following the nearby installation of a wind energy facility (Gulden, 2011). Despite these concerns, many rigorous and statistically defensible studies have concluded that wind energy developments have had no significant effect on surrounding property values.

Prior to 2013, the most comprehensive study on the impact of wind farms on property values was completed by Hoen et al. (2009) This research analyzed data on nearly 7,500 sales of single-family homes situated within 16 km of 24 existing wind farms in the United States. Eight different hedonic pricing models failed to generate statistically significant evidence that property values for houses

located within 16 km of wind farms are influenced by the developments. Subsequent research by the same researchers but employing additional analyses confirmed these results (Hoen et al., 2010).

A study by Hinman (2010) tracked property transactions in communities located close to a 240-turbine wind farm for an eight-year period that spanned pre-development and operation stages. Hinman found that before project approval, property values in the area decreased. This was attributed to a fear of the unknown effects that the development would have; an effect known as anticipation stigma. However, once the development became operational, property values recovered. This recovery was attributed to a greater understanding of the operational effects of the development. Anticipation stigma, however, was not detected in a similar study in Colorado (Laposa & Mueller, 2010), in which it was concluded that the announcement of a large wind energy development did not significantly reduce the selling prices of homes surrounding the proposed development.

The primary limitation of previous research on the effects of wind energy facilities on surrounding home values has long been the relatively small sample sizes (data sets) of relevant home-sale data. The inability to account for the complexity of the various factors that affect property values has also been cited as a limitation of previous studies. Data had been limited for homes located within approximately 800 m of turbines, where impacts would be expected to be the largest: Hinman (2010) (sample size of 11); Carter (2011) (sample size of 41). This is in part because setback requirements generally result in wind facilities being sited in areas with relatively few dwellings, limiting the number of sales transactions available to be analyzed (Hoen et al., 2013). Although these smaller data sets are adequate to examine large impacts (e.g., over 10%), they are less likely to reveal small effects with any reasonable degree of statistical significance.

A study published in August 2013 by Berkeley National Laboratory was conducted to address these gaps in data and included the largest home-sale dataset to date (Hoen et al., 2013). Researchers collected data from 51,276 home sales spanning 27 counties in nine states, related to 67 different wind facilities. These homes were within 16 km of 67 different wind facilities, and 1,198 of the sales analyzed were within 1.6 km of a turbine, giving a much larger dataset than previous studies had collected. The data span the periods well before announcement of the wind facilities to well after their construction (Hoen et al., 2013).

Two types of models were employed during Hoen et al.'s (2013) study to estimate property-value impacts: (1) an ordinary least squares model, which is standard for this type of study, and (2) a spatial-process model, which accounts for spatial variability. These models allowed the researchers to control for home values before the announcement of a wind facility (as well as the post-announcement, pre-construction period), the spatial dependence of unobserved factors affecting home values, and value changes over time. A series of robust models was also employed to add an additional level of confidence to the study results (Hoen et al., 2013).

Regardless of model specification, the results of Hoen et al.'s (2013) study revealed no statistical evidence that home values near turbines were affected in the post-construction or post-announcement/pre-construction periods. Therefore, the authors concluded that if effects do exist, the

average impacts are relatively small (within the margin of error in the models) and/or sporadic (Hoen et al., 2013).

A study analyzing more than 7,000 home and farm sales from 2002 to 2010 in the Melancthon Township and 10 surrounding counties found that Ontario's first and largest wind farm (133 turbines) had "no statistically significant effect" on property values. Further, the study found a lack of significant effect is similar across both rural residential properties and agricultural properties (Vyn & McCullough, 2014).

A more recent review based on housing and property values within specific radii of wind farms and other energy infrastructure by Brinkley and Leach (2019) finds that while most energy infrastructure has an impact on nearby land values, renewable energy projects (including wind farms) do not have statistically significant impacts. These findings are based on seven individual studies of varying scales that all consider the value of property relative to the proximity to wind power, whether a single turbine or more (Brinkley & Leach, 2019).

In 2019, researchers at the University of California, Davis conducted an analysis of property values research in the energy sector. Their analysis found that studies on wind turbines and property values overwhelmingly find that wind turbines do not negatively impact property values at any point during their installment (ACPA, 2023). Similarly, a study of onshore wind energy projects in New England found that negative effects on property value were concentrated within 1 km of the project, were not significant beyond this threshold, and dissipated with time (Dong et al., 2023).

Research has consistently demonstrated that, in a variety of spatial settings and across a wide temporal scale, sale prices for homes near wind energy facilities are not significantly different from those attained for homes sited away from wind energy facilities.

Mitigation Measures

The Project has been designed to minimize potential effects to land use and value through siting considerations and engagement with neighbouring landowners. As part of this process, the total number of turbines within the Study Area was reduced from 84 to 54, reflecting feedback from stakeholders and the findings of desktop, field, and modelling studies. Specific turbines were relocated to minimize visual disturbance to existing homes. Furthermore, the Project has a large spatial (committed to a 1 km minimum setback from non-participating residential dwellings) and topographic separation from most residential dwellings, which will avoid other nuisance interactions such as shadow flicker and wind turbine-related noise.

No specific mitigation related to land use and value is recommended.

Monitoring

No specific land use and value monitoring programs are proposed. The Proponent will maintain ongoing communication with landowners to minimize impacts to nearby residential dwellings.

Conclusion

The impact to land use and value is expected to be negligible, as no change in land value expected and surrounding land use can largely continue and is therefore considered not significant.

8.3 Recreation and Tourism

Consideration of the baseline conditions and potential Project effects on both recreation and tourism must be considered jointly. While some recreational opportunities may attract locals more often than tourists, and vice versa, the region's natural and cultural offerings are an asset to both groups. Recreational opportunities, therefore, should be understood to apply to both locals and people travelling intra-provincially, interprovincially, or internationally for leisure.

8.3.1 Overview and Assessment Methodology

The assessment of recreation and tourism was completed through a review of desktop resources and in consideration of feedback from public engagement to evaluate how the Project may interact with this VC. The following resources were reviewed:

- Nova Scotia Visitor Exit Survey (TNS, 2024)
- Literature review of wind farm impacts on tourism and recreation
- Review of local governments' tourism and recreation websites:
    - Guysborough County (TGS, 2024)
    - Municipality of the District of Guysborough (MODG, n.d.)

8.3.2 Existing Environment

8.3.2.1 Outdoor Recreation

The communities of Pirate Harbour, Middle Melford, Sand Point, and Hadleyville, as well as other communities near the Study Area, are home to a variety of primarily outdoor recreational activities. The primary recreational activities are the area's trails, used by ATV riders in summer and snowmobilers in the winter. Outdoor recreation opportunities are focused around the use of trails, beaches, and other unstructured recreation venues and not in recreation centres. There are indoor community or recreation centres, some with outdoor infrastructure, in the nearby communities of Boylston, St. Francis Harbour, Mulgrave, and Lincolnville. Port Shoreham Beach Provincial Park, a sand and cobble beach, is located approximately 11 km south of the Project and is frequented in the summer for picnics and swimming. Boylston Provincial Park is approximately 16 km southwest of the Project, and is popular for camping, picnics, hiking, fishing, and kayaking.

The region is also known for its recreational offerings such as hiking, camping, and biking. Evidence of ATV or other off-highway vehicle use was observed within the Study Area during biophysical assessments indicating recreational opportunities for motorsport recreationalists within the Study Area. There are several notable hikes in the region, including some featured in Michael Hayne's popular Hiking Trails of Nova Scotia (2002), including trails at Black Duck Cove, Chappel Gully, the Guysborough Nature Trail, Tor Bay, and more, however none are found within or near the Study Area. Furthermore, there are no trails within the Study Area on the public trails repository AllTrails.com (n.d.), a popular and well-used source for information about hikes globally recommended by Hike Nova Scotia as the source for information about trails in Nova Scotia.

Enjoyment of the region's outdoor recreational activities is not expected to be impacted by the Project and Guysborough County will remain an area of interest for visitors from near and far.

Most game and furbearer hunting seasons in Nova Scotia start in the fall and have varying end dates by species. Deer hunting starts in September and October depending on the method of hunting and age of hunter (NSNR, 2024g). Additional approved hunting or trapping may occur on site per NSNR guidelines. Several fish species were confirmed in lakes within the Study Area and several waterfowl were also observed. There are numerous trails that lead to the edges of the lakes that could be used for fishing or waterfowl hunting in this area.

8.3.2.2 Cultural Attractions

Guysborough County has a rich history, dating back over 400 years, and offers museums and historical and cultural attractions including the Old Courthouse Museum in Guysborough. Music and theatre are popular in the area, with Mulgrave Road Theatre, a professional theatre company focused on the Atlantic Canadian experience located in Guysborough, as well as the Chedabucto Place Performance Centre for live performances of all types, also located in Guysborough (MODG, n.d.).

Guysborough is home to the Authentic Seacoast Company, who offer three unique accommodations that are themed on the region's history and attractions (Authentic Seacoast, n.d.). There are other accommodations options for tourists available in Guysborough and several in Port Hawkesbury, but none closer to the Project that can be found through online searches or tourism resources.

Many tourists pass near the area on Highway 344, a scenic route that travels along the Strait of Canso and is part of Nova Scotia's Marine Drive scenic travelway (TNS, 2025). They are either travelling north towards Auld's Cove and Port Hawkesbury, or south towards Boylston and Guysborough.

8.3.2.3 Recreation and Tourism Trends

Tourism Nova Scotia's 2019 visitor exit survey collected information on the reason for people's visits and activities that visitors undertook while in Nova Scotia (TNS, 2021). The top five main reasons for visiting Nova Scotia in 2019 among pleasure visitors were:

- For the scenery/natural landscape (22%)
- To visit a specific area or location in Nova Scotia (18%)
- For the seacoast and ocean (14%)
- To do a specific activity (8%)
- To experience Nova Scotia's culture (8%)

Of those who participated in outdoor activities, the most common were coastal sightseeing, visiting a beach, and hiking (TNS, 2021). No spatial data are available from this or other research products of Tourism Nova Scotia regarding the places visited within province, limiting the understanding of the impact that tourism has on the communities that surround the Project. Additionally, no data were found on intra-provincial travel or local use of these resources. Given the high prevalence of

minimally structured and uncommercialized activities (e.g. hiking and beach exploration), the low prevalence of tourism providers near the Study Area would not necessarily be a deterrent to tourists using the area. However, it is more likely that visitors to MODG seeking natural experiences would visit established destinations such as the previously mentioned Port Shoreham Beach Provincial Park or Boylston Provincial Park, which are each over 10 km from the Project.

8.3.3 Effects Assessment

Project-Recreation and Tourism Interactions

Project activities have the potential to interact with recreation and tourism during all phases if access is changed, is temporarily limited to facilitate work, or if changes to the visual environment impact the user's experience (Table 8.9).

Table 8.9: Potential Project-Recreation and Tourism Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	-
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	X
Turbine Assembly	X
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	-
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	X
Vegetation Management	-
Decommissioning	
Infrastructure Removal	X
Site Reclamation	-

Assessment Boundaries

The LAA for recreation and tourism is MODG and Mulgrave. The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply for recreation and tourism as well. The VC-specific definition for magnitude is as follows:

- Negligible: No expected changes to recreation and tourism.
- Low: Small change to tourism expected and/or minor limitations to recreation use.
- Moderate: Moderate change to tourism and/or moderate limitations to recreation use.
- High: High change to tourism and/or widespread limitation to recreation use or loss of recreational opportunities.

Effects

It is difficult to determine with certainty how tourists will react to a wind power development. Wind farms are objects of fascination for many who might see them as an attraction or at worst neutral in their tourism decisions. Others may find them intrusive in otherwise natural or rural spaces and choose other, less developed areas for tourism and recreational opportunities. Although the Project is generally well-hidden from surrounding vantage points, some of the wind turbines proposed will be visible from several locations along Highway 344. For further information on the viewplanes and landscape impacts related to the proposed turbines, see Section 8.2. While it is not possible to predetermine recreationalists' response to the presence of or the aesthetic qualities of the Project, the Project's direct impacts on recreational opportunities and the experiences sought after by locals and tourists alike can be examined.

Construction of the Project will likely cause overlap with recreational activities practiced in the Study Area. Although the Project is not proposing to implement permanent access restrictions (e.g., gates), trails noted to be used by ATVs, snowmobiles, or that provide access to fishing and hunting may be temporarily inaccessible for safety reasons if in proximity to active construction sites. Such closures will be temporary and limited to construction, with similar temporary closures during decommissioning.

A variety of research has attempted to understand the connection between wind energy development and tourism outcomes, both in terms of tourism demand and tourist experience. Most research finds that the effect of wind turbines on both demand and experience is neutral to slightly negative. Work in Portugal found a generally net neutral outcome of onshore wind farms, in which some tourists and residents expressed slightly negative to positive outlooks (de Sousa & Kastenholz, 2015). The researchers examined the potential for wind farms to become areas of tourism interest, which they concluded requires more investigation though may be practical. Alternatively, in Iceland, tourists especially expressed negative views towards turbines from one project in particular (Sæþórsdóttir & Ólafsdóttir, 2020). The authors of this study found that further development in the region would put 'nature-based tourism' and wind energy in competition for land use, highlighting that the conflict between tourism and wind development is dependent on the prevailing type of tourism practiced in an area. In Germany, researchers found a negative relationship between turbines and tourism demand, and highlighted a strong difference between the effect of onshore inland and onshore coastal, turbines (Broekel & Alfken, 2015). These authors, however, point to the need for greater study to determine if these relationships hold when examined at a greater scale. Finally, research in the Czech Republic finds a generally neutral attitude towards wind farms among regional visitors (Frantál & Kunc, 2011). The authors noted that interestingly, tourists had higher acceptance of turbines than local residents.

Based on literature review, the potential effects of the Project on tourism demand and experience need to be understood in the context of the Project's features and the tourism demand in the area. The terrain relief around the Project means that the entire Project is not visible at once from common viewpoints (Section 8.2.3), either partially or entirely masking the Project from casual observers. In addition to this terrain, its setback from the water means that the Project is less visible from coastal viewpoints (although it may be visible from the water), which should mitigate the effects on coastal sightseeing. The lack of structured recreational opportunities (i.e., established recreation providers) within or adjacent to the Study Area suggest that the Project is unlikely to affect recreational tourism to a substantial degree. It is more likely that the region's tourists seeking structured recreational activities would visit nearby Port Shoreham Beach Provincial Park or Boylston Provincial Park. Less structured recreational activities, such as trail users, may be more affected by the Project. Some recreationalists, especially off-highway vehicle (OHV) riders, may benefit from the Project due to the increased road network allowing for greater access to trails.

The Project Team is committed to working with local recreational groups to ensure continued access to the area and associated trails, within the bounds of all safety considerations, particularly during construction. Following construction, EverWind is not proposing to gate access roads or restrict movement through the Study Area. For Project and public safety, the substation will be fenced throughout operations, but this will only limit access to a small area within the Study Area and not restrict movement. As discussed above, the presence of turbines is highly compatible with most land-based recreation activities and is not expected to limit recreation opportunities, whether by locals or tourists.

Mitigation Measures

- Limit trail, road, and areal closures to temporary periods within the construction and decommissioning phases.
- Continue to work with local recreation groups to ensure continued access to within the Study Area for recreation, including ATV/OHV use, hunting, and trapping.
- Continue to engage with nearby landowners and community members.

Monitoring

No monitoring is proposed.

Conclusion

The impact to tourism and recreation are characterized as follows:

- Magnitude: Magnitude is low due to the potential for minor limitations to recreation, particularly during construction and decommissioning.
- Geographic extent: Within the LAA.
- Frequency: Intermittent, as impacts to recreation use are expected to be limited to the construction and decommissioning phases.
- Duration: Short-term duration as the effects are expected to be limited to the construction and decommissioning phases.

- Reversibility: Reversible, as effects will terminate at the end of the construction phase.
- Significance: Not significant.

9.0 ARCHAEOLOGICAL RESOURCES

9.1 Overview

The purpose of the Archaeological Resource Impact Assessment (ARIA) was to identify areas of high archaeological potential within the Assessment Area. Boreas Heritage Consulting Inc. (Boreas Heritage) was retained to conduct the ARIA, which was directed by Stephen Garcin, in 2023 and 2024 across the original 84 turbine layout. In 2025, Cultural Resource Management Group Ltd (CRM Group) was retained to conduct the ARIA within gap areas of the 54-turbine layout.

9.2 Regulatory Context

The *Special Places Protection Act,* R.S.N.S. 1989, c. 438 provides the province of Nova Scotia with a mandate to protect important archaeological, historical, and paleontological sites and remains, including those underwater. A permit is required for any archaeological or paleontological exploration or excavation in Nova Scotia. The permit system ensures that work is completed based on established standards by qualified applicants.

This ARIA was conducted in accordance with the terms of Heritage Research Permits A2023NS229, A2024NS010, and A2025NS144, issued by the NSCCTH – Special Places Program.

As archaeological work can often result in findings or information that is confidential or sensitive, a summary of the results of the ARIA is provided in the EA, with the ARIA reports provided directly to NSCCTH for review. It is understood that the findings and recommendations of the ARIA are considered “draft” until the reports are accepted by NSCCTH. The reports for the Project have been submitted to NSCCTH; the reports for A2023NS229 and A2024NS010 have been accepted (Appendix N), and the report for A2025NS144 is under review.

9.3 Assessment Methodology

The objectives of the ARIA were to:

- Evaluate archeological potential within the Assessment Area.
- Identify, delineate, and investigate (where recommended) areas considered to exhibit high potential for encountering archaeological resources.
- Provide detailed and accurate information on the results of the survey.
- Provide comprehensive recommendations so that appropriate archaeological resource management strategies can be devised.

To achieve these objectives, Boreas Heritage (A2023NS229 and A2024NS010) and CRM Group (A2025NS144) designed assessment strategies consisting of desktop components (background screening) and field components (archaeological reconnaissance).

The desktop components examined three elements: the environmental context, the archaeological context, and the historical context of the Assessment Area. The environmental context was examined to identify past and current environmental influences or conditions that may elevate archaeological potential (e.g., topography, local resources, and potential for agriculture). The archaeological context was examined to identify how people used and occupied the surrounding landscape based on evidence from previously registered archaeological sites and past archaeological work conducted near the Project. The historical context was examined to identify how people used and occupied the local area based on evidence from published archival documents, ethno-historic records, local oral traditions, historic maps, local and/or regional histories, scholarly texts, and available property records.

In Nova Scotia, the Maritime Archaeological Resource Inventory (MARI) is maintained by the Nova Scotia Museum, on behalf of NSCCTH. Reports from past archaeological assessments and academic research conducted near the Project provide archaeological context, which informs the interpretation and evaluation of any potential archaeological resources identified during the field component of the ARIA.

Additionally, the desktop components involved a general review of topographic maps, coastal charts, aerial photographs, and satellite imagery to identify topographical and hydrological attributes that are associated with high archaeological potential (e.g., waterfalls/rapids as focal points for fishing or requiring portage, submerged marine terraces representing former coastline). For the reviews carried out by Boreas Heritage, these attributes were also incorporated into a geospatial model, the output of which depicts a continuous surface of archaeological potential.

The field components involved on-site visual and non-intrusive examinations, as well as exploratory subsurface sampling (two locations). Field surveys undertaken by Boreas Heritage were completed between November 14 and December 15, 2023 (A2023NS229) and between June 10 and 14, 2024 (A2024NS010) within the assessment area of the original 84 turbine layout. Surveys by CRM Group were conducted between August 5 and 13, 2025, within gap areas remaining in the current Project Assessment Area. During all surveys, visual assessments of archaeological potential were performed by completing parallel pedestrian transects (to maintain effective coverage). Structured pedestrian transects assist in recognizing topographic and/or vegetative anomalies that may inform the extent and nature of previous disturbance factors (e.g., clear-cutting, ploughing, construction earthworks), or suggest an increase in archaeological potential, including evidence of buried archaeological resources (e.g., small knolls, apple trees in the forest, overgrown depressions, abandoned roads).

The process and results of the field components were documented in field notes and with digital photographs. When areas of high archaeological potential or confirmed archaeological resources were identified, locations and features were sufficiently documented to make informed archaeological resource management recommendations. Confirmed archaeological resources, as determined by NSCCTH, will result in the registration of the site(s) in the MARI database.

9.4 Assessment Results

The field components of the ARIA led by Boreas Heritage (A2023NS229 and A2024NS010) resulted in the identification of 20 areas considered to exhibit high potential for encountering archaeological resources. Seven of these intersect with the current Assessment Area.

The field component of the ARIA led by CRM Group (A2025NS144) resulted in the identification of two additional areas considered to exhibit high potential for encountering archaeological resources, both of which intersect with the Assessment Area.

The remaining portions of the Assessment Area are considered to exhibit low potential for encountering archaeological resources. As a result, Boreas Heritage and CRM Group recommend these areas be cleared by NSCCTH of any further requirement for future archaeological assessment.

9.5 Effects Assessment

Project-Archaeological Resources Interactions

Project activities could interact with archaeological resources during earth moving activities in the construction phase (Table 9.1).

Table 9.1: Potential Project-Archaeological Resources Interactions

Project Phase	Potential for Interaction
Site Preparation and Construction	
Land Surveys	-
Geotechnical Investigations	X
Placement of Sedimentation and Erosion Control Measures	-
Clearing and Grubbing	X
Access Road Upgrading and Construction	X
Laydown Area and Turbine Pad Construction	X
Transportation of Turbine Components	-
Turbine Assembly	-
Strait Crossing Connection	-
Removal of Temporary Works and Site Restoration	-
Commissioning	-
Operations and Maintenance	
General Operation and Maintenance	-
Vegetation Management	-
Decommissioning	
Infrastructure Removal	-
Site Reclamation	-

Assessment Boundaries

The LAA for archaeological resources is the Assessment Area (Drawing 2.1). The RAA is not applicable.

Assessment Criteria

Assessment criteria provided in Section 4.5 apply to archaeological resources. The VC-specific definition for magnitude is as follows:

- Low: Activities have a low potential for encountering archaeological resources during ground disturbance.
- Moderate: Activities have a moderate to high potential for encountering archaeological resources during ground disturbance, but risk of harm to potential archaeological resources can be mitigated through appropriate actions and procedures.
- High: Activities have a moderate to high potential for encountering archaeological resources during ground disturbance, and ARIA indicates a high potential for accidental and irrevocable loss of archaeological resources regardless of mitigative measures.

Effects

There is low potential for effects on archaeology resources across most of the Assessment Area.

Areas exhibiting high potential for archaeology resources have either been completely avoided (HPA-2, HPA-6, HPA-7, HPA-10 to 13, HPA-16, HPA-18 to 22), are expected to be avoided (HPA-1, HPA-3, HPA-4, HPA-5, HPA-15), or will be subject to a preliminary shovel testing program (HPA-8, HPA-9, HPA-14, HPA-17) if they cannot be avoided during the detail design phase.

Mitigation

The following mitigation measures are recommended:

- Maintain avoidance of sites of high potential for archaeological sites, where possible, in detail design.
- Conduct shovel testing in accordance with the recommendations of Boreas Heritage/CRM Group and requirements of NSCCTH in areas with high potential for archaeological resources that cannot be avoided.
- Develop a chance find procedure related to the potential unexpected discovery of archaeological items or sites, or human remains, during construction. This would include halting any work immediately upon discovery of suspected resources and contacting NSCCTH. If the resources are suspected to be of Mi'kmaq origin, the Executive Director of KMKNO would also be contacted.
- Conduct additional archaeological assessment if, during the detail design phase, it is determined that ground disturbance is required in areas not previously assessed. The EA Branch will be provided with the acceptance letter from NSCCTH prior to completion of any disturbance in newly proposed areas.

Monitoring

No monitoring programs are proposed.

Conclusion

With the implementation of the above mitigation measures, the residual effects to archeological resources are characterized as follows:

- Magnitude: Low magnitude, as there is low potential for encountering archaeological resources outside of the identified HPAs (which will be avoided or subject to shovel testing).
- Geographic extent: Within the LAA.
- Frequency: Single event.
- Duration: Short-term duration, during the construction phase when clearing and/or disturbances to the ground occur.
- Reversibility: Irreversible, should unlikely impacts to archaeological resources occur.
- Significance: Not significant.

10.0 EFFECTS OF THE UNDERTAKING ON THE ENVIRONMENT

10.1 Summary of Effects of the Undertaking on the Environment

Table 10.1 summarizes the results of the effects assessment for each VC.

Table 10.1: Effects of the Undertaking on the Environment Summary

VC	Magnitude of Effects	Geographic Extent of Effects	Frequency of Effects	Duration of Effects	Reversibility of Effects	Significance Level
Atmosphere and Air Quality	Low – Air quality is expected to remain less than or equal to the maximum permissible ground-level concentrations as defined by the NSAQR.	Within the Study Area	Intermittent	Short-term	Reversible	Not significant
Climate Change	Positive – Project is expected to have a positive effect on GHG emissions.	Within the global environment	Continuous	Long-term	Irreversible	Positive impacts (significance not defined)
Sound	Low – Project activities to be completed in accordance with relevant MODG by-laws and permitting.	Within the 2 km area around turbine locations	Continuous and intermittent (depending on source)	Medium-term	Reversible	Not significant
Shadow Flicker	Low – Measurable shadow flicker levels predicted at the exterior of a residential dwelling are below requirements.	Within the 2 km area around turbine locations	Intermittent	Medium-term	Reversible	Not significant
Geophysical Environment	Moderate – Changes to local topography/geology are possible as geologic hazards exist within proximity to the Assessment Area but can be mitigated with routine measures; impacts to the quality/quantity of groundwater wells are possible if blasting is required (wells are located within 800 m of the Project Footprint)	Within an 800 m radius around the Project Footprint	Intermittent	Short-term	Partially reversible	Not significant

VC	Magnitude of Effects	Geographic Extent of Effects	Frequency of Effects	Duration of Effects	Reversibility of Effects	Significance Level
Surface Water, Fish and Fish Habitat	Low – Small loss of aquatic and fish habitat, with minimal potential for altered hydrology or impact to fish.	Within the Study Area	Single event	Short-term	Partially reversible	Not significant
Wetlands	Moderate - Direct loss of wetland habitat and impact to wetland functions, but wetland area loss will not impact the hydrology of the watershed. Where WSS are impacted, adequate general SAR habitat is prevalent elsewhere within the RAA.	Assessment Area	Single event	Short-term	Partially reversible	Not significant
Terrestrial Habitat	Low – Small to moderate loss of terrestrial habitat, but overall habitat functions remain intact.	Within the Study Area	Single event and intermittent	Medium-term	Partially reversible	Not significant
Terrestrial Flora	Moderate – Small loss of terrestrial flora SOCI or SAR individuals (and associated habitat) that do not have legislated protection status, but their populations remain largely intact.	Within the Assessment Area	Single event and intermittent	Long-term	Partially reversible	Not significant
Terrestrial Fauna	Low – Small loss of habitat supporting fauna and low impacts to fauna behaviour expected.	Within a 5 km buffer of the Study Area	Continuous	Short-term and long-term (depending on course)	Partially reversible	Not significant

VC	Magnitude of Effects	Geographic Extent of Effects	Frequency of Effects	Duration of Effects	Reversibility of Effects	Significance Level
Bats	Moderate – Loss of habitat supporting bats and minimal loss of individuals or impacts to bat behaviours, and these impacts will only be experienced by individuals rather than entire populations.	Within the Study Area	Continuous	Medium-term	Partially reversible	Not significant
Avifauna	Moderate – Moderate loss of important habitat supporting avifauna and moderate impacts to avifauna on an individual level rather than entire populations.	Within a 3 km buffer on the Study Area as well as the airspace that is directly surrounding the turbines	Intermittent and continuous	Medium-term	Partially reversible	Not significant
Economy	Positive – Project is expected to have a positive effect on the economy.	Within Nova Scotia	Continuous	Long-term	Irreversible	Positive impacts (significance not defined)
Land Use and Value	Negligible - No change in land value expected and surrounding land use can largely continue.					Not Significant
Recreation and Tourism	Low – Small change to tourism expected and/or minor limitations to recreation use.	Within MODG and Mulgrave	Intermittent	Short-term	Reversible	Not significant
Archaeological Resources	Low - Activities have a low potential for encountering archaeological resources during ground disturbance.	Within the Assessment Area	Single event	Short-term	Irreversible (to be confirmed based on any identified resources, as applicable)	Not significant

11.0 EFFECTS OF THE ENVIRONMENT ON THE UNDERTAKING

The following section discusses potential effects of the natural environment, including climate change, natural hazards, and weather events, on the infrastructure and operation of the Project. Potential sources of effects from the environment are described below, including mitigation and design strategies for reducing the significance of residual effects.
The primary mitigative measure employed during the construction and operation of the Project is to educate and train site personnel. Environmental and safety orientations will be conducted prior to the start of construction and all staff will be informed of the potential effects of the environment on the Project. Staff responsible for the operation and maintenance of the Project will be trained on the design and operation of the turbines, including applicable operating procedures, safety protocols, and evacuation plans. To further mitigate damages that cannot be controlled by education and training alone, turbines will be equipped with safety mechanisms to limit damage resulting from extreme weather events.

11.1 Climate Change

Climate change is the persistent change in the state of the climate which lasts for decades or longer (IPCC, 2018). Climate change may impact the Project (including turbines, powerlines, roadways, other Project infrastructure) through increased occurrences of extreme weather, precipitation, and subsequent flooding (e.g., washouts and/or direct damage to infrastructure). As described in the following sections, design considerations and operational measures will help to reduce the Project's exposure to climate risks and ensure its resilience to climate change.

11.1.1 Temperature

Global warming, which is defined as an increase in global mean surface temperature averaged over a 30-year period relative to pre-industrial temperatures (IPCC, 2018), is a significant aspect of climate change. Rising temperatures associated with global warming may impact many phases of the Project as well as on-site personnel. For example, longer and more intense heat waves may increase heat-related illnesses and increase the risk of food and water-borne contamination. Hotter and drier conditions also increase the risk of droughts and wildfires (NRCan, 2025). Warmer temperatures can also increase the spread forest and agricultural pests and disease vectors (i.e., ticks), including to the Study Area. Invasive plant species are discussed in greater detail in Section 7.4.2.

Staff will be trained to understand the importance of regular breaks, proper hydration, and unsafe conditions to protect Project personnel. These considerations will become increasingly important as air temperatures increase over the lifespan of the Project. Median annual temperatures within the Study Area are expected to increase by1.6 °C to 2.2 °C over the period 2021 to 2050 (relative to 1971 to 2000), while the number of days with a humidex above 30°C expected to increase by 25 to 29 days per year (ClimateData.ca, 2025).

11.1.2 Sea Level Rise

Sea level rise associated with climate change occurs as a result of the thermal expansion of water as well as the introduction of meltwater from glaciers, ice caps, and icesheets. The relative change in sea level for the coastal waters nearest the Project is projected to be 35 cm by 2050 relative to 1986 to 2005 conditions [change in ocean level relative to land (ClimateData.ca, 2025)]. The majority of the Assessment Area is between approximately 35 masl to 175 masl (based on a projected coordinate system with the Canadian Geodetic Vertical Datum of 2013), and therefore, would experience negligible impacts from rising sea levels. The integrity of roads and turbine pads within the Assessment Area are also not of concern as they are at least 1 km from the nearest tidal waters and in the lowest areas are still a minimum of 35 masl.

11.1.3 Flooding

Intense precipitation events are expected to become more frequent in Nova Scotia under climate change (NSECC, 2025f), which could lead to increased flooding in the Study Area. Inland flooding has the potential to impact both terrestrial and aquatic habitat, damage Project infrastructure, and limit site access. The Project will mitigate the risks of flooding by:

- Developing and implementing a Surface Water Management Plan.
- Minimizing alterations to wetlands.
- Appropriately sizing culverts.
- Concentrating the road and turbine layout in high elevation areas.
- Designing roadside ditches and water off-take infrastructure next to all roads to encourage rainwater drainage.
- Maintaining regular upkeep of said infrastructure.
- Allowing for natural revegetation of roadsides to absorb excess water.

The Study Area is unlikely to be impacted by coastal flooding [e.g., due to storm surge (NSECC, 2025b)] due to being sufficiently inland from the coast.

11.2 Natural Hazards

11.2.1 Severe Weather Events

Nova Scotia is subject to severe weather events, including heavy rainfall, blizzards, and hurricanes, all of which may lead to negative outcomes including power outages, health related emergencies, infrastructure damage, and road damage (Government of Canada, 2024). Severe weather events may therefore pose direct risks to wind farm infrastructure.

Heavy rainfall is a common, highly probable natural hazard in Nova Scotia. Short-duration heavy rainfall is defined as 25 mm or more of rain within one hour, whereas long-duration heavy rainfall includes 25 mm or more of rain within 24 hours during winter, and 50 mm (or 75 mm) of rain or more within 24 hours (or 48 hours) during summer (ECCC, 2024b). Heavy rain and rapid snow melt both have the potential to input high quantities of water within the Study Area over a short period of time. Project design features noted in Section 11.1.3 will

mitigate the effects of heavy rainfall and snow melt to maintain road access during severe precipitation events.

Wind and lightning, which may be associated with heavy rainfall or hurricane conditions, may increase the risk of mechanical issues or electrical fires. To mitigate this risk, turbines will be monitored remotely and equipped with an automatic shutdown that will engage when thresholds for wind are reached (i.e., cut out speed). They will also be designed with a built-in grounding system for lightning strikes. The Proponent will ensure site access is maintained in adverse conditions by clearing roads or providing vehicles that can traverse all conditions.

11.2.2 Turbine Icing

Turbine icing occurs when ice accumulates on the surface of turbine blades, a condition created by specific temperatures and levels of humidity or the presence of freezing rain. Icing may occur more frequently when turbine blades reach 150 m above ground where lower clouds may contain supercooled rain during the cold season (Seifert et al., 2003). Turbine icing may lead to ice throw or ice fall, and the distance and direction in which the ice is thrown/falls is dependent on factors such as wind speed, rotor speed, rotor azimuth, the position of the ice on the blade, and the characteristics of the ice itself. Due to the numerous factors contributing to where ice fragments may land when thrown/fallen, the likelihood of a human being struck is insignificant and thus the risk of injury is low (LeBlanc, 2007).

The risk of injury or damage because of ice throw is present within the maximum throwing distance of ice from a turbine, as determined using the following equation (CREA, 2020):

$$d_t = 1.5 * (D + H)$$

Where:
d_t = Maximum throwing distance (m)
D = Rotor diameter (m)
H = Hub height (m)

Based on the above equation and turbine model specifications (183.4 m rotor diameter and 130 m hub height), the maximum throwing distance associated with the Project's turbines is 470.1 m. All potential receptors are located beyond this distance. Ice throw also presents a risk to maintenance workers who will frequent the Project throughout its operational lifespan. Such access may be required when icing is a factor, and possibly because of icing.

To further reduce the risk of injury from ice throw or falling ice, mitigation measures to protect recreation users and site workers from ice throw or shedding will include:

- Continue engagement and education with local recreational users regarding the safe continued use of lands within the Study Area.

- Install signage illustrating and warning of potential hazards associated with ice throw and shedding around wind turbines, including on any recreational or logging trails or roads within the danger zone of ice throw or shedding.
- Equip staff and workers accessing the Study Area for maintenance or other purposes with necessary PPE and associated safety protocols and procedures to mitigate risk of injury and/or fatality, especially during potential icing conditions.
- Equip turbines with automatic shutdown procedures to avoid damage to the turbines and ice throw. Identification of icing and automatic shutdown can be triggered from factors such as temperature, anemometer (wind) speeds, and power curve comparison.

11.2.3 Wildfire

A substantial portion of the Assessment Area is surrounded by forest cover (Drawings 7.21A to 7.21H) and there is potential for naturally occurring and/or human-caused forest fires to interact with and damage Project infrastructure.

Fire is one of the most important sources of natural disturbance in Nova Scotia, with moderate to high severity fires impacting an estimated 0.17% to 0.4% of forested land per year (A. R. Taylor et al., 2020). The susceptibility of a landscape to fire depends on a range of factors, including stand composition, disturbance history (e.g., presence of blowdown), and human land use. From 1950 to 2018, the Nova Scotia Uplands and Atlantic Coastal ecoregions, which coincide with the Project Study Area, experienced a low to moderate number of fires and area burned per year relative to other ecoregions in the province (A. R. Taylor et al., 2020). As a whole, the frequency and extent of fires has declined in Nova Scotia since 1980 due to the increased effectiveness of fire detection and suppression techniques (A. R. Taylor et al., 2020). However, although it is challenging to precisely predict changes in the province's fire regime, modelling suggests wildfire risk in the Acadian forest region will increase moderately under climate change as a result of warmer and drier conditions (Whitman et al., 2015).

The following operational and technological measures will help to safeguard the Project from fires:

- Develop and implement a Project-specific Contingency Plan that includes a fire safety plan. Circulate the plan to local fire departments for input and awareness.
- Continue to engage with first responders on site access and access to water.
- Ensure fire response equipment is available at the O&M building and that site personnel are trained.
- Equip each turbine with integrated condition-monitoring and control systems that continuously track temperature, electrical load, vibration, and related parameters. When values deviate from set thresholds, the systems automatically alarm, notify remote operators, and initiate an appropriate response (fault management or safe shutdown), providing early warning of abnormal conditions—including those that can precede a turbine fire. If required by final design or the authority having jurisdiction, dedicated fire-detection/suppression systems may also be installed.

11.3 Summary of Effects

Environmental effects associated with climate change and natural hazards have the potential to significantly affect the Project. Project location siting and design measures will minimize many of the risks associated with these environmental hazards, and the mitigation measures described above will allow for both proactive and adaptive management of any remaining risks, thus limiting the likelihood of impacts on all phases of the Project.

12.0 ACCIDENTS AND MALFUNCTIONS

Without proper mitigation, accidents and malfunctions can interact with many VCs and potentially result in adverse effects. However, implementing preventative measures limits the probability of occurrence, and having appropriate response procedures in place reduces the magnitude of residual effects.

Accidents, malfunctions, and unplanned events considered for this Project include:

- Erosion and sediment control failure
- Fire
- General hazardous material spill
- Structural damage
- Transportation-related incidents
- Ice throw (addressed in Section 11.2.2)

The safety of on-site personnel is a vital Project component; however, it is not specifically considered in the EA as workplace occupational health and safety is regulated by the policies, procedures, plans, and codes of practice set in the *Occupational Health and Safety Act,* S.N.S. 1996, c. 7. A site-specific Contingency Plan will be developed to address accidents, spills and malfunctions.

EverWind uses the principles of Safety in Design, a proactive engineering approach that considers all potential hazards and designs systems to eliminate or minimize the likelihood of accidents or injuries. The Project will be designed and constructed in strict compliance with the principles of Safety in Design. EverWind has a long history of safely operating the Point Tupper Terminal, located immediately north of the Project in Point Tupper, and recognizes the importance of ensuring the safety of workers, the public, and the environment. At the Point Tupper Terminal, EverWind has created a world class Emergency Response Team (ERT). The EverWind ERT is comprised of 40 members that are NFPA 1081 Advanced Industrial Firefighter certified, NFPA 470/472 Haz Mat certified, NFPA 1006 Technical Rescue (High Angle Rescue and Confined Space Rescue), and St. John Ambulance Advance First Aid certified. In addition, one of EverWind's ERT members is a certified Paramedic with 12 years' experience with Wood Buffalo Fire & Emergency Services.

EverWind also operates an NSECC approved fire training facility at its Point Tupper Terminal and hosts bi-annual live fire training exercises for regional volunteer fire departments and other local industrial ERTs.

12.1 Erosion and Sediment Control Failures

Failure of erosion and sedimentation controls may result in potential adverse effects on VCs (primarily during construction), most notably to watercourses, wetlands, and fish and fish habitat. Erosion and sedimentation controls may fail due to extreme weather conditions (e.g., flooding), improper installation, improper maintenance, and unforeseen accidents (e.g., collisions). Failure of these control measures may release sediment into the environment, impacting water quality and aquatic and terrestrial habitats.

Mitigation measures to limit the probability of an occurrence and reduce the magnitude and extent of potential effects include:

- Provide workers with training to properly install and repair erosion and sediment controls.
- Implement all mitigation related to erosion and sediment control provided in Section 7.
- Develop and implement an Erosion and Sedimentation Control Plan for all phases of the Project.
- Develop and implement a Project-specific Contingency Plan that includes information on sediment and erosion control.

12.2 Fires

An accidental fire could potentially adversely affect the atmospheric environment (emissions), the terrestrial environment (vegetation and wildlife), and the socio-economic environment (land use and value) during all Project phases.

Fires in wind farms are most often caused by lightning strikes, mechanical and hydraulic faults, and electrical installation failure (You et al., 2023). Publicly available data cannot provide exact statistics, but the rate of fire is estimated to be between 1-in-2,000 and 1-in-15,000, or between a 0.05% and 0.007% chance of fire (Krcmar, 2021), though this will be affected by the installation of fire mitigation technologies such as lightning protection systems. The height and remote nature of the turbines may make the early detection and effective control of fires difficult. However, these factors also reduce the direct impacts of electrical fires on human health.

Various standards and guidelines have been implemented to minimize the chances of fires occurring in turbines and associated infrastructure. The turbines planned for use in this Project are compliant with the International Electrotechnical Commission’s IEC 61400 international standard to avoid damage from hazards during their operational lifespan. This includes lightning and surge protection measures. The turbines are equipped with early detection and control systems, including breakers, temperature and pressor sensors (e.g., PT sensors), that continuously monitor key components such as the gearbox, generator, and electrical systems. If electrical currents or temperatures exceed pre-set thresholds, the turbine will automatically enter a safe shutdown state to prevent potential damage or fire. These systems are monitored remotely via the turbine's SCADA system, allowing operators to respond quickly to abnormal conditions. Additionally, the Project has large setbacks from potential receptors (turbines are at

least 1 km from the nearest residential dwelling) and public roads (greater than 1 km from Highway 344).

Wildfire is addressed in Section 11.2.3.

A fire prevention and evacuation plan will be developed within the Project's Contingency Plan, in addition to general safety protocol and training. Impacts to human health from electrical fires are therefore expected to be negligible.

Mitigation measures to limit the probability of an occurrence and reduce the magnitude and extent of potential effects include:

- Equip each turbine with integrated condition-monitoring and control systems that continuously track temperature, electrical load, vibration, and related parameters. When values deviate from set thresholds, the systems automatically alarm, notify remote operators, and initiate an appropriate response (fault management or safe shutdown), providing early warning of abnormal conditions—including those that can precede a turbine fire. If required by final design or the authority having jurisdiction, dedicated fire-detection/suppression systems may also be installed.
- Prohibit the use of campfires or burning within the Study Area by staff and contractors.
- Dispose of all flammable waste regularly at an approved facility.
- Implement mitigation related to chemical and fuel storage (Section 12.3).
- Allow smoking in designated areas only.
- Equip heavy machinery with fire extinguishers.
- Require turbine technicians heading "up-tower" to carry a fire extinguisher.
- Ensure fire response equipment is available at the O&M building and that site personnel are trained.
- Develop a Contingency Plan including fire safety plan. Circulate the plan to local fire departments for input and awareness.
- Continue to engage with first responders on site access and access to water.

12.3 General Hazardous Material Spills

Hazardous spills resulting from fuel (i.e., storage, refueling, operation of combustion vehicles) and other on-site chemicals may occur during the Project's construction and operations activities. Hazardous spills can adversely impact air, soil, surface water, groundwater quality, human health, and safety. In addition, hazardous spills may risk the health of aquatic, avian, and terrestrial wildlife. The severity of the impacts will depend on the nature of the hazardous material and the quantity spilled.

Mitigation measures to limit the probability of an occurrence and reduce the magnitude and extent of potential effects include the following:

- Develop spill prevention and response procedures within the Contingency Plan, which will set out spill prevention and response procedures.

- Store all fuels, lubricants, and chemicals in designated containers and areas.
- Provide secondary containment in storage areas (where possible).
- Inspect equipment for fluid leaks.
- Locate fuel storage areas, refueling, and/or equipment lubrication a minimum of 30 m from any surface and groundwater feature (i.e., watercourse, well).
- Refuel machinery and equipment on an impervious surface, where possible. If this is not possible, require that the work is completed in a designated area, greater than 30 m from a watercourse/water body/wetland
- Ensure workers remain with equipment during refueling.
- Complete equipment servicing off-site, where possible. If this is not possible, require that the work is completed in a designated area, greater than 30 m from a watercourse/water body/wetland.
- Store all dangerous goods in compliance with the Workplace Hazardous Material Information System.
- Equip mobile equipment with spill kits stocked with appropriate spill containment materials for the activities taking place, such as soaker pads, oil-absorbing materials, and containment booms.
- Locate stationary spill kits or spill drums at work areas using mobile equipment, hazardous fluids and/or in proximity to environmentally sensitive areas (i.e., wetlands or watercourses).
- Stock spill kits with the appropriate quantity and type of material for the anticipated product type(s) and volume(s) in use.
- Train site workers on site specific spill response requirements and equipment.

With the implementation of the above preventative measures, the likelihood of an accident or a malfunction is low. Appropriate response plans will be put in place to ensure any interactions with VCs from an accident or malfunction are limited and the effects can be quickly contained.

12.4 Transportation-related Incidents

Operator error or techno-mechanical malfunctions may occur during all stages of the Project's lifespan, although the type and intensity of vehicular traffic will vary depending on the Project phase. The construction and decommissioning phases will see the highest volume of traffic and largest vehicles both travelling to and on the site. On the site especially, where workers may be near light to heavy-duty traffic, there is a higher risk of incidents affecting human health (HSE, n.d.). During operation, vehicular access by technicians also presents risks that must be managed. While vehicular use has implicit risks that cannot be fully eliminated, an established Traffic Management Plan will ensure that these risks are mitigated to the highest degree possible and that they are understood by anyone accessing the Study Area.

Additionally, mitigation measures to limit the probability of an incident and reduce the magnitude and extent of potential effects include:

- Develop a Traffic Management Plan, outlining traffic management procedures.
- Assess site access routes, including structural integrity of bridges and culverts, baseline traffic levels and high-risk areas prior to construction.

- Install appropriate traffic signage and road markers to identify high-risk areas and communicate traffic rules and safety information.
- Conduct preventative vehicle inspections to ensure all mobile equipment is in good condition (breaks, light system, leaks absent).
- Develop and maintain roads according to the Erosion and Sedimentation Control Plan.
- Establish, post, and enforce speed limits on site.
- Require that public road speed limits are followed by Project vehicles.
- Require that drivers follow all laws and regulations pertaining to distracted (e.g., cell phone usage) or impaired driving on and off site.
- Require that only licensed individuals operate heavy equipment.
- Minimize traffic in school zones and on school bus routes during school hours and bus pick-up and drop-off times.
- Follow weather statements and alerts and adjust plans accordingly to avoid transportation in extreme weather conditions.
- Install signage where existing trails cross access roads to avoid potential interactions with trail users when heavy equipment is in use.
- Establish the following practices within the Study Area, to the extent feasible (HSE, n.d.):
    - Create clear, separate paths or zones for vehicles and pedestrians to reduce the risk of accidents.
    - Minimize vehicle movements.
    - Minimize reversing by providing adequate room to turn vehicles.
- Operate in appropriate weather and provide ample lighting and visibility aids (e.g. mirrors around tight turns).
- Ensure visitors are familiar with the Project Footprint or are accompanied whether in vehicles or on foot.

Detailed information regarding vehicle collision prevention and response procedures will be outlined in the Contingency Plan.

12.5 Structural Damage

Wind turbine damage up to and including failure may result from a variety of factors, both human and environmental, presenting risks to human health, infrastructure, and the environment. The most frequent causes of damage to turbines that may result in failure include damage from lightning, material fatigue over time, leading edge erosion, and damage from icing (Katsaprakakis et al., 2021). While damage by these mechanisms can occur despite quality design and operation, preventing failure or harm to human or environmental health is critical. This typically involves detecting damage before it can result in a complete failure, including partial or full blade detachment. Wind turbine structural health monitoring, through use of advanced sensors, can detect anomalies in performance and abnormal vibrations that might indicate an imbalance requiring further investigation (Algolfat et al., 2023).

Regular monitoring and inspections are essential for ensuring the continued structural integrity of all components of turbines (Enlitia, 2024), and the Proponent will implement mitigative

actions to limit the probability of an occurrence and reduce the magnitude and extent of potential effects, including:

- Maintain sufficient lubrication in bearings, and keep seals clean to prevent excess friction and overheating.
- Maintain and test the lighting protection system and verify grounding integrity.
- Prepare and enact severe weather plans to reduce the risk of physical damage from flying debris or hail and minimize the risk that thermo-electric damage by lightning results in blade failure.
- Inspect and properly maintain turbine pitch, yaw, overspeed, and mechanical brake function.
- Check and change lubrication regularly in the turbine gearboxes to prevent excess heat and minimize wear; conduct oil sampling/analysis at regular intervals.
- Test SCADA/condition-monitoring sensors regularly to ensure that anomalous conditions are detected early and managed before they result in damage to turbines, other infrastructure, or harm human health.
- Inspect blades (e.g., drone/rope access), maintain leading-edge protection, and repair surface defects to control blade erosion and fatigue.
- Implement ice detection/operating procedures (e.g., curtailment/shutdown) and establish temporary exclusion zones during icing events.

The separation of turbines from people and public roads also mitigates the risk to human health and public infrastructure in the highly unlikely event of a failure.

13.0 CUMULATIVE EFFECTS

13.1 Overview

Cumulative effects are changes to environmental, social, and economic values caused by the combined effect of past, present, and potential future human activities and natural processes (Government of British Columbia, 2024). Concerns are often raised about long-term changes that may occur not only as a result of a single action but of the combined effects of each successive action on the environment (Hegmann et al., 1999). While a single undertaking might not cause significant adverse effects, multiple undertakings may result in incremental impacts, referred to as cumulative effects. These cumulative effects may potentially result in an overall impact to a VC of interest.

13.2 Cumulative Effects Assessment Methods

The goal of a Cumulative Effects Assessment (CEA) is to assess changes to an environmental condition (VC) that could occur based on a combination of the proposed Project with other past, present, or reasonably foreseeable future projects. The CEA is completed using publicly available data, with uncertainties clearly identified, following guidance outlined in the Cumulative Effects Assessment Practitioners Guide (Hegmann et al., 1999). As outlined by Hegmann et al. (1999), a CEA scoping exercise is completed using the following steps:

- Identification of the VCs that will enter the CEA process
- Determination of spatial and temporal boundaries for the CEA
- Identification and description of other projects or activities in the spatial boundary (or boundaries)
- Confirmation of which VCs will be carried through the CEA process

For those VCs selected for the CEA process, an analysis was conducted considering the residual effects of the Project on that VC, the effect of other activities or projects on that VC, and potential cumulative effect. Mitigation measures and proposed monitoring programs and follow up are described, if cumulative effects are predicted. At this stage, the certainty in effects predictions was considered. It is not uncommon for data on effects of other projects or activities to be limited, increasing the uncertainty of the CEA predictions.

13.2.1 Selection of Boundaries

To identify other Projects for inclusion in the CEA, a 15 km buffer on the Study Area was selected as a conservatively inclusive boundary (Drawing 13.1).

The temporal boundary for the Project is based on three Project phases: construction (36 months), operations and maintenance (35+ years), and decommissioning and reclamation (18 months). For the CEA, Strum considered past projects as those registered, approved, and constructed within the past 10 years, selected from the Environmental Assessment Projects Dashboard (NSECC, 2025e). Reasonably foreseeable future projects are those which have been registered with an EA document through NSECC but have not been approved or constructed.

13.2.2 Other Undertakings in the Area

General land use is not accounted for as “other activities or Projects” in the CEA. Nova Scotia’s landscape is a mosaic of intensive agricultural land, intact and disturbed forests, communities, and residential development. While these activities all affect the landscape and usage of the lands by humans and other species, there is not a meaningful way to determine or quantify the effect of these activities on various VCs. No meaningful data is available to support an assessment of cumulative effects associated with general land use. Furthermore, the existing land use was considered in the determination of residual environmental effects within each VC within the Project’s Environmental Assessment Registration Document (EARD), so no additional conclusions can be made through the lens of a CEA.

There are a number of industrial facilities, planned developments, and resource extraction operations in the immediate vicinity of the Project. Table 13.1 summarizes industrial activities/developments within approximately 15 km of the Project.

Table 13.1: Nearby Industrial Activities and Developments

Development	Project Type	Status of Activity	Activity Location	Distance to Study Area[(1)]	Terrestrial Fauna Pathway	Terrestrial Habitat Pathway	Avian Mortality pathway	Bat Mortality Pathway
Goose Harbour Lake Wind Farm Project	Wind development	Approved with Conditions	West of the Study Area near Goose Harbour Lake	Study Area adjacent	Yes	Yes	Yes	Yes
EverWind Strait Crossing Transmission Line	Energy	Approved with Conditions	Strait of Canso	0.2 km north	No	No	Yes	Yes
Nova Scotia Power Incorporated (NS Power) Marine Terminal	Marine Terminal	Constructed	Point Tupper	2 km north	No	No	No	No
Point Tupper Wind Farm	Wind Development	Constructed	Point Tupper	3 km north	No	No	Yes	Yes
Bear Head Energy Green Hydrogen and Ammonia Production, Storage, and Loading Facility	Green Hydrogen and Ammonia Production	Approved with Conditions	Point Tupper	2 km northeast	No	No	No	No
Melford International Terminal	Marine Terminal	Approved with Conditions	Middle Melford	Study Area adjacent	Yes	Yes	No	No
EverWind Point Tupper Green Hydrogen/Ammonia Project – Phase 1	Green Hydrogen and Ammonia Production	Approved with Conditions; Industrial Approval	Point Tupper	5 km north	No	No	No	No
EverWind Terminals	Marine Terminal	Constructed	Point Tupper	5 km north	No	No	No	No
Martin Marietta Quarry Fines Storage Development Project	Aggregate Quarry and Bulk Coal Handling Facility	Constructed	Mulgrave	5 km northwest	No	No	No	No

Development	Project Type	Status of Activity	Activity Location	Distance to Study Area[(1)]	Terrestrial Fauna Pathway	Terrestrial Habitat Pathway	Avian Mortality pathway	Bat Mortality Pathway
Mulgrave Community Wind Power Project	Wind Development	Constructed	Mulgrave	5.5 km northwest	Yes	Yes	Yes	Yes
Auld's Cove Transmission Line	Transmission Line	Constructed	Aulds Cove	8 km northwest	No	No	No	No
Chedabucto Aggregates Quarry Expansion Project	Aggregate Quarry Expansion	Constructed	Halfway Cove	11 km north	No	No	No	No

[(1)] Distance to nearest point of the Study Area

13.3 Selection of VCs for Evaluation in the CEA

The primary pathways of effects to the environment from the Project include habitat loss in forest habitats (and therefore effects to species that rely on those habitats), and potential bird and bat mortality from wind turbines and transmission lines. Through the effects assessment, no significant adverse residual effects were identified to the VCs evaluated. Details of the effects assessment for each VC evaluated can be found in Sections 7, 8, and 9.

Table 13.2 summarizes the potential for VCs to have cumulative impacts with other undertakings in the area.

Table 13.2: Potential for Cumulative Effects on Identified VCs

VC	Cumulative Effects Assessed	Reasoning
Atmosphere and Climate Change	No	Residual positive impacts regarding GHG emissions from the use of renewable energy resources. Effects to climate change will be positive.
Sound	No	Cumulative effects are considered in the effects assessment chapter as operational noise from the future neighboring Goose Harbour Lake Wind Project is built into the predictive modelling.
Shadow Flicker	No	Cumulative effects are considered in the effects assessment chapter as shadow flicker from the future neighboring Goose Harbour Lake Wind Project is built into the predictive modelling.
Geophysical Environment	No	The Project will not impact the geologic environment outside the Study Area or interact with nearby industrial activities.
Surface water, Fish and Fish Habitat	No	The Project is maximizing the use of existing disturbed areas to minimize impacts to watercourses. In accordance with provincial permitting requirements, appropriate mitigations will be incorporated into the design of new watercourse crossings, such that there is no significant residual effect, and direct effects are limited to the Project Footprint.
Wetlands	No	The Project is maximizing the use of existing disturbed areas to minimize impacts to wetlands. In accordance with provincial permitting requirements, all impacted wetlands will be compensated for, such that there is no significant residual effect, and direct effects are limited to the Project Footprint.
Terrestrial Habitat	Yes	Habitat disturbance is expected through a large geographic area that may interact with habitat disturbance from nearby projects.
Terrestrial Flora	No	Avoidance of flora SAR with legislated protection status. The Project is maximizing the use of existing disturbed areas to minimize impacts to SAR/SOCI.
Terrestrial Fauna	Yes	Habitat disturbance is expected through a large geographic area that may interact with habitat disturbance from nearby projects.
Bats	Yes	The Project is predicted to have moderate and non-significant impacts to bats through habitat loss and potential mortality. Effects may interact with effects from nearby projects.
Avifauna	Yes	The Project is predicted to have moderate and non-significant impacts to birds through habitat loss and potential mortality. Effects may interact with effects from nearby projects.

VC	Cumulative Effects Assessed	Reasoning
Economy, Land Use, & Recreation/ Tourism	No	Residual impacts are anticipated to be low to negligible, or positive.
Archeology, Culture, & Heritage	No	Avoidance of archaeological, historical, or culturally significant areas.

The following VCs are assessed for cumulative effects:

- Terrestrial Habitat
- Terrestrial Fauna
- Bats
- Avifauna

13.4 Cumulative Effects Assessment

Cumulative effects were assessed for the Project by taking into consideration the potential residual effects (as identified in VC sections) in relation to the activities that have taken place in the past, those that currently exist, and those that can be reasonably expected to be developed within the area surrounding the Project (i.e., undergoing regulatory approval/under construction).

It was identified that the pathways to cumulative effects were similar between terrestrial fauna and terrestrial habitat, and between bird and bat mortality. As a result, these VCs will be evaluated together through the CEA (Terrestrial Fauna + Terrestrial Habitat = Terrestrial; Avifauna Mortality + Bat Mortality = Avian Mortality).

13.4.1 Terrestrial

Terrestrial impacts are discussed in terms of pathways to cumulative effects with the following nearby projects:

- Mulgrave Community Wind Project
- Goose Harbour Lake Wind Farm Project
- Melford International Terminal

Each of these projects assessed overlaps spatially and temporally with the Setapuktuk Wind Project; therefore, there may be a potential cumulative effect between the four Projects. The methods presented in each of these projects do not allow direct comparison of quantifiable effects.

The Mulgrave Community Wind Project is a 2 MW wind project which had an approved EA in 2014. The effect of the project on terrestrial fauna and habitat was not quantified but described as low (potential impact may result in a slight decline in resource in study area during the life of the project. Research, monitoring, and/or recovery initiatives would not normally be required), and not significant. Post construction monitoring data is not available.

The Goose Harbour Lake Wind Farm Project is a 105 MW wind project to be developed near Lincolnville, Big Tracadie, and Mattie Settlement in Guysborough County, directly east of the Setapuktuk Wind Project. The EA was approved in 2023, based on proposed construction of 29 wind turbines, and a total of 65 km of roads (12 km of new roads, and 53 km of upgrades to existing roads). The impact to terrestrial fauna and habitat was not quantified but described as low (small loss of terrestrial habitat or habitat supporting fauna, but overall habitat functions and terrestrial fauna behaviour remain intact) and not significant.

The Melford International Terminal is a proposed Marine Terminal in Middle Melford, along the Strait of Canso. It is anticipated to be connected via rail line to Havre Boucher to allow for the shipment of goods via rail across Canada. This railway corridor is expected to cross the Project's Study Area and has been considered in the design of Project roads and infrastructure. The proposed rail line is 34 km in length, including 24 km of new rail, and the reactivation of 10 km of historical rail bed. For the purposes of this assessment, the Melford Terminal rail line is considered similar to a road, given its linear nature and relative scale.

While the Goose Harbour Lake Wind Farm Project and the Setapuktuk Wind Project are adjacent to one another, the projects both have limited disturbance areas within the broader Study Areas, leaving undisturbed and intact forest available throughout. Neither project will have infrastructure which limits movement of fauna across the landscape such as pits, substantial berms, extensive fencing or above ground pipelines. As such, connectivity and movement between the two Projects, adjacent undisturbed lands, and the Mulgrave Hills Nature Reserve is expected to be maintained. In addition, post-construction monitoring of mainland moose is expected to be conducted for both projects, allowing for a qualitative comparison of pre and post construction usage and to assess the potential effects of disturbance.

The Goose Harbour Lake Wind Farm Project has a Study Area of 9,428 ha, and a Project Footprint of approximately 209 ha, representing a permanent disturbed area of approximately 2.2% of the Study Area. The Setapuktuk Wind Project Study Area of 8,880 ha and Project Footprint of 273 ha represents a permanent disturbance of approximately 3.1% of the Study Area. The cumulative total permanent disturbance between the projects across the combined Study Areas equates to approximately 2.6%. Note that this is an overestimate as both Project Footprints include existing roads and existing areas of disturbance in the calculations. As this cumulative permanent disturbance is a smaller percentage than the Project alone, the magnitude is still considered low.

Between all three of these Projects, 81 km of new road and rail line is expected to be constructed. These new roads are expected to have low traffic levels, with similar types of usage to the ongoing forestry activity in the area. With these low traffic levels and low speeds, there is expected to be limited opportunity for fauna-harming incidents and sensory disturbance, in comparison to nearby provincial highways and residential roads. Given that none of the terrestrial fauna species observed during assessments for all Projects are reliant

on interior forest conditions, the increase in roads is unlikely to cause significant residual cumulative effects.

13.4.2 Avian Mortality

Avian mortality is discussed in terms of cumulative effects based on the Project's proximity to other projects including:

- EverWind Strait Crossing Transmission Line
- Point Tupper Wind Farm
- Mulgrave Community Wind Power Project
- Goose Harbour Lake Wind Farm Project
- Auld's Cove Transmission Line

Each of the projects assessed has temporal overlap with the Project, given its operational timeframe and the long-term nature of wind projects. As avifauna are mobile and migrate across the landscape, projects located within the 15 km buffer can be viewed as having a spatial overlap with avifauna which may migrate through each of the respective project boundaries. Therefore, all five projects evaluated herein have effects with spatial and temporal overlap with the Project. The goal of this evaluation is to determine whether each project's non-significant impacts result in a cumulative effect (additive) using publicly available data and stated thresholds of significance, if possible.

The Project will be connected to the Facility via the EverWind Strait Crossing Transmission Line, a dual-345 kV transmission line spanning the Strait of Canso from Steep Creek to Point Tupper. The Strait Crossing Transmission line will be built to bring power from the Setapuktuk Wind Project, as well as other future Phase 2 projects to the Facility in Point Tupper as a private transmission line.

The Auld's Cove Transmission Line is an energy transmission project that spans the same body of water and is of similar size as the EverWind Strait Crossing Transmission Line, though it is not directly adjacent, but sits approximately 13 km northwest. The suspension towers for that project are shorter (approximately 165 m total height compared to 210 m), and there is less line clearance to the water at center span (49 m compared to 75 m). Post-construction mortality survey data is not publicly available for the Auld's Cove Transmission Line. For both Projects, effects to avifauna were determined to be not significant, with the cumulative effects for the EverWind Strait Crossing transmission line also being assessed as not significant when considering the Auld's Cove Transmission Line.

Three wind projects are present or under construction within 15 km of the Study Area.

The Point Tupper Wind Project consists of 11 wind turbines installed directly across the Strait of Canso from the Study Area. The Project was approved in 2008, and construction was completed by 2010. No estimates of avian mortality were provided in the EARD, and post-construction mortality surveys are not publicly available.

The Mulgrave Community Wind Project consists of one wind turbine, installed in 2014 approximately 6 km northwest of the Study Area. While the project's EARD did not provide an estimate of avian mortality, it was predicted that mortality would be low and not significant based on the project's geographic setting and avian usage of the Study Area. Post-construction mortality survey data is not publicly available.

The Goose Harbour Lake Wind Farm Project currently under construction, includes 29 wind turbines and ancillary infrastructure. While the EARD did present a summary of migratory bird interaction index, (likely activity based on the fall 2022 migratory period which may correlate to increased mortality), no estimate of mortality was presented. Post-construction mortality monitoring is required but has not yet been completed as turbines are not yet in operation.

Given the proximity of nearby wind projects and transmission lines, there are likely additive effects to avian mortality. With the lack of publicly available post-construction mortality data, it is not possible to quantify whether any additive cumulative effects would result in a significant impact to avian mortality. Each project indicated that there is potential for avian mortality, though each deemed the effect to be not significant within the spatial boundaries of each respective EARD.

Wind projects requiring an EA in Nova Scotia are required to complete two years of post-construction mortality monitoring for birds and bats. In addition, it is expected that the Project will be required, as a condition of EA Approval, to develop an Adaptive Management Plan that includes a decision-making process to mitigate potential impacts to bird and bat species during operations. The plan and the monitoring results would be reviewed by NSECC, NSNR, and ECCC. NSECC will also receive the post-construction monitoring results from the Goose Harbour Lake Wind Project. Recent wind EA conditions note NSECC's ability to require additional mitigation as part of adaptive management. Therefore, the potential for cumulative effects will be managed through future requirements for monitoring and adaptive management, as required.

14.0 CONCLUSION

In accordance with A Proponent's Guide to Environmental Assessment (NSECC, 2025a), the studies, regulatory assessments and VC evaluations described within this EA Report have been considered both singularly and cumulatively, for all phases of the Project.

The results of this assessment indicate that in consideration of the Project's mitigative and protection measures, adverse residual effects are anticipated to be not significant.

15.0 CLOSURE

This EA Report was completed by Strum Consulting, an independent, multi-disciplinary team of consultants with extensive experience with submission of EARDs for undertakings within Atlantic Canada. Curriculum vitae for EA Report contributors and Strum Project Team members are provided in Appendix O. A list of the Project Team and their associated roles is provided below.

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