



**DEXTER CONSTRUCTION COMPANY LIMITED
WELSHTOWN QUARRY EXPANSION,
WELSHTOWN, SHELBURNE COUNTY
NOVA SCOTIA**

**Registration Document for a Class 1 Undertaking Under Section 9 (1)
of the Nova Scotia Environment Assessment Regulations**

NOVEMBER 2020

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APPENDICES

Appendix A	Property Information <ul style="list-style-type: none">• Existing Industrial Approval• Joint Stock Certificate• Quarry Survey Plan
Appendix B	Drawings <ul style="list-style-type: none">• Site Location Plan• Future Expansion Area
Appendix C	Rock Sulphur Content Analysis Results
Appendix D	Biophysical Assessment Report (Envirosphere 2020)
Appendix E	Cultural Resource Management Report (CRM 2020)
Appendix F	Public Consultation Documentation

1.0 INTRODUCTION

Dexter Construction Company Limited (herein after referred to as “Dexter”) of Bedford, Nova Scotia is proposing to expand an existing aggregate quarry located on Upper Clyde Road, Welshtown, Shelburne County, Nova Scotia. An approval to expand the quarry is required under the Nova Scotia Environmental Assessment Regulations. The registration of this Environmental Assessment (“EA”) is in response to Schedule A of the Environmental Assessment Regulations, Undertaking B.2., “*A pit or quarry that is larger than 4 ha. in area for extracting building or construction stone.*”

Dexter is a private Canadian company. It is incorporated under the laws of Nova Scotia and registered to do business in Nova Scotia under the Nova Scotia Corporations Registration Act. Dexter’s Registry of Joint Stock Certificate is attached in **Appendix A** “Property Information.” Municipal Enterprises Limited is the parent company of Dexter Construction Company Limited and may be referred to within the appendices.

Address:

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P.O. Box 48100
Bedford, NS, B4A 3Z2
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Proponent Contact:

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Phone: 902-832-6346

Consultant Contact:

Mr. J. H. Fraser, M. A. Sc., P. Geo.
Consulting Hydrogeologist
Phone: 772-812-1981 (Cell)

The Welshtown quarry operates under an existing Industrial Approval (Approval No. 2016-095706), which has a current expiry date of April 22, 2026. A copy of the Industrial Approval (NSE File # 92100-30) is also attached in **Appendix A** “Property Information”.

2.0 THE UNDERTAKING

2.1 Description of the Undertaking

Dexter proposes to expand its existing Welshtown quarry for the production of aggregate, primarily used in the local highway and construction industry. The proposed undertaking (“*the quarry*”) involves the expansion of an existing Nova Scotia Environment approved quarry from a less than four hectare permit area to a 35.3 hectare permit area. The permitted site plan of the existing quarry is included in **Appendix A**. The proposed expanded quarry boundaries are illustrated in **Appendix B**.

2.2 Location

The existing and expanded quarry properties are located on a combination of company owned (PID# 80106925) and private land (PID#'s 80106875; 80106867; 80106826) leased to Dexter on the Upper Clyde Road in Welshtown, Shelburne County, Nova Scotia, 4849985 Northing, 310276 Easting, UTM Zone 20, NAD 83. The site is shown in Google Earth satellite imagery from May 10, 2020. (**Figures 1 & 2 (below) and Drawing 1, Appendix B**).

PID's 80106875, 80106867, and 80106826 are properties leased from Robert Davis and Rosalie Davis. PID 80106925 is owned by Municipal Enterprises Limited, the parent company of Dexter Construction.

Municipal zoning in the area encompassing the quarry properties is "General Development" which allows a quarry and associated works.



Figure 1. Project Location

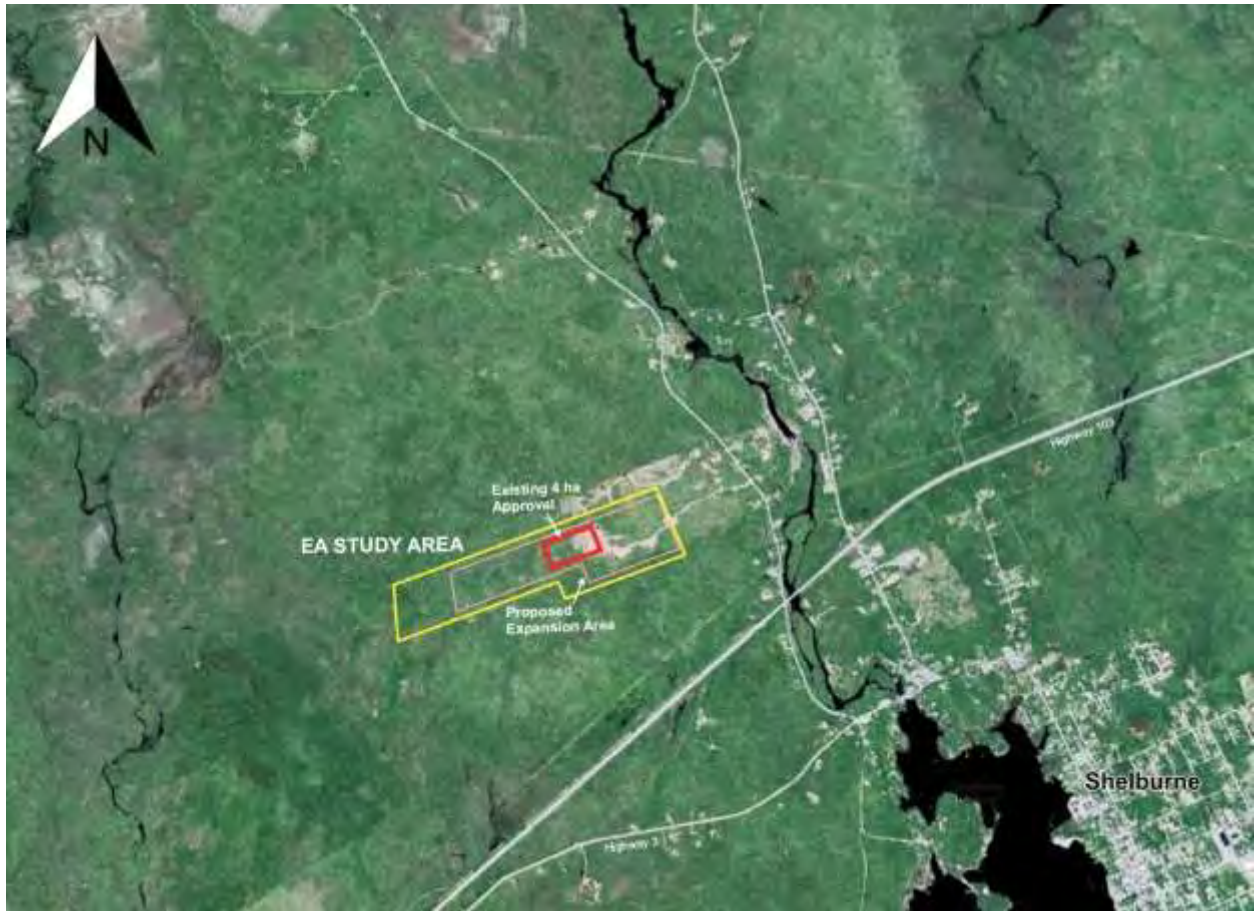


Figure 2. Site Location and Adjacent Land Use

3.0 SCOPE OF THE UNDERTAKING

Dexter intends to expand the existing Welshtown quarry for the continued purpose of extracting and supplying aggregate for the local construction industry. The existing quarry has been operating under a NSE Industrial Approval (2016-095706) for a less than four hectare quarry for approximately 5 years. The scope of this application is for expansion of the existing quarry to a 35.3 hectare permit area. Other than an increase in the total operating footprint of the site, site activities are not expected to increase in scope or frequency from past use.

The existing active area includes on-site related facilities including a scale house as well as a staging area for a portable asphalt plant, portable crushing spread, and stockpiling areas. During past operations, Dexter has extracted an average of approximately 25,000 to 50,000 tonnes of aggregate per year from the quarry during years in which the quarry was active. There are no off-site related support facilities, other than the provincial highway network.

It is Dexter's intent to continue quarry operations on the property, using existing infrastructure. It is anticipated that future operations will involve the extraction of up to 50,000 tonnes/year for the foreseeable future. However, the annual quantity may vary depending on local demand and associated project requirements.

3.1 Purpose/Need of the Undertaking

Dexter proposes to expand the existing Welshtown quarry for the production of aggregate, primarily used in the road and local construction industry. The primary benefit will be to the people of Nova Scotia via the continued construction and maintenance of the Provincial highway system.

3.2 Consideration of Alternatives

Dexter operates rock quarries throughout Nova Scotia and Atlantic Canada and uses modern industry standard methodologies in all phases of the extraction, processing and delivery processes. Alternative processes are always being considered in terms of their efficiency, cost effectiveness and environmental mitigation advantages. Continuing operations of the Welshtown quarry will be assessed on an on-going basis to ensure that the best available techniques are being utilized in all phases of day to day operations.

3.3 Scope of the Environmental Assessment

The scope of the environmental assessment is in keeping with the Nova Scotia Environment document entitled "Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia" as well as Dexter's experience with respect to similar projects over the past several decades. The scope also takes into consideration that the quarry is, at present, operational, and subject to an existing Industrial Approval. Additional approvals that will be required for the project include amending the existing Industrial Approval, and wetland alteration approvals for any wetlands that may be impacted by the project. No other licenses, certificates, permits, or approvals specific to the proposed quarry expansion are expected to be required for the project.

The following sections of this document provide a description of the project and an overview of the human uses and biophysical features of the local environment; outlines the key "Valued Environmental Components" addressed by the EA document; and presents an evaluation and summary of the benefits and potential drawbacks to the environment during all phases of the proposed undertaking. In support of the EA a "Biophysical Description and Assessment"

(Appendix D) and an “Archaeological Resource Impact Assessment” (Appendix E) were completed.

4.0 PUBLIC INVOLVEMENT

4.1 Methods of Involvement

Dexter has engaged various public entities, as outlined below. Public notification to date has focussed on meeting with local elected officials to notify them of Dexter’s intent to file an EA application to expand the existing Welshtown quarry, and provide background information on the project. In this regard, the following persons have been engaged regarding the intent of this EA document:

Stakeholder	Description of Engagement	Summary of Engagement	Concerns Identified	Concerns Addressed
Acadia First Nation – Chief Deborah Robinson	April 24, 2020 – Early Engagement Letter October 20, 2020 - Notification Letter	Early engagement letter, including brief description of project and anticipated timeline, offer to discuss the project and commitment to send a follow up letter prior to EA registration. <ul style="list-style-type: none"> No response received. Notification letter, including EA registration date, copy of public notice & publish locations, location of hard & electronic copies available for review, deadline for submission of comments, offer to meet to discuss.	No concerns received	N/A
Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) Ms. Twila Gaudet	April 24, 2020 – Early Engagement Letter October 20, 2020 – Follow up Notification Letter	Copied KMKNO on early engagement letter to Acadia First Nation. <ul style="list-style-type: none"> Forwarded a copy of early engagement letter via email. No response received. Notification letter, including EA registration date, copy of public notice & publish locations, location of hard & electronic copies available for review, deadline for submission of comments, offer to meet to discuss.	No concerns received	N/A

Table 1. Welshtown Quarry Environmental Assessment - Stakeholder Engagement Summary

Stakeholder	Description of Engagement	Summary of Engagement	Concerns Identified	Concerns Addressed
Native Council of Nova Scotia (NCNS) Chief Lorraine Augustine	April 24, 2020 – Early Engagement Letter October 20, 2020 - Notification Letter	Early engagement letter, including brief description of project and anticipated timeline, offer to discuss the project and commitment to send a follow up letter prior to EA registration. <ul style="list-style-type: none"> • Forwarded a copy of early engagement letter via email to Dan Jewell (NCNS). • No response received. Second notification letter, including EA registration date, copy of public notice and publish locations, location of hard and electronic copies available for review, deadline for submission of comments, offer to meet to discuss. <ul style="list-style-type: none"> • Forwarded a copy of early engagement letter via email to Jamie MacDonald (NCNS). 	No concerns received	N/A
Office of Aboriginal Affairs Ms. Gillian Fielding Consultation Advisor	April 14, 2020 - Email April 24, 2020 – Early Engagement Letter October 20, 2020 - Notification Letter	Dexter request to OAA for recommended First Nation stateholders for project. OAA responded via email on April 17, 2020 with recommendation. Copied OAA on early engagement letter to Acadia First Nation. <ul style="list-style-type: none"> • Forwarded a copy of early engagement letter via email. Copied OAA on Notification Letter letter to Acadia First Nation. <ul style="list-style-type: none"> • Forwarded a copy of Notification Letter via email. 	No concerns received	N/A

Table 1. Welshtown Quarry Environmental Assessment - Stakeholder Engagement Summary				
Stakeholder	Description of Engagement	Summary of Engagement	Concerns Identified	Concerns Addressed
Local Community - Elected Officials Ms. Kim Masland MLA	September 21, 2020 - Email	Dexter email to notify of project and upcoming EA Registration, including an offer to meet & discuss.	General questions regarding project were received. No concerns identified at this time.	N/A
	September 28, 2020 – Meeting	Provided general information on quarries around the Province, including rehabilitation requirements and typical terms and conditions. Reviewed EA process, public consultation requirements, First Nations engagement and the EA public comment timeline. Provided background information on the existing quarry and the scope of biophysical assessment and archaeology studies completed as part of the EA process. Both parties commented that the existing Dexter quarries in the Shelburne area have not generated any local concerns and are important contributors to the local economy.		
	October 20, 2020 - Email	Email to notify of registration date and placement of public notices.		

Stakeholder	Description of Engagement	Summary of Engagement	Concerns Identified	Concerns Addressed
Local Community - Elected Officials Mr. Terry McIntyre – Councilor District 4 Ms. Penny Smith – Warden Ms. Trudy Payne - CAO	September 22, 2020 – Email	Dexter email to notify of project and upcoming EA Registration, including an offer to meet & discuss.	General questions regarding project were received. No concerns identified at this time.	N/A
	October 7, 2020 – Meeting	High level discussion on Dexter quarry operations around the Province and history of operation at the Welshtown quarry. Discussed typical conditions of Industrial Approval including reclamation and bonding requirements. Reviewed EA process, community engagement requirements and steps Dexter will take to solicit public input. All parties agreed that there have been no local concerns regarding the operation of the existing Welshtown quarry.		
	October 20, 2020 - Email	Email to notify of registration date and placement of public notices, and provide Welshtown Quarry FAQ.		

With respect to the First Nations Community, Dexter has followed the Proponent’s Guide: The Role of Proponents in Crown Consultation with the Mi’kmaq of Nova Scotia. In this regard, as above, Dexter has advised Chief Deborah Robinson (Acadia First Nation) of its intent to file the Registration Document for a Class 1 Undertaking under Section 9 (1) of the NS Environmental Assessment Regulations in a letter dated April 24, 2020. Dexter also sent this letter to Ms. Twila Gaudet of the Kwilmu’kw Maw-klusuaqn Negotiation Office (KMKNO), Chief Lorraine Augustine of the Native Council of Nova Scotia and Ms. Gillian Fielding of the Office of Aboriginal Affairs. A copy of this letter is included in **Appendix F**. A follow up letter was also sent to all noted First Nation representatives on October 20, 2020 advising of the EA registration date, public viewing locations, and timelines for the submission of comments. A copy of these letters are included in **Appendix F**. No concerns regarding the project have been received from the First Nations Community to date. Dexter will continue to liaison with the First Nation Community when appropriate, and forward any comments received regarding the Project to NSE.

4.2 Public Concerns

No public concerns regarding the project have been received to date. General questions regarding the project were received from local community elected officials, who also requested to be notified should Dexter receive any concerns from local stakeholders and community members. Dexter will document any concerns received during the public consultation portion of the EA process, and provide a copy to NSE.

4.3 Future Steps

The public will be notified of the EA Registration by an advertisement in the Chronicle Herald on November 3, 2020. A copy of the newspaper advertisement is included in **Appendix F**.

5.0 DESCRIPTION OF THE UNDERTAKING

5.1 Existing Quarry Operations

The existing quarry operations involve blasting, crushing, and stockpiling of aggregate and associated trucking on an as required basis. In addition, a portable NSE approved asphalt plant is occasionally situated on the property.

The quarry is operated in accordance with an existing Industrial Approval (Approval No. 2016-095706). A copy of the Industrial Approval (NSE File # 92100-30) is also included in **Appendix A**. The quarry also operates in accordance with the Nova Scotia Pit and Quarry Guidelines. These Guidelines apply to all pit and quarry operations in the Province and provide separation distances for operations, blasting limits, liquid effluent discharge limits, suspended particulate matter limits, sound level limits and requirements for a reclamation plan and security bond. Dexter is committed to the utilization of Best Management Practices in all phases of their operations, including the on-site management of air quality, greenhouse gas emissions, noise, dust, and water quality and will operate in accordance with applicable Federal and Provincial legislation and standards.

Blasting, crushing and trucking of aggregate products have occurred on an as-required basis, with blasting occurring on an average of one to two times per year for years in which the site is active. As the quarry expands, surface water controls will be maintained and associated surface water monitoring will be implemented to ensure that surface water leaving the site meets all applicable water quality guidelines

With respect to the characteristics of the quarry bedrock, Dexter arranged for the collection and analysis of a rock sample for sulphur content to determine if the material was sulphide bearing. The results of this analysis yielded a sulphur concentration of 0.028 % (0.87 kg H₂SO₄/tonne), which is well below the maximum (0.4 % S; 12.51 kg H₂SO₄/tonne) defined by NSE as sulphide bearing material and is therefore not acid producing. The laboratory results of this sample, and an associated lab duplicate, are included in **Appendix C**.

5.2 Future Quarry Operations

Dexter proposes to expand the Welshtown quarry for the extraction, storage and removal of aggregate, primarily used in the road and local construction industry. This EA is focussing on current needs, but also future needs; therefore Dexter is requesting the EA approval for approximately 35.3 hectares, which includes provisions for both production and operational working areas, storage (stockpiles) areas, aggregate reserves, and provisions for surface water control. Other than an increase in the total operating footprint of the site, site activities are not expected to increase in scope or frequency from past use.

Although totally dependent on local market conditions, it is anticipated, at this time, that future development will involve the production of up to approximately 50,000 tonnes of aggregate per year, for the foreseeable future. The quarry highwall would advance in a westerly direction from the existing face, away from residents located on Upper Clyde Road (**Drawing # 2, Appendix B**). **Drawing # 2, Appendix B** identifies the total 35.3 hectare expansion area.

Quarry operations will generally coincide with the road construction season; therefore it would be reasonable to anticipate periodic, seasonal operations within a similar time frame (April – December). The quarry will operate when and as required within the typical 32 week construction season, depending on local demand and project requirements. A typical project (often an NSTIR Contract) will require crushing activities at the quarry for a period of two to three weeks at a time. During crushing activities the site may be operated 24 hours per day, possibly 7 days per week. Following crushing activities, aggregate products would be loaded and hauled from the quarry for several weeks, or as required by the project. During load and haul activities the site is typically operated during daylight hours (approx. 12 hours per year), possibly 7 days per week.

Dexter is committed to the utilization of Best Management Practices in all phases of their operations, including the on-site management of air quality, greenhouse gas emissions, noise, dust and water quality, and will operate in accordance with applicable Federal and Provincial legislation and standards.

Consistent with current operations, aggregate production would commence with drilling and blasting, utilizing a qualified blasting contractor to conduct this work. The blasting contractor would be responsible for blast designs and methods in accordance with the General Blasting Regulations contained in the Nova Scotia Occupational Health and Safety Act, 1996. Blasting would also be conducted to maintain limits in accordance with the Pit and Quarry Guidelines. Blasting and noise level guidelines respecting the time of day/day of the week will be followed and blast monitoring will be conducted for every blast event. The existing Industrial Approval stipulates blasting monitoring requirements.

The blasted rock will be excavated with a front-end loader or excavator and processed by portable crushing equipment. The various aggregate products will be stockpiled in designated areas within the quarry. Material, within the quarry, will be hauled and moved with a front-end loader. Products will be transported from the quarry via tandem and tractor trailer trucks via the Upper Clyde Road and will be routed as necessary through the provincial highway and roadway network to support local projects. The number of trucks hauling aggregate will be determined on a job by job basis, however as the site is not expected to increase in level of activity, trucking activity is not expected to increase from past use. Employment numbers are also not expected to vary significantly from past use.

It is important to note that aggregate excavation will not take place below the current quarry floor elevation and therefore will not intercept the deep bedrock water table. In addition, there will be no pumping of groundwater and therefore no dewatering of the associated bedrock aquifer.

6.0 EXISTING ENVIRONMENT

6.1 Physical Environment

6.1.1 Climate and Winds

The Welshtown Quarry study site is moderately exposed to winds originating from the ocean (located approximately 6 km from the Atlantic Coast) and has a low elevation 35 to 85 m. Proximity to the ocean leads to the occurrence of short cool summers and relatively mild, wet winters (Webb and Marshall 1999) while the climate also has inland influences leading to mild, early springs, cool summers and mild winters (Webb and Marshall 1999). Average daily

temperatures are moderate¹, ranging from a low of -4.6 °C in January to 19.4°C in July and an annual average of 7.7°C (Canadian Climate Normals 2019 (Figure 3)). The area has a high annual average precipitation of 1486 mm (measured at Liverpool), about 12% coming as snow, mainly in January (Canadian Climate Normals 2019). Rain falls predominantly in March-April and secondarily in October-November. Extreme daily precipitation events can be expected, as in most parts of Nova Scotia, in particular due to a tendency for more extreme weather events to occur as a result of global climate change. Fog is common along the Atlantic Coast, associated with southerly winds, and is a major problem in coastal areas of Southwest Nova Scotia, particularly in summer (Environment Canada 2016). Wind patterns are similar to other locations on the south shore of Nova Scotia—generally strongest in winter, predominantly from the west to northwest (November-February), shifting to southwest in March and to south in April. Predominantly southwest winds in May to August-September shift back to the west to northwest for October to December (TDC Atlas 1991). In particular the site is potentially exposed to winds in strong north easterly gales which move along the Nova Scotia coast predominantly in winter.

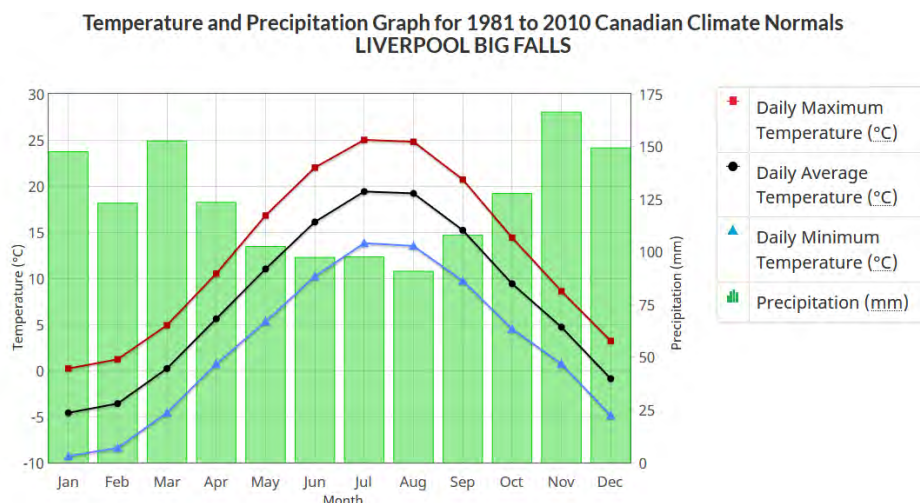


Figure 3. Annual precipitation and temperature cycle, Liverpool, Big Falls (1981-2010) (Canadian Climate Normals 2019).

6.1.2 Topography and Geology

Landscape

The Welshtown Quarry and associated study area is located at the south edge of a bedrock plateau, with resulting steep slopes around it descending southeast, south and west. To the east from the existing quarry, the land slopes gradually to the Roseway River (see Figure 42). To the south, land slopes steeply to a table-like plateau with irregular drainage that supports peatlands, and with a moderate slope to the west. Uplands at the site are characteristically regenerated mixed forest stands with some characteristic older and taller and iconic species such as White Pine, and swales and basins occupied by forested swamps (Figures 4 and 5). Topography at the site mainly follows the bedrock surface, which is characterized by bedrock prominences, the highest reaching an elevation of approximately 85 m in the north central part, and contains swales

¹ Climate conditions are measured at Liverpool, Big Falls, and summarized for 1981 to 2010 (Canadian Climate Normals 2019).

and several basins 20 m or more in depth. The study area lacks drumlins which are characteristic of areas both east and west (NSDLF 2019).



Figure 4. Forest landscape at Welshtown Quarry, October 2019.



Figure 5. Forested swamp in a topographic basin at Welshtown Quarry, June 2020.

Bedrock Geology

The Welshtown Quarry is located over a geological contact between igneous granites of the Shelburne Pluton and the metamorphic Goldenville Formation (Figure 6). The eastern half of the study site is Goldenville Formation, one of two bedrock groups that makes up the Cambrian-Ordovician-aged Meguma Supergroup. The lower Goldenville Formation, which occurs under the eastern section of the site, is composed of grey, laminated or cross-laminated metasandstone (greywacke, quartzite), locally imbedded with metasiltstone and slate, containing coarse-grained metasandstone and conglomerate (White et al. 2001; Mallinson 1988; White 2012) (Figure 6). The western half of the site is underlain by the Shelburne Pluton, a granite intrusion through the Meguma Supergroup that occurred in Southwest Nova Scotia. At the site, these consist of Middle-Late Devonian monzogranite, one of the two main groups that make up the Shelburne Pluton (Rogers and Barr 1988).

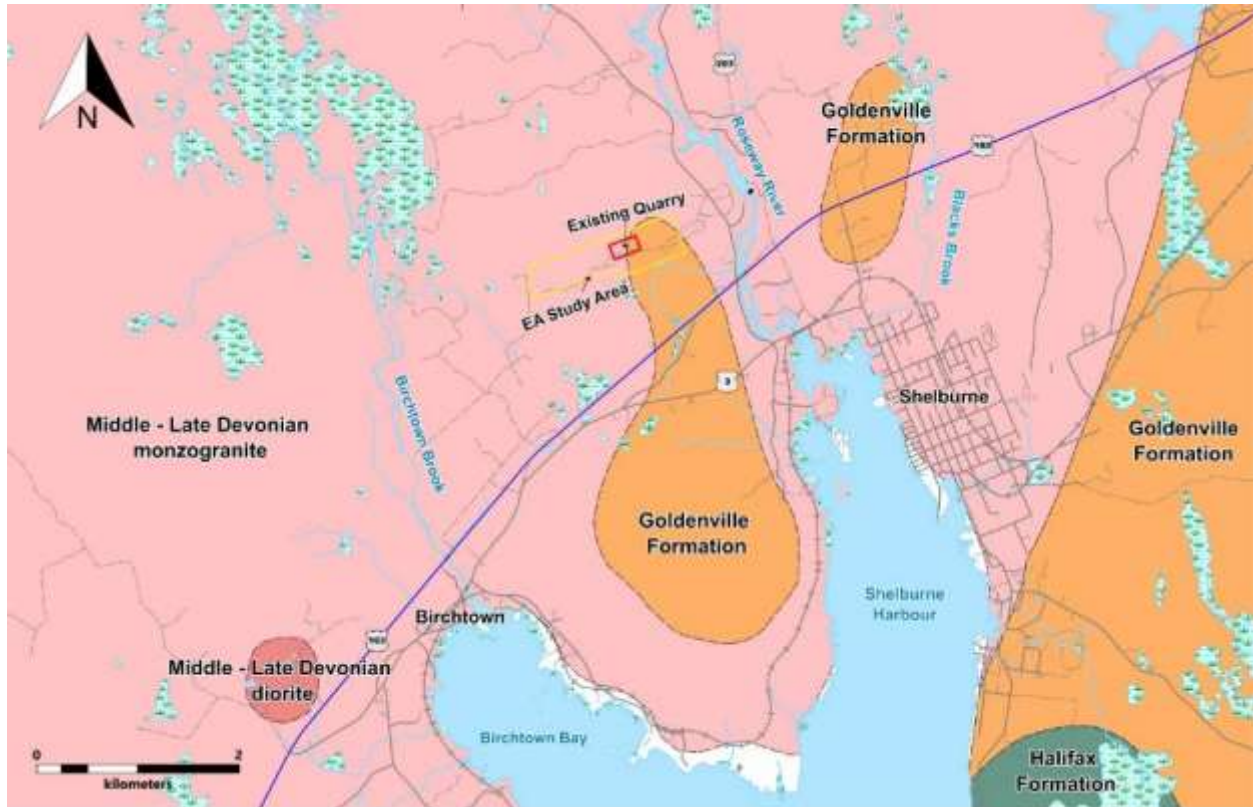


Figure 6. Bedrock formations in the vicinity of the Welshtown Quarry (Keppie 2000).

Surficial Geology

The Welshtown Quarry site is on a shallow till plain overlying a level to gradually sloping bedrock surface near the eastern end of the Shelburne Granite Plain (Davis and Browne 1997). Till is predominantly stony, sandy, and shallow, derived from local bedrock (Stea et al. 1992) (Figure 7). Bedrock exposures and boulders occur throughout the study area. Basins in bedrock with surface water accumulations have developed shallow peat deposits. The Shelburne Plain is characterized by poor drainage, shallow depth to bedrock, and hard pan development which leads to accumulation of surface water and development of peat (Davis and Browne 1997).

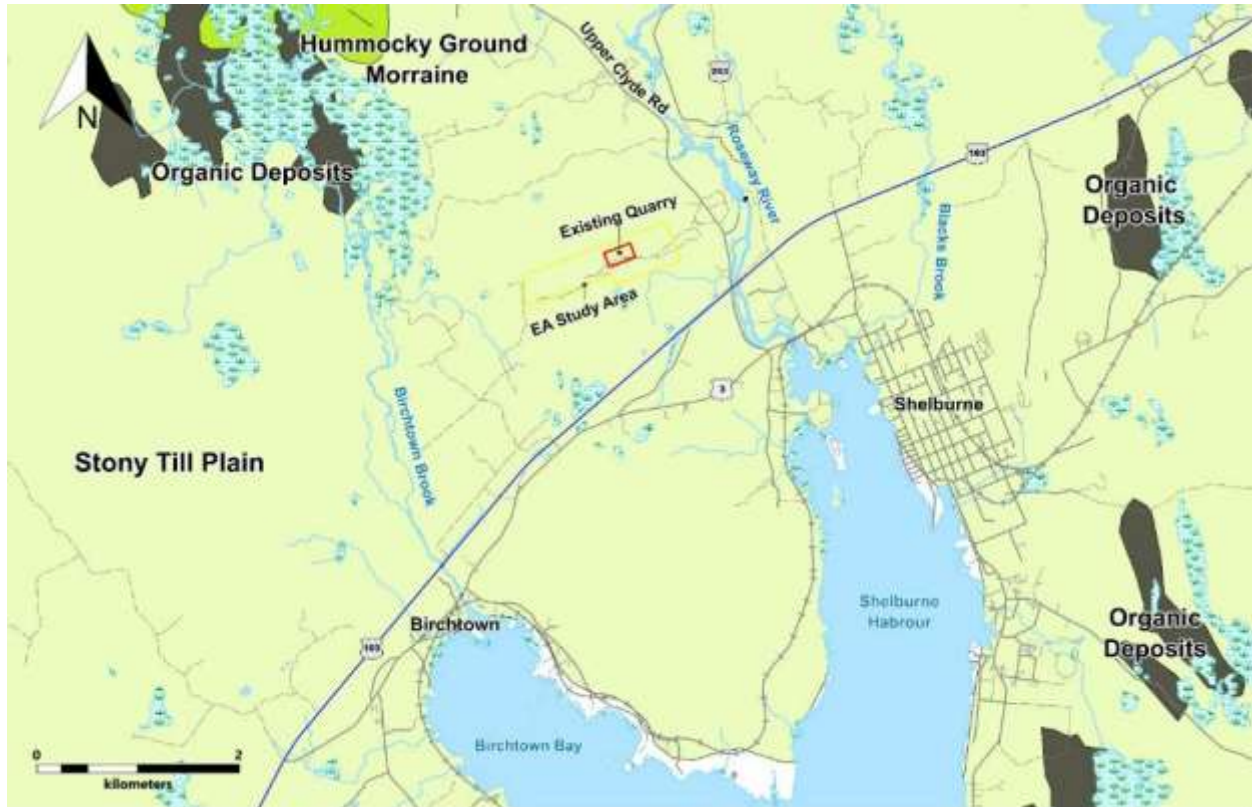


Figure 7. Surficial geology of the study area. From Stea et al. (1992) and digital version (2016).

6.1.3 Air Quality, Noise & Light

The Shelburne area experiences moderate levels of artificial light, ambient noise, and moderate to high air quality. The Town of Shelburne is a major source of artificial light and would be seen as sky reflections from the quarry; ambient noise levels at the quarry reflect traffic along Highway 103, as well as a lesser source from traffic and operations of the quarry; and air quality is expected to be good due to the rural location and predominantly forested setting.

Apart from light from the Town, house and yard lights as well as vehicle lights are the main sources of artificial light at the site. Residences along Upper Clyde Road near the site will contribute to light occurring at the site, though traffic traveling on Upper Clyde Road, are expected to be minor sources. Lights at the quarry, as well as 'skyshine' from operations when low cloud occurs, can probably be seen from Shelburne and offshore areas; however nearby residents of Upper Clyde Road interviewed noted that light from the quarry was not noticeable while it was in operation.

The Shelburne area is expected to have relatively high natural baseline air quality typical of areas with high percentage occurrence of natural landscape such as neighbouring forested wilderness areas, and also to open water such as the Atlantic Ocean on the south. Low levels of human activity, including vehicle traffic along Highway 103 and Upper Clyde Road, as well as that associated with quarry activities, have little impact on overall air quality at the site. Periodic dust and vehicle exhaust emissions from quarry activities as well as regular residential vehicle traffic are the main contributors to particulates and exhaust emissions, which are expected to be at low levels.

The quarry and associated movement of trucks and equipment would continue to provide a minor and periodic source of noise in the area. Operations at the quarry are periodic in response to demand for product and are likely one of the main noise sources in the area. Blasting occurs typically one to two times per year; operation of a portable crusher and heavy equipment may take place periodically and temporarily add to noise levels when the quarry is in operation; a portable asphalt plant may operate at the site periodically; and trucks are used to transport product and move the portable equipment as required. Typical noise includes blasting and sounds from the crusher and other heavy equipment operations (e.g. motors, generators, back-up signals etc.). The scope of operations, including annual usage, for the quarry are not expected to change and ambient noise levels in general are expected to be localized. Due to the presence of other sources of noise and light, activities at the quarry are likely to be less noticeable than otherwise. All trucks leaving the site are required to follow Company best operational practices, as well as those established by Truckers Association of Nova Scotia (TANS) and the Nova Scotia Road Builders Association (NSRBA), to minimize emissions. Noise levels arising from the quarry in the future will continue to meet the limits established in the Pit and Quarry Guidelines and are expected to be consistent with those produced by the existing quarry operations at the site.

6.1.4 Hydrology

The Welshtown Quarry is located on the divide between the 1EC-3 and 1EC-4 secondary watersheds that drain into the Roseway River on the east and Birchtown Brook to the west, respectively, and then into the Atlantic Ocean (Figure 8). Uplands have shallow to non-existent overburden and occasional bedrock exposures leading to rapid runoff after precipitation events down slopes or into intermittent watercourse channels or ravines, which are often dry. The lower portions of ravines support small, low-flowing watercourses. Basins and swales, however, accumulate water with overflow through some intermittent channels, and leading to development of pools and sphagnum moss and peat deposits. The west side of the Welshtown Quarry property drains into Birchtown Brook watershed while the eastern side drains into Roseway River watershed. Drainage down the south slope from the quarry enters a level plateau and disorganized drainage which supports an unnamed permanent watercourse that is a tributary to the Roseway River. This watercourse, although visible on Provincial mapping, is mainly subterranean and only occasionally visible at the surface.

Among the intermittent streams and flowages, as well as artificial drainage structures (i.e. ditches) found at the site, an intermittent stream in a small ravine crosses an access road in the center of the quarry property; and an intermittent stream flows west was found at the west end of the study site (Appendix D, Map A-4). The ravine for the first watercourse is formed by bedrock outcrops and drains into a small wetland (0.12 ha) (centre photo, Figure 9; Appendix D, Map A-4). The head of the ravine contained a wetland dominated by New York fern and occasional sphagnum moss, and was dry during the July survey. The wetland drains via a culvert under the access road (Figure 9) into a wetland on the south side of the road. At this point the watercourse does not have a defined channel and no flow through the culvert was observed at the time of the July survey. All the runoff is directed into the wetland and presumably leaves the site in groundwater or shallow, near-surface flow.



Figure 8. Welshtown Quarry property is divided by two sub-watersheds: Birchtown Brook and Roseway River.



Figure 9. Fern dominated ravine (left) that drains into sphagnum wetland with intermittent pools (center) and drains through a culvert under the main access road (right) located in the center of study area, Welshtown Quarry, June 24-26, 2020 & July 8, 2020.

Another intermittent stream was identified at the west end of the study site, where it originated in a red maple basin swamp just north of the access road (Figure 10, Appendix D, Map A-4) and led northwest to a second swamp at the west property boundary (Figure 10) from which it drains towards Birchtown Brook.



Figure 10. Red maple Swamp (left) and intermittent stream (center) that eventually drains into a hummocky wetland (right) at west end of study area, Welshtown Quarry, June 24-26, 2020 & July 8, 2020.

An analysis of surface water drainage patterns conducted using a digital elevation model (DEM) developed from local contours² showed disorganized drainage, supporting the flow pattern observed in the field (Figure 11). The active quarry site drains predominantly east along the prevailing downgradient. Surface runoff from the quarry floor first drains east and then transitions toward the south, exiting at the southeast corner via ditches, eventually flowing into the woods off the property and disappearing subsurface. A first order watercourse shown on Provincial mapping at the site was subterranean, with flow visible sporadically at the base of rocky depressions (Figure 12). Due to the prevailing slope, the source of this watercourse is predominantly from the west, and would only be influenced by drainage from the extreme western end of the quarry expansion area. This off-site stream becomes well defined, however, and emerges as a surface feature southeast of the quarry before it meets the Roseway River (Figure 13). Surface water drainage from the southwest end of the active quarry site drains toward the south and southwest where it enters a broad, low-lying peatland basin off the quarry property, which may drain to the unnamed tributary to the east. Some runoff also originates from precipitation reaching the outer slopes of berms and grubbing piles which surround the quarry and accumulates at the toe of slope, and also surface flow accumulates in ditches. In addition to surface water flow, some precipitation is expected to enter the water table by percolation through the quarry floor where it will continue to groundwater. Precipitation and associated surface and groundwater flows are expected to peak in the spring and winter periods with maximum flows estimated in May and December and minimum between July to September corresponding to the peaks in the regional runoff cycle (Figure 14).

² The Multiple Flow Direction (MFD) method in ArcGIS's Raster Analysis tool box, was used to determine flow direction.

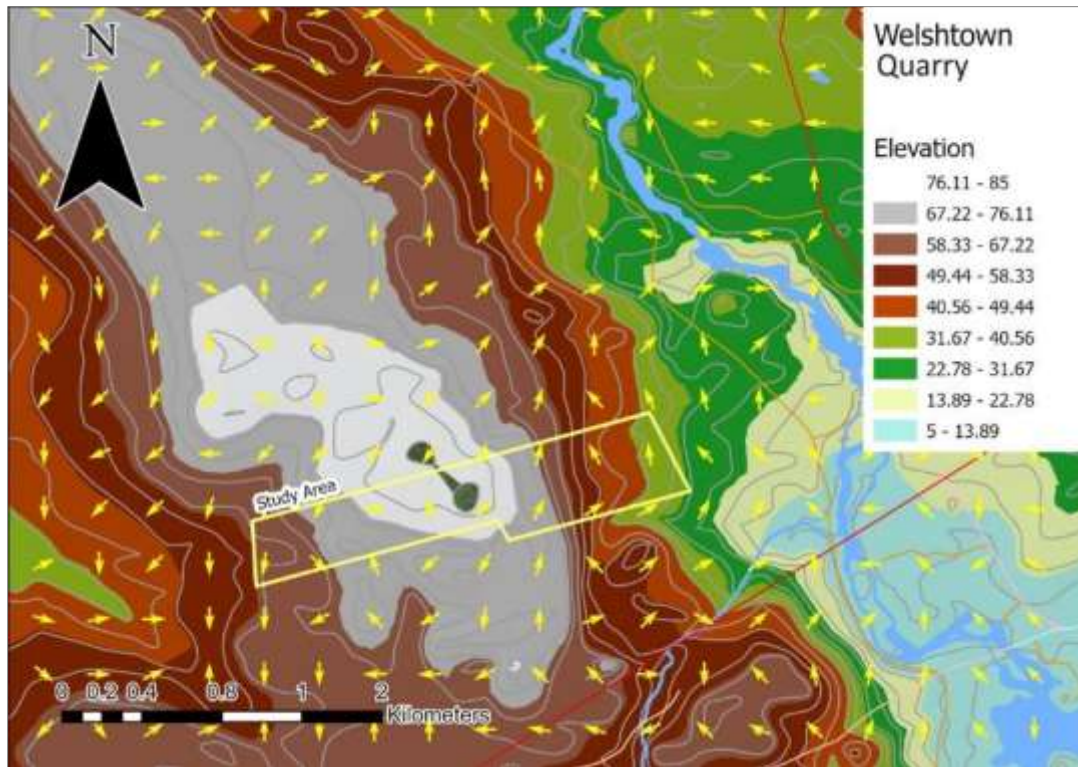


Figure 11. Modeled surface water flow direction analysis for Welshtown Quarry. Arrows show modeled flow direction.



Figure 12. Intermittent and subterranean flows of the unnamed tributary located south of the study area where the stream comes the closest to the Welshtown Quarry, July 8, 2020.



Figure 13. Unnamed tributary that becomes well defined before flowing through a concrete culvert under Upper Clyde Road and entering the Roseway River, July 8, 2020.

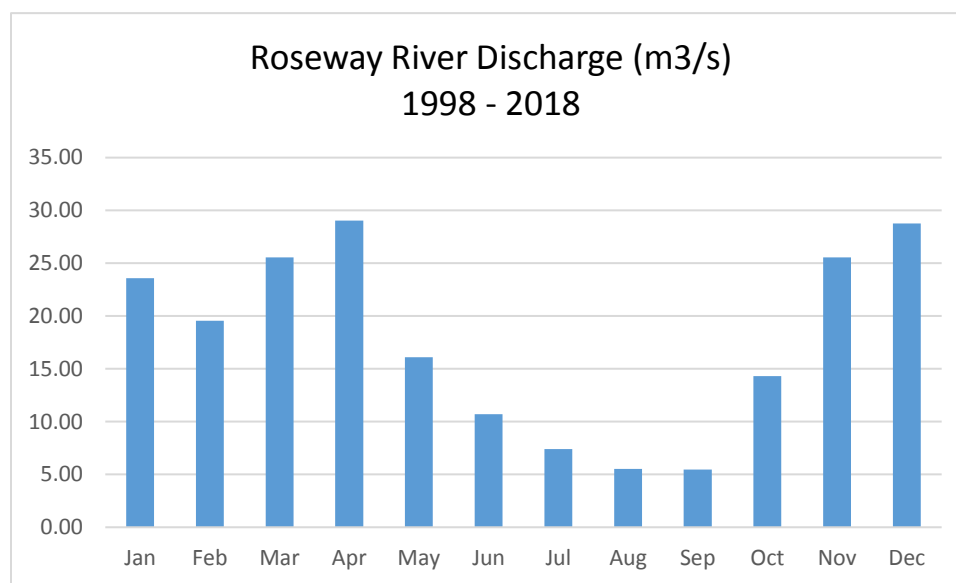


Figure 14. Annual pattern of surface water runoff in the vicinity of Welshtown. Roseway River flows measured at South Ohio, 1998 to 2018. Roseway River watershed area is 495 km².

6.1.5 Hydrogeology

The site is underlain predominantly by igneous and metamorphic bedrock, and groundwater develops predominantly subsurface in cracks and fractures, on horizontal surfaces between strata in bedrock, and in till which is shallow at the site. The water table at the site is below the floor of the quarry based on current drainage characteristics at the site. The actual depth of the bedrock water table at the quarry site is not known, but it has not been encountered during previous quarry operations, and it is not anticipated that the quarry expansion will reach the bedrock water table.

Surficial and shallow groundwater flow is anticipated to mirror the topographic slope, which although disorganized, flows west at the west end of the study area, south to southeast in central areas of the study area, and east to southeast at the east end.

Precipitation reaching the quarry floor infiltrates the floor or leaves via ditches and outflows into the surrounding forest; while some is expected to enter groundwater as seepage through cracks and fractures. Some areas of the site have small surface accumulations of water retained above bedrock in local depressions, however this is retained surface water and not an expression of the groundwater table.

6.1.6 Soils

The site is located on Gibraltar soils – yellowish brown to brown sandy loams that are prone to drying and are developed from till derived from granite. Topography is undulating with low hills and ridges, and soils are well drained to dry on the high areas (Cann et al. 1961). These soils prominently feature excessive amounts of granite stones and boulders littering the surface. The stoniness and imperfectly drained soils are limiting factors in land use and such soils are not suited for agriculture. Small areas are used for mixed farming and small pastures, but much of the area is forested and consists of pine, spruce, hemlock, birch and maple. Areas that have been swept by fires and remain forest barren consist of blueberry, crowberry, sweet fern, lambkill and wire birch (Cann et al. 1961).

6.2 Biological Resources and Habitat

6.2.1 Terrestrial Environment

The site is forested with predominantly medium aged White Pine, Red Spruce, Red Oak and Large-tooth Aspen at the highest elevations, mainly in the north central parts of the site. White Pine, Red and Balsam Fir, and Red Maple occupy slopes which extend to the west, south and southeast. Bases of several northeast- to southwest-trending swales are located centrally in the site; a basin occupying part of the west end; and the lower slope southeast of the site, are dominated by Balsam Fir, Black Spruce and Red Maple, associated with sphagnum slope or sphagnum basin swamps (Figures 15 to 21). This type of landscape is classified as Pine Oak Hills and Hummocks (NSDLF 2019). Forests at the higher elevations are drier and prone to fire disturbance. Higher elevations are characterized by exposed bedrock and bedrock prominences.

The study site is located in southwestern Nova Scotia near the Atlantic Coast where the damp and cool environment leads to the development of mixed and coniferous forests dominated by Balsam Fir, with a mix of understory plants including Cinnamon Fern (*Osmundastrum cinnamomeum*), Bunchberry (*Cornus canadensis*), Inkberry (*Ilex glabra*) and Red Maple seedlings (*Acer rubrum*), which are common throughout much of coastal Nova Scotia. Low relief and gradual slopes over poorly-drained soil lead to a patchwork of forest communities the characteristics of which are related to elevation and drainage, favouring development of wetlands in many areas (Davis and Browne 1997) (Appendix D, Map A-4). The terrain is gently rolling with subdued ridges separating poorly drained swamps and bogs in small, poorly-drained depressions (CEAA 2014). Forests in the vicinity of the quarry have largely been harvested at one time or another, and consist of regenerated stands of various ages.



Figure 15. Coniferous woodland with mosses dominating the forest floor (R. Newell, October 2019 botany survey).

Red Maple swamps occur in several areas on the study site and are dominated by Red Maple (*Acer rubrum*), Balsam Fir (*Abies balsamea*) and Sphagnum moss. Common herbaceous species and shrubs in the wetter portions of wooded swamps include New York Fern (*Thelypteris noveboracensis*), Cinnamon Fern (*Osmundastrum cinnamomeum*), Black Huckleberry (*Gaylussacia baccata*), Sheep Laurel (*Kalmia angustifolia*), Goldthread (*Coptis trifolia*), and Starflower (*Lysimachia borealis*), with Sphagnum (*Sphagnum* spp.) forming the dominant ground cover.



Figure 16. Red Maple swamp (W4 in Figure 30). Cinnamon Fern (*Osmundastrum cinnamomeum*) occurs in foreground (R. Newell, October 2019 botany survey).

Higher elevations on the property generally support patches of dry (mesic) woodland (Figure 15), with a mix of harvested stands – consisting of regenerated stands of various ages— and some

apparently undisturbed. Dominant tree species include Balsam Fir (*Abies balsamea*), Red Maple (*Acer rubrum*), Red Oak (*Quercus rubra*), Red Spruce (*Picea rubens*), and White Pine (*Pinus strobus*) with Large-toothed Aspen (*Populus grandidentata*) and White Birch (*Betula papyrifera*) less common. Interspersed between the higher elevations are occasional small, low, damp, sphagnous areas often with dense patches of Cinnamon Fern (*Osmundastrum cinnamomeum*) (Figure 16). Other common species within the shrub layer include Black Huckleberry (*Gaylussacia baccata*), Witch-hazel (*Hamamelis virginiana*), Bayberry (*Morella pensylvanica*), Inkberry (*Ilex glabra*), Chokeberry (*Photinia* sp.) and Sheep Laurel (*Kalmia angustifolia*). Ground vegetation includes Starflower (*Lysimachia borealis*), Wintergreen (*Gaultheria procumbens*), Indian Cucumber-root (*Medeola virginiana*), Bracken (*Pteridium aquilinum*) and Wild Sarsaparilla (*Aralia nudicaulis*). Some areas have dense shrub cover with sizeable boulders scattered throughout (Figures 17 and 18).



Figure 17. Mesic mixed woodland occurring at higher elevations (R. Newell, October 2019 botany survey).



Figure 18. Mesic mixed forest located south of the existing quarry. Dense shrub layer (left) with sizeable boulders are thinly scattered throughout this area (and elsewhere on the property) are often moss and lichen-covered with occasional ferns and flowering plants (right) (R. Newell, October 2019 botany survey).

Small exposed rock outcroppings occur locally (Figures 19 and 20), with commonly-occurring shrub species including Black Huckleberry (*Gaylussacia baccata*), Lowbush Blueberry (*Vaccinium angustifolium*), Sheep Laurel (*Kalmia angustifolia*) and Bayberry (*Morella pensylvanica*). These areas also supported various low shrubs (“subshrubs”) including several that were not observed elsewhere on the property including Golden-heather (*Hudsonia ericoides*) and Broom Crowberry (*Corema conradii*). Tree species on rock outcrops include Wire Birch (*Betula populifolia*), Red Oak (*Quercus rubra*), Red Spruce (*Picea rubens*) and White Pine (*Pinus strobus*), all of which are stunted, likely the result of limited soil and moisture. Various reindeer lichens (*Cladonia* spp.) are abundant on these outcrops (Figures 19 and 20).



Figure 19. Rock outcrop and associated plant communities (R. Newell, October 2019 botany survey).



Figure 20. Extensive beds of reindeer lichens (*Cladonia spp.*) (whitish ground cover) occurring on rock outcrops (R. Newell, October 2019 botany survey).

Small marshes and occasional damp sphagnum areas occasionally occurred across from or directly beside woods trails through the property (Figure 21). Disturbance and alteration of drainage associated with the construction of the trails may have led to the formation of these habitats, which are dominated by Cinnamon Fern (*Osmundastrum cinnamomeum*) and Black Huckleberry (*Gaylussacia baccata*), with occasional Steeplebush (*Spiraea tomentosa*), Atlantic Sedge (*Carex atlantica*), Canada Manna Grass (*Glyceria canadensis*), Common Woolly Bulrush (*Scirpus cyperinus*), Red Maple (*Acer rubrum*), Black Spruce (*Picea mariana*), Soft Rush (*Juncus effusus*), and Woodland Rush (*Juncus subcaudatus*) in the various wetlands. A mix of native and exotic vascular plant species occurs in other dryer areas along the edges of woods trails as well as directly on the trails themselves. Commonly-occurring species in these areas observed during botany surveys include: Green Alder (*Alnus alnobetula ssp. crispa*), Sweetfern (*Comptonia peregrina*), Wire Birch (*Betula populifolia*), Pinweed (*Lechea intermedia*), Pearly Everlasting

(*Anaphalis margaritacea*), Calico Aster (*Symphotrichum lateriflorum*), Downy Goldenrod (*Solidago puberula*), Rough Bentgrass (*Agrostis scabra*), Canada St. John's-wort (*Hypericum canadense*), Poverty Grass (*Danthonia spicata*) and Fall Dandelion (*Leontodon autumnalis*).



Figure 21. Marshy part of a sphagnum basin swamp disturbed by a woods road (W8 in Figure 30) located near the east boundary of the study site and a boggy marsh habitat (W6 in Figure 30) (R. Newell, October 2019 botany survey).

The study area supports a comparatively diverse plant community, with 88 species recorded during botany surveys conducted in October 2019 and June 2020. Four plant species of conservation concern were found during the surveys³, but most did not occur in the proposed expansion area. These included Golden-heather, which was primarily restricted to rock outcroppings on the property and was relatively common in this particular habitat (listed as imperiled, S2) (Figure 22); Woodland Rush (listed as vulnerable, S3) was observed at one site; Southern Twayblade (Figure 23) (listed as a Vulnerable, S3) was found only in a Red Maple Swamp located at the west end of the property. Eastern Blue-eyed Grass (Figure 24) was observed along an overgrown logging road in the northeast corner of the survey and expansion area (listed as vulnerable to apparently secure, S3S4). The lichen *Fucscopannaria leucosticta* (S2/S3 status) was found near the south edge of the study area, but its location is not within the proposed expansion area of the quarry (Figure 36). Several other lichens with S3 status were also found at the site (Figure 36).

³ No species at risk (i.e. listed under federal or provincial legislation) were encountered in the study area.



Figure 22. Golden-heather (*Hudsonia ericoides*) was observed primarily on rock outcrops during the fall survey (R. Newell, October 2019 botany survey).



Figure 23. Southern Twayblade (*Neottia bifolia*) in Red Maple swamp at west end of the survey area (R. Newell, June 2020 botany survey).



Figure 24. Eastern Blue-eyed Grass (*Sisyrinchium atlanticum*) occurring along a damp, grown-in logging road in the upper east corner of the survey area (R. Newell, October 2019 botany survey).

6.2.2 Aquatic Environment

The study site is located on a well-drained to dry headwater upland plateau where limited surface water can accumulate. The only surface water drainage features on site are flowages and intermittent streams originating around the margin of the plateau with no permanent, first-order streams on site. Flowages occur in the form of small ponds and channels and between rocks and outcrops along artificial structures such as roads. These flowages onsite are typically intermittent with occasional subterranean flows that move downslope (Figure 25). Several spring pools were identified in the northeast part of the study area (Figure 30, Appendix D, Map A-4). These deep pools were sporadic in the area and have formed in depressions where runoff accumulates on level surfaces during high runoff events.



Figure 25. Unnamed intermittent stream at WS1, July 8, 2020. For location see Figure 29.



Figure 26. Flow in ditch along access road at WS2, July 8, 2020. For location see Figure 29.

An unnamed, first order stream identified on Provincial NTS mapping is located in the vicinity of the study area about 100 m to the south (Figure 30, Appendix D, Map A-4). It sharply turns away from the quarry property toward the southeast and eventually drains into the Roseway River. The stream is small, typically less than 0.50 m in width and 10 cm deep near the quarry property (Figure 30) and widens as it nears the Roseway River (Figure 27). In the upper reaches near the quarry, bottom types range from sand to boulder and peat, with a high proportion of woody debris. The stream passes through a culvert at the Upper Clyde Road before it joins the Roseway River. Water quality of surface water that was sampled during the July site visit was high, showing high oxygen, low TSS and moderate pH (Table 2).



Figure 27. Unnamed permanent stream 100 m south of the EA study area (above) and at Upper Clyde Road (below), July 8, 2020.

6.2.3 Water Quality

Water quality measurements were made during the July 8 and 9, 2020 field survey at several locations (Figure 29), including: an intermittent stream at the west end of the study area (WS1); a ditch on the east end (WS2) (Figure 26); in surface water in an artificial depression (WS3) (Figure 28); and in an unnamed tributary to the Roseway River south of the study area (WS4) (above photo, Figure 27). A fifth site (WS5) represented water quality down gradient from the site, but with potential impact from the adjacent Upper Clyde Road (below photo, Figure 27). Overall, surface water quality at the Welshtown Quarry site is good. Surface waters sampled at WS1 and WS4 were typical of relatively undisturbed natural environments in upper watershed areas of southwestern Nova Scotia. WS2, WS3 represented water quality in disturbed parts of the site. Sites WS2 and WS5 were both collected near culverts under the main access road on the quarry site and the Upper Clyde Road, respectively, and showed high dissolved oxygen levels. Site WS3, an artificial surface water accumulation with no inlets or outlets also had high water quality. Conditions were typical of standing, shallow water bodies, and tadpoles were present, indicating use by local frog species.

Table 2. Water quality measurements from surface waters located at the Welshtown quarry and within the vicinity of Welshtown quarry. Site locations shown in Figure 29.					
Site Location & Date	July 8, 2020				
	Welshtown Quarry			Welshtown Quarry Vicinity	
	WS1	WS2	WS3	WS4	WS5
Site Description	Unnamed stream on west end of study site.	Drainage Ditch	Surface Water Accumulation	Unnamed tributary to Roseway River South of study site	Unnamed tributary to Roseway River, Upper Clyde Road
Temperature °C	12.7	17.4	21.8	13.3	15.2
Dissolved Oxygen (mg/L)	5.7	8.0	3.3	4.8	10.2
Dissolved Oxygen (% saturation)	52.9	85.5	35.1	46.5	99.3
Conductivity (µs/cm)	0	35.8	24.8	28.9	83.0
Specific Conductivity (25°) (µs/cm)	0	42.2	26.4	37.4	101.1
pH	4.5	6.0	6.3	6.5	6.2
TSS (mg/L)	4.0	-- ¹	16.0	9.0	<0.5
Colour	Clear, pale yellow-brown	Clear, pale yellow-brown	Clear, very pale yellow	Clear, pale yellow	Clear, pale yellow-brown
Sample Time	11:08 AM	6:44 PM	6:50 PM	6:15 PM	6:58 PM

1. Heavy growth of filamentous algae precluded TSS measurement. Note: TSS = Total Suspended Solids.

These surface waters showed moderate to high oxygen levels, slightly acidic conditions characteristic of headwaters, low conductivities, and generally low suspended sediment levels. Surface waters at the unnamed tributary to Roseway River showed high dissolved oxygen, and higher conductivity than the other streams, as expected due to its position lower in the watershed. pH levels were within guideline ranges for the protection of freshwater aquatic life at site WS4 while dissolved oxygen levels were acceptable at site WS1 (CCME 1999) (Table 2).



Figure 28. Surface water accumulation (WS3), July 8, 2020.



Figure 29. Locations for breeding bird and owl surveys (June 2020) and water sampling (July 8 to 9, 2020).

6.2.4 Wetlands

Wetlands are areas of land that are periodically or permanently flooded and support particular types of vegetation which are adapted to life in such environments. Types of wetlands occurring at the site are predominantly sphagnum slope swamps, small and large sphagnum basin swamps, and spring pools or ponds⁴. In places, modified forms of these types occur, where forest

⁴ National Wetland Working Group. 1997. The Canadian Wetland Classification System.

overstorey has been removed, drainage has been blocked by roads and altered by use of logging equipment, prior to current quarry operations.

In the higher elevation plateau and on higher slopes predominantly in the northeast section of the site, several small sphagnum swamps have developed in shallow swales and small basins (Figure 30; Appendix D, Map A-4). Some have been disturbed by logging equipment and road construction. Spring ponds (small openings between bedrock and boulders with standing water) also occur here. These develop various vegetation types ranging from shrubs to sphagnum around the margins. Treed slope swamps occur at lower elevations near the base of slopes in the south central part of the study area where drainage is

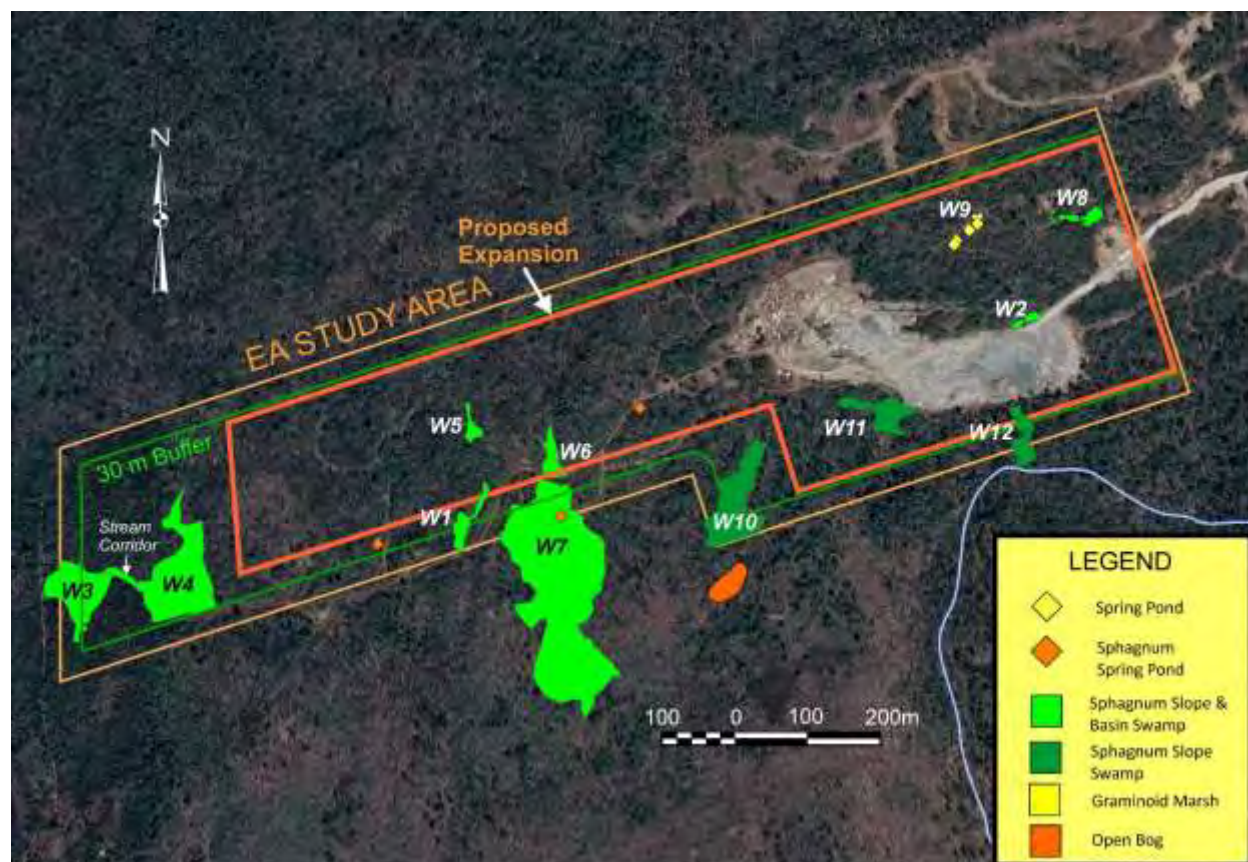


Figure 30. Wetlands at Welshtown Quarry.

predominantly south and southeast; and along the southwest slope at the west end of the study area. Slope swamps grade into treed sphagnum basin swamps. This complex occurs in two deep swales on the west central part of the site; and at the west end of the site; and a large basin swamp complex is found at the extreme west end of the proposed expansion area. Wetlands in the study area are shown in Figures 31 to 33 and on Appendix D, Map A-4 and summarized in Table 3.



Figure 31. Spring pool located in the northeast part of the study site, July 9, 2020.



Figure 32. Spring pool north of current quarry footprint, July 9 2020.



Figure 33. Sphagnum swamp modified to a marsh / fen (W8 in Figure 30) by blocked downstream flow.

Identification	Area (ha)	Wetland Type and Comments
W1	0.12	Slope swamp basin swamp
W2	0.04	Disturbed basin swamp
W3	0.43 (0.07)	Sphagnum basin swamp and slope swamp
W4	0.91	Sphagnum slope swamp / maple basin swamp
W5	0.06	Basin swamp slope swamp marsh fen
W6	0.12	Disturbed basin swamp marsh
W7	0.40 (2.42)	Treed basin swamp
W8	0.01	Graminoid Marsh
W9	0.03	Disturbed Sphagnum Graminoid Swamp / Marsh
W10	0.57	Sphagnum slope swamp
W11	0.23	Sphagnum basin & slope swamp
W12	0.09 (0.06)	Sphagnum slope swamp

6.2.5 Fish & Fish Habitat

No fish habitat occurs at the site—there are no streams or water bodies which could support fish. Watercourses at the site are all shallow, intermittent and occasionally subterranean and unconnected with fish-bearing waters. No direct runoff from the working area of the quarry enters ditches or ravines, which could impact directly on local fish habitat (e.g. Roseway River) (Figure 37). The unnamed tributary to the Roseway River nearest to the quarry (approximately 100 m from the south boundary of the study area) was intermittent and subterranean and therefore was

not accessible or suitable for fish (Figure 38). This tributary eventually becomes more defined as it nears the Roseway River, although there, it is not accessible by fish due to a hanging culvert under Upper Clyde Road. The Roseway River system supports Brook Trout, and possibly Atlantic salmon in addition to other freshwater fish typical of the area, including Yellow Perch, and the introduced Chain Pickerel and Smallmouth Bass (NSDFA 2020).



Figure 34. Roseway River at Upper Clyde Road near outlet of the unnamed watercourse, looking downstream, July 8, 2020.



Figure 35. Outlet of culvert of unnamed tributary at Upper Clyde Road and Roseway River, July 8, 2020.

6.2.6 Birds

Birds are important in the ecosystem in the vicinity of the Welshtown Quarry. Breeding birds observed during the site survey are summarized in Table 4. One hundred species of birds have been recorded as potentially breeding in the study area (Maritimes Breeding Bird Atlas 2019, Lower South Shore Region 18, Table 5), but additional species may breed at the site from time to time. There were no rare species in Nova Scotia (listed federally or provincially) observed or heard at any of the sites during bird surveys, although a Red-Breasted Nuthatch, a species with vulnerable status in the province of Nova Scotia, was present at one site during bird surveys. Two Important Bird and Biodiversity (IBA) Areas (NS017 South Shore (Roseway to Baccaro) and NS004 South Shore (Port Joli sector)) occur approximately 15 km southeast and northeast respectively⁵.

Habitat types in and around the study site include a mixture of forest types consisting of Red Maple, Black Spruce, Red Spruce, and White Pine as leading forest species. Surveys at the site included: a site walkover, a night owl survey and ten-minute dawn point-count surveys at seven sites on June 9, 2020 (Figure 29). A night survey for owls (0300 hrs to 0500 hrs) (observation sites shown in Figure 29) identified four Barred Owls in the approximate study area; one Saw Whet Owl in the distance; and four Barred Owls north of the site. Thirty-two (32) species of birds were heard in the dawn survey, through 10-minute point counts from 0510 to 0825 hrs (Table 4).

The most common and abundant species at the study site observed in the point-count survey were Magnolia Warbler and Hermit Thrush, which occurred in all habitat types and were moderately abundant (5.3 and 5.8 per site per 10-min, respectively); however American Robin, Palm Warbler, Common Yellowthroat and Ovenbird also occurred at all sites, though in lower numbers (Table 4).

Relatively high abundances of several species, and highest number of species overall were observed at the softwood dominant Site 7 (19 species) (Table 4, Figure 29), where important species included Swainson's Thrush, Hermit Thrush, Magnolia Warbler, American Robin, Common Yellow Throat, Black-and-white Warbler and Ovenbird (Table 4). All birds were expected based on the Maritimes Breeding Bird Atlas (2019) records for the area.

⁵ The *Important Birdlife and Biodiversity Areas Program Canada* (IBA) is a joint project of Bird Studies Canada and Nature Canada coordinated by BirdLife International.

Table 4. Bird species heard or observed during dawn point-count bird survey conducted June 9, 2020 between 0510 and 0825 hrs at the Welshtown Quarry study site. Survey locations shown in Figure 29).

Bird Species	Mixed White Pine, Red Spruce, Birch (Sites 1 & 3)		Mixed Red Spruce, Black Spruce, Red Maple, Trembling Aspen (Sites 4, 5 & 8)		Mixed Red Spruce, Black Spruce, Red Maple, Trembling Aspen (Site 7)		Mixed Red Maple and White Pine (Site 9)		Mixed Red Spruce, Red Maple, Trembling Aspen (Site 6)	
	Number of	Average/10	Number of	Average/10	Number of	Average/10	Number of	Average/10	Number of	Average/10
Passeriformes (Songbirds)										
Alder Flycatcher	2	2.0	0	0.0	0	0.0	0	0.0	0	0.0
American Crow	0	0.0	2	0.7	1	1.0	1	1.0	1	1.0
American Robin	2	1.5	3	4.0	1	2.0	1	2.0	1	2.0
Black-and-white Warbler	1	1.5	1	1.7	1	4.0	1	2.0	1	2.0
Black-capped Chickadee	1	0.5	1	1.0	1	2.0	0	0.0	1	2.0
Black-throated Blue Warbler	0	0.0	2	0.7	0	0.0	0	0.0	0	0.0
Black-throated Green Warbler	0	0.0	0	0.0	1	1.0	0	0.0	0	0.0
Blue-headed Vireo	1	0.5	3	1.3	1	1.0	0	0.0	1	3.0
Blue Jay	1	0.5	0	0.0	0	0.0	1	2.0	0	0.0
Cedar Waxwing	0	0.0	0	0.0	0	0.0	1	2.0	0	0.0
Common Yellowthroat	2	1.5	3	1.7	1	5.0	1	2.0	1	2.0
Dark-eyed Junco	2	1.5	0	0.0	1	1.0	1	2.0	0	0.0
Golden-crowned Kinglet	0	0.0	2	1.0	1	3.0	0	0.0	1	2.0
Hermit Thrush	2	2.0	3	3.3	1	19.0	1	3.0	1	10.0
Magnolia Warbler	2	7.0	3	3.3	1	6.0	1	8.0	1	4.0
Mourning Warbler	0	0.0	0	0.0	1	2.0	0	0.0	1	2.0
Northern Parula Warbler	0	0.0	1	0.3	0	0.0	1	1.0	1	1.0
Ovenbird	2	3.0	3	4.0	1	4.0	1	3.0	1	2.0
Palm Warbler	2	4.0	2	4.0	0	0.0	1	3.0	1	3.0
Purple Finch	1	0.5	0	0.0	1	1.0	0	0.0	0	0.0
Red-breasted Nuthatch	0	0.0	0	0.0	1	2.0	0	0.0	0	0.0
Red-eyed Vireo	2	2.5	3	1.0	0	0.0	1	1.0	1	2.0
Scarlet Tanager	0	0.0	1	0.3	0	0.0	0	0.0	0	0.0
Swainson's Thrush	1	0.5	3	2.3	1	20.0	1	1.0	1	5.0
Tree Swallow	1	1.0	0	0.0	0	0.0	0	0.0	0	0.0
White-throated Sparrow	2	4.0	0	0.0	0	0.0	0	0.0	0	0.0

Table 4. Bird species heard or observed during dawn point-count bird survey conducted June 9, 2020 between 0510 and 0825 hrs at the Welshtown Quarry study site. Survey locations shown in Figure 29).										
Bird Species	Mixed White Pine, Red Spruce, Birch (Sites 1 & 3)		Mixed Red Spruce, Black Spruce, Red Maple, Trembling Aspen (Sites 4, 5 & 8)		Mixed Red Spruce, Black Spruce, Red Maple, Trembling Aspen (Site 7)		Mixed Red Maple and White Pine (Site 9)		Mixed Red Spruce, Red Maple, Trembling Aspen (Site 6)	
	Number of	Average/10	Number of	Average/10	Number of	Average/10	Number of	Average/10	Number of	Average/10
Yellow-rumped Warbler	1	0.5	2	0.7	0	0.0	0	0.0	0	0.0
Gaviiformes (Loons)										
Common Loon	0	0.0	1	0.3	1	1.0	0	0.0	1	1.0
Strigiformes (Owls)										
Barred Owl	0	0.0	0	0.0	1	1.0	0	0.0	0	0.0
Piciformes (Woodpeckers)										
Hairy Woodpecker	0	0	1	0.3	0	0.0	1	2.0	0	0.0
Northern Flicker	0	0	2	0.7	0	0.0	0	0.0	0	0.0
Yellow-bellied Sapsucker	0	0	1	0.3	1	1.0	0	0.0	0	0.0
SUMMARY										
AVERAGE ABUNDANCE PER SITE	34.5		33.0		77.0		35.0		44.0	
TOTAL SPECIES IN HABITAT	17		16		19		15		16	
AVERAGE NUMBER OF SPECIES PER SITE	14.0		14.3		19.0		15.0		16.0	

Table 5. Birds potentially breeding in the Welshtown/Shelburne area of the Lower South Shore (Maritime Breeding Bird Atlas-Online 2020).	
Swans, Geese & Ducks (Anseriformes: Anatidae)	
Wood Duck ‡	Mallard
American Black Duck	Common Eider §
Pheasants, Grouse and Turkeys (Galliformes, Phasianidae)	
Ruffed Grouse	Ring-necked Pheasant
Loons and Grebes (Gaviidae and Podicipedidae)	
Common Loon	
Storm-Petrels, Cormorants, Wading Birds (Hydrobatidae, Phalacrocoracidae, Ardeidae)	
Double-crest Cormorant §	
Hawks & Falcons (Falconiformes: Accipitridae, Falconidae)	
Osprey	Red-tailed Hawk
Northern Harrier	American Kestrel

Table 5. Birds potentially breeding in the Welshtown/Shelburne area of the Lower South Sore (Maritime Breeding Bird Atlas-Online 2020).

Sharp-shinned Hawk	Merlin ‡
Broad-winged Hawk	
Shorebirds	
Sandpipers & Snipes (Charadriiformes, Scolopacidae)	
Spotted Sandpiper	Wilson's Snipe
Willet	American Woodcock
Gulls, Terns, Kittiwake (Charadriiformes, Laridae)	
Herring Gull §	Great Black-backed Gull §
Pigeons & Doves (Columbiformes: Columbidae)	
Rock Pigeon	Mourning Dove
Owls (Strigiformes)	
Barred Owl	North Saw-whet Owl
Long-eared Owl †	
Swifts (Apodiformes, Apodidae) and Hummingbirds (Apodiformes, Trochilidae)	
Common Nighthawk †	Ruby-throated Hummingbird
Chimney Swift †	
Kingfishers (Coraciiformes, Alcedinidae)	
Belted Kingfisher	
Woodpeckers (Order Piciformes, Picidae)	
Yellow-bellied Sapsucker	Black-back Woodpecker ‡
Downy Woodpecker	Northern Flicker
Hairy Woodpecker	Pileated Woodpecker
Songbirds (Passeriformes)	
Olive-sided Flycatcher †	American Redstart
Eastern Wood-Pewee	Cape May Warbler ‡
Alder Flycatcher	Northern Parula
Least Flycatcher	Magnolia Warbler
Great Crested Flycatcher	Bay-breasted Warbler
Eastern Kingbird	Blackburnian Warbler
Blue-headed Vireo	Yellow Warbler
Red-eyed Vireo	Chestnut-sided Warbler
Gray Jay	Black-throated Blue Warbler
Blue Jay	Palm Warbler
American Crow	Yellow-rumped Warbler
Common Raven	Black-throated Green Warbler
Tree Swallow	Wilson's Warbler
Cliff Swallow §	Chipping Sparrow
Barn Swallow	Savannah Sparrow
Black-capped Chickadee	Nelson's Sh.-tail Sparrow
Boreal Chickadee	Fox Sparrow
Red-breast Nuthatch	Song Sparrow
White-breast Nuthatch ‡	Swamp Sparrow
Brown Creeper	White-throat Sparrow
Winter Wren	Dark-eyed Junco
Golden-crown Kinglet	Northern Cardinal ‡
Ruby-crown Kinglet	Indigo Bunting ‡
Veery	Red-wing Blackbird
Swainson's Thrush	Common Grackle
Hermit Thrush	Purple Finch
American Robin	House Finch †
Gray Catbird	Red Crossbill †
European Starling	Pine Siskin
Cedar Waxwing	American Goldfinch
Ovenbird	Evening Grosbeak
Nashville Warbler	White-winged Crossbill
Common Yellowthroat	

Table 5. Birds potentially breeding in the Welshtown/Shelburne area of the Lower South Shore (Maritime Breeding Bird Atlas-Online 2020).

This list includes all species found during the Maritimes Breeding Bird Atlas (1st atlas: 1986-1990, 2nd atlas: 2006-2010) in the region #18 (Lower South Shore).

Rare/Colonial Species Report Forms should be completed for species marked: § (Colonial), ‡ (regionally rare), † (rare in the Maritimes) or †† (rare in the Maritimes, documentation only required for confirmed records). Current as of 2/07/2019. 20 QR17 & 20QR18

6.2.7 Mammals

Various large and small mammal species, including game and furbearing species, are found in Shelburne County and may occur at the quarry site. Mammals expected to occur regularly or occasionally reflect the communities typical of the dominant terrestrial habitat in the surrounding area, which includes coniferous and mixed forest. White-tailed Deer, Snowshoe Hare, and Eastern Coyote occur in the general vicinity of the quarry, and occasional scat and sign were observed at the site on July 8 – 9, 2020. Moose and Canada Lynx (both provincially listed as Endangered) are known to occur in the general area of the study site. Other species likely to occur in the general area include carnivores such as American Fisher; as well as rodents and small mammals including foxes (Red Fox) and bats (Little Brown Myotis – federally and provincially listed as Endangered) (iNaturalist 2020; ACCDC 2020). Bat populations are diminished at present due to the White Nose Syndrome in North America. Some of the rocky outcrops at the study site may provide roosting areas for mammals although overwintering is unlikely.

6.2.8 Reptiles and Amphibians

Some of the common Nova Scotian amphibians and reptiles are expected to occur at the site although there is little open water habitat present. The small ponds and intermittent streams and adjacent riparian areas likely support amphibian species such as Leopard Frog, Wood Frog, Green Frog, Pickerel Frog, American Toad, Spring Peeper and salamanders (e.g. Red-spotted newt, Eastern Redback Salamander). An uncommon species, Four-toed Salamander has been observed within 11 km of the study site (ACCDC 2020; Nova Scotia Museum 2020). The species breeds in sphagnum mosses associated with pools; however such habitats at the site are likely too small, fragmented and isolated for the species to occur here. Tadpoles of unidentified amphibians were observed a surface water accumulation at the east end of the quarry (WS3, Figure 29). Lands around the quarry will support snakes, including the Eastern Garter Snake and Eastern Smooth Green Snake. Habitat is not present at the site for species of conservation concern such as Wood Turtle or Snapping Turtle, although have both been observed recently within 7 km of the study site. (ACCDC 2020; iNaturalist 2020). Small pits where rock and peat have been removed in previous times have formed both temporary and permanent ponds and would be suitable habitat for amphibians.

6.2.9 Species at Risk

Background: Species at Risk are plants or animals whose existence is threatened, or which are in danger of being threatened, by human activities or natural events. The Canadian Committee on the Status of Endangered Wildlife in Canada (COSEWIC) presently recommends species to be listed for legal federal protection under the federal *Species at Risk Act* (SARA). At the provincial level, the Nova Scotia Species at Risk Working Group completes assessments and recommendations for a species' status. Nova Scotia maintains a list of legally protected species under the *Nova Scotia Endangered Species Act*. A third status list is the *Nova Scotia General Status of Wild Species*, which is a provincial system used as a "first-alert tool" for identifying and

prioritizing species potentially at-risk and does not provide legal protection. General status rankings are assigned by a provincial General Status Species Assessment process based on expert scientific evaluation of a set of criteria. Species listed as “Red” (any species known to be, or believed to be, at risk), and “Yellow” (any species known to be, or believed to be, particularly sensitive to human activities or natural events) are considered priority species. Species that may be at risk of extirpation or extinction are candidates for a detailed risk assessment by COSEWIC, or provincial or territorial equivalents.

Survey Results: Several plant species of conservation concern having an S2 or S3 ranking (imperiled or vulnerable status) were encountered during the various field studies for this project; however, with the exception of Eastern Blue-eyed Grass (*Sisyrinchium atlanticum*) (S2 rank), none are in the proposed expansion area. As per ACCDC records, species of conservation concern listed under federal or provincial legislation as well as with general status that occur within five kilometres of the Welshtown Quarry site include both animals and plants (Table 5). There are no animals *per se* of particular conservation concern in the study area, however, Canada Lynx, American Marten and Eastern Moose mainland population, which are all currently listed as “Endangered” under the *NS Endangered Species Act*, are of concern due to low numbers and may occasionally occur. Bird species of particular conservation concern occurring within 5 km of the study site include the Chimney Swift (listed federally as Threatened and listed provincially as Endangered) and the Common Nighthawk (listed as Threatened under the *Federal Species at Risk Act* and provincial *Endangered Species Act* and is listed as Special Concern by COSEWIC) (ACCDC 2020). Plant species of concern reported within 5 km of the study area includes, Graceful Felt Lichen also known as Vole Ears Lichen (*Erioderma mollissimum*), Boreal Felt Lichen (*Erioderma pedicellatum* [Atlantic population]) (both listed federally and provincially as Endangered), Black foam Lichen (*Anzia colpodes*) (listed federally and provincially as Threatened), and Eastern Lilaeopsis (*Lilaeopsis chinensis*) (listed federally as Special Concern and provincially as Vulnerable) (ACCDC 2020; Nova Scotia Museum 2020). Boreal Felt Lichen (*Erioderma pedicellatum*), an endangered species with an S1 status in Nova Scotia has a high potential for occurring in the area, but was not observed during a dedicated survey for the species. A lichen species which commonly co-occurs with Boreal Felt Lichen—*Coccocarpia palmicola*—was observed at two locations, on mature balsam fir on which both lichens typically occur, but the habitat was not suitable for Boreal Felt Lichen. Several rare lichen species were observed on the site (Figure 38). They include Blue Felt Lichen (*Pectenaria plumbea*), Peppered Moon Lichen (*Sticta fuliginosa*), Corrugated Shingles Lichen (*Fuscopannaria ahlneri*), Rimmed Shingles Lichen (*Fuscopannaria leucosticta*) and Blistered Jellyskin (*Leptogium corticola*). Other cyanolichen lichen species found at the site include: Fringed Kidney Lichen (*Nephroma heleticum*), Lungwort (*Lobaria pulmonaria*), Smooth Lungwort (*Lobaria quercizans*), Textured Lungwort (*Lobaria scrobiculata*), Yellow Specklebelly Lichen (*Pseudocyphelaria perpetua*), Mealy-rimmed Shingle Lichen (*Pannaria conoplea*), Brown-eyed Shingle Lichen (*Pannaria rubiginosa*), Tree Jelly Lichen (*Collema subflaccidum*), Blue Jellyskin Lichen (*Leptogium cyanescens*), and Black-bordered Shingle Lichen (*Parmeliella triptophylla*).



Figure 36. Important plant and lichen species found at the site during botany and lichen surveys, 2020.

Suitable habitat for both Chimney Swift and Common Nighthawk typically are found on the site. Chimney Swifts prefer wetland habitats, including areas with giant hollow trees for nesting sites; and Common Nighthawk are found in open areas with little ground vegetation including logged or burned over areas, forest clearings, rocky outcrops and peat bogs. Although no federally or provincially listed bird species were observed during the June 9, 2020 bird survey, a Red-Breasted Nuthatch, (conservation status of Vulnerable in the province of Nova Scotia), was present during the survey visit.

Other animals of conservation concern potentially occurring at the site include the Little Brown Myotis (*Myotis lucifugus*), Long-eared Myotis (*Myotis septentrionalis*), and the Eastern Pipistrelle or Tri-Coloured Bat (*Perimyotis subflavus*) (all are federally and provincially listed as Endangered). The Little Brown Myotis has been observed within 2.1 km of the study site along as well as other bat species (*Vespertilionidae* sp.) documented 3.3 km from the study site (ACCDC 2020). The Long-eared Myotis and Eastern Pipistrelle have not been documented within a 5 km radius of the study site, but the Eastern Pipistrelle has been observed within 100 km and all at risk bat species may intersect with the study site because it supports good bat feeding habitat as well as the possibility of the large outcrops being used as a hibernacula for hibernating bats. (ACCDC 2020).

Botany surveys of the site conducted in the spring and fall of 2019 did not detect any of the federally or provincially listed rare species within 5 km of the study area, however four species of conservation concern within Nova Scotia were observed (Figure 36). Approximately 20 plants of Southern Twayblade (*Neottia bifolia*) were observed during the spring botany surveys and is currently listed by the Atlantic Canada Conservation Data Centre as an S3 species (i.e.,

Vulnerable) although the Nova Scotia General Status Rank is S4 (Apparently Secure/light green). Eastern Blue-eyed Grass (*Sisyrinchium atlanticum*) was also observed during the spring survey and in Nova Scotia is ranked as an S3S4 species (Vulnerable to Apparently Secure/yellow to light green). This species is considered Vulnerable in some areas of the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation. Eastern Blue-eyed Grass may be considered Apparently Secure in other areas of the province due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors. Golden-heather (*Hudsonia ericoides*) was observed during the fall 2019 botany survey on rock outcrops within the study area. Both the Nova Scotia General Status Rank and the Atlantic Canada Conservation Data Centre subnational status designation for this species is S2 (Imperilled/orange). It is considered to be at high risk of extirpation in the province due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors. Woodland Rush (*Juncus subcaudatus*) was also observed during the fall survey in a small marsh within the study area. This species is ranked as S3 (Vulnerable/yellow) species, due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors (Newell 2019).

Vole Ears Lichen (also known as Graceful Felt Lichen) and Boreal Felt Lichen are both rare and endangered species of lichen in Nova Scotia and may occur in forested habitats in the Welshtown Quarry area (Figure 37). Both species of lichen are federally and provincially listed as Endangered and have been observed within 10 km of the quarry site, but were not observed on the study site during botany or dedicated lichen surveys (Table 6) (Figure 36 and 37). These provincially listed species have been observed within 10 km of the site. Vole Ears Lichen and Boreal Felt Lichen prefer cool, moist habitats, typically on north-facing slopes dominated by Balsam Fir stands with sphagnum moss wetlands. Boreal felt lichen also was not expected to occur in the type of habitat at the site, based on modeled distributions (Mr. Brad Toms, Mersey Tobeatic Research Institute, personal communications, 2019). A list of plants and animals of concern within a 100 km radius of the study site is included in Appendix C.

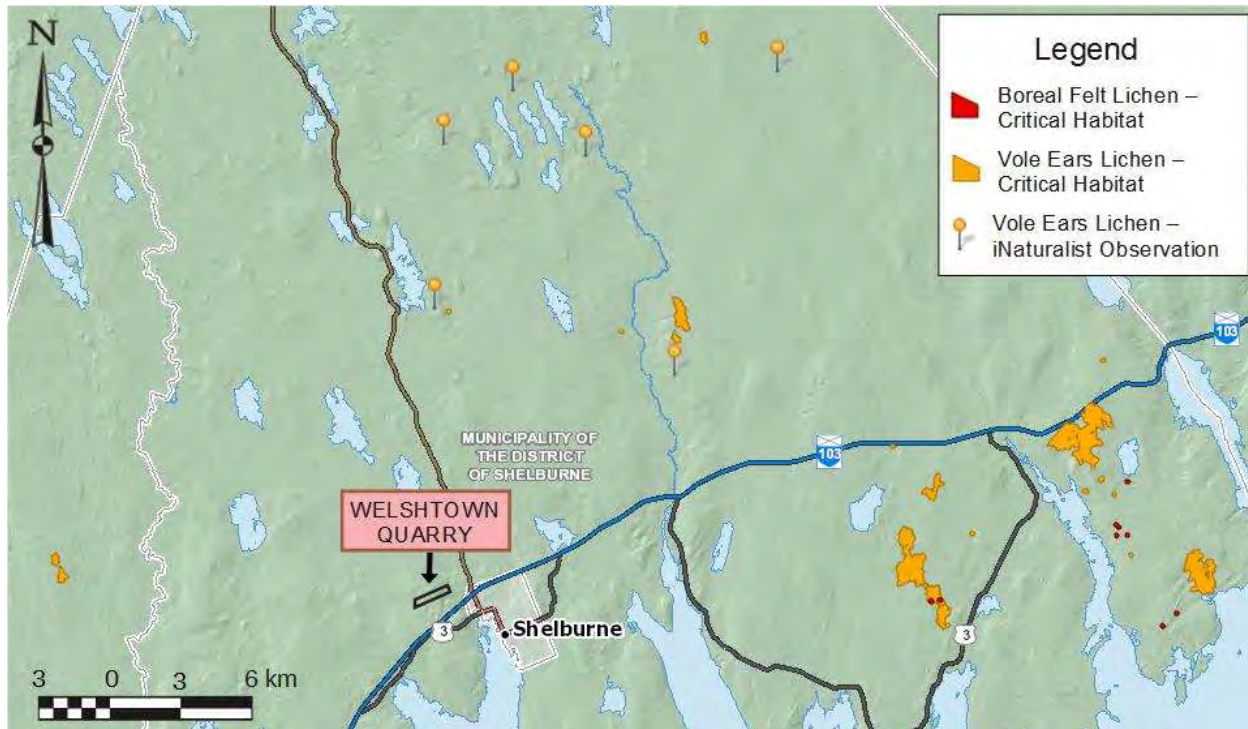


Figure 37. Lichen species at risk critical habitat and iNaturalist observations in Shelburne County.

Table 6. Records of species of concern within a 5 km radius of Welshtown Quarry, Shelburne County. Atlantic Canada Conservation Data Centre (ACCDC) Database, April 2020.

Family/Scientific Name	Common Name	Status/Rank					AC CDC ⁴ Rankings (GRANK, SRANK ⁵)
		SARA	COSEWIC (NPROT ¹)	NS ESA (SPROT ²)	General Status of Wild Species Rankings ³		
FLORA							
Apiaceae	<i>Lilaeopsis chinensis</i>	Eastern Lilaeopsis	Special Concern	Special Concern	Vulnerable	3 Sensitive	G5, S2
Caryophyllaceae	<i>Sagina nodosa</i>	Knotted Pearlwort	-	-	-	4 Secure	G5, S2S3
	<i>Stellaria longifolia</i>	Long-leaved Starwort	-	-	-	3 Sensitive	G5, S2
Coccocarpiaceae	<i>Coccocarpia palmicola</i>	Salted Shell Lichen	-	-	-	4 Secure	G5, S3S4
Cyperaceae	<i>Carex swanii</i>	Swan's Sedge	-	-	-	3 Sensitive	G5, S3
Lamiaceae	<i>Teucrium canadense</i>	Canada Germander	-	-	-	3 Sensitive	G5, S3
Lobariaceae	<i>Sticta fuliginosa</i>	Peppered Moon Lichen	-	-	-	3 Sensitive	G3G5, S3
Nephromataceae	<i>Nephroma bellum</i>	Naked Kidney Lichen	-	-	-	3 Sensitive	G5, S3
Pannariaceae	<i>Moelleropsis nebulosi</i>	Blue-gray Moss Shingle Lichen	-	-	-	4 Secure	GNR, S3
	<i>Erioderma mollissimum</i>	Graceful Felt Lichen	Endangered	Endangered	Endangered	2 May Be At Risk	G4G5, S1S2
	<i>Anzia colpodes</i>	Black-foam Lichen	Threatened	Threatened	Threatened	3 Sensitive	G3G5, S3

Table 6. Records of species of concern within a 5 km radius of Welshtown Quarry, Shelburne County. Atlantic Canada Conservation Data Centre (ACCDC) Database, April 2020.

Physciaceae	<i>Heterodermia neglecta</i>	Fringe Lichen	-	-	-	4 Secure	GNR, S3S4
Poaceae	<i>Piptatheropsis pungens</i>	Slender Ricegrass	-	-	-	3 Sensitive	G5, S2
Primulaceae	<i>Samolus parviflorus</i>	Seaside Brookweed	-	-	-	3 Sensitive	G5T5, S3
Rosaceae	<i>Potentilla canadensis</i>	Canada Cinquefoil	-	-	-	3 Sensitive	G5, S2S3
Schizaeaceae	<i>Schizaea pusilla</i>	Little Curlygrass Fern	-	-	-	4 Secure	G3G4, S3S4
Smilacaceae	<i>Smilax rotundifolia</i>	Round-leaved Greenbrier	-	Not At Risk	-	4 Secure	S3
ANIMALS-BIRDS							
Aeshnidae	<i>Boyeria grafiana</i>	Ocellated Darner	-	-	-	3 Sensitive	G5, S3
Apodidae	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Endangered	1 At Risk	G4G5, S2B, S1M
Caprimulgidae	<i>Chordeiles minor</i>	Common Nighthawk	Threatened	Special Concern	Threatened	1 At Risk	G5, S2B
Cardinalidae	<i>Passerina cyanea</i>	Indigo Bunting	-	-	-	5 Undetermined	G5, S1?B
Corduliidae	<i>Somatochlora tenebrosa</i>	Clamp-Tipped Emerald	-	-	-	4 Secure	G5, S3
Fringillidae	<i>Loxia curvirostra</i>	Red Crossbill	-	-	-	4 Secure	G5, S3S4
Libellulidae	<i>Nannothemis bella</i>	Elfin Skimmer	-	-	-	4 Secure	G4G5, S3
	<i>Pantala hymenaea</i>	Spot-Winged Glider	-	-	-	3 Sensitive	G5, S2?B
Nymphalidae	<i>Polygonia interrogationis</i>	Question Mark	-	-	-	4 Secure	G5, S3B
Sittidae	<i>Sitta canadensis</i>	Red-breasted Nuthatch	-	-	-	4 Secure	G5, S3
Vespertilionidae	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	1 At Risk	S1

1. NPROT, National conservation status of species, as designated by COSEWIC.

Extinct (X) – A wildlife species that no longer exists.

Extirpated (XT) - A wildlife species that no longer exists in the wild in Canada but exists elsewhere.

Endangered (E) - A wildlife species facing imminent extirpation or extinction.

Threatened (T) - A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

Special Concern (SC) - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Data Deficient (DD)- A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.

Not at Risk (NAR) - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

2. SPROT=Provincial Rank/Status of Taxon.

3. General Status of Wild Species Rank listed for Nova Scotia: 0.2=Extinct (Blue); 0.1=Extirpated (Purple); 1=At Risk (Red); 2=May be at Risk (Orange); 3=Sensitive (Yellow); 4=Secure (Green); 5=Undetermined (light grey); 6=Not Assessed (dark grey); 7=Exotic (Black); 8=Accidental (Aqua).

4. Atlantic Canada Conservation Data Centre (ACCDC).

5. GRANK, Global rarity rank of species, using CDC/NatureServe methods

G1 **Critically Imperiled**—At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.

G2 **Imperiled**—At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

G3 **Vulnerable**—At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

G4 **Apparently Secure**—At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

Table 6. Records of species of concern within a 5 km radius of Welshtown Quarry, Shelburne County. Atlantic Canada Conservation Data Centre (ACCDC) Database, April 2020.

G5	Secure —At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
GU	Unrankable —Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. NOTE: Whenever possible (when the range of uncertainty is three consecutive ranks or less), a range rank (e.g., G2G3) should be used to delineate the limits (range) of uncertainty.
GNR	Unranked —Global rank not yet assessed.
G#G#	Range Rank —A numeric range rank (e.g., G2G3, G1G3) is used to indicate the range of uncertainty about the exact status of a taxon or ecosystem type. Ranges cannot skip more than two ranks (e.g., GU should be used rather than G1G4).
Q	Questionable taxonomy that may reduce conservation priority —Distinctiveness of this entity as a taxon or ecosystem type at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon or type in another taxon or type, with the resulting taxon having a lower-priority (numerically higher) conservation status rank. The “Q” modifier is only used at a global level and not at a national or subnational level.
C	Captive or Cultivated Only —Taxon or ecosystem at present is presumed or possibly extinct or eliminated in the wild across their entire native range but is extant in cultivation, in captivity, as a naturalized population (or populations) outside their native range, or as a reintroduced population or ecosystem restoration, not yet established. The “C” modifier is only used at a global level and not at a national or subnational level. Possible ranks are GXC or GHC. This is equivalent to “Extinct” in the Wild (EW) in IUCN’s Red List terminology (IUCN 2001).
T	Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a “T-rank” following the species’ global rank. Rules for assigning T-ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species. For example, a G1T2 subrank should not occur. A vertebrate animal population, (e.g., listed under the U.S. Endangered Species Act or assigned candidate status) may be tracked as an infraspecific taxon and given a T-rank; in such cases a Q is used after the T-rank to denote the taxon’s informal taxonomic status.
SRANK, Sub-National (Provincial) Rarity Ranks	
S1	Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2	Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3	Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in at some locations (21 to 100 occurrences).
S4	Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g. watch list). (100+ occurrences).
S5	Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions.
S#S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).
SH	Historical: Element occurred historically throughout its range in the province (with expectation that it may be rediscovered), perhaps having not been verified in the past 20 - 70 years (depending on the species) and suspected to be still extant.
SU	Unrankable: Possibly in peril throughout its range in the province, but status uncertain; need more information.
SX	Extinct/Extirpated: Element is believed to be extirpated within the province.
S?	Unranked: Element is not yet ranked.
SA	Accidental: Accidental or casual in the province (i.e., infrequent and far outside usual range). Includes species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded.
SE	Exotic: An exotic established in the province (e.g., Purple Loosestrife or Coltsfoot); may be native in nearby regions.
SE#	Exotic numeric: An exotic established in the province that has been assigned a numeric rank.
SP	Potential: Potential that Element occurs in the province, but no occurrences reported.
SR	Reported: Element reported in the province but without persuasive documentation, which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.
SRF	Reported falsely: Element erroneously reported in the province and the error has persisted in the literature.
SZ	Zero occurrences: Not of practical conservation concern in the province, because there are no definable occurrences, although the species is native and appears regularly. An NZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations) or transitory. In other words, the migrant regularly passes through the province, but enduring, mappable Element Occurrences cannot be defined.

Table 7. Provincially listed species of concern with potential to occur in the vicinity of the project site (~10 km). Nova Scotia Museum records (A. Cross, NS Museum, personal communications, 2020).						
Scientific Name	Common Name	SARA	COSEWIC (NPROT¹)	NS ESA (SPROT²)	General Status of Wild Species Rankings³	AC CDC⁴ Rankings (GRANK, SRANK⁵)
Other						
<i>Euthamia graminifolia</i>	Flat-top goldenrod	-	-	-	5 Undetermined	G5, S5
<i>Erioderma mollissimum</i>	Vole ears lichen (Graceful felt lichen)	Endangered	Endangered	Endangered	2 May Be At Risk	G4G5, S1S2
<i>Erioderma pedicellatum</i>	Boreal felt lichen	Endangered	Endangered	Endangered	1 At Risk	G2G3, S1
<i>Fuscopannaria sp.</i>	Fungi	-	Threatened	-	2 May Be At Risk	S2S3
<i>Lechea intermedia</i>	Largepod pinweed	-	-	-	4 Secure	G5, S4
<i>Rubus idaeus</i>	Common red raspberry	-	-	-	4 Secure	G5, S5
<p>1. NPROT, National conservation status of species, as designated by COSEWIC. Extinct (X) – A wildlife species that no longer exists. Extirpated (XT) - A wildlife species that no longer exists in the wild in Canada, but exists elsewhere. Endangered (E) - A wildlife species facing imminent extirpation or extinction. Threatened (T) - A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction. Special Concern (SC) - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats. Data Deficient (DD)- A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction. Not At Risk (NAR) - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.</p> <p>2. SPROT=Provincial Rank/status of taxon & Provincial GS Rank. 3. National General Status of Wild Species Rank listed for Nova Scotia: 0.2=Extinct (Blue); 0.1=Extirpated (Purple); 1=At Risk (Red); 2=May be at Risk (Orange); 3=Sensitive (Yellow); 4=Secure (Green); 5=Undetermined (light grey); 6=Not Assessed (dark grey); 7=Exotic (Black); 8=Accidental (Aqua). 4. Atlantic Canada Conservation Data Centre (ACCDC). 5. GRANK, Global rarity rank of species, using CDC/Nature Serve methods; SRANK, Sub-National (Provincial) Rarity Rank.</p>						

6.2.10 Natural Areas & Wilderness

The Shelburne area where the quarry is located is a relatively remote and undeveloped location in Nova Scotia. Situated in Southwest Nova Scotia along the South Shore, the area has a relatively high proportion of wilderness and natural areas both inland and along its coast. Although settlement and consequent expansion and logging in the past changed the character of the landscape, much of the land has returned to forest in most areas, although logging activity is

currently taking place in a recent stage of forest harvesting. A high proportion of Crown Land in the area has been devoted to protected and managed wildlife areas, leaving many natural and untouched areas, including the Roseway River Wilderness Area, Bowers Meadows Wilderness Area and Tidney River Wilderness area, as well as a number of nature reserves (Figure 39). Wild land allows preservation for wildlife, hunting and outdoor recreation which are important to locals and visitors to the area. People living in these areas are exposed to the natural environment day-to-day and appreciate the presence of, and access to, undeveloped land and nature, while accepting the usual activities needed to use the resources (e.g. aggregate quarries, forestry operations) on which many of them depend for their livelihood.

Shelburne County is also one of five counties that make up the Southwest Nova Biosphere Reserve (SNBR) (Figure 38). The SNBR is a UNESCO designated and internationally recognized unique region of natural and cultural heritage. It encompasses terrestrial and coastal ecosystems and promotes the conservation of

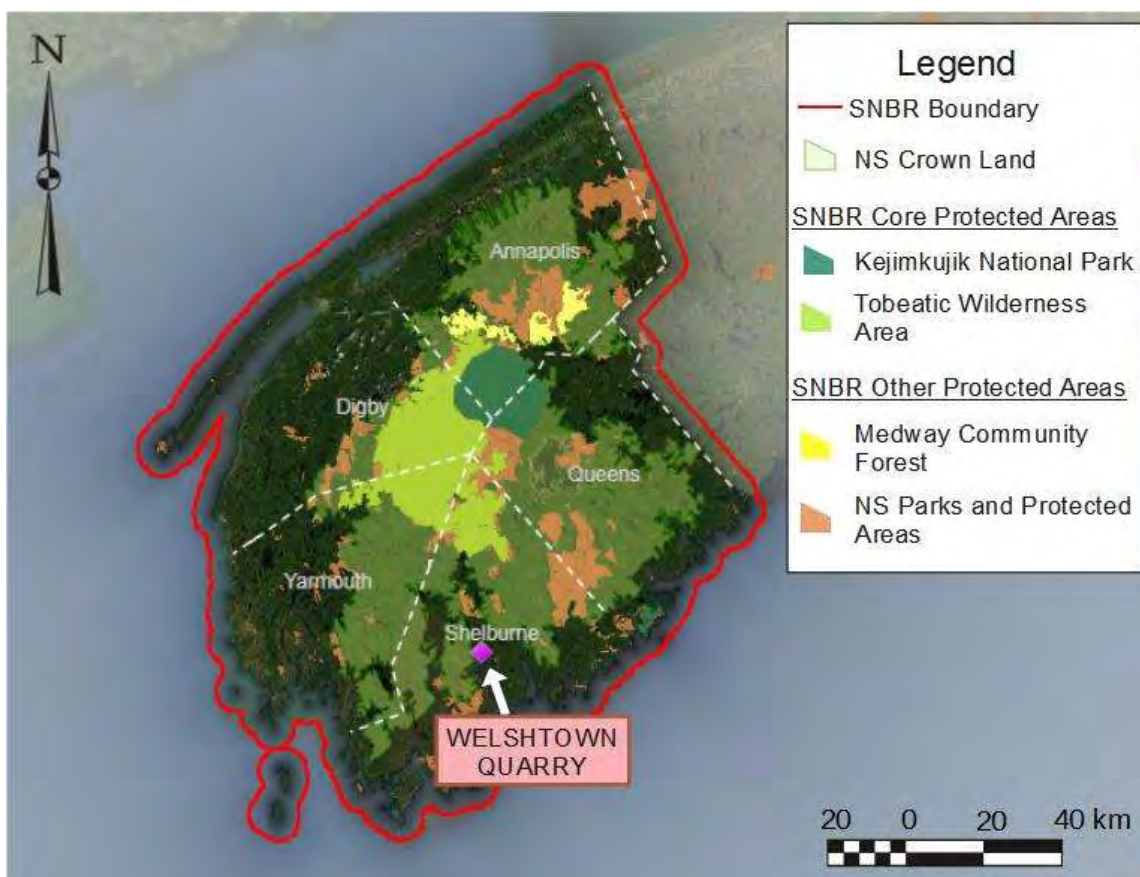


Figure 38. Southwest Nova Biosphere Reserve (SNBR).

biological diversity and contributes to the maintenance of healthy ecosystems. The bioserve also provides an opportunity to learn about natural systems and how they are changing as well as traditional forms of land use through knowledge sharing and collaborative management (SNBR 2020). The Welshtown Quarry is located within the SNBR, however, is not in any specific protected area within Biosphere Reserve.

6.3 Human Uses of the Environment

6.3.1 Mi'kmaq

The Mi'kmaq maintain aboriginal claim to all of the landmass of Nova Scotia, and the Province of Nova Scotia maintains a policy that proponents of industrial development projects engage with the Mi'kmaq concerning their activities. The nearest Mi'kmaq communities to the study site are Acadia First Nation and Bear River First Nation. Acadia First Nation's geographical composition spreads through the Southwestern regions of Nova Scotia spanning five counties from Yarmouth to Halifax and lands are accessed throughout the region for various uses such as hunting and fishing, as well as traditional ceremonial activities. The nearest Acadia communities to the study area are in Yarmouth and Queens Counties. The Yarmouth Reserve situated in Yarmouth County is approximately 100 km west of the study site. The Medway Reserve and Wildcat reserve are both in Queens County at a similar distance of approximately 100 km northeast of the study site. In addition to the five separate reserves, Acadia First Nation has two separate land holdings, including one in the Town of Shelburne, where many Band members live off reserve. The sub-office located in Shelburne serves off-reserve members in the Lockeport, Shelburne, Barrington and surrounding areas. The Bear River First Nation is located in both Annapolis and Digby Counties and is situated approximately 100 km northwest of the study site.

The study area for Welshtown Quarry is in what was once was the Mi'kmaw territory known as Kespukwitk, meaning 'land eel territory' (CRM 2020). Lakes and watercourses in this area would have provided important transportation corridors and provided a resource base for the Mi'kmaq, their ancestors and predecessors prior to the arrival of European settlers. In particular, the Roseway River is part of an intricate system of waterways which facilitated travel and access to resources between the Bay of Fundy and Annapolis Basin to the Atlantic Ocean (Robertson 1983 from CRM 2020). Roseway River and Shelburne Harbour share the Mi'kmaq name *So'qmkiknuk*, meaning 'At the place where the pole us used to push (instead of paddling)' (Ta'n Weji-sqalia'tiek 2015 from CRM 2020). There are no registered Mi'kmaq archaeological sites within the study area perimeter, however the Roseway River Quartz Scatter Site, traditionally used for scattering quartz flakes, is within a one-kilometer radius. Three additional pre-contact sites within a five-kilometer radius are also associated with access to water: The Carlyle Bower Site, The Eel Weir Site, and a third unnamed site. These sites were traditionally used for general community activities, for fishing, and as a site of possible burial or historic field clearing activities, respectively (CRM 2020). Presently, no significant Mi'kmaq cultural activities occur in or around the study area although traditional fishing continues in the general area of Shelburne.

Two tribal councils exist in Nova Scotia: The Confederacy of Mainland Mi'kmaq (CMM) and Union of Nova Scotia Indians (UNSI). CMM is a not-for-profit organization incorporated in 1986, whose mission is to promote and assist Mi'kmaq communities. *The UNSI, created in 1969, was formed to provide a cohesive political voice for Mi'kmaq people.* The Native Council of Nova Scotia (NCNS) represents Mi'kmaq living off reserve. The NCNS is a self-governing agency located in Truro. The Office of Aboriginal Affairs in Nova Scotia estimates that approximately 35% of Mi'kmaq live off reserve. The goal of NCNS is "to operate and administer a strong and effective Aboriginal Peoples Representative Organization that serves, advocates and represents our community."

The Mi'kmaq Rights Initiative (Kwilmu'kw Maw-klusuaqn; KMK) also represent a number of the First Nations in Nova Scotia. The mission of KMK—whose name means, "we are seeking consensus"— is "to address the historic and current imbalances in the relationship between Mi'kmaq and non-Mi'kmaq people in Nova Scotia and secure the basis for an improved quality of Mi'kmaq life." KMK's objective is to negotiate between the Mi'kmaq of Nova Scotia whom it represents, the province and the Government of Canada, and operates from its main office in Millbrook. The Atlantic First Nations Environmental Network (AFNEN) is an environmental

organization of Mi'kmaq communities and organizations. The CMM and UNSI are members of the AFNEN, with the Mi'kmaq Confederacy of PEI in Charlottetown currently the acting coordinator. The AFNEN includes a representative from each Mi'kmaq organization and community interested in environmental issues. The Network meets regularly during the year through meetings, conferences, and the Internet to discuss environmental matters or concerns. Two First Nations—Millbrook First Nation, and Sipekne'katik (Indian Brook) operate independently of these organizations. Millbrook is situated outside Truro and includes activities in Cole Harbour, Sheet Harbour, and Beaver Dam. Sipekne'katik First Nation is one of 13 First Nations and is the second largest Mi'kmaq band in Nova Scotia. Sipekne'katik First Nation includes the communities of Indian Brook, New Ross, Pennal, Dodd's Lot, Wallace Hills and Grand Lake.

6.3.2 Population and Economy

The Welshtown Quarry is located in the Municipality and District of Shelburne, the municipal unit occupying the eastern section of Shelburne County. Shelburne Municipality has a population of approximately 4,290, making it one of the smallest municipalities in Nova Scotia, and population has been declining slowly over the past several decades, dropping 2.7% between 2011 and 2016 (Statistics Canada 2017). The main population centers in the Municipality and District of Shelburne are in the Town of Shelburne (population 1,743 (2016)) and Lockeport (population 531 (2016)), supporting almost half of the municipality's total population (Statistics Canada 2017). The Town of Shelburne is the largest population center nearest to the study site.

Local economies in Shelburne County are tied primarily to fishing and forestry, and their communities face some of the similar challenges as elsewhere in Nova Scotia, including lack of economic growth and an aging population (NSDMA 2019). Lobster fishing dominates the marine fishing industry in Shelburne County, providing employment opportunities through year-round harvesting, processing and exporting of the species. Manufacturing, and shipbuilding and repair facilities also support the fishing industry in the area. As of 2018, Shelburne County accounted for almost half of all aquaculture production in the province with approximately 101 full- and part-time employees. Licensed seafood buyers in Shelburne County recorded the highest value of seafood purchases in 2017 with \$230,315,328 for a total of 24,248,322 kgs of seafood of all species (Johnson 2018). Forestry is a common occupation inland, and has been for generations. Health care and social assistance is also a significant sector in Shelburne County providing important sources of income. The annual median family income of the Municipality and District of Shelburne is \$28,535 – lower than the median of Nova Scotia (\$31,813) (Statistics Canada 2017).

6.3.3 Water Supply and Residential Wells

Drinking water for the County of Shelburne is provided by both public and private water systems. The public water supplies are surface water sources originally developed to supply fish plants in the area and include the Town of Shelburne and the Town of Lockeport. The Town of Shelburne public water system is supplied by Rodney Lake and provides water to various commercial, industrial and institutional operations and approximately 10% (approximately 170 people) of the town residences (CBCL Limited 2015). Similarly the Town of Lockeport water supply is from Hayden Lake and provides water to three residential homes and twelve commercial, industrial and institutional facilities (Drage et al. 2016).

The majority of Shelburne County residents (approximately 99%) rely on private wells (Drage et al. 2016). Both drilled and dug wells are used as drinking water sources in the Welshtown and Shelburne area. Two homes on groundwater wells, are located within 1 km of the study area; however neither are within 800 m of the quarry. Of homes outside 1km, dug wells are used at 10761, 10721 and 10712 Upper Clyde Road, and a drilled well at 44 Powerdam Road.

6.3.4 Land Use

Land in the vicinity of the quarry is predominantly wilderness and undeveloped forest land, with rural residential use concentrated along the Upper Clyde Road and in the coastal community of Shelburne (Appendix D, Map A-2). Two residences are located along Powerdam Road, a side street 150 m southeast of the entrance to the quarry site. There is limited forestry and commercial use (e.g. quarries) in the area and there are a few residences, small woodlots, and home-operated businesses found nearby. Travel routes are used by tourists and outdoor recreational enthusiasts. Hunting, trapping and commercial fishing based in Shelburne are important local activities. Land ownership in the vicinity is a mix of privately-owned land and Crown land (Appendix D, Map A-3).

6.3.5 Hunting and Trapping

Lands in the vicinity of the Welshtown quarry site support many of the common game and fur-bearing species characteristic of Nova Scotia in general, including some less common fur-bearing species, such as Canada Lynx and American Marten. Some hunting or trapping activity may take place in the general vicinity of the site, although trapping statistics indicate that the Shelburne County has a small harvest of most species. White-tail Deer are common; the County typically ranks among the highest for deer harvest in the province. The main furbearers trapped in the five-year period (2014 to 2018) were beaver, muskrat and mink. No lynx were reported trapped, however four American Marten were trapped incidentally. Snowshoe Hare and Ruffed Grouse are the most commonly hunted upland game (Table 8). Moose are not important for hunting in the area as the western region of Nova Scotia, including Shelburne County, is not zoned for moose hunting (NSDLF 2020).

Animal	Shelburne County Reported Harvest	Provincial Reported Harvest	Percent (%) of total for province
LARGE MAMMALS			
Deer (Zone 101)	6,799	45,294	15.0%
Bear	35	1,780	2.0%
UPLAND GAME			
Snowshoe Hare	9,790	347,328	2.8%
Ruffed Grouse	1,356	206,282	0.7%
Ring-necked Pheasant	11	20,762	0.1%
FUR HARVEST			
Beaver	599	12,422	4.8%
Muskrat	1,770	43,133	4.1%
Otter	43	1,486	2.9%

Animal	Shelburne County Reported Harvest	Provincial Reported Harvest	Percent (%) of total for province
Mink	420	4,167	10.1%
Bobcat	183	3,911	4.7%
Fox	20	1,962	1.0%
Raccoon	167	5,147	3.2%
Skunk	0	160	0.0%
Squirrel	42	2,305	1.8%
Weasel	53	1,315	4.0%
Coyote	334	10,675	3.1%
Canadian Lynx*	0	14	0.0%
American Marten*	4	21	19.0%
Fisher	24	565	4.2%
Total Furbearers	3,659	87,283	4.2%

*Trapped incidentally. Trappers Association of Nova Scotia prepares incidental pelts for auction and all proceeds go to the NS Species at Risk Conservation Fund.

6.3.6 Forestry & Agriculture

Forestry and agriculture contribute to the mix of industries in the County of Shelburne, but the impact is relatively small compared with the rest of Nova Scotia. Small private woodlots comprise of nearly half (approximately 49.2%) of the total productive forest area of Western Nova Scotia including Kings, Annapolis, Yarmouth, Shelburne, Queens and Lunenburg Counties; public land accounts for 37%, private industrial lands, 6.3% and 7.7% is non-forested (WWSC 2020). A review of harvest volumes by county shows a consistent volume of non-industrial, private harvesting has occurred in Shelburne County, with no dramatic losses or increases between the years 2006 to 2016 (Williams 2018). In the vicinity of the Welshtown Quarry, there is an operating private woodlot located north of the quarry property.

Farming is not a large economic sector in Shelburne County, including in the immediate study area. Shelburne County farms reported a total of over \$3 million in gross farm receipts in 2010, accounting for 0.56% of all receipts in Nova Scotia. Main agricultural activities include greenhouse, nursery and floriculture production, fruit and tree nut, and other animal production (NS Federation of Agriculture, online, 2017). Little agricultural activity in Shelburne County is largely due to the terrain and lack of agricultural land, although in the early days of settlement, local agriculture was more important.

6.3.7 Recreational, Commercial, and Mi'kmaq Fishing

Commercial fishing takes place from the community of Shelburne. Continental Seafoods, a division of Clearwater Seafoods, employs approximately 90 people and operates two vessels out of the Town of Shelburne, primarily fishing sea scallops, and also operates a preparation and packaging plant that produces cured, salted, dried, and pickled fish as well as fresh or frozen shellfish and lobster and fish roe. Sandy Point Lobster Ltd and True World Foods Inc. of Canada are two wholesale seafood distributors in Shelburne County that mainly export live lobster and other fish, to Asia and the United States.

Recreational fishing provides an important resource and pastime for residents and visitors to Shelburne County and marine fisheries are the mainstay of coastal communities. The study area itself is not particularly important for freshwater recreational fishing but rivers and lakes in the area including Roseway River, Dexter's Lake, North and South Churchover Lakes, Round Bay, Lake George, Clam and Horseshoe lakes and Clyde River are fished recreationally for Chain Pickerel, Brook Trout, Smallmouth Bass, and Atlantic salmon, and Beaver Dam Lake supports ice fishing for Brook Trout and Rainbow Trout (NSDFA 2020). Locals and visitors to Shelburne also partake in recreational ocean fishing for Atlantic Mackerel in Birchtown Bay or off the Gunning Cove government wharf in the Town of Shelburne. Mi'kmaq residing in the area likely use the recreational fishing resource as well. Other streams in the area are either too small, are not accessible, or have too steep a gradient to promote fishing.

6.3.8 Historical, Archaeological and Palaeontological Resources

The study area is part of the greater Mi'kmaq territory known as *Kespukwitk* (CRM 2020). Mi'kmaq originally occupied the area, with Europeans settling around Shelburne Harbour in the late seventeenth century, despite earlier known European fishing operations. Between 1693 and 1722, the large, natural harbour was utilized by the Acadians and then by the New England privateers, whose attempt at a permanent fishing station was raided by the Mi'kmaq, and the area was then raided again by pirate Ned Low who commonly raided fishing fleets at harbours and fishing stations in Nova Scotia (CRM 2020).

The Town of Shelburne, approximately 2 km southeast of the study area, was settled by thousands of Empire Loyalists after the American Revolutionary War in 1783. The Empire Loyalists cleared lines for streets and town blocks and were granted a series of thirteen 50 acre lots located north of the town plot. Early census data shows approximately 16, 000 inhabitants of Shelburne at its peak in 1786, but then rapidly declined as a result of taxes and duties imposed by the government. Shipbuilding and boat building were Shelburne's primary industry in the 1820s. In 1818, a small group of settlers from Wales formed the community of New Cambria, later called Welshtown, situated approximately 6 km north of the study site.

The Black Loyalist community of Birchtown, approximately 3.5 km southwest of the study area, is associated with 27 archaeological sites. The Southerland Enclosure Site is the nearest registered archaeological site located approximately one kilometer southeast of the study site and consists of a five-sided rock wall enclosure (CRM 2020). There are four other sites that make up the Birchtown Complex of domestic and/or agricultural sites located between three and 5 km from the study site (CRM 2020).

Prior to the arrival of European settlers, Mi'kmaq would have used the streams, lakes and wetlands surrounding the study area as a means of transportation and resource base. The Welshtown Quarry site likely lacks the environmental features that would have been suitable for

encampments and there are no registered Mi'kmaq archaeological sites within the study area. Several nearby areas, however, are registered archeological sites including the Roseway River Quartz Scatter site located approximately 740 meters to the east of the study site as well as Carlyle Bower Site (2 km), Eel Weir Site (5 km) and an unnamed burial or historic field clearing site (2 km). These areas are located along the Roseway River, which would have also been a historically important area as a resource base and transportation route (CRM 2020).

Archaeology database searches show no records of archaeological sites within the study area (CRM 2020). Based on the lack of evidence of historic land use in the vicinity of the Welshtown Quarry site; site reconnaissance and the absence of signs of settlement; and other limiting physical factors such as the numerous surface boulders and steep slopes, the study area is considered to have low potential for encountering precontact and/or early historic Mi'kmaq and/or Euro-Canadian archaeological resources (CRM 2020).

6.3.9 Parks and Protected Areas

The Province of Nova Scotia actively protects natural landscapes and promotes and supports nature-based recreation and conservation through its Provincial Parks and Wilderness Areas system, and through other management and protection means. Several wilderness and protected areas, and provincial parks, have been designated in the general area of the study site including five wilderness areas, four conservation lands, six nature reserves, four Provincial park and one bird sanctuary. There are also two managed areas with some level of protection for wildlife in the vicinity of the study site: the Granite Village/East Pubnico Rail Corridor and the Battery Point Spur Rail Corridor (ACCDC 2019) (Table 9, Figure 39). Types of parks and protected areas shown in Table 9 include:

Wilderness Areas are provincially-significant areas that protect representative examples of natural landscapes, native biological diversity, and outstanding natural features of Nova Scotia. They are used for scientific research, education and a variety of recreation and nature-tourism related activities such as hiking, canoeing, sea-kayaking, sport-fishing and hunting. These areas are designated under Nova Scotia's *Wilderness Areas Protection Act*.

Nova Scotia Nature Trust's Conservation Lands are protected areas that are safeguarded and stewarded for the purposes of nature conservation. The properties have come under the care of the Nature Trust through donation, part-donation, purchase, or conservation easement and protects Nova Scotia's rare, outstanding and unique natural areas while fulfilling landowner wishes to permanently protect the natural legacy that so many of them have proudly stewarded for generations.

Nova Scotia Nature Reserves are established to preserve and protect areas representative of natural ecosystems and associated plant and animal species. Scientific research and education are the primary uses of nature reserves and recreation is generally restricted. These areas are protected under the *Special Places Protection Act*.

Provincial Parks protect provincially or regionally significant natural heritage values such as coastlines and beaches, scenic views, diverse landscapes, forests, and lakes and rivers, for recreational use and general enjoyment by residents and tourists. Provincial Parks are important in conserving biodiversity as well as contributing to a high quality nature experience for users of the parks and economic development for nearby communities. Provincial Parks are established under the *Provincial Parks Act*.

National Wildlife Areas are created to conserve nationally significant habitat for wildlife, and to provide opportunities for research and interpretation. Environment and Climate Change Canada uses an ecosystem approach to manage and plan national wildlife areas and controls human activity in them to minimize impact. National Wildlife Areas are established under the *Canada Wildlife Act*.

Managed Areas are classified by the Atlantic Canada Conservation Data Center (ACCDC) as a variety of official sites which have some level of legal protection for wildlife within their boundaries.

Name of Site	Primary Type of Protection	Protection Status	Area (ha)
Battery Point Spur Rail Corridor	Managed Area	-	1 km in length
Bowers Meadows Conservation Lands	Land Trust Property	Considered Protected	241
Bowers Meadows Wilderness Area	Wilderness Area	Designated (1998)	4,120
Bowers Meadows Wilderness Area Addition	Wilderness Area	Pending Designation	30
Ghost Antler Nature Reserve	Nature Reserve	Designated (2015)	1,007
Granvite Village/Lower East Pubnico Rail Corridor	Managed Area	-	130 km in length
Harpers Lake Nature Reserve	Nature Reserve	Pending Designation	401
Hemeon's Head Conservation Lands	Land Trust Property and Conservation Easement	Considered Protected (2013)	130
The Islands Provincial Park	Provincial Park	Designated	54
Louis Head Provincial Park	Provincial Park	Pending Designation	7
Northwest Brook Nature Reserve	Nature Reserve	Designated (2016)	270
Northwest Brook Nature Reserve (subject to mineral interests)	Nature Reserve	Designated (subject to mineral interests)	130
Port L'Hebert Nature Reserve	Nature Reserve	Designated (2015)	691
Quinns Meadows Conservation Lands	Land Trust Property	Considered Protected (2009)	359
Quinns Meadows Nature Reserve	Nature Reserve	Designated (2004)	392
Roseway Beach Provincial Park	Provincial Park	Pending Designation	18
Roseway River Wilderness Area	Wilderness Area	Designated (2016)	1,691
Round Bay Conservation Lands	Land Trust Property	Considered Protected	102
Sable River Bird Sanctuary	Migratory Bird Sanctuary	Designated (1941)	260
Sable River Provincial Park	Provincial Park	Designated	54
Tidney River Wilderness Area	Wilderness Area	Designated (1998)	22,700
Tidney River Wilderness Area (subject to mineral interests)	Wilderness Area	Designated (subject to mineral interest)	113



Figure 39. Parks and protected areas in the general vicinity of the Welshtown Quarry.

6.3.10 Recreational/Cultural Features

Residents and visitors to Shelburne County access natural areas for a wide range of outdoor recreation activities. In the Shelburne area, the predominant outdoor recreational activities are sightseeing, walking/hiking, birding, beachcombing, camping, boating (i.e., kayaking and canoeing), hunting and angling. There are frequently used hiking trails along the abandoned CN railway that has been converted into multi-use trails through the Rails to Trails Program including the Shelburne Rail Trail, Tom Tigney Trail, Footbridge Trail, Jordan River Trail, Roseway River Trail, and Woodland Multi-Use Trail. The Islands Provincial Park overlooks Shelburne Harbour and is frequented by locals and visitors for its wooded camp sites and beach access providing paddling and boating opportunities (Figure 40). Carleton River Beach's white sands are frequented by locals for dog walking, swimming, and exploring while the Roseway Beach offers ocean swimming from a breakwater, freshwater swimming, bird watching and surfing. The inland Welkum Municipal Park offers freshwater lake swimming and day-use picnic areas along Welshtown Lake (Figure 41). Shelburne Harbour Yacht Club and Marina offers guided boating excursions and rentals. Roseway River is a popular paddling route for sightseeing, angling and birding. (Boulder Cover Cottages, personal communication, July 2020).



Figure 40. The Islands Provincial Park located in Shelburne offers wooded campsites, an unsupervised beach and a boat launch (located approximately 2.5 km southeast of the Welshtown Quarry).



Figure 41. Local recreational beaches.

6.3.11 Residential Use

There are few residences in the vicinity of the Welshtown Quarry, located mainly along the Upper Clyde Road (Appendix D, Map A-3). Lot sizes are large and may include surrounding tracts of forested land. Lifestyles of the residents of the general area tend towards younger individuals engaged in economic activities such as fishing in the area (Boulder Cover Cottages, personal communications, July 2020), retirees maintaining their homes and properties, and residents working locally. Residents use the area and backcountry for recreation such as walking or hiking,

canoeing or kayaking, and use of ATVs and snowmobiles, as well as for access to natural resources (e.g. firewood). The quarry is approximately 2 km from the town of Shelburne, where residents can access various local services as well as recreational amenities such as coastal walking trails and ecotourism businesses (Candlebox Kayaking, Shelburne Sailing School Association, Geo Trail Adventure Geocaching).

6.3.12 Commercial/Industrial Development

No active commercial establishments are in the immediate vicinity of the study area, but logging occurs on private properties within the vicinity of the study site on Upper Clyde Road. Most commercial activity occurs in the towns of Shelburne and Birchtown and centres on tourism and fishing, including rental cottages (e.g. Roseway River Cottages located on the other side of the Roseway River, 47 Riverview Drive), a large garden centre (Spencer's Garden Center, 5 Ohio Road) and a fishing supply store (Vernon D'Eon Fishing Supplies Ltd, 42 Falls Lane).

The Roseway Hydro system, a hydroelectric dam on the Roseway River, is located at the end of Powerdam Road approximately 1 km east of the study site. The dam has not generated electricity since 2009. The system encompasses 524 km² of the Roseway watershed and features four dams with one powerhouse and a fishway for fish passage (NSPI 2018).

6.3.13 Tourism and Viewscape

Tourism is an important element in the economy in the vicinity of Welshtown and the Town of Shelburne, centred on nature and outdoor recreational activities, including angling and hunting, hiking, paddling, and beachcombing. The area was historically the home of the United Empire Black Loyalist, the largest free black settlement outside of Africa, and attracts tourists to the area. The Black Loyalist Heritage Centre in Birchtown showcases the site of the largest free Black settlement which occupied the area in the 1780's. The Centre includes historic buildings as well as presentations on the Black Loyalist journey from Africa to the American colonies then to Nova Scotia and back to Africa. Shelburne County Archives and Genealogical Society in the Town of Shelburne also offers resources for tracing family history or for conducting research on Nova Scotia's rich history. Many of the recreational attractions for locals (see Section 6.3.10) are also appealing to tourists. The area offers significant coastal views including from The Islands Provincial Park, on the shores of Shelburne's large, natural harbour and from several sand beaches along Water Street through the town of Shelburne and the coastal Sandy Point and Shore Roads.

Highways in the area pass through scenic forested landscapes or along the coast with ocean views. The quarry is not visible from the Upper Clyde Road (Figure 42) but may be visible in the distance from Highway 103 east of the site.



Figure 42. Welshtown Quarry entrance along Upper Clyde Road, facing west, June 9, 2020.

6.3.14 Transportation

Comparatively low levels of truck and equipment traffic are expected to originate from the Welshtown Quarry, due mainly to the generally low level of industrial and economic activity and consequent need for aggregate in the area. Upper Clyde Road, which runs past the quarry site, is a local paved road that connects the communities along the west side of Roseway River (Welshtown and Upper Clyde) with Highway 3, the main coastal route in the area. Upper Clyde Road supports mainly traffic arising from the quarry and local traffic of residents in the area for local activities and to access the more populous areas including the Town of Shelburne. The intersection of Upper Clyde Road and Highway 3 is important as the highway is a busy local thoroughfare and most of the truck and equipment traffic from the Quarry passes through it. Local use of Highway 3 includes shipping fish products, pulp logs, and gravel operations in addition to the traffic associated with the quarry, which is typically seasonal. Roads in the area support moderate traffic in comparison to the Highway 103, the main, east-west highway from the city of Halifax to the south shore and Yarmouth. Traffic volumes for Highway 3 (Reids Hill to Birchtown) have ranged from 193 to 487 vehicles per day (annual average of 160 to 440 vehicles per day) in the 2006 to 2018 period. In contrast, traffic on Highway 103, the main provincial highway connecting Halifax to Yarmouth on the south shore, shows a much larger traffic volume. Average daily traffic ranges from 3,072 to 3,726 vehicles per day (annual average of 2,540 to 3,340 vehicles per day) travelling between the town of Shelburne and Birchtown (Exits 26 and 27) and 2,513 to 3,059 vehicles per day (annual average of 2,100 to 2,740 vehicles per day) travelling between the Town of Shelburne and the end of the Shelburne by-pass (Exits 26 and Exits 25 respectively) over a comparable period (Nova Scotia Open Data Portal 2020). When operating, the Welshtown Quarry contributes truck traffic and some heavy equipment traffic (e.g., trucks, crushers, asphalt trucks, etc.) in the vicinity of the site, typically in the summer and fall construction seasons. Most of the equipment leaving the quarry, and production equipment moved to the Welshtown Quarry, takes place along the Highway 3 to Ohio Road and on to Highway 103. Access to the quarry from Upper Clyde Road is unobstructed with good sight lines, and similarly the nearby intersection with Highway 3 is clear. Neither are expected to be hazardous.

7.0 ENVIRONMENTAL IMPACTS, SIGNIFICANCE, AND MITIGATION

7.1 Assessment Approach and Methods

Information for the assessment was obtained from consultants' personal knowledge, from reviews of available information, and knowledge of the purpose and proposed design of the project. The environmental assessment follows *Guide to Preparing an EA Registration Document for Pit and Quarry Developments in Nova Scotia* (NSE September 2009) and uses assessment methodology typical for environmental assessment screenings of this kind. For this assessment a list of valued environmental components (VECs)⁶ (also known as VCs)⁷, and project activities and outcomes for the expansion of the existing quarry were developed, and the potential for interactions of these activities with VECs was identified. Where interactions were identified, and there was potential for significant impacts if mitigation was not undertaken, mitigating actions or activities have been suggested that will avoid the impact or reduce it to acceptable levels before the project proceeds. The process ensures that all potentially significant impacts on VECs are identified and all potential impacts on them have been considered, and sufficient mitigation planned.

7.2 Valued Environmental Components

The list of Valued Environmental Components considered for the assessment, and interactions with project components, are presented in Table 7. The environmental effects and potential impacts of the project along with their significance and suggested mitigations are outlined in the following.

BIOPHYSICAL	SOCIO-ECONOMIC
Air Quality, Noise and Light	Mi'kmaq
Groundwater	Recreation, Tourism & Viewscape
Hydrology	Recreational, Commercial & Mi'kmaq Fishing
Water Quality	Archaeological, Cultural and Historical
Freshwater Aquatic Environments and Wetlands	Economy, Land Use and Value
Terrestrial Environments	Transportation
Fish & Fish Habitat	Residential Use
Flora & Fauna & Habitat	Commercial /Industrial Use
Species at Risk	Water Supplies & Residential Wells
Natural Areas & Wilderness	Parks & Protected Areas
	Forestry, Hunting & Trapping

⁶ Valued Environmental Components (VECs) are features or things in the environment, which are particularly important either ecologically, socially, economically or culturally. The environmental assessment addresses potential interactions of the project with each VEC identified and assesses potential impacts. The process followed involves identifying all the activities or outcomes of the project, which interact with each VEC, and then determining and rating the magnitude of the impact in a standard way, in this case in a manner guided by standard approaches that have been developed for environmental assessments.

⁷ Valued Environmental Components (VECs) and Valued Components (VCs) are equivalent. Use of the acronym VC was used in environmental assessments carried out under the federal environmental assessment process under the Canadian Environmental Assessment Act (2012) and is recommended to be used in assessments carried out under its replacement, the federal Impact Assessment Act (IAA) (2019).

7.3 Socioeconomic Impacts

7.3.1 Mi'kmaq

The Mi'kmaq maintain a general interest in all lands in Nova Scotia and claim they have never surrendered, ceded, or sold the Aboriginal title, and that they claim all of Nova Scotia. As co-owners of the land and its resources, they expect that any potential impacts to rights and title be addressed. Mi'kmaq occupied much of Nova Scotia prior to European contact, and lands were used to varying degrees for habitation, hunting and fishing, as noted in Sections 4.3.1 and 4.3.8. In more recent times, treaties made with the British and continued through Canadian law have maintained their rights. Coastal areas in the vicinity of Shelburne, and freshwater bodies such as Welshtown and Courtenay Lakes and the Roseway River system may have been used by Mi'kmaq, including as a transportation route as Mi'kmaq moved throughout the Province; however, there is low potential for occurrence of Mi'kmaq archaeological resources at the quarry site (CRM 2020).

Operation of the Welshtown Quarry will use land that would otherwise be occupied by terrestrial ecosystems and would not likely be used for Mi'kmaq activities or by other residents for activities such as nature walks and hunting or fishing (either recreationally or for subsistence). Best management practices used at the site will reduce any potential impacts quarry activities may have on water quality and quantity. The land area affected is small in relation to the available wildlife habitat in the area, and would not likely affect wildlife or fish populations, potentially used by Mi'kmaq, and there are unlikely to be cumulative effects of other activities in the area; consequently none of these effects are considered significant.

7.3.2 Recreational Activities

Recreational use and nature appreciation of the environment in the vicinity of the site consists principally of water-based recreation along the Roseway River, tourist cottages, walking/hiking, camping, hunting, fishing, and home-based recreation (e.g. gardening) concentrated around Shelburne and along Upper Clyde Road. Only activities associated with Upper Clyde Road are likely to be affected by quarry activities—principally by truck traffic—and then principally when the quarry is operating. Operations at the quarry would be cyclic, likely occupying several weeks during the construction season during the years in which the site is active, and the facilities are well maintained. Although quarry operations could likely be heard and residents would experience truck traffic and other effects of quarry operations, the frequency and scope of the quarry is not expected to increase from past use, and any impact on normal activities of residents as a result of the proposed quarry expansion are expected to be negligible.

7.3.3 Tourism and Viewscape

Welshtown Quarry is not expected to impact tourism and viewscape. The property is located approximately 700 m from Upper Clyde Road and is not currently visible from there, although it may be visible in the distance from Highway 103 east of the site. Truck and equipment traffic accessing and exiting the site onto the Upper Clyde Road and at the intersection with Highway 3 is expected to be the main interaction with tourists. This traffic is expected to be occasional, will be similar now as in the future, and would likely be only a minor impediment to tourist vehicle traffic in the area. Both intersections have good sightlines, are well maintained, and do not present a particular safety concern; however, use of signage (e.g. “Trucks Turning”) during periods of onsite activity, would improve safety by alerting travelers. Lights, if present, at the site can be seen from immediate residents, but would be controlled by proper environmental management practices at the site. Overall the impacts on viewscape and tourism are expected to be negligible.

7.3.4 Recreational, Commercial & Mi'kmaq Fishing

Although the Roseway River in the immediate vicinity of the Welshtown Quarry supports fish in recreational and Mi'Kmaq fisheries, the Quarry does not influence any surface waters which will result in significant changes in flow regime or water quality in waterways downstream of the site. A minimum 30 m buffer will be maintained between the quarry site and the property line, and the nearest surface watercourse is more than 100 m from the quarry. There is no direct runoff from the quarry into adjacent streams and surface waters at the site have high quality, including low turbidity and neutral pH, which would lead to good quality of waters downstream for fish. Overall a negligible impact of the quarry on recreational, commercial, and Mi'Kmaq fishing is expected.

7.3.5 Archaeological/Cultural/Historical

The land proposed for the quarry expansion has low potential for pre-contact and/or early historic native or European archaeological resources (CRM 2020). Despite early use of the Shelburne area by European fishers, the area was not settled by Europeans until late in the seventeenth century and was not intensely settled until more recently, and then generally along travel routes. The quarry is set back from the Upper Clyde Road, and the adjacent land has not been used for agriculture and likely was used only for resource removal such as logging, trapping and hunting. If an archaeological feature of significance is encountered during quarry activities, particularly evidence of Mi'kmaq occupation, the effects will be reduced by halting operations and consulting with experts in the field to ensure the artifact or feature is not disturbed and is adequately documented and preserved.

7.3.6 Economy, Land Use and Value

The fishing industry based in Shelburne and activities which support it, as well as forestry, hunting and trapping, and tourism, as well as rural-residential activities, are the major economic activities in the vicinity of the site and the study area as a whole. The land on the site is not suitable for agriculture, and aggregate production is among the only potential commercial uses of the area. Land in the general vicinity of the site is also designated for conservation and wildlife management and contains habitat for game species such as White-tailed Deer, which support hunting—an important activity for locals, visitors and Mi'kmaq alike. The expanded quarry will remove only a small fraction of available land for these purposes in the area, and therefore won't have a significant impact on these uses. Areas not required for the quarry will be preserved if possible, to assist in maintaining forest ecosystems and wetlands for wildlife, and to buffer adjacent areas from quarry activities. Quarry activities are also not expected to impact existing residential, industrial or conservation and scientific use of nearby areas. As the scope and frequency of activities are not expected to change from past use, residential property values in the area are not expected to change significantly. The existing quarry has been operating at the site with little to no impact, while providing economic development and a source of aggregate for local construction projects.

7.3.7 Transportation

Welshtown Quarry will generate a comparatively low level of truck traffic on highways in the area, but activity levels are not expected to increase significantly, and consequently the quarry is not expected to change the existing traffic volumes significantly. During periods of site operation, signage for truck and equipment operators, as well as the surrounding communities will be placed to help avoid dangerous situations at the quarry entrance.. Safe use of the road and avoidance of accidents is essential, both for human impacts and the potential impacts of vehicle accidents and spills on the local watercourses and environments. Warning signs and speed limits can be placed in areas leading to the quarry, in particular when the quarry is operating, to improve safety.

Equipment and truck operators for the quarry will be given instruction on safe and environmentally acceptable procedures. With suitable foresight and care, overall the impact of the project on transportation and safety is expected to be minimal, will little / no charge from previous operations at the quarry.

7.3.8 Residential Use

Quarry activities can potentially interfere with normal use and enjoyment of nearby residential properties by creating background noise, and through truck and equipment traffic and dust, which some residents may find objectionable. The property is located approximately 2 km from Shelburne and is not visible, and there are few residents in the vicinity, located along Upper Clyde Road. Noise and dust from routine operations in the quarry will be within regulated limits and will not normally disturb residents living nearby; truck movements along Upper Clyde Road may result in periodic elevated noise levels. Mitigation measures such as maintaining appropriate operational buffers, controlling vehicle speed and engine braking, securing equipment to prevent banging (e.g. doors and chains), covering loads, wetting working areas, etc. will be practiced to ensure that quarry operations comply with noise and dust limits according to the Pit and Quarry Guidelines. Normal traffic noise on Upper Clyde Road would likely exceed any noise coming from the quarry for homes located nearby. Traffic volumes from the site would be moderate when the Quarry is in use, and a high frequency of truck traffic would be an irregular occurrence, depending on the supply requirements for particular projects. Dust from operations may reach residential areas, and attention is expected to be given to dust management.

Quarry activities such as blasting, are not expected to impact residential water supplies, as homes are located at a significant distance from the site. All blasting events are expected to continue to be monitored for concussion and ground vibration to ensure blasting limits are achieved. A groundwater monitoring program for water supplies will be implemented to establish baseline groundwater quality and provide on-going monitoring to ensure that any possible effects of the quarry are identified.

Most operations at the site occur during daylight hours. On rare circumstances when they are undertaken at night, activities will involve minimal additional lighting and noise, and are unlikely to be a significant disturbance to residents. The quarry will include signage with phone numbers and contact persons should any members of the community wish to register complaints or concerns. A complaint resolution procedure will be put in place by Dexter Construction to address complaints and concerns.

7.3.9 Commercial/Industrial Use

There are no businesses near the quarry which could be affected. The quarry contributes to net economic benefit in the community through supporting local trucking operations and providing access to aggregate and other quarry products.

7.3.10 Water Supplies and Residential Wells

Nearby residents use drilled wells and dug surface wells for potable water supply; however there are no wells within 800m of the quarry study area. Groundwater recharge generated by the quarry is likely to be of high quality (low conductivity and dissolved solids and neutral in pH). Best management practices surrounding blasting will be followed, established operational procedures for fueling will be followed, and a contingency plan will be maintained to mitigate reasonable impacts on aquifers at the site.

7.3.11 Parks and Protected Areas

Welshtown Quarry site is not expected to be visible by tourists traveling by road, and road traffic activity due to the quarry is not expected to be high enough in volume to disrupt tourist traffic. Occasional blasting may be heard locally along Upper Clyde Road and in Shelburne (e.g. at the Island Provincial Park) but occurrences are likely to be brief, and distant, and not likely to be a significant concern to visitors/users of those areas. The quarry will be restored at the end of its useful life. Expansion of the quarry will not affect the integrity of any nearby protected areas.

7.3.12 Resource Use—Forestry, Hunting & Trapping

Use of the land for a quarry will remove the potential for logging the site, at least until after the quarry is closed and rehabilitated in future; however the area occupied by the quarry is relatively small in relation to the available forest resources in the area, and the overall impact on economic return is expected to be small. The quarry will occupy a relatively small area of habitat for furbearing and game species and will not have a significant impact on hunting and trapping.

7.4 Biophysical Impacts—Impacts of the Project on the Environment

7.4.1 Air Quality, Noise, and Light

Quarry activities are not expected to change from the previous scope of operations, however various project activities have the potential to generate dust, combustion emissions, noise, and light. In particular, operation of heavy equipment (e.g. earth movers, crushers), rock drilling and blasting, as well as onsite routine operations contribute to increased dust and particulate levels. Dust may also impact adjacent wetlands, which are typically nutrient-poor ecological systems where sphagnum moss predominates; however the relative contribution of the quarry is expected to be small relative to other sources such as atmospheric deposition. Noise levels can impact human use and enjoyment of the environment. Dust emissions are expected to be localized and short term and are expected to be minimal from routine operations. Dust management will be undertaken, including use of water spray and covering working and laydown areas with blasted rock, dust suppression systems on crusher equipment, and reducing equipment and vehicles speeds. Monitoring of airborne particulate emissions will be conducted at the request of NSE and in accordance with the Pit and Quarry Guidelines and the Nova Scotia Air Quality Regulations. Industry standards and best practices will be followed during all phases of operations.

Exhaust emissions will occasionally be generated by the operation of vehicles and equipment and may be detected at a distance from the site and along Upper Clyde Road during transport of product. Vehicles and heavy equipment are expected to follow efficient operating procedures such as not idling unnecessarily when not in use. Given the relatively small size of the quarry and the scope of the planned operations, these emissions will be minimal (i.e. restricted to several pieces of heavy equipment, earth movers, trucks etc. as well as operation of crushers and asphalt plant) and will be localized and similar in type and amount to those produced during previous operations. Ambient air quality monitoring will be conducted at the request of NSE.

Noise levels from the expanded quarry are expected to be similar to those already produced at the site, since the operations are expected to be similar in size at a given time. Noise mitigation will include maintaining appropriate operational buffers, maintaining vehicles and heavy equipment in proper working order, and giving attention to traffic patterns around the site to reduce the need for heavy equipment to back up (thus reducing the frequency of backup beepers). The operator should ensure that heavy equipment does not exceed the noise limits specified in the Nova Scotia Pit and Quarry Guidelines. Blasting is expected to occur infrequently (1-2 times per year). All blasting events will be monitored for concussion and ground vibrations. Noise monitoring will be conducted at the request of NSE.

Occasional nighttime operations may be required. Light during nighttime operations— particularly during times of low-hanging cloud and fog—can attract migrating birds traveling over water towards the rest of the mainland of Nova Scotia. Measures can be taken to ensure use of directional lighting, which minimizes emanation of light upward and laterally over the horizon.

7.4.2 Groundwater

Activities associated with the project including forest clearing, grubbing and removal of overburden, and blasting, influence groundwater flow locally in the vicinity of the quarry, but are not expected to influence groundwater aquifers over a broader area. The amount of recharge area involved in project activities is moderate in relation to the overall size of the aquifers in the general vicinity; however the quarry floor will continue to add recharge in approximately the same amount as at present. A contingency plan is expected to be established to manage any spill or release occurrences potentially impacting groundwater in the area. A groundwater monitoring program will be established to determine baseline groundwater quality and provide on-going monitoring to ensure that any possible effects of the quarry are identified. Overall, the effect on overall groundwater flow patterns are expected to be negligible.

7.4.3 Hydrology

Expansion of the quarry will modify the existing hydrology at the site, resulting in an artificial though managed regime of surface water movement and runoff at the site. The proposed expansion area is split between the watersheds of the Roseway River on the east; and Birchtown Brook on the west. Due to the topography, with the height of land in the approximate centre of the property, precipitation and groundwater intercepted by the quarry, however, has the potential to be channelled by quarry drainage systems to either watershed, and to the south, and consequently supply to surface waters in the vicinity is not expected to be disrupted significantly. Surface water runoff from the quarry is inherently intermittent however this will be buffered by the drainage system and associated wetlands and is not expected to affect overall flow characteristics in downstream areas significantly. Runoff from the outside areas of the quarry such as the surrounding berms will be managed to ensure that it meets acceptable environmental standards. Dexter Construction will maintain the drainage management system which is currently in place and continue to manage the flow in a natural way and minimize damage to the local landscape.

7.4.4 Water Quality

Water quality leaving the quarry is expected to be high, and is not expected to impact downslope areas, in particular the Roseway River. There are no watercourses within 100 m of the study area. Quality of water leaving the site and entering groundwater is high, due both to the onsite management and the low-contaminant characteristics of the bedrock. Quarry rock is within acceptable limits for sulphur and acid-generating potential. Blasting is not expected to result in groundwater quality changes, and, as is current practice, potential releases of chemicals such as nitrates used in blasting will be monitored. Forest clearing and grubbing activities can lead to releases of fines from the soil, resulting locally in elevated suspended sediment levels but little surface water flow from grubbed areas is expected off the site and sediments will be removed during flow through the adjacent landscapes. Possible release of other contaminants such as oils and lubricants from operating equipment is expected to be mitigated by normal precautions on equipment operations and fuelling locations. Contaminants arising from operations of the quarry are expected to be exceedingly low. All activities will conform to the Nova Scotia Erosion and Sedimentation Control Handbook (NSE 1988) and the Nova Scotia Pit & Quarry Guidelines (NSE 1999). Runoff from road surfaces potentially can lead to temporarily elevated suspended sediment levels in flows in ditches adjacent to them, although effects would be short term. Impact of the quarry on water quality in adjacent streams and other waters is expected to be negligible.

7.4.5 Freshwater Aquatic Environments and Wetlands

There are no permanent streams within 100 m of the study area. Wetlands around the fringes of the study area have been intentionally avoided in determining the proposed expansion area. Any wetland removal will be negotiated with Nova Scotia Environment following the normal wetland alteration approval process and all wetlands which are removed or altered will be compensated for as development proceeds. Because surface water leaving the quarry is expected to parallel the present regime, wetlands in adjacent areas downslope of the quarry are not expected to experience a significant change in the source or supply of water and therefore are unlikely to be affected. Quantities of runoff arising from the site in future from the outer slopes of berms and grubbing piles will be approximately the same as at present and will remain in the same watershed. The quarry is unlikely to generate significant quantities of contaminants or suspended sediments that could impact any freshwater habitat.

7.4.6 Terrestrial Environments

Proposed expansion will utilize areas which are mainly medium-aged softwood and mixed forest—types which are common in the general vicinity, and in particular locally at the site—and the quarry will not remove a large proportion of either type. Some of the features of the site and those associated with bedrock uplands in general, including exposed bedrock and its plant communities including Reindeer Lichen and Golden-heather have been avoided in determining the expansion area.

7.4.7 Fish and Fish Habitat

None of the proposed project activities will physically impact potentially fish bearing streams. Surface runoff from the site is distributed into the two watersheds headwaters spanned by the proposed expansion area, and the quarry will occupy a relatively small area in relation to both watersheds as a whole. Fish passage at the main outflow of a stream near the quarry into the Roseway River is blocked by a hanging culvert and there is not suitable upstream fish habitat. Water quality typically found in runoff from the quarry will be monitored and is expected to meet guidelines for maintenance of Freshwater Aquatic Life. All guidelines for activities and timing of blasting in the quarry will be followed. Overall the effects of the quarry construction and operations are expected to be negligible.

7.4.8 Flora and Fauna and Habitat

Expanding the Welshtown Quarry will remove existing terrestrial ecosystem (plants and animals) in the footprint of the quarry. With time, areas no longer suitable for quarry operations will be remediated, through a site reclamation plan which will be established as a condition of quarry approval. Plant and animal communities that arise in remediated areas will likely differ to some degree from those at present; however, a goal of remediation will be to ensure that conditions (e.g. soil types and topography) are reasonably restored to pre-existing conditions, to allow natural communities to regenerate. During recovery and revegetation of abandoned areas, the forest succession will provide habitat for a moderate diversity of species. Removal of forest cover is a feature that quarry development shares with logging activities, which affects local ecosystems to a moderate degree, and is allowed in Nova Scotia. Normal management practices regarding forest clearing, such as avoidance of cutting or major clearing activities during critical breeding periods of songbirds from mid-April to mid-September, will reduce loss of nesting birds in forest areas. Expansion of the Welshtown Quarry will result in only a comparatively small change in the coverage of natural and mature forest stands in the area and is expected to have comparatively small impact on interior forest birds and wildlife. During operations, modified areas of the quarry offer potential nesting sites for certain species of birds and other wildlife, including hunting spaces

for species such as owls and nesting for ground nesting birds such as nighthawks. Quarry employees should be educated on the need to check areas for activity and nests including both ground- and tree-nesting birds, before undertaking activities which would disturb established surfaces. Night operations and use of lights have various effects, including attracting insects which otherwise would need darkness to mate and reproduce; light pollution is considered to be an important factor globally in decline of songbird populations, through declines in populations of some insects. Night operation lighting during migration periods (August – September) would attract migrating birds. Lighting used at the site should focus downward and below the normal horizon, to limit visibility by birds and insects from a distance.

7.4.9 Species at Risk

No federally or provincially-listed species at risk, or species more sensitive than S3 ranking (vulnerable), were found in the proposed expansion area. Moose and Canada Lynx (both provincially listed as Endangered) are known to occur in the general area of the study site. Red-breasted Nuthatch (status vulnerable) occurred during the site surveys. Common Nighthawk, a ground-nesting species, potentially could nest in grubbed and marginal but open areas of the quarry; employees should be made aware of the need to check areas for activity and nests before undertaking activities which would disturb established surfaces. Activities such as logging and site clearing should be scheduled outside the April to August nesting period for breeding birds such as Red-breasted Nuthatch. Lights during night operations during migration periods (April – June, August – September) would attract various bird species and insects, which could include species at risk. Lighting used at the site should focus downward and below the normal horizon, to limit visibility from a distance.

7.4.10 Natural Areas & Wilderness

Natural areas in the vicinity of the site such as the Roseway River are appreciated by locals and tourists alike, and the Shelburne area is dominated by natural areas, including some of the most remote and wild areas of Nova Scotia. Residential use along the Upper Clyde Road, and in Shelburne, contrast with the undeveloped forested areas over much of the landscape in the vicinity of the quarry, and Welshtown Quarry affects a small proportion of the natural landscape at the site and has a limited effect on visitors to the area who are looking for nature experiences. Dexter Construction is committed to minimizing potential effects of the quarry, in particular to reduce traffic, noise, dust and light from operations. Restoration should also consider values important in conservation of biological communities and ecosystems, as well as changes in physical conditions that could affect those communities. Normal procedures such as dust control and light management will help to minimize impacts on natural and wilderness values at the site.

8.0 IMPACTS OF THE ENVIRONMENT ON THE PROJECT

The operating quarry will not be impacted in general by weather, including high rainfall and precipitation. Quarry design, which includes site water management, is required to account for extreme rainfall events. Aggregate and other rock products stored at the site are stable under varying conditions of rainfall and wind. Integrity of any runoff management structures at the site must be maintained and appropriately designed to remove the possibility of catastrophic failure. Changing climate may increase the operating season for transportation projects, and the need for aggregates produced by the quarry.

9.0 CUMULATIVE IMPACTS

Because of the remoteness of the location, all the potential impacts of the quarry operation (dust, noise, lights, blasting, traffic volume) are unlikely to be compounded by other development or human activity. Since site operations are not expected to increase in frequency or scope from past use, the cumulative effect of other local human activity is not expected to increase from past levels.

10.0 MONITORING

In accordance with Pit and Quarry Guidelines under the NS Environmental Act and the Industrial Approval for the quarry site, Dexter will implement surface and groundwater monitoring programs to monitor hydrological conditions as well as water quality. Routine monitoring of noise levels and particulate levels will be conducted in accordance with the site Industrial Approval.

11.0 PUBLIC CONSULTATION

Informing the public and Mi'kmaq about proposed industrial activities which potentially affect them is an important part of environmental and project management. Potential benefits include exposure to local knowledge, which may improve environmental performance, and overall operations of the project; and public involvement and support in subsequent operations. In addition to contacts already made in developing this assessment and in conducting operations in the Welshtown area, Dexter will be publishing a Notice in the provincially circulated newspaper inviting the local community to review and submit comments regarding the project. Stakeholders are encouraged to forward comments regarding this application to NSE to be considered as part of the regulatory review process.

12.0 PROJECT CLOSURE

Remediation of the affected environment during the closure or decommissioning phase of the quarry will involve the execution of a Rehabilitation Plan developed in consultation with the NSE as part of the Industrial Approval process.

13.0 APPROVAL OF UNDERTAKING

Dexter will comply with all provisions of the Nova Scotia Environment Act and Regulations. An application for an amendment to the existing Industrial Approval will be submitted to Nova Scotia Environment if Dexter is successful in obtaining an Environmental Assessment Approval for the project.

14.0 FUNDING

No public or other government funding is involved in the execution of this undertaking. All costs are borne by Dexter.

15.0 SIGNATURE OF CEO AND DATE

Date Oct 21/2020 
David Wood – Vice President & Chief Financial Officer
Dexter Construction Company Limited