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HALIFAX REGIONAL MUNICIPALITY
FUTURE SERVICED COMMUNITIES

FINAL REPORT
VOLUME 3: HIGHWAY 102 STUDY AREA
REPORT – LAND SUITABILITY ANALYSIS

January 6 2025

Prepared for:
Halifax Regional Municipality

Prepared by:
Stantec Consulting Ltd

Project Number:
160410459

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3 Land Suitability Analysis

Stantec Consulting Ltd. (Stantec) completed a land suitability analysis of four potential Future Serviced Communities (FSC) within HRM: Sandy Lake, Highway 102 West Corridor, Morris Lake Expansion, and Westphal. The land suitability analysis included an evaluation of select biophysical characteristics, a contaminated sites review, and an archaeological and cultural study for each Study Area. The objective of the land suitability analysis was to determine what portions of each Study Area are potentially suitable for new housing development based on these limited characteristics. This analysis, along with other factors, will contribute to informed decision-making regarding future community planning work.

This section discusses the work completed in the Highway 102 Study Area (HSA). The terms “HSA” and “Study Area” are used interchangeably in this section; both refer to the Study Area indicated on Figure 3.1. Note that not all areas within the Study Area (Figure 3.1) are being considered for future development (e.g., if they are privately owned and/or are already developed).

There are many possible ways to evaluate biophysical characteristics and the roles they play in the landscape. The land suitability analysis described in this report is one approach to evaluate biophysical components and the impact they could have on development. Results of the landscape suitability analysis are intended to be considered alongside other study components (e.g., watershed nutrient load modelling, stormwater modelling, transportation studies and engagement activities) to inform the decision-making process for future community planning work. Additional work may be undertaken to further understand the biophysical components of the Study Area as well as potential implications of climate change on future development.

Land suitability analysis is an evaluation of the current landscape and environmental features within that landscape to be able to suggest areas that may be relatively more or less conducive to development considering a wide range of factors. It is acknowledged that climate change may affect some of these factors regarding land suitability in the future. For example, changes in precipitation rates and distribution related to future climate change could, over time, result in changes to surface water hydrology and wetlands and the habitats they support. It could also result in changes to the distribution of rare or uncommon species due to changes to natural habitats and migration patterns. Modelling these changes and related timeframes in localized candidate development areas would be challenging and is beyond the scope of this analysis.

3.1 Overall Study Approach

The land suitability analysis for the HSA included both desktop and field components. Information was also gathered through targeted stakeholder engagement efforts. The desktop component involved a review of existing data for the HSA, including information gathered through previous studies provided by HRM. Desktop sources included:

- Atlantic Canada Conservation Data Centre (AC CDC) data for a 5 km radius around HSA
- Nova Scotia Department of Natural Resources and Renewables (NSDNRR) Forest Inventory data
- NSDNRR Wetland Inventory data (and the Nova Scotia Environment and Climate Change [NSECC] Wetlands of Special Significance [WSS] layer)
- Wet Areas Mapping (WAM) data (Forest Watershed Research Centre, 2012)
- Boreal felt lichen habitat model (Cameron and Neily 2008)
- Aerial imagery and LiDAR data
- The Halifax Green Network Plan (HGNP)
- Blue Mountain – Birch Cove Lakes Comprehensive Study (Stantec 2022)

Stantec also reviewed regional and local studies completed by other organizations, including:

- Wildlife Corridor Landscape Design Charrette Chebucto to Timberlea Sandy Lake area (March 2021). Nova Scotia Crown Share Land Legacy Trust

The reports for these studies offer valuable information; however, supplemental desktop and field work was required to address gaps. In particular, some of these studies lacked field confirmation, particularly related to wetland functional assessments, forest inventory, and additional areas from the previous Archaeology assessment.

In addition to the desktop review, Stantec completed a variety of field surveys (late summer-fall 2023) to collect further information on environmental components and evaluate the potential for areas of cultural significance.

The land suitability analysis addresses the following components:

- Wetland Habitat
- Watercourses and Water Quality
- Forest Habitat and Species at Risk
- Landscape Connectivity
- Surficial and Bedrock Geology
- Topography
- Contaminated Sites
- Areas of Cultural Significance

Note that there were some unsafe and/or inaccessible areas within the HSA. Interactions with the public in proximity to encampments located on site were deemed unsafe by Stantec and were avoided by field staff for the duration of the project. Heavy rain events expanded watercourses and wet areas causing delays in foot access. Alternative access via canoe was utilized to access the Northwest side of the study area.

Sections 3.2 through 3.8 describe desktop and field results followed by details about how each environmental component was evaluated from a land suitability perspective. Suitability for development was generally ranked as follows:

- a score of 1 indicates low suitability for development
- a score of 2 indicates moderate suitability for development
- a score of 3 indicates high suitability for development

Lower scores generally correspond to areas with higher ecological function, making them generally more suitable for conservation purposes and potentially less suitable for development. Conversely, higher scores indicate lands that are potentially less desirable for conservation efforts and potentially more suitable for development. It is important to note that many factors, in addition to those addressed in this section, contribute to suitability for development and/or conservation, including views expressed by members of the public, other stakeholders and Indigenous groups. Therefore, the information presented here should not be viewed in isolation.

Study Area

Utilities
- Transmission Line

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
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Project Location
Halifax Regional Municipality,
Nova Scotia

Prepared by NW on 2023-07-19
Reviewed by MB on 2024-03-18
Revised by NW on 2024-05-29

Fig ID: 160410459_006

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure No.
3.1

Title
Highway 102 West Corridor Study Area (HSA)

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

\\ca0213-pp\fs01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS ProHRM FCM 2022.aprx: HRM_FCM_006 HRM Base Map AerialRevised: 2024-05-29 By: niwhite

3.2 Wetland Habitat

The objective of the wetland evaluation was to determine where wetland habitat exists within the HSA and determine if any Wetlands of Special Significance (WSS) are present. Having a general understanding of where the wetland boundaries are within the HSA will support development planning and guide future wetland evaluations required to support permitting.

Wetland conservation in Nova Scotia is guided by the Nova Scotia Wetland Conservation Policy and supported by regulation under the provincial *Environment Act* and Activities Designation Regulations. The goals of the policy are to have no loss of WSS and to prevent net loss in area and function for other wetlands (Government of Nova Scotia 2011).

Current NSECC guidance indicates that wetland evaluation (i.e., delineation and functional assessment) should be completed in the same year (within 12 months) of permitting application submissions. Considering this guidance and the current stage of planning, wetland evaluation to support permitting applications was not proposed as part of the current scope of work. To inform planning, Stantec instead completed a desktop review and identified potential wetland areas. Subsequent field surveys helped to refine these boundaries.

3.2.1 DESKTOP AND FIELD SUMMARY

The wetland areas presented on Figure 3.2 were developed based on a combination of desktop and field information. Prior to field surveys, preliminary wetland areas were developed using LiDAR and aerial imagery. During field surveys, boundaries of these preliminary wetland areas were verified as they were encountered or adjusted as necessary. Any additional wetlands encountered during field surveys (i.e., that had not been identified through desktop review) were noted. Wetlands in the HSA were categorized by class and type following the Canadian Wetland Classification System (CWCS). Wetland function was evaluated using the Wetland Ecosystem Services Protocol – Atlantic Canada (WESP-AC) method, which consists of both field and office forms (NBDELG 2018). Forty-four wetlands were identified within the HSA and thirty-five of these were evaluated using WESP-AC (Table 3.1). Though attempts were made to evaluate as many wetlands as possible, nine wetlands were not evaluated using WESP-AC due to their proximity to encampments. As per NSECC guidance, further wetland evaluation (i.e., delineation and functional assessment) will be required (prior to construction) to support permitting applications.

Table 3.1 Wetlands in the HSA

Wetland ID	Wetland Class and Type	Approximate Wetland Area (ha)	Evaluated using WESP-AC	WSS1
WL1	Hardwood Treed Swamp	0.27	Yes	No
WL2	Hardwood Treed Swamp	0.47	Yes	No
WL3	Hardwood Treed Swamp	0.31	Yes	No
WL4	Mixedwood Treed Swamp	0.05	Yes	No
WL5	Hardwood Treed Swamp	0.19	Yes	No
WL6	Hardwood Treed Swamp	0.02	Yes	No
WL7	Tall Shrub Swamp	0.39	Yes	No
WL8	Mixedwood Treed Swamp	0.04	Yes	No
WL9	Hardwood Treed Swamp	0.03	Yes	No
WL10	Mixedwood Treed Swamp	0.05	Yes	No
WL11	Mixedwood Treed Swamp	0.02	Yes	No
WL12	Mixedwood Treed Swamp	0.05	Yes	No
WL13	Tall Shrub Swamp	0.14	Yes	No
WL14	Low Shrub Lacustrine Swamp	0.03	Yes	No
WL15	Mixedwood Treed Swamp, Tall Shrub Swamp	0.05	Yes	No
WL16	Mixedwood Treed Swamp, Tall Shrub Swamp	0.41	Yes	No
WL17	Mixedwood Treed Swamp, Tall Shrub Swamp	0.04	Yes	No
WL18	Mixedwood Treed Swamp, Tall Shrub Swamp	0.01	Yes	No
WL19	Low Shrub Swamp	0.17	Yes	No
WL20	Mixedwood Treed Swamp	0.10	Yes	No
WL21	Mixedwood Treed Swamp	0.02	Yes	No
WL22	Lacustrine Fen	0.18	Yes	No
WL23	Mixedwood Treed Swamp	0.12	Yes	No
WL24	Tall Shrub Basin Swamp	0.01	Yes	No
WL25	Mixedwood Treed Swamp, Tall Shrub Swamp	0.13	Yes	No
WL26	Low Shrub Swamp	0.19	Yes	No
WL27	Mixedwood Treed Swamp, Tall Shrub Swamp	0.40	Yes	No
WL28	Mixedwood Treed Swamp	0.35	Yes	No
WL29	Mixedwood Treed Swamp	0.07	Yes	No
WL30	Mixedwood Treed Swamp	0.04	Yes	No
WL31	Mixedwood Treed Swamp	0.28	Yes	No
WL32	Mixedwood Treed Swamp	0.22	Yes	No
WL33	Mixedwood Treed Swamp	0.30	Yes	No
WL34	Mixedwood Treed Swamp	0.07	Yes	No

Table 3.1 Wetlands in the HSA

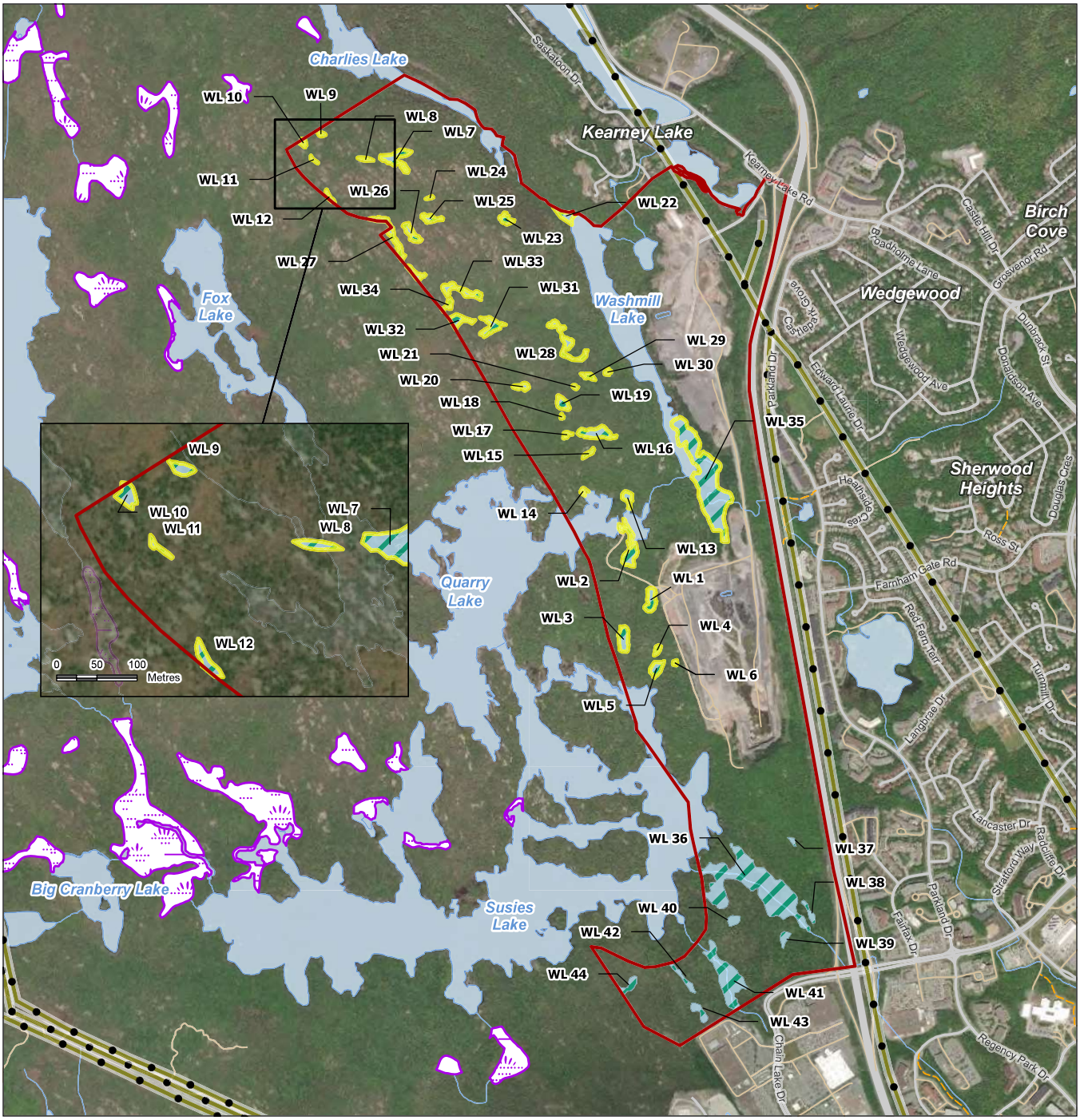
Wetland ID	Wetland Class and Type	Approximate Wetland Area (ha)	Evaluated using WESP-AC	WSS1
WL35	Mixedwood Treed Swamp, Tall Shrub Swamp, Low Shrub Swamp, Freshwater Marsh	3.35	Yes	No
WL36	Low Shrub Swamp, Mixedwood Treed Swamp, Fen	0.42	No	NE
WL37	Mixedwood Treed Swamp	0.05	No	NE
WL38	Mixedwood Treed Swamp	0.14	No	NE
WL39	Mixedwood Treed Swamp	0.14	No	NE
WL40	Coniferous Treed Swamp	0.14	No	NE
WL41	Mixedwood Treed Swamp, Low Shrub Swamp	1.49	No	NE
WL42	Coniferous Treed Swamp	0.19	No	NE
WL43	Mixedwood Treed Swamp	0.21	No	NE
WL44	Mixedwood Treed Swamp	0.21	No	NE

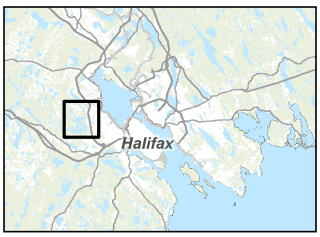
Notes:

[1] – As indicated in the Nova Scotia Wetland Conservation Policy, a wetland can be considered a WSS based on a variety of factors. The information in this column is based on the results of the WESP-AC functional WSS interpretation tool. Further surveys, observations, and/or evaluation could result in any of these wetlands being considered a WSS.

NE – Not Evaluated – these wetlands were not evaluated using WESP-AC and therefore, details of the WESP-AC functional WSS interpretation tool are not available at this time.

WL – Wetland





Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Service Nova Scotia NSTDB; Government of Nova Scotia Environment and Climate Change
3. Background: ESRI 2023

- Study Area
- Wetlands (Stantec, 2023)
- Wetlands Evaluated Using WESP-AC (Stantec, 2023)
- Wetland of Special Significance (NSECC)

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Utilities
- Transmission Line

Other Features
- Waterway
- Waterbody

0 250 500 Metres
(At original document size of 8.5x11)
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Project Location	Prepared by lpodrug on 2024-02-29
Halifax Regional Municipality, Nova Scotia	Revised by NWhite on 2024-10-02
Client/Project	Fig ID: 160410459_011a
Halifax Regional Municipality Future Serviced Communities Background Studies	
Figure No.	
3.2	
Title	
Wetlands in the HSA	

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3.2.2 LAND SUITABILITY ANALYSIS – WETLANDS

The WESP-AC functional assessment method is currently the accepted standardized approach for assessing wetland function in Atlantic Canada. WESP-AC generates scores and ratings for a variety of wetland functions (e.g., water storage, carbon sequestration, habitat characteristics – refer to Table 3.5). The scores and ratings that result from the functional assessment can be used to inform decisions about development near wetlands (NBDELG 2018). WESP-AC includes a functional WSS interpretation tool, to help determine if the wetland should be considered a WSS.

The land suitability analysis for wetlands considered the level of ecosystem function each wetland provides based on the WESP-AC functional assessment results. Wetlands were scored using the WESP-AC results for ecological condition, wetland risk, the composite function score, and the WSS interpretation tool (Table 3.2). Taken together, this evaluation system provides a relative ranking of wetland values in terms of conservation and development potential. Higher conservation values generally resulted in a lower ranking for development suitability with lower conservation values generally resulting in higher suitability for development based on this ranking matrix.

As discussed in Section 3.2.1, not all wetlands in the Study Area could be evaluated using WESP-AC. Wetlands that were not evaluated using WESP-AC were not included in the land suitability analysis.

Table 3.2 Wetlands – Land Suitability Ranking Framework

Inputs	Land Suitability Ranking		
	1 - Low suitability for development	**2 - Moderate suitability for development**	**3 - Higher suitability for development**
WESP-AC Ecological Condition	Higher	Moderate	Lower
WESP-AC Risk	Higher	Moderate	Lower
Land Suitability Function Score[1]	51-40**	39-29	28-17*
WESP-AC Functional WSS Interpretation Tool	None of the 13 wetlands evaluated using WESP-AC were determined to be a WSS using the WESP-AC Functional WSS Interpretation Tool		

Notes:

[1] – Derived from the WESP-AC function (composite score)

*17 is the lowest possible score if all functions are assigned a 1
**51 is the highest possible score

3.2.2.1 Ecological Condition

Wetland ecological condition is determined by the WESP-AC Non-Tidal form for Nova Scotia. It is defined in the WESP-AC Manual as the integrity or health of the wetland as defined primarily by its vegetation composition (because that is the only meaningful indicator that can be estimated rapidly). The tool states that non-tidal wetlands in excellent ecological condition often have no invasive plants and at least one species of conservation concern. Equally, they have little bare ground, no strongly dominant herbaceous or shrub species, may have varied microtopography, and no extensive algal blooms. However, many wetlands perceived to be in excellent condition do not have any of these characteristics (NBDELG 2018). Thus, wetlands with higher ecological conditions are prioritized for avoidance for development as they are more likely to support higher biodiversity compared to lower scoring wetlands.

For each of the 35 wetlands assessed using WESP-AC, a value is calculated for ecological condition which is ranked as Lower, Moderate or Higher through a comparison with calibrated wetlands for the region (Table 3.3). This output value is ranked based on the output status and assigned values of 3, 2 or 1. Wetlands with higher ecological function are assigned a lower value for development suitability, compared to wetlands with lower ecological function, which are assigned a higher suitability for development. Wetlands that could not be evaluated using WESP-AC were not provided a score for ecological condition for this land suitability analysis. The Ecological Condition of the wetlands is mostly moderate, receiving an LSA value of 2 for 19 of 35 wetlands, with only six wetlands of 35 receiving a higher score ranking and as such a low LSA score. The remaining 10 wetlands have a low Ecological Condition score and are thus assigned a higher LSA score.

Table 3.3 Ecological Condition Scores

Wetland ID	Ecological Condition Score	Ecological Condition Ranking	Land Suitability Ranking[1]
WL1	4.78	Moderate	2
WL2	4.78	Moderate	2
WL3	6.52	Moderate	2
WL4	4.78	Moderate	2
WL5	8.26	Higher	1
WL6	4.78	Moderate	2
WL7	8.26	Higher	1
WL8	4.78	Moderate	2
WL9	4.78	Moderate	2
WL10	4.78	Moderate	2
WL11	4.78	Moderate	2
WL12	4.78	Moderate	2
WL13	3.04	Lower	3
WL14	5.36	Moderate	2

Table 3.3 Ecological Condition Scores

Wetland ID	Ecological Condition Score	Ecological Condition Ranking	Land Suitability Ranking[1]
WL15	6.52	Moderate	2
WL16	4.78	Moderate	2
WL17	3.04	Lower	3
WL18	3.62	Lower	3
WL19	3.04	Lower	3
WL20	3.04	Lower	3
WL21	3.04	Lower	3
WL22	7.1	Higher	1
WL23	4.78	Moderate	2
WL24	6.52	Moderate	2
WL25	4.78	Moderate	2
WL26	8.26	Higher	1
WL27	3.62	Lower	3
WL28	8.26	Higher	1
WL29	3.04	Lower	3
WL30	4.78	Moderate	2
WL31	4.78	Moderate	2
WL32	4.78	Moderate	2
WL33	3.04	Lower	3
WL34	3.04	Lower	3
WL35	8.84	Higher	1

Notes:

1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development

3.2.2.2 Wetland Risk

Wetland risk is determined by the WESP-AC Non-Tidal form for Nova Scotia. Wetland risk is defined in the WESP-AC Manual as the average of the wetland sensitivity score and the wetland stressors score. The WESP-AC Manual defines wetland sensitivity as the lack of intrinsic resistance and resilience of the wetland to human and natural stressors (Niemi et al. 1990), including but not limited to changes in water chemistry, shade, frequency and duration of inundation or soil saturation, water depth, biological invasion, habitat fragmentation, and others as described in the USEPA report by Adamus et al. (2001) (NBDELG 2018). Wetland stress is defined as the degree to which the wetland is or has recently been altered by, or exposed to risk from, human-related factors that degrade its ecological condition and/or reduce its capacity to perform one or more of the functions listed in the form (NBDELG 2018).Thus, wetlands with higher risk are relatively more vulnerable to disturbance associated with development and as such should be avoided as areas for development compared to wetlands with more risk tolerance.

For each of the 35 wetlands assessed using WESP-AC, a value was calculated for wetland sensitivity and wetland stressors which were ranked Lower, Moderate or Higher compared to the calibrated wetlands for the region. This output value was ranked based on the output status and assigned values of 3, 2 or 1 (Table 3.4). Wetlands with higher risk (i.e., greater sensitivity) were assigned a lower value (1) for potential development, compared to wetlands with lower risk function. Wetlands that could not be evaluated using WESP-AC were not provided a score for wetland risk for this land suitability analysis. Most wetlands score moderate (19) or higher (15) for wetland risk, receiving a moderate or lower suitability for development. Only WL2 scores lower for wetland risk (i.e., higher for development).

Table 3.4 Wetland Risk Scores

Wetland ID	Wetland Risk Score1	Wetland Risk Ranking	Land Suitability Ranking
WL1	8.53	Higher	1
WL2	3.38	Lower	3
WL3	6.3	Moderate	2
WL4	6.51	Moderate	2
WL5	7.29	Higher	1
WL6	8.65	Higher	1
WL7	7.26	Higher	1
WL8	6.9	Higher	1
WL9	5.99	Moderate	2
WL10	5.11	Moderate	2
WL11	6.48	Moderate	2
WL12	7.26	Higher	1
WL13	5.41	Moderate	2
WL14	4.71	Moderate	2
WL15	6.64	Moderate	2

Table 3.4 Wetland Risk Scores

Wetland ID	Wetland Risk Score1	Wetland Risk Ranking	Land Suitability Ranking
WL16	7.06	Higher	1
WL17	6.3	Moderate	2
WL18	5.69	Moderate	2
WL19	5.24	Moderate	2
WL20	6.48	Moderate	2
WL21	5.8	Moderate	2
WL22	5.94	Moderate	2
WL23	5.92	Moderate	2
WL24	5.79	Moderate	2
WL25	6.78	Higher	1
WL26	7.41	Higher	1
WL27	7.26	Higher	1
WL28	7.22	Higher	1
WL29	7.01	Higher	1
WL30	7.26	Higher	1
WL31	6.51	Moderate	2
WL32	4.72	Moderate	2
WL33	6.17	Moderate	2
WL34	7.02	Higher	1
WL35	7.12	Higher	1

Notes:

[1] - This number is an average of the WESP-AC scores for wetland sensitivity and stressors

1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development

3.2.2.3 Function (Composite Score)

The wetland function (composite score) was calculated using the WESP-AC wetland function scores determined by the WESP-AC Non-Tidal protocol developed for Nova Scotia (Adamus 2018). Functions that are considered in the WESP-AC evaluation are presented in Table 3.5.

While the land suitability analysis for wetlands considers the composite function score, scores for individual functions for each wetland could be reviewed if one or more functions are deemed to be of greater value when considering future development scenarios. For example, the function scores for water storage could be reviewed to understand which wetlands provide that function, and to what degree. The scores for each of the assessed wetlands can be viewed in Table 3.7 and the thresholds for function scores are presented in Table 3.6. Using wetland WL1 as an example, Table 3.7 indicates that this wetland scored a 7.27 for water storage, which (according to Table 3.6) is considered high. WL2, on the other hand, scored a 1.83 for water storage, which is considered low.

Table 3.5 Wetland Functions

Function		Description
WS	Water Storage	The effectiveness of a wetland for storing or delaying the downslope movement of surface water for long or short periods. This potentially influences the height, timing, duration, and frequency of inundation in downstream and downslope areas. Many of the region's wetlands can perform this function.
SFS	Stream Flow Support	The effectiveness of a wetland for prolonging surface water in headwater streams during seasonally dry periods. This is important for fish passage and overall ecological support
WC	Water Cooling	The effectiveness of a wetland for maintaining or reducing the water temperature, primarily in headwater streams. Many of the region's wetlands are capable of performing this function.
SR	Sediment Retention	The effectiveness of a wetland for intercepting and filtering suspended inorganic sediments, allowing their deposition, reducing current velocity, resisting erosion, and stabilizing underlying sediments or soil. Many of the region's wetlands are capable of performing this function.
PR	Phosphorus Retention	The effectiveness for retaining phosphorus for long periods as a result of chemical adsorption complexation, or from translocation by plants to belowground zones or decay-resistant peat such that there is less potential for physically or chemically remobilizing phosphorus into the water.
NR	Nitrate Removal	The effectiveness for retaining particulate nitrate and converting soluble nitrate and ammonia to nitrogen gas, primarily through the microbial process of denitrification, while generating little or no nitrous oxide (a potent “greenhouse gas”).
CS	Carbon Sequestration	The effectiveness of a wetland both for retaining incoming particulate and dissolved carbon, and through the photosynthetic process, converting carbon dioxide gas to organic matter (particulate or dissolved). And to then retain that organic matter on a net annual basis for long periods while emitting little or no methane (a potent “greenhouse gas”).
OE	Organic Nutrient Export	The effectiveness of a wetland for producing, rapidly cycling, and subsequently exporting organic matter, either particulate (detritus) or dissolved, and including net export of nutrients (C, N, P, Si, Fe) comprising that matter. It does not include exports of carbon in gaseous form (methane and carbon dioxide) or as animal matter (e.g., emerging aquatic insects, fish).

Table 3.5 Wetland Functions

Function		Description
FA	Anadromous Fish Habitat	The capacity to support an abundance of native anadromous fish for functions other than spawning.
FR	Resident Fish Habitat	The capacity to support an abundance and diversity of native non-anadromous fish. The model described below will not predict habitat suitability accurately for every species, nor is it intended to assess the ability to restore fish access to a currently inaccessible wetland.
INV	Aquatic Invertebrate Habitat	The capacity to support an abundance and diversity of invertebrate animals which spend all or part of their life cycle underwater, on the water surface, or in moist soil. Includes dragonflies, aquatic flies, clams, snails, crustaceans, aquatic beetles, aquatic worms, aquatic bugs, and others, including semi-aquatic species.
AM	Amphibian & Reptile Habitat	The capacity of a wetland to support an abundance and diversity of native amphibians (frogs, toads, salamanders) as well as turtles.
WBF	Waterbird Feeding Habitat	The capacity to support an abundance and diversity of feeding waterbirds, primarily the migratory species present outside of the usual nesting season.
WBN	Waterbird Nesting Habitat	The capacity to support an abundance and diversity of nesting waterbirds.
SBM	Songbird, Raptor & Mammal Habitat	The capacity to support, at multiple spatial scales, an abundance and diversity of songbirds, raptors, and mammals, especially species that are most dependent on wetlands or water.
POL	Pollinator Habitat	The capacity to support pollinating insects, such as bees, wasps, butterflies, moths, flies, and beetles, and also pollinating birds (hummingbirds and perhaps others).
PH	Native Plant Habitat	The capacity to support, at multiple spatial scales, a diversity of native vascular and non-vascular (e.g., bryophytes, lichens) species and functional groups, especially those that are most dependent on wetlands or water.
Reference: NBDELG 2018		

The score of each of the functions presented in Table 3.5 were evaluated and thresholds were determined, which are described in Table 3.6. The scores were then converted to values of 1, 2 or 3. These values correspond to the output of the WESP-AC model of Higher, Moderate, and Lower, respectively. The sum of these values was calculated for each wetland evaluated by WESP-AC and assigned an overall score (Table 3.7). The scores were then ranked based on suitability for development, with higher functioning wetlands scoring lower in preference for development due to the higher contribution of ecosystem functions provided by these wetlands (Table 3.7).

Table 3.6 Thresholds for Function Scores

Function	Lower if ≤	Higher if ≥
Water Storage (WS)	3.80	7.63
Stream Flow Support (SFS)	1.51	4.62
Water Cooling (WC)	2.04	5.29
Sediment Retention & Stabilization (SR)	3.54	6.44
Phosphorus Retention (PR)	3.00	6.67
Nitrate Removal (NR)	2.76	4.62
Carbon Sequestration (CS)	3.22	6.36
Organic Nutrient Export (OE)	0	7.46
Anadromous Fish Habitat (FA)	0.96	2.87
Resident Fish Habitat (FR)	1.30	5.14
Aquatic Invertebrate Habitat (INV)	3.42	5.43
Amphibian & Reptile Habitat (AM)	3.56	6.67
Waterbird Feeding Habitat (WBF)	0	6.43
Waterbird Nesting Habitat (WBN)	2.36	6.55
Songbird, Raptor, & Mammal Habitat (SBM)	0	7.52
Native Plant Habitat (PH)	0	7.95
Pollinator Habitat (POL)	3.57	6.23

Notes:
Moderate ranking assigned if value falls between the lower and higher threshold value
From WESP-AC Non-Tidal Form 2021: Nova Scotia Normalization Reference Values

Table 3.7 Wetland Function Scores

Wetland ID	WESP-AC Normalised Function Scores[1]																	Land Suitability Function Score[2]	Land Suitability Ranking[3]
	WS	SFS	WC	SR	PR	NR	CS	OE	FA	FR	INV	AM	WBF	WBN	SBM	POL	PH		
WL1	7.27	0.00	7.63	10.0	10.0	10.0	0.00	7.80	0.00	0.00	6.6	4.95	5.60	4.15	7.30	7.89	1.51	35	2
WL2	1.83	3.93	2.67	2.51	1.78	3.74	0.18	9.09	0.00	9.44	2.83	6.86	7.82	4.73	7.36	6.29	2.92	31	2
WL3	0.22	0.00	7.60	3.82	2.86	3.58	4.18	7.86	0.00	0.00	8.36	6.17	6.19	6.98	8.96	8.41	4.86	35	2
WL4	6.85	0.00	5.45	10.0	10.0	10.0	4.46	8.37	0.00	0.00	6.41	5.60	5.84	6.83	8.95	7.94	3.14	38	2
WL5	3.29	4.17	6.85	5.00	3.33	5.17	4.60	10.0	0.00	0.00	8.03	6.15	5.25	6.96	8.89	8.51	3.75	38	2
WL6	8.12	0.00	7.63	10.0	10.0	10.0	4.55	9.33	0.00	0.00	4.09	4.60	4.08	6.90	6.98	9.07	3.73	39	2
WL7	9.26	0.00	0.00	7.86	4.56	10.0	7.82	8.32	0.00	0.00	7.79	3.07	0.00	0.00	6.65	7.63	5.00	33	2
WL8	2.27	3.48	7.55	3.76	3.67	3.97	4.81	10.0	0.00	0.00	7.72	5.16	5.09	6.32	8.86	7.41	4.81	35	2
WL9	5.94	0.00	7.38	10.0	10.0	10.0	5.74	9.22	0.00	0.00	5.84	4.05	4.91	6.50	7.25	8.19	2.88	37	2
WL10	2.79	3.14	6.80	4.29	3.67	4.01	5.38	10.0	0.00	0.00	6.94	5.25	5.74	6.36	8.67	8.24	3.70	36	2
WL11	2.07	3.14	6.63	2.99	4.26	3.71	5.07	10.0	0.00	0.00	7.37	4.31	5.99	6.96	7.40	7.82	3.62	34	2
WL12	6.74	0.00	7.38	10.0	10.0	10.0	5.40	9.20	0.00	0.00	6.01	3.98	5.71	6.88	7.49	8.65	3.46	38	2
WL13	2.71	2.79	6.63	3.58	4.22	3.26	5.01	10.0	0.00	0.00	6.10	4.53	6.16	8.07	7.69	7.59	6.10	36	2
WL14	2.90	3.17	4.38	4.79	3.26	2.94	2.85	10.0	0.00	7.69	6.76	6.70	8.32	10.0	7.15	8.97	3.92	38	2
WL15	4.90	2.09	7.38	5.66	5.06	3.97	6.25	9.75	0.00	0.00	6.43	4.09	4.59	7.74	7.47	9.11	3.70	37	2
WL16	2.27	3.48	7.40	3.76	3.84	3.44	4.89	10.0	0.00	0.00	7.46	5.10	5.79	6.25	9.19	8.25	4.48	36	2
WL17	1.51	3.31	6.75	3.02	4.65	2.51	5.59	10.0	0.00	0.00	6.20	4.23	5.54	6.39	7.67	7.74	5.16	33	3
WL18	2.66	1.98	6.75	3.28	4.88	3.29	5.01	9.89	0.00	0.00	6.43	4.40	5.10	6.39	7.77	8.60	5.24	35	2
WL19	7.36	0.00	7.55	10.0	10.0	10.0	5.79	7.71	0.00	0.00	2.61	2.69	5.30	4.23	8.62	7.66	2.77	34	2
WL20	3.43	2.09	6.63	3.46	3.92	2.66	5.56	10.0	0.00	0.00	6.57	4.17	5.52	6.96	7.27	7.64	3.23	32	3
WL21	6.62	0.00	6.65	10.0	10.0	10.0	4.65	9.32	0.00	0.00	6.53	4.96	5.35	5.96	8.70	7.92	2.85	37	2
WL22	1.48	5.93	6.10	3.84	3.22	4.61	2.25	8.92	0.00	9.17	10.0	8.43	8.34	9.30	9.14	8.47	6.14	41	1

Table 3.7 Wetland Function Scores

Wetland ID	WESP-AC Normalised Function Scores[1]																	Land Suitability Function Score[2]	Land Suitability Ranking[3]
	WS	SFS	WC	SR	PR	NR	CS	OE	FA	FR	INV	AM	WBF	WBN	SBM	POL	PH		
WL23	3.43	2.09	7.38	3.88	4.79	2.69	4.69	10.0	0.00	0.00	7.29	3.99	6.44	7.68	7.62	7.82	4.55	36	2
WL24	6.74	0.00	6.75	10.0	10.0	10.0	4.54	7.90	0.00	0.00	6.70	3.76	5.28	7.16	7.2	8.31	2.41	38	2
WL25	6.74	0.00	7.38	10.0	10.0	10.0	5.35	9.20	0.00	0.00	7.14	3.65	5.23	6.50	7.47	7.84	3.33	36	2
WL26	6.93	0.00	2.90	10.0	10.0	10.0	5.02	7.09	0.00	0.00	3.40	3.04	4.50	5.25	7.20	9.11	3.43	32	2
WL27	6.74	0.00	7.40	10.0	10.0	10.0	5.28	8.91	0.00	0.00	5.75	5.13	5.35	5.96	8.96	8.25	3.46	38	2
WL28	2.72	3.14	6.65	3.58	2.97	2.95	4.98	10.0	0.00	0.00	8.75	5.02	6.04	6.80	9.03	8.59	4.83	36	2
WL29	6.74	0.00	6.63	10.0	10.0	10.0	4.67	9.32	0.00	0.00	5.42	4.04	5.52	6.77	7.18	8.02	3.23	37	2
WL30	7.41	0.00	5.30	10.0	10.0	10.0	4.74	8.58	0.00	0.00	6.41	5.19	5.01	6.60	8.98	8.22	4.56	40	1
WL31	2.31	3.14	5.30	3.76	3.67	3.94	4.75	10.0	0.00	0.00	6.58	5.31	5.52	6.32	8.94	7.94	4.70	35	2
WL32	2.79	3.14	6.80	4.29	3.67	3.92	4.25	10.0	0.00	0.00	6.30	5.31	5.30	6.17	8.88	8.34	4.78	36	2
WL33	3.43	2.09	7.38	3.64	4.67	3.30	5.31	10.0	0.00	0.00	5.31	3.79	5.35	6.69	7.49	8.44	3.17	34	2
WL34	3.43	2.09	7.38	3.28	4.67	3.19	5.31	10.0	0.00	0.00	6.36	3.78	5.35	6.31	7.25	6.84	2.46	32	2
WL35	3.31	1.76	3.58	4.20	3.23	4.65	3.61	9.11	0.00	7.42	5.85	8.73	9.31	9.20	9.40	8.77	6.27	41	1

Notes:

1 – The normalised function scores (found in the scores tab of each WESP-AC form) are summarized here for the 35 wetlands evaluated using WESP-AC. The values were categorized as higher, moderate, lower according to the thresholds presented in Table 3.6

2 – The land suitability function score is the sum of the functions scores after they have been converted to higher (1), moderate (2), or lower (3).

3 – The land suitability ranking is based on the land suitability function scores.

1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development

3.2.2.4 Summary and Recommendations

Forty-four wetlands were identified in the HSA using the approach described in Section 3.2.1. Due to the constraints discussed in Section 3.2.1, thirty-five of the forty-four wetlands in the Study Area were evaluated using WESP-AC and are included in the land suitability analysis. The land suitability analysis for wetlands considered the level of ecosystem function each wetland provides based on the WESP-AC functional assessment results. Wetlands were scored using the WESP-AC results for ecological condition, wetland risk, the composite function score, and the WSS interpretation tool. These results are summarized in Table 3.8 and presented on Figure 3.3.

Table 3.8 Wetlands – Land Suitability Rankings

Wetland ID	Land Suitability Ranking			Average LSA Score[1]
	Ecological Condition	Wetland Risk	Function	
WL1	2	1	2	1.6
WL2	2	3	2	2.3
WL3	2	2	2	2
WL4	2	2	2	2
WL5	1	1	2	1.3
WL6	2	1	2	1.6
WL7	1	1	2	1.3
WL8	2	1	2	1.6
WL9	2	2	2	2
WL10	2	2	2	2
WL11	2	2	2	2
WL12	2	1	2	1.6
WL13	3	2	2	2.3
WL14	2	2	2	2
WL15	2	2	2	2
WL16	2	1	2	1.6
WL17	3	2	2	2.3
WL18	3	2	2	2.3
WL19	3	2	2	2.3
WL20	3	2	2	2.3
WL21	3	2	2	2.3
WL22	1	2	1	1.3
WL23	2	2	2	2
WL24	2	2	2	2
WL25	2	1	2	1.6

Table 3.8 Wetlands – Land Suitability Rankings

Wetland ID	Land Suitability Ranking			Average LSA Score[1]
	Ecological Condition	Wetland Risk	Function	
WL26	1	1	2	1.3
WL27	3	1	2	2
WL28	1	1	2	1.3
WL29	3	1	2	2
WL30	2	1	1	1.3
WL31	2	2	2	2
WL32	2	2	2	2
WL33	3	2	2	2.3
WL34	3	1	3	2.3
WL35	1	1	1	1

Notes:
1 – Average Land Suitability Analysis (LSA) Score is rounded to the nearest decimal

1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development

Wetlands that were not evaluated using WESP-AC are shown in grey on Figure 3.3. Note that while the WESP-AC functional WSS interpretation tool was included as a component of the analysis, none of the 35 wetlands evaluated using WESP-AC were determined to be WSS using that method. Wetlands not evaluated using WESP-AC will require further wetland evaluation if these wetlands are to be considered in the land suitability analysis.

Wetlands represent an important constraint for any development in Nova Scotia. Conservation of wetlands in the province is guided by the Nova Scotia Wetland Conservation Policy and supported by regulation under the provincial *Environment Act* and Activities Designation Regulations. The goals of the policy are to have no loss of WSS and to prevent net loss in area and function for other wetlands (Government of Nova Scotia 2011). The policy states that the following 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
- wetlands known to support at-risk species as designated under the federal SARA or the NS ESA
- wetlands in designated protected water areas as described within Section 106 of the Environment Act

Support/approval for alteration of a WSS will only be considered when the alteration is required to maintain, restore, or enhance a WSS, or if the alteration is deemed to provide necessary public function (Government of Nova Scotia 2011). While none of the wetlands in the HSA evaluated using WESP-AC (i.e., 35 out of 44) were determined to be WSS, there are multiple factors that can result in a wetland being considered a WSS and further work and/or consultation with regulators may result in any of the wetlands within the HSA being considered a WSS.

As indicated in the Policy, wetland conservation is achieved by considering the mitigative sequence (avoidance, minimization, compensation). This sequence should be considered during the planning and design stage of any development.

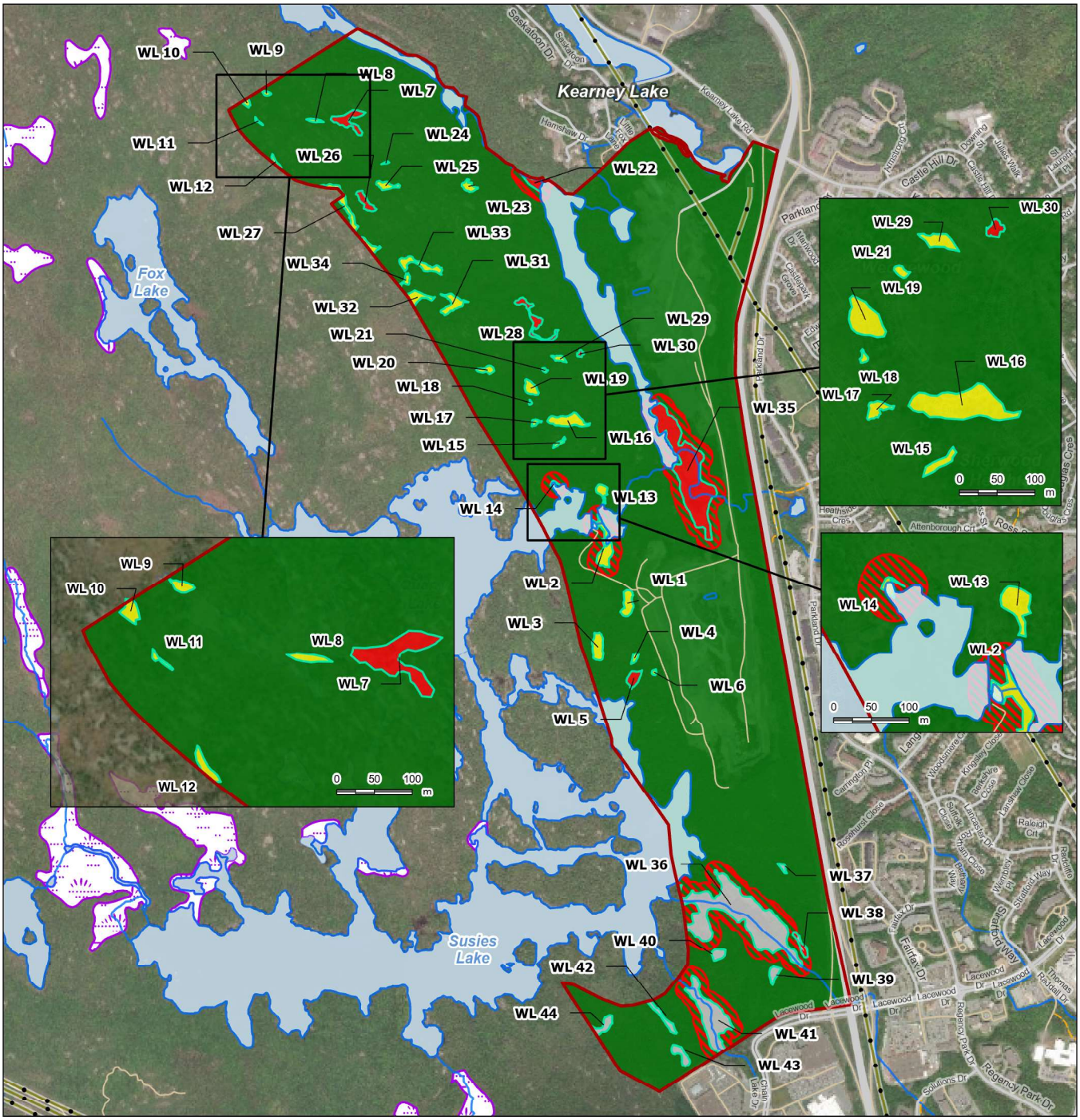
The first step in the sequence (and the priority) is avoidance. This option involves avoiding alteration to wetlands, forcing the consideration of alterative options for the project that may result in fewer impacts to wetlands. If no other alternative option exists, minimization is recommended, meaning that any unavoidable impacts to the wetland be managed in such a way that adverse impacts are reduced. This can be accomplished through specific techniques, materials, and/or site choice. Compensation is required for any permanent loss of wetland area or function. Compensation can be in the form of restoration, enhancement, creation and/or expansion of a wetland ecosystem. The amount of compensation necessary is determined by NSECC and ranges from 1 to 4 ha for every 1 ha of wetland altered, depending on the compensation approach and the relative ecological/social value.

Stantec recommends engaging with NSECC as early as possible to discuss potential wetland impacts (direct or indirect), the permitting process, and compensation requirements (e.g., potential opportunities for wetland restoration, enhancement, or creation).

Once a construction timeline has been established, complete wetland evaluations (i.e., delineation and functional assessment) will likely be required to support permitting applications for wetlands that could be impacted by development. NSECC guidance indicates that wetland evaluation should be conducted during the growing season (June 1 to September 30) and within the same year that the application for alteration approval is submitted.

The land suitability analysis for wetlands is based on the WESP-AC results for ecological condition, wetland risk, the composite function score, and the WSS interpretation tool (Table 3.2). As discussed in Section 3.2.2.3, specific wetland functions may need to be considered in more detail depending on proposed development scenarios and results from other studies. When applying the mitigative sequence for decision making (i.e., avoidance, minimization, compensation, discussed above), avoidance should be a priority where larger areas of contiguous wetland habitat have been identified. Areas such as this are also considered in landscape connectivity planning (refer to Section 3.5). Additional consideration was taken when scoring wetlands to manually adjust the weighting of policy-protected constraints including established environmental buffers such as a 30 m wetland setback for wetlands intersected by watercourses. This is portrayed by the red hatching in Figure 3.3. Per the mitigative sequence, areas outside delineated wetlands are considered to have higher suitability for development, since development in these areas would avoid impacting wetlands.

The land suitability analysis represents one evaluation technique that can help prioritize areas for development and/or conservation. Within Nova Scotia there are regulatory processes and policies in place relating to wetlands and their conservation including the *Activities Designation Regulations* made under Section 66 of the *Environment Act*, Nova Scotia Wetland Conservation Policy and the Federal Policy on Wetland Conservation. These include aspects such as the prevention of a net loss of wetland area and function and the designation of wetlands of special significance based on wetlands that play particularly important roles in providing ecosystem services or functions (e.g., supporting rare or migratory species, protecting drinking water supplies, maintaining watershed health).



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia (Service Nova Scotia and Internal Services, Environment and Climate Change)
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

- Study Area
- Wetlands (Stantec, 2023)
- Wetland of Special Significance (NSECC)
- Setback on Wetlands Contiguous with Watercourses (30 m)

Land Suitability Score
- 3 (High)
- 2
- 1 (Low)
- No Score

Utilities
- Transmission Line

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody

0 250 500 Metres
(At original document size of 8.5x11)
1:21,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-20
Revised by NWhite on 2024-08-29

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_006

Figure No.
3.3

Title
Wetlands in the HSA with Required Setbacks – Land Suitability Analysis

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3.3 Watercourses and Water Quality

Watercourses are defined in the Nova Scotia *Environment Act* to include "the bed and shore of every river, stream, lake, creek, pond, spring, lagoon, or other natural body of water – whether it contains water or not". Desktop mapping of watercourses within the HSA took place in spring 2023, with field verification of select watercourses completed concurrent with the water quality sampling between May and November. Stantec considered an aquatic feature a watercourse if:

- a watercourse was shown on a National Topographic Series (NTS) map;
- recent satellite imagery showed evidence of a watercourse channel; or
- field characteristics such as flowing water and clearly defined physical features such as substrate, bed, banks, aquatic vegetation, or aquatic animals were observed.

The objectives of the watercourses and water quality section of the land suitability analysis was to:

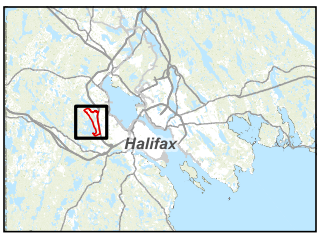
- identify watercourses present within the HSA using field and desktop methods
- describe the aquatic habitat in the watercourses within the HSA
- establish baseline water quality using historical and recently collected field data, and
- establish criteria to determine land suitability in relation to watercourses and water quality

3.3.1 DESKTOP AND FIELD SUMMARY

Stantec completed a desktop inventory of watercourses using LiDAR, aerial imagery, and flow accumulation mapping (also known as wet areas mapping; Figure 3.4). The wet areas mapping indicates depth to water table and can be used to predict what areas may accumulate surface water in watercourses and wetlands. Wet areas mapping was used to inform water sampling location only and did not play a direct influence on land suitability analysis due to its lack of accuracy in the data set. Section 3.6.3 provides additional desktop data on existing ground water wells in the area. Figure 3.4 also indicates regional watersheds.

The watercourses in this desktop inventory were verified during field surveys conducted concurrently with the 2024 water quality sampling program. At each location where a watercourse was sampled for the water quality sampling program the following information was collected:

- Channel and wetted width
- Water depth
- Substrate composition
- Bank description
- Functional in-water and riparian vegetation cover



Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Water Sampling Locations

Water Table Depth (metres)

- 0 - 0.10 m
- 0.11 - 0.50 m
- 0.51 - 2 m
- > 2m

Watershed Context Lands

- Kearney Run
- Nine Mile River
- Shore Direct

Other Features

- Waterway
- Waterbody
- Designated Wetland of Special Significance
- Wetland (NSECC)

Utilities

- Transmission Line

Transportation

- Highway
- Road
- Resource / Seasonal Road
- Trail
- Study Area

0 250 500 Metres

(At original document size of 8.5x11)
1:23,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by IProdrug on 2024-03-06
Revised by SChubbs on 2024-05-14
Reviewed by MB on 2024-03-18

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_009

Figure No.
3.4

Title
Watershed and Wet Area Mapping in the HSA

\\Ca0213-ppfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM FCM 2022.aprx: HRM_FCM_009 Fig 3.4 Water Quality LocationsRevised: 2024-05-14 By: schubbs

3.3.1.1 Watercourses

The HSA is located within a portion of the Kearney Run Watershed and contains Washmill Lake and a portion of Quarry Lake, Susies Lake (commonly referred to as Birch Cove Lakes), and Charlies Lake. The watercourses and waterbodies within the HSA flow into Washmill lake before leaving the HSA and flowing into Kearney Lake which eventually discharges into the marine environment of the Bedford Basin via Paper Mill Lake.

Preliminary mapping identified six mapped watercourses, and four mapped waterbodies. All six of the mapped watercourses were confirmed during the water quality monitoring program and each contained at least one surface water monitoring station, while three of the mapped waterbodies were sampled (Figure 3.4).

Washmill Lake (SW-19) is located centrally in the HSA with a surface area of 7.5 ha. Charlies Lake is located to the north and is only partially contained within the HSA. The total surface area of Charlies Lake is 5.5 ha. Located on the western boundary of the HSA and only partially located within the HSA the Birch Cove Lakes (SW-20 and SW-22) have a surface area of 120 ha.

SW-17 is located on the unnamed watercourse on the northern end of the HSA that is fed from Charlies Lake. The watercourse flows through wetland WL22 before entering Washmill Lake.

SW-18 is located on Little Fox Brook at the point where the brook flows past the HSA border and into Kearney Lake. SW-18 is the sample location located the furthest downstream in the watershed; all lakes and watercourses within the HSA drain out through the Little Fox Brook.

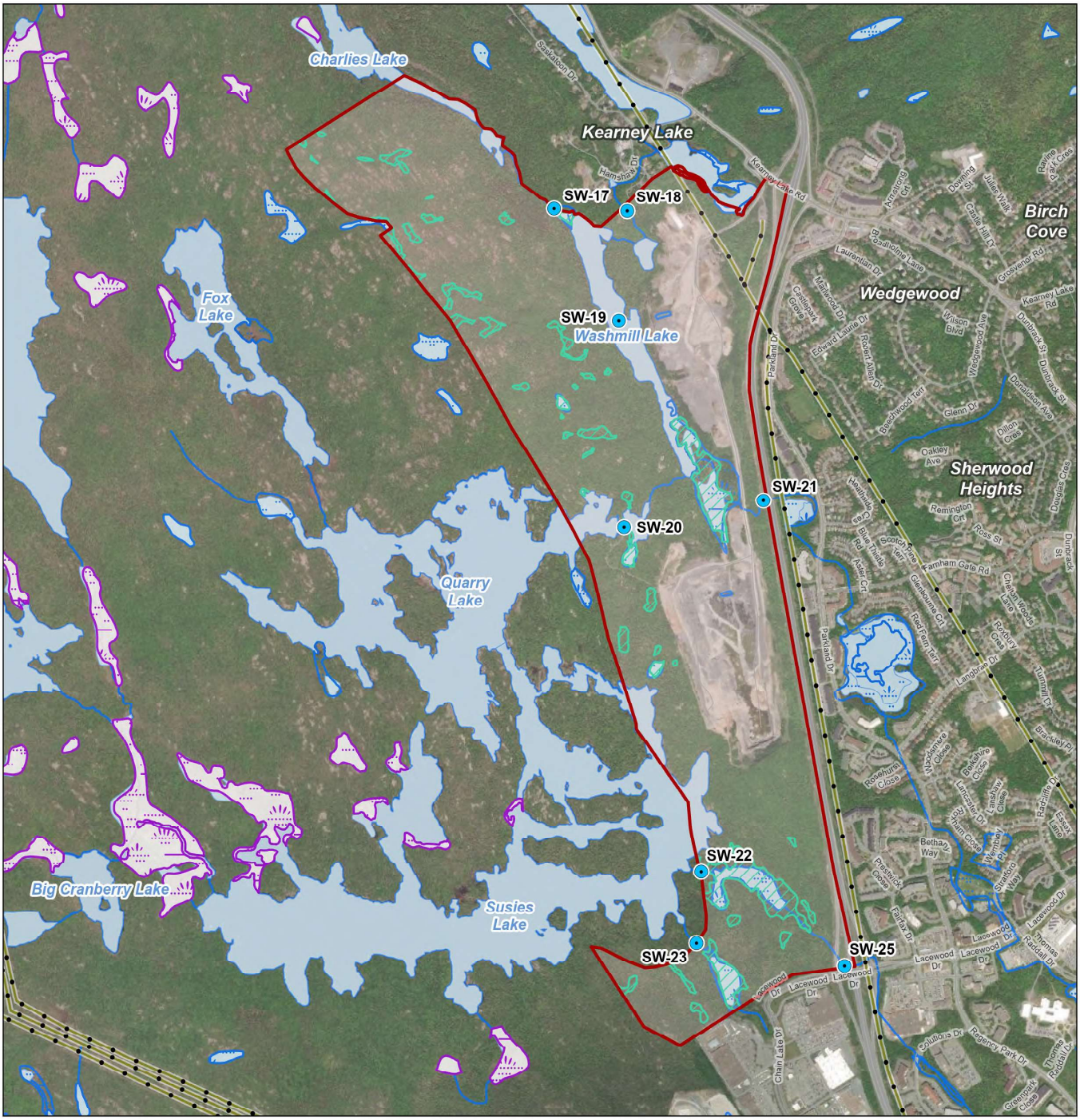
SW-19 is located at the deepest point of Washmill Lake at the center of the HSA. Washmill Lake is fed from Birch Cove Lake and Charlies Lake.

SW-20 is located downstream of the dam on Quarry Lake. The sampling location is located within wetland WL2 before the watercourse opens into an unnamed body of water.

SW-21 is located on an unnamed watercourse on the eastern border of the HSA. The headwaters originate approximately 600 meters east of the HSA in Belchers Pond. This watercourse flows through wetland WL35 before entering Washmill Lake.

SW-22 and SW-25 are on an unnamed watercourse that crosses the southern part of the HSA flowing from east to west from under Hwy 102 into Susies Lake. The watercourse is partially fed from overland drainage associated with development on Lacewood Drive. Within the HSA this watercourse flows through wetland WL36.

SW-23 is located at the southernmost part of the HSA. The watercourse is fed from the Bayers Lake stormwater drainage system. This watercourse flows through wetland WL41 before entering Susies Lake.



- Water Sampling Location
- Waterway
- Waterbody
- Wetlands (Stantec, 2023)
- Wetland (NSECC)
- Wetland of Special Significance (NSECC)
- Study Area

Utilities
- Transmission Line

Transportation
- Highway
- Road

0 250 500 Metres
(At original document size of 8.5x11)
1:23,000

N

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2023-07-19
Revised by NWhite on 2024-07-25

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_008

Figure No.
3.5

Title
Watercourse Mapping and Surface Water Sampling Locations in the HSA

3.3.1.3 Fish and Fish Habitat

The Birch Cove Lakes and Kearney Lake have been used for sport fishing and contain white sucker (*Catostomus commersoni*), brook trout (*Salvelinus fontinalis*), yellow perch (*Perca flavescens*), golden shiner (*Notemigonus crysoleucas*), brown bullhead (*Ameiurus nebulosus*), brown trout (*Salmo trutta*) (Department of Fisheries and Oceans [DFO] 1986, NSFA 2009). Despite the large number of lakes upstream the HSA supports a limited community of freshwater fish (EDM 2006). Conservation organizations comprised of trout anglers are working to protect and enhance aquatic habitats and wild trout population in the Birch Cove Lakes area. The trout population in the Birch Cove Lakes is low but believed to be healthy (Jacques Whitford 2008). While fish community surveys were not conducted as part of this analysis, potential fish presence was based on watercourse characteristics, including water levels, channel geometry, water quality and connectivity to watercourses downstream with known fish populations.

Prior to the development of lands within the HSA, it is recommended that dedicated fish habitat assessments be conducted to determine the use of habitats by fish and to provide data to fulfill applicable regulatory requirements at the time of construction.

All the watercourses encountered from desktop and field surveys drain into Kearney Lake. Connectivity is sufficient to provide fish passage into the drainage areas above Kearney Lake and below Birch Cove Lakes. Therefore, the watercourses within the HSA are expected to contain a fish community which contains white sucker, brook trout, yellow perch, brown bullhead, and brown trout.

Physical watercourse characteristics were collected during the water quality sampling program. Table 3.9 outlines the results of the watercourse assessments for the six watercourses confirmed in the field.

Table 3.9 Physical Watercourse Characteristics – HSA

Watercourse	Channel Width (m)	Wetted Width (m)	Substrate Composition	Riparian Habitat Description
SW-17	1.0 to 1.5	0.8 to 1.5	Fine and organic material	Grassy overhanging banks with woody shrubs and predominantly coniferous mixed wood forest. At points contiguous with wetlands.
SW-18 (Little Fox Brook)	3.7 to 5.5	3.5 to 5.0	Boulder sized rock with smaller amounts of rubble and cobble.	Grassy low-lying banks with woody shrubs and predominantly deciduous mixed wood forest.
SW-19 (Washmill Lake)	75 to 100	75 to 100	Organics and fines	Grassy low-lying banks with boulders, woody shrubs and predominantly deciduous mixed wood forest.
SW-20	2.3 to 4.0	2.0 to 3.5	Boulder and rubble sized rocks with smaller amounts of cobble	Bare rock with minimal woody vegetation.
SW-21	1.3 to 3.2	1.1 to 3.0	Rubble sized rock with smaller amounts of cobble and fines.	Grassy/bare low-lying banks with woody shrubs and predominantly young deciduous mixed wood forest.

Table 3.9 Physical Watercourse Characteristics – HSA

Watercourse	Channel Width (m)	Wetted Width (m)	Substrate Composition	Riparian Habitat Description
SW-22	0.8 to 1.9	0.5 to 1.5	Rubble sized rock with smaller amount of cobble and fines	Grassy low-lying banks with woody shrubs and predominantly deciduous mixed wood forest. At points contiguous with wetlands.
SW-23	1.2 to 2.8	1.0 to 2.5	Rubble sized rock with smaller amount of boulder and cobble	Grassy low-lying banks with woody shrubs and predominantly deciduous mixed wood forest. At points contiguous with wetlands.
SW-25 (constructed ditch)	1.1 to 1.6	1.0 to 1.5	Ruble sized rock with smaller amounts of boulder	Grassy/bare banks. Surrounded by roads
Notes: Boulder = >259 mm; Rubble = 100 mm to 250 mm; Cobble = 15 mm to 100 mm; Gravel = 5 mm to 15 mm; Sand = 0.02 to 2 mm; Fines = <0.02 mm				

3.3.1.4 Water Quality

Information on surface water quality for the HSA was obtained using historical water quality reports from projects in the area, as well as field-based data collected monthly from April 2023 to November 2023. The majority of the historical water quality monitoring in the HSA has been performed in the lakes within the Birch Cove Lakes area, namely Susies Lake, Washmill Lake, and Quarry Lake. This monitoring has taken place on an irregular basis since 1980. DFO included Susies Lake and Quarry Lake in their synoptic water quality monitoring program measured once every 10 years. Table 3.10 presents data sources used to infer historical water quality in the HSA for this report. As shown in Table 3.10, historical monitoring of the HSA has been infrequent until the field-based monitoring by Stantec in 2023.

Table 3.10 Historical Water Quality Data Sources

Organization	Sampling Location	Period of Record	Number of Samples	Parameters Sampled
DFO	Susies Lake, Quarry Lake	1980, 2000, 2011, 2021	1 per site per year sampled for a total of 4 per site	Alkalinity, Aluminum, Ammonia, Arsenic, Calcium, Chloride, Chlorophyll-a, Color, Conductivity, Copper, Dissolved Organic Carbon, Iron, Magnesium, Manganese, Nitrate, pH, Potassium, Silica, Sodium, Sulphate, Total nitrogen, Total Phosphorus, Zinc
AECOM	Susies Lake, Washmill Lake, Quarry Lake	2011	4 per site	TSS, Total Phosphorus, Total coliform, e. coli, nutrients, inorganics
Porter Dillon	Susies Lake, Quarry Lake, Washmill Lake	1994-1995	Once per season per site	General chemistry, metals, chlorophyll-a, Total Phosphorus, Chloride,

Table 3.10 Historical Water Quality Data Sources

Organization	Sampling Location	Period of Record	Number of Samples	Parameters Sampled
HRM Lake Watchers	Susies Lake	2021 and 2022	Once in Spring (April/May) and once in late summer (August)	Color, E.coli (counts), Total Phosphorus, Chlorophyll-a, Chloride, total metals
Stantec	HSA – 8 locations across the study area including Washmill Lake, Washmill Lake Deep Zone, Quarry Lake outlet, Little Belchers pond outlet, Little Fox Brook, Washmill Lake outlet, 3 Tributaries to Susie's Lake	2023	Monthly from April to November	Total phosphorous, Dissolved chloride, Turbidity, Colour, Total suspended solids, and E.coli (counts)

Historically, water quality in the HSA is low in alkalinity (<10 mg/L) and has neutral pH (values ranging between 6.45 to 7.36). Total phosphorus values ranged from 2 ug/L to 13 ug/L between 1980 and 2021, with a median concentration over this timeframe of 9 ug/L which is indicative of oligotrophic conditions. Potential sources of phosphorous within the watershed are primarily anthropogenic including nearby subdivisions and the commercial area of Bayers Lake. The median dissolved chloride concentration from 1980 to 2021 was 55 mg/L in the lake systems indicative of the relatively undeveloped watershed areas within the Birch Cove Lakes wilderness areas.

Water quality sampling for this Project began in April 2023 and continued monthly in the HSA until November 2023 at the stations shown in Figure 3.5 with the Washmill Lake station located within a deepwater basin. Laboratory analysis of bacteria, total suspended solids (TSS), Total Phosphorus, turbidity, colour, and chloride was conducted on each sample with water quality results presented in Table 3.11.

Lake water quality has lower concentrations of microbiological parameters compared to watercourse systems due to the assimilative capacity of the lakes (Table 3.11). The average total phosphorous values for the Washmill Lake (SW-19) and Quarry Lake outlet (SW-20), are within the range of historical total phosphorous values observed in these systems. The SW-25 sample is located in a section of stream located next to an exit-ramp of Hwy-102 and receives overland runoff from development on Lacewood Drive, and as a result has a higher concentrations of chloride and total phosphorous compared to the other stream sites which are located within undeveloped areas. Chloride concentrations at SW-21, SW-22, SW-23 and SW-25 were also observed to be the highest over the sampling period. The mean chloride values for these four sampling sites (SW-21, SW-22, SW-23, and SW-25) exceed the CCME CWQG-FAL value of 120 mg/L.

Table 3.11 Mean Water Quality Results from the HSA collected during 2023

	Units	CCME CWQG-FAL	Value	SW-17	SW-18	SW-19	SW-20	SW-21	SW-22	SW-23	SW-25	Washmill Lake
Microbiological												
Escherichia coli	CFU / 100mL	-	Mean	227	295	57.5	80	112	180	96	87	123
			Median	85	120	55	80	90	140	100	40	40
			Max	700	900	100	150	300	400	120	200	400
			Min	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total Coliforms	CFU / 100mL	-	Mean	714	420	385	168.3	726.25	727	1317	715	324
			Median	610	310	300	205	570	750	1200	605	200
			Max	1700	1300	700	280	1300	1200	2100	1700	900
			Min	<100	<100	<100	<100	<100	<100	<100	<100	<100
Inorganics												
Dissolved Chloride (Cl-)	mg/L	120	Mean	6.8	40.6	42.4	37.4	146	143.8	357.1	218.6	40
			Median	4.35	37	38.5	35.5	103	120	300	200	35
			Max	26	60	64	54	340	290	580	380	63
			Min	2.3	25	26	24	49	66	180	89	23
Colour	TCU	Narrative[a]	Mean	40.1	50.75	50.5	56.25	27.5	29.4	33.9	32.3	53.2
			Median	37	49	48	56	26	26	32	38	54.5
			Max	79	74	74	78	45	54	73	47	79
			Min	19	29	30	35	13	5.1	9.5	12	28
Total Phosphorus	mg/L	Trigger Ranges[b]	Mean	0.008	0.005	0.006	0.004	0.01	0.006	0.009	0.092	0.031
			Median	0.009	0.005	0.004	0.004	0.01	0.006	0.01	0.0775	0.019
			Max	0.011	0.005	0.01	0.005	0.013	0.007	0.011	0.17	0.098
			Min	0.005	0.004	0.004	0.004	0.007	0.006	0.007	0.023	0.004
Total Suspended Solids (TSS)	mg/L	-	Mean	6.35	1.47	1.15	1.8	1.12	1.9	4.4	2.5	22.9
			Median	2.3	1.2	1.0	1.8	1.2	1.6	2.4	2.3	5.3
			Max	19	2.8	1.6	2.4	1.2	3.0	9.8	3.8	100
			Min	1.8	1.0	1.0	1.2	1.0	1.4	1.0	1.6	1.2

	Units	CCME CWQG-FAL	Value	SW-17	SW-18	SW-19	SW-20	SW-21	SW-22	SW-23	SW-25	Washmill Lake
Turbidity	NTU	Narrative[c]	Mean	0.82	0.99	0.945	0.86	0.82	1.18	1.70	2.52	4.52
			Median	0.47	0.925	0.85	0.625	0.79	1.225	1.305	2.25	2.3
			Max	1.7	1.8	1.7	2.4	1.7	2.1	4.1	4.6	13
			Min	0.31	0.45	0.61	0.44	0.27	0.35	0.36	0.78	0.64

Notes:

[a] – TCU Shall not be significantly higher than the seasonally adjusted expected value for the system under consideration (CCME 2004)

[b] – Guidance framework provides Trigger Ranges for Total Phosphorous (ug/L). See Guidance Framework for Phosphorous Factsheet (CCME 2004)

[c] – Maximum increase of 8 NTU from background levels at any one time when background levels are between 8 and 80 NTU.

3.3.2 LAND SUITABILITY ANALYSIS – WATERCOURSES AND WATER QUALITY

The land suitability analysis for watercourses and water quality considered that development within watercourses is generally regulated, provincially and federally. Provincially, the Nova Scotia *Environment Act* provides the overall authority to protect watercourses. Any activity that changes a watercourse, a water resource, or the flow of water therein requires an approval or a notification in accordance with the Activities Designation Regulations. Before any work can be done, an activity requires either an approval from NSECC or a notification to the Department for minor works.

Fish habitat is a significant and important component of aquatic habitat found in watercourses. In addition to provincial watercourse alteration requirements, Fisheries and Oceans Canada (DFO) is responsible, under the *Fisheries Act* and the SARA, for ensuring protection of fish and fish habitat. The federal *Fisheries Act* defines fish habitat as “water 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.

Physical works within the watercourses are regulated by provincial and federal acts. Water quality is regulated under the provincial *Environment Act*, as well as the federal *Fisheries Act* where there are prohibitions against pollution, specifically termed deleterious substances. Within the *Fisheries Act* a deleterious substance “can be any substance that, if added to any water, would degrade or alter the water quality such that it could directly or indirectly harm fish, fish habitat, or the use of fish by humans.” Stormwater discharges are also managed in accordance with the Halifax Stormwater Management Standards for Development Activities (Halifax Regional Municipality 2020). Setbacks from watercourses are provided in the Halifax Mainland Land Use By-Laws (Halifax Regional Municipality 2024).

To protect aquatic ecosystems, the land suitability analysis considered riparian zones in addition to the bed and banks of the watercourse. Riparian zones are areas adjacent to watercourses, which are ecologically and geomorphologically diverse landscapes. Riparian zones provide a buffer that protects the watercourse from the impacts of adjacent development. In urban environments riparian zones also reduce the severity of flooding on adjacent lands.

Considering the ecological value associated with watercourses and their riparian habitats, values were assigned to the lands within the HSA based on distance to the watercourse and termed ‘ecological zones’ (Table 3.12). Areas located within 30 m of a watercourse were considered to have low suitability for development. Areas between 30 m and 100 m from a watercourse were considered to have moderate suitability for development while areas greater than 100 m from a watercourse were considered to have higher suitability for development.

The objective was to provide suitable areas for development while retaining watercourse function and potential habitat quality for fish. The ecological zones were established based on watercourse setbacks and buffer of 30 m proposed in the Regional Plan review process (Halifax Regional Municipality 2024). Wider buffers are more effective at filtering contaminants, encouraging infiltration and providing diversity of habitat (Collison and Gromack 2022). Buffer widths beyond the minimum standard should be evaluated on a case-by-case basis taking into account local site conditions and community needs.

Considering the effective width varies with soil type, slope, watercourse size, ecological habitat function and vegetative cover the 30 m setbacks proposed under the Regional Plan review are considered the minimum criteria levels and additional buffer width may be implemented during the Planning or Subdivision Approval process.

The land suitability analysis seeks to conserve the following ecological functions of watercourses:

- aquatic habitat which considers the value watercourses play in providing habitat for fish and other aquatic species
- water quality which has two aspects: the provision of suitable habitat for aquatic species and the intrinsic value for local residents

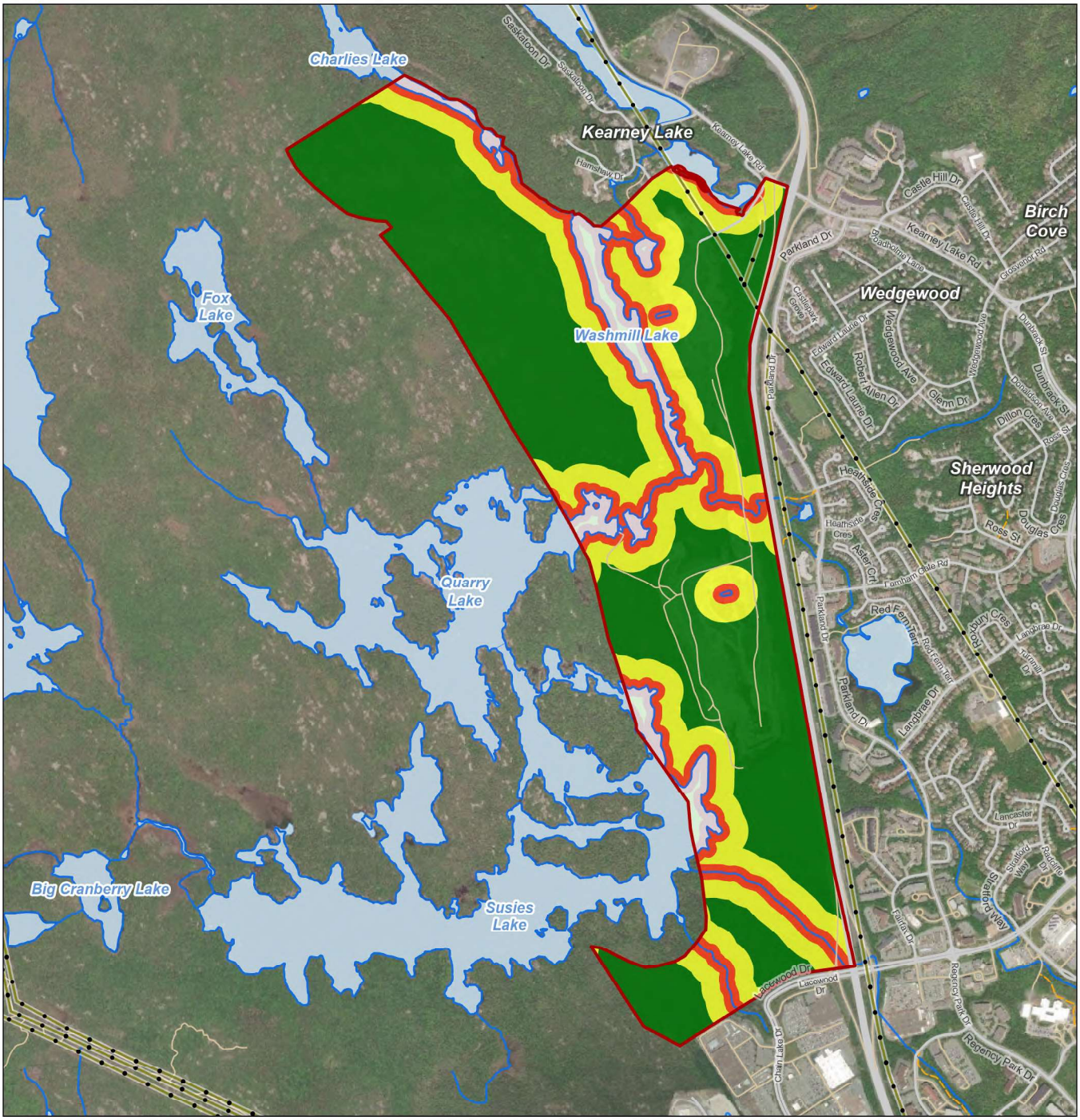
Areas immediately surrounding watercourses provide the greatest amount of riparian and aquatic habitat. Land considered to have low suitability for development was determined to be areas within 30 m of mapped and field identified watercourses. Land that extends from 30 m to 100 m from a watercourse is considered to have moderate suitability for development. Land with higher suitability for development is considered to be great than100m from watercourses as developing these areas would protect the greatest amount of riparian and aquatic habitat and therefore have a higher suitability for development (Table 3.11).

This process culminated in the creation of a map (Figure 3.6) that illustrates the land suitability rating related to development suitability and general development constraints. A lower score for land suitability for development generally corresponds with higher ecological and social value.

Note that recommendations for landscape connectivity have also considered the location of watercourses in the Study Area (refer to Section 3.5). If construction will impact watercourse bed and banks within the LSA Stantec recommends additional fish and fish habitat surveys be completed in compliance with the provincial and federal regulations pertaining to watercourse alteration permitting and the alteration of fish habitat.

Table 3.12 Watercourses and Water Quality– Land Suitability Ranking Framework

Layer	Land Suitability Ranking		
	1 - Low suitability for development	**2 - Moderate suitability for development**	**3 - Higher suitability for development**
Water-courses	Areas within 30 m of mapped and field identified watercourses consistent with recommendations in the Regional Plan Review Process	Areas that extend from 30 m to 100 m from a watercourse	Areas that are greater than 100 m from watercourses



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Study Area

Land Suitability Score
- 3 (High)
- 2
- 1 (Low)

Utilities
- Transmission Line

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody

0 250 500 Metres
(At original document size of 8.5x11)
1:23,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-08
Revised by NWhite on 2024-05-30

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_031

Figure No.
3.6

Title
Watercourses in the HSA – Land Suitability Analysis

\\ca0213-pp\fs01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS ProHRM_FCM_2024_Synthesis.aprx: HRM_FCM_031_Watercourse_LSARevised: 2024-05-30 By: niwhite

3.4 Forest Habitat and Species at Risk

Forest habitat within the HSA was evaluated using the NSDNRR Forest and Wetland Inventory databases, the Nova Scotia Forest Ecosystem Classification (FEC) system (Neily et al. 2023), and data collected during field surveys (Appendix B).

A desktop review of species at risk (SAR) and species of conservation concern (SOCC) was conducted using data requested from the AC CDC (AC CDC 2023; Appendix A) and the NSDNRR Boreal Felt Lichen predictive habitat layer (Cameron and Neily 2008). The desktop review was supplemented by incidental field observations recorded during field programs (Appendix C).

SAR presence noted within the study area was based on incidental observations, AC CDC data, and the Boreal Felt Lichen Predicative data layer. Though these data sources provide a good preliminary understanding, collecting more than one season of field survey data would provide a more complete picture of SAR presence. Some AC CDC data is also obscured for species safety and access was not requested as part of this analysis. Evaluating individual VTs for likelihood of providing SAR (e.g., boreal felt lichen) habitat was also considered outside the scope of this study.

Forest habitat and SAR were combined for land suitability analysis. The FEC data (combined with wetland data and field observations) were used to understand what habitat types are present in the Study Area. Once habitat types within the HSA were identified, they were compared to known habitat preferences of SAR recorded within 5 km of the Study Area to understand the distribution of potential SAR habitat.

Habitat VT types can also provide insight to community climate resilience planning. Some terrestrial VTs and wetland types are recognized to be effective carbon sinks and fire breaks, as well as attenuating stormwater flow. An evaluation of these services should be completed during any ensuing planning processes.

There were limitations of time, scope and resources in the completion of this study. Though useful as a multidisciplinary decision-making tool, this report is not a complete representation of all ecological features present within the study area. Knowledge gaps that should be considered in future studies and planning efforts include targeted SAR surveys; it is noted that many VTs identified within the study area are known to be associated with rare plants. Though spot vegetation surveys were completed, it is possible that some rare species remained undetected within the study area.

3.4.1 FOREST HABITAT

The NSDNRR Forest Inventory database is based on air photo interpretation and are not ground-truthed. NSDNRR forest polygons were visited during field surveys in late summer 2023 (indicated as ‘field survey sites’ on Figure 3.7). Vegetation within the polygons was evaluated and then compared with the FEC system, which places forest stands into Forest Groups (FG) that are composed of different Vegetation Types (VTs) with similar site conditions, successional pathways, and species composition (Neily et al. 2023). A patchwork of different forest and plant communities reflect a changing landscape based on disturbance (blowdown, insects, fire, disease, anthropogenic), site conditions and natural successional stages.

The HSA is located within the Eastern Interior and St. Margarets Bay Ecodistricts (NSDNR 2017). The Eastern Interior Ecodistrict is mainly underlain by meta-sedimentary rock. This is the largest Ecodistrict in the province, stretching from Pockwock Lake (Halifax County) in the west to Chedabucto Bay (Guysborough County) in the east. This expansive tract of upland topography is a rolling till-plain comprised of generally gravelly and stony soils (NSDNR 2017). The St. Margarets Bay Ecodistrict encompasses much of the Chebucto peninsula and western Halifax County, extends inland to Hants County, and includes portions of eastern Lunenburg County. The St. Margaret's Bay Ecodistrict is mainly underlain by the southeastern most portion of the South Mountain Batholith, a massive granitoid formation underlying much of western Nova Scotia (NSDNR 2017).

The Eastern Interior Ecodistrict has several significant forest ecosystems: a zonal climax black spruce forest (Spruce Pine Forest Group) that is widely dispersed on dry to moist, nutrient poor soils (28%); a zonal softwood/mixedwood forest of red spruce (*Picea rubens*), hemlock (Tsuga canadensis) and yellow birch (*Betula alleghaniensis*) and red maple (Acer rubrum) (Spruce Hemlock Forest Group) on fresh to fresh-moist, nutrient medium soils (50%); and a zonal Tolerant Hardwood forest of sugar maple (Acer saccharum), yellow birch (*Betula papyrifera*) and red maple on fresh, nutrient medium to rich soils (10%) (NSDNR 2017).

The St. Margarets Bay Ecodistrict has expansive stands of Acadian softwood forests of red spruce with hemlock, white pine (*Pinus strobus*), and yellow birch (Spruce Hemlock Forest Group) which occur on hilly and hummocky terrain. Soils are well to rapidly drained, coarse to medium textured soils derived from granite till. As soil drainage gets progressively poorer, wet forests of red maple, alders (*Alnus sp*), false holly (*Nemopanthus mucronate),* winterberry (*Ilex verticillate*), and other woody shrubs are common (NSDNR 2017). The HSA contains the following FEC FGs:

- Intolerant Hardwood Forest (IH)
- Mixedwood Forest (MW)
- Old Field (OF)
- Open Woodland (OW)
- Spruce Hemlock Forest (SH)
- Spruce Pine Forest (SP)
- Tolerant Hardwood (TH)Wet Coniferous Forest (WC)
- Wet Deciduous Forest (WD)
- Wet-Mixedwood (WM)

Dominant vegetation was described for 44 forest inventory polygons visited during field surveys (Table 3.13). Unique identifiers were assigned at the point surveyed (HWY1-HWY42). All plant species were recorded at that point in the tree, shrub and ground vegetation layers as well as site specific details such as drainage class, stand description and estimated stand age (Appendix B). VTs were identified and inventoried based on the overall percent cover of dominant tree and shrub species (Appendix B). Transitions to other VTs were marked and compared to existing data as they were encountered. The FEC classification for each stand is presented in Appendix B. VTs and their typical description can be found below. Many VTs identified within the study area are known to be associated with rare plants. Though spot vegetation surveys were completed, it is possible that some rare species remained undetected within the study area. A list of plants observed is included in Appendix B.

Table 3.13 Summary of Vegetation Types in the HSA

Vegetation Type (VT)	FEC VT Code	VT Frequency[1]	Forest Group (FG)
Large-tooth aspen / Lambkill / Bracken	IH1	1	IH
Large-tooth aspen / Lambkill / Bracken – Red oak variant	IH1a	1	
Red oak / Witch-hazel - Lambkill	IH2	6	
Red oak / Witch-hazel – Lambkill – Red maple variant	IH2a	7	
White birch – Red maple / Sarsaparilla – Bracken	IH6	2	
White birch – Red maple / Sarsaparilla – Bracken – Aspen variant	IH6a	1	
White birch – Red maple/Sarsaparilla – Bracken – White birch variant	IH6b	1	
Red maple/Hay-scented fern – Wood-sorrel	IH7	1	
Red spruce – Red maple – White birch / Goldthread	MW2	6	MW
Black spruce – Red maple / Bracken - Sarsaparilla	MW9	1	
Red oak – White pine / Teaberry	MW11	1	
White pine – Red maple/Velvet-leaf blueberry/Bracken	MW12	2	
Trembling aspen – Grey birch / Rough goldenrod - Strawberry	OF5	1	OF
Black spruce / Lambkill / Reindeer lichen	OW2	1	OW
Black Huckleberry Heath	S1	2	S[2]
Red spruce – Balsam fir / Schreber's moss – Stair-step moss	SH5	1	SH
White pine / Blueberry / Bracken	SP4	1	SP
Red oak – Yellow birch / Striped maple / Partridge-berry	TH6	1	TH
Yellow birch – White birch / Evergreen wood fern	TH7	1	
Red maple – Yellow birch / Striped maple	TH8	1	
Black spruce / Lambkill – Labrador tea / Sphagnum – Inkberry variant	WC2a	1	WC
Red maple / Cinnamon fern / Sphagnum	WD2	1	WD
Red maple – Black spruce / Lambkill / Cinnamon fern / Sphagnum	WM3	3	WM

Notes:
[1] – Frequency is the number of stands of each VT out of 44 total stands with VTs
[2] – Barrens Group (Porter et al. 2020)

3.4.2 FOREST ECOSYSTEM CLASSIFICATION

A total of 11 FGs represented the 23 individual VTs and 1 barrens type noted in Table 3.13. FGs are presented on Figure 3.7. The following sections describe each VT including successional stage, disturbance, and specific ecological features. For comprehensive information on all FGs and VTs in Nova Scotia, Stantec recommends consulting the provincial FEC guide (Neily et al. 2023), This resource is highly valuable for understanding habitat details and making informed decisions at the stand level.

3.4.2.1 Intolerant Hardwood

Intolerant hardwoods (IH) are early to mid-successional closed canopy forest stands that are dominated by red maple, white birch, grey birch (*Betula populifolia*) and aspen trees. The canopy is closed hardwood, with scattered residuals from previous succession stages. The shrub layer is typically extensive and has woody shrub species (e.g., wild raisin [*Viburnum cassinoides*] and honey-suckle [*Lonicera canadensis]*). Intolerant hardwood stands are typically short-lived, even-aged forests that result from stand-level disturbance events such as fire, windthrow, or harvesting. These stands provide habitat for deer, moose, and snowshoe hare.

IH1 Large-tooth aspen / Lambkill / Bracken

Variants: IH1a

IH1a - Red oak variant: stands with this variant have a scattered to abundant presence of red oak

- Succession: Early
- Typical Disturbance Type: windthrow, insects/disease.
- Ecological Features: Aspen supports many insects and leaves are browsed by moose and deer.

Large-tooth aspen (*Populus grandidentata*) and red maple are the dominant overstory species in the IH1 vegetation type, with white birch, white pine and red oak (*Quercus rubra*) as common associates. This VT sits on dry to fresh, nutrient poor soils. The shrub layer is well developed and has a variety of tall woody shrubs. The bryophyte layer is typically poorly developed.

IH2 Red oak / Witch-hazel - Lambkill

Variants: IH2a

IH2a - Red maple variant: stands with this variant have an overstory dominated by shade-intolerant hardwoods and less abundant red oak.

- Succession: Edaphic
- Typical Disturbance Type: fire
- Ecological Features: Red oak is a valuable hard mast food source for small mammals, bear, ruffed grouse and deer.

Red oak is the dominant overstory species in the IH2 vegetation type, with white birch, large-tooth aspen and scattered black spruce and white pine are common associates. This VT sits on dry to fresh, nutrient poor soils. The shrub layer is well developed and has a variety of tall woody shrubs and regenerating tree species. The herbaceous layer contains species indicative of poor or dry conditions. The bryophyte layer is typically poorly developed.

IH6 White birch-Red maple / Sarsaparilla-Bracken: White birch variant

Variants: IH6a & 6b

IH6a – Aspen variant: stands of this variant have abundant aspen species (trembling and/or large-tooth) and co-dominant white birch and red maple.

IH6b – White birch variant: stands of this variant are dominated by white birch, with little red maple and aspen.

- Succession: Early
- Typical Disturbance Type: Fire, windthrow, harvesting, insects/disease.
- Ecological Features: Red maple and white birch are favoured browse for moose and deer.

White birch and red maple are the dominant species in the IH6 vegetation type, with occasional balsam fir (*Abies balsamea*), red spruce, white spruce (*Picea glauca*), eastern white pine and yellow birch. This VT establishes after disturbance events like fire, windthrow, or clearcutting on well-drained ecosites of moderate fertility. The shrub layer is well developed and is dominated by regenerating tree species and a variety of tall woody shrubs. The bryophyte layer is typically poorly developed.

IH7 Red maple / Hay-scented fern – Wood-sorrel

- Succession: Early to Mid
- Typical Disturbance Type: Windthrow, harvesting and clear-cutting.
- Ecological Features: Regeneration of the forest is done by seed or coppice and provide early and abundant pollen and nectar sources.

This vegetation type is associated with fresh to moist, nutrient medium to rich soils. Red maple is the dominant species in the overstory which is closed canopy, along with lesser amounts of sugar maple, yellow birch, red spruce, and/or American beech (*Fagus grandifolia*). The shrub layer is moderately developed and includes regenerating tree species (e.g., balsam fir). The herb layer is dominated by ferns, notably the hay-scented fern (*Dennstaedtia punctilobula*). This VT is found in upper slope positions and is the most widespread red maple forest in the Maritimes.

3.4.2.2 Mixedwood

The characteristics of the mixedwood (MW) group can be quite variable, including both coniferous and deciduous trees, ranging from early to late successional stages. Mixedwood vegetation types can be composed of either shade-tolerant or intolerant canopy species and can be large patch to matrix scale forests with complex canopy structures including softwood or hardwood inclusions or, more commonly, a relatively even blend of both growth forms. Earlier successional MW forests include red maple, white birch, grey birch, aspen(s), and/or balsam fir. In turn, later successional forests are characterized by yellow birch, sugar maple, red spruce, white spruce and/or eastern hemlock.

MW2 Red spruce – Red maple – White birch / Goldthread

- Succession: Mid
- Typical Disturbance Type: Windthrow, harvesting.
- Ecological Features: Increased Forest structural complexity can provide nesting habitat for woodpeckers, owls, and northern goshawks (*Accipiter gentilis*).

This VT is associated with fresh to fresh-moist sites, and is typically dominated by red spruce, red maple, and large-tooth or trembling aspen (*Populus tremuloides*). It is a closed canopy and mid-successional forest, which follows partial disturbances such as harvesting. The shrub layer is mainly composed of regenerating tree species, and the herb layer contains species such as starflower (*Trientalis borealis*), sarsaparilla (*Aralia nudicaulis*) and several fern species. MW2 also facilitates nutrient cycling, rapid site revegetation, and the establishment of nurse crops for late-successional species.

MW9 Black spruce – Red maple / Bracken – Sarsaparilla

- Succession: Edaphic
- Typical Disturbance Type: Stand-replacing disturbances (e.g., windthrow, fire, harvesting).
- Ecological Features: Occurs in small to large patches on surfaces with high stoniness. Mature forests will develop old man's beard and lichen.

MW9 is an even-aged VT which develops in fresh to moist, nutrient poor soils. There is a mixedwood overstory which has moderate canopy closure supported by herbaceous plants. The shrub layer is co-dominated by lambkill (*Kalmia angustifolia*), velvet-leaf *(Abutilon theophrasti*) and lowbush blueberry (*Vaccinium myrtilloides, V. angustifolium*), and huckleberry (*Gaylussacia* sp.). This VT patches are typically large and found on sites with high amounts of stoniness.

MW11 Red oak – White pine / Teaberry

- Succession: Late
- Typical Disturbance Type: Stand-replacing disturbances (e.g. Fire, windthrow or harvesting).
- Ecological Features: long-standing snags in this VT provide nesting and denning sites for many vertebrate species.

MW11 develops in dry to fresh, nutrient poor soils. The overstory is dominated by abundant white pine and red oak in combination with other associates. The shrub layer can be extensive depending on light availability and is usually comprised of regenerating tree species and ericaceous shrubs. The herbaceous layer is well developed with species common for dry to poor sites, while the bryophyte layer is poorly developed.

MW12 White pine – Red maple / Velvet-leaf blueberry / Bracken

- Succession: Early to Mid
- Typical Disturbance Type: Stand-level disturbances (e.g., windthrow, fire and harvesting).
- Ecological Features: Several bird species may use this forest as nesting habitat in older sites.

MW12 is comprised of shade-intolerant hardwoods but defined by the abundant to dominant levels of white pine and red maple in the overstory. The shrub layer is well developed with high cover of ericaceous shrubs. MW12 occurs on fresh to dry, nutrient poor soils. The bryophyte layer is poorly developed.

3.4.2.3 Oldfield

Oldfield (OF) vegetation types develop after the abandonment of old farmland. The soils of such sites tend to be rich in organic matter, and the vegetation is composed mostly of early successional softwood species. The structure usually consists of a dense overstory of species such as white spruce, tamarack (*Larix laricina*), balsam fir, as well as a very patchy, but diverse, shrub and herb layer. Mosses, such as Schreber's moss (*Pleurozium schreberi*) and mycorrhizal mushrooms are very common under the dense canopy cover of the overstory.

OF5 Trembling aspen – Grey birch / Rough goldenrod – Strawberry

- Succession: Early
- Typical Disturbance Type: Natural disturbance agents (e.g., insects and windthrow)
- Ecological Features: Older aspen snags provide suitable cavities for several species of birds such as the pileated woodpecker.

OF5 is on fresh to fresh-moist to moist-wet, nutrient medium to rich soils. Grey birch is often abundant in younger stands but is soon overtopped by aspen. Other canopy associates include white birch, red maple, balsam fir and white spruce. The shrub layer is well developed and is comprised of woody shrubs and regenerating tree species. The herbaceous layer has species indicative of the past agricultural use such as strawberry (*Fragaria* sp.). There is limited cover but high species diversity in the bryophyte layer.

3.4.2.4 Open Woodland

Open woodland (OW) ecosystems have open canopies resulting from stressful site conditions and/or frequent disturbances. Site qualities (e.g., low soil fertility, moisture deficits, shallow soils, abundant stoniness) determine the tree growth and density and subsequently canopy closure. The shrub-layer is typically well-developed and reindeer lichen (*Cladonia rangiferina*) is typically present. Species commonly found in the canopy layer include pine, black spruce, red maple, and red oak which are all tolerant of dry, poor, and shallow soils.

OW2 Black spruce / Lambkill / Reindeer lichen

- Succession type: Early, edaphic
- Typical Disturbance Type: Stand level disturbances (e.g., fire, windthrow)
- Ecological Features: Limited distribution and only exists in Atlantic Canada, creating conservation challenges.

OW2 is a VT found on acidic bedrock and thin glacial soils, with dry to moist, nutrient very poor or stoney soils. Black spruce or pine dominate, and other species are typically uncommon. The understory is woody and has acid-tolerant shrubs (e.g., lambkill), and the herbaceous layer is low in species richness and abundance. This VT only is successful during early successional stages and only exists in the Atlantic provinces in small patches; however, it supports animal, plant, and epiphytic lichen species.

3.4.2.5 Shrubland Associations

The shrubland association is one of three barrens' associations in Nova Scotia. These VTs are found in a separate guide to the FEC classifications (Porter et al. 2020). The shrubland associations are distinguished by characteristic shrub presence.

S1 Black Huckleberry Heath

- Succession: N/A
- Typical Disturbance Type: Fire
- Ecological Features: N/A

S1 is the only barrens VT dominated by black huckleberry (*Gaylussacia baccata*). It typically occurs on sites with shallow and stony soils, frequently with a cemented or partially cemented horizon. The soils of this association are typically nutrient poor and acidic humus over coarse-grained mineral soils. This association is among the most widespread shrubland associations of Nova Scotia's barrens.

3.4.2.6 Spruce-Hemlock

Spruce-Hemlock (SH) VT is a mid- to late-successional group with closed canopy and softwood species, predominantly red spruce, eastern hemlock and eastern white pine. Mid to late successional stages are typically even-aged, closed canopy, but can develop a multi-age structure as they progress into a later successional stage. Within the well-developed canopies, the mid successional stages usually have a significant balsam fir component along with eastern hemlock, red spruce, and eastern white pine in the overstory. The SH type occurs on soils with a wide range of moisture levels; however, the fertility levels are typically moderate. SH can potentially provide habitat for small mammals and ungulates and diverse communities of birds and invertebrates. These species use forests for shelter, foraging and/or reproduction.

SH5 Red spruce-Balsam fir / Schreber's moss – Stair-step moss

Variants: SH5b

SH5b – Balsam fir variant: This variant has abundant to dominant balsam fir (>26%) in the overstory.

- Succession: Mid
- Typical Disturbance Type: Windthrow or harvesting.
- Ecological Features: Occupies large areas forming matrix forests with many microhabitats. Mature stands can support multi-cohort structures and provide habitat complexity.

The SH5 VT occurs on fresh to moist, nutrient medium soils. The canopy is closed and is composed largely of balsam fir, while the shrub and herb layers are sparsely developed because of the heavy shade cast by the tree overstory. A needle carpet is common, as well as carpets of Schreber's moss. This VT provides habitat for wildlife including ruffed grouse (*Bonasa umbellus*) and black-backed woodpecker (*Picoides arcticus*).

3.4.2.7 Spruce Pine

Spruce pine forests are nutrient poor and are often dominated by black spruce and pines with plants in the understory that are tolerant of nutrient poor soils. They are typically associated with sloped environments with bedrock ridges and outcrops. The shrub layer of these stands is often dominated by lambkill, blueberry and black huckleberry. The herb layer is variable in species composition depending on the amount of light available.

SP4 White pine / Blueberry / Bracken

- Succession: Edaphic
- Typical Disturbance: Stand replacing events (e.g., fire, harvesting)
- Ecological Features: Comprised of long-lived species which provide habitat for wildlife.

SP4 is a closed canopy VT which develops on dry, nutrient poor soils with white pine and shade-intolerant shrub and herb layer species. SP4a variant is dominated by black spruce in the overstory, the shrub layer is dominated by black spruce and balsam fir, and the herb layer is dominated by bracken, mayflower (*Epigaea repens*), and teaberry (*Gaultheria procumbens*) and have relatively low species diversity. The white pine trees will provide disturbance resistance and a vertical structure to the VT and legacy seed sources.

3.4.2.8 Tolerant Hardwood

Tolerant hardwood (TH) vegetation types are typically comprised of mid to late successional shade-tolerant hardwoods on zonal Acadian Forest ecosites. Stands are dominated by sugar maple, yellow birch, and American beech. White ash (*Fraxinus americana*), ironwood (*Ostyra virginiana*), red maple (and in western Nova Scotia, red oak) are common associates. Spruce-fir understories are often common as well as an extensive shrub layer. The herbaceous layer is often dominated by ferns. Stand level disturbances are rare and most vegetation types maintain themselves through gap replacement. These vegetation types are typically large patches and matrix forests that have a high potential for old growth stands and numerous different microhabitats (e.g., vernal pools, seeps, abundant leaf litter).

TH6 Red oak – Yellow birch / Striped maple / Partridge-berry

- Succession: Mid-to-Late
- Typical Disturbance: Gap disturbances, fire
- Ecological Features: provides habitat for many songbirds, the oak present in this VT is a favored browse for deer.

This VT occurs on dry to moist, nutrient medium soils. The canopy of this forest type is composed of red oak and many other shade tolerant hardwoods. Other common associates are red maple (frequent), sugar maple, yellow birch and beech. The shrub layer can have abundant softwood composition but is often comprised of regenerating hardwoods. The herbaceous layer is diverse and characterized by sarsaparilla and other upland species. The bryophyte layer is poorly developed.

TH7 Yellow birch – White birch / Evergreen wood fern

- Succession: Mid
- Typical Disturbance: harvesting, insect/disease
- Ecological Features: Large diameter, living, hollow trees are common in this forest type and provide good denning sites, cavity nest sites for songbirds, and canopy nest sites.

This VT occurs on fresh, nutrient medium soils. This closed canopy forest has a dominant component of yellow and white birch with lesser amounts of red maple. Balsam fir is also common in both the canopy and the shrub layer. The herbaceous layer has extensive fern cover while the bryophyte layer is discontinuous and species poor.

TH8 Red maple – Yellow birch / Striped maple

- Succession: Mid to Late
- Typical Disturbance Type: Windthrow, ice damage, insects/disease, and harvesting.
- Ecological Features: Occupies large patches spanning several hundred hectares and creating internal forest ecosystems.

This VT is associated with fresh to fresh-moist, nutrient medium to rich soils. Red maple and yellow birch are the dominant species in the overstory, creating a closed canopy. The shrub layer is often dominated by advanced regeneration of balsam fir, and the herb layer is often dominated by ferns. These stands occupy large areas and can produce Yellow birch trees that are up to 25 m tall, with diameters of 100 cm. This is conducive to the development of living, hollow trees which provide good denning opportunities for various small mammals and avifauna.

3.4.2.9 Wet-Coniferous

Wet-coniferous (WC) VTs are wet forest ecosystems that have water at or near the soil surface. The canopy is partially closed and is dominated by softwood species. There is a well-developed understory of plants that are tolerant of wet conditions. The shrub layer of WC VTs is typically characterized by ericaceous species and tall shrubs such as mountain holly (*Ilex mucronata*). These forests create unique landscapes which are important for carbon storage, nitrogen cycling, and often form the headwaters of watercourses so they can be important in flow regulation.

WC2 Black spruce / Lambkill – Labrador tea / Sphagnum

Variants: WC2a

WC2a – Inkberry variant: This variant contains species of coastal plains flora such as inkberry (*Ilex glabra*) and is distinguished by this presence or by moderate to high levels of huckleberry.

- Succession: Mid
- Typical Disturbance Type: Windthrow and uprooting
- Ecological Features: Supports low species richness and limited habitat diversity due to harsh site conditions.

This VT occurs on nutrient poor to very poor soils that are poorly drained. The canopy is dominated by black spruce and crown closure is considered low to moderate. The canopy may also be formed by stunted trees. The shrub layer, in instances where the stand is young, is more exposed, or extremely wet. The understory is woody and dominated by lambkill or other species such as Labrador tea (*Rhododendron groenlandicum*), rhodora (*Rhododendron canadense*) and mountain holly. These stands are maintained by limiting conditions including soil saturation limiting the rooting potential; however, they can sustain old growth conditions that are often overlooked due to the generally small size of the trees. Some plant Species of Conservation Concern may be associated with this VT.

3.4.2.10 Wet-Deciduous

The wet-deciduous (WD) forest group is characterized by water at or near the ground surface for much of the growing season. Canopies are often partly open or closed and are generally dominated by red maple, and occasionally white ash. Vegetation types occur primarily on level to depressional topography or within riparian zones.

WD2 Red maple/Cinnamon fern/Sphagnum

- Succession: Early to mid, edaphic
- Typical Disturbance Type: Windthrow, harvesting.
- Ecological Features: Moderately productive system which can support black ash (*Fraxinus nigra*).

WD2 is a widespread maple swamp VT that is found throughout Nova Scotia. The soils are usually organic deposits or poorly drained mineral soils. It has a relatively high percentage of deciduous trees, primarily red maple. Shrub cover is moderate; however, it is characterized by low species diversity. It can include regenerative overstory species, as well as other shrub species (e.g., speckled alder [*Alnus incana*]). The herbaceous layer is also characterized by low diversity but can have high vegetation cover. Wildlife species that are associated with WD2 include olive-sided flycatcher and Canada warbler.

3.4.2.11 Wet-Mixedwood

Wet-mixedwood (WM) vegetation types occur on poorly drained sites where the water table is at or near the soil surface for most of the growing season. Canopies are partly open to closed, and are generally dominated by red maple, spruce, balsam fir, white ash, and yellow birch. WM vegetation types are mid-successional and have fluctuating water levels, wind throw, and insect/disease disturbance. They support both coniferous and deciduous tree species. They exist in small patches that act as a transition ecosystem for forest wetland species.

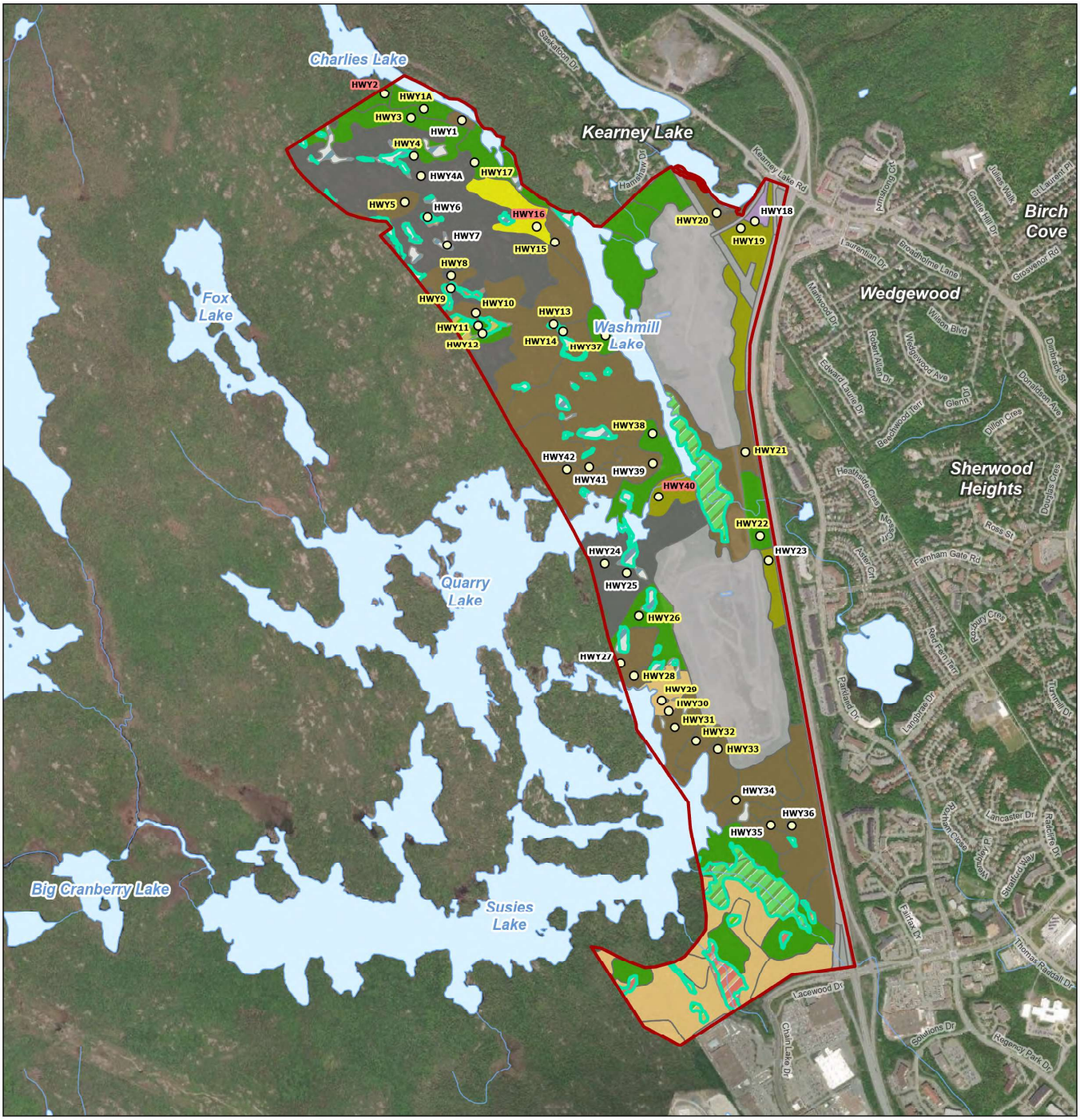
WM3 Red maple-Black spruce/Lambkill/Cinnamon fern/Sphagnum

- Succession: Mid, Edaphic
- Typical Disturbance Type: Windthrow and timber harvesting
- Ecological Features: Occupies small areas and acts as a stepping-stone in large forest matrices for wetland dependent species.

This VT occurs on poorly drained sites that are underlain by wet mineral or organic deposits. It is a closed canopy forest with high shrub and herbaceous cover, and a well-developed sphagnum moss layer. The canopy is dominated by black spruce, red maple, and balsam fir. WM3 is characterized by the lowest nutrient availability of the WM VTs. This type typically consists of small patches found within large matrices. There are often pools of open water and peaty hummocks which provide habitat for amphibians, invertebrates, and avifauna.

3.4.2.12 Forested Wetlands

There are several wetlands within the HSA, varying in size, type, and complexity. Many of these wetlands are complexes, containing more than one wetland community (e.g., a fen with a tree and shrub swamp halo around the perimeter). Although the Nova Scotia FEC system provides habitat types that are described as ‘wet coniferous’ or ‘wet deciduous’ conditions, there isn’t a sufficient classification within this system for all wetland types (Section 3.2). Some of the wet forest groups are also not always indicative of wetland conditions and can also include forest mosaics or moist sites. The variation between wet forest groups is also difficult to distinguish from digital data sources, therefore they were simply identified as ‘wetland’ in Figure 3.7.



Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Stantec; Government of Nova Scotia; Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Field Survey Location

Forest Group

- Intolerant Hardwood (IH)
- Tolerant Hardwood Forest (TH)
- Mixedwood (MW)
- Old Field (OF)
- Spruce - Hemlock Forest (SH)
- Spruce - Pine Forest (SP)

Non-Forest Group

- Barrens
- Urban Other

Wetland

- Low Shrub Swamp (LSS)
- Wet Mixedwood Forest (WM)
- Wet Coniferous Forest (WC)
- Wet Deciduous Forest (WD)
- Wetland Other

Other Features

- Waterway
- Waterbody
- Wetlands (Stantec, 2023)
- Study Area

Forest Stand Estimated Age

- PC18 > 80 Years
- PC18 30 to 80 Years
- PC18 < 30 Years

0 250 500 Metres

(At original document size of 8.5x11)
1:23,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2023-07-19
Revised by NWhite on 2024-07-25

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_021

Figure No.
3.7

Title
Forest Groups - HSA

HRM FCM 2022.aprx Revised: 2024-08-29 By: niwhite

3.4.3 SPECIES AT RISK

AC CDC records (AC CDC 2023) indicate that the HSA and surrounding environment may support a variety of wildlife, including SAR and SOCC.

These species can be adversely affected by development in a variety of ways. These include direct loss of habitat as well as indirect habitat loss caused by sensory disturbance which can prevent species from using existing suitable habitat. Fragmentation of habitat can prevent species from accessing suitable habitat patches or may result in the formation of isolated habitat patches that are too small to support species that require large home ranges. Development can also result in increased rates of mortality associated with collisions with automobiles and structures such as windows of buildings or guy wires, exposure to anthropogenic toxins, and predation by domestic pets and generalist predators such as crows, racoons, coyotes and foxes that are tolerant of the presence of humans. Stantec recommends submitting new AC CDC data requests prior to any new studies. It is anticipated that organization will have completed a data set regarding community at risk which could be valuable for the next stage of planning.

For the purposes of this report, SAR are defined as any species with a status of Special Concern, Vulnerable, Threatened, Vulnerable, or Endangered by the Nova Scotia *Endangered Species Act* (NS ESA), the Federal *Species at Risk Act* (SARA), or the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). SOCC are defined as any species with an AC CDC S-rank of S1 (Critically Imperiled), S2 (Imperiled), or S3 (Vulnerable), and not otherwise defined as SAR. Table 3.14 presents SAR and SOCC species identified in the AC CDC data report (full report provided in Appendix A). The distribution of SAR and SOCC that have been recorded in or near the HSA either during the field surveys or from existing records are presented on Figure 3.8. Some SAR are considered to be location sensitive since their populations may be placed at risk by illegal collection if their locations were publicly available. AC CDC does not provide location data for these species. For the purposes of this report, location sensitive species were presumed to have been recorded within 5 km of the HSA in the same manner as SAR for which location data were available. Desktop data sources provide a preliminary baseline understanding, however collecting more than one season of field data would likely provide a more complete picture of SAR presence.

A different method was used to assess the potential presence of boreal felt lichen (*Erioderma pedicellatum)*. A predictive habitat model for boreal felt lichen has been developed for Nova Scotia (Cameron and Neily 2008) and is now integral in supporting habitat identification according to Special Management Practices (NSDNR 2018). Less than 20% of known occurrences of the rare boreal felt lichen are located within the modelled habitat (NSDNR 2018), but the model identifies the coarse-scale habitat features of importance to boreal felt lichen across all of Nova Scotia. The model output showing the predicted distribution of boreal felt lichen was compared to the most recent imagery of the HSA to confirm that suitable habitat was still present. If suitable habitat was still present, boreal felt lichen was potentially present.

Table 3.14 SAR and SOCC Within 5 km of the HSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Birds					
Hydrobates leucorhous	**Leach's Storm-petrel**	TH			S3B
Bucephala islandica	**Barrow's Goldeneye**	SC	SC		S1N, SUM
Falco peregrinus pop. 1	**Peregrine Falcon**		NAR	VU	S1B, SUM
Tringa flavipes	**Lesser Yellowlegs**		TH		S3M
Chordeiles minor	**Common Nighthawk**	SC	SC	TH	S3B
Contopus cooperi	**Olive-sided Flycatcher**	SC	SC	TH	S3B
Contopus virens	**Eastern Wood-Pewee**	SC	SC	VU	S3S4B
Riparia riparia	**Bank Swallow**	TH	TH	EN	S2B
Hirundo rustica	**Barn Swallow**	TH	SC	EN	S3B
Cardellina canadensis	**Canada Warbler**	TH	SC	EN	S3B
Dolichonyx oryzivorus	**Bobolink**		SC	VU	S3B
Euphagus carolinus	**Rusty Blackbird**	SC	SC	EN	S2B
Anas acuta	Northern Pintail				S1B, SUM
Mareca strepera	Gadwall				S2B, SUM
Bucephala clangula	Common Goldeneye				S2S3B, S5N, S5M
Cathartes aura	Turkey Vulture				S2S3B, S4S5M
Accipiter cooperii	Cooper's Hawk		NAR		S1?B, SUN, SUM
Falco sparverius	American Kestrel				S3B,S4S5M
Charadrius semipalmatus	Semipalmated Plover				S1B, S4M
Charadrius vociferus	Killdeer				S3B
Tringa melanoleuca	Greater Yellowlegs				S3B, S4M
Calidris minutilla	Least Sandpiper				S1B, S4M
Calidris melanotos	Pectoral Sandpiper				S3M
Sterna hirundo	Common Tern				S3B
Asio otus	Long-eared Owl				S2S3
Myiarchus crinitus	Great-crested Flycatcher				S1B
Tyrannus tyrannus	Eastern Kingbird				S3B
Petrochelidon pyrrhonota	Cliff Swallow				S2S3B
Perisoreus canadensis	Canada Jay				S3
Poecile hudsonicus	Boreal Chickadee				S3
Mimus polyglottos	Northern Mockingbird				S1B
Vireo gilvus	Warbling Vireo				S1B, SUM
Setophaga tigrina	Cape May Warbler				S3B, SUM
Setophaga pinus	Pine Warbler				S2S3B, S4S5M

Table 3.14 SAR and SOCC Within 5 km of the HSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Setophaga striata	Blackpoll Warbler				S3B, S5M
Cardellina pusilla	Wilson's Warbler				S3B, S5M
Pheucticus ludovicianus	Rose-breasted Grosbeak				S3B
Passerina cyanea	Indigo Bunting				S1?B, SUM
Icterus galbula	Baltimore Oriole				S2S3B, SUM
Pinicola enucleator	Pine Grosbeak				S3B, S5N, S5M
Spinus pinus	Pine Siskin				S3
Mammals					
Myotis and Perimyotis	**Bats or Bat hibernaculum[1]**	EN	EN	EN	S1
Alces alces americana	**Moose**			EN	S1
Amphibians					
Hemidactylium scutatum	Four-toed Salamander		NAR		S3
Reptiles					
Chelydra serpentina	**Snapping Turtle**	SC	SC	VU	S3
Chrysemys picta picta	**Eastern Painted Turtle**	SC	SC		S4
Glyptemys insculpta	**Wood Turtle**	TH	TH	TH	S2
Insects					
Bombus bohemicus	**Gypsy Cuckoo Bumble Bee**	EN	EN	EN	S1
Bombus terricola	**Yellow-banded Bumble Bee**	SC	SC	VU	S3
Danaus plexippus	**Monarch**	SC	EN	EN	S2?B, S3M
Strophiona nitens	Chestnut Bark Long-horned Beetle				S3
Elateroides lugubris	Sapwood Ship-timber Beetle				S3
Chilocorus stigma	Twice-stabbed Lady Beetle				S3
Myzia pullata	Streaked Lady Beetle				S3
Satyrium calanus	Banded Hairstreak				S3
Strymon melinus	Gray Hairstreak				S3
Erora laeta	Early Hairstreak				S1
Polygonia interrogationis	Question Mark				S3B
Polygonia comma	Eastern Comma				S1?
Polygonia satyrus	Satyr Comma				S1?
Nymphalis l-album	Compton Tortoiseshell				S2S3
Aglais milberti	Milbert's Tortoisehell				S2S3

Table 3.14 SAR and SOCC Within 5 km of the HSA (AC CDC 2023)

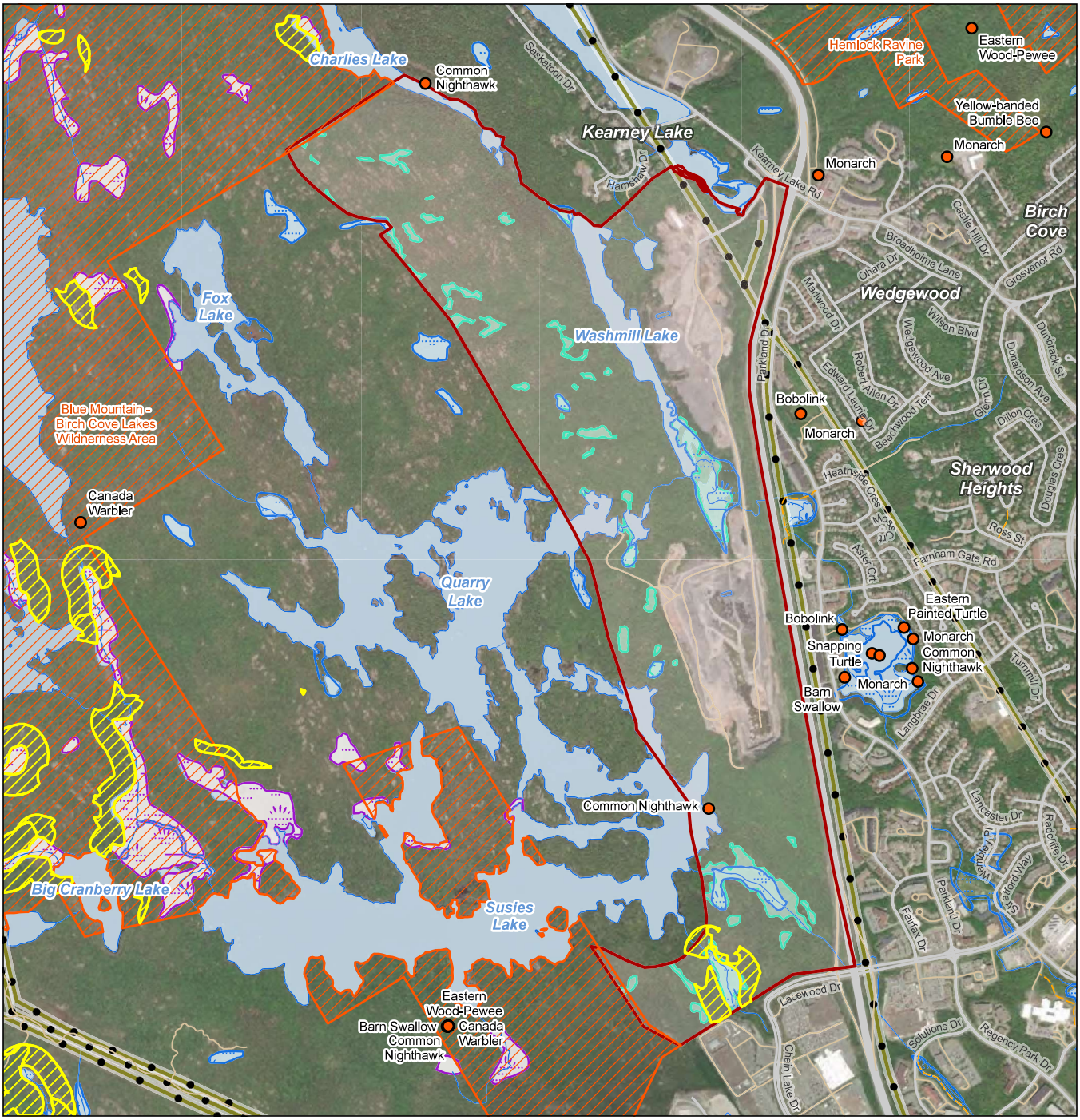
Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Lichens and Mosses					
Erioderma pedicellatum Atlantic pop.)	**Boreal Felt Lichen**	EN	EN	EN	S1
Fuscopannaria leucosticta	**White-rimmed Shingle Lichen**		TH		S3
Barbula convoluta	Lesser Bird's-claw Beard Moss				S3?
Ditrichum rhynchostegium	A moss				S2?
Moelleropsis nebulosa	Blue-gray Moss Shingle Lichen				S2S3
Cystocoleus ebeneus	Rockgossamer Lichen				S2
Acarospora sinopica	A cracked lichen				S1S3
Cladonia mateocyatha	Mixed-up Pixie-cup				S2S3
Scytinium lichenoides	Tattered Jellyskin Lichen				S3
Scytinium tenuissimum	Birdnest Jellyskin Lichen				S2S3
Stereocaulon intermedium	Pacific Brain Foam Lichen				S1S3
Peltigera collina	Tree Pelt Lichen				S3
Vascular Plants					
Juglans cinerea	**Butternut**	EN	EN		SNA
Mononeuria groenlandica	Greenland Stitchwort				S3
Hypericum X dissimulatum	Disguised St. John's-wort				S2S3
Samolus parviflorus	Seaside Brookweed				S3
Caltha palustris	Yellow Marsh Marigold				S2S3
Pilea pumila	Dwarf Clearweed				S3
Carex adusta	Lesser Brown Sedge				S2S3
Carex swanii	Swan's Sedge				S3

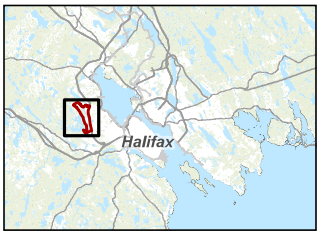
Table 3.14 SAR and SOCC Within 5 km of the HSA (AC CDC 2023)

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Neottia bifolia	Southern Twayblade				S3
Ophioglossum pusillum	Northern Adder's-tongue				S2S3

Notes:
Bold indicates SAR status.
†ACCDC includes three species of bats as one unit. These species are the *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat). Each has the same status (EN) and the same S-Rank (S1).
[1] Species at risk in Canada listed under Schedule 1 the federal *Species at Risk Act* as Endangered (EN), Threatened (TH), or Special Concern (SC) (Government of Canada 2023).
[2] Species in Canada assessed by COSEWIC as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC); not at risk species = NAR, Data Deficient = DD (Government of Canada 2023).
[3] Species at risk in Nova Scotia listed under the provincial *Endangered Species Act* (NS) as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC; Government of Nova Scotia 2023).
[4] Species ranked as Critically Imperiled (S1), Imperiled (S2), or Vulnerable (S3) by the Atlantic Canada Conservation Data Centre (AC CDC 2023) and recorded within 5 km of the Project by desktop data source, where:
S1: Critically Imperiled – Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences). May be especially vulnerable to extirpation.
S2: Imperiled – Imperiled in the province because of rarity due to very restricted range, very few populations (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3: Vulnerable – Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer).
S4: Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors (80+ occurrences).
S5: Secure – Common, widespread, and abundant in the province.
S#S#: A numeric range rank (*e.g.*, S2S3) is used to indicate any range of uncertainty about the status of the species or community.
SH: Possibly Extirpated (Historical) – Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
SU: Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

Incidental observations of wildlife were recorded during wetland, vegetation, water, and archeology field programs. Stantec observed 113 species (16 birds, 2 mammals, 95 vascular plants). No SAR or SOCC were observed during the field surveys, but this is not definitive proof of their absence in the HSA. A full list of wildlife species observed during field studies is available in Appendix C.





Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Natural Resources and Renewables; NS Environment and Climate Change; East Coast Aquatics - Ecological aspects of a local Wood Turtle (*Glyptemys insculpta*) population along the Sackville River, Nova Scotia (Page 17) 2016;. Atlantic Canada Conservation Data Centre, 2023
3. Background: Government of Nova Scotia Department of Service Nova Scotia and Internal Services; Nova Scotia Department of Natural Resources and Renewables

- Species at Risk and Species of Conservation Concern (ACCDC)
- Transmission Line
- Highway
- Road
- Resource / Seasonal Road
- Trail
- Waterway
- Waterbody
- Wetland (Stantec, 2023)
- Wetland (NSECC)
- Designated Wetland of Special Significance
- Boreal Felt Lichen Predicted Habitat (NSECC, 2010)
- Managed Area (ACCDC)
- Study Area

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(At original document size of 8.5x11)
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N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by IPodrug on 2024-03-07
Revised by NWhite on 2024-03-14
Revised by SChubbs on 2024-05-10

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure ID: 007

Figure No.
3.8

Title
SAR, SOCC, and Sensitive Habitats Identified - HSA

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3.4.3.1 Species at Risk Descriptions

SAR identified in either the AC CDC (2023) report or identified during the field programs are described below. Species are presented in the order they appear in the tables above and information is provided on the species biology, as well as its regulatory status.

Leach's Storm-petrel

Leach's storm-petrel is listed as Threatened by COSEWIC but is not listed under either the federal SARA or the NS ESA. The Leach's storm-petrel is a small pelagic seabird that nests on coastal islands (COSEWIC 2020b). They nest in burrows that they construct in well drained habitats, typically grassy areas or stunted forest. This species is highly pelagic and typically only comes to land to nest. They forage nocturnally in open oceanic waters and are rarely observed in coastal waters but may be driven into nearshore waters or inland by storms.

There is one record of Leach's storm-petrel within 5 km of the HSA. This record was from Rockingham approximately 4.2 km east of the HSA. The study area provides neither suitable breeding nor wintering habitat for this species.

Barrow's Goldeneye

Barrow's goldeneye is listed as Special Concern under the federal SARA but is not listed under the NS ESA. The federal ranking was first assigned in 2003, and was reevaluated, with no changes made, in 2011 (COSEWIC 2000, 2011a). Barrow's goldeneye is a medium-sized diving duck residing in Canada and the United States. Most Barrow's goldeneyes are found west of the Rocky Mountains; however, a small population is present in Quebec and the Atlantic provinces (COSEWIC 2011). In eastern Canada Barrow's goldeneyes nest in Quebec in the boreal forest along the north shore of the St. Lawrence River. This species does not nest in Nova Scotia; however, small numbers of Barrow's goldeneyes winter in nearshore coastal waters of Nova Scotia where they feed on mussels and other aquatic invertebrates.

There are nine records of Barrow's Goldeneye within approximately 5 km of the HSA. Seven of the records are from Bedford, 5.7 to 6.1 km from the HSA. The remaining two records are from Millview, 4.6 to 4.7 km to the northeast of the HSA. The Study Area provides neither suitable breeding nor wintering habitat for this species.

Peregrine Falcon

The Peregrine Falcon is listed as Vulnerable under the NS ESA but is no longer listed under the federal SARA or under COSEWIC due to the cessation in the use of DDT and successful re-introduction programs (COSEWIC 2017b). In Nova Scotia, all Peregrine Falcon nests are found on coastal cliffs along the Bay of Fundy. In other areas of Canada, Peregrine Falcons have been observed nesting on tall buildings, bridges and the banks of open pit mines. In some areas where cliffs or analogous man-made structures are not available, Peregrine Falcons will use the nests of other birds in trees.

Peregrine falcons have been recorded near the HSA. This species is considered a location sensitive species in Nova Scotia, and thus location data for individual sightings of Peregrine Falcons are not provided in the AC CDC data report. The steep banks of the quarry along the eastern edge of the has Highway 102 Site could potentially provide nesting habitat for Peregrine Falcons. No peregrine falcons were observed during the field surveys.

Lesser Yellowlegs

The lesser yellowlegs is a medium-sized shorebird that nests in wetlands in the Boreal Forest of Canada and Alaska. This species is listed as Threatened by COSEWIC but is not listed under either the federal SARA or the NS ESA. Lesser yellowlegs do not nest in Nova Scotia but pass through during fall migration. In the Maritime Provinces, lesser yellowlegs typically use both freshwater and marine shorelines during migration (COSEWIC 2020b). No lesser yellowlegs were encountered during the field surveys. There are two records of lesser yellowlegs observed within 5 km of the HSA. Both records are from Belchers Marsh near Sherwood Heights between 1.1 and 1.2 km east of the HSA. Areas within the HSA that could provide suitable migration foraging habitat for lesser yellowlegs include several open wetlands near Susies Lake and Washmill Lake.

Common Nighthawk

Common nighthawk is listed as Special Concern under the federal SARA and as Threatened under the provincial NS ESA. Common nighthawk was first federally listed as Threatened in 2007 (COSEWIC 2007); however, due to a stabilization in the rate of decline, and the abundance of common nighthawk in suitable environments, COSEWIC (2018a) revised the status to Special Concern in 2018. The federal SARA status was downgraded from Threatened to Special Concern in 2023. Common nighthawk is a medium-sized aerial insectivore that nests in a variety of open habitats with minimal ground vegetation including open forest (especially areas with cuts, burns or rock outcrops), short grass prairie, dry bogs, rocky areas (such as quarries, gravel pits, and bedrock outcrops), sandy coastal habitats and settled areas that resemble open natural areas such as railways, gravel roads, airports, cultivated fields, orchards, parks, buildings with gravel roofs, oil-well pads, and pipelines. Common nighthawks are opportunistic generalist foragers and aggregate in areas where flying insects are abundant including waterways, lighted areas, and wetlands.

No common nighthawks were encountered during the field surveys. There are seven records of common nighthawk within 5 km of the HSA. The nearest records are from the southern end near Susies Lake, Charlies Lake on the eastern boundary of the HSA, and Belchers Marsh 1.3 km east. The Charlies Lake record is located just outside of the northern boundary of the HSA (Figure 3.8). The record from Susies Lake is from within the HSA. The remaining records are from the Timberlea Maritime Breeding Bird Atlas (MBBA) square. The MBBA records are derived from a 100 km^2 area. The center of the MBBA square is used as the location coordinates for all birds recorded in this area so it is not possible to determine with any accuracy where these Common Nighthawks were observed. Suitable nesting habitat is present at the HSA at several locations. In the northern portion of the HSA there is a large area of bedrock outcropping which could provide nesting habitat. On the eastern side is a large quarry which could also provide suitable nesting habitat. If common nighthawks are nesting near the HSA, they may use lakes, ponds, and open wetlands in the HSA as foraging habitat.

Olive-sided Flycatcher

Olive-sided flycatcher is listed as Special Concern under the federal SARA and as Threatened under the provincial NS ESA. It was first federally listed as Threatened in 2007; however, due to a stabilization in the rate of decline, COSEWIC (2018b) revised the status to Special Concern in 2018. The official federal SARA status was downgraded from Threatened to Special Concern in 2023. In Nova Scotia, olive-sided flycatchers are found in forested areas where scattered trees remain after clear-cutting or fire, as well as mature stands of black spruce adjacent to bogs, fens, beaver ponds, where hydrological alterations have created gaps in the canopy with scattered snags in them. Nests are established in black spruce trees adjacent to the forest gaps.

No olive-sided flycatchers were encountered during the field surveys. The AC CDC data report (2023) indicates that olive-sided flycatchers have been recorded twice within approximately 5 km of the Study Area. Both records are from the Timberlea MBBA square in 2006 so precise locations are not available. Habitat mapping for the Study Area indicates that suitable nesting habitat for olive-sided flycatcher may be present at one location near the southern end of Susies Lake. This area appears to be a forested swamp that has recently suffered heavy tree mortality probably because of hydrological fluctuations. The presence of open wetland habitat with scattered snags surrounded by a fringe of black spruce would provide good olive-sided flycatcher habitat.

Eastern Wood-Pewee

Eastern wood-pewee is listed as Special Concern under the federal SARA and Vulnerable under the NS ESA. Eastern wood-pewee is a medium-sized flycatcher that typically nests in mature deciduous and mixedwood forest stands. They typically occupy the mid to upper layers of the canopy and favor areas where canopy openings are present where they can catch flying insects (NSDNRR 2022). Threats to eastern wood-pewee are poorly understood, but like most aerial insectivores, a decline in insect populations is thought to be a key contributor (COSEWIC 2012).

No eastern wood-pewees were encountered during the field surveys. The AC CDC data request (2023) indicates that there are three records of eastern wood-pewee within approximately 5 km of the HSA. Two records are from within the 100 km^2 Timberlea MBBA square so it is not possible to determine with any precision where these birds were observed. The second record is from Birch Cove, 2.4 km east of the HSA. FEC forest stand mapping for the Study Area suggests that suitable nesting habitat may be present. This would include mature deciduous and mixedwood forest stands that border open habitats such as man-made clearings (quarry), lakes, and non-forested wetlands. Most potentially suitable eastern wood-pewee habitat is found along the eastern portion of the HSA where mature deciduous and mixed forest combined with adjacent clearings are most plentiful.

Bank Swallow

Bank swallow is listed as Threatened under the federal SARA and as Endangered under the provincial NS ESA. Bank swallows nest in burrows that they excavate in a variety of habitat types. These include lake and ocean bluffs; stream and riverbanks; sand and gravel pits; roadcuts; piles of sand, topsoil, sawdust, coal ash, and other materials (COSEWIC 2013a). The nest burrows are excavated in vertical or near vertical slopes (76 - 105º slope). Critical habitat has been defined and mapped for bank swallow in Nova Scotia (NSDNRR 2021a). Critical habitat is the habitat that is necessary for the survival or recovery of a species. Critical habitat for this species consists of suitable nesting habitat as well as suitable foraging habitat that is found within 500 m of the nesting habitat. Foraging habitat consists of open habitats that produce insects such as wetlands, salt marshes, grasslands, and hay fields. Seasonal wetlands or ponds that are flooded are important sources of insect prey for bank swallows. The Study Area does not fall within bank swallow critical habitat that is currently mapped.

No bank swallows were encountered during the field surveys. The AC CDC data search (2023) indicated that there are two records of Bank Swallow within approximately 5 km of the HSA. One of the records is from a MBBA square so it is not possible to determine with any precision where this bird was recorded. The second record is from Killarney which is located 5.7 km from the HSA There are no natural potential nesting sites (sandy lake bluffs and stream banks) at the site; however, anthropogenic nesting sites (steep embankments or soil stockpiles) could be present in the gravel quarry located on site so there is some potential for Bank Swallows to be present on site. If bank swallows are nesting near the HSA, they may use lakes, ponds, and open wetlands in the HSA as foraging habitat.

Barn Swallow

Barn swallow is listed as Threatened under the federal SARA and Endangered under the provincial NS ESA; however, the species was re-assessed as Special Concern in 2021 (COSEWIC 2021) making it eligible for a status change under the federal SARA. Barn swallow is a mid-sized aerial insectivore that forages in open habitats (e.g., agricultural fields, shorelines) and nests on anthropogenic structures, particularly in rural areas, and other structures (e.g., culverts; COSEWIC 2011b). Before European settlement, the barn swallow's nesting habitat was mainly characterized by natural features, such as caves, holes, crevices, and ledges associated with rocky cliff faces. Although barn swallows continue to nest in traditional natural situations, they are now most closely associated with human-made structures in rural areas. Such nesting sites include a variety of artificial structures that provide either a horizontal nesting surface (e.g., a ledge) or a vertical face, usually with some sort of overhang that provides shelter. Nests are most commonly located in and around open barns, garages, sheds, boat houses, bridges, road culverts, verandahs, and wharfs, and are situated on such things as beams and posts, light fixtures, and ledges over windows and doors (COSEWIC 2011b). This species was listed on Schedule 1 of SARA in 2017, but critical habitat has not been identified to date.

The HSA field surveys were conducted too late in the summer to detect barn swallows. There were three records of barn swallows reported by the AC CDC (2023) within 5 km of the HSA. The nearest record is from Belchers Marsh in Colby Village, 1.1 km east of the HSA. Suitable nesting habitat may be present inside the HSA on buildings associated with the quarry. These buildings are located at the northeastern

end of the site. The northeastern corner of the HSA is bordered in some areas by residences, some of which may provide suitable nesting habitat. Potential foraging habitat for barn swallows that might nest adjacent to the HSA would include Susies Lake and Quarry Lake at the southern end of the site and Washmill Lake and Charlies Lake along the northeastern boundary.

Canada Warbler

Canada warbler is listed as Threatened under the federal SARA and Endangered under the provincial NS ESA; however, the species was re-assessed as Special Concern in 2020 (COSEWIC 2020a) making it eligible for a status change under the federal SARA. Close to 80% of the Canada warbler population breeds in Canada (COSEWIC 2020a). Many key threats identified by COSEWIC (2020a) are present on the wintering grounds outside of Canada, though habitat loss in Canada is recognized as a contributing factor.

Canada warblers are found in a variety of forest types, but are most common in wet, mixed deciduous-coniferous forest with a well-developed shrub layer. It is also found in shrub swamps, red maple stands, eastern white cedar (*Thuja occidentalis*) stands, conifer swamps dominated by black spruce and tamarack, and riparian woodlands along rivers and lakes.

No Canada warblers were encountered during the field surveys. This species is typically found in dense vegetation and the field surveys were not conducted during peak Canada warbler breeding activity in June when this species can be detected by its song. Therefore, it is possible that Canada warbler went undetected during the field surveys. There are six AC CDC records of Canada warbler within approximately 5 km of the HSA. Four of the records are from the Halifax MBBA square so precise location data are not available for these records. The remaining records are from outside of the HSA near Timberlea approximately 5.7 km west.

There is suitable habitat for Canada warblers at various locations within the HSA. Forested or tall shrub-dominated wetlands having relatively open tree overstories and dense shrub understories were encountered at various locations during the field surveys which could provide suitable breeding habitat for this species.

Bobolink

The bobolink is a medium-sized grassland passerine that is listed as Threatened under the federal SARA and Vulnerable under the NS ESA. Bobolinks nest in natural grasslands and in agricultural lands used as hay fields and pasture. They prefer to nest in areas that are composed mainly of dense grass of moderate height (ECCC 2022b). Grass swards with moderate thatch are preferred. Forb cover in suitable nesting habitat is low to moderate and the cover of trees and shrubs is low. Scattered trees, tall shrubs, power poles, or fence posts are required as singing posts for male bobolinks. Minimum habitat size varies geographically and by habitat quality, but 10 ha is believed to be the minimum habitat size required for successful nesting.

No bobolinks were encountered during the field surveys. The AC CDC data report indicates that there are two records of bobolink within 5 km of the HSA. One record was from 900 m from the center of the HSA and the second was from Sherwood Heights 1.0 km from the HSA. Overall, the HSA contains no suitable habitat for bobolinks and this species is not expected to be present at the site.

Rusty Blackbird

Rusty blackbird is listed as Special Concern under the federal SARA and Endangered under the provincial NS ESA. Rusty blackbird is a medium-sized blackbird found in coniferous-dominated forests adjacent to wetlands (COSEWIC 2017a). Approximately 85% of the rusty blackbird breeding range is in Canada. Rusty blackbird breeding habitat includes sedge meadows, beaver ponds, muskegs, swamps, scrub riparian habitats of islands, lakes, rivers, and streams, as well as alder and willow thickets. This species typically selects breeding areas that contain shallow water areas for foraging and low open coniferous cover for nesting. Rusty blackbirds are typically found in remote areas.

No rusty blackbirds were recorded during the field surveys. There is one record located within approximately 5 km of the Study Area. This record is from the Halifax MBBA square in 1986. No precise location data are available for this record other than that it was recorded somewhere within the 100 km^2 square whose center is located 2.0 km from the HSA. The habitat mapping for the Study Area reveals that potential rusty blackbird nesting habitat may be present in coniferous forest and conifer-dominated forested wetlands located adjacent to streams that flow through the HSA including the stream that flows from Charlies Lake to Washmill Lake along the northeastern margin of the site and two small streams at the southern end that flow into Susies Lake. However, given the proximity of the HSA to an active quarry, a large business park, and residential development, the likelihood of rusty blackbirds nesting in these areas is low.

Myotis and Perimyotis Bats

The AC CDC data request results indicate that bats may be present near the HSA. Three species of hibernating bat have been recently listed as Endangered by both the federal government and the province of Nova Scotia. These include little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*) and tri-colored bat (*Perimyotis subflavus*) (COSEWIC 2013b). The populations of these three bat species have been severely reduced by white-nose syndrome, an introduced disease caused by a fungus (*Pseudogymnoascus destructans*) that affects hibernating bats. Little brown myotis, northern myotis and tri-colored bat are considered location sensitive species in Nova Scotia, and thus location data for sightings of these species are considered confidential and are not provided in AC CDC reports.

Habitat for these three species consists of hibernacula for overwinter survival and summering areas with suitable foraging areas within commuting range to structures used for roosting or maternity colonies. Hibernacula have been identified as critical habitat for little brown myotis, northern myotis and tri-colored bat (ECCC 2018b). All three species hibernate in caves or abandoned mines. Hibernation habitat is used for approximately six months each year. No critical habitat has been identified near the HSA. The nearest area known to provide bat hibernacula is near Centre Rawdon approximately 30 km to the north.

These bat species forage in a variety of habitat types which vary by species. Foraging habitat includes lakes, ponds and rivers, forest gaps, wetlands, the edges of forests and along trails. These bat species tend to avoid large open areas such as agricultural land, large clear-cuts and burned forests. Maternity colony habitat varies by species. Little brown myotis females will establish maternity colonies in buildings, under bridges, in rock crevices, or in cavities of canopy trees in forests. Northern myotis establish maternity colonies in large trees. Tri-colored bats often establish maternity roosts in clumps of arboreal lichens and may rarely establish maternity colonies in buildings. Maternity colonies often consist of hundreds of females and their young, so the locations of these roost sites are important. Males typically do not roost in large numbers and may use a variety of sites such as snags, crevices under bark and human made structures.

Hibernaculum sites and maternity colonies are the most important and sensitive habitats for non-migratory bats since large numbers of individuals gather at these sites. The geology of the HSA is not conducive to the formation of solution caves and there was no evidence to indicate that underground mine workings are present. It is therefore unlikely that the Study Area provides potential hibernacula for bats. The HSA is mostly forested; the mature mixed forest stands could potentially be suitable for maternity colonies. Attics in residences situated around the periphery of the HSA could provide maternity colony sites for little brown myotis and possibly tri-colored bat. Suitable foraging habitat would be present throughout most of the Study Area.

Moose

The *Americana* subspecies of moose in Nova Scotia is listed as Endangered under the NS ESA but is not listed under the federal SARA. Moose are associated with varying ages and types of boreal and temperate coniferous and mixedwood forest habitats. Preferred habitat has an abundance of mature forest that moose use for security and thermal cover interspersed with young deciduous trees and shrubs that they use for food. (NSDNRR 2021b). This interspersion of mature and young forest can occur as a result of natural disturbances such as fire, wind, and tree diseases or through anthropogenic disturbances such as timber harvesting. Moose have large home ranges and their choice of habitat varies over the seasons. During the summer months moose seek refuge from high temperatures and make use of mature coniferous forests that provide shade as well as wetlands, lakes, and ponds that provide thermal refuges from high temperatures and respite from biting insects. Mature closed canopy coniferous forest are used in late winter to provide relief from deep snow and cold temperatures. During the summer months moose feed mainly on trembling aspen (*Populus tremuloides*) and white birch (*Betula papyrifera*) along with a variety of aquatic plants. During the winter months moose browse on a wide variety of deciduous and coniferous woody plants with the bulk of their diet made up of deciduous species.

No evidence of moose (sightings, scat, tracks, browse, or rubs) were recorded during the field surveys. There is one record of moose located near the Study Area. This record is of a pair of moose that were observed near Beechville, 6.4 km south of the HSA in 2022. The habitat mapping for the Study Area reveals that potential moose habitat is present throughout much of the HSA with the exception of the heavily disturbed areas associated with the quarry. The most important potential moose habitat in the HSA would include mature coniferous forest and mixedwood forest as well as wetlands, ponds, and lakes. Although moose make use of a wide variety of upland, wetland, and aquatic habitats, they are

relatively sensitive to sensory disturbance associated with human activities. Given the proximity of the northern, southern, and eastern portions of the HSA to an active quarry, a large business park and residential development, the likelihood of moose being regularly present in these areas is low. Moose are also sensitive to habitat fragmentation and progressive loss of connectivity with other areas of potential moose habitat may adversely affect the ability of moose to access areas of suitable habitat.

Snapping Turtle

Snapping turtle is listed as Special Concern under the federal SARA and Vulnerable under the provincial NS ESA. Snapping turtles are found in Canada throughout Nova Scotia, New Brunswick, Quebec, Ontario, and in parts of Saskatchewan (COSEWIC 2008). They are typically found in slow moving or standing water with a soft mud bottom and dense aquatic vegetation. Snapping turtles are found in lakes, ponds, sloughs, shallow bays or river edges and slow streams. Snapping turtles will bask on offshore logs or rocks when water temperatures are low. This species spends most of its time in the water; however, between mid-May and mid-June female snapping turtles leave the water to find suitable sites to lay their eggs. These nesting sites include sand and gravel banks along waterways, muskrat houses, abandoned beaver lodges, railroad and road embankments, gardens, pastures, sawdust piles, manure piles, and forest clearings. Nesting sites are usually located near water. Snapping turtles may follow streams (including rocky streams) to reach suitable nesting sites. Mating may occur in these streams during the movements to nesting sites. The eggs hatch during the early fall and the hatchlings disperse to water where they bury themselves under leaf litter and debris and hibernate until spring.

No snapping turtles were encountered during the field surveys. There are three records of snapping turtles within approximately 5 km of the HSA. The nearest records are from Sherwood Heights 1.1 km to the east. The third record is from near Paper Mill Lake 4.1 km to the north of the site. Potentially suitable snapping turtle habitat is found through much of the HSA. The various lakes and ponds would provide suitable aquatic habitat. Washmill Lake and associated ponds found on the western side of the quarry would provide the best snapping turtle habitat. These waterbodies are located near open areas and roads containing deposits of sand and gravel which would provide attractive nesting sites for snapping turtles.

Eastern Painted Turtle

The eastern subspecies of the painted turtle is listed as Special Concern under the federal SARA but is not listed under the NS ESA. Eastern painted turtle was first assessed by COSEWIC in 2018 (COSEWIC 2018c) and was designated as Special Concern in 2021. This suggests that a status change under the NS ESA is possible, as the federal designation was recent. The painted turtle is a small turtle with one of the most northernly distributions of North American freshwater turtles. In Canada, the eastern painted turtle subspecies is found in mainland Nova Scotia and near the coast in New Brunswick.

Eastern painted turtles occupy slow moving, relatively shallow and well vegetated wetlands (swamps, marshes, ponds, and oxbows) and water bodies (lakes, rivers, creeks, and streams) with abundant basking sites and organic substrate. They are found in association with aquatic plants including water shield (*Brasenia schreberi*), American water lily (*Nymphaea odorata*), cow lily (*Nuphar variegata*), pickerel weed *(Pontederia cordata*), and pondweed (*Potamogeton* spp.), which are used for cover and feeding.

No eastern painted turtles were encountered during the field surveys. There are three AC CDC records of this species from within approximately 5 km of the Study Area. The nearest record is from Belchers Marsh, 1.2 km east of the HSA. The next closest record is from Cabin Lake 2.5 km to the northeast. The third record is from Greenwood Heights, 3.9 km to the southwest. Suitable habitat for eastern painted turtles is present through much of the HSA. The various lakes and ponds would provide suitable aquatic habitat. Washmill Lake and associated ponds found on the western side of the quarry would provide the best eastern painted turtle habitat. These waterbodies are located near open areas and roads containing deposits of sand and gravel which would provide attractive nesting sites for this species.

Wood Turtle

Wood turtle is listed as Threatened under both the federal SARA and the provincial NS ESA. Wood turtle was first added to Schedule 1 of SARA in 2010 and had the status of Threatened reaffirmed in 2018 (COSEWIC 2018d). Wood turtle is a medium-sized turtle with a grey/brown or yellow carapace. They can be found throughout Eastern North America, and prefer semi-aquatic, riparian environments. Wood turtle is considered a location sensitive species in Nova Scotia, and thus location data for individual sightings of wood turtle are considered confidential.

Wood turtles are associated with meandering shallow rivers with sand, gravel and/or cobble bottoms. These rivers are typically clear, with moderate current and frequent oxbows. Secondary tributaries (brooks) that feed these rivers may also support wood turtles by providing travel routes to resource patches. Still water or slow water habitats such as vernal pools, oxbows, marshes, and beaver ponds are also used, though less frequently than riverine habitats. Wood turtles are highly terrestrial and will forage in riparian and wetland habitats adjacent to river systems.

A population of wood turtles is present on the Sackville River (East Coast Aquatics 2016). A two-year monitoring study of this population demonstrated a high degree of site fidelity with none of the 11 marked wood turtles leaving the Sackville River. However, incidental observations compiled by East Coast Aquatics (2016) indicated that wood turtles have been observed away from the Sackville River on its tributaries. A wood turtle was observed and photographed in the Kingswood subdivision which is located 5.4 km north of the HSA. This wood turtle was found on the Johnson River which is part of the Sackville River watershed. This may be the AC CDC record of wood turtle recorded approximately 5 km from the HSA. The HSA is not located within the Sackville River watershed so it is unlikely that wood turtles would be able to follow streams to get to the HSA. There are several streams in the Study Area; however, they would provide poor nesting or foraging habitat for wood turtles. Wood turtles are not expected to be present in the HSA.

Gypsy Cuckoo Bumble Bee

The gypsy cuckoo bumble bee is listed as Endangered under both the federal SARA and the NS ESA. This species is an obligate nest parasite of other bumble bee species. Gypsy cuckoo bumble bee queens usurp the nests of other bumble bee species and use the host worker bees to care for the offspring of the gypsy cuckoo bumble bee queen (ECCC 2022). In Nova Scotia, the host species is the yellow-banded bumble bee which is also a SAR. Because the gypsy cuckoo bumble bee is entirely dependent on yellow-banded bumble bees, required habitat for this species is the same as for the yellow-banded bumble bee. Gypsy cuckoo bumble bee has been recorded once within approximately 5 km of the HSA at Armdale, 5.8 km to the southeast. Given the generalist nature of the yellow-banded bumble bee and the wide range of forested and open habitats that it uses, the parasitic gypsy cuckoo bumble bee could potentially be present throughout the Study Area.

Yellow-banded Bumble Bee

Yellow-banded bumble bee is designated as Special Concern under the federal SARA and as Vulnerable under the NS ESA. The species was first assessed in 2015 (COSEWIC 2015) and was designated for federal status in 2018. Yellow-banded bumble bee is found in much of Canada and parts of the United States and occurs in a diverse range of habitats, including mixed woodlands, farmlands, urban areas, montane meadows, prairie grasslands and boreal habitats. It has been recorded foraging on flowers for pollen and nectar from a variety of plant genera. Like many bumble bees, it usually nests underground in pre-existing cavities such as abandoned rodent burrows and rotten logs. Yellow-banded bumble bee queens overwinter underground and in decomposing organic material such as rotting logs (COSEWIC 2015; ECCC 2022a).

There are 11 records of yellow-banded bumblebee within approximately 5 km of the HSA. The nearest record is approximately 2.2 km east of the HSA. Given the generalist nature of this species and the wide range of forested and open habitats that it uses, yellow-banded bumble bees could potentially be present throughout the HSA.

Monarch

Monarch is listed as Special Concern under the federal SARA and as Endangered under the NS ESA. The monarch is a milkweed butterfly in the family Nymphalidae. The eastern North American population is migratory and monarchs that breed in Northeastern North America migrate to over wintering sites in Mexico, Florida, and the Gulf Coast of the United States (COSEWIC 2016). Adult monarchs feed on a variety of plant species and can be found in a variety of habitats. In Nova Scotia, monarch larvae feed on the introduced common milkweed (*Asclepias syriaca*) and the native swamp milkweed (*Asclepias incarnata*). This limited selection of suitable larval food plants restricts the distribution of larval monarchs to the distribution of the two milkweed species. Common milkweed is typically found along roadsides and in agricultural fields particularly in sandy soils. It is uncommon in most of Nova Scotia but may be locally common in the Annapolis Valley. Swamp milkweed is an uncommon native species in Nova Scotia that is typically found in wet thickets usually near a stream or lake shore.

Monarchs have been recorded 41 times within approximately 5 km of the HSA. The nearest record is 1.0 km east in Sherwood Heights. Five of the records were larval monarchs, adults laying eggs or reports of adults foraging on milkweed which are indicative of the presence of suitable host plants. The nearest record indicative of the presence of host milkweed plants is from approximately 1.9 km east of the HSA at Wedgewood. Neither common milkweed nor swamp milkweed was noted at the HSA during the habitat surveys; however, small populations of these species could potentially be present. Gardeners may also cultivate milkweed species to provide breeding habitat for monarchs. Areas of the HSA with the greatest potential to provide breeding habitat for monarchs would be relatively rich swamps and shorelines where swamp milkweed may be present such as along the shores of Washmill Lake. Patches of common milkweed could potentially be present on roadsides and disturbed areas within the footprint of the quarry. Residential areas, which are found on the periphery of a small portion of the HSA, could also provide breeding habitat. Adult monarchs feed on nectar of a wide variety of flowers. Residential areas and open habitats such as the quarry site could provide high concentrations of flowers. Suitable feeding areas for adult monarchs in the HSA would include the margins of trails and disturbed areas where preferred food plants such as asters and goldenrod produce abundant flowers. The HSA could provide habitat for both larval and adult monarchs.

Boreal Felt Lichen

The boreal felt lichen is a cyanolichen that is listed as Endangered under both the federal SARA and the NS ESA (ECCC 2018). This epiphytic lichen grows in cool moist areas within 25 km of the coast and at elevations under 200 m. It typically grows on mature and overmature balsam fir that are growing adjacent to wetlands where carpets of sphagnum moss (*Sphagnum* spp.) are present. The boreal felt lichen is sensitive to air pollution and to changes in its environment that affect the microclimate where it lives such as drying associated with nearby timber harvesting.

There are two records of boreal felt lichen from Blueberry Lake dating from 1989. These records are likely for the same population which is located 5.2 km from the HSA. The AC CDC record indicates that attempts have been made to relocate this population with no success and it is believed this population no longer exists. A predictive habitat model for boreal felt lichen in Nova Scotia was originally developed by Cameron and Neily (2008), which is now integral in supporting habitat identification according to Special Management Practices (NSDNR 2018). Output from the Boreal Felt Lichen predictive habitat layer revealed a cluster of three small potential boreal felt lichen habitat patches located at the southern tip of the HSA. Although suitable habitat is present, the close proximity of these patches to the Bayers Lake Industrial Park and Highway 102 may make these areas inhospitable for boreal felt lichen as a result of exposure to air pollution and to the drying effect of large areas of adjacent open habitat.

White-rimmed Shingle Lichen

The white-rimmed shingle lichen is listed as Threatened by COSEWIC but is not listed under either the federal SARA or the NS ESA. This species is an arboreal cyanolichen that grows in cool moist habitats. In Nova Scotia it is typically found in forested wetlands where red maple is present in the canopy. Understory species that white-rimmed shingle lichen is associated with include cinnamon fern (*Osmundastrum cinnamomeum*), royal fern (*Osmunda regalis*), winterberry (*Ilex verticillata*), mountain holly, and sphagnum moss (COSEWIC 2019). White-rimmed shingle lichen grows on medium to large red maple that are leaning.

There is one record of white-rimmed shingle lichen within 5 km of the HSA which is 300 m northwest of the northern end of the HSA near Charlies Lake. There are three forested wetlands at the HSA that may provide suitable habitat for white-rimmed shingle lichen. These include a small wetland in the center of the HAS(WL36) and two relatively large wetlands at the southern end (WL36 and WL41).

Butternut

The butternut (*Juglans cinerea*) is medium to large tree in the walnut family that is listed as Endangered under the federal SARA but is not listed under the NS ESA. It typically grows on pH neutral to alkaline soils and grows best in deep well drained soils on floodplains, streambanks, terraces, and on ravine slopes (COSEWIC 2017b). It is generally absent from acidic soils. Butternuts are not native to Nova Scotia but are occasionally grown as ornamental trees.

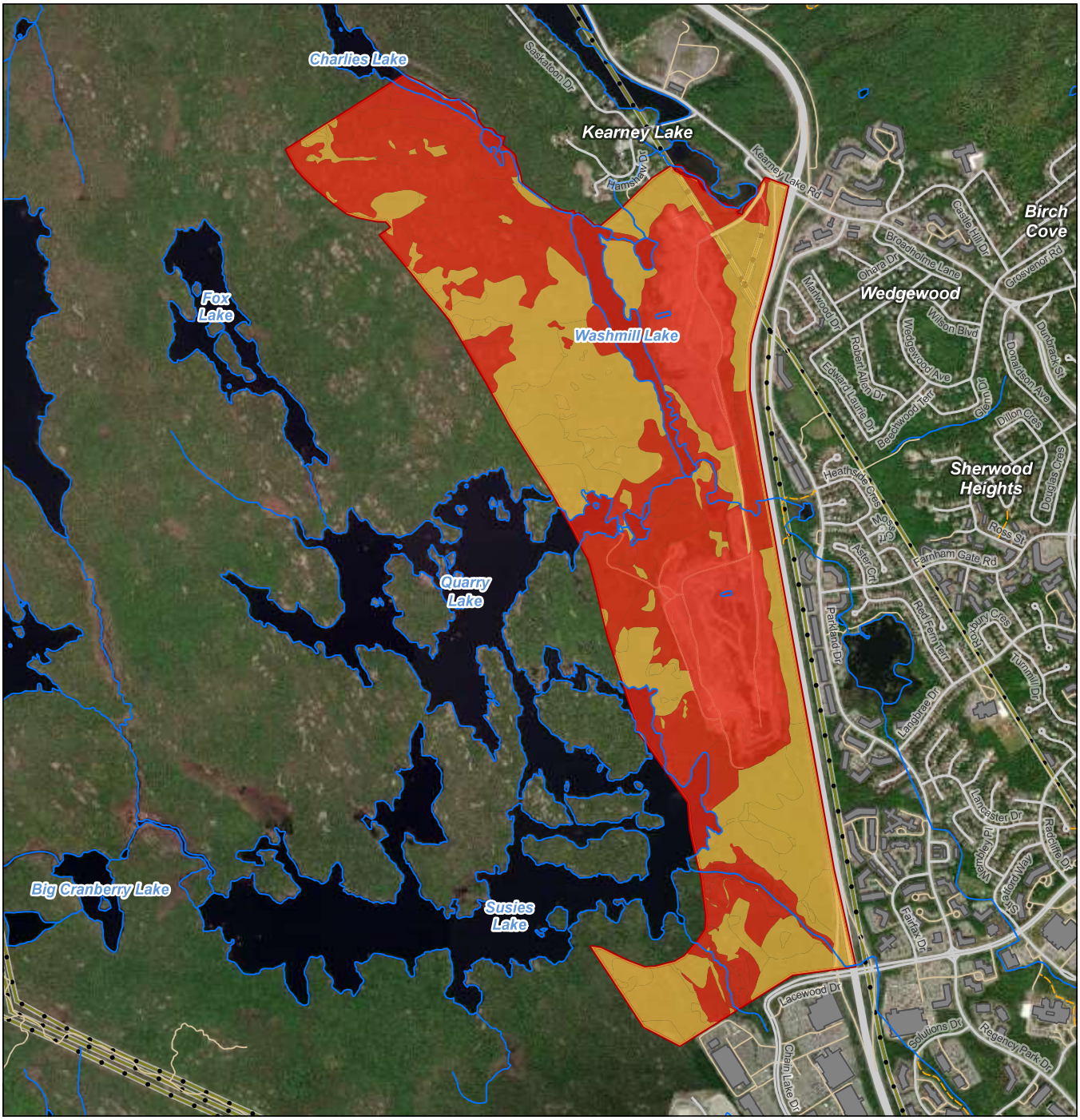
There are two records of butternut within approximately 5 km of the HSA. The closest record is 1 km northwest of the northern end of the HSA. The second record is 5 km southeast at the Ashburn golf course. Both records would be planted ornamental trees. The HSA is characterized by thin acidic, extremely stony soils. It is highly unlikely that butternut would occur naturally within the HSA.

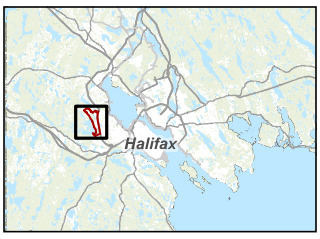
3.4.3.2 Species at Risk Distribution

The presence of individual SAR was not used exclusively to evaluate the presence and distribution of SAR within the HSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present in the HSA. Instead, SAR that are or could potentially be present were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the HSA. The habitat preferences of these species were compared to the results of the upland, wetland, and aquatic surveys conducted in the HSA along with available habitat mapping and aerial imagery. Where matches were found between SAR habitat preferences and the habitats that had been mapped in the Study Area, those species were considered potentially present. The habitat mapping was then used to map the potential distribution of various SAR in the Study Area.

The distributions of each SAR that could potentially be present in the HSA were plotted onto a single map to identify areas where SAR were potentially present, absent or where multiple SAR could be present. The habitat areas were ranked based on the number of SAR species the area could potentially support. Habitat areas that could potentially support more than three SAR were given the lowest priority for development, while habitat areas that are unlikely to support any SAR were given the highest priority for

development. In some instances, SAR habitat areas are subdivisions of habitat polygons. Subdivision of habitat polygons was done when the habitat polygon contained areas that were both suitable and unsuitable for a particular SAR and where these suitable and unsuitable areas could be viewed and mapped from the available imagery. In other instances, buffers were created around habitat features such as watercourses or shorelines to identify habitat areas such as riparian areas that may be regularly used by semi-aquatic SAR. The map product incorporates the potential suitable habitat for all SAR that may be present in the HSA (Figure 3.9).





Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

- Study Area

Species at Risk
- Habitat Potentially used by 4+ SAR
- Habitat Potentially used by 1-3 SAR
- Habitat Unlikely to be used by SAR

Utilities
- Transmission Line

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail
- Waterway
- Building

0 250 500 Metres
(At original document size of 8.5x11)
1:23,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-05-23
TR by SMacFarlane on 2024-05-23

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_024

Figure No.
3.9

Title
Potential Distribution of Species at Risk - Highway 102 West Corridor

HRM FCM 2022.aprx Revised: 2025-02-03 By: niwhite

Several patterns are visible in the SAR distribution mapping. No areas in the HSA can be excluded as being potential SAR habitat. This is attributable to the potential presence of yellow-banded bumble bee and gypsy cuckoo bumble bee which can occur in a wide variety of upland and wetland habitats. The yellow-banded bumble bee can potentially be found in all terrestrial habitat types in the HSA The gypsy cuckoo bumble bee is a brood parasite of the yellow-banded bumble bee, so although its niche is very narrow (the nests of its host species), it can be found in a wide variety of habitats due to the wide niche breadth of its host.

Areas in the HSA potentially capable of supporting more than three SAR are typically associated with four habitat features including watercourses, wetlands, mature forests, and anthropogenic habitats. Watercourses could potentially provide habitat and travel routes for a variety of SAR that have been recorded in the vicinity of the HSA including snapping turtle, eastern painted turtle, moose, common nighthawk, bank swallow, and barn swallow. SAR associated with wetlands include lesser yellowlegs, Canada warbler, olive-sided flycatcher, rusty blackbird, common nighthawk, moose, yellow-banded bumble bee gypsy cuckoo bumble bee, boreal felt lichen, and white-rimmed shingle lichen. SAR that are associated with mature forests include eastern wood pewee, evening grosbeak, little brown myotis, northern myotis, tri-colored bat, moose, yellow-banded bumblebee, and gypsy cuckoo bumble bee.

Many of the areas where SAR are potentially concentrated are linked by watercourses. This is probably attributable to several factors. The watercourses provide habitat for their own suite of SAR. Wetlands often develop along these watercourses or are the headwaters for watercourses and support a different group of SAR. The riparian habitats along the watercourses are protected by buffer zones within which no forest harvesting may occur. Therefore, the remnants of mature forest can become concentrated along the shores of these watercourses. These mature forest remnants provide habitat for other SAR. These linear concentrations of SAR are of particular benefit since they can provide both habitat for SAR and corridors to connect plant and animal populations in urban areas.

Eight of the 21 SAR that have been identified as potentially present in the HSA are known to make use of anthropogenic habitat for at least part of their life history. These include bank swallow, barn swallow, common nighthawk, little brown myotis, common snapping turtle, yellow-banded bumble bee, gypsy cuckoo bumble bee, and monarch. Although these species can exploit anthropogenic habitats, they often require nearby undisturbed habitats to satisfy other aspects of their natural history. For instance, bank swallows, barn swallows and common nighthawks often nest on human structures or in areas heavily disturbed by humans; however, these species require nearby foraging habitats such as wetlands or water courses that produce abundant flying insects to provide food for themselves and their nestlings. In heavily developed areas these food sources may not be present or may be degraded to the point where they do not produce enough food.

3.4.4 LAND SUITABILITY ANALYSIS – FOREST HABITAT AND SPECIES AT RISK

Stantec conducted a land suitability assessment for forest habitat and species at risk by collating existing desktop data, referring to previously published reports, and conducting field surveys. The data underwent analysis using geographic information systems (GIS) and other tools to identify factors influencing land suitability. Following digitization, Stantec established a list of key terrestrial layers and devised a scoring system based on their significance to the assessment objectives. The evaluated layers include:

- Forest Maturity and Forest Succession
- Species at Risk Habitat

This process culminated in the creation of a map (Figure 3.10) that illustrates these criteria and weights used to evaluate the suitability of different areas for development. The results allow for the identification of suitable and unsuitable areas, as well as the recognition of potential constraints. The sections below apply a suitability score for field confirmed forest habitat and its potential to facilitate SAR.

Figure 3.10 displays the land suitability output collated from the previous sections based on scoring criteria presented in Table 3.15. The reader is reminded that a lower score for land suitability for development generally corresponds with higher ecological value associated with the three categories, and a higher suitability score corresponds with a lower ecological value for the three categories.

Table 3.15 Forest Habitat and Species at Risk – Land Suitability Ranking Framework

Layers	Land Suitability Ranking		
	1 - Low suitability for development	**2 - Moderate suitability for development**	**3 - Higher suitability for development**
Forest Maturity / Forest Succession*	Potential old growth (>80 years old) / late and mid-to-late successional	Mature (30-80 years old) / mid-successional and edaphic	Immature (<30 years old) / early and early-to-mid successional
SAR Habitat	Habitat potentially used by more than 3 SAR	Habitat potentially used by 3 or fewer SAR	Habitat unlikely to be used by SAR

Note:
*When no forest maturity class could be determined based on field determined stand age, forest succession was used

3.4.4.1 Forest Maturity and Forest Succession

Forest maturity classes were assigned based on the estimated stand ages from field data collection. Forested stands under 30 years of age are considered immature stands, while stands between 30-80 years of age are considered mature. Immature stands are composed of younger vegetation compared to the mature stands which have progressed towards the climax community seen in old growth forests. Many VTs identified within the study area are immature, successional dynamics suggest that many could support the development of old growth characteristics given enough time. For this analysis, forested stands above 80 years of age are considered to have the potential to be old growth forest. The province of Nova Scotia 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 type (NSDNRR 2022). This age criteria ranges between 100-140 years of age depending on the FEC VT. At this time, the exact stand age and forest maturity status cannot be determined without specific old growth forest sampling and thus stands estimated to be over 80 years old are considered to have the potential to be old growth forest for this land suitability analysis.

Where age was not estimated in the field, forest succession types from the FEC manual are used based on the above ranking criteria. Forest succession is typically divided into three classes; early successional, mid successional, and late successional which correspond to stand age and successional dynamics. Using the FEC VTs for each stand, each VT (e.g. MW2, IH6, SH5) is assigned successional classifications of early, early-to-mid, mid, mid-late, late and edaphic. For sites classified as barrens types, they are assigned a score of 2 based on the lack of available knowledge on successional dynamics of barrens in Nova Scotia and the potential for diversity within the VT.

Upon final community design, forested wetland VTs should be considered for conservation given their value as effective carbon sinks and wildfire breaks, in addition to attenuating stormwater flow.

Stands with the potential for old growth forest provide the highest ecological significance and are ranked as lower for potential future development. While immature stands are ranked higher for development. VTs with early and early to mid-successional stages are assigned a higher priority for development as they generally do not support key habitat and are not close to progression to later more structurally complex successional stages. A list of VT types that can reach old growth classification can be found in Appendix E. Stands with site limiting factors such as sites with low nutrients or wetlands are denoted as edaphic and are rated as moderate for development; while they will not reach a climax stage they can provide distinct habitat types. Late successional forests are assigned the lowest priority for development due to their limited occurrence on the landscape and the high potential to provide key habitat.

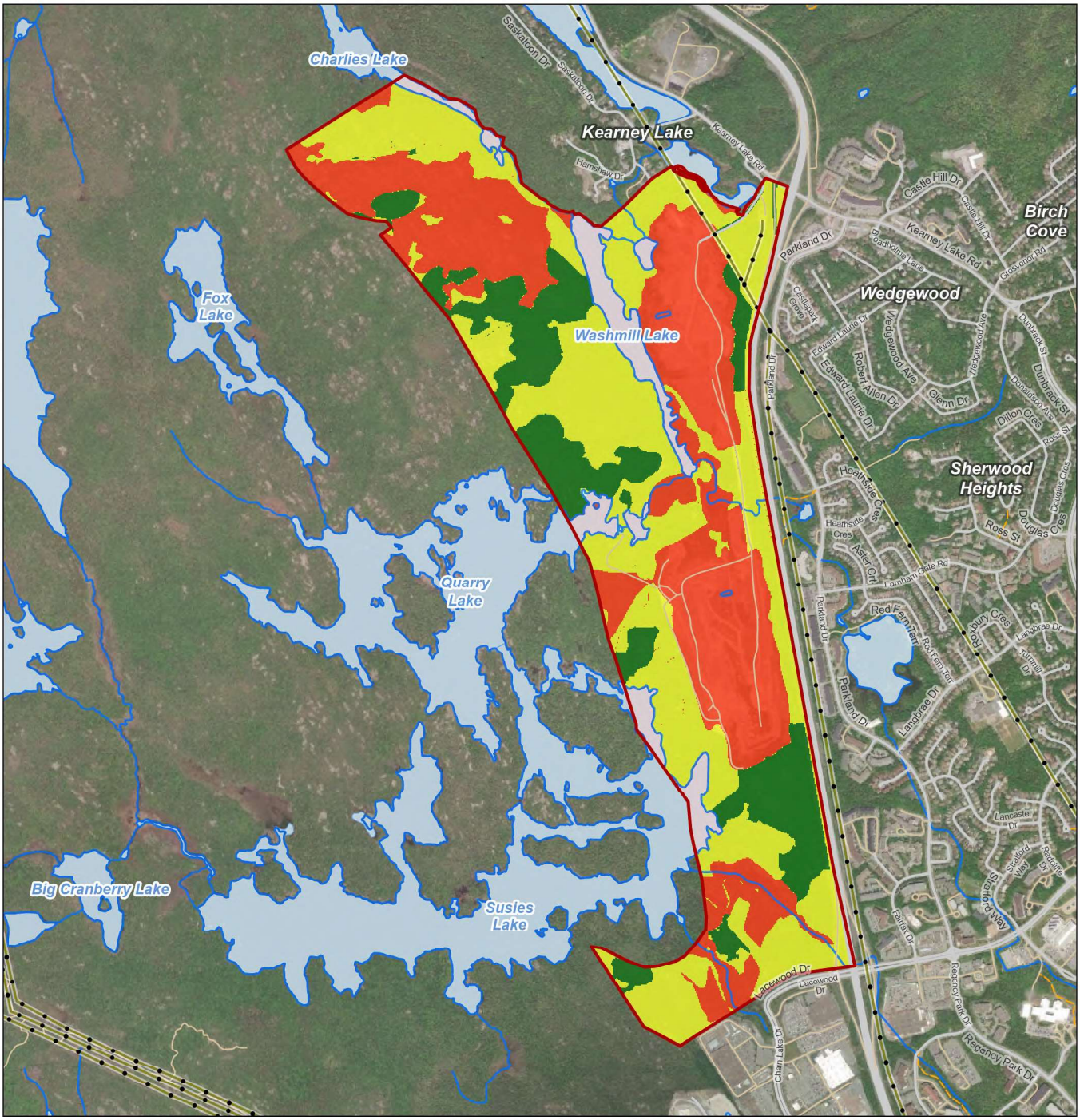
There is an old growth policy applicable to crown lands in Nova Scotia and it provides accepted survey methods for confirming old growth forests within the province. Stantec recommends HRM consider these surveys in the event the municipality wishes to develop a provincially acceptable inventory of old growth forests within the municipality. Although applicable to crown land only, the policy also encourages projects on private lands to survey for old growth forests (Natural Resources and Renewables, 2022).

3.4.4.2 Species at Risk

The presence of individual SAR was not used exclusively to evaluate the role of SAR on land suitability within the HSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present at the HSA. Instead, SAR that are or could potentially be present in the HSA were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the HSA. The habitat preferences of these species were compared to the results of the upland, wetland and aquatic surveys conducted on the HSA along with available habitat mapping. Where matches were found between SAR habitat preferences and the habitats that had been mapped in the HSA, those species were considered potentially present. The habitat mapping was then used to map the potential distribution of various SAR on the site. This information was considered and evaluated as part of the landscape connectivity exercise.

SAR identified in either the AC CDC (2023) report or identified during the field programs noted above that have suitable habitat within the HSA are compiled and the habitat areas are ranked based on the number of SAR species this habitat could potentially support. Habitat areas that potentially support multiple species (i.e., more than 3) of SAR are given the lowest priority for development, while habitat areas that are unlikely to be used by SAR are given the highest priority for development. Some habitat areas are subdivisions of habitat polygons or buffers are created around habitat features such as watercourses as habitat preferences vary by species. Figure 3.10 incorporates the potential suitable habitat for all SAR that may be present in the HSA.

The preceding analysis of potential land suitability based on forest habitat and species at risk should only be viewed as a preliminary tool to assist in planning for future development in the HSA. Responsible land development depends on many factors including those described above, and no one factor or group of factors should be considered determinative. Rankings are meant to be indicative, and to lay the groundwork for future, site specific investigations to be conducted as planning proceeds. In particular, further field confirmation will be required (e.g., for wetlands) in areas not covered in this study.



Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Study Area

Land Suitability Score

- 3 (High)
- 2
- 1 (Low)

Utilities

- Transmission Line

Transportation

- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:23,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-15
Revised by NWhite on 2024-05-24

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_033

Figure No.
3.10

Title
Forest Habitat and SAR Land Suitability Analysis - HSA

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3.5 Landscape Connectivity

The land suitability mapping derived from the integration of forest maturity and forest succession, and SAR mapping exercises, wetland mapping, and watercourse mapping were used in conjunction with existing studies of landscape connectivity in HRM to identify potential wildlife corridors within the HSA. The goal of this exercise is to provide connectivity between patches of undisturbed habitat that may be potentially isolated by development. The provision of wildlife corridors allows wildlife that require larger home ranges to inhabit areas that would otherwise consist of isolated patches too small to support those species. Wildlife corridors allow wildlife to emigrate from areas that are overpopulated and immigrate to areas where suitable habitat is available. They also provide conduits for genetic material, reducing the potential for inbreeding.

The HSA, is located adjacent to the Blue Mountain-Birch Cove Lakes Wilderness Area and proposed national urban park. These areas together constitute a large area of relatively undisturbed habitat that is largely surrounded by urban and suburban development. Providing landscape connectivity between this area, other protected areas within the developed portion of the HRM and undeveloped areas of the HRM are important for the maintenance of biodiversity in this area. Figure 3.11a presents general mapping of the HSA and the area surrounding it including the portion of the Blue Mountain-Birch Cove Lakes Wilderness Area located near the HSA to facilitate interpretation of the landscape connectivity text. Figure 3.11b shows both the Blue Mountain-Birch Cove Lakes Wilderness Area and various corridors that have been proposed by the Halifax Green Network Plan (HGNP 2018) and the Nova Scotia Crown Share Land Legacy Trust (NSCSLLT 2021) to provide required landscape connectivity. This figure presents these corridors in relation to the HSA to determine if the HSA can contribute to landscape and watercourse connectivity. Figure 3.11c presents a proposed, updated corridor system for the HSA that aims to provide both connectivity as well as protection for sensitive ecological features found in the HSA. The following text summarizes some of the previous corridor planning efforts in the region of the HSA as context for the newly proposed corridor within the HSA.

The Halifax Green Network Plan (HGNP) identifies one Essential Corridor and two Important Corridors that are located near the HSA. The Essential Corridor consists of a patch of habitat centered on Susies Lake that connects two isolated properties that are part of the Blue Mountain-Birch Cove Lakes Wilderness Area (Figure 3.11b).

There is a large tract of Important Corridor that forms a ring around the Blue Mountain-Birch Cove Lakes Wilderness Area (Figure 3.11b). This Important Corridor links the Blue Mountain-Birch Cove Lakes Wilderness Area to protected areas to the south of Highway 103 at two locations. The first corridor links the Blue Mountain-Birch Cove Lakes Wilderness Area to the protected area that flanks the Nine Mile River via The Links at Brunello golf course. The second corridor links the Blue Mountain-Birch Cove Lakes Wilderness Area to the protected area near Ragged Lake via a corridor that runs along Hobsons Lake Drive. Most of this corridor has recently been heavily developed and no longer constitutes a viable wildlife corridor.

The large tract of Important Corridor also extends northwards and provides a connection between the Blue Mountain-Birch Cove Lakes Wilderness Area and protected areas around the Sackville River via Sandy Lake. Part of this Important Corridor extends into the southern tip of the HSA.

There is a second small patch of Important Corridor that runs north/south along the eastern edge of Susies Lake and Quarry Lake. The northern end of this corridor is situated inside the middle of the HSA but does not connect to any protected habitat further to the north (Figure 3.11b).

The HGNP recommends that Essential Corridors be at least 1 km wide and be composed of intact habitat to facilitate movement of wildlife. The HGNP recommends that Important Corridors be at least 100 m wide to facilitate movement of wildlife (Halifax Regional Municipality and O2 Planning + Design 2018).

The Nova Scotia Crown Share Land Legacy Trust (NSCSLLT 2021) has also assessed the HSA regarding landscape connectivity. NSCSLLT has identified a terrestrial Primary Corridor that extends from the Sackville River south to the Blue Mountain Birch Cove Lakes Wilderness Area just north of Ash Lake to the west of the HSA which aligns with the HGNP corridor mapping (Figure 3.11b). Similarly, NSCSLLT has also identified a Secondary Terrestrial Corridor that extends north/south from the Blue Mountain-Birch Cove Lakes Wilderness Area to the protected area along Nine Mile River via The Links at Brunello. NSCSLLT does not identify a corridor near Hobsons Lake Drive. The NSCSLLT mapping is more recent than the HGNP mapping and this area has experienced increased development in recent years.

NSCSLLT has identified two Aquatic Corridors near the HSA. One of these Aquatic Corridors extends from near Ash Lake at the northern end of the Blue Mountain Birch Cove Lakes Wilderness Area to Sandy Lake via Black Duck Brook and on to the Sackville River. The second Aquatic Corridor arises at Crane Lake in the southern half of the Blue Mountain Birch Cove Lakes Wilderness Area and flows into the Birch Cove Lakes. It then flows across the HSA to Washmill Lake and then into Kearney Lake via Little Fox Brook (Figure 3.11b). From Kearney Lake it then flows to Paper Mill Lake and Bedford Basin.

One of the NSCSLLT Aquatic Corridors passes through the HSA. This corridor would provide habitat and a travel route for aquatic and semi-aquatic species. Watercourses in the HSA will be buffered 30 m on each side to protect the watercourses and riparian habitats associated with them. According to proposed HRM regulations, the margins of wetlands contiguous with watercourses also receive 30 m buffers. Although there are no provincial regulations that require wetland margins to be buffered, the Province of Nova Scotia does recommend that, where feasible, wetlands should be buffered in the same manner as watercourses (Government of NS 2011). The margins of wetlands in the HSA will therefore be buffered by 30 m to reduce the potential for adverse effects to these wetlands from adjacent development such as hydrological or trophic level disturbances. Watercourses and wetlands are important ecological features that are regulated under provincial legislation. Given the importance of watercourses and wetlands, these features have low Land Suitability Rankings.

The preservation of riparian habitats along these watercourses and wetlands associated with them would not only help preserve habitat quality in these watercourses but would also provide intact terrestrial habitat and movement corridors for terrestrial species. There are several mature forest stands (including the only potential old growth stand in the HSA) as well as several wetlands areas that flank the Aquatic Corridor. These are ecologically valuable habitat types and, along with the watercourses, can potentially harbour relatively high concentrations of SAR and SOCC. Given these habitat values, it is recommended they be incorporated into the Aquatic Corridor.

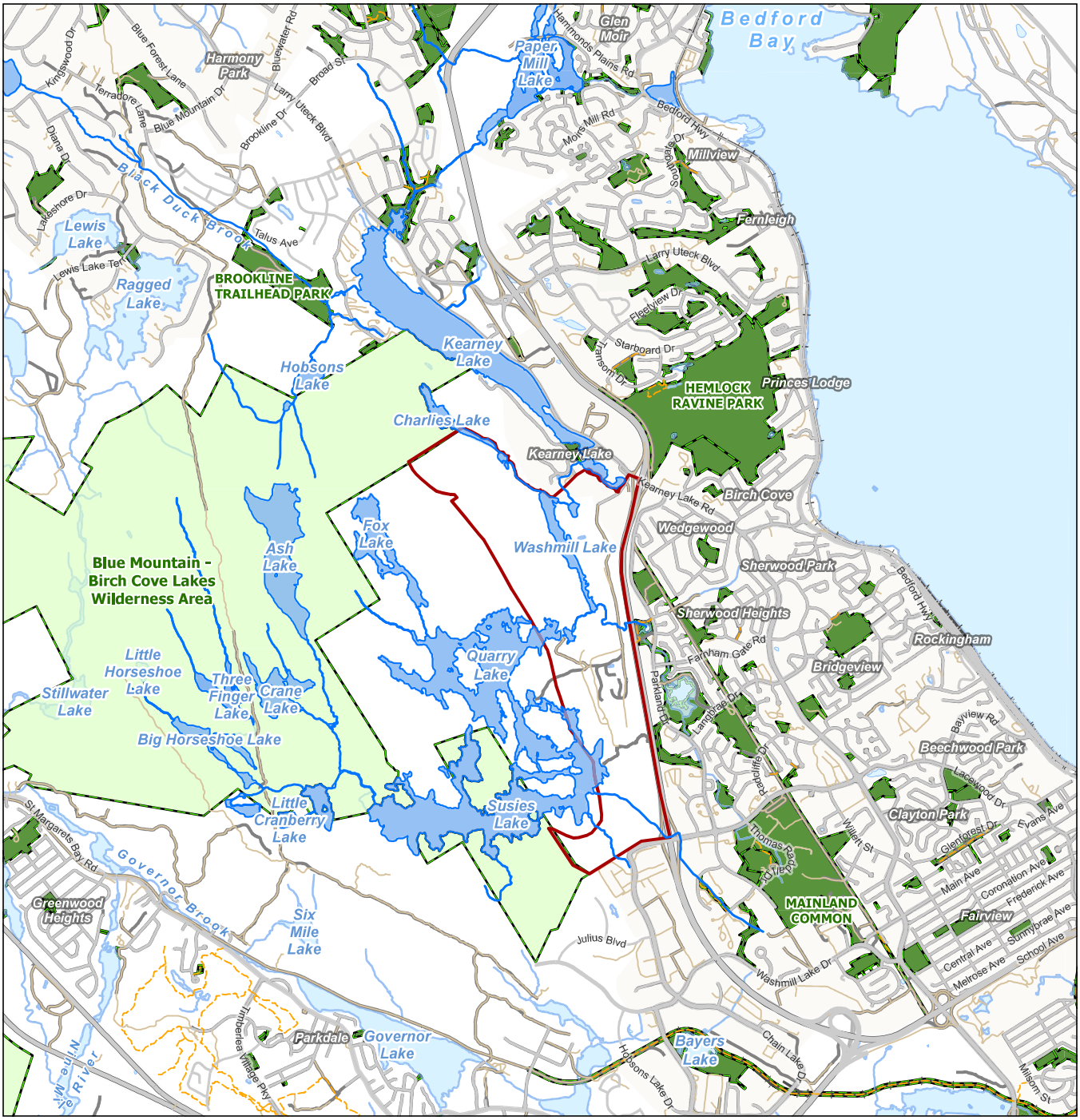
Charlies Lake and its outflow form the northern boundary of the HSA. This system discharges into Washmill Lake. The valley through which this stream flows has steep slopes which support some of the oldest forests in the HSA. It is recommended that these stands be incorporated into a buffer to protect the water quality of Charlies Lake and its outflow. This system would be incorporated into the Aquatic Corridor and would provide additional connectivity to the Blue Mountain Birch Cove Lakes Wilderness Area.

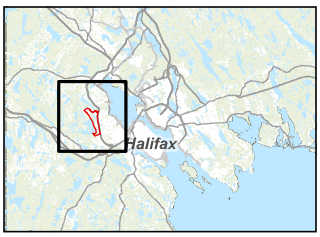
Figure 3.11c shows the configuration of the recommended Aquatic Corridor. The SAR habitat modelling indicates that the proposed Aquatic Corridor has potential to support many of the SAR that have been reported from the vicinity of the HSA including bank swallow, barn swallow, lesser yellowlegs, common nighthawk, eastern wood pewee, little brown myotis, northern myotis, tri-colored bat, snapping turtle, eastern painted turtle, yellow-banded bumble bee, and gypsy cuckoo bumble bee.

The southern end of the large Important Corridor extends into the southern tip of the HSA. It partially encompasses two wetlands that have high potential to support SAR. It is recommended that the Important Corridor be extended to the east to encompass these wetlands (Figure 3.11c). This extension would also encompass a 30 m buffer along the shoreline of the portion of Susies Lake that extends into the HSA.

The proposed wildlife corridor runs parallel to an operating quarry which may reduce its efficacy due to exposure to sensory disturbance. Species that are particularly sensitive to the presence of anthropogenic activities may be reluctant to use the wildlife corridor. However, most species present in the area would be expected to make use of it. It is important to consider that the quarry is inactive at night and noisy activities such as blasting and crushing do not occur on a daily basis. The proposed wildlife corridor incorporates corridors for terrestrial, aquatic and semi-aquatic species, preserves sensitive habitats (aquatic and terrestrial) and provides a buffer to protect surface water quality.

It may be necessary to cross the ecological corridors with roads and utilities to pursue development in areas deemed suitable, this should be avoided as much as possible. It is recommended that roads and utilities enter the areas suitable for development using existing roads and utility corridors wherever possible to minimize disturbance to the proposed ecological corridors. If crossing streams cannot be avoided, bridges should be used as opposed to culverts. Bridges allow for the maintenance of plant communities at the crossing site which provides some habitat continuity and reduces sensory disturbance that might deter wildlife from crossing at these locations. Bridges also permit wildlife to cross under the road reducing the potential for collisions between vehicles and wildlife. To enhance public safety and maintain ecological connectivity, the number of locations where roads or utilities intersect wildlife corridors should be kept as low as possible to reduce traffic and wildlife interactions.





Study Area
Halifax Regional Municipality Parks
Protected Wilderness Area

Other Features
Highway
Road
Resource / Seasonal Road
Rail Road
Trail
Waterways
Waterbodies

0 250 500 750 1,000
Metres
(At original document size of 8.5x11)
1:50,000

N

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. GIS Note: Only labels for public parks larger than 1 hectare are active in figure. Aquatic corridor digitized from Nova Scotia Crown Share Land Legacy Trust (NSCSLLT) Wildlife Corridor Charrette Halifax Summary Report (2021).
3. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services, NSCSLLT
4. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2023-04-25

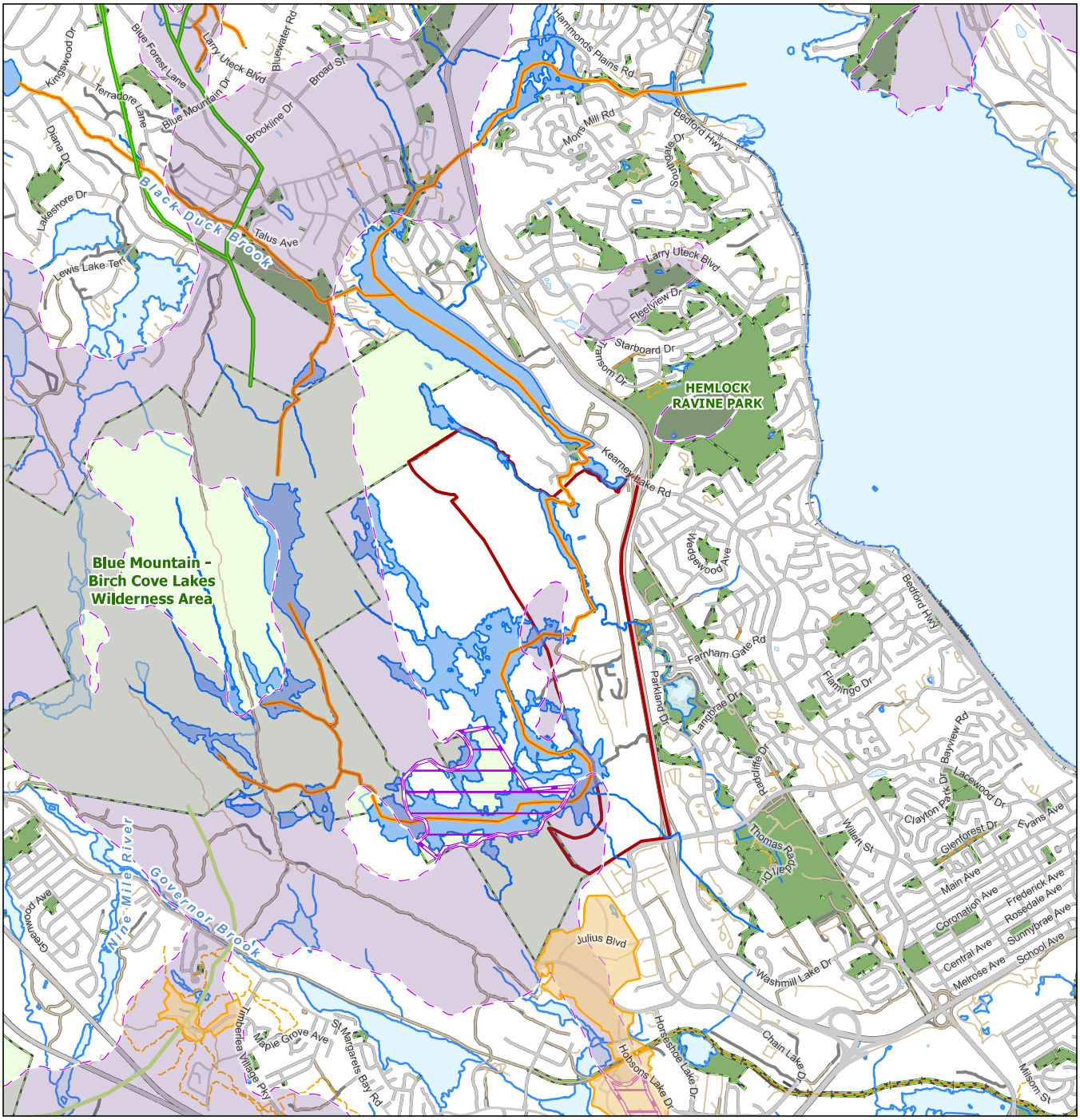
Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

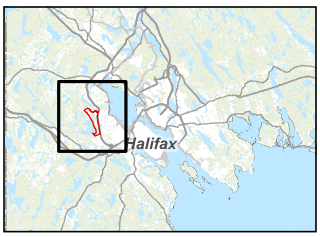
Fig ID: 160410459_025a

Figure No.
3.11a

Title
Highway 102 West Study Area and Adjacent Lands

HRM FCM 2022.aprx Revised: 2024-05-29 By: schubbs





Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. GIS Note: Aquatic corridor modified and land corridors generalized from Nova Scotia Crown Share Land Legacy Trust (NSCSLLT) Wildlife Corridor Charrette Halifax Summary Report (2021).
3. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services, NSCSLLT
4. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

- Study Area
- Potential Corridor Barrier

Other Proposed Corridors
- Aquatic Corridor (Stantec, 2024)
- Primary Terrestrial Corridors (NSCSLLT, 2021)
- Secondary Terrestrial Corridors (NSCSLLT, 2021)
- Halifax Green Network Plan Important Corridor
- Halifax Green Network Plan Essential Corridors

Parks and Protected Areas
- Halifax Regional Municipality Parks
- Protected Wilderness Area

Other Features
- Highway
- Road
- Resource / Seasonal Road
- Rail Road
- Trail
- Waterways
- Waterbodies

0 250 500 750 1,000 Metres
(At original document size of 8.5x11)
1:50,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-05-29

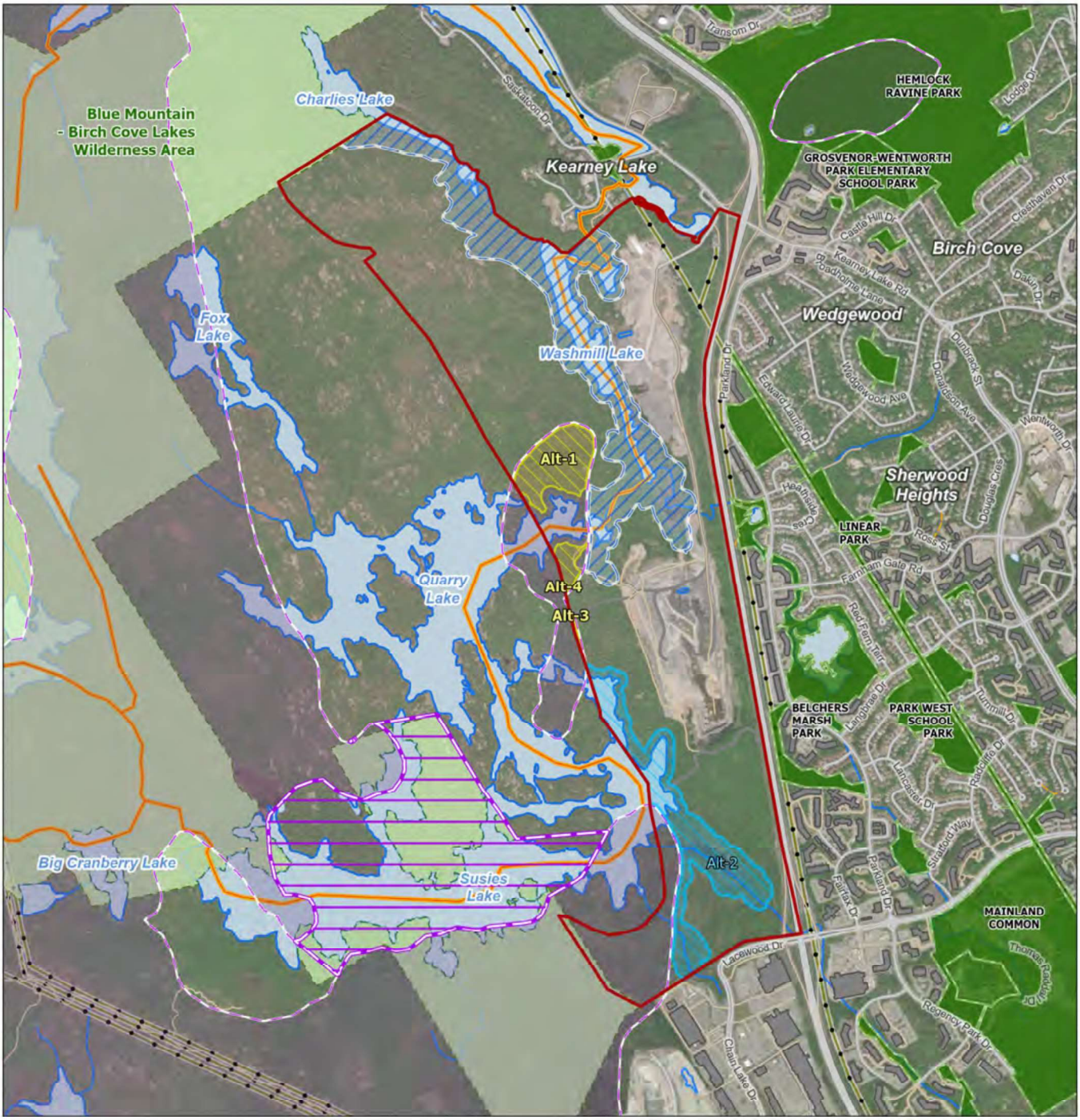
Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_025b

Figure No.
3.11b

Title
Corridors Identified by the Halifax Green Network Plan and the Nova Scotia Crown Share Land Legacy Trust

HRM FCM 2022.aprx Revised: 2024-05-29 By: schubbs



Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. GIS Note: Aquatic corridor modified from Nova Scotia Crown Share Land Legacy Trust (NSCSLLT) Wildlife Corridor Charrette Halifax Summary Report (2021).
3. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services, NSCSLLT
4. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

- Study Area
- Proposed Corridor
  - Proposed Corridor (Stantec 2024)
  - Suggested Corridor Alteration (Addition)
  - Suggested Corridor Alteration (Removed)
- Other Proposed Corridors
  - Aquatic Corridor (Stantec, 2024)
  - Halifax Green Network Plan Important Corridor
  - Halifax Green Network Plan Essential Corridor
- Halifax Regional Municipality Park
- Protected Wilderness Area
- Utilities
  - Transmission Line
- Other Features
  - Highway
  - Road
  - Resource / Seasonal Road
  - Rail Road
  - Trail
  - Waterway
  - Waterbody
  - Building

0 250 500 750 Metres

(At original document size of 8.5x11)
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N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-05-29

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_025

Figure No.
3.11c

Title
Proposed Landscape Connectivity Options for MLSA

\\Cal0213-pnfss01\work_group\1214\active\160410459\gis_data\mapping\ArcGIS Pro\HRM_SAR_working\Mapping\HRM_SAR_HabitatAndCorridorAprxRevised: 2024-08-29 By: schubbs

3.6 Surficial and Bedrock Geology

A desktop assessment was conducted using provincial bedrock and surficial geology mapping and GIS layers to delineate and inventory the acid generating potential of bedrock and the amount of overburden that may be covering the bedrock (i.e., surficial geology). An inventory of acid rock potential was developed for the HSA using publicly available GIS data, including surficial and bedrock geologic mapping and acid-rock drainage (ARD) risk mapping developed for Nova Scotia. The reported depth to the water table in the vicinity of the Study Area was estimated through an assessment of existing groundwater wells using data gathered from the NSECC Well Logs Database (NSECC 2022) and is also noted through wet area mapping noted in Figure 3.4.

The presence of sulphide-bearing rock has land-use planning implications as disturbance during development/construction can expose the bedrock to air and water, which has the potential to leach sulphuric acid. This leaching can result in decreased pH of associated waters, which can then result in mobilization of metals and adversely affect aquatic habitats. Increased costs for development can be incurred as excavated material in areas of known sulphide-bearing rock must be managed and disposed of according to Sulphide Bearing Material Disposal Regulations (NSECC 2021).

3.6.1 BEDROCK GEOLOGY

The HSA is underlain by the Cambrian to Early Ordovician age metamorphosed sedimentary bedrock of the Goldenville Group and by the Late Devonian age South Mountain Batholith and is proximal to the Halifax Group (White et. al. 2014) (Figure 3.12).

In the study area, the Goldenville Group consists of the Taylors Head Formation consisting of grey, thickly bedded, and weakly cleaved, metasandstone locally interlayered with green, cleaved metasiltstone and rare black to rusty slate and is considered non-acid producing. The Beaverbank Formation, also part of the Goldenville Group lies approximately 100 m southeast of the study area and overlies the Taylors Head Formation, consisting of grey to black, cleaved metasiltstone interbedded with minor thin, light grey metasandstone and black graphitic slate and is considered potentially acid producing (White and Goodwin 2011).

The South Mountain Batholith is comprised of multiple formations. For the purposes of this study, the only formation from the South Mountain Batholith underlying the development area is the Quarry Lake Granodiorite. This formation consists of grey, equigranular granodiorite with minor alkali feldspar megacrysts. The South Mountain Batholith is non-acid producing (White and Goodwin 2011).

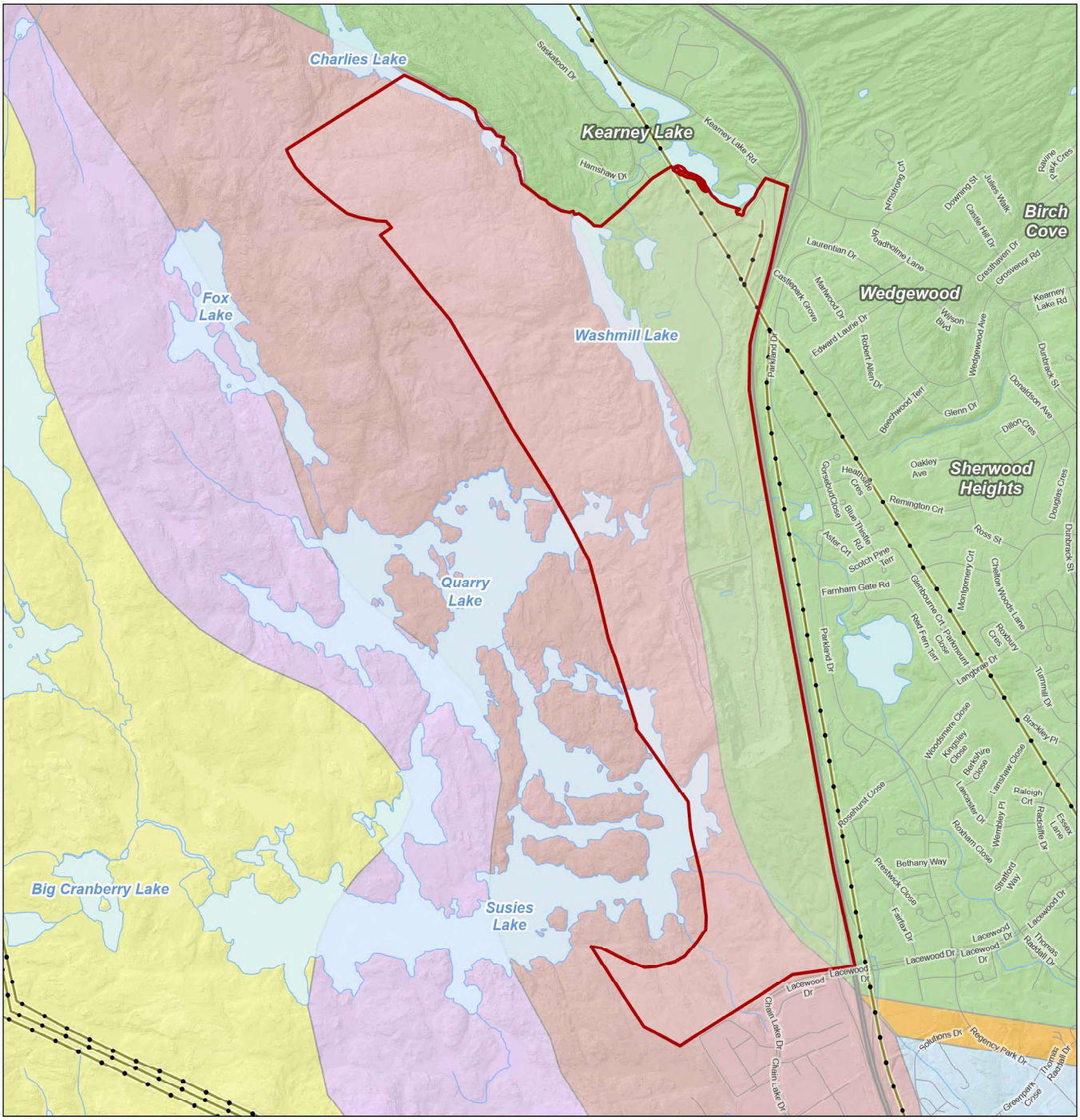
The Halifax Group consists of the Bluestone and Cunard Formations. The Cunard Formation consists of black and rusty slate with thin beds and lenses of black metasiltstone. This formation typically contains abundant sulphide-rich pyrrhotite and pyrite and is considered to have the highest acid-producing potential for bedrock in the HRM (White and Goodwin 2011). The Bluestone Formation is not located in the vicinity of the development areas.

The HSA is underlain by the Taylors Head Formation on the eastern half of the development area, and by the Quarry Lake Granodiorite on the western half of the development area. The potentially acid producing Beaverbank Formation lies within 100 m of the southeast corner of the development area and the sulphide-rich Cunard Formation lies approximately 250 m southeast of the development area.

3.6.2 SURFICIAL GEOLOGY

A review of surficial geology mapping for the area (Stea et al. 1992) was carried out to identify areas of exposed bedrock, which may present a greater risk for ARD during development (Figure 3.13)

The HSA is mapped entirely as exposed bedrock and is expected to have only shallow soils with large areas of exposed bedrock (Stea et al. 1992). Areas of exposed bedrock correspond to the non-acid producing Quarry Lake Granodiorite and Taylors Head Formations.



Study Area

South Mountain Batholith
- Quarry Lake Granodiorite
- Halifax Peninsula Leucomonzogranite
- Sandy Lake Biotite Monzogranite

Halifax Group
- Cunard Formation

Goldenville Group
- Beaverbank Formation
- Taylors Head Formation

Utilities
- Transmission Line

Other Features
- Highway
- Road
- Waterway
- Waterbody

0 250 500 Metres
(At original document size of 8.5x11)
1:23,000

N

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Natural Resources and Renewables
3. Background: Government of Nova Scotia Department of Service Nova Scotia and Internal Services; Nova Scotia Department of Natural Resources and Renewables

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

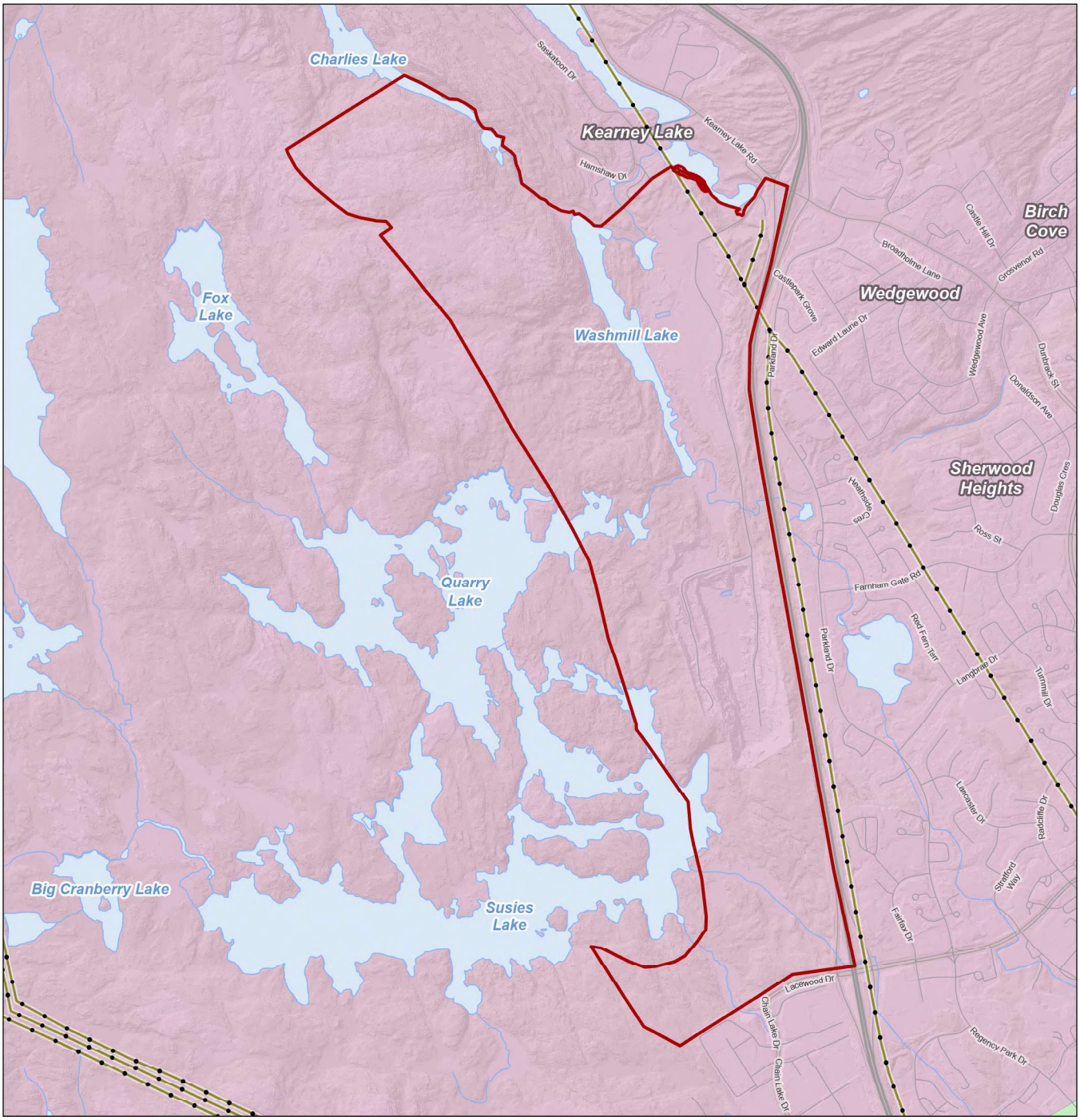
Prepared by IPodrug on 2024-01-05
Revised by NWhite on 2024-05-23

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure ID: 003

Figure No.
3.12

Title
Bedrock Geology - HSA



Study Area

Surficial Geologic Units

- Stony Till Plain (Ground Moraine)
- Exposed Bedrock

Utilities

- Transmission Line

Other Features

- Highway
- Road
- Waterway
- Waterway

0 250 500 Metres

(At original document size of 8.5x11)
1:23,000

N

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Natural Resources and Renewables
3. Background: Government of Nova Scotia Department of Service Nova Scotia and Internal Services; Nova Scotia Department of Natural Resources and Renewables

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by IPodrug on 2024-01-05
Revised by NWhite on 2024-05-23

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Figure ID: 002

Figure No.
3.13

Title
Surficial Geology - HSA

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3.6.3 DEPTH TO WATER TABLE

Depth to water table in the HSA was estimated using static water levels in existing drilled wells provided in the NSECC Well Logs Database (NSECC 2022). While static water levels in drilled wells can be used to infer the depth to water table, they are not considered a precise representation of the water table, particularly with partially confined or confined aquifer conditions if the water level is measured prior to full recovery in the wells and if water levels are measured during different seasons. Statistical summaries of static water levels in existing groundwater wells within 100 m of the HSA are shown in Table 3.16.

Table 3.16 Static Water Level Summary in Existing Groundwater Wells

Development Area	Number of Wells[1]	Minimum Static Water Level (mbtoc[2])	Maximum Static Water Level (mbtoc)	Average Static Water Level (mbtoc)	Median Static Water Level (mbtoc)
Highway 102	4	3.65	9.14	6.24	6.09

Notes:
[1] – Includes wells with static water level data within the HSA boundary and any well within a 100 m radius of the HSA boundary
[2] – mbtoc=meters below top of casing

The NSECC Well Logs Database generally indicates that static water levels in drilled wells are shallow (generally within 6 m of ground surface). Shallow groundwater table is also inferred from nearby surface water bodies and wetlands in the vicinity of the development area. The provincial wet areas mapping, shown on Fig 3.4 of this report, also indicates depth to water table.

3.6.4 LAND SUITABILITY ANALYSIS – GEOLOGY

For the geology component of the land suitability analysis, bedrock was classified based on its acid producing potential (Table 3.17; Figure 3.14). In the context of ARD, surficial geology is primarily relevant when overburden thickness is insufficient to prevent exposure of potentially acid producing bedrock to air and/or water during development. Surficial geology and the depth to groundwater have been excluded from this analysis due to the lack of Potentially Acid-Producing bedrock in the HSA.

Surficial and bedrock geology, as it relates to potential acid generation, is only one of many factors that must be considered when evaluating land suitability for development. The current assessment of surficial and bedrock geology is based on a desktop review of available provincial mapping, and does not purport to be definitive regarding development risks and opportunities. If sulphide-bearing rock is encountered during development, it must be managed and disposed of according to Sulphide Bearing Material Disposal Regulations (NSECC 2021).

Table 3.17 Surficial and Bedrock Geology – Land Suitability Ranking Framework

Layer	Land Suitability Ranking		
	1 - Low suitability for development	**2 - Moderate suitability for development**	**3 - Higher suitability for development**
Bedrock Geology	Cunard Formation	Beaverbank Formation	Taylors Head Formation / South Mountain Batholith

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Study Area

Land Suitability Analysis

- 3 (High)
- 2
- 1 (Low)

Transportation

- Highway
- Road
- Resource / Seasonal Road
- Trail

Utilities

- Transmission Line

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
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N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-08
Revised by NWhite on 2024-05-17

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_032

Figure No.
3.14

Title
Geology Land Suitability Analysis - HSA

HRM FCM 2022.aprx Revised: 2024-05-23 By: niwhite

3.7 Topography

Stantec processed LiDAR data provided by HRM to classify slopes within the HSA. This was primarily a desktop exercise using ESRI ArcMAP, with considerations from the field (field crews noted any significant slopes along watercourses and wetlands).

3.7.1 LAND SUITABILITY ANALYSIS – TOPOGRAPHY

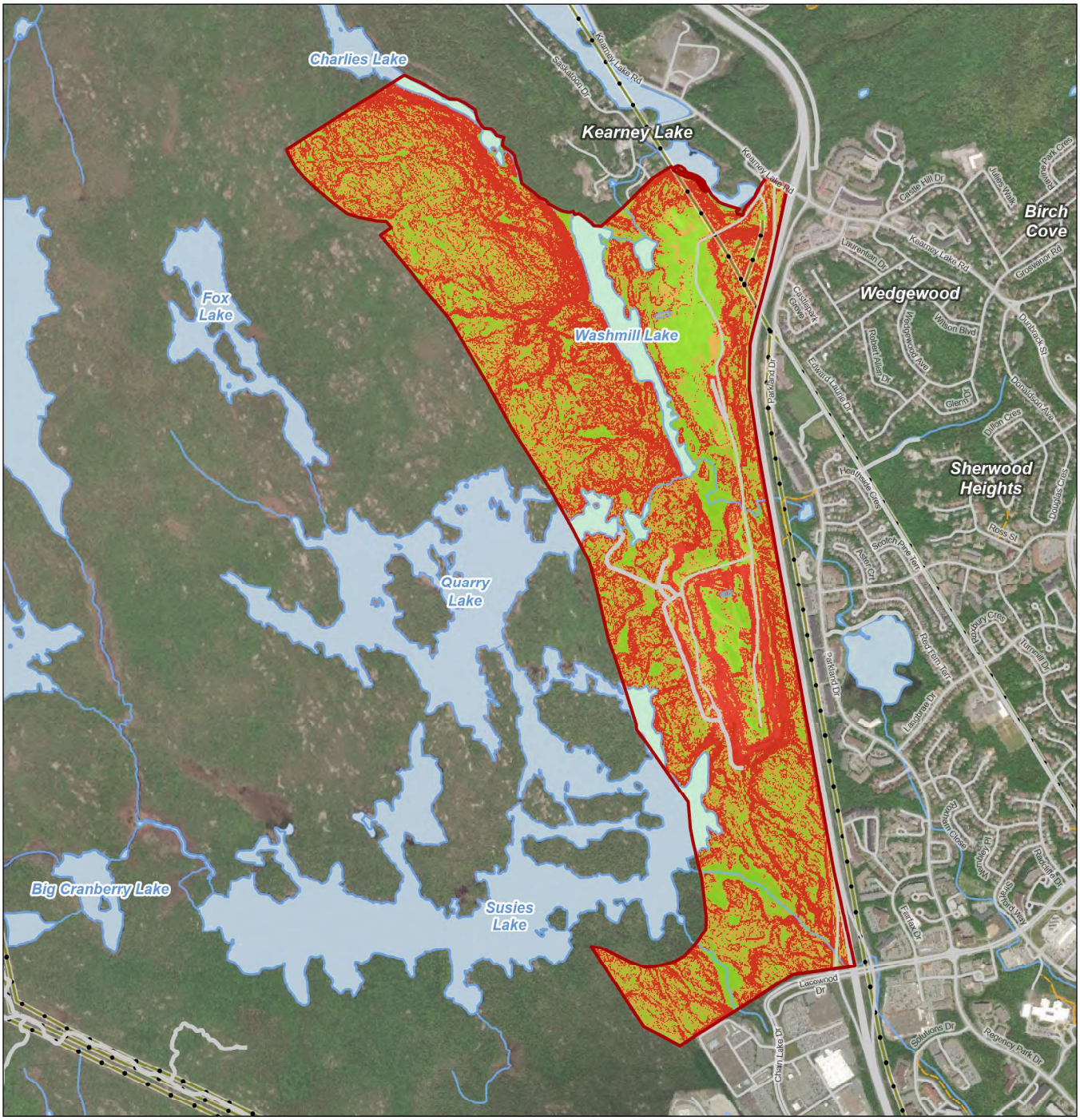
Steep slopes can be associated with environmental features such as rock outcrops, shallow soils, and groundwater springs. These features can have various impacts on development planning including surface water flow, water quality, erosion, and sediment patterns. These factors also influence microclimate which contributes to vegetation growth and succession. These unique features can also provide niche habitat for SAR, specifically bank swallows and bats.

For this land suitability analysis, steeper slopes were ranked as the least favorable for development while the relatively flatter topography is ranked higher for development (Table 3.18). Slopes have been classified into three categories based on their percent rise: 0%-5%, 5.01%-15% and >15%. Slope mapping can be found below in Figure 3.15.

Slope is only one of many factors that must be considered when evaluating land suitability for development. The current assessment of topography is based primarily on a desktop review of available provincial mapping, and does not purport to be definitive regarding development risks and opportunities. Stantec recommends a slope review be conducted prior to finalizing consultation planning.

Table 3.18 Topography – Land Suitability Ranking Framework

Layer	Land Suitability Ranking		
	1 - Low suitability for development	2 - Moderate suitability for development	3 - Higher suitability for development
Slope	>15%	5.01%-15%	0%-5%



Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Study Area

Slope Analysis (Percent Rise)
- 0 - 5%
- 5.01 - 15%
- >15%

Transportation
- Trail
- Highway
- Other Road

Utilities
- Transmission Line

Other Features
- Waterway
- Waterbody

0 250 500 Metres
(At original document size of 8.5x11)
1:23,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by IPodrug on 2023-11-09
Revised by NWhite on 2024-05-17

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_014

Figure No.
3.15

Title
Slope Land Suitability Analysis - Highway 102 West Corridor

HRM FCM 2022.aprx Revised: 2024-05-29 By: niwhite

3.8 Contaminated Sites

Stantec conducted a contaminated sites review of the HSA. The purpose of the review was to assess if evidence of potential or actual environmental contamination exists in connection with the Study Area, because of current or past activities on the Study Area or neighboring properties.

3.8.1 METHODOLOGY

The contaminated sites review consisted of the following:

- records review including, but not limited to, aerial photographs, LiDAR imagery
- provincial government regulatory search for the Study Area
- a site visit (relevant features were recorded during the wetland delineation; a site visit specifically to document potential environmental contamination concerns was not completed)
- evaluation of information

The review does not include sampling or testing of air, soil, groundwater, surface water or building materials. Nor does it include a review or audit of operational environmental compliance issues, or of any environmental management systems, which may exist for the Study Area.

Desktop mapping and field verification for the Study Area took place in spring/summer 2023. Stantec field staff documented the location of sites that exhibited characteristics of contamination as well as incidental evidence of anthropogenic activities (e.g., illegal dumping, camp sites). Existing structures were not accessed, and private properties occupied and unoccupied were not evaluated in the field. The Study Area and readily visible and publicly accessible portions of adjoining and neighboring properties were examined for the presence of potential sources of environmental contamination. No interviews were conducted with persons associated with the Study Area. Areas near encampments were avoided.

3.8.2 DESKTOP REVIEW

Aerial Photography / LiDAR Review

The HSA is located within HRM boundaries in Halifax County, Nova Scotia. The study area includes Gateway Materials Limited land and HRM owned undeveloped lands, including Washmill Lake and Charles Lake.

From at least 1954 until the late 1960s the study area was undeveloped woodland. From the late 1960s until the early 1970s, a partially cleared and disturbed area (quarry) was present to the east of Washmill Lake on Property Identifier (PID) 40806200. In the 1974 aerial photo the quarry had expanded to the south. By the early 1990s the quarry had developed further to the south and a road extended to the south. By the early 2000s a second cleared area (quarry) appeared along the same road on PIDs 40806218 and 40806266.

LiDAR imagery shows the presence of an open pit quarry on PIDs 40806192, 40806200, 40806218 and 40806266.

The following concerns regarding potential environmental contamination issues were noted:

- The presence of two quarries on the eastern portion of the study area from the late 1960s to the present. Details of the operation are unknown.

Regulatory Request

NSECC was queried for information about the HSA and received NSECC's Environmental Registry response. The information is summarized below.

Regulatory Infractions Search: NSECC has provided no records of infractions for the Study Area.

Environmental Investigations: Information pertaining to site assessments, risk assessments, remedial work or other environmental investigations registered with NSECC for the Study Area are available only through "Freedom of Information" requests which require a ninety-day turn-around time. Ms. Tina Skeir of NSECC indicated the following files requiring a "Freedom of Information and Protection of Privacy" (FOIPOP) request were on file for the following properties, which fall within the boundary of the Study Area:

- A water investigation/enforcement file (file # 92100-35-BED-2365761) containing inspection report, correspondence, intake, and audit pertaining to 56 Crusher Road (PID 40806192).

These FOIPOP records may provide additional information relevant to the proposed development of the HSA.

Tank Registrations: Information from the NSECC Petroleum Storage Tank Registry indicated that no tanks were registered to the Study Area:

Other:

160 Kearney Lake Rd, Halifax (PID 40806192):

- Environment Act Directive, dated December 10, 2014: "the Approval Holder shall retain the services of a qualified consultant to update their pre-blast survey protocol for which there is currently major residential infringement of the 800 meter buffer zone. The protocol must also present a guide for selection the best locations for blast monitoring equipment that accurately reflects the potential influence to structures within the 800m zone."

This may represent a potential environmental concern to the HSA related to the past use of explosives.

Approvals:

- Nova Scotia Department of Environment and Labour, Water Approval Water Withdrawal and/or Storage on PID 40806192 for Gateway Materials Limited was reviewed. The approval holder was authorized for water withdrawal for the purpose of dust control at Washmill Lake adjacent to Gateway Quarry. The Approval expired on January 17, 2012. This approval is not expected to represent an environmental concern to the HSA.

3.8.3 FIELD RESULTS

The following environmental concerns were noted during the site visit and are noted on Figure No. 3.16-Contamianted Sites in the HSA:

- Potential Contaminated Site S1: PID 41120577-HRM-an abandoned camp.
- Potential Contaminated Site S2: PID 40420747-HRM-located behind the Brown Street and Hamshaw Drive neighbourhood-the presence of a hunting blind.
- Potential Contaminated Site S3: PID 40420747-HRM-on the northern shore of Washmill Lake-the presence of a former dock and an associated pile of debris.
- Potential Contaminated Site S4: PID 40806192-Gateway Materials Limited-a fenced high-voltage transformer compound.
- Potential Contaminated Site S5: PID 40806192-Gateway Materials Limited-Gateway quarry and associated heavy equipment parked on the property.
- Potential Contaminated Site S6: PID 41269853-HRM-to the west of Washmill Lake-debris pile (building materials).
- Potential Contaminated Site S7: PID 00323154-HRM-the presence of a hunting blind.

3.8.4 INFLUENCE ON LAND SUITABILITY

The study has revealed evidence of potential and/or actual environmental contamination associated with the Study Area. The following environmental concerns were identified:

- The presence of two quarries on the eastern portion of the study area from the late 1960s to the present (PID 40806192, 40806200, 40806218, and 40806266). Details of the operation are unknown but includes the use of explosives, heavy equipment use, and may include infilling, dumping, storage and handling of fuel, etc.
- PID 41120577, 40420747, 41269853, and 00323154-HRM-various signs of human activity (abandoned camp, hunting blinds, former dock/debris).

Due to the potential presence of environmental contamination within the Study Area, if material is exposed or is planned to be excavated and removed from the Site during redevelopment, it should be tested to confirm the handling and disposal requirements. Additional environmental assessment and reporting to NSECC under the Contaminated Sites Regulations may be required as part of the development process. There are no constraints to development provided the NSECC Regulations are followed.

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

- Potential Contaminated Site
- NSECC Filc (FOIPOP, Tank Registration, other)
- Study Area

Utilities
- Transmission Line

Transportation
- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features
- Waterway
- Waterbody
- Property Boundary

0 250 500 Metres

(At original document size of 8.5x11)
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Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-05-13

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_036

Figure No.
3.16

Title
Contaminated Sites in the HSA

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3.9 Areas of Cultural Significance

Stantec conducted an archaeological and cultural study that includes an Archaeological Resource Impact Assessment (ARIA) which was conducted under Heritage Research Permit (HRP) A2023NS154 and identified areas of archaeological potential within the HSA. The scope of the assessment included a site walkover carried out on September 21, 2023, and a background study (including environmental setting, Pre-Contact and Historic Period land use, property history, and past archaeological assessments, and engagement with stakeholders and land users). This archaeological assessment was conducted to provide a baseline for future study, informed by Mi'kmaq knowledge. The results of the ARIA are detailed in a final report under a separate cover to be submitted to the Nova Scotia Department of Communities, Culture, Tourism, and Heritage to fulfill the requirements of the HRP. Refer to Appendix D for the full ARIA report and recommendations.

3.10 Summary of Land Suitability Analysis

Stantec has prepared a summary of the land suitability analysis which integrates results from the environmental components that were studied for the HSA. The objective of the land suitability analysis was to determine what portions of the Study Area are potentially most suitable for new community development based on a desktop and field analysis of these components. Note that not all areas within the Study Area (Figure 3.1) are being considered for future development (e.g., if they are privately owned and/or are already developed).

It is important to note that this is not an exhaustive analysis of all parameters that could influence whether or not a given location is amenable for development. It is also not possible to definitively declare which parameters are most important in determining whether an area is suitable for development. Therefore, each parameter used in the summary analysis is equally weighted and caution should be used when applying the combined analysis for planning purposes. In Stantec's opinion, it is recommended that planners consider the results, including regulatory requirements and management implications, for each of the components on their own for a more useful representation of development opportunities and constraints.

Sections 3.2 through 3.8 describe desktop and field results followed by details about how each environmental component was evaluated from a land suitability perspective. Suitability for development was generally ranked as follows:

- a score of 1 indicates low suitability for development
- a score of 2 indicates moderate suitability for development
- a score of 3 indicates high suitability for development

Lower scores generally correspond to areas with higher ecological function, making them generally more suitable for conservation purposes and potentially less suitable for development. Conversely, higher scores indicate lands that are potentially less desirable for conservation efforts and potentially more suitable for development. It is important to note that many factors, in addition to those addressed throughout this report, contribute to suitability for development and/or conservation, including views expressed by members of the public, other stakeholders and Indigenous groups. Therefore, the information presented in this summary should not be viewed in isolation.

Stantec divided the final mapping into two cumulative analyses: one focusing on the project's biological components and the other on geological/topographic information. While acknowledging the relationship between these analyses, this approach was chosen to enhance the decision-making process for users from a landscape planning perspective, whether for development or conservation pathways. Another key component that should inform development is landscape connectivity, which is discussed in Section 3.5. While it is noted that landscape connectivity coincides with other biological components explicitly considered in the sections above and this summary (i.e., watercourses, wetlands, forest habitat/SAR), Section 3.5 considers these factors in a holistic way regarding wildlife movement and sustainability.

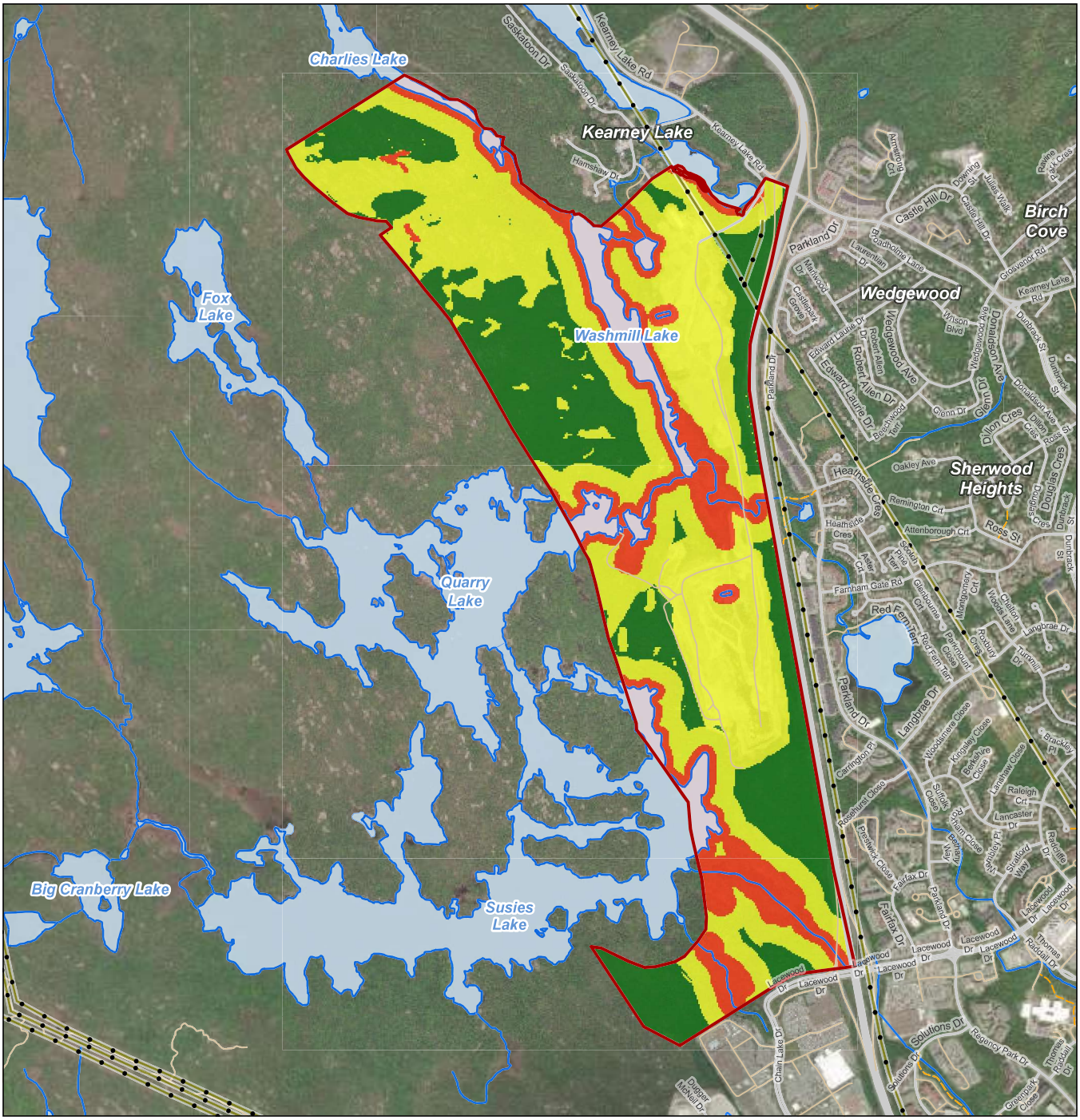
3.10.1 BIOLOGICAL COMPONENTS

This section combines the LSA figures for wetlands (Section 3.2.2; Figure 3.3), watercourses (Section 3.3.2; Figure 3.6) and forest habitat and species at risk (Section 3.4.4; Figure 3.10).

Forty-four wetlands were identified within the HSA and thirty-five of these were evaluated using WESP-AC (Table 3.1). As not all the wetlands in the Study Area could be evaluated using WESP-AC (refer to Section 3.2.1), wetlands that were not evaluated using WESP-AC were not included in the land suitability analysis. As per NSECC guidance, further wetland evaluation (i.e., delineation and functional assessment) will be required (prior to construction) to support permitting applications.

The forest habitat and species at risk analysis combines three layers: Forest Maturity and Forest Succession and Species at Risk. For the forest maturity layer, 44 forest inventory polygons visited during field surveys were classified according to the Nova Scotia FEC system (Table 3.13). Where age is not determined in the field due to various constraints, the maturity class from the FEC or age from the NSDNRR Forest Inventory was used. The presence of individual SAR was not used exclusively to evaluate the presence and distribution of SAR within the HSA since it was not feasible to conduct comprehensive investigations to detect all individuals of all SAR species that may be present at the HSA. Instead, SAR that are or could potentially be present in the HSA were identified from both the results of the field surveys and from AC CDC records of SAR reported within 5 km of the HSA. Where matches were found between SAR habitat preferences and habitats mapped in the HSA, those species were considered potentially present and reflected in the LSA mapping.

Each of the three LSA figures for the biological components have been weighted and combined to show the overall summary LSA of biological components (Figure 3.17). Stantec manually adjusted the weighting of policy-protected constraints, including established environmental buffers such as watercourse setbacks and wetlands intersected by watercourses. These features were deemed to have low development suitability and were manually emphasized as indicated by the red shading in (Figure 3.17).



Study Area

Land Suitability Score

- 3 (High)
- 2
- 1 (Low)

Utilities

- Transmission Line

Transportation

- Highway
- Road
- Resource / Seasonal Road
- Trail

Other Features

- Waterway
- Waterbody

0 250 500 Metres

(At original document size of 8.5x11)
1:23,000

N

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-20
Revised by NWhite on 2024-07-09

Client/Project
Halifax Regional Municipality
Future Serviced Communities Background Studies

Fig ID: 160410459_035

Figure No.
3.17

Title
Land Suitability Analysis of Biological Components - HSA

Notes
1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

HRM FCM 2022.aprx Revised: 2025-02-03 By: niwhite

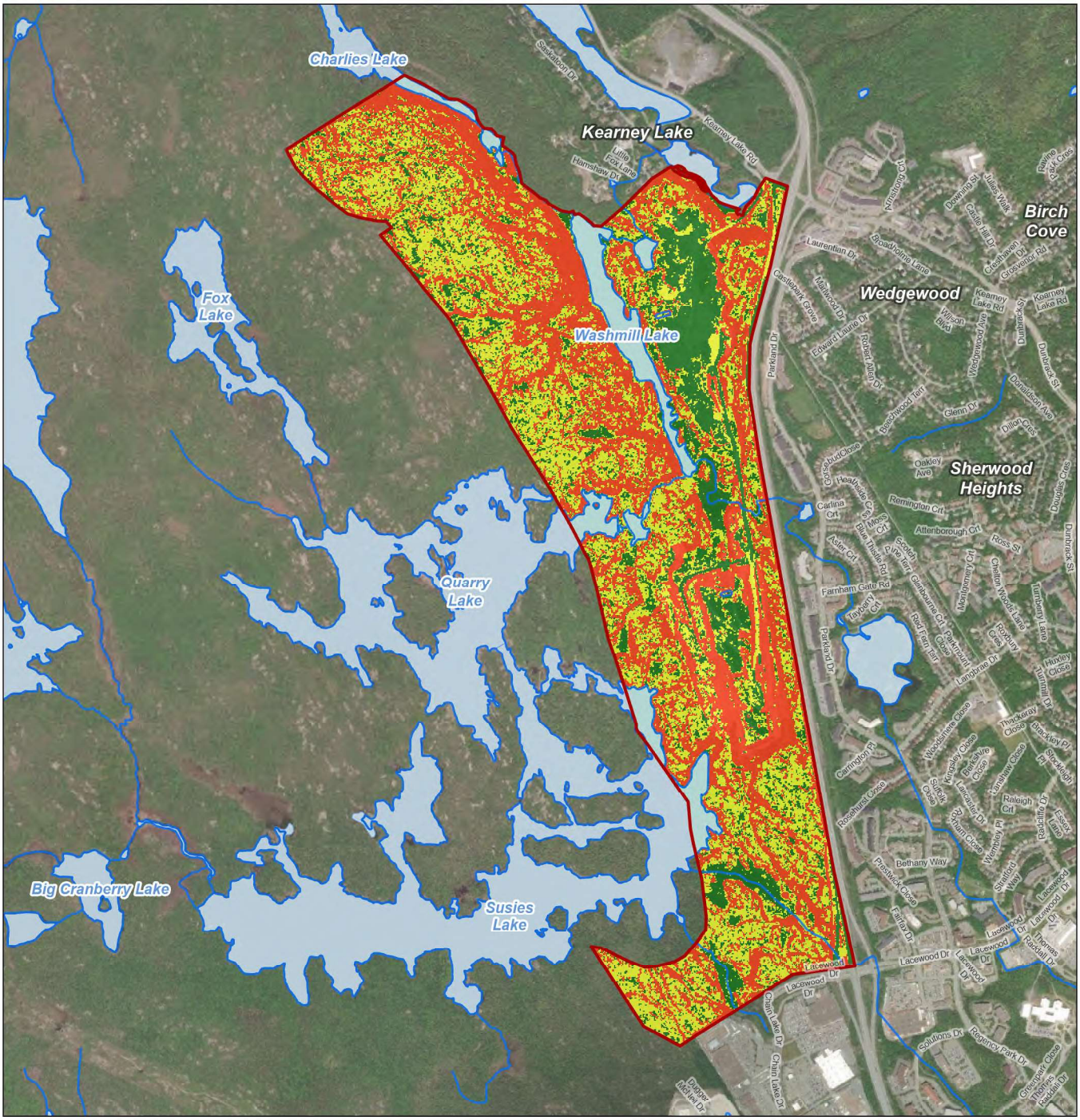
3.10.2 GEOLOGY AND TOPOGRAPHY COMPONENTS

This section combines the LSA figures for geology (Section 3.6.4: Figure 3.14) and topography (Section 3.7.1: Figure 3.15).

The primary parameter used to evaluate geology in the HSA for potential land suitability for development is the acid producing potential associated with sulphide-bearing bedrock (Table 3.18; Figure 3.14). Acid producing potential is considered an important and regulated constraint for development. The current assessment of surficial and bedrock geology is based on a desktop review of available provincial mapping and indicates a general absence of acid producing bedrock in the HSA. These findings should be confirmed through further investigations. If sulphide-bearing rock is encountered during development, it must be managed and disposed of according to Sulphide Bearing Material Disposal Regulations (NSECC 2021).

For the topography component of the land suitability analysis, LiDAR data provided by HRM to was used to classify slopes within the HSA. This was primarily a desktop exercise using ESRI ArcMAP, with incidental field observations. These findings should be confirmed through further investigations.

Each of the two LSA figures for geology and topography have been weighted equally and combined to show the overall summary LSA for these components (Figure 3.18).



Land Suitability Score

- 3 (High)
- 2
- 1 (Low)
- Study Area

- Waterways
- Waterbodies

0 250 500 Metres

(At original document size of 8.5x11)
1:23,000

N

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: Stantec; Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by NWhite on 2024-03-20
Revised by NWhite on 2024-04-22

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_034

Figure No.
3.18

Title
Land Suitability Analysis of Geological and Topographic Components - HSA

HRM FCM 2022.aprx Revised: 2024-04-29 By: niwhite

3.11 References

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APPENDIX A

AC CDC Report

DATA REPORT 7796: Hwy 102 West Corridor, NS

Prepared 4 August 2023
by J. Churchill, Data Manager

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; www.accdc.com) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
Hwy102wCorriNS_7796ob.xls	Rare or legally-protected Flora and Fauna in your study area
Hwy102wCorriNS_7796ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
Hwy102wCorriNS_7796msa.xls	Managed and Biologically Significant Areas in your study area
Hwy102wCorriNS_7796ff_py.xls	Rare Freshwater Fish in your study area (DFO database)

1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries
Sean Blaney
Senior Scientist / Executive Director
(506) 364-2658
sean.blaney@accdc.ca

Animals (Fauna)
John Klymko
Zoologist
(506) 364-2660
john.klymko@accdc.ca

Data Management, GIS
James Churchill
Conservation Data Analyst / Field Biologist
(902) 679-6146
james.churchill@accdc.ca

Billing
Jean Breau
Financial Manager / Executive Assistant
(506) 364-2657
jean.breau@accdc.ca

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

Western: Emma Vost
(902) 670-8187
Emma.Vost@novascotia.ca

Western: Sarah Spencer
(902) 541-0081
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-0816
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
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Kimberly.George@novascotia.ca

Eastern: Harrison Moore
(902) 497-4119
Harrison.Moore@novascotia.ca

Eastern: Maureen Cameron-MacMillan
(902) 295-2554
Maureen.Cameron-MacMillan@novascotia.ca

Eastern: Elizabeth Walsh
(902) 563-3370
Elizabeth.Walsh@novascotia.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

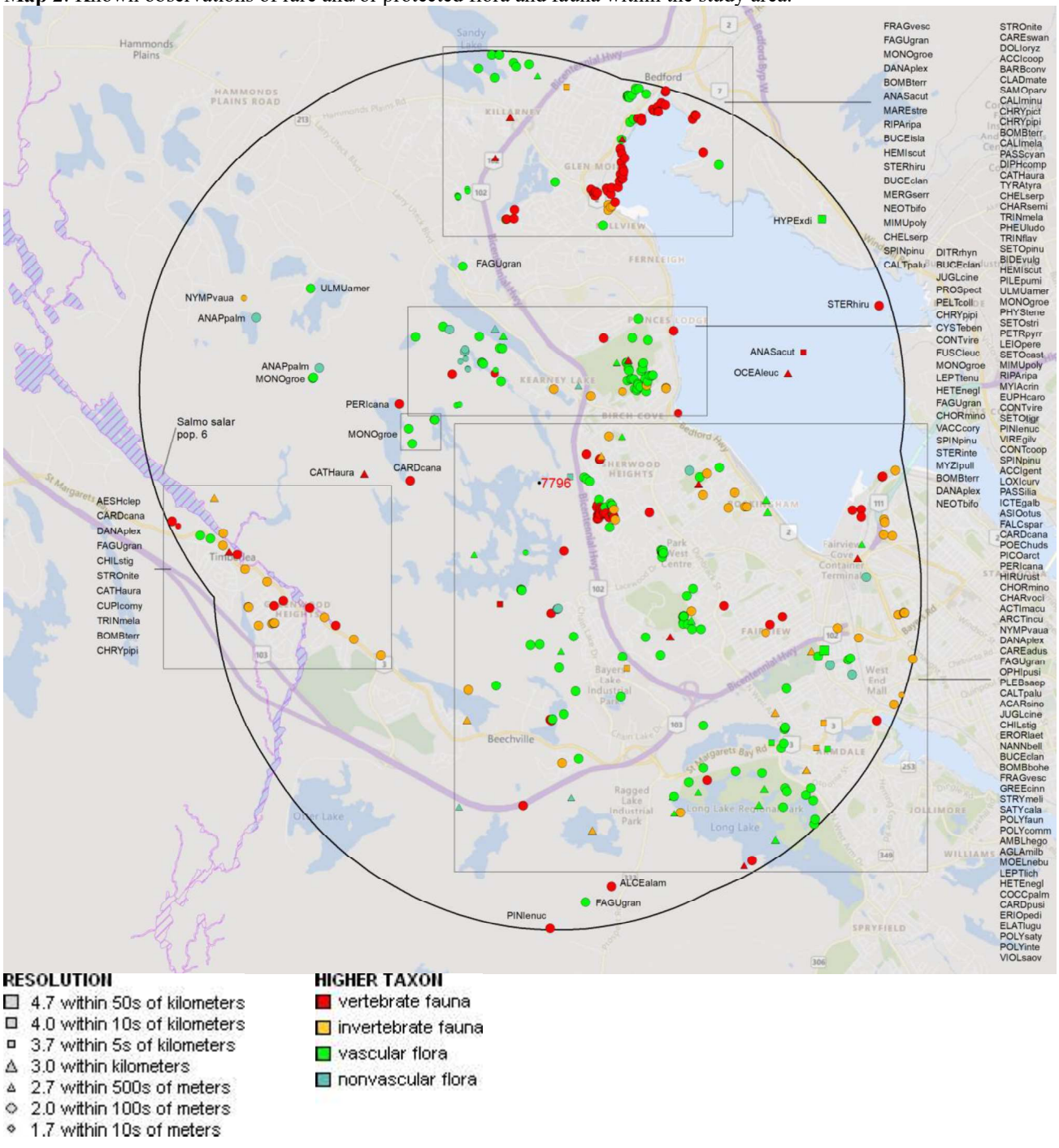
2.1 FLORA

The study area contains 196 records of 19 vascular and 27 records of 17 nonvascular flora (Map 2 and attached: *ob.xls), excluding 'location-sensitive' species.

2.2 FAUNA

The study area contains 183 records of 53 vertebrate and 101 records of 21 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List), excluding 'location-sensitive species'. Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.



RESOLUTION

- 4.7 within 50s of kilometers
- 4.0 within 10s of kilometers
- 3.7 within 5s of kilometers
- 3.0 within kilometers
- 2.7 within 500s of meters
- 2.0 within 100s of meters
- 1.7 within 10s of meters

HIGHER TAXON

- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

3.0 SPECIAL AREAS

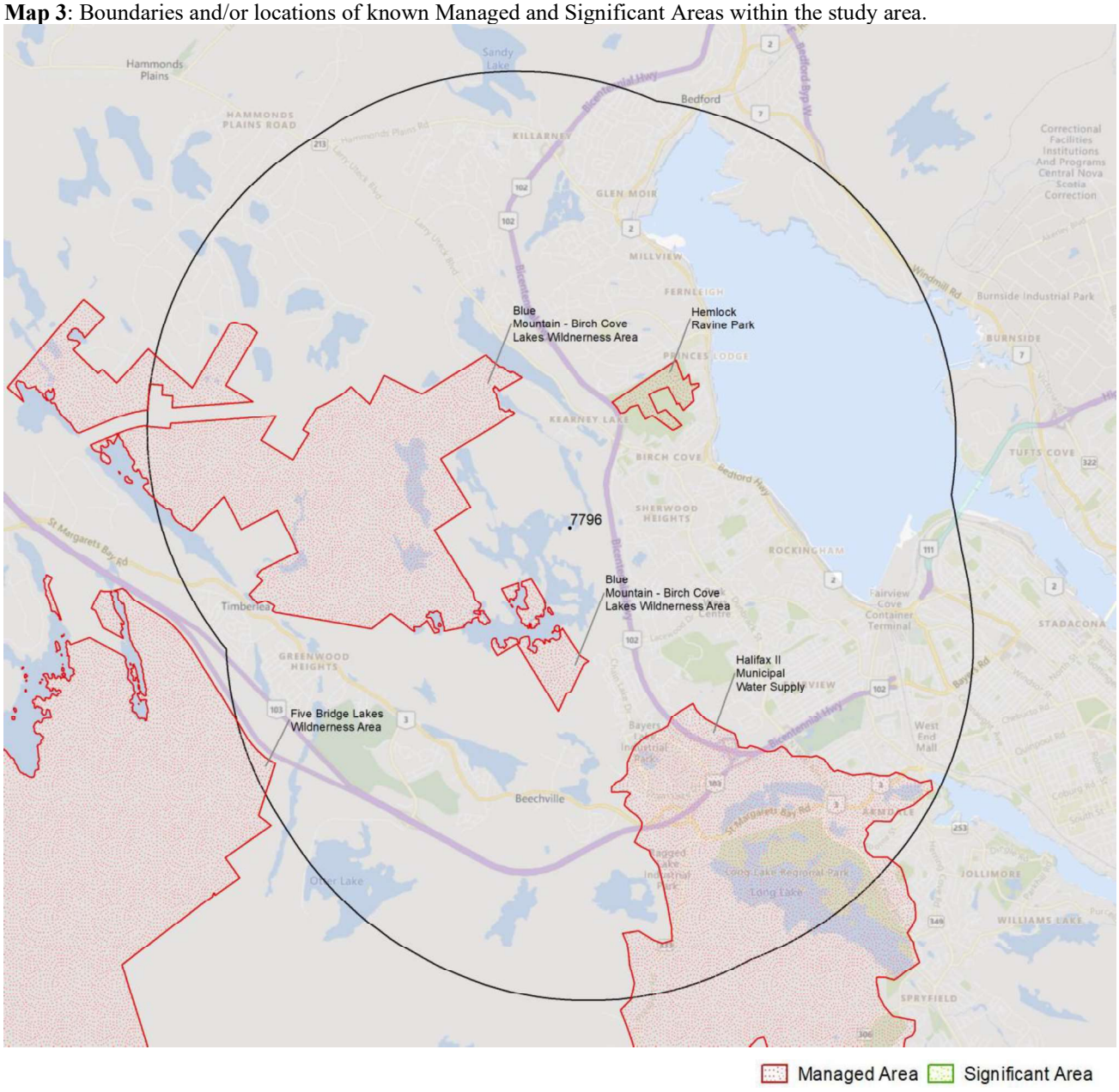
3.1 MANAGED AREAS

The GIS scan identified 5 managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS

The GIS scan identified no biologically significant sites in the vicinity of the study area (Map 3).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding "location-sensitive" species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	2	5.2 ± 0.0
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S3	1	2.2 ± 0.0
N	*Acarospora sinopica*	a cracked lichen				S1S3	2	5.3 ± 0.0
N	*Stereocaulon intermedium*	Pacific Brain Foam Lichen				S1S3	1	1.6 ± 0.0
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S2	2	2.4 ± 0.0
N	*Ditrichum rhynchostegium*	a Moss				S2?	1	2.5 ± 1.0
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S2S3	2	4.9 ± 0.0
N	*Cladonia mateocyatha*	Mixed-up Pixie-cup				S2S3	1	0.5 ± 5.0
N	*Scytinium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	1	2.3 ± 0.0
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	1	4.9 ± 0.0
N	*Peltigera collina*	Tree Pelt Lichen				S3	1	2.8 ± 0.0
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3?	1	2.3 ± 0.0
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	3	2.0 ± 0.0
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	1	4.9 ± 0.0
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	1	5.3 ± 0.0
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	3	3.9 ± 0.0
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	3	2.1 ± 0.0
P	*Juglans cinerea*	Butternut	Endangered	Endangered		SNA	2	2.9 ± 0.0
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	1	6.0 ± 10.0
P	*Caltha palustris*	Yellow Marsh Marigold				S2S3	4	4.1 ± 0.0
P	*Carex adusta*	Lesser Brown Sedge				S2S3	3	2.5 ± 0.0
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	1	5.1 ± 50.0
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	29	1.1 ± 0.0
P	*Samolus parviflorus*	Seaside Brookweed				S3	1	3.5 ± 1.0
P	*Pilea pumila*	Dwarf Clearweed				S3	1	2.2 ± 0.0
P	*Carex swanii*	Swan's Sedge				S3	1	1.5 ± 0.0
P	*Neottia bifolia*	Southern Twayblade				S3	11	1.7 ± 0.0
P	*Bidens vulgata*	Tall Beggarticks				S3S4	1	5.1 ± 0.0
P	*Vaccinium corymbosum*	Highbush Blueberry				S3S4	1	2.2 ± 0.0
P	*Fagus grandifolia*	American Beech				S3S4	130	0.7 ± 0.0
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3S4	1	2.4 ± 1.0
P	*Fragaria vesca*	Woodland Strawberry				S3S4	3	1.1 ± 0.0
P	*Ulmus americana*	White Elm				S3S4	2	2.2 ± 0.0
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S3S4	2	5.6 ± 0.0
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	1	3.6 ± 1.0
P	*Greeneochloa coarctata*	Small Reedgrass				SH	1	5.4 ± 6.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	2	2.0 ± 7.0
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S3B	1	4.2 ± 1.0
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	2	1.1 ± 0.0
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern		S1N,SUM	9	4.6 ± 0.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	1	2.0 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	3	1.1 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	3	1.1 ± 0.0
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	6	2.0 ± 0.0
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	7	1.1 ± 0.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	2	2.0 ± 7.0
A	*Dolichonyx oryzivorus*	Bobolink	Special Concern	Threatened	Vulnerable	S3B	2	0.9 ± 0.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	3	2.0 ± 7.0
A	*Chrysemys picta*	Painted Turtle	Special Concern	Special Concern		S4	1	1.2 ± 0.0
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	3	1.2 ± 0.0
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	2	1.0 ± 0.0
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	2	5.1 ± 0.0
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	4	4.9 ± 0.0
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	1	2.0 ± 7.0
A	*Alces alces americana*	Moose			Endangered	S1	1	6.4 ± 0.0
A	*Passerina cyanea*	Indigo Bunting				S1?B,SUM	2	4.9 ± 0.0
A	*Myiarchus crinitus*	Great Crested Flycatcher				S1B	1	2.0 ± 7.0
A	*Mimus polyglottos*	Northern Mockingbird				S1B	3	2.0 ± 7.0
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S4M	4	1.1 ± 0.0
A	*Calidris minutilla*	Least Sandpiper				S1B,S4M	1	1.0 ± 0.0
A	*Anas acuta*	Northern Pintail				S1B,SUM	2	4.6 ± 7.0
A	*Vireo gilvus*	Warbling Vireo				S1B,SUM	3	2.0 ± 7.0
A	*Mareca strepera*	Gadwall				S2B,SUM	1	6.2 ± 0.0
A	*Asio otus*	Long-eared Owl				S2S3	1	2.0 ± 7.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	1	2.0 ± 7.0
A	*Cathartes aura*	Turkey Vulture				S2S3B,S4S5M	6	1.1 ± 0.0
A	*Setophaga pinus*	Pine Warbler				S2S3B,S4S5M	5	1.8 ± 0.0
A	*Bucephala clangula*	Common Goldeneye				S2S3B,S5N,S5M	24	2.4 ± 0.0
A	*Icterus galbula*	Baltimore Oriole				S2S3B,SUM	1	2.0 ± 7.0
A	*Perisoreus canadensis*	Canada Jay				S3	5	2.0 ± 0.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3	2	2.0 ± 7.0
A	*Spinus pinus*	Pine Siskin				S3	5	1.0 ± 0.0
A	*Charadrius vociferus*	Killdeer				S3B	8	1.0 ± 0.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	2	1.1 ± 0.0
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	1	5.0 ± 0.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S4M	5	1.0 ± 0.0
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	1	2.0 ± 7.0
A	*Setophaga striata*	Blackpoll Warbler				S3B,S5M	4	3.4 ± 0.0
A	*Cardellina pusilla*	Wilson's Warbler				S3B,S5M	3	2.0 ± 7.0
A	*Pinicola enucleator*	Pine Grosbeak				S3B,S5N,S5M	3	2.0 ± 7.0
A	*Setophaga tigrina*	Cape May Warbler				S3B,SUM	4	2.0 ± 7.0
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	1	1.1 ± 0.0
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	2	2.0 ± 7.0
A	*Loxia curvirostra*	Red Crossbill				S3S4	1	2.0 ± 7.0
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	1	2.0 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	8	1.0 ± 0.0
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	2	2.0 ± 7.0
A	*Passerella iliaca*	Fox Sparrow				S3S4B,S5M	2	2.0 ± 7.0
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5M,S5N	13	4.8 ± 0.0
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	1	5.8 ± 5.0
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	41	1.0 ± 3.0
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	11	2.2 ± 0.0
I	*Erora laeta*	Early Hairstreak				S1	1	5.1 ± 1.0

Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
Polygonia comma	Eastern Comma				S1?	5	6.1 ± 2.0
Polygonia satyrus	Satyr Comma				S1?	5	5.5 ± 2.0
Nymphalis l-album	Compton Tortoiseshell				S2S3	5	4.2 ± 0.0
Aglais milberti	Milbert's Tortoiseshell				S2S3	2	6.1 ± 1.0
Strophiona nitens	Chestnut Bark Long-horned Beetle				S3	2	1.3 ± 0.0
Elateroides lugubris	Sapwood Ship-timber Beetle				S3	1	5.6 ± 0.0
Chilocorus stigma	Twice-stabbed Lady Beetle				S3	4	3.4 ± 0.0
Myzia pullata	Streaked Lady Beetle				S3	1	1.5 ± 0.0
Satyrium calanus	Banded Hairstreak				S3	3	6.1 ± 2.0
Strymon melinus	Gray Hairstreak				S3	1	6.1 ± 1.0
Polygonia interrogationis	Question Mark				S3B	5	3.0 ± 0.0
Amblyscirtes hegon	Pepper and Salt Skipper				S3S4	7	5.0 ± 2.0
Cupido comyntas	Eastern Tailed Blue				S3S4	1	4.5 ± 0.0
Polygonia faunus	Green Comma				S3S4	2	6.1 ± 2.0
Aeshna clepsydra	Mottled Darner				S3S4	1	5.1 ± 1.0
Nannothemis bella	Elfin Skimmer				S3S4	1	3.9 ± 1.0
Icaricia saepiolus	Greenish Blue				SH	1	5.0 ± 2.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with "YES".

Nova Scotia

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
Fraxinus nigra	Black Ash		Threatened	No
Emydoidea blandingii	*Blanding's Turtle - Nova Scotia pop.*	Endangered	Endangered	No
Glyptemys insculpta	**Wood Turtle**	**Threatened**	**Threatened**	**YES**
Falco peregrinus pop. 1	**Peregrine Falcon - anatum/tundrius pop.**		**Vulnerable**	**YES**
Bat hibernaculum or bat species occurrence		**[Endangered][1]**	**[Endangered][1]**	**YES**

1 *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NS Endangered Species Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 43636 records of 164 vertebrate and 2061 records of 73 invertebrate fauna; 10770 records of 286 vascular and 3032 records of 192 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including "location-sensitive" species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Coregonus huntsmani*	Atlantic Whitefish	Endangered	Endangered	Endangered	S1	147	78.2 ± 1.0	NS
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	328	4.0 ± 0.0	NS
A	*Myotis septentrionalis*	Northern Myotis	Endangered	Endangered	Endangered	S1	31	38.9 ± 0.0	NS
A	*Perimyotis subflavus*	Tricolored Bat	Endangered	Endangered	Endangered	S1	34	38.9 ± 0.0	NS
A	*Emydoidea blandingii*	Blanding's Turtle	Endangered	Endangered	Endangered	S1	2433	8.4 ± 0.0	NS
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered		S1	37	20.3 ± 0.0	NS
A	*Salmo salar pop. 6*	Atlantic Salmon - Nova Scotia Southern Upland population	Endangered			S1	30	7.8 ± 1.0	NS
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	1082	14.8 ± 0.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	65	20.9 ± 0.0	NS
A	*Dermochelys coriacea pop. 2*	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered		S1S2N	3	27.8 ± 5.0	NS
A	*Morone saxatilis pop. 2*	Striped Bass - Bay of Fundy population	Endangered			S2S3B,S2S3N	4	31.5 ± 0.0	NS
A	*Melanerpes erythrocephalus*	Red-headed Woodpecker	Endangered	Threatened		SNA	1	81.8 ± 0.0	NS
A	*Protonotaria citrea*	Prothonotary Warbler	Endangered	Endangered		SNA	1	24.9 ± 0.0	NS
A	*Icteria virens*	Yellow-Breasted Chat	Endangered	Endangered		SNA	24	9.5 ± 0.0	NS
A	*Lasiurus cinereus*	Hoary Bat	Endangered			SUB, S1M	31	23.4 ± 0.0	NS
A	*Lasionycteris noctivagans*	Silver-haired Bat	Endangered			SUB,S1M	12	11.5 ± 0.0	NS
A	*Lasiurus borealis*	Eastern Red Bat	Endangered			SUB,S1M	1	66.1 ± 0.0	NS
A	*Colinus virginianus*	Northern Bobwhite	Endangered	Endangered			7	18.6 ± 0.0	NS
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern		S1B	31	9.6 ± 7.0	NS
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	1148	2.1 ± 5.0	NS
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened	Endangered	S2B	1446	2.0 ± 7.0	NS
A	*Thamnophis saurita*	Eastern Ribbonsnake	Threatened	Threatened	Threatened	S2S3	450	74.9 ± 1.0	NS
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2S3B,S1M	929	7.2 ± 0.0	NS
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S2S3M	102	20.8 ± 0.0	NS
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened			S2S3N	12	41.6 ± 0.0	NS
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S3B	30	4.2 ± 1.0	NS
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	935	1.1 ± 0.0	NS
A	*Anguilla rostrata*	American Eel	Threatened			S3N	116	6.6 ± 0.0	NS
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened		SHB	3	12.8 ± 0.0	NS
A	*Melanerpes lewis*	Lewis's Woodpecker	Threatened	Threatened		SNA	2	23.1 ± 0.0	NS
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened		SUB	2	11.0 ± 0.0	NS
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened		SUB	36	40.7 ± 7.0	NS
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S1?B	13	9.0 ± 0.0	NS
A	*Passerculus sandwichensis princeps*	Ipswich Sparrow	Special Concern	Special Concern		S1B	30	17.0 ± 0.0	NS
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern		S1N,SUM	20	4.6 ± 0.0	NS
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2B	227	2.0 ± 7.0	NS
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	3	24.9 ± 0.0	NS
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S2S3M	12	20.9 ± 0.0	NS
A	*Histrionicus histrionicus pop.*	Harlequin Duck - Eastern	Special Concern	Special Concern	Endangered	S2S3N,SUM	69	11.5 ± 0.0	NS

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
	1	population							
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	479	1.1 ± 0.0	NS
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Endangered	S3B	1094	1.1 ± 0.0	NS
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Endangered	S3B	986	2.0 ± 7.0	NS
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B	519	1.1 ± 0.0	NS
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	799	2.0 ± 7.0	NS
A	*Dolichonyx oryzivorus*	Bobolink	Special Concern	Threatened	Vulnerable	S3B	663	0.9 ± 0.0	NS
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern	Vulnerable	S3B,S3N,S3M	584	8.1 ± 7.0	NS
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern		S3N,SUM	21	22.9 ± 0.0	NS
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Vulnerable	S3S4B	900	2.0 ± 7.0	NS
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern			S4	15	9.4 ± 0.0	NS
A	*Phocoena phocoena pop. 1*	Harbour Porpoise - Northwest Atlantic Population	Special Concern			S4	2	65.3 ± 0.0	NS
A	*Chrysemys picta*	Painted Turtle	Special Concern	Special Concern		S4	81	1.2 ± 0.0	NS
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	676	1.2 ± 0.0	NS
A	*Calidris subruficollis*	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	52	20.3 ± 0.0	NS
A	*Zonotrichia querula*	Harris's Sparrow	Special Concern			SNA	1	10.7 ± 0.0	NS
A	*Anarhichas lupus*	Atlantic Wolffish	Special Concern	Special Concern		SNR	5	21.0 ± 0.0	NS
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern			1	82.0 ± 0.0	NS
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SUN,SUM	12	1.0 ± 0.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	41	8.7 ± 0.0	NS
A	*Chlidonias niger*	Black Tern	Not At Risk			S1B	1	33.8 ± 0.0	NS
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk		Vulnerable	S1B,SUM	115	5.8 ± 2.0	NS
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	2	82.9 ± 0.0	NS
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S2?B,SUM	4	48.4 ± 7.0	NS
A	*Lynx canadensis*	Canada Lynx	Not At Risk		Endangered	S2S3	2	70.5 ± 1.0	NS
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	3	21.4 ± 0.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	36	5.1 ± 1.0	NS
A	*Megaptera novaeangliae*	Humpback Whale	Not At Risk			S3	2	17.4 ± 0.0	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	298	4.9 ± 0.0	NS
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	64	10.5 ± 0.0	NS
A	*Buteo lagopus*	Rough-legged Hawk	Not At Risk			S3N	1	20.3 ± 0.0	NS
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	128	2.0 ± 7.0	NS
A	*Glaucomys volans*	Southern Flying Squirrel	Not At Risk			S3S4	8	23.1 ± 2.0	NS
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	5	22.4 ± 2.0	NS
A	*Ammospiza nelsoni*	Nelson's Sparrow	Not At Risk			S3S4B	145	15.1 ± 7.0	NS
A	*Calidris canutus rufa*	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	644	21.0 ± 0.0	NS
A	*Calidris canutus*	Red Knot	E,SC	E,T		S2M	4	20.7 ± 1.0	NS
A	*Morone saxatilis*	Striped Bass	E,SC			S2S3B,S2S3N	29	8.4 ± 0.0	NS
A	*Gadus morhua*	Atlantic Cod	E,SC,DD			SNR	11	16.6 ± 0.0	NS
A	*Salmo salar*	Atlantic Salmon	E,T,SC			S1B,S1N	14	25.1 ± 0.0	NS
A	*Alces alces americana*	Moose			Endangered	S1	32	6.4 ± 0.0	NS
A	*Alces alces*	Moose				S1	7	10.7 ± 0.0	NS
A	*Uria aalge*	Common Murre				S1?B	7	10.1 ± 0.0	NS
A	*Passerina cyanea*	Indigo Bunting				S1?B,SUM	20	4.9 ± 0.0	NS
A	*Oxyura jamaicensis*	Ruddy Duck				S1B	13	10.0 ± 0.0	NS
A	*Gallinula galeata*	Common Gallinule				S1B	8	11.4 ± 0.0	NS
A	*Myiarchus crinitus*	Great Crested Flycatcher				S1B	28	2.0 ± 7.0	NS
A	*Cistothorus palustris*	Marsh Wren				S1B	2	63.7 ± 0.0	NS
A	*Mimus polyglottos*	Northern Mockingbird				S1B	79	2.0 ± 7.0	NS
A	*Toxostoma rufum*	Brown Thrasher				S1B	16	9.6 ± 7.0	NS
A	*Charadrius semipalmatus*	Semipalmated Plover				S1B,S4M	1885	1.1 ± 0.0	NS
A	*Calidris minutilla*	Least Sandpiper				S1B,S4M	1351	1.0 ± 0.0	NS
A	*Anas acuta*	Northern Pintail				S1B,SUM	70	4.6 ± 7.0	NS
A	*Vireo gilvus*	Warbling Vireo				S1B,SUM	21	2.0 ± 7.0	NS
A	*Vespertilionidae sp.*	bat species				S1S2	238	0.8 ± 0.0	NS

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A	*Pooecetes gramineus*	Vesper Sparrow				S1S2B,SUM	28	20.4 ± 7.0	NS
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B,SUM	35	16.4 ± 0.0	NS
A	*Alca torda*	Razorbill				S2B	26	6.4 ± 0.0	NS
A	*Fratercula arctica*	Atlantic Puffin				S2B	31	27.5 ± 0.0	NS
A	*Empidonax traillii*	Willow Flycatcher				S2B	30	8.9 ± 0.0	NS
A	*Molothrus ater*	Brown-headed Cowbird				S2B	153	9.6 ± 7.0	NS
A	*Spatula clypeata*	Northern Shoveler				S2B,SUM	28	6.5 ± 0.0	NS
A	*Mareca strepera*	Gadwall				S2B,SUM	35	6.2 ± 0.0	NS
A	*Piranga olivacea*	Scarlet Tanager				S2B,SUM	48	8.1 ± 7.0	NS
A	*Calidris alba*	Sanderling				S2N,S3M	1466	16.8 ± 0.0	NS
A	*Martes americana*	American Marten			Endangered	S2S3	3	33.5 ± 0.0	NS
A	*Asio otus*	Long-eared Owl				S2S3	21	2.0 ± 7.0	NS
A	*Rallus limicola*	Virginia Rail				S2S3B	19	26.5 ± 7.0	NS
A	*Rissa tridactyla*	Black-legged Kittiwake				S2S3B	16	27.4 ± 0.0	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B	244	2.0 ± 7.0	NS
A	*Phalacrocorax carbo*	Great Cormorant				S2S3B,S2S3N	78	6.4 ± 0.0	NS
A	*Cathartes aura*	Turkey Vulture				S2S3B,S4S5M	103	1.1 ± 0.0	NS
A	*Setophaga pinus*	Pine Warbler				S2S3B,S4S5M	44	1.8 ± 0.0	NS
A	*Bucephala clangula*	Common Goldeneye				S2S3B,S5N,S5M	288	2.4 ± 0.0	NS
A	*Icterus galbula*	Baltimore Oriole				S2S3B,SUM	84	2.0 ± 7.0	NS
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	258	21.0 ± 0.0	NS
A	*Numenius phaeopus*	Whimbrel				S2S3M	21	20.4 ± 0.0	NS
A	*Numenius phaeopus hudsonicus*	Whimbrel				S2S3M	256	20.7 ± 0.0	NS
A	*Phalaropus fulicarius*	Red Phalarope				S2S3M	4	21.0 ± 0.0	NS
A	*Perisoreus canadensis*	Canada Jay				S3	526	2.0 ± 7.0	NS
A	*Poecile hudsonicus*	Boreal Chickadee				S3	504	2.0 ± 7.0	NS
A	*Spinus pinus*	Pine Siskin				S3	462	1.0 ± 0.0	NS
A	*Salvelinus fontinalis*	Brook Trout				S3	134	6.5 ± 0.0	NS
A	*Salvelinus namaycush*	Lake Trout				S3	2	39.5 ± 0.0	NS
A	*Sorex maritimensis*	Maritime Shrew				S3	1	70.5 ± 1.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3	1	82.9 ± 0.0	NS
A	*Pekania pennanti*	Fisher				S3	9	42.8 ± 0.0	NS
A	*Calcarius lapponicus*	Lapland Longspur				S3?N,SUM	7	17.0 ± 0.0	NS
A	*Spatula discors*	Blue-winged Teal				S3B	68	9.6 ± 7.0	NS
A	*Charadrius vociferus*	Killdeer				S3B	575	1.0 ± 0.0	NS
A	*Tringa semipalmata*	Willet				S3B	1850	15.1 ± 7.0	NS
A	*Sterna paradisaea*	Arctic Tern				S3B	63	17.7 ± 7.0	NS
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	45	15.1 ± 7.0	NS
A	*Tyrannus tyrannus*	Eastern Kingbird				S3B	214	1.1 ± 0.0	NS
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	388	5.0 ± 0.0	NS
A	*Alosa pseudoharengus*	Alewife				S3B	32	7.1 ± 0.0	NS
A	*Somateria mollissima*	Common Eider				S3B,S3M,S3N	930	6.3 ± 0.0	NS
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S4M	2078	1.0 ± 0.0	NS
A	*Falco sparverius*	American Kestrel				S3B,S4S5M	247	2.0 ± 7.0	NS
A	*Gallinago delicata*	Wilson's Snipe				S3B,S5M	579	8.1 ± 7.0	NS
A	*Setophaga striata*	Blackpoll Warbler				S3B,S5M	135	3.4 ± 0.0	NS
A	*Cardellina pusilla*	Wilson's Warbler				S3B,S5M	83	2.0 ± 7.0	NS
A	*Pinicola enucleator*	Pine Grosbeak				S3B,S5N,S5M	133	2.0 ± 7.0	NS
A	*Setophaga tigrina*	Cape May Warbler				S3B,SUM	144	2.0 ± 7.0	NS
A	*Branta bernicla*	Brant				S3M	3	20.4 ± 0.0	NS
A	*Pluvialis squatarola*	Black-bellied Plover				S3M	2038	16.9 ± 0.0	NS
A	*Arenaria interpres*	Ruddy Turnstone				S3M	795	11.4 ± 0.0	NS
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	1680	11.3 ± 0.0	NS
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	349	1.1 ± 0.0	NS
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	1296	18.9 ± 0.0	NS
A	*Chroicocephalus ridibundus*	Black-headed Gull				S3N	30	9.3 ± 0.0	NS
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	149	2.0 ± 7.0	NS

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A	*Loxia curvirostra*	Red Crossbill				S3S4	241	2.0 ± 7.0	NS
A	*Botaurus lentiginosus*	American Bittern				S3S4B,S4S5M	179	9.6 ± 7.0	NS
A	*Setophaga castanea*	Bay-breasted Warbler				S3S4B,S4S5M	355	2.0 ± 7.0	NS
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	785	1.0 ± 0.0	NS
A	*Leiothlypis peregrina*	Tennessee Warbler				S3S4B,S5M	379	2.0 ± 7.0	NS
A	*Passerella iliaca*	Fox Sparrow				S3S4B,S5M	79	2.0 ± 7.0	NS
A	*Mergus serrator*	Red-breasted Merganser				S3S4B,S5M,S5N	324	4.8 ± 0.0	NS
A	*Calidris maritima*	Purple Sandpiper				S3S4N	202	9.9 ± 0.0	NS
A	*Lanius borealis*	Northern Shrike				S3S4N	2	26.5 ± 0.0	NS
A	*Morus bassanus*	Northern Gannet				SHB	62	9.0 ± 0.0	NS
A	*Aythya americana*	Redhead				SHB	5	9.7 ± 0.0	NS
A	*Leucophaeus atricilla*	Laughing Gull				SHB	13	16.9 ± 0.0	NS
A	*Progne subis*	Purple Martin				SHB	2	24.9 ± 0.0	NS
A	*Eremophila alpestris*	Horned Lark				SHB,S4S5N,S5M	28	20.4 ± 7.0	NS
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered	Endangered	S1	28	5.8 ± 5.0	NS
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Endangered	S2?B,S3M	1007	1.0 ± 3.0	NS
I	*Danaus plexippus plexippus*	Monarch	Endangered	Special Concern		S2?B,S3M	2	42.0 ± 0.0	NS
I	*Barnea truncata*	Atlantic Mud-piddock	Threatened	Threatened		S1	10	70.0 ± 0.0	NS
I	*Bombus suckleyi*	Suckley's Cuckoo Bumble Bee	Threatened			SH	4	43.3 ± 5.0	NS
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Threatened	S3	5	46.2 ± 0.0	NS
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern	Vulnerable	S3	156	2.2 ± 0.0	NS
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern		Endangered	SH	3	37.3 ± 2.0	NS
I	*Gomphurus ventricosus*	Skillet Clubtail	Special Concern	Endangered		SH	2	29.0 ± 1.0	NS
I	*Cicindela formosa*	Big Sand Tiger Beetle				S1	1	76.1 ± 1.0	NS
I	*Erora laeta*	Early Hairstreak				S1	1	5.1 ± 1.0	NS
I	*Ophiogomphus anomalus*	Extra-Striped Snaketail				S1	3	96.4 ± 0.0	NS
I	*Pachydiplax longipennis*	Blue Dasher				S1	28	8.4 ± 0.0	NS
I	*Polygonia comma*	Eastern Comma				S1?	21	6.1 ± 2.0	NS
I	*Polygonia satyrus*	Satyr Comma				S1?	7	5.5 ± 2.0	NS
I	*Boloria chariclea*	Arctic Fritillary				S1S2	2	95.1 ± 2.0	NS
I	*Somatochlora brevicincta*	Quebec Emerald				S1S2	1	30.0 ± 0.0	NS
I	*Tharsalea dospassosi*	Maritime Copper				S2	6	8.0 ± 5.0	NS
I	*Satyrium acadica*	Acadian Hairstreak				S2	4	86.2 ± 2.0	NS
I	*Coenagrion resolutum*	Taiga Bluet				S2	2	15.8 ± 1.0	NS
I	*Margaritifera margaritifera*	Eastern Pearlshell				S2	67	36.4 ± 1.0	NS
I	*Pantala hymenaea*	Spot-Winged Glider				S2?B	6	9.3 ± 1.0	NS
I	*Nymphalis l-album*	Compton Tortoiseshell				S2S3	19	4.2 ± 0.0	NS
I	*Aglais milberti*	Milbert's Tortoiseshell				S2S3	22	6.1 ± 2.0	NS
I	*Somatochlora kennedyi*	Kennedy's Emerald				S2S3	3	15.5 ± 1.0	NS
I	*Somatochlora williamsoni*	Williamson's Emerald				S2S3	1	98.0 ± 0.0	NS
I	*Enallagma geminatum*	Skimming Bluet				S2S3	2	77.8 ± 0.0	NS
I	*Stylurus scudderi*	Zebra Clubtail				S2S3	6	31.1 ± 0.0	NS
I	*Alasmidonta undulata*	Triangle Floater				S2S3	25	10.3 ± 0.0	NS
I	*Strophiona nitens*	Chestnut Bark Long-horned Beetle				S3	4	1.3 ± 0.0	NS
I	*Psephenus herricki*	Herrick's Water Penny Beetle				S3	1	80.8 ± 0.0	NS
I	*Lebia ornata*	Ornate Harp Ground Beetle				S3	1	89.2 ± 0.0	NS
I	*Carabus serratus*	Serrated Ground Beetle				S3	1	83.7 ± 0.0	NS
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	3	15.5 ± 0.0	NS
I	*Disonycha pensylvanica*	Pennsylvania Flea Beetle				S3	1	75.5 ± 0.0	NS
I	*Chrysochus auratus*	Dogbane Leaf Beetle				S3	1	43.8 ± 0.0	NS
I	*Naemia seriata*	Seaside Lady Beetle				S3	29	19.7 ± 0.0	NS
I	*Elateroides lugubris*	Sapwood Ship-timber Beetle				S3	1	5.6 ± 0.0	NS
I	*Chilocorus stigma*	Twice-stabbed Lady Beetle				S3	10	3.4 ± 0.0	NS
I	*Myzia pullata*	Streaked Lady Beetle				S3	5	1.5 ± 0.0	NS

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I	*Monochamus marmorator*	Balsam Fir Sawyer				S3	1	24.2 ± 0.0	NS
I	*Trachysida aspera*	Rough Flower Longhorn Beetle				S3	1	10.9 ± 0.0	NS
I	*Dicerca tuberculata*	Swollen Jewel Beetle				S3	1	10.9 ± 9.0	NS
I	*Astylopsis sexguttata*	Six-speckled Long-horned Beetle				S3	2	15.5 ± 0.0	NS
I	*Satyrium calanus*	Banded Hairstreak				S3	73	6.1 ± 2.0	NS
I	*Callophrys lanoraieensis*	Bog Elfin				S3	22	10.9 ± 9.0	NS
I	*Strymon melinus*	Gray Hairstreak				S3	14	6.1 ± 1.0	NS
I	*Ophiogomphus aspersus*	Brook Snaketail				S3	2	22.1 ± 0.0	NS
I	*Ophiogomphus mainensis*	Maine Snaketail				S3	7	71.2 ± 0.0	NS
I	*Ophiogomphus rupinsulensis*	Rusty Snaketail				S3	31	31.1 ± 0.0	NS
I	*Epitheca princeps*	Prince Baskettail				S3	14	11.7 ± 0.0	NS
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4	7.3 ± 1.0	NS
I	*Enallagma vernale*	Vernal Bluet				S3	5	19.7 ± 1.0	NS
I	*Polygonia interrogationis*	Question Mark				S3B	167	3.0 ± 0.0	NS
I	*Lepturopsis biforis*	Two-spotted Long-horned Beetle				S3S4	1	51.1 ± 0.0	NS
I	*Cecropterus pylades*	Northern Cloudywing				S3S4	5	82.9 ± 2.0	NS
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S3S4	29	5.0 ± 2.0	NS
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	28	4.5 ± 0.0	NS
I	*Argynnis aphrodite*	Aphrodite Fritillary				S3S4	38	23.2 ± 0.0	NS
I	*Polygonia faunus*	Green Comma				S3S4	14	6.1 ± 2.0	NS
I	*Oeneis jutta*	Jutta Arctic				S3S4	6	27.2 ± 1.0	NS
I	*Aeshna clepsydra*	Mottled Darner				S3S4	11	5.1 ± 1.0	NS
I	*Aeshna constricta*	Lance-Tipped Darner				S3S4	21	10.4 ± 0.0	NS
I	*Boyeria grafiana*	Ocellated Darner				S3S4	10	42.5 ± 1.0	NS
I	*Gomphaeschna furcillata*	Harlequin Darner				S3S4	15	8.4 ± 0.0	NS
I	*Somatochlora franklini*	Delicate Emerald				S3S4	2	29.0 ± 1.0	NS
I	*Erythrodiplax berenice*	Seaside Dragonlet				S3S4	7	20.7 ± 0.0	NS
I	*Nannothemis bella*	Elfin Skimmer				S3S4	20	3.9 ± 1.0	NS
I	*Enallagma vesperum*	Vesper Bluet				S3S4	4	32.7 ± 0.0	NS
I	*Amphiagrion saucium*	Eastern Red Damsel				S3S4	2	83.2 ± 1.0	NS
I	*Sphaerophoria pyrrhina*	Violaceous Globetail				SH	1	82.1 ± 5.0	NS
I	*Icaricia saepiolus*	Greenish Blue				SH	1	5.0 ± 2.0	NS
I	*Polygonia gracilis*	Hoary Comma				SH	1	83.8 ± 2.0	NS
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered	Endangered	Endangered	S1	19	35.5 ± 0.0	NS
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1	255	5.2 ± 0.0	NS
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened	Threatened	S1	41	56.0 ± 0.0	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened	Threatened	S2S3	212	25.7 ± 13.0	NS
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened	Threatened	S3	53	28.9 ± 0.0	NS
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S3	30	2.2 ± 0.0	NS
N	*Heterodermia squamulosa*	Scaly Fringe Lichen	Threatened			S3	94	60.4 ± 0.0	NS
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S3	235	8.4 ± 0.0	NS
N	*Sclerophora peronella (Atlantic pop.)*	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S3S4	29	16.6 ± 0.0	NS
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	18	7.2 ± 0.0	NS
N	*Fissidens exilis*	Pygmy Pocket Moss	Not At Risk			S3	16	45.2 ± 1.0	NS
N	*Aloina brevirostris*	Short-Beaked Rigid Screw Moss				S1	2	42.3 ± 2.0	NS
N	*Orthotrichum gymnostomum*	Aspen Bristle Moss				S1	1	100.0 ± 0.0	NS
N	*Sematophyllum demissum*	a Moss				S1	2	17.2 ± 2.0	NS
N	*Blennothallia crispa*	Crinkled Jelly Lichen				S1	1	65.4 ± 0.0	NS
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S1	1	14.4 ± 5.0	NS
N	*Usnea perplexans*	Powdered Beard Lichen				S1	1	65.7 ± 0.0	NS
N	*Scytinium dactylinum*	Brown-buttoned Jellyskin				S1	1	90.5 ± 0.0	NS

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N	*Lathagrium cristatum*	Lichen Fingered Jelly Lichen				S1	3	50.0 ± 0.0	NS
N	*Ephebe perspinulosa*	Thread Lichen				S1	1	90.4 ± 1.0	NS
N	*Fuscopannaria praetermissa*	Moss Shingles Lichen				S1	1	46.9 ± 0.0	NS
N	*Scytinium schraderi*	Wrinkled Jellyskin Lichen				S1	1	64.6 ± 0.0	NS
N	*Lichina confinis*	Marine Seaweed Lichen				S1	4	24.7 ± 0.0	NS
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S1	1	82.9 ± 0.0	NS
N	*Pseudevernia consocians*	Common Antler Lichen				S1	1	69.3 ± 0.0	NS
N	*Sticta limbata*	Powdered Moon Lichen				S1	4	31.6 ± 3.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S1	7	45.7 ± 0.0	NS
N	*Bryoria nitidula*	Tundra Horsehair Lichen				S1	2	22.6 ± 0.0	NS
N	*Hypogymnia hultenii*	Powdered Honeycomb Lichen				S1	14	32.3 ± 1.0	NS
N	*Calypogeia neogaea*	Common Pouchwort				S1?	2	64.7 ± 0.0	NS
N	*Jubula pennsylvanica*	a liverwort				S1?	1	36.3 ± 0.0	NS
N	*Aloina rigida*	Aloe-Like Rigid Screw Moss				S1?	3	42.3 ± 2.0	NS
N	*Imbribryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1?	2	56.3 ± 0.0	NS
N	*Conardia compacta*	Coast Creeping Moss				S1?	1	26.7 ± 2.0	NS
N	*Tortula obtusifolia*	a Moss				S1?	3	78.0 ± 0.0	NS
N	*Didymodon tophaceus*	Olive Beard Moss				S1?	2	65.0 ± 4.0	NS
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	1	77.6 ± 0.0	NS
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	3	43.8 ± 0.0	NS
N	*Physcomitrium immersum*	a Moss				S1?	6	78.0 ± 0.0	NS
N	*Schistostega pennata*	Luminous Moss				S1?	2	41.3 ± 0.0	NS
N	*Trichodon cylindricus*	Cylindric Hairy-teeth Moss				S1?	1	90.6 ± 0.0	NS
N	*Enchylium limosum*	Lime-loving Tarpaper Lichen				S1?	2	65.0 ± 4.0	NS
N	*Scytinium intermedium*	Forty-five Jellyskin Lichen				S1?	1	65.0 ± 4.0	NS
N	*Melanelia culbersonii*	Appalachain Camouflage Lichen				S1?	1	35.0 ± 0.0	NS
N	*Porella pinnata*	Pinnate Scalewort				S1S2	1	86.0 ± 0.0	NS
N	*Arrhenopterum heterostichum*	One-sided Groove Moss				S1S2	3	42.3 ± 2.0	NS
N	*Hypnum pratense*	Meadow Plait Moss				S1S2	1	86.5 ± 3.0	NS
N	*Mnium thomsonii*	Thomson's Leafy Moss				S1S2	1	47.8 ± 2.0	NS
N	*Tortula acaulon*	Cuspidate Earth Moss				S1S2	4	83.3 ± 0.0	NS
N	*Plagiothecium latebricola*	Alder Silk Moss				S1S2	2	44.2 ± 5.0	NS
N	*Platydictya confervoides*	a Moss				S1S2	1	45.8 ± 0.0	NS
N	*Sematophyllum marylandicum*	a Moss				S1S2	2	17.4 ± 3.0	NS
N	*Timmia megapolitana*	Metropolitan Timmia Moss				S1S2	2	83.9 ± 1.0	NS
N	*Tortula mucronifolia*	Mucronate Screw Moss				S1S2	1	84.1 ± 3.0	NS
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	1	71.0 ± 0.0	NS
N	*Haplocladium microphyllum*	Tiny-leaved Haplocladium Moss				S1S2	1	73.2 ± 5.0	NS
N	*Rhynchostegium serrulatum*	Dark Beaked Moss				S1S2	1	29.3 ± 2.0	NS
N	*Enchylium bachmanianum*	Bachman's Jelly Lichen				S1S2	2	50.1 ± 0.0	NS
N	*Placidium squamulosum*	Limy Soil Stipplescale Lichen				S1S2	1	76.9 ± 6.0	NS
N	*Pilophorus cereolus*	Powdered Matchstick Lichen				S1S2	1	85.7 ± 3.0	NS
N	*Rhizoplaca subdiscrepans*	Scattered Rock-posy Lichen				S1S2	1	36.4 ± 1.0	NS
N	*Parmotrema reticulatum*	Netted Ruffle Lichen				S1S2	7	67.4 ± 0.0	NS
N	*Parmeliella parvula*	Poor-man's Shingles Lichen				S1S2	9	38.6 ± 0.0	NS
N	*Umbilicaria polyrhiza*	Ballpoint Rocktripe Lichen				S1S3	1	77.7 ± 0.0	NS
N	*Lecanora polytropa*	a lichen				S1S3	2	24.6 ± 1.0	NS
N	*Acarospora sinopica*	a cracked lichen				S1S3	2	5.3 ± 0.0	NS
N	*Heterodermia galactophylla*	Branching Fringe Lichen				S1S3	1	36.4 ± 0.0	NS

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N	*Xylopsora friesii*	a Lichen				S1S3	2	8.6 ± 0.0	NS
N	*Stereocaulon grande*	Grand Foam Lichen				S1S3	1	94.0 ± 0.0	NS
N	*Stereocaulon intermedium*	Pacific Brain Foam Lichen				S1S3	5	1.6 ± 0.0	NS
N	*Anacamptodon splachnoides*	a Moss				S2	3	6.5 ± 30.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S2	2	21.3 ± 3.0	NS
N	*Sphagnum subnitens*	Lustrous Peat Moss				S2	1	62.9 ± 2.0	NS
N	*Usnea flavocardia*	Blood-splattered Beard Lichen				S2	1	8.6 ± 4.0	NS
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S2	5	2.4 ± 0.0	NS
N	*Hypotrachyna catawbiensis*	Powder-tipped Antler Lichen				S2	4	36.2 ± 0.0	NS
N	*Scytinium imbricatum*	Scaly Jellyskin Lichen				S2	2	62.3 ± 4.0	NS
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2	1	16.9 ± 1.0	NS
N	*Nephroma resupinatum*	a lichen				S2	11	15.4 ± 0.0	NS
N	*Placynthium flabellosum*	Scaly Ink Lichen				S2	1	45.5 ± 17.0	NS
N	*Moerckia flotoviana*	Flotow's Ruffwort				S2?	1	65.8 ± 0.0	NS
N	*Riccardia multifida*	Delicate Germanderwort				S2?	2	40.5 ± 0.0	NS
N	*Anomodon viticulosus*	a Moss				S2?	1	85.3 ± 0.0	NS
N	*Weissia muhlenbergiana*	a Moss				S2?	6	47.8 ± 1.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	2	86.9 ± 5.0	NS
N	*Ptychostomum pendulum*	Drooping Bryum				S2?	1	42.3 ± 2.0	NS
N	*Drepanocladus polygamus*	Polygamous Hook Moss				S2?	5	17.2 ± 2.0	NS
N	*Pseudocampylium radicale*	Long-stalked Fine Wet Moss				S2?	1	86.5 ± 3.0	NS
N	*Climacium americanum*	American Tree Moss				S2?	1	94.1 ± 0.0	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S2?	3	22.1 ± 0.0	NS
N	*Ditrichum rhynchostegium*	a Moss				S2?	1	2.5 ± 1.0	NS
N	*Grimmia anomala*	Mountain Forest Grimmia				S2?	1	54.3 ± 1.0	NS
N	*Kiaeria starkei*	Starke's Fork Moss				S2?	1	50.1 ± 10.0	NS
N	*Orthotrichum anomalum*	Anomalous Bristle Moss				S2?	2	48.7 ± 2.0	NS
N	*Philonotis marchica*	a Moss				S2?	2	90.4 ± 0.0	NS
N	*Platydictya jungermannioides*	False Willow Moss				S2?	1	48.1 ± 0.0	NS
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2?	1	8.6 ± 5.0	NS
N	*Platylomella lescurii*	a Moss				S2?	6	31.6 ± 0.0	NS
N	*Phylliscum demangeonii*	Black Rock-wafer Lichen				S2?	5	47.7 ± 0.0	NS
N	*Oxyrrhynchium hians*	Light Beaked Moss				S2S3	4	13.7 ± 5.0	NS
N	*Platydictya subtilis*	Bark Willow Moss				S2S3	1	93.3 ± 3.0	NS
N	*Scorpidium revolvens*	Limprichtia Moss				S2S3	3	27.0 ± 2.0	NS
N	*Moelleropsis nebulosa*	Blue-gray Moss Shingle Lichen				S2S3	48	4.9 ± 0.0	NS
N	*Moelleropsis nebulosa ssp. frullaniae*	Blue-gray Moss Shingle Lichen				S2S3	3	58.8 ± 0.0	NS
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S2S3	11	22.5 ± 5.0	NS
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2S3	76	6.2 ± 1.0	NS
N	*Usnea ceratina*	Warty Beard Lichen				S2S3	2	69.2 ± 0.0	NS
N	*Usnea rubicunda*	Red Beard Lichen				S2S3	6	43.0 ± 0.0	NS
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S2S3	19	9.3 ± 0.0	NS
N	*Usnocetraria oakesiana*	Yellow Band Lichen				S2S3	12	6.8 ± 0.0	NS
N	*Cladonia mateocyatha*	Mixed-up Pixie-cup				S2S3	5	0.5 ± 5.0	NS
N	*Cladonia parasitica*	Fence-rail Lichen				S2S3	3	16.5 ± 0.0	NS
N	*Chaenotheca gracilenta*	a lichen				S2S3	1	9.7 ± 0.0	NS
N	*Scytinium tenuissimum*	Birdnest Jellyskin Lichen				S2S3	7	2.3 ± 0.0	NS
N	*Melanohalea septentrionalis*	Northern Camouflage Lichen				S2S3	1	65.7 ± 0.0	NS
N	*Myelochroa aurulenta*	Powdery Axil-bristle Lichen				S2S3	3	70.6 ± 2.0	NS
N	*Parmelia fertilis*	Fertile Shield Lichen				S2S3	8	55.8 ± 0.0	NS
N	*Hypotrachyna minarum*	Hairless-spined Shield Lichen				S2S3	3	54.2 ± 0.0	NS
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	2	8.4 ± 0.0	NS

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N	*Racodium rupestre*	Rockhair Lichen				S2S3	4	11.8 ± 1.0	NS
N	*Umbilicaria polyphylla*	Petalled Rocktripe Lichen				S2S3	2	21.0 ± 0.0	NS
N	*Usnea cavernosa*	Pitted Beard Lichen				S2S3	4	65.7 ± 0.0	NS
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	1	65.7 ± 0.0	NS
N	*Fuscopannaria sorediata*	a Lichen				S2S3	8	9.3 ± 0.0	NS
N	*Stereocaulon condensatum*	Granular Soil Foam Lichen				S2S3	1	93.6 ± 0.0	NS
N	*Physcia subtilis*	Slender Rosette Lichen				S2S3	2	21.0 ± 0.0	NS
N	*Dimelaena oreina*	Golden Moonglow Lichen				S2S3	2	15.3 ± 0.0	NS
N	*Cetraria arenaria*	Sand-loving Icelandmoss Lichen				S2S3	13	54.5 ± 0.0	NS
N	*Cladonia coccifera*	Eastern Boreal Pixie-cup Lichen				S2S3	4	23.0 ± 2.0	NS
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S2S3	3	49.7 ± 4.0	NS
N	*Cladonia phyllophora*	Felt Lichen				S2S3	2	82.3 ± 4.0	NS
N	*Usnea flammea*	Coastal Bushy Beard Lichen				S2S3	1	24.6 ± 1.0	NS
N	*Ephemerum serratum*	a Moss				S3	3	49.5 ± 5.0	NS
N	*Fissidens taxifolius*	Yew-leaved Pocket Moss				S3	15	42.3 ± 0.0	NS
N	*Anomodon tristis*	a Moss				S3	10	59.4 ± 15.0	NS
N	*Sphagnum contortum*	Twisted Peat Moss				S3	5	64.5 ± 4.0	NS
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3	3	62.9 ± 2.0	NS
N	*Rostania occultata*	Crusted Tarpaper Lichen				S3	1	90.2 ± 0.0	NS
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	43	20.7 ± 0.0	NS
N	*Solorina saccata*	Woodland Owl Lichen				S3	11	47.5 ± 2.0	NS
N	*Fuscopannaria ahlneri*	Corrugated Shingles Lichen				S3	80	15.5 ± 0.0	NS
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	33	4.9 ± 0.0	NS
N	*Leptogium milligranum*	Stretched Jellyskin Lichen				S3	18	43.6 ± 0.0	NS
N	*Nephroma bellum*	Naked Kidney Lichen				S3	7	8.6 ± 4.0	NS
N	*Placynthium nigrum*	Common Ink Lichen				S3	1	78.0 ± 0.0	NS
N	*Platismatia norvegica*	Oldgrowth Rag Lichen				S3	1	64.3 ± 0.0	NS
N	*Punctelia appalachensis*	Appalachian Speckleback Lichen				S3	111	83.7 ± 0.0	NS
N	*Viridothelium virens*	a lichen				S3	4	15.5 ± 2.0	NS
N	*Ephebe lanata*	Waterside Rockshag Lichen				S3	4	45.5 ± 17.0	NS
N	*Phaeophyscia adiastola*	Powder-tipped Shadow Lichen				S3	1	8.7 ± 0.0	NS
N	*Phaeophyscia pusilloides*	Pompom-tipped Shadow Lichen				S3	9	6.2 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S3	10	2.8 ± 0.0	NS
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3?	3	2.3 ± 0.0	NS
N	*Calliergon giganteum*	Giant Spear Moss				S3?	2	39.9 ± 3.0	NS
N	*Drummondia prorepens*	a Moss				S3?	2	46.8 ± 5.0	NS
N	*Elodium blandowii*	Blandow's Bog Moss				S3?	5	15.4 ± 7.0	NS
N	*Mnium stellare*	Star Leafy Moss				S3?	3	43.2 ± 0.0	NS
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S3?	1	76.8 ± 0.0	NS
N	*Sphagnum riparium*	Streamside Peat Moss				S3?	2	50.9 ± 0.0	NS
N	*Cladonia stygia*	Black-footed Reindeer Lichen				S3?	8	42.7 ± 0.0	NS
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	2	83.8 ± 0.0	NS
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S3S4	3	13.2 ± 3.0	NS
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	1	25.9 ± 0.0	NS
N	*Encalypta ciliata*	Fringed Extinguisher Moss				S3S4	2	84.1 ± 3.0	NS
N	*Splachnum ampullaceum*	Cruet Dung Moss				S3S4	1	50.3 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S3S4	5	66.4 ± 0.0	NS
N	*Tomentypnum nitens*	Golden Fuzzy Fen Moss				S3S4	4	43.8 ± 0.0	NS
N	*Schistidium agassizii*	Elf Bloom Moss				S3S4	3	54.3 ± 1.0	NS
N	*Hylocomiastrum pyrenaicum*	a Feather Moss				S3S4	1	8.6 ± 0.0	NS

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N	*Bryoria pseudofuscescens*	Mountain Horsehair Lichen				S3S4	4	22.8 ± 1.0	NS
N	*Enchylium tenax*	Soil Tarpaper Lichen				S3S4	10	43.8 ± 0.0	NS
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3S4	65	12.7 ± 2.0	NS
N	*Arctoparmelia incurva*	Finger Ring Lichen				S3S4	86	2.0 ± 0.0	NS
N	*Scytinium teretiusculum*	Curly Jellyskin Lichen				S3S4	14	24.9 ± 0.0	NS
N	*Leptogium acadiense*	Acadian Jellyskin Lichen				S3S4	30	6.8 ± 0.0	NS
N	*Scytinium subtile*	Appressed Jellyskin Lichen				S3S4	26	21.6 ± 0.0	NS
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	4	23.0 ± 0.0	NS
N	*Vahliella leucophaea*	Shelter Shingle Lichen				S3S4	1	88.7 ± 0.0	NS
N	*Heterodermia speciosa*	Powdered Fringe Lichen				S3S4	60	46.7 ± 0.0	NS
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S3S4	90	9.3 ± 0.0	NS
N	*Melanohalea olivacea*	Spotted Camouflage Lichen				S3S4	2	65.7 ± 0.0	NS
N	*Parmeliopsis hyperopta*	Gray Starburst Lichen				S3S4	1	91.1 ± 0.0	NS
N	*Parmotrema perlatum*	Powdered Ruffle Lichen				S3S4	35	26.7 ± 0.0	NS
N	*Peltigera hymenina*	Cloudy Pelt Lichen				S3S4	2	23.0 ± 2.0	NS
N	*Sphaerophorus fragilis*	Fragile Coral Lichen				S3S4	11	22.8 ± 0.0	NS
N	*Sclerophora peronella*	Frosted Glass-whiskers Lichen				S3S4	2	76.4 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S3S4	377	4.9 ± 0.0	NS
N	*Physcia caesia*	Blue-gray Rosette Lichen				S3S4	3	24.6 ± 1.0	NS
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	7	5.3 ± 0.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	152	3.9 ± 0.0	NS
N	*Evernia prunastri*	Valley Oakmoss Lichen				S3S4	36	41.3 ± 0.0	NS
N	*Heterodermia neglecta*	Fringe Lichen				S3S4	120	2.1 ± 0.0	NS
P	*Rhynchospora macrostachya*	Tall Beakrush	Endangered	Endangered	Endangered	S1	7	94.9 ± 0.0	NS
P	*Clethra alnifolia*	Coast Pepper-Bush	Endangered	Threatened	Vulnerable	S2	3	14.1 ± 0.0	NS
P	*Juglans cinerea*	Butternut	Endangered	Endangered		SNA	32	2.9 ± 0.0	NS
P	*Fraxinus nigra*	Black Ash	Threatened		Threatened	S1S2	807	8.6 ± 0.0	NS
P	*Liatris spicata*	Dense Blazing Star	Threatened	Threatened		SNA	4	8.5 ± 0.0	NS
P	*Lachnanthes caroliniana*	Redroot	Special Concern	Special Concern	Vulnerable	S2	318	93.9 ± 0.0	NS
P	*Lophiola aurea*	Goldencrest	Special Concern	Special Concern	Vulnerable	S2	462	78.0 ± 1.0	NS
P	*Lilaeopsis chinensis*	Eastern Lilaeopsis	Special Concern	Special Concern	Vulnerable	S3	154	69.2 ± 0.0	NS
P	*Scirpus longii*	Long's Bulrush	Special Concern		Vulnerable	S3	151	88.6 ± 0.0	NS
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Vulnerable	S3	13	90.2 ± 0.0	NS
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2S3	39	82.7 ± 1.0	NS
P	*Acer saccharinum*	Silver Maple				S1	12	69.2 ± 0.0	NS
P	*Osmorhiza depauperata*	Blunt Sweet Cicely				S1	1	70.8 ± 5.0	NS
P	*Andersonglossum boreale*	Northern Wild Comfrey				S1	5	45.5 ± 1.0	NS
P	*Turritis glabra*	Tower Mustard				S1	1	72.6 ± 0.0	NS
P	*Lobelia spicata*	Pale-Spiked Lobelia				S1	8	77.1 ± 7.0	NS
P	*Ribes americanum*	Wild Black Currant				S1	4	45.0 ± 3.0	NS
P	*Trichostema dichotomum*	Forked Bluecurls				S1	9	93.5 ± 0.0	NS
P	*Fraxinus pennsylvanica*	Red Ash				S1	11	27.2 ± 5.0	NS
P	*Persicaria careyi*	Carey's Smartweed				S1	1	67.0 ± 3.0	NS
P	*Phytolacca americana*	Common Pokeweed				S1	4	7.4 ± 0.0	NS
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S1	4	80.4 ± 0.0	NS
P	*Montia fontana*	Water Blinks				S1	1	8.4 ± 1.0	NS
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	1	17.8 ± 0.0	NS
P	*Amelanchier nantucketensis*	Nantucket Serviceberry				S1	1	97.0 ± 1.0	NS
P	*Salix myrtillifolia*	Blueberry Willow				S1	1	54.1 ± 0.0	NS
P	*Salix serissima*	Autumn Willow				S1	2	53.9 ± 0.0	NS
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S1	2	98.7 ± 1.0	NS
P	*Carex garberi*	Garber's Sedge				S1	4	91.6 ± 0.0	NS
P	*Carex laxiflora*	Loose-Flowered Sedge				S1	2	82.9 ± 1.0	NS
P	*Carex ormostachya*	Necklace Spike Sedge				S1	1	88.6 ± 5.0	NS
P	*Carex plantaginea*	Plantain-Leaved Sedge				S1	4	86.9 ± 0.0	NS
P	*Carex prairea*	Prairie Sedge				S1	2	84.2 ± 1.0	NS

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P	*Carex viridula var. saxilittoralis*	Greenish Sedge				S1	5	76.9 ± 2.0	NS
P	*Scirpus atrovirens*	Dark-green Bulrush				S1	4	44.8 ± 0.0	NS
P	*Schoenoplectus torreyi*	Torrey's Bulrush				S1	6	92.9 ± 0.0	NS
P	*Iris prismatica*	Slender Blue Flag				S1	1	80.7 ± 100.0	NS
P	*Sisyrinchium fuscatum*	Coastal Plain Blue-eyed-grass				S1	1	77.9 ± 0.0	NS
P	*Juncus secundus*	Secund Rush				S1	1	85.9 ± 0.0	NS
P	*Juncus vaseyi*	Vasey Rush				S1	1	92.2 ± 0.0	NS
P	*Trillium grandiflorum*	White Trillium				S1	3	84.2 ± 1.0	NS
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	5	77.1 ± 10.0	NS
P	*Spiranthes casei var. casei*	Case's Ladies'-Tresses				S1	2	63.2 ± 0.0	NS
P	*Dichanthelium xanthophysum*	Slender Panic Grass				S1	10	74.4 ± 1.0	NS
P	*Elymus hystrix*	Spreading Wild Rye				S1	11	42.8 ± 0.0	NS
P	*Adiantum pedatum*	Northern Maidenhair Fern				S1	26	36.0 ± 1.0	NS
P	*Dryopteris goldieana*	Goldie's Woodfern				S1	1	60.7 ± 1.0	NS
P	*Equisetum palustre*	Marsh Horsetail				S1	1	78.4 ± 5.0	NS
P	*Botrychium lunaria*	Common Moonwort				S1	10	24.9 ± 0.0	NS
P	*Selaginella rupestris*	Rock Spikemoss				S1	1	44.7 ± 0.0	NS
P	*Solidago hispida*	Hairy Goldenrod				S1?	1	9.6 ± 7.0	NS
P	*Suaeda rolandii*	Roland's Sea-Blite				S1?	5	45.8 ± 2.0	NS
P	*Carex pensylvanica*	Pennsylvania Sedge				S1?	3	25.2 ± 0.0	NS
P	*Allium schoenoprasum*	Wild Chives				S1?	2	9.4 ± 0.0	NS
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S1?	1	83.5 ± 7.0	NS
P	*Crocanthemum canadense*	Long-branched Frostweed			Endangered	S1S2	33	9.7 ± 1.0	NS
P	*Cypripedium arietinum*	Ram's-Head Lady's-Slipper			Endangered	S1S2	308	40.5 ± 0.0	NS
P	*Sanicula odorata*	Clustered Sanicle				S1S2	10	43.0 ± 0.0	NS
P	*Draba glabella*	Rock Whitlow-Grass				S1S2	2	84.9 ± 0.0	NS
P	*Proserpinaca intermedia*	Intermediate Mermaidweed				S1S2	5	47.3 ± 0.0	NS
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	5	83.5 ± 7.0	NS
P	*Carex haydenii*	Hayden's Sedge				S1S2	4	77.5 ± 1.0	NS
P	*Platanthera huronensis*	Fragrant Green Orchid				S1S2	1	43.3 ± 10.0	NS
P	*Euphrasia farlowii*	Farlow's Eyebright				S1S3	2	74.7 ± 0.0	NS
P	*Carex vacillans*	Estuarine Sedge				S1S3	1	67.5 ± 0.0	NS
P	*Zizia aurea*	Golden Alexanders				S2	41	65.8 ± 0.0	NS
P	*Antennaria parlinii ssp. fallax*	Parlin's Pussytoes				S2	34	42.2 ± 0.0	NS
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S2	27	27.4 ± 7.0	NS
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S2	1	85.0 ± 0.0	NS
P	*Cardamine maxima*	Large Toothwort				S2	2	70.8 ± 0.0	NS
P	*Hudsonia ericoides*	Pinebarren Golden Heather				S2	212	6.7 ± 0.0	NS
P	*Desmodium canadense*	Canada Tick-trefoil				S2	12	71.4 ± 1.0	NS
P	*Hylodesmum glutinosum*	Large Tick-trefoil				S2	23	45.7 ± 0.0	NS
P	*Conopholis americana*	American Cancer-root				S2	21	73.7 ± 7.0	NS
P	*Anemonastrum canadense*	Canada Anemone				S2	16	7.9 ± 0.0	NS
P	*Hepatica americana*	Round-lobed Hepatica				S2	74	40.6 ± 3.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S2	26	8.9 ± 1.0	NS
P	*Galium boreale*	Northern Bedstraw				S2	6	77.1 ± 7.0	NS
P	*Gratiola neglecta*	Clammy Hedge-Hyssop				S2	6	61.5 ± 0.0	NS
P	*Dirca palustris*	Eastern Leatherwood				S2	75	39.9 ± 0.0	NS
P	*Carex gynocrates*	Northern Bog Sedge				S2	2	54.1 ± 0.0	NS
P	*Carex pellita*	Woolly Sedge				S2	2	76.4 ± 10.0	NS
P	*Carex livida*	Livid Sedge				S2	13	9.1 ± 0.0	NS
P	*Juncus greenei*	Greene's Rush				S2	5	7.9 ± 10.0	NS
P	*Allium tricoccum*	Wild Leek				S2	76	70.9 ± 0.0	NS

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P	*Lilium canadense*	Canada Lily				S2	71	37.4 ± 0.0	NS
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	27	18.1 ± 7.0	NS
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	13	42.9 ± 0.0	NS
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	58	38.3 ± 0.0	NS
P	*Platanthera flava var. flava*	Southern Rein Orchid				S2	12	69.8 ± 7.0	NS
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S2	14	68.5 ± 1.0	NS
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S2	5	51.3 ± 1.0	NS
P	*Bromus latiglumis*	Broad-Glumed Brome				S2	28	75.2 ± 0.0	NS
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S2	60	74.2 ± 0.0	NS
P	*Elymus wiegandii*	Wiegand's Wild Rye				S2	6	9.6 ± 7.0	NS
P	*Festuca subverticillata*	Nodding Fescue				S2	13	57.0 ± 7.0	NS
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	10	61.9 ± 10.0	NS
P	*Cryptogramma stelleri*	Steller's Rockbrake				S2	3	49.9 ± 0.0	NS
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	1	27.6 ± 0.0	NS
P	*Rumex persicarioides*	Peach-leaved Dock				S2?	1	43.4 ± 0.0	NS
P	*Crataegus submollis*	Quebec Hawthorn				S2?	5	32.8 ± 7.0	NS
P	*Carex peckii*	White-Tinged Sedge				S2?	4	45.1 ± 5.0	NS
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S2S3	14	28.2 ± 0.0	NS
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2S3	17	46.0 ± 0.0	NS
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2S3	2	77.4 ± 1.0	NS
P	*Lactuca hirsuta*	Hairy Lettuce				S2S3	4	30.5 ± 7.0	NS
P	*Impatiens pallida*	Pale Jewelweed				S2S3	3	71.4 ± 0.0	NS
P	*Caulophyllum thalictroides*	Blue Cohosh				S2S3	70	35.6 ± 7.0	NS
P	*Draba arabisans*	Rock Whitlow-Grass				S2S3	13	82.9 ± 1.0	NS
P	*Boechera stricta*	Drummond's Rockcress				S2S3	10	82.9 ± 1.0	NS
P	*Stellaria humifusa*	Saltmarsh Starwort				S2S3	4	65.4 ± 0.0	NS
P	*Oxybasis rubra*	Red Goosefoot				S2S3	2	76.9 ± 2.0	NS
P	*Hypericum majus*	Large St John's-wort				S2S3	5	9.4 ± 0.0	NS
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2S3	5	6.0 ± 10.0	NS
P	*Empetrum atropurpureum*	Purple Crowberry				S2S3	5	9.6 ± 7.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S2S3	12	55.3 ± 3.0	NS
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2S3	9	28.0 ± 1.0	NS
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	17	24.1 ± 5.0	NS
P	*Oenothera fruticosa ssp. tetragona*	Narrow-leaved Evening Primrose				S2S3	7	11.9 ± 7.0	NS
P	*Polygala polygama*	Racemed Milkwort				S2S3	1	7.9 ± 1.0	NS
P	*Polygonum aviculare ssp. buxiforme*	Box Knotweed				S2S3	8	42.3 ± 7.0	NS
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				S2S3	5	39.7 ± 1.0	NS
P	*Polygonum oxyspermum*	Sharp-fruit Knotweed				S2S3	1	10.4 ± 0.0	NS
P	*Rumex triangulivalvis*	Triangular-valve Dock				S2S3	10	39.8 ± 0.0	NS
P	*Primula mistassinica*	Mistassini Primrose				S2S3	17	81.7 ± 1.0	NS
P	*Anemone quinquefolia*	Wood Anemone				S2S3	15	9.0 ± 0.0	NS
P	*Caltha palustris*	Yellow Marsh Marigold				S2S3	27	4.1 ± 0.0	NS
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2S3	1	73.9 ± 7.0	NS
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	11	5.8 ± 0.0	NS
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2S3	1	91.6 ± 0.0	NS
P	*Salix pellita*	Satiny Willow				S2S3	3	61.5 ± 2.0	NS
P	*Tiarella cordifolia*	Heart-leaved Foamflower				S2S3	17	48.6 ± 0.0	NS
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S2S3	1	93.8 ± 0.0	NS
P	*Boehmeria cylindrica*	Small-spike False-nettle				S2S3	56	39.7 ± 0.0	NS
P	*Carex adusta*	Lesser Brown Sedge				S2S3	8	2.5 ± 0.0	NS
P	*Carex capillaris*	Hairlike Sedge				S2S3	1	93.5 ± 0.0	NS

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P	*Carex comosa*	Bearded Sedge				S2S3	7	48.5 ± 5.0	NS
P	*Carex houghtoniana*	Houghton's Sedge				S2S3	1	64.9 ± 1.0	NS
P	*Carex hystericina*	Porcupine Sedge				S2S3	7	79.4 ± 0.0	NS
P	*Eleocharis ovata*	Ovate Spikerush				S2S3	4	23.3 ± 0.0	NS
P	*Scirpus pedicellatus*	Stalked Bulrush				S2S3	7	41.5 ± 0.0	NS
P	*Vallisneria americana*	Wild Celery				S2S3	11	40.0 ± 1.0	NS
P	*Najas gracillima*	Thread-Like Naiad				S2S3	2	34.7 ± 0.0	NS
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S2S3	20	41.0 ± 0.0	NS
P	*Spiranthes casei*	Case's Ladies'-Tresses				S2S3	1	99.0 ± 0.0	NS
P	*Spiranthes casei var. novaescotiae*	Case's Ladies'-Tresses				S2S3	3	61.2 ± 0.0	NS
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2S3	13	45.9 ± 0.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S2S3	10	77.6 ± 1.0	NS
P	*Woodsia glabella*	Smooth Cliff Fern				S2S3	1	91.3 ± 1.0	NS
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S2S3	4	63.1 ± 5.0	NS
P	*Botrychium simplex*	Least Moonwort				S2S3	7	44.5 ± 0.0	NS
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	5	5.1 ± 50.0	NS
P	*Potamogeton pulcher*	Spotted Pondweed			Vulnerable	S3	20	70.1 ± 0.0	NS
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	1	77.7 ± 0.0	NS
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S3	2	54.7 ± 0.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S3	2	82.3 ± 1.0	NS
P	*Iva frutescens*	Big-leaved Marsh-elder				S3	59	44.6 ± 0.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S3	29	20.7 ± 1.0	NS
P	*Symphyotrichum boreale*	Boreal Aster				S3	6	27.1 ± 5.0	NS
P	*Symphyotrichum undulatum*	Wavy-leaved Aster				S3	130	8.1 ± 1.0	NS
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S3	20	45.6 ± 0.0	NS
P	*Alnus serrulata*	Smooth Alder				S3	347	77.2 ± 0.0	NS
P	*Betula michauxii*	Michaux's Dwarf Birch				S3	69	22.0 ± 0.0	NS
P	*Betula pumila*	Bog Birch				S3	3	51.5 ± 0.0	NS
P	*Cardamine parviflora*	Small-flowered Bittercress				S3	15	26.2 ± 1.0	NS
P	*Palustricodon aparinoides*	Marsh Bellflower				S3	17	49.3 ± 1.0	NS
P	*Mononeuria groenlandica*	Greenland Stitchwort				S3	235	1.1 ± 0.0	NS
P	*Sagina nodosa*	Knotted Pearlwort				S3	57	17.2 ± 0.0	NS
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S3	10	24.1 ± 0.0	NS
P	*Stellaria longifolia*	Long-leaved Starwort				S3	10	43.4 ± 5.0	NS
P	*Ceratophyllum echinatum*	Prickly Hornwort				S3	7	74.3 ± 0.0	NS
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S3	43	40.7 ± 0.0	NS
P	*Crassula aquatica*	Water Pygmyweed				S3	1	27.3 ± 0.0	NS
P	*Empetrum eamesii*	Pink Crowberry				S3	94	9.6 ± 7.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S3	4	21.3 ± 1.0	NS
P	*Halenia deflexa*	Spurred Gentian				S3	3	23.5 ± 0.0	NS
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	21	44.0 ± 0.0	NS
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	3	49.3 ± 7.0	NS
P	*Utricularia resupinata*	Inverted Bladderwort				S3	2	89.3 ± 0.0	NS
P	*Epilobium strictum*	Downy Willowherb				S3	9	50.1 ± 0.0	NS
P	*Polygala sanguinea*	Blood Milkwort				S3	33	9.3 ± 0.0	NS
P	*Persicaria arifolia*	Halberd-leaved Tearthumb				S3	11	51.3 ± 0.0	NS
P	*Plantago rugelii*	Rugel's Plantain				S3	8	6.9 ± 0.0	NS
P	*Primula laurentiana*	Laurentian Primrose				S3	22	77.4 ± 7.0	NS
P	*Samolus parviflorus*	Seaside Brookweed				S3	50	3.5 ± 1.0	NS
P	*Pyrola minor*	Lesser Pyrola				S3	2	15.2 ± 0.0	NS
P	*Anemone virginiana*	Virginia Anemone				S3	19	43.1 ± 5.0	NS
P	*Cephalanthus occidentalis*	Common Buttonbush				S3	644	8.3 ± 0.0	NS
P	*Galium labradoricum*	Labrador Bedstraw				S3	79	51.1 ± 0.0	NS
P	*Salix pedicellaris*	Bog Willow				S3	130	43.2 ± 0.0	NS
P	*Salix sericea*	Silky Willow				S3	124	29.6 ± 1.0	NS

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P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S3	4	77.1 ± 7.0	NS
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	9	45.2 ± 0.0	NS
P	*Laportea canadensis*	Canada Wood Nettle				S3	48	40.0 ± 0.0	NS
P	*Pilea pumila*	Dwarf Clearweed				S3	9	2.2 ± 0.0	NS
P	*Viola nephrophylla*	Northern Bog Violet				S3	7	58.4 ± 1.0	NS
P	*Carex bebbii*	Bebb's Sedge				S3	24	42.8 ± 0.0	NS
P	*Carex castanea*	Chestnut Sedge				S3	39	51.1 ± 0.0	NS
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3	12	28.2 ± 6.0	NS
P	*Carex eburnea*	Bristle-leaved Sedge				S3	11	64.4 ± 1.0	NS
P	*Carex hirtifolia*	Pubescent Sedge				S3	30	43.0 ± 2.0	NS
P	*Carex lupulina*	Hop Sedge				S3	68	6.9 ± 0.0	NS
P	*Carex rosea*	Rosy Sedge				S3	43	42.2 ± 2.0	NS
P	*Carex swanii*	Swan's Sedge				S3	4	1.5 ± 0.0	NS
P	*Carex tenera*	Tender Sedge				S3	5	45.2 ± 0.0	NS
P	*Carex tribuloides*	Blunt Broom Sedge				S3	13	44.7 ± 0.0	NS
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	32	43.1 ± 2.0	NS
P	*Carex atratiformis*	Scabrous Black Sedge				S3	3	95.4 ± 0.0	NS
P	*Eleocharis nitida*	Quill Spikerush				S3	11	43.5 ± 5.0	NS
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S3	8	12.6 ± 0.0	NS
P	*Eriophorum gracile*	Slender Cottongrass				S3	6	29.4 ± 7.0	NS
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S3	13	65.2 ± 1.0	NS
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S3	578	11.3 ± 0.0	NS
P	*Neottia bifolia*	Southern Twayblade				S3	126	1.7 ± 0.0	NS
P	*Platanthera flava*	Southern Rein-Orchid				S3	34	74.2 ± 0.0	NS
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	77	8.0 ± 0.0	NS
P	*Platanthera hookeri*	Hooker's Orchid				S3	18	44.8 ± 1.0	NS
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S3	8	48.9 ± 7.0	NS
P	*Piptatheropsis canadensis*	Canada Ricegrass				S3	20	26.3 ± 1.0	NS
P	*Poa glauca*	Glaucous Blue Grass				S3	8	45.9 ± 1.0	NS
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3	3	70.1 ± 5.0	NS
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	7	54.5 ± 0.0	NS
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S3	15	43.6 ± 5.0	NS
P	*Asplenium viride*	Green Spleenwort				S3	10	83.9 ± 7.0	NS
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3	12	91.0 ± 0.0	NS
P	*Sceptridium dissectum*	Dissected Moonwort				S3	4	70.3 ± 0.0	NS
P	*Polypodium appalachianum*	Appalachian Polypody				S3	23	8.4 ± 0.0	NS
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S3?	20	41.5 ± 0.0	NS
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S3?	40	10.8 ± 7.0	NS
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3?	1	82.9 ± 0.0	NS
P	*Bidens vulgata*	Tall Beggarticks				S3S4	6	5.1 ± 0.0	NS
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3S4	25	41.6 ± 7.0	NS
P	*Hieracium paniculatum*	Panicled Hawkweed				S3S4	29	39.0 ± 11.0	NS
P	*Bidens beckii*	Water Beggarticks				S3S4	8	43.5 ± 0.0	NS
P	*Packera paupercula*	Balsam Groundsel				S3S4	104	40.5 ± 0.0	NS
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S3S4	13	50.8 ± 0.0	NS
P	*Shepherdia canadensis*	Soapberry				S3S4	113	34.9 ± 7.0	NS
P	*Vaccinium boreale*	Northern Blueberry				S3S4	3	55.8 ± 0.0	NS
P	*Vaccinium cespitosum*	Dwarf Bilberry				S3S4	55	24.3 ± 0.0	NS
P	*Vaccinium corymbosum*	Highbush Blueberry				S3S4	15	2.2 ± 0.0	NS
P	*Fagus grandifolia*	American Beech				S3S4	742	0.7 ± 0.0	NS
P	*Bartonia virginica*	Yellow Bartonia				S3S4	31	23.5 ± 0.0	NS
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3S4	48	2.4 ± 1.0	NS
P	*Decodon verticillatus*	Swamp Loosestrife				S3S4	5	43.8 ± 0.0	NS

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P	*Nuphar microphylla*	Small Yellow Pond-lily				S3S4	1	33.5 ± 0.0	NS
P	*Persicaria pensylvanica*	Pennsylvania Smartweed				S3S4	25	39.3 ± 7.0	NS
P	*Fallopia scandens*	Climbing False Buckwheat				S3S4	18	16.7 ± 0.0	NS
P	*Rumex pallidus*	Seabeach Dock				S3S4	1	44.8 ± 0.0	NS
P	*Pyrola asarifolia*	Pink Pyrola				S3S4	10	43.5 ± 50.0	NS
P	*Endotropis alnifolia*	alder-leaved buckthorn				S3S4	271	38.2 ± 0.0	NS
P	*Amelanchier spicata*	Running Serviceberry				S3S4	47	8.2 ± 0.0	NS
P	*Crataegus succulenta*	Fleshy Hawthorn				S3S4	1	9.0 ± 0.0	NS
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	68	39.0 ± 0.0	NS
P	*Fragaria vesca*	Woodland Strawberry				S3S4	16	1.1 ± 0.0	NS
P	*Galium aparine*	Common Bedstraw				S3S4	48	10.2 ± 0.0	NS
P	*Geocaulon lividum*	Northern Comandra				S3S4	4	55.6 ± 0.0	NS
P	*Limosella australis*	Southern Mudwort				S3S4	10	16.0 ± 3.0	NS
P	*Ulmus americana*	White Elm				S3S4	76	2.2 ± 0.0	NS
P	*Verbena hastata*	Blue Vervain				S3S4	167	8.4 ± 0.0	NS
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S3S4	32	5.6 ± 0.0	NS
P	*Viola selkirkii*	Great-Spurred Violet				S3S4	5	40.2 ± 4.0	NS
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S3S4	10	8.3 ± 0.0	NS
P	*Carex argyrantha*	Silvery-flowered Sedge				S3S4	9	46.1 ± 1.0	NS
P	*Sisyrinchium atlanticum*	Eastern Blue-Eyed-Grass				S3S4	36	58.6 ± 0.0	NS
P	*Triglochin gaspensis*	Gasp ├ Arrowgrass				S3S4	29	23.5 ± 0.0	NS
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	9	9.3 ± 0.0	NS
P	*Juncus subcaudatus*	Woods-Rush				S3S4	24	9.5 ± 0.0	NS
P	*Luzula parviflora ssp. melanocarpa*	Black-fruited Woodrush				S3S4	2	82.7 ± 0.0	NS
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3S4	6	56.7 ± 0.0	NS
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	11	9.3 ± 0.0	NS
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	8	9.6 ± 10.0	NS
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3S4	9	40.2 ± 4.0	NS
P	*Alopecurus aequalis*	Short-awned Foxtail				S3S4	8	45.4 ± 0.0	NS
P	*Dichanthelium clandestinum*	Deer-tongue Panic Grass				S3S4	298	8.2 ± 0.0	NS
P	*Coleataenia longifolia*	Long-leaved Panicgrass				S3S4	433	88.2 ± 0.0	NS
P	*Panicum philadelphicum*	Philadelphia Panicgrass				S3S4	10	45.2 ± 0.0	NS
P	*Koeleria spicata*	Narrow False Oats				S3S4	16	42.3 ± 0.0	NS
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3S4	14	65.9 ± 0.0	NS
P	*Equisetum pratense*	Meadow Horsetail				S3S4	15	43.0 ± 0.0	NS
P	*Diphasiastrum complanatum*	Northern Ground-cedar				S3S4	13	3.6 ± 1.0	NS
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S3S4	2	70.9 ± 1.0	NS
P	*Huperzia appressa*	Mountain Firmoss				S3S4	16	68.8 ± 7.0	NS
P	*Sceptridium multifidum*	Leathery Moonwort				S3S4	10	57.9 ± 10.0	NS
P	*Botrychium matricariifolium*	Daisy-leaved Moonwort				S3S4	5	25.1 ± 0.0	NS
P	*Viola canadensis*	Canada Violet				SH	2	49.2 ± 0.0	NS
P	*Greeneochloa coarctata*	Small Reedgrass				SH	1	5.4 ± 6.0	NS

5.1 SOURCE BIBLIOGRAPHY (100 km)

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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8	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
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5	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
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5	McKendry, Karen. 2016. Rare species observations, 2016. Nova Scotia Nature Trust, 19 recs.
5	Porter, K. 2013. 2013 rare and non-rare vascular plant field data. St. Mary's University, 57 recs.
5	Towell, C. 2014. 2014 Northern Goshawk and Common Nighthawk email reports, NS. NS Department of Natural Resources.
5	White, S. 2019. Notable species sightings, 2018. East Coast Aquatics.
5	Whittam, R.M. 1999. Status Report on the Roseate Tern (update) in Canada. Committee on the Status of Endangered Wildlife in Canada, 36 recs.
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4	Cody, W.J. 2003. Nova Scotia specimens of Equisetum pratense at the DAO herbarium in Ottawa. , Pers. comm. to C.S. Blaney. 4 recs.
4	Forsythe, B. 2006. Cypripedium arietinum at Meadow Pond, Hants Co. Pers. comm. to C.S. Blaney. 4 recs, 4 recs.
4	Hennigar, Briana; Gow, Jonas. 2023. Bank Swallow Nesting Site in Waterville. The Jijuktu'kwejk Watershed Alliance.
4	Klymko, J. Dataset of butterfly records at the New Brunswick Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2016.
4	McMullin, R.T. 2022. Maritimes lichen records. Canadian Museum of Nature.
4	McNeil, J.A. 2017. Eastern Ribbonsnake (Thamnophis sauritus) sightings, 2017. Mersey Tobeatic Research Institute, 36 recs.
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4	Sabine, D.L. Bombus terricola specimens in Dwayne Sabine's personal collection. pers. comm. 2022.
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3	Basquill, S.P. 2009. 2009 field observations. Nova Scotia Dept of Natural Resources.
3	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
3	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
3	Bradford, R. 2004. Coregonus huntsmani locations. Dept of Fisheries & Oceans, Atlantic Region, Pers. comm. to K. Bredin. 4 recs.
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3	Doubt, J. 2013. Email to Sean Blaney with Nova Scotia records of Fissidens exilis at Canadian Museum of Nature. pers. comm., 3 records.
3	Frittaion, C. 2012. NSNT 2012 Field Observations. Nova Scotia Nature Trust, Pers comm. to S. Blaney Feb. 7, 34 recs.
3	Herman, T.B. & Power, T.D., Eaton, B. 1995. Population status of Blanding's Turtle (Emydoidea blandingii) in Nova Scotia. Can. Field-Nat., 109: 182-191. 79 recs.
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3	Hughes, Cory. 2020. Atlantic Forestry Centre Coccinella transversoguttata collections. Canadian Forest Service, Atlantic Forestry Centre.
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3	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
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2	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
2	Basquill, S.P. 2011. Field observations & specimen collections, 2010. Nova Scotia Department of Natural Resources, Pers. comm. , 8 Recs.
2	Blaney, C.S. 1999. Fieldwork 1999. Atlantic Canada Conservation Data Centre. Sackville NB, 292 recs.
2	Blaney, C.S. 2019. Sean Blaney 2019 field data. Atlantic Canada Conservation Data Centre, 4407 records.
2	Cameron, B. 2005. C. palmicola, E. pedicellatum records from Sixth Lake. Pers. comm. to C.S. Blaney. 3 recs, 3 recs.
2	Cameron, R.P. 2012. Rob Cameron 2012 vascular plant data. NS Department of Environment, 30 recs.
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2	Hill, N.M. 2019. Observation of Crocanthemum canadense near Auburn, Annapolis Co. NS on May 29, 2019. Fern Hill Institute, 2 recs.
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2	Kennedy, B. & Cron, C.; Patriquin, D. 2018. Email to Sean Blaney on observations of Trichostema dichotomum at Shingle Lake, Nova Scotia. , 2 records.
2	Klymko, J. 2019. Atlantic Canada Conservation Data Centre zoological fieldwork 2018. Atlantic Canada Conservation Data Centre.
2	Klymko, J.J.D. 2011. Insect fieldwork & submissions, 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 742 recs.
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2	Neily, T.H.; Smith, C.; Whitman, E. 2011. NCC Logging Lake (Halifax Co. NS) properties baseline survey data. Nature Conservancy of Canada, 2 recs.
2	Newell, R. E., MacKinnon, C. M. & Kennedy, A. C. 2006. Botanical Survey of Boot Island National Wildlife Area, Nova Scotia, 2004. Canadian Wildlife Service, Atlantic Region, Technical Report Series Number 450. 3 recs.
2	Newell, R.E. 2006. Rare plant observations in Digby Neck. Pers. comm. to S. Blaney, 6 recs.
2	O'Neil, S. 1998. Atlantic Salmon: Eastern Shore Nova Scotia SFA 20. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-10. 4 recs.
2	Phinney, L. 2019. Little Brown Myotis maternal colony counts and birdSAR, 2019. Mersey Tobeatic Research Institute.

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2	Standley, L.A. 2002. Carex haydenii in Nova Scotia. , Pers. comm. to C.S. Blaney. 4 recs.
2	White, S. 2018. Notable species sightings, 2016-2017. East Coast Aquatics.
1	Amirault, D.L. 2003. 2003 Peregrine Falcon Survey. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
1	Amirault, D.L. 2005. 2005 Peregrine Falcon Survey. Canadian Wildlife Service, Sackville, unpublished data. 27 recs.
1	Amiro, Peter G. 1998. Atlantic Salmon: Southern Nova Scotia SFA 21. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-11. 1 rec.
1	Anderson, Frances. 2022. Heterodermia squamulosa record near Lunenburg, NS. pers. comm.
1	Anon. Dataset of butterfly records for the Maritime provinces. Museum of Comparative Zoology, Harvard University. 2017.
1	Austin-Smith, P. 2014. 2014 Common Nighthawk personal communication report, NS. NS Department of Natural Resources.
1	Basquill, S. P. 2008. Nova Scotia Dept of Natural Resources.
1	Basquill, S.P. 2004. C. americana and Sedum sp records, 2002. Pers. comm. to C.S. Blaney. 2 recs, 2 recs.
1	Basquill, S.P. 2012. 2012 Bryophyte specimen data. Nova Scotia Department of Natural Resources, 37 recs.
1	Basquill, S.P.; Quigley, E. 2006. New Minuartia groenlandica record for NS. Pers. comm. to C.S. Blaney, Oct 6, 1 rec.
1	Basset, I.J. & Crompton, C.W. 1978. The Genus Suaeda (Chenopodiaceae) in Canada. Canadian Journal of Botany, 56: 581-591.
1	Belliveau, A.G. E.C. Smith Herbarium Specimen Database 2019. E.C. Smith Herbarium, Acadia University. 2019.
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1	Benjamin, L.K. 2003. Cypripedium arietinum in Cogmagun River NS. Pers. comm. to S. Blaney, 1 rec.
1	Berg, L. 2020. Canada Warbler observations, Birch Lake, NS. pers. comm. to J. Churchill.
1	Blaney, C.S. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
1	Brach, A.R. 2019. Correspondence to Sean Blaney regarding Calamagrostis cinnoides specimen from Halifax NS. pers. comm., Harvard University Herbaria, 1 record.
1	Breen, A. 2017. 2017 Atlantic Whitefish observation. Coastal Action.
1	Brooks, Fiona. Erioderma mollissimum records in Lunenburg County, NS. Pers. comm., 2 records.
1	Bruce, J. 2014. 2014 Wood Turtle email report, Nine Mile River, NS. NS Department of Natural Resources.
1	Clayden, S.R. 2006. Pseudevernia cladonia records. NB Museum. Pers. comm. to S. Blaney, Dec, 4 recs.
1	Clayden, S.R. 2020. Email to Sean Blaney regarding Pilophorus cereus and P. fibula at Fidele Lake area, Charlotte County, NB. pers. comm., 2 records.
1	COSEWIC (Committee on the Status of Wildlife in Canada). 2013. COSEWIC Assessment and Status Report on the Eastern Waterfan Peltigera hydrothyria in Canada. COSEWIC, 46 pp.
1	Creaser, Alissa & Belliveau, Alain Bombus specimens collected in Wolfville, Nova Scotia, in July 2022. E.C. Smith Herbarium. 2022.
1	Crowell, A. 2004. Cypripedium arietinum in Weir Brook, Hants Co. Pers. comm. to S. Blaney, 1 rec.
1	Crowell, M. 2013. email to Sean Blaney regarding Listera australis at Bear Head and Mill Cove Canadian Forces Station. Jacques Whitford Environmental Ltd., 2.
1	deGooyer, K. 2019. Snapping Turtle and Eastern White Cedar observations. Nova Scotia Environment.
1	Docherty, Joanne. 2022. Phone call to John Klymko about Danaus plexippus observation in Nova Scotia. Personal communication.
1	Eastman, A. 2019. Snapping Turtle observation at Brookfield, Colchester Co. NS. Halifax Field Naturalists Nova Scotia Nature Archive Facebook Page, 1 record.
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1	Golder Associates Ltd. 2021. Black Ash location from Goff's Quarry Expansion Environment Assessment, 2017. Golder Associates Ltd., 1 record.
1	Hill, N.; Manning, I. 2020. Wild Leek observation, Cornwallis River, NS, floodplain. pers. comm. to J. Churchill.
1	Jacques Whitford Ltd. 2003. Cananda Lily location. Pers. Comm. to S. Blaney. 2pp, 1 rec, 1 rec.
1	Klymko, J.J.D. 2010. Miscellaneous observations reported to ACCDC (zoology). Pers. comm. from various persons, 3 recs.
1	Klymko, J.J.D. 2012. Insect field work & submissions. Atlantic Canada Conservation Data Centre, 852 recs.
1	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
1	Lautenschlager, R.A. 2010. Miscellaneous observations reported to ACCDC (zoology). Pers. comm. from various persons, 2 recs.
1	MacKinnon, D.; Wright, P.; Smith, D. 2014. 2014 Common Tern email report, Eastern Passage, NS. NS Department of Environment.
1	MacKinnon, D.S. 1998. Ponhook Lake survey map & notes. Dept of Environment and Labour, Protected Areas Branch, 13 recs.
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1	Majka, C.G. & McCorquodale, D.B. 2006. The Coccinellidae (Coleoptera) of the Maritime Provinces of Canada: new records, biogeographic notes, and conservation concerns. Zootaxa. Zootaxa, 1154: 49–68. 7 recs.
1	McNeil, J.A. 2013. Ribbonsnake (Thamnophis sauritus) sightings, 2012 . Parks Canada, 63 records of 26+ individuals.
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1	Neily, T.H. 2012. 2012 Erioderma pedicellatum records in Nova Scotia.
1	Newell, R.E. 2004. Hepatica nobilis var. obtusa record. Pers. comm. to S. Blaney, 1 rec.
1	Newell, R.E. 2019. Crocanthemum canadense records compiled for provincial status report. pers. comm. from Ruth Newell to AC CDC.
1	Niel, K. & Majka, C. 2008. New Records of Tiger Beetles (Coleoptera: Carabidae: Cicindelinae) in Nova Scotia. Journal of the Acadian Entomological Society, 4: 3-6.
1	Payzant, P. 2018. Satyr Comma record from Bible Hill, NS. https://novascotiabutterflies.ca.
1	Riley, J. 2019. Digby County lichen observations. Pers. comm. to J.L. Churchill, 50 recs.
1	Scott, F.W. 1988. Status Report on the Southern Flying Squirrel (Glaucomys volans) in Canada. Committee on the Status of Endangered Wildlife in Canada, 2 recs.
1	Skevington, Jeffrey H. 2020. Syrphid records used for the Field Guide to the Flower Flies of Northeastern North America. Canadian National Collection of Insects.
1	Sollows, M.C,. 2009. NBM Science Collections databases: Coccinellid & Cerambycid Beetles. New Brunswick Museum, Saint John NB, download Feb. 2009, 569 recs.
1	Sollows, M.C. 2008. NBM Science Collections databases: herpetiles. New Brunswick Museum, Saint John NB, download Jan. 2008, 8636 recs.

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1	Sollows, M.C. 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
1	Stewart, P. 2013. email to Sean Blaney regarding the discovery of a Listera australis population at Blockhouse. Envirosphere Consultants Limited, 1.
1	Toms, Brad. 2011. Species at Risk data from 2011 field surveys. Mersey Tobeatic Research Institute, 17 recs.
1	Toms, Brad. 2022. Non-Lichen Observations from Lichen SMP and NCC Property Searches. Mersey Tobeatic Research Institute.
1	WIlliams, M. Cape Breton University Digital Herbarium. Cape Breton University Digital Herbarium. 2013.

APPENDIX B

Vegetation Data

Table B.1 - Observed Vegetation in the HSA

Species Name	Common Name	S Rank
Alnus alnobetula	Green Alder	S5
Abies balsamea	Balsam Fir	S5
Acer pensylvanicum	Striped Maple	S5
Acer rubrum	Red Maple	S5
Acer saccharum	Sugar Maple	S4S5
Acer spicatum	Mountain Maple	S5
Alnus incana	Speckled Alder	S5
Amauropelta noveboracensis	New York Fern	S5
Amelanchier sp.	Serviceberry	N/A
Aralia nudicaulis	Wild Sarsaparilla	S5
Aronia arbutifolia	Red Chokeberry	S4
Aronia melanocarpa	Black Chokeberry	S5
Bazzania trilobata	Bazzania	S5
Betula alleghaniensis	Yellow Birch	S5
Betula cordifolia	Heart-leaved Birch	S5
Betula papyrifera	White Birch	S5
Brachyelytrum aristosum	Northern Shorthusk	S5
Carex arctata	Black sedge	S5
Carex sp.	A Sedge	N/A
Carex trisperma	Three-seeded Sedge	S5
Centaurea nigra	Black Knapweed	SNA
Chamaedaphne calyculata	Leatherleaf	S5
Cladonia sp.	Reindeer Lichen	N/A
Claytosmunda claytoniana	Interrupted Fern	S5
Clintonia borealis	Yellow Bluebead Lily	S5
Coptis trifolia	Goldthread	S5
Corema conradii	Broom Crowberry	S4
Cornus canadensis	Bunchberry	S5
Cypripedium acaule	Pink Lady's-Slipper	S5
Danthonia spicata	Poverty Oat Grass	S5
Dendrolycopodium hickeyi	Hickey's Tree-clubmoss	S4
Dennstaedtia punctilobula	Eastern Hay-Scented Fern	S5
Dichanthelium acuminatum	Woolly Panic Grass	SNA
Dichanthelium sp.	*Dichanthelium*	N/A
Dicranium sp.	*Dicranium*	N/A
Diervilla lonicera	Northern Bush Honeysuckle	S5
Dryopteris carthusiana	Spinulose Wood Fern	S5
Dryopteris intermedia	Evergreen Wood Fern	S5
Dryopteris marginalis	Marginal Wood Fern	S5
Empetrum nigrum	Black Crowberry	S5
Epigaea repens	Trailing Arbutus	S5
Fagus grandifolia	American beech	S3S4
Fallopia cilinodis	Fringed Black Bindweed	S5
Festuca filiformis	Hair Fescue	SNA
Fraxinus americana	White ash	S4
Gaultheria hispidula	Creeping Snowberry	S5
Gaultheria procumbens	Eastern Teaberry	S5
Gaylussacia baccata	Black Huckleberry	S5
Glyceria canadensis	Canada Manna Grass	S5
Glyceria grandis	Common Tall Manna Grass	S5
Hamamelis virginiana	American Witch-hazel	S5
Hieracium sp.	Hawkweed	N/A
Hylocomium splendens	Stairstep moss	S5
Hypnum imponens	Feather moss	S5
Ilex mucronata	Mountain holly	S5
Ilex verticillata	Common Winterberry	S5
Iris versicolor	Harlequin Blue Flag	S5
Jacobaea vulgaris	Tansy Ragwort	SNA
Juncus tenuis	Slender Rush	S5
Kalmia angustfolia	Sheep Laurel	S5
Larix laricina	Tamarack or Eastern larch	S5
Lysimachia borealis	Northern Starflower	S5
Maianthemum canadense	Wild Lily-of-the-valley	S5
Medeola virginiana	Cucumber Root	S5
Mitchella repens	Partridgeberry	S5
Monotropa uniflora	Convulsion-Root	S5
Morella pensylvanica	Northern bayberry	S5
Moss sp.	a Moss	N/A
Oclemena acuminata	Whorled Wood Aster	S5
Oclemena x blakei	a hybrid White Panicled American-Aster	S5

Table B.1 - Observed Vegetation in the HSA

Species Name	Common Name	S Rank
Osmunda regalis	Royal fern	S5
Osmundastrum cinnamomeum	Cinnamon fern	S5
Picea glauca	White Spruce	S5
Picea mariana	Black Spruce	S5
Picea mariana x rubens	Hybrid Black and Red spruce	N/A
Picea rubens	Red spruce	S5
Pilosella sp.	a Hawkweed	N/A
Pinus resinosa	Red Pine	S4S5
Pinus strobus	Eastern White Pine	S5
Pleurozium schreberi	Scherber's Moss	S5
Polypodium virginianum	Rock Polypody	S5
Polytrichum sp.	a Moss	N/A
Populus grandidentata	Large-toothed Aspen	S5
Prunus pensylvanica	Pin Cherry	S5
Pteridium aquilinum	Bracken fern	S5
Quercus rubra	Northern Red Oak	S5
Rhododendron canadense	Rhodora	S5
Rhododendron groenlandicum	Common Labrador Tea	S5
Rubus hispidus	Bristly Dewberry	S5
Sarracenia purpurea	Northern Pitcher Plant	S5
Sibbaldia tridentata	Three-toothed Cinquefoil	S5
Solidago bicolor	White Goldenrod	S5
Solidago canadensis	Canada Goldenrod	S4S5
Solidago puberula	Downy Goldenrod	S5
Solidago rugosa	Rough-stemmed Goldenrod	S5
Sorbus americana	American Mountain Ash	S5
Sphagnum sp.	Sphagnum Moss	N/A
Symphyotrichum lateriflorum	Calico aster	S5
Symphyotrichum novi-belgii	New York Aster	S5
Taraxacum officinale	Common Dandelion	SNA
Toxicodendron radicans	Poison Ivy	S5
Tsuga canadensis	Eastern Hemlock	S4
Tussilago farfara	Coltsfoot	SNA
Vaccinium angustifolium	Late Lowbush Blueberry	S5
Vaccinium myrtilloides	Velvet-leaved Blueberry	S5
Veronica officinalis	Common speedwell	SNA
Viburnum cassinoides	Northern Wild Raisin	S5
Viburnum lantanoides	Hobblebush	S4

Table B.2 - Stand Data for the HSA

Site ID	Field Description	Drainage Type	Estimated Stand Age	Forest Group (FG)	VT(2022)	Forest Maturity	Maturity Score	Forest Succession	Succession Score
HWY1	immature hardwood forest	well drained	15	IH	IH6	Immature	3	Early	3
HWY1a	mature mixedwood forest	well drained	70	MW	MW2	Mature	2	Mid	2
HWY2	mature mixedwood forest	well drained	80	MW	MW2	Potenital Old Growth	1	Mid	2
HWY3	mature mixedwood forest	well drained	50	MW	MW2	Mature	2	Mid	2
HWY4	barrens	well drained	30	Barrens	OW2	Mature	2	Edaphic	2
HWY4a	rock barrens	xeric	unknown	Barrens	S1	N/A	2*	N/A	N/A
HWY5	Immature hardwood forest	well drained	30	IH	IH2	Mature	2	Edaphic	2
HWY6	mixedwood treed basin swamp	hygric	20	WM	WM3	Immature	3	Edaphic, Mid	2
HWY7	low shrub swamp	hydric	unknown	wetland	LSS	N/A	N/A	N/A	N/A
HWY8	immature hardwood forest	well drained	30	IH	IH1a	Mature	2	Early	3
HWY9	coniferous treed swamp	hygmic	30	WM	WM3	Mature	2	Edaphic, Mid	2
HWY10	immature hardwood forest	well drained	30	IH	IH2a	Mature	2	Edaphic	2
HWY11	immature mixedwood forest	mesic	30	MW	MW9	Mature	2	Early	3
HWY12	coniferous treed swamp	hygric	70	WC	WC2a	Mature	2	Edaphic	2
HWY13	deciduous treed stream swamp	hygric	40	WD	WD2	Mature	2	Edaphic, Early	2
HWY14	mature hardwood forest	mesic	70	IH	IH2a	Mature	2	Edaphic	2
HWY15	mature mixedwood forest	mesic	70	IH	IH2a	Mature	2	Edaphic	2
HWY16	mature coniferous forest	mesic	80	SH	SH5	Potenital Old Growth	1	Mid	2
HWY17	mature mixedwood forest	mesic	60	MW	MW2	Mature	2	Mid	2
HWY18	Old field. disturbed	well	<10	OF	OF5	Immature	3	Early	3
HWY19	mature tolerant hardwood on a steep slope	rapid	50	TH	TH7	Mature	2	Mid	2
HWY20	mid successional, mixed species composition on steep rocky slope	well to rapid	40	IH	IH7	Mature	2	Early to Mid	3
HWY21	narrow (~10m width) forested stand between HWY 104 and steep banks of gravel mining operation	rapid	30	IH	IH2	Mature	2	Edaphic	2
HWY22	narrow (~30-40m width) forested stand between HWY 104 and mine site.	well	40	MW	MW12	Mature	2	Early to Mid	3
HWY23	heavily disturbed forest	well	variable/ dis	TH	TH8	Immature	3	Mid to Late	1
HWY24	relatively dry intolerant hardwood	rapid	25	IH	IH1	Immature	3	Early	3
HWY25	Black Huckleberry Heath (Porter et al 2020)	rapid		Barrens	S1	N/A	2*	N/A	N/A
HWY26	mid-successional mixedwood with a RM canopy(~40) and WP supercanopy (~100+)	well	40	MW	MW12	Mature	2	Early to Mid	3
HWY27	open canopy early-successional mixedwood with ericaceous understory	well	25	MW	MW2	Immature	3	Mid	2
HWY28	early successional mixedwood with a supercanopy of white pine	rapid	35	IH	IH2a	Mature	2	Edaphic	2
HWY29	early successional intolerant hardwood	well	30	IH	IH2a	Mature	2	Edaphic	2
HWY30	early successional SP	well	35	SP	SP4	Mature	2	Edaphic	2
HWY31	early succesional IH	well	35	IH	IH6	Mature	2	Early	3
HWY32	oak dominated stand	well	40	IH	IH2	Mature	2	Edaphic	2
HWY33	mature oak stand on a rocky slope adjacent to a lake	well	65	IH	IH2	Mature	2	Edaphic	2
HWY34	early successional oak on dry, stony soil	well to rapid	15	IH	IH2	Immature	3	Edaphic	2
HWY35	early successional oak on a slight depression	well	15	IH	IH2a	Immature	3	Edaphic	2
HWY36	early successional oak with scattered conifers	well to rapid	25	IH	IH2	Immature	3	Edaphic	2
HWY37	mature mixedwood	mesic	60	MW	MW2	Mature	2	Mid	2
HWY38	mature mixedwood	mesic	75	MW	MW11	Mature	2	Late	1
HWY39	early-successional intolerant hardwood	mesic	17	IH	IH6b	Immature	3	Early	3
HWY40	late successional, probable old growth	mesic	130	TH	TH6	Potenital Old Growth	1	Mid to Late	1
HWY41	early to mid successional intolerant hardwood	well to rapid	17	IH	IH2a	Immature	3	Early	3
HWY42	early-successional intolerant hardwood	well	17	IH	IH6a	Immature	3	Early	3

Table B.3 - Vegetation Percent Cover Matrix for the HSA

	Forest Group (FG)	Intolerant Hardwood (IH)																				
	Vegetation Type (VT)	IH1	IH1a	IH2	IH2	IH2	IH2	IH2	IH2	IH2a	IH2a	IH2a	IH2a	IH2a	IH2a	IH6	IH6	IH6a	IH6b	IH7		
Vegetation Type	Species Name	HWY24	HWY8	HWY5	HWY21	HWY32	HWY33	HWY34	HWY36	HWY10	HWY14	HWY15	HWY28	HWY29	HWY35	HWY41	HWY1	HWY31	HWY42	HWY39	HWY20	
Tree	*Abies balsamea*	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	
	Acer pensylvanicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,5	0	0	0	5	
	Acer rubrum	0	15	8	2	2	10	3	15	10	15	15	25	25	35	10	30	30	15	0	0	
	Acer saccharum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Betula alleghaniensis	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	25	
	Betula cordifolia	20	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	10	5	0	
	Betula papyrifera	0	2	5	0	0	5	0	0	5	10	10	0	2	0	0	30	0	0	50	5	
	Fraxinus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Hamamelis virginiana	0	0	0	0	0	0	0	2	0	0	0	0	0	5	0	0	5	0	0	0	
	Larix laricina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Picea mariana	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Picea mariana x rubens	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	0	0	
	Picea rubens	0	3	0	0	0	5	0	7	0	10	20	0	5	0	10	0	2	7	2	5	
	Pinus strobus	15	0	0	0	1	5	0	0	0	0	5	5	5	0	0	0	15	0	0	15	
	Populus grandidentata	30	25	0	0	0	0	0	2	20	2	0	0	0	5	20	0	0	15	5	0	
	Quercus rubra	5	30	65	65	55	35	40	35	40	35	35	10	20	30	25	5	0	7	10	5	
Shrub	*Abies balsamea*	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	
	Acer pensylvanicum	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Acer rubrum	5	0	1	2	0	0	10	0	1	0	5	0	0	0	5	0	0	5	0	0	
	Alnus incana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
	Alnus alnobetula	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Amelanchier sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0,5	1	0	
	Betula alleghaniensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	
	Betula papyrifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5	0	
	Chamaedaphne calyculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Fagus grandifolia	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	5	
	Gaylussacia baccata	50	60	5	0	25	0	0	5	10	35	10	25	0	5	90	12	10	35	0	0	
	Hamamelis virginiana	0	2	25	0	10	0	7	7	0	10	15	5	10	5	0	2	5	0	15	0	
	Ilex mucronata	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	0	0	0	
	Ilex verticillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Kalmia angustfolia	1	30	80	0	30	0	15	40	70	10	0	3	5	25	15	10	1	25	40	0	
	Morella pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Picea mariana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Picea mariana x rubens	0	10	0	0	0	0	0	0	4	0	0	0	0	0	0	10	0	0	0	0	
	Picea rubens	0	0	0	2	5	10	0	0	0	5	10	15	20	10	0	0	15	5	5	15	
	Pinus strobus	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	
	Quercus rubra	0	0	0	0	10	0	5	5	4	10	0	0	0	0	5	2	0	0	3	5	
	Rhododendron canadense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Rhododendron groenlandicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	
	Sorbus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Tsuga canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	
	Vaccinium angusifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	
	Vaccinium myrtilloides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	
	Viburnum cassinoides	0	3	5	0	0,5	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0

Table B.3 - Vegetation Percent Cover Matrix for the HSA

	Forest Group (FG)	Intolerant Hardwood (IH)																				
	Vegetation Type (VT)	IH1	IH1a	IH2	IH2	IH2	IH2	IH2	IH2	IH2a	IH2a	IH2a	IH2a	IH2a	IH2a	IH6	IH6	IH6a	IH6b	IH7		
Vegetation Type	Species Name	HWY24	HWY8	HWY5	HWY21	HWY32	HWY33	HWY34	HWY36	HWY10	HWY14	HWY15	HWY28	HWY29	HWY35	HWY41	HWY1	HWY31	HWY42	HWY39	HWY20	
Ground Vegetation	*Acer rubrum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Aralia nudicaulis	5	1	0	0.5	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
	Bazzania trilobata	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	5	0	0	0	0	
	Carex arctata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Carex sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Centaurea nigra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Cladonia sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Claytosmunda claytoniana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Coptis trifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Cornus canadensis	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	
	Danthonia spicata	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	
	Dichanthelium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Dicranium sp.	0	1	5	0	0	0	0	0	2	10	5	0	0	0	0	0	0	0	0	0	
	Dryopteris carthusiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	
	Dryopteris marginalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Dryopteris intermedia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	
	Epigaea repens	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	
	Festuca filiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	
	Gaultheria hispidula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Gaultheria procumbens	5	0	5	10	25	0.5	40	25	5	2	0	0	10	15	0	0	0	15	0	0	
	Glyceria canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Iris versicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Hylocomium splendens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Hypnum imponens	0	2	2	0	0	0	0	0	3	5	30	0	0	0	0	10	0	0	0	0	
	Jacobea vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Kalmia angustfolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Lysimachia borealis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
	Maianthemum canadense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Mitchella repens	0	0	0	0	0	0	0	1	0	0	3	0	0.5	0	0	0	0	0	0	0	
	Moss sp.	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Oclemena acuminata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Oclemena x blakei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Osmundastrum cinnamomeum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Osmunda regalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Pilosella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Pleurozium schreberi	0	2	0	0	0	0	0	0	1	0	10	0	0	0	0	25	0	0	0	0	
	Polytrichum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Pteridium aquilinum	7	1	10	0	10	0	7	0	5	10	10	25	10	1	15	15	5	20	0	0	
	Sarracenia purpurea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Solidago bicolor	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Solidago canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Solidago puberula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	
	Solidago rugosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Sphagnum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Symphyotrichum lateriflorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Symphyotrichum novi-belgii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Tussilago farfara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Vaccinium angusifolium	15	15	0	5	0	0	0	0	0	0	0	15	0	5	10	0	1	10	0	0	
	Vaccinium myrtilloides	5	0	0	2	10	0	0	0	2	0	5	15	15	0	0	0	0	0	0	0	
	Viburnum cassinoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Veronica officinalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table B.3 - Vegetation Percent Cover Matrix for the HSA

	Forest Group (FG)	Mixedwood Forest (MW)										Old Field Fo	Open Wooc	Shrubland Association		Spruce Hen	Spruce Pine	Tolerant Hardwood Forest (TH)			Wet Conifer	Wet Deciduc	Mixedwood Forest (W	Wetland	
	Vegetation Type (VT)	MW11	MW12	MW12	MW2	MW2	MW2	MW2	MW2	MW2	MW9	OF5	OW2	S1	S1	SH5	SP4	TH6	TH7	TH8	WC2a	WD2	WM3	WM3	LSS
Vegetation Type	Species Name	HWY38	HWY22	HWY26	HWY1a	HWY2	HWY3	HWY17	HWY27	HWY37	HWY11	HWY18	HWY4	HWY4a	HWY25	HWY16	HWY30	HWY40	HWY19	HWY23	HWY12	HWY13	HWY6	HWY9	HWY7
Tree	*Abies balsamea*	0	0	0	0	2	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Acer pensylvanicum	5	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	15	35	0	0	0	0	0
	Acer rubrum	25	15	35	25	40	30	15	10	35	10	0	0	0	0	15	5	20	30	20	2	50	30	10	0
	Acer saccharum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
	Betula alleghaniensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	35	10	0	0	0	0	0
	Betula cordifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Betula papyrifera	10	0	15	1	0	5	0	0	25	8	20	0.5	0	0	0	0	0	0	0	0	0	0	0	0
	Fraxinus americana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
	Hamamelis virginiana	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
	Larix laricina	0	0	0	0	0	0	0	0	0	15	0	0.5	0	0	0	5	0	0	0	10	0	25	0	0
	Picea mariana	0	0	0	0	0	0	0	0	0	0	0	20	1	0	0	0	0	0	0	20	0	10	20	3
	Picea mariana x rubens	0	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	10	5	2	20	30	35	15	5	15	0	0	0	0	0	65	15	20	0	0	0	5	0	0	0
	Pinus strobus	15	45	25	20	5	10	5	0	15	0	0	0.5	0	0	0	35	5	0	0	0	0	0	0	1
	Populus grandidentata	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quercus rubra	30	0	0	15	0	15	40	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0
Shrub	*Abies balsamea*	0	5	0	8	5	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	0	0	0	0
	Acer pensylvanicum	5	0	0	15	2	2	15	0	7	0	0	0	0	0	5	0	7	0	5	0	0	0	0	0
	Acer rubrum	0	0	10	0	1	0	0	1	10	0	0	0	0	10	0	0	0	0	0	5	0	0	0	0
	Alnus incana	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0
	Alnus alnobetula	0	0	0	0	0	0	0	0	0	0	25	1	0	0	0	0	0	0	0	0	0	0	1	0
	Amelanchier sp.	0	0	0.5	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Betula alleghaniensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	3	10	0	0	0	0	0	0
	Betula papyrifera	0	0	0	0	0	0	1	0	0	0	10	1	0	0	0	0	0	0	0	0	0	0	0	0
	Chamaedaphne calyculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
	Fagus grandifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
	Gaylussacia baccata	15	0	15	5	2	5	2	25	2	35	0	60	30	50	0	5	0	0	0	30	2	2	15	30
	Hamamelis virginiana	15	0	0	8	0	5	10	0	1	0.5	0	0	0	0	2	10	7	0	0	0	0	0	0	0
	Ilex mucronata	0	0	0	0	0	1	0	0	0	1	0	15	0	0	0	0	0	0	0	35	15	15	30	35
	Ilex verticillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	1	0	0
	Kalmia angustfolia	0	0	0	5	0	20	5	15	0	25	0	50	10	0	0	0	0	0	0	1	1	8	15	10
	Morella pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	10
	Picea mariana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	10	5	0
	Picea mariana x rubens	0	0	0	10	40	10	10	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Picea rubens	5	5	10	0	0	0	0	5	0	0	0	0	0	0	0	15	10	1	0	0	0	0	0	0
	Pinus strobus	0	0	1	0	0	0	0	0	0	0	0	0	0	5	0	0	5	1	0	0	0	0	0	0
	Quercus rubra	3	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rhododendron canadense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
	Rhododendron groenlandicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	Sorbus americana	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tsuga canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vaccinium angusifolium	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
	Vaccinium myrtilloides	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Viburnum cassinoides	0	0	0	0	0	1	0	0	0	2	0	2	0	0	0	0	0	0	0	1	0	0	0	0

Table B.3 - Vegetation Percent Cover Matrix for the HSA

	Forest Group (FG)	Mixedwood Forest (MW)										Old Field Fo	Open Wood	Shrubland Association		Spruce Hen	Spruce Pine	Tolerant Hardwood Forest (TH)			Wet Conifer	Wet Deciduo	Mixedwood Forest (W	Wetland	
	Vegetation Type (VT)	MW11	MW12	MW12	MW2	MW2	MW2	MW2	MW2	MW2	MW9	OF5	OW2	S1	S1	SH5	SP4	TH6	TH7	TH8	WC2a	WD2	WM3	WM3	LSS
Vegetation Type	Species Name	HWY38	HWY22	HWY26	HWY1a	HWY2	HWY3	HWY17	HWY27	HWY37	HWY11	HWY18	HWY4	HWY4a	HWY25	HWY16	HWY30	HWY40	HWY19	HWY23	HWY12	HWY13	HWY6	HWY9	HWY7
Ground Vegetation	*Acer rubrum*	0.5	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Aralia nudicaulis	1	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0.5	0
	Bazzania trilobata	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0
	Carex arctata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	Carex sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	Centaurea nigra	0	0	0	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cladonia sp.	0	0	0	0	0	0	0	0	0	1	0	0	40	0	0	0	0	0	0	0	0	0	0	0
	Claytosmunda claytoniana	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coptis trifolia	0	0	0	5	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cornus canadensis	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2
	Danthonia spicata	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Dichanthelium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
	Dicranium sp.	0	0	0	0	0	1	2	0	0	2	0	2	0	0	1	0	0	0	0	0	0	0	0	0
	Dryopteris carthusiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
	Dryopteris marginalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
	Dryopteris intermedia	0	0	0	0	0	0	0	0	40	0	0	0	0	0	0	0	0	30	2	0	0	0	0	0
	Epigaea repens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Festuca filiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gaultheria hispidula	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gaultheria procumbens	2	0	0	0	0	0	5	0	0	0	0	5	1	10	0	0	0.5	0	0	0	0	0	0	0
	Glyceria canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0
	Iris versicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0
	Hylocomium splendens	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hypnum imponens	0	0	0	10	0	10	15	0	0	1	0	0	0	0	10	0	0	0	0	0	0	2	0	0
	Jacobea vulgaris	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0
	Kalmia angustfolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0
	Lysimachia borealis	1	0	0	1	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Maianthemum canadense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0
	Mitchella repens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.5	0	0	0	0	0	0	0
	Moss sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oclemena acuminata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	5	0	0	0
	Oclemena x blakei	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
	Osmundastrum cinnamomeum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70	0	5	50	0
	Osmunda regalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0
	Pilosella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
	Pleurozium schreberi	0	0	0	15	5	5	1	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Polytrichum sp.	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
	Pteridium aquilinum	5	0	5	5	3	5	8	35	0	3	0	15	0	2	0	3	0	0	0	0	0	0	0	0
	Sarracenia purpurea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	10	0.5
	Solidago bicolor	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solidago canadensis	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solidago puberula	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
	Solidago rugosa	0	0	0	0	0	0	0	0	0	0	45	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sphagnum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	80	90	80	70
	Symphyotrichum lateriflorum	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	Symphyotrichum novi-belgii	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tussilago farfara	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	Vaccinium angusifolium	10	0	20	0	0	0	0	15	5	0	0	5	0	0.5	0	0.5	0	0	0	0	0	0	0	5
	Vaccinium myrtilloides	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Viburnum cassinoides	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0
	Veronica officinalis	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX C

Wildlife Observations

Table C.1 Incidental Wildlife Observations Recorded During Field Programs

Scientific Name	Common Name	SARA[1]	COSEWIC[2]	NS ESA[3]	AC CDC[4]
Birds					
Catharus guttatus	Hermit Thrush	-	-	-	S5B
Catharus ustulatus	Swainson's Thrush	-	-	-	S4B,S5M
Certhia americana	Brown Creeper	-	-	-	S5
Corvus brachyrhynchos	American Crow	-	-	-	S5
Cyanocitta cristata	Blue Jay	-	-	-	S5
Dryobates pubescens	Downy Woodpecker	-	-	-	S5
Dryobates villosus	Hairy Woodpecker	-	-	-	S5
Empidonax alnorum	Alder Flycatcher	-	-	-	S5B
Geothlypis trichas	Common Yellowthroat	-	-	-	S5B
Junco hyemalis	Dark-eyed Junco	-	-	-	S4S5
Poecile atricapillus	Black-capped Chickadee	-	-	-	S5
Regulus satrapa	Golden-crowned Kinglet	-	-	-	S5
Setophaga palmarum	Palm Warbler	-	-	-	S5B
Setophaga striata	Blackpoll Warbler	-	-	-	S3B,S5M
Spinus tristis	American Goldfinch	-	-	-	S5
Vireo solitarius	Blue-headed Vireo	-	-	-	S5B
Mammals					
Erethizon dorsata	North American Porcupine	-	-	-	S5
Odocoileus virginianus	White-tailed Deer	-	-	-	S5

Notes:
* Indicates the species is considered a SAR; all others are SOCC.
[1] Species at risk in Canada listed under Schedule 1 the federal *Species at Risk Act* as Endangered (EN), Threatened (TH), or Special Concern (SC) (Government of Canada 2023).
[2] Species of conservation concern in Canada assessed by COSEWIC as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC); not at risk species = NAR, Data Deficient = DD (Government of Canada 2023).
[3] Species at risk in Nova Scotia listed under the provincial *Endangered Species Act* (NS) as Endangered (EN), Threatened (TH), Vulnerable (VU), or Special Concern (SC; Government of Nova Scotia 2023).
[4] Species ranked as Critically Imperiled (S1), Imperiled (S2), or Vulnerable (S3) by the Atlantic Canada Conservation Data Centre (AC CDC 2023) and recorded within 5 km of the Project by desktop data source, where:
S1: Critically Imperiled – Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences). May be especially vulnerable to extirpation.
S2: Imperiled – Imperiled in the province because of rarity due to very restricted range, very few populations (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3: Vulnerable – Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer).
S4: Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors (80+ occurrences).
S5: Secure – Common, widespread, and abundant in the province.
S#S#: A numeric range rank (*e.g.*, S2S3) is used to indicate any range of uncertainty about the status of the species or community.
SH: Possibly Extirpated (Historical) – Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
SU: Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

APPENDIX D

ARIA Report

HRM Serviced Communities Background Study: Highway 102 West Corridor Archaeological Resource Impact Assessment ARIA, Bedford, Halifax Regional Municipality, Nova Scotia (2023)

HRP #A2023NS169

Final Report

June 5, 2024

Submitted to:
Nova Scotia Department of Communities, Culture, Tourism & Heritage
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HRM SERVICED COMMUNITIES BACKGROUND STUDY: HIGHWAY 102 WEST CORRIDOR ARCHAEOLOGICAL RESOURCE IMPACT ASSESSMENT (ARIA), HALIFAX REGIONAL MUNICPILITY, NS (2023)

This document entitled HRM Serviced Communities Background Study: Highway 102 West Corridor Archaeological Resource Impact Assessment ARIA, Bedford, Halifax Regional Municipality, Nova Scotia (2023) was prepared by Stantec Consulting Ltd. ("Stantec") for the account of Halifax Regional Municipality (HRM), (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Kyte, Jonathan

Digitally signed by Kyte, Jonathan
Date: 2024.06.05 15:58:27 -03'00'

(signature)

Jonathan Kyte, M.A., Archaeologist

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Project Personnel

Project Manager:	Shawn McFarlane, B.ScF., RPF
Background Research:	Jonathan Kyte, MA.
Site Visit:	Jonathan Kyte, MA., Chase McLean, MA., Mike Rooney, BA.
Report Writer:	Chase McLean, MA.
GIS Specialist:	Mike Rooney, BA.
Quality Review:	Chris Blair, BA.
Independent Review:	Robert Federico, MPA.

1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by the Halifax Regional Municipality (HRM) to conduct an Archaeological Resource Impact Assessment (ARIA), for the HRM Future Serviced Communities Background Study; Highway 102 West Corridor, located in Bedford, Nova Scotia (the Project; Figure 1, Appendix A). An ARIA is required to determine if there are heritage resources that may be affected by future ground disturbance in relation to housing and transportation developments. HRM has retained Stantec to carry out an ARIA as part of the background study for environmental, land-use suitability, transportation, and infrastructure for the Highway 102 West Corridor area in Bedford, Nova Scotia (Figure 2, Appendix A).

HRM is planning to expand housing development approvals in the Highway 102 West Corridor area to accelerate the provision of land for new housing. This expansion triggered an environmental assessment to be completed prior to approval of the proposed works. As part of the environmental assessment, it was determined that an ARIA must be completed to assess the potential for archaeological resources to be located within the area to be affected by the Project. The ARIA consisted of background research, and a field-based archaeological survey. All work was completed in compliance with Nova Scotia's Archaeological Resource Impact Assessment (Category C) Guidelines (Government of Nova Scotia 2014) as well as the Special Places Protection Act (Chapter 438 of the Revised Statutes, 1989).

The ARIA was conducted under Heritage Research Permit (HRP) No. A2023NS169 issued to Jonathan Kyte of Stantec, by the Province of Nova Scotia Department of Community, Culture, Tourism, and Heritage (NSCCTH). The fieldwork for the walkover component of the ARIA was conducted by Jonathan Kyte, MA., and Chase McLean, MA., on September 22, 2023, and Jonathan Kyte and Mike Rooney, BA. on September 25 and 26, 2023.

2.0 PROJECT DEVELOPMENT AREA

For the purposes of this report, the Project Development Area (PDA) is the area may be affected by the potential housing development and that was the subject of the ARIA. This area mainly consists of undeveloped lands within the western corridor of Highway 102 in the Washmill Lake area, south of Kearney Lake, Bedford Regional Municipality, Nova Scotia. HRM initiated the background study to establish the appropriate portion of the PDA that is suitable for new housing development and future community planning work. The total size of the PDA is approximately 286 ha. The PDA is identified with the red outline in Figure 1 (Appendix A).

3.0 METHODOLOGY

3.1 BACKGROUD RESEARCH

Desktop historical background research was conducted for the Project using digital and archival information available from various government and non-government sources including published, unpublished, and on-line historical and environmental records. A wider Study Area that includes the lands within a 1 km radius of the PDA is defined as the geographic area may have pertinent Historic or Pre-Contact archaeological or built heritage resources. The scope of work for the desktop historical background research included, but was not limited to, the sources of information listed below to gather information on general and specific history, including the Pre-Contact and Historic periods, and known archaeological resources within the Study Area, to determine the potential for archaeological resources to be within the PDA:

- Review of relevant Maritime Archaeological Resource Inventory (MARI) forms for information relating to recorded archaeological sites within a 1 km radius of the PDA
- Review of previous archaeological investigations conducted within or near the PDA through consultations with Special Places Coordinator from the Nova Scotia Department of Communities, Culture, Tourism, and Heritage (NSCCTH)
- Review of historical maps and aerial photographs, maps, published sources, and historical and archival records of the PDA and adjoining properties to gain information on historical land use
- A review of the Canadian Register of Historic Places (CRHP)
- Engagement with the Kwilmu'kw Maw-klusuaqn Negotiation Office's Archaeological Research Division (KMKNO's ARD) to gather information pertaining to traditional or historical use of the PDA
- Review base mapping of the subject property to identify environmental and physiographic features such as topography and historic water margins that would influence human settlement and resource exploitation patterns
- Knowledge of the Stantec Archaeology Team
- Consultations with local historical experts, and archaeologist, as applicable

The results of the historical background research were used to identify leading archaeological and environmental indicators for the potential presence of archaeological resources within the PDA. The results of the research are presented in the sections that follow.

3.2 ARCHAEOLOGICAL FIELD SURVEY

Stantec conducted a field survey (walkover) of the PDA to identify, visually inspect, and document previously unrecorded heritage resources and identify areas of elevated archaeological potential. The walkover was completed via transects. The 2023 field season focused on shoreline and watercourse areas throughout the subject property to assess ground and topographical conditions. The findings of the walkover were documented, taking into consideration the results of the desktop historical background research, and following the Provincial Guidelines (Category C, 2014) as well as the experience, knowledge, and professional judgement of the Stantec Archaeology Team. Assessment notes were taken

as reference points during the walkover and recorded into Field Maps mobile phone application and labeled with the initials of the archaeologist and number of the assessment note (e.g., JRK-ARCH-###).

Locations with elevated potential for archaeological resources are delineated as polygons (e.g., JRK-POLY-###). If heritage resources or archaeological sites are identified recorded during the ARIA, they are defined as Historically Significant Features (HSF) and are into Field Maps by the archaeologist initials, HSF, and the numerical number assigned by Stantec to the HSF (e.g., JRK-HSF-###).

Field data were collected using a mobile phone device running field maps, a data collection and field mapping software developed by ESRI. Digital field maps were generated for the Project that combine relevant environmental and project data in GIS-based layers. A digital copy of all data collected in the field is provided in the Project Site Plan and with this report (Figure 2, Appendix A)

4.0 BACKGROUND RESEARCH RESULTS

This section details the results of the historical background research gathered on the geology, environment, and cultural and historical background review of the PDA and broader area around the PDA (Study Area).

It came to Stantec's attention after the fieldwork component of this ARIA was complete that previous archaeological assessments for a portion of the PDA had been completed by others (Boreas 2015; 2016; 2020a; 2020b). Stantec has included, where relevant, discussion and information on the results of the previous ARIAs in the sections below.

4.1 THE NATURAL ENVIRONMENT

The Study Area consists mostly of woodland with lakes and intermittent wetlands along water courses. It also includes granite bedrock ridges, glacial erratics, and sections of barrens. The Study Area is situated between known historical settlements including Hammonds Plains in the north, Bedford to the northeast, Kearney Lake to the east and Timberlea to the south (Stantec 2023).

The Study Area is within the Granite Uplands Theme Region (Theme Region 451a.). The surficial geology of this Region consists of granite bedrock with scattered glacial erratics that were deposited across the landscape when the glacial ice receded at the end of the last glaciation period (circa 14,000 years before present (BP). A coarse granite till thinly covers the surface with some areas of thicker Lawrencetown till. The primary soil is Gibraltar, which is a coarse-textured, well drained gravelly, sandy loam derived from granite, usually shallow, heavily leached, and very acidic. Gibraltar soils are also associated with poorly drained Bayswater and Aspotogan soils, along with many areas of peat (Davis and Brown 1996:81; Stantec 2023).

Fresh water within this area of the Halifax County segment of this theme region has several long north south orientated lakes running along fault lines within the granite bedrock. The forests within this region are mixed hardwoods and softwoods with spruce mostly predominating, with patches of barrens formed in areas of low soil development and exposed bedrock. The Study Area borders the Quartzite Barrens Theme Region (Theme Region 413a) where the area contains Halifax soils, being well drained, stony, sandy loams, developed on till derived principally from quartzite (Davis and Brown 1996; Stantec 2023).

4.2 CULTURAL AND HISTORICAL BACKGROUND

4.2.1 Pre-Contact Period

The Pre-Contact Period is defined as the period before the arrival of mostly European-derived peoples to North America, before approximately 500 years ago. In Nova Scotia, this is interpreted as approximately 13,000 – 500 BP). The earliest period of human occupation in Nova Scotia is Sa'qewe'l L'nu'k (the Ancient People) or "Palaeo-Indian" period (13,000 – 9,000 BP), which saw the arrival of peoples who harvested caribou, possibly along with a variety of other fauna, following deglaciation of the region (Bonnichsen, Keenlyside and Turnmire 1991). This period is best represented in Nova Scotia by the Debert-Belmont site complex near Truro, NS.

Sites of the following Mu Awsami Kejihaw'k L'nu'k (the Not so Recent People) or the Archaic Period (9,000-3,000 BP), are characterized in part by distinctive ground stone tool industries. In Nova Scotia, sites of this period are known primarily from interior locations, and for the most part date only to the latter half of this period (the Late Archaic). Nevertheless, it is inferred that people were present in the province throughout this period, and that their lifeways included a focus on harvesting the resources of the coast as well as interior waterways. The scarcity of evidence for occupation early in the period and on the coast is seen to reflect the effects of rising sea levels; such sites now being situated in marine environments.

The last phase of the Pre-Contact Period, Kejihawek L'nu'k (the Recent People) or Woodland/Ceramic period (3,000- 500 BP), sees the appearance of ceramic technology in the context of wide-ranging interactions with other peoples of the greater northeast. Coastal archaeological sites are more clearly documented (albeit still threatened by rising sea levels and coastal erosion) and, in some cases, include substantial shell middens, indicating the harvesting of marine shellfish. Nevertheless, both marine and terrestrial resources figured in the seasonal round during this time, with some regional variation (Nash and Miller 1987; Davis 1991).

The Study Area is part of a greater Mi'kmaw territory known as Eskikewa'kik, meaning "Skin dressers" (CMM 2007). The rivers, streams, and lake systems would have been an important transportation route and resource base of the local Mi'kmaq and their ancestors for thousands of years prior to the arrival of Europeans. A research inquiry was submitted for the Study Area with KMKNO-ARD and their review found 22 recorded traditional use sites within a 1 km radius of the Study Area used for hunting, fishing, and harvesting food, aquatic species, wood, and logs. At this time, it is understood that none of these 66 traditional use sites are within the PDA for the Project. There are many sites used by large groups of families who settled in the area including sites used during traveling (KMKNO-ARD 2024.

The KMKNO-ARD noted that the Study Area is located near Bedford Basin which was an area used extensively by the Mi'kmaq within all aspects of their lives and includes records of found diagnostics, quartz flakes, and petroglyphs (KMKNO-ARD 2024). The Mi'kmaw name for Birch Cove in *Minkwaqnik*, which means "long river" and the Mi'kmaw name for Bedford Basin is *Asoqmapskiajk*, which means "at the rocky crossing" (KMKNO-ARD 2024).

The Study Area was also identified in KMKNO-ARD historical review as being referenced in 1746 for having two summer Mi'kmaq camp sites on the shore of the Sackville River where it empties into the Bedford Basin and at Birch Cove. The Study Area is interpreted to have been used by the Mi'kmaq in the Historic Period during European colonization.

4.2.2 Historic Period

The Historic Period is defined as the period from the arrival of mostly European-derived peoples to North America, approximately 500 years ago, until the modern era. For Mi'kmaq communities, this period is referred to as *Kiskukew'k L'nu'k* (Today's People) or Contact Period (500 BP- Present), which saw the growth of European settlement in the region, and with it, a variety of changes for *Kiskukew'k L'nu'k* associated with trade, conflict, and disease (Whitehead 1991).

The first European population to have a presence at the mouth of Halifax Harbour were the French during the late 17th century. There was some seasonal use by New Englanders during the first half of the 18th century for the fishery, although, there was not a large population of European settlement until the British founded Halifax in 1749 (Ward 1971).

The alignment of the original Lunenburg Road that ran west of Flat (Maple) Lake and Frasers Lake was constructed in 1757 and was probably created from an existing path used by the Mi'kmaq prior to the establishment of Halifax (CRM 2009). This road was abandoned in 1840 when the St. Margaret's Bay Road (Trunk 3) was constructed (Withrow 1997). A segment of this abandoned road is located within the Study Area. Although there are no known registered archaeological sites associated with this segment, there is raised archaeological potential associated with earlier use by the Mi'kmaw.

The lack of Historic Period settlement within the Study Area is likely due to the uneven terrain, bedrock exposures and poor soil quality, with more favourable soil and topographical conditions in other locations of the Halifax Region. The Study Area was used for the most part for resource extraction, in particular timber harvesting. The Study Area has several old lumbering routes along watercourses and that were used to transport lumber to surrounding mills. A review of historical mapping found that there are approximately fifteen historical land grants outside the boundaries of the Study Area. Six of the lots were near Timberlea, a community located at the southwest end of Frasers Lake associated with the historic lumbering activities. The original name for Timberlea was Nine Mile River and originally known by the Mi'kmaw name *"Wokumeak"* meaning "trail route" (Fame 1892:12; Brown 1922:104). By 1900 the name of the area changed to Bower Station after Angus Bower who kept a hotel and was postmaster after the rail line was constructed through the community. The area was also popular with sport fisherman during this time who would spend time on the many lakes within the community. The name changed before 1922 to Timberlea when it became a considerable sawmilling community (PANS 1967).

The first land granted within Timberlea was to George Boutilier with two lots granted in 1821. In 1822, John, Peter, and Jacob Boutilier who owned farms in St. Margaret's Bay, petitioned for a 650-acre grant, to which they already cut a road on the Nine Mile River (Crown Grant Book K:32; PANS 1967). The mill site was purchased from the estate of Cyrus Boutilier by George Fraser, who produced wooden boxes there, and whose sons Robert, Charles and Aubry Fraser were still operating a mill until the 1950s (PANS 1967:674). The historical land grants given to families in Timberlea are outside the boundaries of the PDA and Study Area but reflect evidence of attempts of European urbanization in this part of Nova Scotia.

The Fraser family originally came from St. Margaret's Bay to Timberlea where they were granted a lease of 100-acres in 1856 to bolster their lumber business (Fraser 2022). The Fraser sawmill site is located within a property lot granted along the Nine Mile River at the lower end of Frasers Lake. Lot 'B' annex 8 1/3 acres was not granted until 1879 to George G. Fraser and Charles Fraser, both farmers from St. Margaret's Bay. The Fraser sawmill was constructed sometime after the property lots were granted to George Fraser as no improvements were referenced within the land documentation. The site was chosen to construct a mill that used a vertical saw powered by a waterwheel. The Mill was in operation until 1921 when a new sawmill was constructed further downstream (Fraser 2022). The Fraser Mill is outside the PDA and is located to the west and outside of the Study Area.

The quarry and dam sites located at Quarry Lake and Birch Cove Lakes are within a property lot originally granted to Alexander Brymer Esq., in 1787 (Crown Land Grant Index Map 066). The quarry site and the dam site are not present on the Church map of 1865 although present on the Faribault map of 1908 (Church 1885; Faribault 1908). It can be concluded that this site was in use during the turn of the twentieth century. A Club House or camp is also present on the Faribault map on the western shore of Quarry Lake and is possibly one of many camps located outside the Study Area such as concrete foundations and a cribwork dock located at the south end of Ash Lake. A camp was also noted on the Faribault map located on a small island in Ash Lake. There are also remains of a camp beside Crane Lake, near a known portage route between Ash Lake and Crane Lake. Within the PDA, there are other historic property lots that were granted to Elias Marshall, who was granted approximately 400 acres east of Fox Lake and west of Charlies Pond. Leonard Dunn was granted 400 acres in the same area within the PDA. John Thomas Lane was granted 180 acres south of the Birch Cove Lakes and within the PDA (Crown Land Grant Index Map 066). Directly outside of the PDA, the United Church was granted land north of Washmill Lake and southwest of Kearney Lake (Crown Land Grant Index Map 066).

A review of the Canadian Register of Historic Places (CRHP 2024) and the HRM Heritage Property Registry (HRM 2024) found that there are no registered historic places or heritage sites located in the Study Area. However, there are five registered historic places or heritage sites located within 2 km of the Study Area. These are: the Beechville United Baptist Church, built in 1844 and approximately 1.7 km south of the Study Area, the Caribou Lodge, built in 1891, approximately 1.4 km east of the Study Area, the MCGhee – Moir House, built in 1895/1901, approximately 0.5 km east of the Study Area, the Prince's Lodge Rotunda, originating to 1785, approximately 0.8 km east of the Study Area and the Moirs Power House, originating to 1878, located approximately 2 km east of the Study Area. No buildings of heritage value were found during the ARIA. There is an abandoned cabin located near Charlies Lake and a steel pump house off the edge of Washmill Lake, both within the PDA, that date to the early twentieth century and mid-twentieth century, respectively. A 1906 City of Halifax Water Supply Map (Figure 4, Appendix A)

depicts the major waterbodies that were surveyed under the 2023 ARIA. In 1931, aerial imagery over the PDA shows Washmill Lake and the eastern section of the Birch Cove Lakes prior to any quarry activities (NRCan 1931; Figure 5, Appendix A).

4.2.3 Registered Archaeological Sites in the Study Area

A review of the NSCCTH MARI online database found that there are no registered archaeological sites within the PDA and five registered archaeological sites within a 5 km radius of the PDA: BeCw-01, BeCw-02, BeCw-03, BeCv-11, and BeCv-15. BeCw-01 is located approximately 5 km from the PDA and consists of an isolated artifact find of a diagnostic Late-Archaic Period grooved axe. The Bedford Barrens Petroglyphs site (BeCw-02) consist of carvings edged into a series of roughly parrel quartzite ridges (Goldenville Formation) that follows the contours of the high ground overlooking the head of the Bedford Basin (Molyneaux 1993). BeCw-03 is the Historic Period Acadian paper mill, established in 1818 by Anthony Holland on Paper Mill Lake. Archaeological features at BeCw-03 include, dikes, sluice channels, stone walls visible both on the island and underwater in this location (Thomson 1990). BeCv-11 is the Princess Lodge site dating to the late eighteenth century and consists of the surviving surface features of the Duke of Kents Country Residence (Davis 1983). BeCv-15 is a Pre-Contact archaeological site that consists of a stemmed projectile point that, according to the MARI form, was reported in 1985 and dates to the Late Archaic or Early Woodland Period (Reston 1985). The presence of diagnostic lithic artifacts and a petroglyph site near the Study Area is evidence of a strong presence for past Indigenous use of the Area.

4.2.4 Previous Archaeological Resource Impact Assessments

Several previous ARIA's have been conducted around the PDA, and six ARIA's have been completed in the Study Area (Stantec 2023). In 1999, Washburn & Gillis Associates Limited (WGA) completed an ARIA for a planned connector 9.9 km highway (HWY 113), between HWY 102 (near Exit 3) and HWY 103 (north of Exit 4) (WGA 2000). That assessment examined the proposed right of way for the planned highway and was followed up in 2009 by CRM group Limited (CRM) with an additional assessment and shovel testing to mitigate areas of high archaeological potential (CRM 2009) identified in the 1999 WGA assessment. A third ARIA consisted of a walkover survey of the Sandy Lake Development Property, completed by CRM in 2008. The survey identified two areas of high archaeological potential and identified multiple historical features such as cellar pits, foundation depressions, roads, and stone walls/piles. Jacques Whitford Environment Limited (JWEL 2008) completed an archaeological screening study (desktop assessment) in 2008 for the proposed interchange at Highway 102, east of Kearney Lake. The desktop assessment did not identify any archaeological resources within the Study Area and determined it had low archaeological potential. A fourth ARIA was a walkover survey of the Black Duck Brook West Bedford on behalf of Clayton Developments Limited (CRM 2020). The areas along Black Duck Brook, including the trail identified as the alignment of the original Annapolis Road One area, were identified as having elevated archaeological potential while the remainder of the PDA had low archaeological potential for the undisturbed land on either side (CRM 2020).

A fifth ARIA completed outside the Study Area was the Sandy Lake Development assessment completed by CRM in 2022. The assessment identified four areas of high archaeological potential and three historic period features, located north of Hammonds Plains Road. These were two infilled cellars and an infilled well that was first recorded in 2008 and then revisited in 2022. CRM recommended shovel testing for the areas of high archaeological potential and avoidance of the historic features (CRM 2022). A sixth ARIA was the Blue Mountain – Birch Cove Lakes (BMBCL) assessment and was completed by Stantec in 2022 on behalf of HRM to assess for archaeological resources for that project. It involved a desktop study and focused archaeological walkover that identified seven areas of elevated archaeological potential for Pre-Contact archaeological resources and historically significant features in areas with elevated potential for additional Historic Period archaeological resources (Stantec 2023). The BMBCL assessment partially overlapped with the PDA for the Highway 102 West Corridor Project as it surveyed high potential areas around Birch Cove Lakes (Stantec 2023), similar to the 2023 field assessment which surveyed the eastern shorelines around Birch Cove Lakes. JRK-HSF-008 and JRK-HSF-011 were two recorded features initially documented in the BMBCL assessment and were noted during the 2023 field assessment while surveying the southern part of the PDA.

The Stantec Archaeology Team was unaware during their 2023 ARIA that ARIA's had been completed by other consulting firms in different sections of the PDA. Boreas Heritage Consulting Inc. (BHCI) completed two ARIA's in 2015 within the boundaries of the 2023 PDA. The first ARIA involved a desktop assessment and walkover survey of the properties that the 2015 ARIA identified 14 areas of high archaeological potential. These were located east of Birch Cove Lakes, east of Washmill Lake and south of Kearney Lake. These locations were recommended for avoidance, but if not practical, then archaeological shovel testing was recommended if this area will be impacted (BHCI 2015). The subsequent assessment that BHCI completed in 2015 involved shovel testing in the four of the areas they had identified with high archaeological potential that were determined will be impacted by the Susie's Lake Development (SLD). The shovel testing completed by BHCI did not encounter any archaeological resources (BHCI 2016).

In 2020, BHCI completed two additional assessments where one assessment (2020a) also overlapped with part of the 2023 assessment that Stantec completed. BHCI conducted a desktop assessment and subsequent walkover survey of areas interpreted as high archaeological potential. The survey was conducted to the south of Kearney Lake and east of the industrial quarry area that borders Washmill Lake. The results of this survey located one area considered to exhibit high archaeological potential and recorded several historic features (BHCI 2020a). The subsequent assessment involved the excavation of 67 STP's within two locations within 'Area 1' directly outside the Stantec 2023 PDA and east of Kearney Lake Road, the area of high archaeological potential delineated by BHCI during the 2020a assessment. Out of the 67 STP's excavated, only 18 yielded material from the latter half of the twentieth century (BHCI 2020b). No Pre-Contact artifacts were found in any of the BHCI 2015 or 2020 assessments, and no additional recommendations were made.

5.0 2023 FIELD SURVEY RESULTS

The results presented below are presented as the field survey component of this ARIA was completed, prior to the knowledge that previous ARIA's had been completed within a portion to the PDA.

The field survey (walkover) conducted by Stantec in 2023 for this Project focused on assessing the PDA where housing expansion is being considered in the west corridor of Highway 102 (Figure 2, Appendix A). The crew consisted of two archaeologists walking in 10 m transects focusing mainly on the watercourse shorelines for surface heritage resources and to assess ground conditions for archaeological potential.

The walkover began in the southwestern corner of the PDA, adjacent from Lacewood Drive and Highway 102. The PDA is delineated by a treeline at the bottom of a steep slope from Lacewood Drive (JRK-ARCH-128; Photo 1, Appendix B). Heading north from JRK-ARCH-128, the forest conditions are a mixture of white pine, spruce and maple trees. The terrain has a slope greater than 20 degrees continuing north. The forest floor is undulating, has visible surface boulders and covered in sphagnum moss and has poor soil development due to wet conditions. Large glacial erratics are visible further north into the PDA (CKM-ARCH-055; Photo 2, Appendix B). Approximately 50 m north from CKM-ARCH-055, the terrain changes and becomes boggy and low. Additional boulders are visible approximately 150 m north from CKM-ARCH-055, displaying a slope greater than 25 degrees (CKM-ARCH-057; Photo 3, Appendix B). The ground conditions remained mossy and wet, with the edge of a riparian wetland visible at CKM-ARCH-058 (Photo 4, Appendix B). The riparian wetland is adjacent to the Birch Cove Lakes and the two watercourses that move through this section of the PDA would enable flooding and consistent wet, rocky conditions. Boggy terrain with areas of standing water are visible (CKM-ARCH-059; Photo 5, Appendix B) with additional large glacial erratics encountered along the edges of the wetland noted at CKM-ARCH-060. The watercourse that feeds into Birch Cove Lakes is visible at JRK-ARCH-132 (Photo 6, Appendix B). Overall, this section of the PDA is found to have low archaeological potential due to the rocky and wet ground conditions.

Turning southward towards Chain Lake Drive, the topography shows consistent wet conditions (CKM-ARCH-062; Photo 7, Appendix B) with hydrophytic fern species growing in bog like conditions. Continuing southwest, the Stantec Archaeology Team noted that at JRK-ARCH-133, the slope increases in elevation greater than 20 degrees to the west. Albeit dryer, the forest floor conditions remain rocky with boulders visible on the undulating surface. Proceeding north from JRK-ARCH-133, the edge of the boggy wetland area that the Stantec Archaeology Team previously crossed is recorded at CKM-ARCH-063, with a slope greater than 25 degrees to the west and with boulders and wet boggy terrain abundant (Photo 8, Appendix B). A small watercourse was encountered at CKM-ARCH-064 that drains from Birch Cove Lakes into the boggy wetland visible at CKM-ARCH-063 (Photo 9, Appendix B).

Turning west at CKM-ARCH-063, the topographic conditions change at JRK-ARCH-134 as the forest floor becomes dryer and has a higher elevation. There are many blowdowns in this section of the PDA, possibly due to past weather events or forest harvesting activities (Photo 10, Appendix B). The slope interchanges between high and lower degrees of elevation, with few flat areas suitable for Pre-Contact campsites or settlements. A pedestrian hiker trail is visible at CKM-ARCH-065. The hiker trail follows the

southwestern extent of the PDA, and the slope of the trail becomes greater than 20 degrees (Photo 11, Appendix B). Bedrock is visible within the southwestern corner of the PDA following the hiker trail towards the southern extent of the PDA (Photo 12, Appendix B). Due to the presence of wetlands, steeper elevation, and surface bedrock, this section of the PDA is interpreted as having low potential for archaeological resources.

The field assessment resumed on September 25th, 2023, near the Quarry Lake Dam, near MPR-ARCH-074. Imported rock material was noted as covering an access road at JRK-ARCH-135; Photo 13, Appendix B. This section of the PDA has immature pine and maple trees, over an undulating dry terrain with frequent boulder scatters. A concrete dam at assessment note JRK-ARCH-136 is still in use (Photo 14, Appendix B). A riparian wetland and glacial erratics were encountered at MPR-ARCH-075 along the shoreline of the Quarry Lake outlet before the terrain rises (Photo 15, Appendix B). Photos of the concrete dam are visible at JRK-ARCH-137 facing west (Photo 16, Appendix B). This was documented as JRK-HSF-011 during the 2022 Stantec field assessment during the Blue Mountain – Birch Cove Lakes Archaeological Resource Impact Assessment (Stantec 2023). No areas of elevated archaeological potential were identified within this section of the PDA.

Headed northwest along the exterior of the PDA from the Quarry Lake, the topography remained unchanged until JRK-ARCH-139, when the land started to slope down lower and became more wet (Photo 17, Appendix B). Undifferentiated hardwoods over rolling duff terrain with frequent boulder scatters and large glacial erratics were encountered past JRK-ARCH-139. Approximately 65 m north, an elevated bedrock exposure was documented at MPR-ARCH-080 (Photo 18, Appendix B). Within 100 m northwest, the topography's elevation descended into a wetland at MPR-ARCH-081 with dense woody shrubs, ferns, and open spruce trees with sphagnum moss. The Stantec Archaeology Team continued to move east towards Washmill Lake, and another elevated and dry rock exposure was recorded. In getting closer to the edge of the lake, the elevation drops more than 25 degrees and becomes very rocky with large boulders at JRK-ARCH-140 (Photo 19, Appendix B). No areas of elevated archaeological potential were encountered in this section of the PDA.

At the head of the inlet of Washmill Lake, an area with elevated archaeological potential was recorded as MPR-ARCH-083. The terrain is level and in an open mixed wood duff environment (Photo 20, Appendix B). It's likely that the ground has seasonal flooding but it was likely a flat dry terrace before Washmill Lake was impounded. This area of elevated archaeological potential was delineated as polygon MPR-POLY-005. The Stantec Archaeology Team continued north up the watercourse at the head of Washmill Lake towards Charlies Pond and Charlies Lake. On the way, a small watercourse was encountered at JRK-ARCH-142 that flows into Washmill Lake (Photo 21, Appendix B). The western edge of Charlies Pond was recorded at MPR-ARCH-085 and recorded wet sphagnum moss with dense woody shrubs at the base of steep slopes. The inlet of the watercourse at Charlies Pond has a rocky slate fault line following the watercourse on the western bank and the toe of slope is at the edge of the watercourse along this section. The land separating Charlies Pond and Charlies Lake is interpreted to have low archaeological potential at MPR-ARCH-086 due to steep boulder terrain that lacks flat terraces all the way down to the water's edge (Photo 22, Appendix B). After assessment note MPR-ARCH-086, the Stantec Archaeology Team continued north and surveyed the western shoreline of the southern extent of Charlies Lake that's within the PDA. An abandoned log cabin was encountered at JRK-ARCH-144 near the western shoreline

of Charlies Lake in the PDA (Photo 23, Appendix B). It is not interpreted to be historically significant. Overall, this section of the PDA is found to have low archaeological potential except for the area delineated as elevated potential polygon MPR-POLY-005 at the northwestern edge of Washmill Lake. If avoidance of MPR-POLY-005 is not feasible, then archaeological shovel testing is recommended before any potential ground disturbance activities occur.

The Stantec Archaeology Team proceeded south from MPR-POLY-005 and survey the remaining portions of the PDA, starting with the mid-section of the western shoreline of Washmill Lake. There are boulder scatters that are visible along the entire shoreline that slopes down to the waters edge at approximately 30 – 35 degrees (Photo 24, Appendix B). Topographic conditions remained unchanged with low archaeological potential along the western shoreline of Washmill Lake. From here, the Stantec Archaeology Team proceeded to survey the watercourse starting at MPR-ARCH-089 at the edge of Washmill Lake (Photo 25, Appendix B) and moving in between Washmill Lake towards Quarry Lake at MPR-ARCH-090 (Photo 26, Appendix B) and at JRK-ARCH-146. Due to extensive rocky and steep terrain along the surveyed watercourses, no areas of high archaeological potential were documented.

The field survey then moved to assess the watercourse that flows into a pond west of Kearney Lake, which is in the northeastern section of the PDA, adjacent from Holland Street and Hanshaw Drive (Figure 2, Appendix B). In this location, there is heavy equipment present with a storage building and contemporary garbage on the ground surface (Photo 27, Appendix B). On the other side of this watercourse, the ground is very level and dry but the soil exposure under tree throws did not identify any lithic material. Plastic bins, debris from cinder blocks and recent cut lumber is also available (MPR-ARCH-093; Photo 28, Appendix B). The Stantec Archaeology Team proceeded to survey around Kearney Lake and noted no significant changes. One area of elevated archaeological potential was identified at JRK-ARCH-150 and delineated as JRK-POLY-014. It has a dry and flat ground surface on the western section of the pond (Photo 29, Appendix B). No significant changes were noted at assessment point JRK-ARCH-152. Overall, this section of the PDA is found to have low archaeological potential except for the area delineated as elevated potential polygon JRK-POLY-014 at the northeast of Washmill Lake. If avoidance of JRK-POLY-014 is not feasible, then archaeological shovel testing is recommended before any potential ground disturbance activities occur.

The Stantec Archaeology Team proceeded to move down Crusher Road and then redirected towards the watercourses at the southeastern corner of Washmill Lake. Wetland conditions are prevalent in this section of the PDA and are noted at MPR-ARCH-096 (Photo 30, Appendix B). A view of the southern extent of Washmill Lake was encountered at JRK-ARCH-153. Continuing north, rocky ground conditions were noted at MPR-ARCH-098 under existing tree throws that has shallow soil development (Photo 31, Appendix B). Push piles were encountered between the quarry and shoreline of Washmill Lake at JRK-ARCH-154 on the lake shoreline (Photo 32, Appendix B). Crushed rock and a steel pump house with an access road was also located between the quarry and Washmill Lake at JRK-ARCH-155 (Photo 33, Appendix B), indicating extensive disturbance from past quarry activities along the lake shoreline. Consistent crushed rock and push piles were recorded along the shoreline demonstrating continued disturbance from quarrying. The elevation of the land rises at MPR-ARCH-101 and is very wet, with alders and thorn bushes growing in wet ground. The Stantec Archaeology Team returned to the Crusher Road and surveyed the waterbody that flows into Kearney Lake which is adjacent from Crusher Road and

Little Fox Lane. Elevated slopes greater than 35 degrees with rocky and wet conditions were noted at MPR-ARCH-102 (Photo 34, Appendix B) and this area is interpreted to have low potential for archaeological resources.

The Stantec Archaeology Team proceeded to drive down the Route 102 Highway to survey additional watercourses along the eastern shoreline of the Birch Cove Lakes that is within the PDA (Figure 2, Appendix A). Surface bedrock along the eastern shoreline of the Birch Cove Lakes is visible at JRK-ARCH-158 (Photo 35, Appendix B). The concrete pad that was first identified during the Blue Mountain Birch Cove Lakes – Archaeological Resource Impact Assessment (Stantec 2023) was located at JRK-HSF-088, with a contemporary rock fireplace constructed on top of it overlooking the lake (Photo 36, Appendix B). From JRK-ARCH-158, the topography begins to slope around the coves greater than 35 degrees with boulder swales. An area of elevated archaeological potential was recorded at MPR-ARCH-103 that is defined as a well-drained open flat area. A current informal encampment exists here. There are some boulders, but the soil development is deep. It was delineated as elevated potential polygon MPR-POLY-007 (Photo 37, Appendix B). Approximately 40 m north from MPR-POLY-007, another area of high archaeological potential was identified and was delineated by elevated potential polygon MPR-POLY-006 (Photo 38, Appendix B). From this polygon, the Stantec Archaeology Team continued to survey north along the eastern shoreline of the Birch Cove Lakes and identified no significant changes in topography. While most of this section of the PDA was assessed as having low archaeological potential, two areas of elevated potential were identified and defined as polygons MPR-POLY-006 and MPR-POLY-007. If avoidance of these areas is not feasible, then archaeological shovel testing is recommended before any potential ground disturbance activities occur.

6.0 SUMMARY AND RECOMMENDATIONS

The PDA transects an area of Indigenous territory that would have been used throughout the Pre-Contact, Proto-Historic, and Historic periods for hunting, fishing, and gathering. Theoretical archaeological potential also existed for Historic Period Euro-Canadian use of the PDA beyond agricultural activity. During the field survey by the Stantec Archaeology Team, two above ground historically significant resources that were identified during a 2022 were noted and were temporarily identified as JRK-HSF-008 and JRK-HSF-011.

Four areas of elevated archaeological potential were identified during the walkover survey. In consideration that much of the 2023 PDA that the Stantec Archaeology Team completed was previously assessed (BHCI 2015, BHCI 2016, BHCI 2020a, BHCI 2020b), Stantec's recommendations have been modified based on the new information gathered and incorporating the result of the relevant aspects of the previous ARIA's to the PDA as defined for this Project.

- MPR-POLY-005: It is recommended that Project construction activities avoid interaction with elevated archaeological potential area MPR-POLY-005. If part or all of this potential area cannot be avoided, subsurface testing is recommended where ground disturbing interactions may occur.

- MPR-POLY-006: It is interpreted that MPR-POLY-006 is in a similar location as the high potential area identified by BHCI in 2016 as Area 10. Area 10 was not shovel tested during the ARIA completed by BHCI. It is therefore recommended that Project construction activities avoid interaction with elevated archaeological potential area MPR-POLY-006. If part or all of this potential area cannot be avoided, subsurface testing is recommended where ground disturbing interactions may occur.
- MPR-POLY-007: It is interpreted that MPR-POLY-007 is in a similar location as the high potential area identified by BHCI in 2016 as Area 9. Thirty-one STP's were excavated at 5 m intervals within Area 9 by BHCI. No significant archaeological resources were encountered and no evidence of historically significant land modification was identified during the shovel testing program. Based on these results, there are no further recommendations for archaeological mitigation at this location.
- JRK-POLY-014: It is interpreted that JRK-POLY-014 is in a similar location as the high potential area identified by BHCI in 2016 as Area 12. Area 12 was not shovel tested during the ARIA completed by BHCI. It is therefore recommended that Project construction activities avoid interaction with elevated archaeological potential area JRK-POLY-014. If part or all of this potential area cannot be avoided, subsurface testing is recommended where ground disturbing interactions may occur.
- JRK-HSF-008 (concrete pad): This feature is not considered archaeologically significant. No additional archaeological mitigation is recommended.
- JRK-HSF-011 (dam structure): This feature is not considered archaeologically significant. No additional archaeological mitigation is recommended.

It is important to note that while no Pre-Contact Period archaeological resources were identified during the field assessment, there is still potential for sub-surface archaeological resources to be present, even in areas previously subject to shovel testing. If potential archaeological resources are discovered during development, contractors or HRM are required to contact NSCCTH to assess the discovery and develop appropriate mitigation.

7.0 CLOSING

This report has been prepared as a requirement of Heritage Research Permit No. A2023NS169 for the sole benefit of HRM and may not be used by any other person or entity, other than for its intended purposes, without the express written consent of Stantec Consulting Ltd. (Stantec) and HRM. Any use which a third party makes of this report is the responsibility of such third party.

The information and recommendations contained in this report are based upon work undertaken in accordance with generally accepted scientific practices current at the time the work was performed. Further, the information and recommendations contained in this report are in accordance with our understanding of the Project as it was presented at the time of our report. The information provided in this report was compiled from existing documents, design and planning information provided by HRM, data provided by regulatory agencies and others, as well as the field survey carried out in 2023 specifically in support of this report. If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, Stantec requests that we be notified immediately, and permitted to reassess the conclusions provided herein. Any follow-up work recommended in this report must be reviewed and approved by Special Places, the Nova Scotia Department of Communities, Culture, Tourism, and Heritage.

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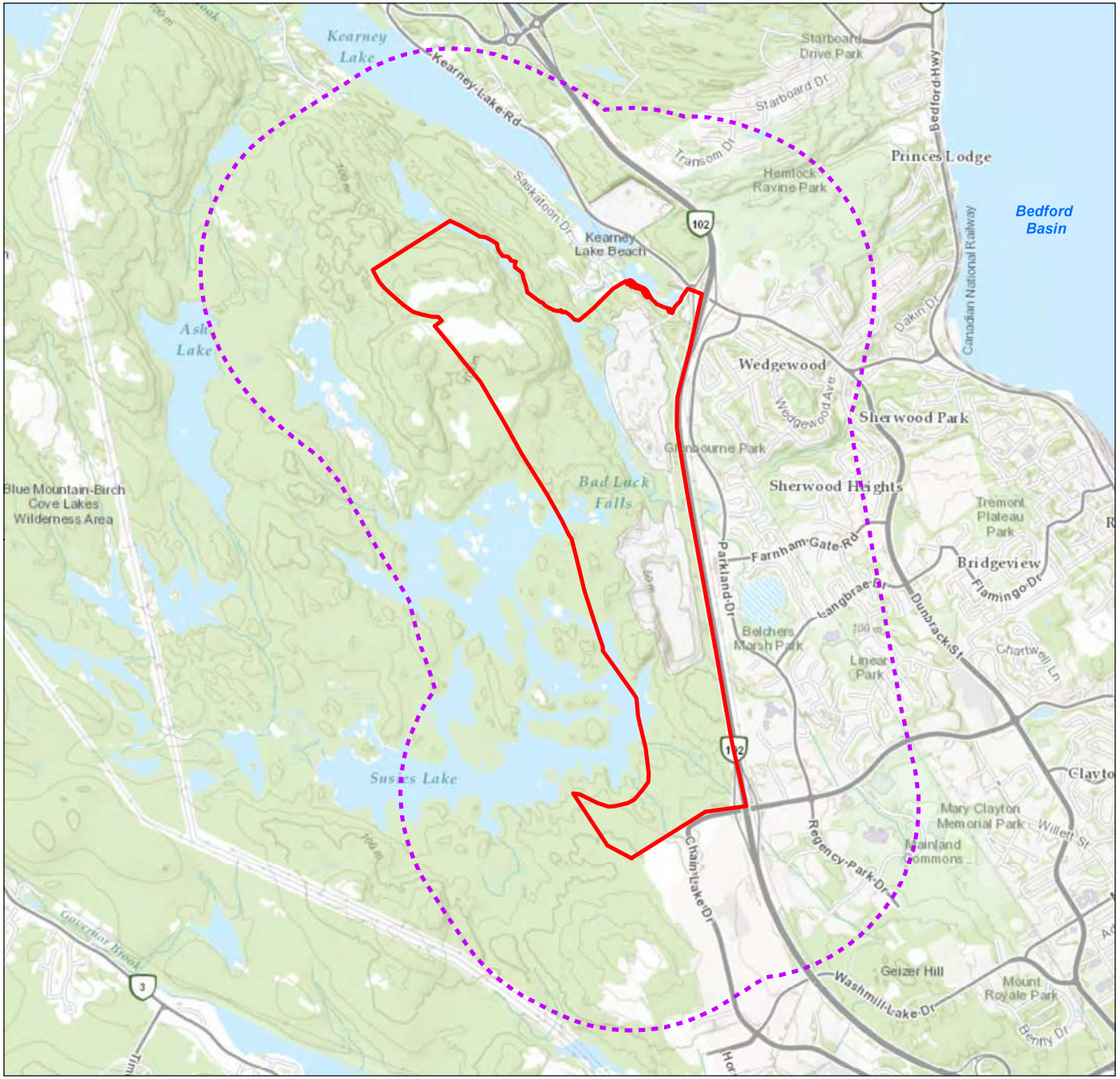
APPENDIX A

Figures



Stantec

HALIFAX

Project Development Area

ARIA Study

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Notes

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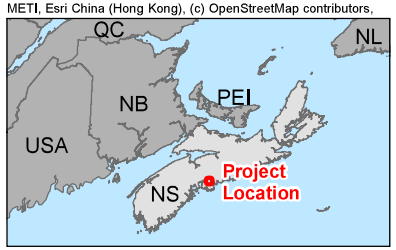
2. Data Sources: HRM
3. Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors,



Project Location
Halifax,
Nova Scotia

Prepared by MPR on 2024-02-23

Client/Project
Halifax Regional Municipality
Future Serviced Communities: Highway 102 West Corridor ARIA

160410459-0001 REVA

Figure No.
1

Title
Project Development Area / Study Area

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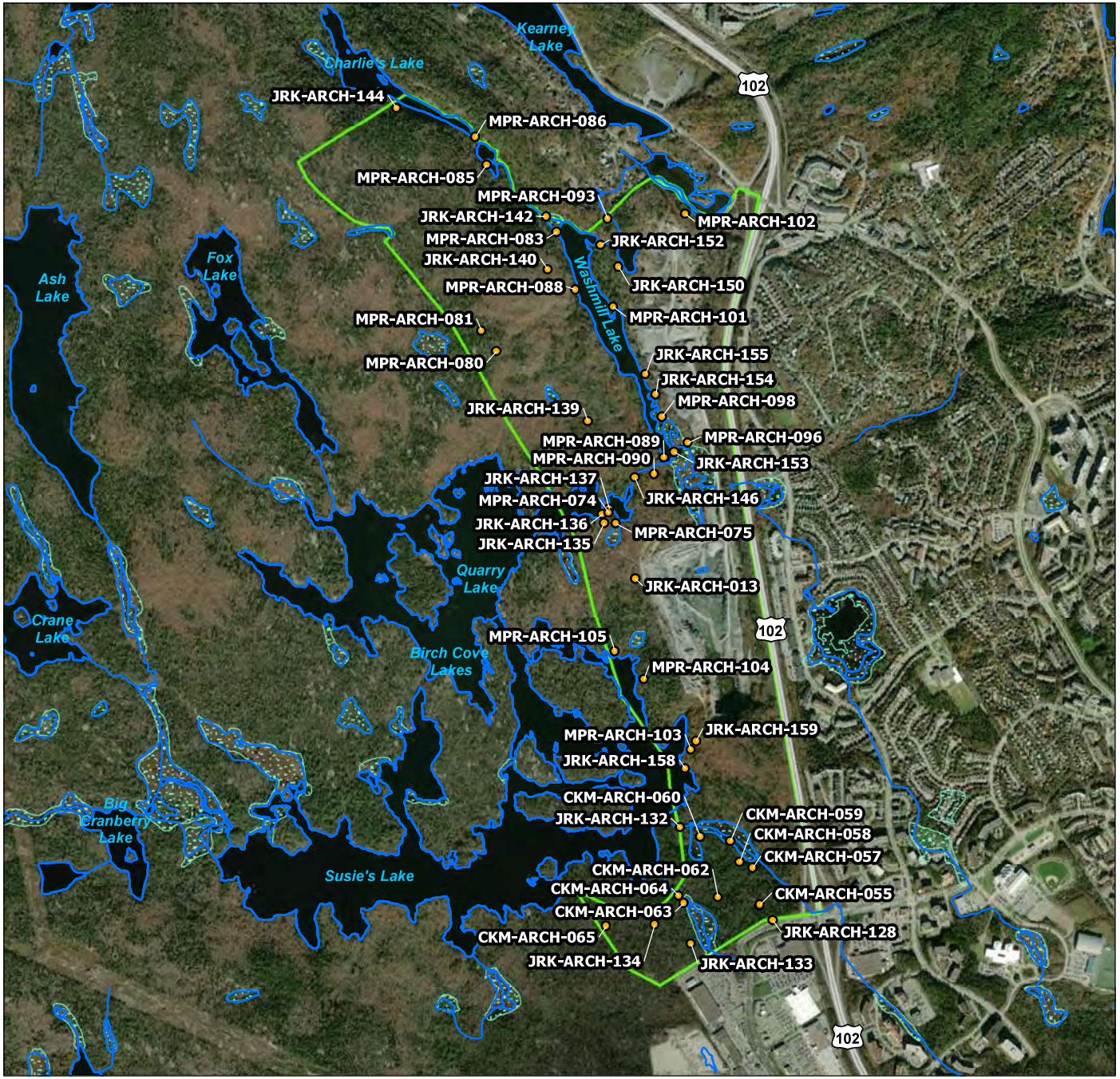

Stantec

HALIFAX

- Archaeological Assessment Note
- Highway
- Watercourse
- Waterbody
- Wetland
- Project Development Area

N

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(At original document size of 8.5x11)

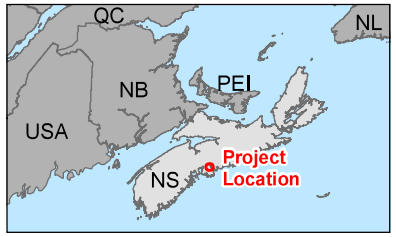
1:25,000

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N

2. Data Sources: GNS, HRM, and GPS

3. Background: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



Project Location

Halifax,
Nova Scotia

Prepared by MPR on 2024-02-23

Client/Project

160410459-0001 REVA

Halifax Regional Municipality
Future Serviced Communities: Highway 102 West Corridor ARIA

Figure No.

2

Title

Archaeological Assessment Notes

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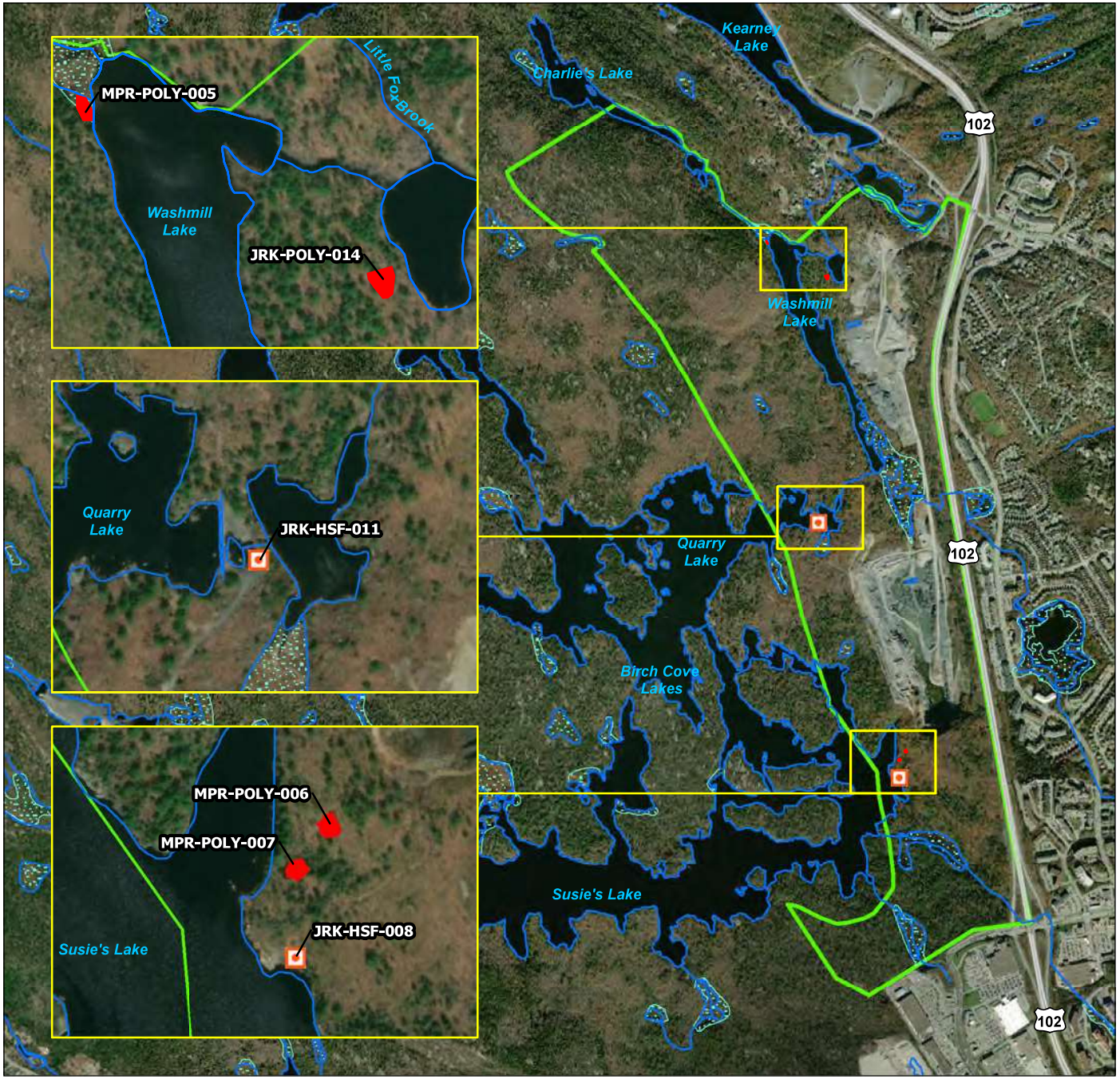

Stantec

HALIFAX

- Heritage Feature
- High Archaeological Potential
- Highway
- Watercourse
- Waterbody
- Wetland
- Project Development Area

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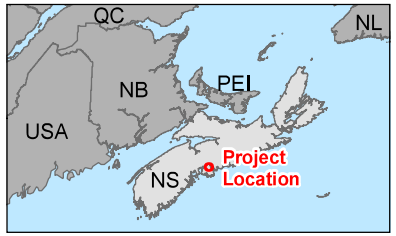

Project Location
Halifax,
Nova Scotia

Prepared by MPR on 2024-02-23

Client/Project
160410459-0001 REVA

Halifax Regional Municipality
Future Serviced Communities: Highway 102 West Corridor ARIA

Figure No.
3

Title
Heritage Features and High Potential Areas

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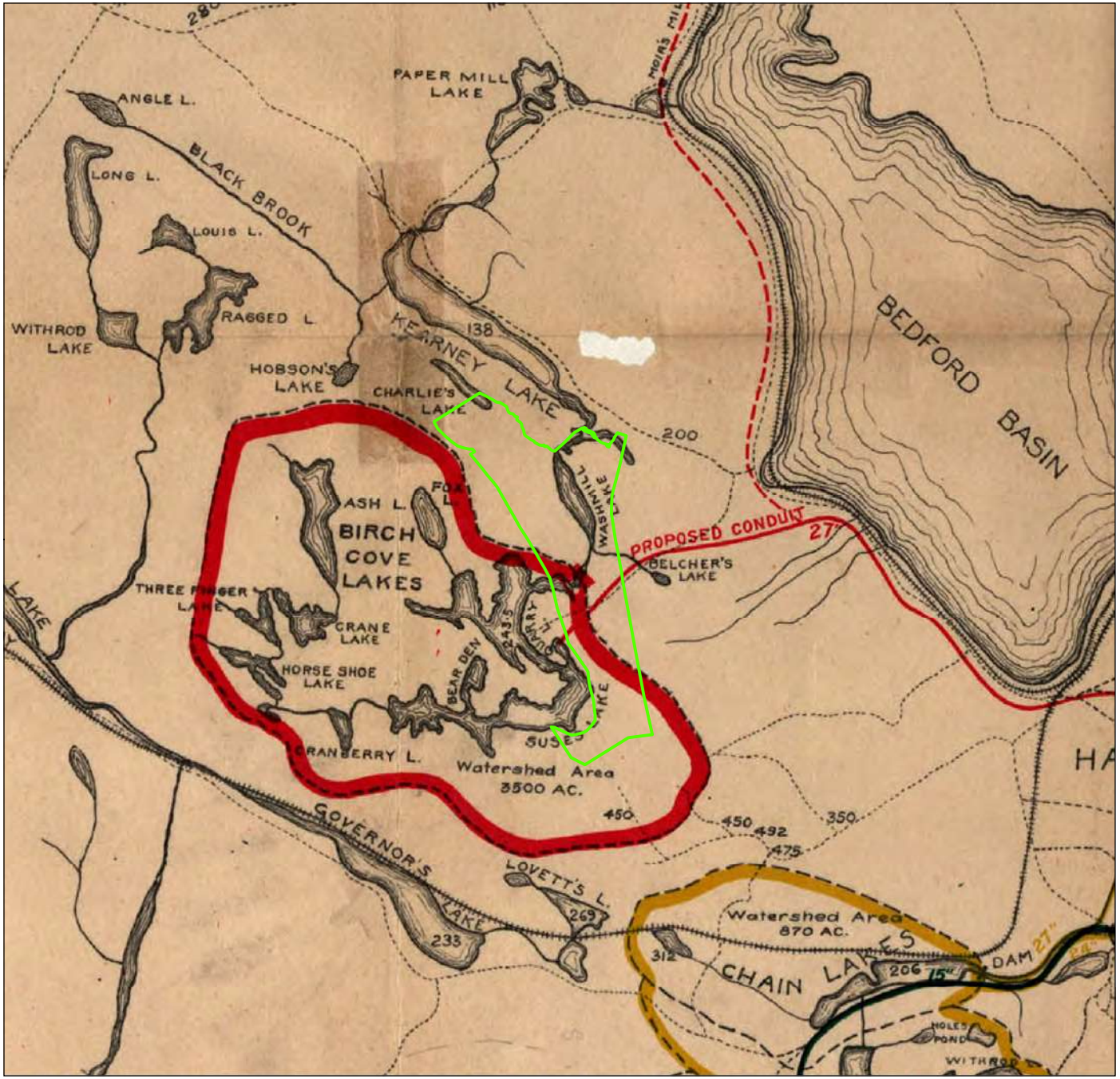

Stantec

HALIFAX

Project Development Area

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Notes

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2. Data Sources: HRM and PANS
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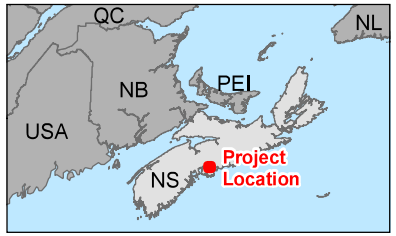

Project Location
Halifax,
Nova Scotia

Prepared by MPR on 2024-02-23

Client/Project
160410459-0001 REVA

Halifax Regional Municipality
Future Serviced Communities: Highway 102 West Corridor ARIA

Figure No.
4

Title
1906 Map of City of Halifax Water Supply

\\Ca0213-pfs01\work_group\1214\active\160410459\gis_dataworking\mpr\Figure4-160410459_Hwy102_ARIA_1906_map.mxd Revised: 2024-02-26 By: mrooney

Stantec

HALIFAX

Project Development Area

N

0 300 600 Meters

(At original document size of 8.5x11)
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Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
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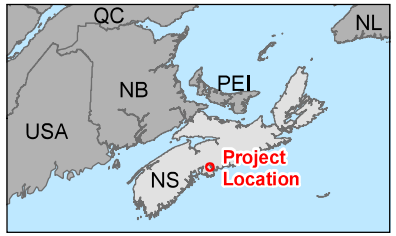
3. Background: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community and NRCan 1931 Historic Air Photo A3561-0017



Project Location

Prepared by MPR on 2024-02-23

Halifax,
Nova Scotia

Client/Project

160410459-0001 REVA

Halifax Regional Municipality
Future Serviced Communities: Highway 102 West Corridor ARIA

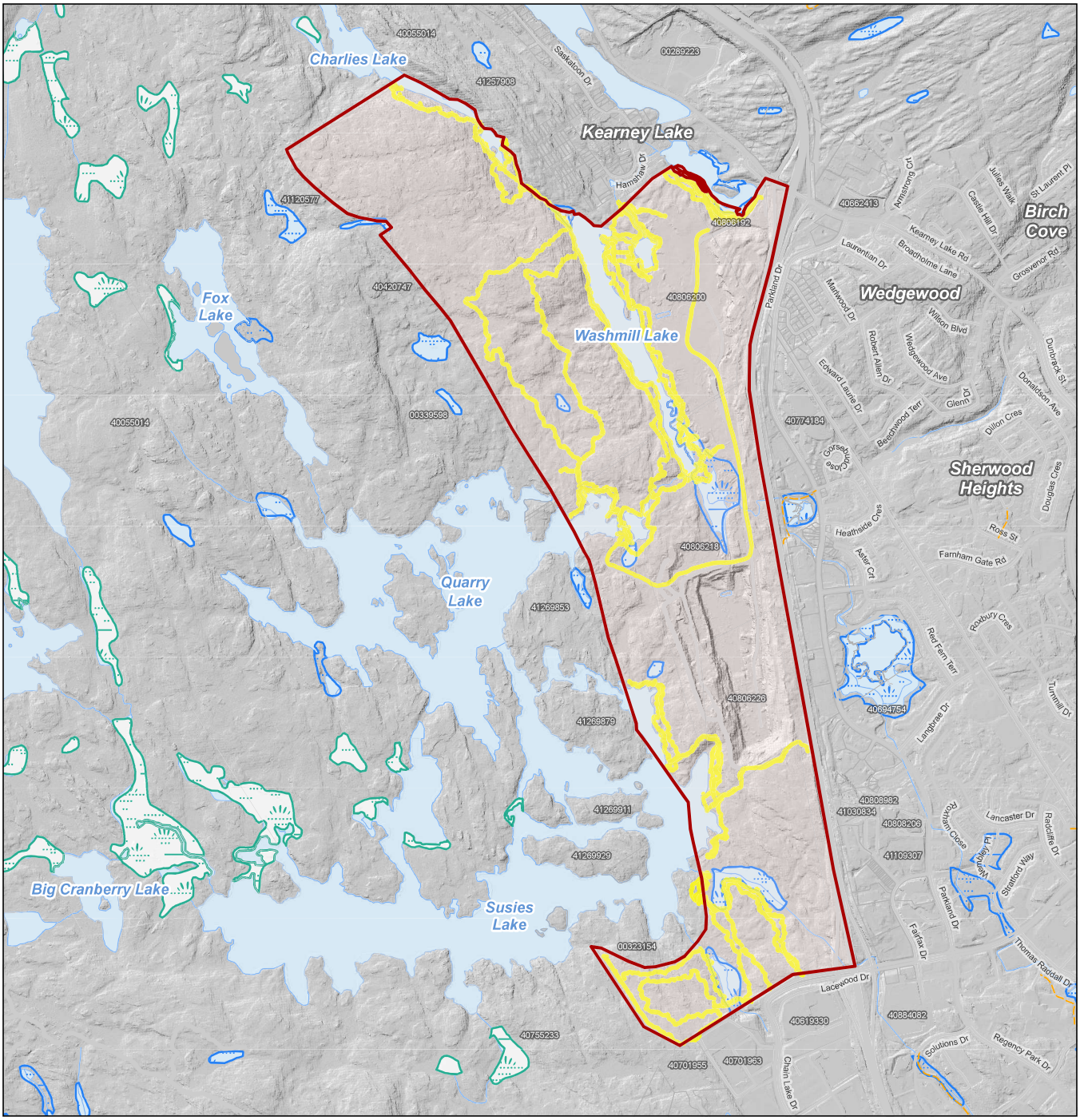
Figure No.

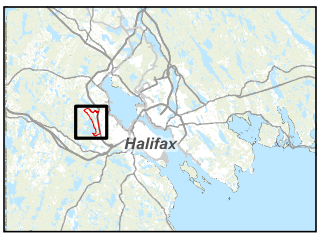
5

Title

1931 Historic Air Photo

\\Ca0213-ppfss01\work_group\1214\active\160410459\gis_dataworking\mpr\Figure5-160410459_Hwy102_ARIA_1931_aerial.mxd Revised: 2024-02-26 By: mrooney





Legend

- Archaeological Tracklog
- PDA

Transportation

- Trail
- Highway
- Other Road

Other Features

- Waterways
- Waterbodies
- Designated Wetland of Special Significance
- Wetland
- Property Boundary

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(At original document size of 8.5x11)
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Stantec

Project Location
Halifax Regional Municipality, Nova Scotia

Prepared by SChubbs on 2024-06-12

Client/Project
Halifax Regional Municipality
Future Serviced Communities
Background Studies

Fig ID: 160410459_043

Figure No.
6

Title
LiDAR with Survey Tracklogs

Notes

1. Coordinate System: NAD 1983 CSRS UTM Zone 20N
2. Data Sources: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services
3. Background: Government of Nova Scotia, Department of Service Nova Scotia and Internal Services

HRM FCM 2022.aprx Revised: 2024-06-12 By: schubbs

APPENDIX B

Photographs

HRP A2023NS169	
	
Photo 1 JRK-ARCH-128: The treeline marks the beginning of the PDA. It is at the bottom of a steep slope, adjacent from Lacewood Drive. Facing east.	Photo 2 CKM-ARCH-055: Large glacial erratics are visible headed north. Facing southeast.
	
Photo 3 CKM-ARCH-057: Additional boulders covered in sphagnum moss with a slope greater than 25 degrees. Facing east.	Photo 4 CKM-ARCH-058: The edge of a riparian wetland is visible in the PDA. Facing north.

HRP A2023NS169	
	
Photo 5 CKM-ARCH-059: Long grass and alders cover the northwestern section of the western quadrant. Facing south.	Photo 6 JRK-ARCH-132: Watercourse that drains into Birch Cove Lakes. Facing northwest.

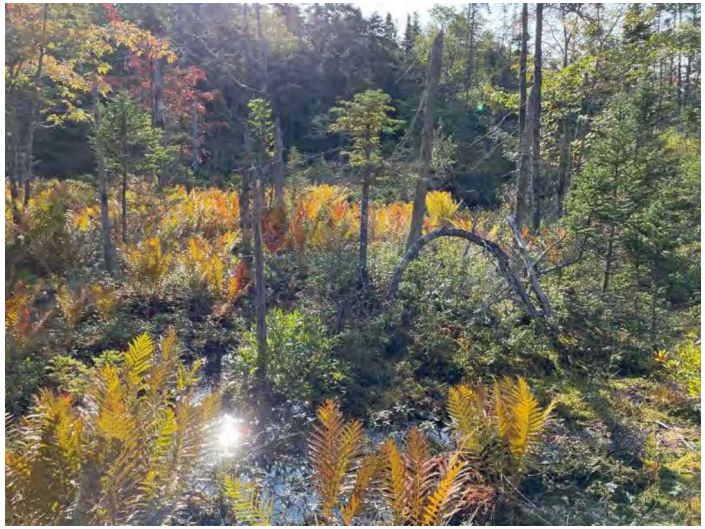
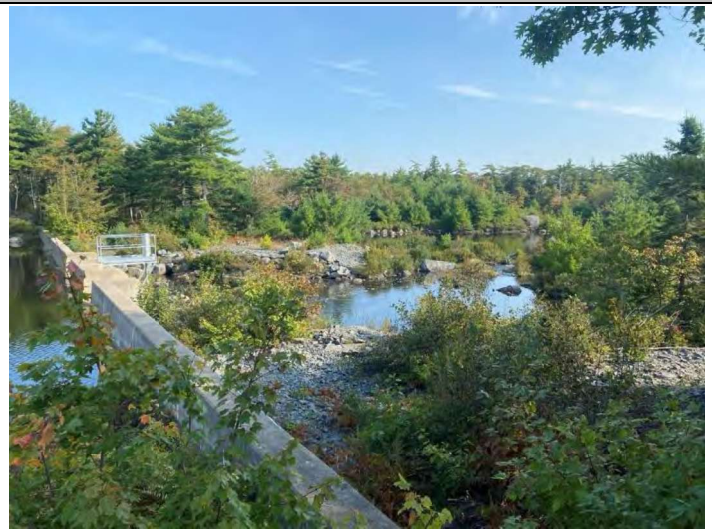
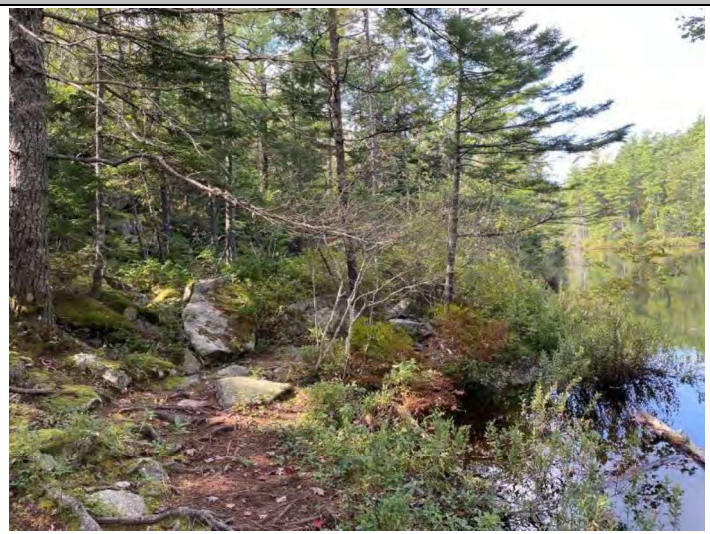



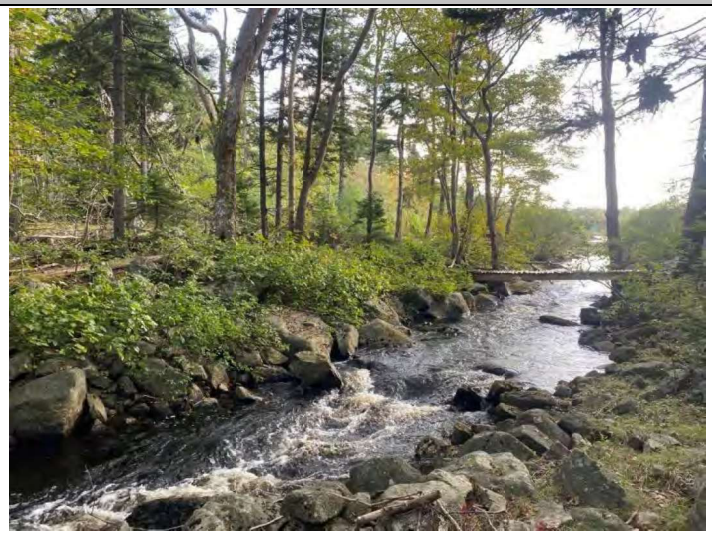
Photo 7 CKM-ARCH-062: Hydrophytic species growing in bog like conditions in the southern portion of the PDA. Facing east.	Photo 8 CKM-ARCH-063: Edge of wetland area. Boulders are present along a slope greater than 25 degrees. Facing east.

HRP A2023NS169	
	
Photo 9 CKM-ARCH-064: Watercourse that feeds into the wetland from Birch Cove Lakes. Boulders are present along the edge of the watercourse. Facing north.	Photo 10 The ground conditions change in this higher elevation area. The topography is undulating and is covered in shrubs and blowdowns. Facing east.
	
Photo 11 CKM-ARCH-065: The hiker trail visible at the edge of the PDA. A mixture of softwood and hardwoods with low lying ferns encircle a rocky hiker trail at the edge of the PDA. Facing north	Photo 12 Bedrock covering the ground surface in the southern extent in the PDA. Facing south.

HRP A2023NS169	
	
Photo 13 JRK-ARCH-135: Access road that has crushed rock covering the entirety of the road surface. Facing northeast.	Photo 14 JRK-ARCH-136: Contemporary concrete and stone dam that is still in use. Facing north.
	
Photo 15 MPR-ARCH-075: Riparian wetland visible along the shoreline of the Quary Lake outlet. Boulder squatters are frequent here as well. Facing south.	Photo 16 JRK-ARCH-137: Concrete dam at Quarry Lake. Facing west.

HRP A2023NS169	
	
Photo 17 JRK-ARCH-139: The land begins to slope lower and become more wet. Ferns are visible covering the ground floor. Facing south.	Photo 18 MPR-ARCH-080: Elevated rock exposure headed east towards Washmill Lake. Facing south.
	
Photo 19 JRK-ARCH-140: The terrain slopes down more than 25 degrees towards Washmill Lake. Facing north.	Photo 20 MPR-ARCH-083/MPR-POLY-005: A well drained flat area near the top of the inlet at Washmill Lake. Facing north.

HRP A2023NS169	
	
Photo 21 JRK-ARCH-142: Watercourse that flows into Washmill Lake. Facing south.	Photo 22 MPR-ARCH-086: Steep boulder terrain separates Charlies Lake and Charlies Pond. Facing east.
	
Photo 23 JRK-ARCH-144: Abandoned log cabin adjacent to the western shoreline along Charlies Lake. Facing north	Photo 24 Boulder scatters along the western shoreline of Washmill Lake. Facing southeast.

HRP A2023NS169	
	
Photo 25 MPR-ARCH-089: Edge of watercourse southwest of Washmill Lake. Facing northwest.	Photo 26 MPR-ARCH-090: Rocky terrain along the watercourse between Washmill Lake and Quarry Lake. Facing south.
	
Photo 27 Modern debris and very rocky soil exists along the western section of the watercourse emptying into Kearney Lake. Facing northwest.	Photo 28 MPR-ARCH-093: Cinder block debris and push piles located north of Kearney Lake. Facing east.

HRP A2023NS169	
	
Photo 29 Elevated potential area JRK-ARCH-014 identified along the shoreline of the pond in the northeastern section of the PDA. Facing east.	Photo 30 MPR-ARCH-096: Wetland conditions southeast of Washmill Lake. Facing south.
	
Photo 31 MPR-ARCH-098: Shallow soil development and rocky ground under a tree throw east of Washmill Lake. Facing southwest.	Photo 32 JRK-ARCH-154: Rocky push pile on the eastern edge of Washmill Lake. Facing north.

HRP A2023NS169	
	
Photo 33 JRK-ARCH-155: Steel pump house and access road on eastern edge of Washmill Lake, leading to the quarry. Facing west.	Photo 34 MPR-ARCH-102: Boulder scatters with soft and hardwood trees. Sloping downwards towards the shoreline of the pond. Facing northwest.
	
Photo 35 JRK-ARCH-158: Bedrock outcrop along the eastern shoreline of Birch Cove Lakes. Facing west.	Photo 36 HSF-JRK-008 identified east of Birch Cove Lakes. Facing west.

HRP A2023NS169	
	
Photo 37 MPR-POLY-007 identified east of the Birch Cove Lakes. The ground is open and flat. Contemporary garbage exists on the ground. Facing northwest.	Photo 38 MPR-POLY-006 identified east of the Birch Cove Lakes. The area is well drained and is flat with sporadic hard wood trees. Facing south.

APPENDIX E

Old Growth Forest Types – Nova Scotia

Table C.1 Old-Growth Forest Community Comparisons from Other Jurisdictions

Nova Scotia FEC Forest Group	Nova Scotia FEC Vegetation Types	Nova Scotia Old Growth Age-of-Onset (years)	ON [a] General Species Association	ON [a] Old Growth Age-of-Onset (years)	Minnesota [b] Old-Growth Forest Types	Minnesota [b] Old Growth Age-of-Onset (years)
Tolerant Hardwood	TH1, TH2, TH3, TH4, TH5, TH6, TH7, TH8	140	Hard Maple Yellow Birch Red Oak	120-140 150-160 110-120	Northern Hardwood Forests	120
Spruce-Hemlock	SH3, SH4, SH5, SH6, SH7	125	White Spruce	110-130	White Spruce Forests	90
Spruce-Hemlock	SH1, SH2	140	Hemlock	140-180	n/a	
Mixedwood	MW1, MW2, MW3	125	Yellow Birch Soft Maple Hemlock	150-160 80-120 140-180	Oak Forests	120
Spruce-Pine	SP4, SP5. SP7, SP9	125	White Pine Black Spruce	130-150 90-150	Red and White Pine Forests [c]	
Cedar	CE1	100	White Cedar	100-150	Upland White Cedar Forests	120
Wet Coniferous	WC1, WC2, WC5, WC8	100	Black Spruce	90-150	n/a	
Coastal	CO1, CO4	100	Black Spruce Balsam Fir	90-150 70-80	n/a	
Coastal	CO3, CO5, CO6	125	White Birch Soft Maple	90-110 80-120	n/a	
Highland	HL1, HL2	100	n/a		n/a	
Highland	HL3, HL4	140	Yellow Birch	150-160	n/a	
Wet Deciduous	WD3, WD4, WD6, WD8	115	Soft Maple	80-120	Lowland Hardwood Forests	120
Floodplain	FP1, FP2, FP3	125	Hard Maple Soft Maple Red Oak	120-140 80-120 110-120	Lowland Hardwood Forests	120
Karst	KA1, KA2	125	Hemlock	140-180	n/a	

a – Uhlig et al. (2001) b – Minnesota DNR (2021) c – Minnesota DNR (1989)

Table C.2 Maximum longevity for dominant tree species associated with the forest groups (and vegetation types) included in Nova Scotia's old-growth forest definition

Tree Species	Literature Max age [ab]	Literature Max age – 50%	L&F database Max age [cde]
Eastern Hemlock	800	400	520
Red Spruce	400	200	335
White Pine	450	225	288
Black Spruce	250	125	277
Black Spruce Coastal	250	125	150
Balsam Fir	200	100	160
Sugar Maple	400	200	276
Yellow Birch	366	183	370
Red Oak	400	200	205
Red Maple	300	150	188

a – Burns and Honkala (1990).
b – Loehle (1987).
c – Natural Resources and Renewables Permanent Sample Plot Database
d – Natural Resources and Renewables Forest Ecosystem Classification Plot Database
e – Natural Resources and Renewables Old-Forest Research Plot Database