APPENDIX D
BIOPHYSICAL ASSESSMENT REPORT
(Envirosphere Consultants Limited, 2016)

Environmental Assessment Registration Document:
Loch Katrine Quarry Expansion
Loch Katrine, Guysborough County, Nova Scotia

Biophysical Assessment:
Loch Katrine Quarry Expansion
140 Highway 316, Guysborough County, Nova Scotia – PID 01245588

September 2016

Submitted to:

Dexter Construction Company Limited
Bedford, Nova Scotia

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1 INTRODUCTION

Dexter Construction Company Limited, Bedford, Nova Scotia, is proposing to expand its quarry in the Loch Katrine area of Guysborough County, near Antigonish, Nova Scotia. The quarry is presently operating under an industrial approval for quarries less than four hectares in size; an approval to expand the quarry beyond the current size is required under the Environmental Assessment Regulations of the Nova Scotia Environment Act. Dexter Construction Company Limited contracted Envirosphere Consultants Limited of Windsor, Nova Scotia, to prepare a biophysical and socio-economic overview and assessment of the expansion in support of the approval application. This report contains the results of the overview and assessment. It presents a description of the methodology and scope, existing environment, environmental effects, cumulative effects, discussion, and conclusions. The assessment provides a sufficient level of detail to ensure that all information necessary to allow adequate review of the project is provided; to demonstrate how the assessment was conducted; and to document the information on which the conclusions were based.

2 INFORMATION SOURCES

Information for the biophysical and socio-economic overview and assessment was collected from various sources, including interviews with representatives of the Department of Natural Resources, Nova Scotia Department of Aquaculture and Fisheries (NSDAF), Fisheries and Oceans Canada, contacts with organizations, businesses and individuals in the Loch Katrine area; review of existing published information including soil surveys, reports on geology and natural history (e.g. *Natural History of Nova Scotia*); use of relevant websites and databases (Nova Scotia Open Data Portal; DNR Significant Habitat and Wetland Databases, Atlantic Canada Conservation Data Centre, and Nova Scotia Museum of Natural History); use of maps, digital data on land use and property ownership, aerial photos, and 1:50,000 topographic maps. Site visits and walkovers by project personnel were carried out on October 16, 2015 and June 7, 2016 (fall and late spring/early summer botany surveys); May 6-8 and June 9, 2016 (owls and breeding birds); and June 9-10 & 16 (site reconnaissance). Key project personnel included Patrick Stewart (M.Sc.), Valerie Kendall (M.Env.Sci), and Heather Levy (B.Sc. Hons. Environmental Science) (background review, site reconnaissance, wetlands, water quality & fish habitat assessment); Ruth Newell, M.Sc. (botany surveys); and Mr. Fulton Lavender and Mr. Richard Hatch (bird surveys).

3 SITE LOCATION AND STUDY AREA

Loch Katrine Quarry operated by Dexter Construction Company Limited in Guysborough County is located approximately one kilometre east of South River Lake and Highway 316, and southeast of the Antigonish-Guysborough County line, at approximately UTM Zone 20, NAD83, Easting 584,120 and Northing 5028160. The site is shown in air photos Air Photos 2007 406_067 & 406-138, July 27, 2007, and Google Earth satellite imagery from June 22, 2011. The focus area for the assessment is shown on Figures 1 & 2 and Map A-1, Appendix A. The quarry is shown in Figures 3 & 4. The proposed expansion area will be located entirely within the EA study area.

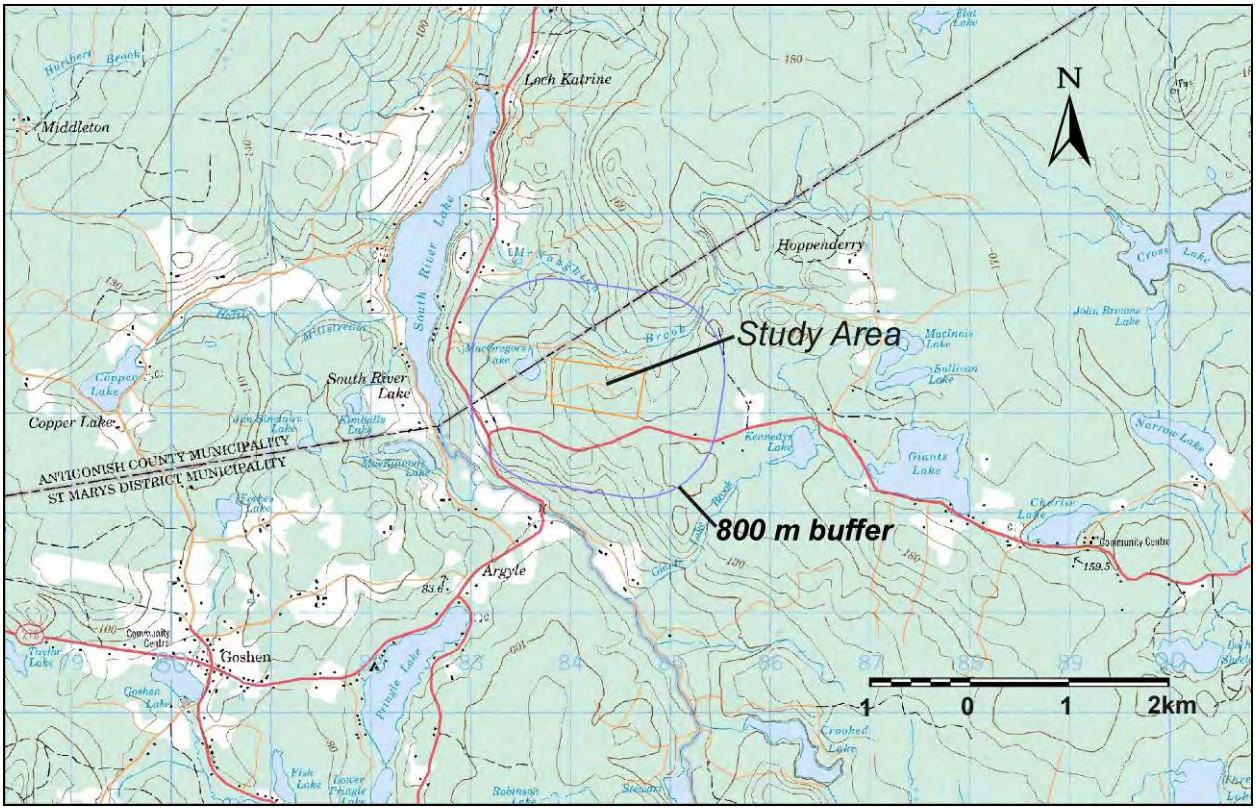

Figure 1. Project location shown on NTS 1:50,000 Map 11F5.

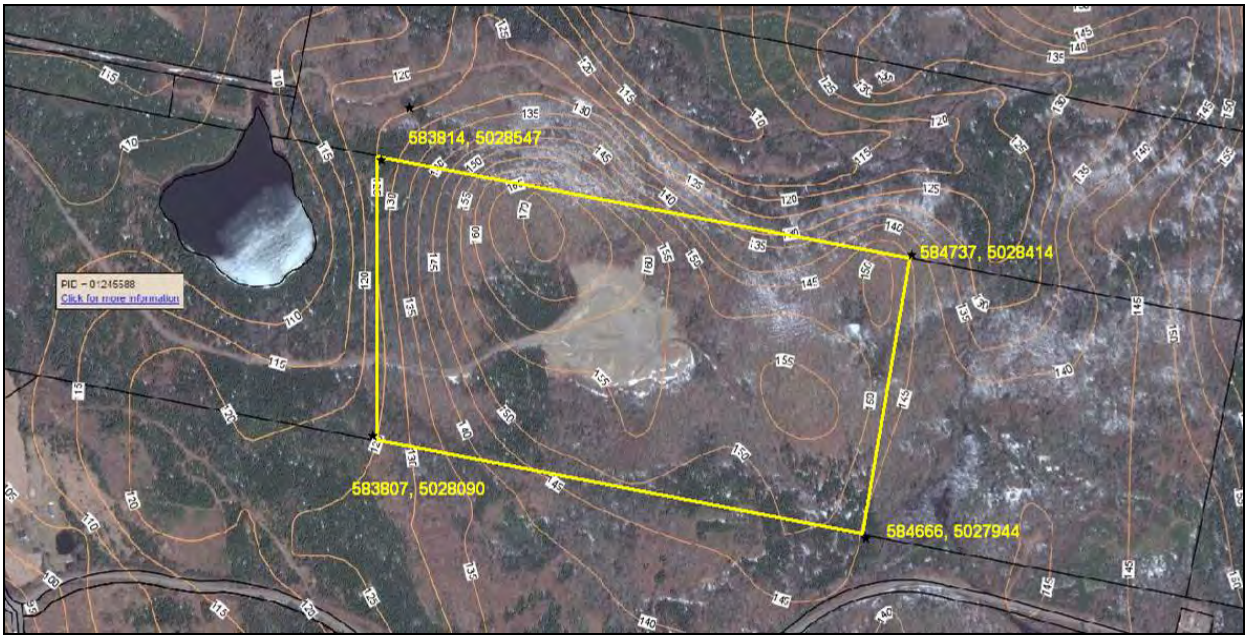

Figure 2. Study area in relation to local site features in a 2012 air photo.

Figure 3. Panoramic view of Loch Katrine Quarry, facing west, June 2016.

Figure 4. Southwest view of Loch Katrine Quarry, June 2016.

4 EXISTING ENVIRONMENT

4.1 PHYSICAL ENVIRONMENT

4.1.1 CLIMATE AND WINDS

The Loch Katrine Quarry study site is located inland, approximately 35 kilometers south of St. Georges Bay on Northumberland Strait, 35 kilometers west of Guysborough, and approximately 50 kilometers north of the Nova Scotia Eastern Shore. Proximity of the area to these coastal regions results in a moderate, humid climate, with wet spring and summer seasons and high precipitation in fall and winter

(Figure 5). Average annual precipitation over 20 years is relatively high, at more than 1300 mm; while average annual temperature of the area is 6 ºC., with daily average high in summer of about 18 ºC and minus 6.5 ºC during winter (Canadian Climate Normals 2016; Webb and Marshall 1999). Annual winds are predominantly from the north to northwest in winter, shifting to the south and southwest during the May to November period (TDC 1991).

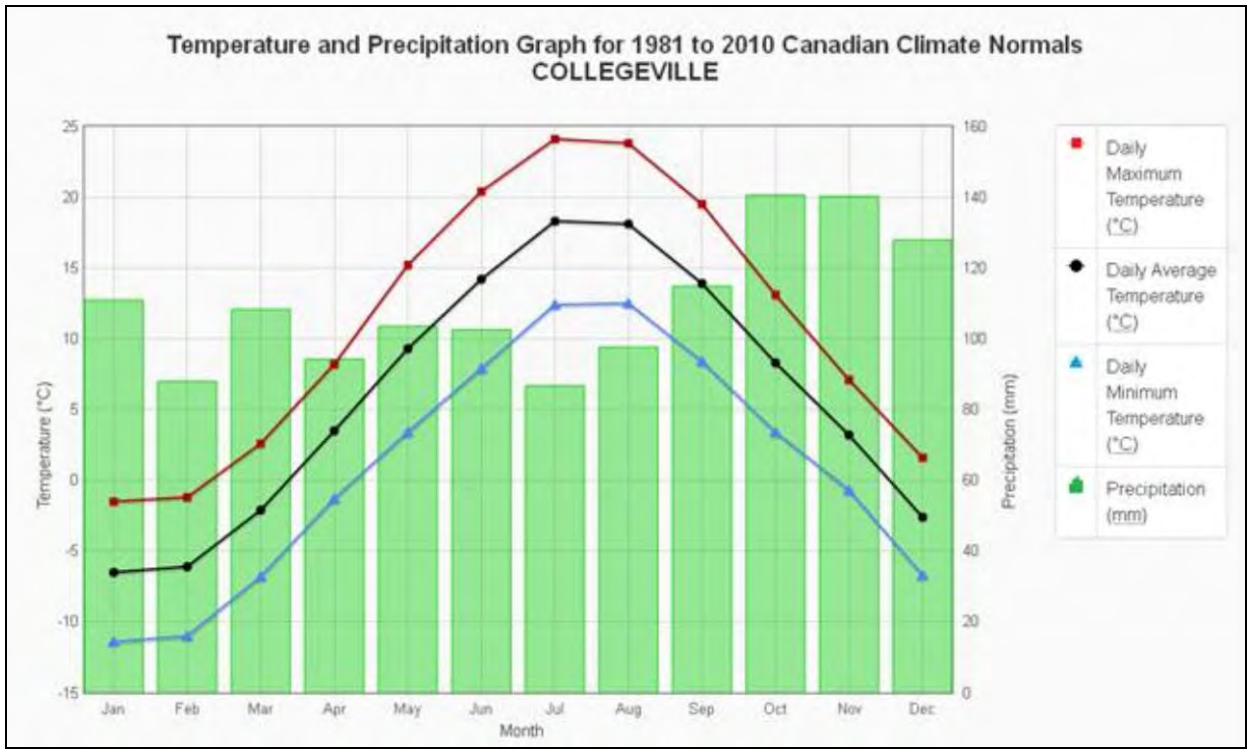

Figure 5. Annual precipitation cycle for Loch Katrine Quarry using observations from Collegeville (1981-2010) (Canadian Climate Normals 2016).

4.1.2 TOPOGRAPHY AND GEOLOGY

Landscape

Topography in the area is relatively level with the site located on a slight topographic high that slopes steeply to the north and west (1:6) and moderately to the east (1:50) and south (1:25) with a depression in the northeast corner containing a 0.1-hectare pond (Figure 2, Maps A-1 & A-4).

Bedrock Geology

The site is on the Mulgrave Plateau in the Avalon Zone of Nova Scotia whose bedrock formations include sandstones and conglomerates overlying basalts and other volcanic deposits (Davis and Browne 1997). Although much of the Plateau consists of sedimentary rocks, harder igneous and metamorphic

bedrock protrude, creating topographic highs containing rocks suitable for aggregate production. The Loch Katrine site is underlain by the volcanic Sunnyville Formation, which is one of the main volcanic bedrock units in the area, composed of Devonian basalt, andesite, rhyolite and tuff and overlain predominantly in the south and west with resistant conglomerates in the Glenkeen Formation (Figure 6) (Keppie 2000). Younger Devonian siltstones, sandstones, wacke, conglomerate and dolostone predominate north and south to southwest of the Loch Katrine to South River Lake area (Figure 6). The Plateau is generally moderately level and South River Lake just west of the site is in a valley presumed to represent an ancient runoff channel in the bedrock surface (Davis and Browne 1997).

Surficial Geology

Surface deposits in the Loch Katrine-South River Lake area are a mixture of types ranging from an overburden of glacial till with occasional bedrock outcrops; to glacial features such as drumlins, eskers and kame fields; as well as abundant depressions containing surface water (e.g. lakes, ponds etc.) and alluvially-formed deposits, and peat. The dominant surface type is stony till plain, from 2-20 meters in thickness, flat to rolling with numerous surface boulders; which transitions into flat to rolling siltier till with fewer boulders and 3 to 30 meters thickness which predominates to the south and southwest of the site (Figure 7, Stea *et al,* 1992). Shallow bedrock, which occurs predominantly northeast of the site and southwest of South River Lake, is covered by a discontinuous veneer of till. Drumlins are numerous, dominated by those containing silty till, and other ice-movement and glacial drainage features, including kame moraines and esker systems northwest of South River Lake (Figure 7)(Stea *et al* 1992).

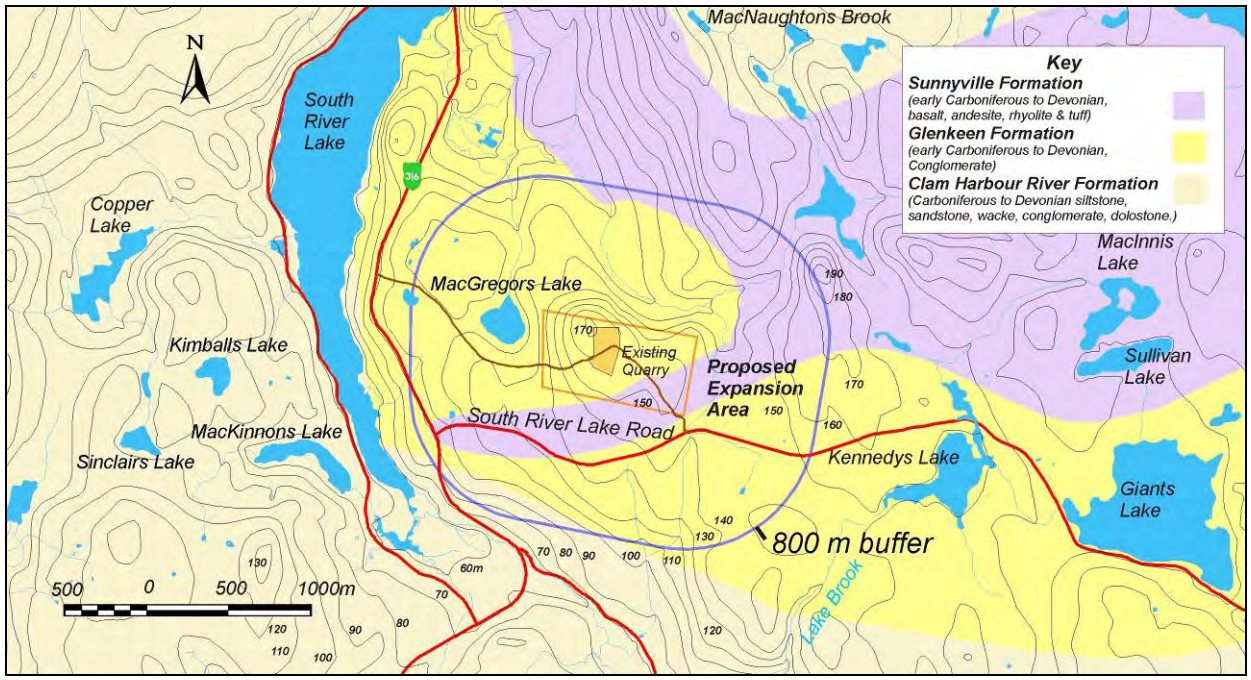

Figure 6. Bedrock geology of the study area. From Keppie (2000) and digital version (2016).

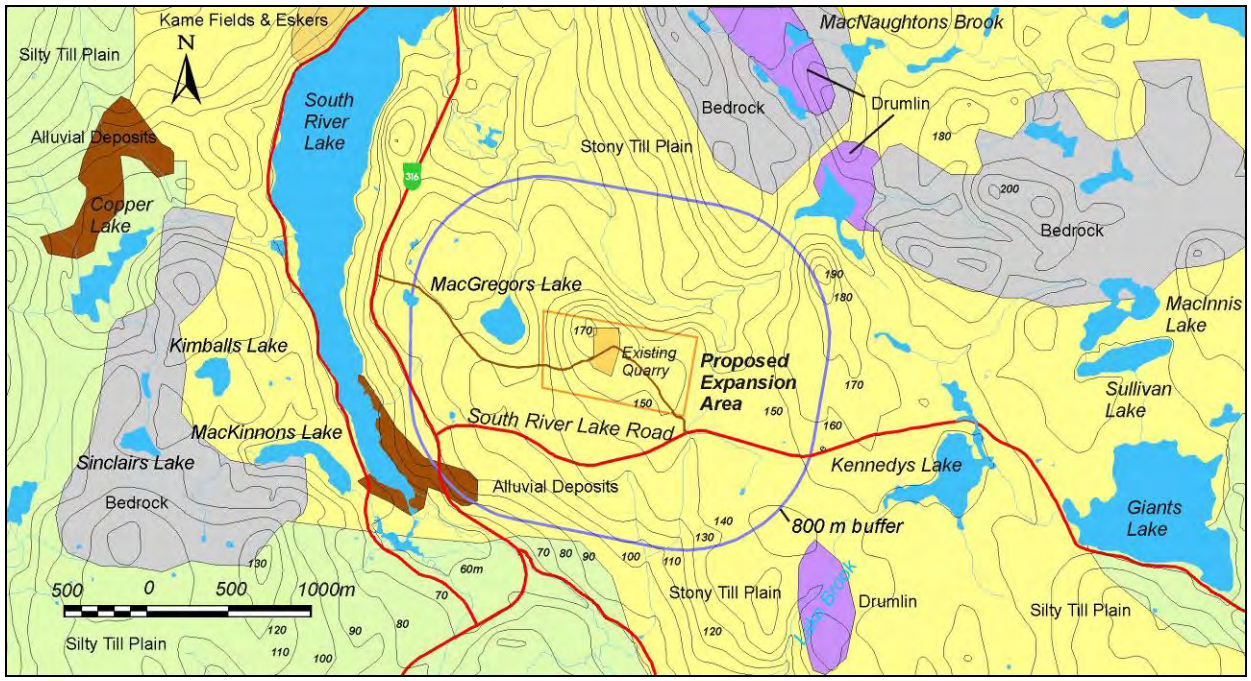

Figure 7. Surficial geology of the study area. From Stea *et al* (1992) and digital version (2016).

4.1.3 AIR QUALITY, NOISE & LIGHT

The Loch Katrine area experiences low levels of artificial light, low levels of ambient noise, and high air quality. There are few sources of artificial light in the area; ambient noise levels reflect local vehicle traffic, logging equipment, and operations of the quarry; and air quality is expected to be good due to the rural location and predominantly forested setting.

House and yard lights as well as vehicle lights are the main sources of artificial light at the site. These include light from local residences and traffic traveling on Route 316, a collector road connecting Lower South River at Highway 104 with Half Island Cove at Trunk 16. Traffic levels on South River Lake Road, which passes south of the quarry, are low and generate little artificial light. Lights at the quarry, as well as 'skyshine' from operations when low cloud occurs, can probably be seen from Route 316 in areas north of Loch Katrine, and residences in the area.

The Loch Katrine area is expected to have a relatively high natural baseline air quality typical of areas with low levels of human activity. Neighbouring forested areas as well as vehicle traffic, including that associated with quarry activities, may influence air quality. Areas surrounding the site are predominantly forested with a low density of residential properties. Route 316 and South River Lake Road are the two main roads that pass through the area and vehicle use is relatively low along these routes. 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 scope of operations for the quarry are not expected to change and ambient noise levels in general are expected to be low due to the relatively isolated location of the quarry. Peak vehicle noise on the highway is expected to coincide with vehicle traffic patterns. Morning and evening traffic and noise level peaks, as well as seasonal (summer) peaks in traffic noise corresponding to tourist activities, are expected. The quarry and associated movement of trucks and equipment would continue to provide a minor and periodic source of noise in the area and noise levels reaching the nearest residences are minor[1]. 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 may take place periodically for a few weeks at a time; a portable asphalt plant may operate at the site periodically; and transport of product using trucks and heavy loading equipment would occur on an as-required basis. Typical noise includes blasting, and sound from crusher and other heavy equipment operations (e.g. motors, back-up signals etc.). All trucks leaving the site are required to follow best operational practices to minimize noise and to cover loads to minimize dust release. Noise levels arising from the quarry in future are expected to be consistent with those produced by the existing quarry operations at the site.

4.1.4 HYDROLOGY

Loch Katrine quarry is located in the South River/West River watershed, draining north into St. Georges Bay and the Gulf of St. Lawrence. The north part of the site drains north into McNaughton Brook which flows into Lower South River about two and a half kilometers northwest of the site; the south part of the site drains into a chain of small streams which form the upper watershed of South River Lake (Figure 8). There are no permanent first-order streams on the site, and no surface water bodies with the exception of a small pond (0.1 ha) located near the northeast corner (Map A-4).

1 Local residents interviewed did not indicate problems with noise from the quarry.

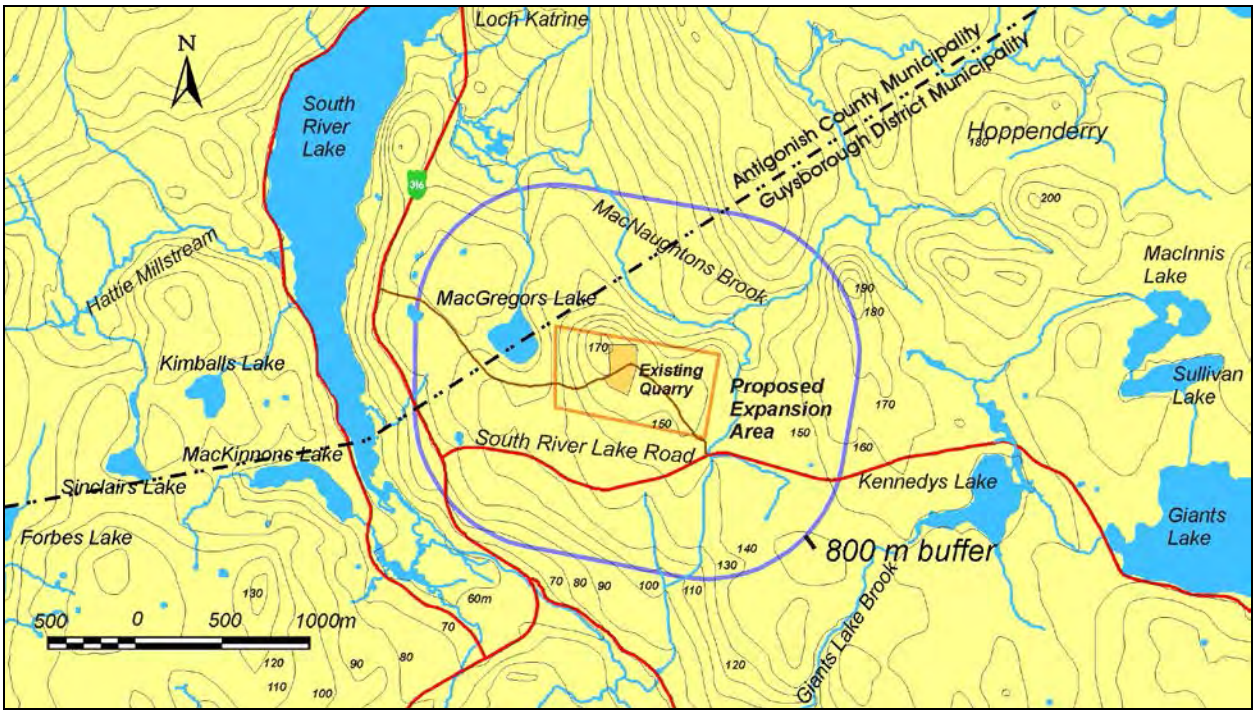

Figure 8. Surface waters in the vicinity of the Loch Katrine quarry.

4.1.5 HYDROGEOLOGY

Groundwater develops predominantly subsurface in cracks and fractures as well as horizontal surfaces between strata in bedrock at the site as well as in till that can accumulate to significant depth at some locations in the area. There is little surface water runoff in the form of streams or flowages, and most of the precipitation leaves the site subsurface. Prevalence of glacial till would allow development of near surface wells and dug wells are presumably the main water source for residences in the area. There are currently no wells documented in the Nova Scotia well log database within one kilometer of the study area (Kennedy and Fisher 2013).

4.1.6 SOILS

Soils at the study site are derived from tills formed from dominant igneous and metamorphic bedrock (e.g. quartzite and slate) in the area. The predominant soil type at the site is Thom—dark reddish brown friable sandy loam over dark red-brown sandy loam—with Halifax soils consisting of light brown sandy loam over yellowish brown sandy loam on the northern slope (Cann & Hilchey 1954; Hilchey et al. 1954; Webb and Marshall 1999; Davis and Browne 1996). Soils in Antigonish County generally are relatively heavy, shallow and well drained, and supporting a mixture of tolerant hard- and softwoods.

4.2 BIOLOGICAL RESOURCES AND HABITAT

4.2.1 TERRESTRIAL ENVIRONMENT

The site was originally forested in its entirety but forest cover has been largely removed through development of the Loch Katrine Quarry and recent (1-2 years) logging activity. The north, northwest and east slopes of land adjacent to the quarry contain a medium age to mature regenerated deciduous forest (sugar maple, moose maple, red maple, yellow and white birch, beech and balsam fir); and the south side is occupied by a mixed forest dominated by softwoods, primarily balsam fir with white spruce and hardwoods (red and sugar maple and yellow birch). Topography is rolling with highest elevations in the northwest and northeast quadrants (Figures 9-11).

Figure 9. Northeast view from the edge of the present active work area, Loch Katrine Quarry, showing topography (June 10, 2016).

Figure 10. View from northeast corner of study area towards northeast pond and hill in background, June 10, 2016.

Figure 11. View of southeast section of study area, showing gradual slope to the south and recently cutover area, June 10, 2016.

Plant communities at the site are comparatively diverse with 94 species recorded (Appendix B). One species of conservation concern—the Large Round-leaved Orchid (*Platanthera macrophylla*)—was found at one location immediately north of the present pit area (Map A-4). The species is Yellow Listed[2] and has a sub-national S2 rank[3] however no other rare or unusual plants or habitats were identified in the fall 2015 or summer 2016 surveys. Landscape at the site is predominantly forested, however a significant amount of clear-cutting on the eastern half of the study area and south, east and west sides of the existing quarry has occurred in the past two years. Remaining uncut forest habitat on the property consists predominantly of second growth mixed stands of coniferous deciduous woodland along the south side of the existing quarry and primarily deciduous woodland on the east, north and west sides; beyond the west end, the adjoining property has been logged within the past five years and currently shows hardwood regeneration. Coniferous and deciduous woodlands consisted primarily of Balsam Fir (*Abies balsamea*), Red Maple (*Acer rubrum*) and Yellow Birch (*Betula lutea*) with a mix of Sugar Maple (*Acer saccharum*), White Birch (*Picea glauca*), American Beech (*Fagus grandifolia*), and White Ash (*Fraxinus americana*) saplings, reflecting typical species found in southern Antigonish and northern Guysboroough Counties in the area (Newell, R. 2016; Hilchey et al 1964; Cann and Hilchey 1954; Davis and Browne 1997) (Figures 12-18). Common understorey herbaceous plants in the woodlands include Bunchberry (*Cornus canadensis*), Wood Aster (*Oclemena acuminata*), Wild Lily-of-the-Valley (*Maianthemum canadense*), Rough Goldenrod (*Solidago rugosa*), Starflower (*Trientalis borealis*), Goldthread (*Coptis trifolia*), and Heal-all (*Prunella vulgaris*). Fern species include Sensitive Fern (*Onoclea sensibilis*), Christmas Fern (*Polystichum acrostichoides*), Evergreen Wood Fern (Dryopteris intermedia), New York Fern (*Thelypteris noveboracensis*), Cinnamon Fern (*Osmunda cinnamomea*), Lady Fern (*Athyrium filx-femina*) and Beech Fern (*Phegopteris connectilis*). In wet areas, including in a mixed deciduous/coniferous swamp along the south border of the study site, Sphagnum mosses (*Sphagnum* spp.) are dominants, with Schreber's Moss (*Pleurozium schreberi*) and Stair-step Moss (*Hylocomium splendens*) dominant in drier areas.

2 A yellow-listed species is a sensitive species, which in Nova Scotia is not believed to be at risk of immediate extirpation or extinction, but may require special attention or protection to prevent them from becoming at risk.
3 Rarity due to restricted range, few populations, steep declines or other factors which make it vulnerable to extirpation (Newell, 2016; Appendix B).

Figure 12. Coniferous woodland with fern species understorey in south to southeast section of study area (June 10, 2016).

Figure 13. Regenerated mixed forest on the west side of quarry and recent cut over area (June 10, 2016).

Figure 14. Regenerated maple-beech-birch forest on eastern boundary of study area, with hay-scented fern in the foreground (June 10, 2016).

Figure 15. Open area of regenerated treed swamp south of study area (June 10, 2016).

Figure 16. Regenerated beech-maple-birch stand northeast of main quarry, looking towards cutover area (June 10, 2016).

Figure 17. Mature deciduous forest on a knoll in northeast corner of study area (June 10, 2016).

Figure 18. Regenerated softwood stand near entrance near southeast corner of study area (June 10, 2016).

4.2.2 AQUATIC ENVIRONMENT

There are no permanent, first-order streams on site. A swale on the north slope of the property is occupied by an ephemeral flowage supplied largely by runoff from the quarry, as well as some surface drainage from adjacent slopes, and was dry at the time of the field survey. It passes north downslope through predominantly deciduous forest where it occasionally disappears into the ground or breaks up into shallow braided channels, which were largely dry at the time of the survey except for small subsurface flow in places. The source is a wooded swampy area created by the quarry outflow (Figures 19, 22 & 23). The flowage eventually meets a ditch on the logging road at the base of the slope near the north property boundary, and the combined flow passes through a culvert, forming a stream which eventually joins McNaughton Brook. A berm occupies the foot of the slope where the flowage ends, evidently constructed to catch flash flows down the slope (Figure 20).

Two ponds occur on the site—a small shallow L-shaped pond (presumably a fire pond) near the northeast corner of the quarry; and a circular pond (0.1 ha) located in a basin-type depression without an outlet in the northeast corner of the study area (Map A-4). The larger pond has little open water; is vegetated with *Sphagnum* moss with grasses and sedges becoming the dominant cover, and has a narrow border of tall trees (Figure 21). A small permanent stream flows northeast past the southeast corner of the study area (Map A-4). This stream passes through a culvert under South River Lake Road adjacent to a secondary quarry site access road.

Figure 19. A culvert diverts flowage from the existing quarry site, toward the north boundary and downward slope (June 10, 2016).

Figure 20. Berm at the bottom of slope, north of the quarry. An unnamed access/logging road is visible in background (June 10, 2016).

4.2.3 WATER QUALITY

Surface waters sampled at the site were within normal and guideline ranges for the protection of freshwater aquatic life, except for the northeast pond, 'W2', in which the pH was slightly below the guideline level (Table 1) although this appears to be natural and not due to the existing quarry. This pond, which did not have an outlet, also showed the lowest conductivity. The stream southeast of the site showed the highest conductivity and a moderate pH. Lower conductivity of water at W3 below the site indicates that the flow coming from the quarry is one of several contributors to the flow at the sampling location.

Table 1. Water quality measurements from streams located at the Loch Katrine Quarry study site.
For locations see Map A-4.

Site Location & Date	**June 10, 2016**			
	W1 Stream southeast of site near south exit	**W2** Northeast forest pond	**W3** Flowage leaving north border of site	**W4** Drainage culvert from quarry
Temperature ºC	12.1	11.6	10.3	9.1
Conductivity (µs/cm)	323.2	11.3	71.2	162.7
Specific Conductivity (25˚) (µs/cm)	428.9	15.2	99.1	234.5
Salinity	0.2	0	0.0	0.1
pH	6.7	5.9	7.5	7.2
Colour	Pale Yellow/Clear	Pale Yellow/Clear	Pale Yellow/Clear	Pale Yellow/Clear
Freshwater Aquatic Life Guideline for pH is 6.5 – 9.				

Figure 21. Small pond at northeast corner of study area (June 10, 2016).

4.2.4 WETLANDS

Two small wetlands occur in the study area; and two others abut the south side but are outside (Figures 22 & 23); and the pond on the northeast corner of the site supports a *Sphagnum*-sedge-grass openwater marsh (0.1 ha)(Table 1) containing several species of sedges, grasses, ferns (e.g. Cinnamon fern) and moss, which have largely encroached on open water in the pond. Two small wooded swamps (total area 0.05 ha) occur at the northeast corner of the quarry floor where drainage from the quarry runoff enters the adjacent forest (Figures 22 & 23). The main plant species include alders, various sedges, sensitive fern etc. amid an overstorey of deciduous trees.

The south boundary of the study area borders on a treed maple / sphagnum swamp (Figure 24) which has been modified by past logging activities including equipment tracks and trails. Common species include balsam fir, white spruce, sphagnum, cinnamon fern, sensitive fern, etc., and includes upland species including bunchberry and starflower, as well as young birch and spruce tree species. The wetland extends beyond the area surveyed to approximately South River Lake Road. A wooded riparian swamp occurs immediately east of the southeast corner of the property in the floodplain of the stream, which drains northeast from the site.

Table 2. Wetlands, Loch Katrine Quarry Expansion. Locations shown in Figure 7.

Identification	Area (ha)	Type and Comments
WL1*	0.03	Treed maple sphagnum swamp
WL2*	0.24	Treed maple sphagnum swamp
WL3	0.05	Chain of two small treed riparian swamps.
WL4	0.11	Open water/graminoid marsh (Northeast Pond).

** WL1 and LW2 are not located within the study area boundary.*

Figure 22. Swamp formed in wooded area due to discharge from quarry (June 10, 2016).

Figure 23. Riparian swamp in outwash area immediately downstream of wetland shown in Figure 22 (June 10, 2016).

Figure 24. Swamp located southeast of the study site (June 10, 2016).

4.2.5 FISH & FISH HABITAT

No streams or water bodies that could support fish occur within the study area. South River Lake is approximately 1.5 kilometers west of the site, and MacGregor's Lake, a small lake (300 m diameter) is about 450 meters northwest. The small pond at the northeast corner of the property is unlikely to contain fish due to the small volume, shallow depth, and high acidity. MacNaughton's Brook, into which the intermittent stream leaving the quarry drains, would be good nursery and spawning habitat for salmonid species including Brown, Brook and Rainbow Trout, which also occur in South River Lake (Nova Scotia Open Data Portal, 2016); and MacGregor's Lake likely supports fish spawning and rearing habitat. A spring and fall stocking program administered by Fraser's Mills Hatchery located on South River just north of the lake, includes stocking South River with wild and domestic Brook Trout as well as Rainbow Trout (Nova Scotia Open Data Portal, 2016).

4.2.6 BIRDS

Birds are an important component of the ecosystem in the vicinity of the Loch Katrine Quarry. Approximately 160 bird species occur in Antigonish County (Maritime Breeding Bird Atlas, 2013) and have the potential to occur at the site; and 88 bird species have been identified in the two 10 x 10 kilometer survey squares in the immediate vicinity of the Loch Katrine Quarry, based on suspected or confirmed breeding occurrences (Table 3) (Maritime Breeding Bird Atlas 2013). Habitat types in and surrounding the study site include deciduous and mixed forest, open and remediated quarry, as well as

wetland areas. Surveys at the site included: site walkovers on May 6,7 & 8; a night owl survey on May 8; and ten-minute dawn point count surveys at nine sites on June 9, 2016. Both Barred and Great Horned Owl were identified at the site during the owl survey; and barred owl was detected during other surveys. The June point-count survey documented 34 species (Table 4). Other species occurring at or in the vicinity of the site included: in May, Ruby-Crowned Kinglet, White-Throated Sparrow, Hermit Thrush, Northern Flicker, Hooded Merganser, American Woodcock and Common Loon; and in June, Common Grackle, Yellow-rumped and Chestnut-sided Warbler, American Kestrel, Common Loon, and Black-capped Chickadee. All birds were expected based on the Maritimes Breeding Bird Atlas (2013) records for the area.

Table 3. Bird species occurring in adjacent 10 x 10 kilometer survey squares encompassing the Loch Katrine Quarry study site. Shaded names indicate species documented in both survey squares (Maritime Breeding Bird Atlas, 2016).

Pied-billed Grebe	Eastern Kingbird	Ruby-crowned Kinglet
Rusty Blackbird	Eastern Wood-Pewee *	Ruby-throated Hummingbird
Sora	European Starling	Ruffed Grouse
White-winged Crossbill	Golden-crowned Kinglet	Savannah Sparrow
Alder Flycatcher	Gray Catbird	Song Sparrow
American Bittern	Gray Jay	Spotted Sandpiper
American Black Duck	Green-winged Teal	Swainson's Thrush
American Crow	Hairy Woodpecker	Swamp Sparrow
American Goldfinch	Hermit Thrush	Tennessee Warbler
American Kestrel	Hooded Merganser	Tree Swallow
American Redstart	House Sparrow	White-throated Sparrow
American Robin	Least Flycatcher	Wilson's Snipe
American Woodcock	Lincoln's Sparrow	Winter Wren
Bald Eagle	Magnolia Warbler	Yellow Warbler
Barn Swallow *	Mallard	Yellow-bellied Sapsucker
Belted Kingfisher	Mourning Dove	Yellow-rumped Warbler
Black-and-white Warbler	Mourning Warbler	Bank Swallow
Black-backed Woodpecker	Nashville Warbler	Barred Owl
Black-billed Cuckoo	Northern Flicker	Bay-breasted Warbler
Black-capped Chickadee	Northern Harrier	Blackburnian Warbler
Black-throated Green Warbler	Northern Parula	Bobolink
Blue Jay	Northern Waterthrush	Broad-winged Hawk
Blue-headed Vireo	Olive-sided Flycatcher *	Brown Creeper
Boreal Chickadee	Osprey	Cape May Warbler
Canada Goose	Ovenbird	Cliff Swallow
Canada Warbler *	Palm Warbler	Eastern Phoebe
Cedar Waxwing	Pileated Woodpecker	Evening Grosbeak
Chestnut-sided Warbler	Pine Siskin	Great Horned Owl
Chipping Sparrow	Purple Finch	Killdeer
Common Grackle	Red-breasted Nuthatch	Long-eared Owl
Common Loon	Red-eyed Vireo	Merlin
Common Merganser	Red-tailed Hawk	Northern Saw-whet Owl
Common Raven	Red-winged Blackbird	Veery
Common Yellowthroat	Ring-necked Duck	Wood Duck
Dark-eyed Junco	Rock Pigeon	Wood Thrush
Downy Woodpecker	Rose-breasted Grosbeak	Yellow-bellied Flycatcher

** Rare and / or endangered species (SARA) within a 5km-buffered area of study site (ACCDC, 2015).*

Table 4. Bird species heard or observed during dawn bird surveys conducted June 9 2016 between 04:30 and 08:00 am at the Loch Katrine Quarry study site. For locations of observation points, see Map A-4.

Bird Species	Southwest wooded roadway to quarry (Sites 1 & 2)		Central deforested area (Sites 3, 4, 5, 6)		Northeast deforested area near tree line (Sites 9 & 10)		Southeast deforested area near tree line (Sites 7 & 8)	
	no. /10 min.	no. of sites	no. /10min.	no. of sites	no. /10 min.	no. of sites	no. /10 min.	no. of sites
Passeriformes								
American Crow	2	1	3	2	0	0	1	1
American Kestrel	1	1	0	0	0	0	0	0
American Redstart	0	0	6	3	0	0	3	2
American Robin	25	2	20	4	3	2	3	1
Black-and-white Warbler	4	2	1	1	0	0	3	2
Blackburian Warbler	1	1	0	0	0	0	1	1
Black-throated Green Warbler	2	1	2	2	2	2	4	2
Blue Jay	0	0	1	1	0	0	0	0
Blue-headed Vireo	1	1	0	0	0	0	2	2
Chestnut-sided Warbler	0	0	1	1	1	1	0	0
Common Raven	1	1	0	0	0	0	0	0
Common Yellowthroat	17	2	6	2	0	0	5	2
Dark Eyed Junco	11	2	8	4	3	2	2	1
Eastern Wood Pewee	0	0	0	0	4	2	0	0
Golden Crowned Kinglet	0	0	0	0	0	0	3	1
Hermit Thrush	18	2	12	4	6	2	8	2
Least Flycatcher	0	0	12	4	7	2	0	0
Lincoln's Sparrow	7	1	0	0	0	0	0	0
Magnolia Warbler	3	2	1	1	0	0	6	2
Mourning Warbler	10	2	31	4	6	2	4	1
Northern Parula	1	1	0	0	1	1	3	2
Northern Waterthrush	0	0	0	0	0	0	1	1
Ovenbird	9	2	10	3	3	2	4	2
Red-eyed Vireo	0	0	36	4	13	2	13	2
Ruby Crowned Kinglet	0	0	0	0	0	0	4	2
Song Sparrow	2	1	3	1	0	0	0	0
Swainson's Thrush	11	2	11	2	10	2	6	2
White Throated Sparrow	20	2	4	4	0	0	2	1
Yellow-bellied Flycatcher	5	1	3	1	0	0	6	1
Yellow-rumped Warbler	2	1	0	0	0	0	0	0
Anseriformes								
Canada Goose	2	1	1	1	0	0	1	1
Piciformes								
Northern Flicker	0	0	1	1	0	0	0	0
Strigiformes								
Barred Owl	4	2	1	1	0	0	0	0

Table 4. Bird species heard or observed during dawn bird surveys conducted June 9 2016 between 04:30 and 08:00 am at the Loch Katrine Quarry study site. For locations of observation points, see Map A-4.

Bird Species	Southwest wooded roadway to quarry (Sites 1 & 2)		Central deforested area (Sites 3, 4, 5, 6)		Northeast deforested area near tree line (Sites 9 & 10)		Southeast deforested area near tree line (Sites 7 & 8)	
	no. /10 min.	no. of sites	no. /10min.	no. of sites	no. /10 min.	no. of sites	no. /10 min.	no. of sites
Accipitriformes								
Red-tailed Hawk	0	0	1	1	0	0	0	0

4.2.7 MAMMALS

Various large and small mammals, including game and furbearing species, are found in Antigonish and Guysborough Counties. Mammal species occurring regularly or occasionally at the quarry site are expected to reflect the community of the surrounding areas which includes coniferous, deciduous and mixed forest. No significant or unique mammals were detected during site visits and walkovers in the study area. Mammals known to occur in the general area and within 100 kilometers of the study site include carnivores such as coyote, Red Fox, American Marten, Black Bear, bobcat, weasel and raccoon; as well as rodents and small mammals including squirrels (Red Squirrel and Eastern Chipmunk), American Water Shrew, American Pygmy Shrew, and Long-tailed shrews (ACCDC, 2015; Department of Natural Resources, 2016). Species less likely to be seen on casual surveys include Little Brown and Northern Long-Eared Bats, which use the general area for foraging and may migrate through the area. Populations of both species are diminished at present due to the White Nose Syndrome in North America (S. Weseloh-McKeane, Nova Scotia Museum, personal communication, 2016). During the site visit conducted on June 9th and 10th, Black Bear scat was observed at one location on the southeast boundary; deer scat was occasionally observed; and Red Squirrels and Eastern Chipmunk were seen. The site is in a deer-wintering area and mainland moose concentrate in the general area (M. Pulsifer, DNR, personal communication 2016; NS Significant Species & Habitats Database, 2016).

4.2.8 REPTILES AND AMPHIBIANS

Many of the common Nova Scotian amphibians and reptiles are expected to occur at the site. Although little wetland and open water habitat is present on the site, there is suitable habitat in adjacent areas and most of the typical species for Nova Scotia likely occur from one time to another. Species observed or heard during site visits include Pickerel Frog, Wood Frog, Spring Peepers and American Toad. Most of the common other amphibians including salamanders, red eft, and snakes (Green Snake, Maritime Garter Snake, etc.) are expected at the site. Habitat is not present at the site for species of conservation concern such as Wood Turtle or Four-toed Salamander.

4.2.9 SPECIES AT RISK

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.

Species of conservation concern listed under federal or provincial legislation as well as with general status that occur within five kilometres of the Loch Katrine Quarry study site include both animals and plants. In terms of animals, the mainland population of moose is of concern due to low numbers, and the species can occur in the general vicinity of the study area. Bird species include: Barn Swallow, Canada Warbler, Olive-sided Flycatcher, Rusty Blackbird and Eastern Wood-Pewee (listed under the federal *Species at Risk Act* (ACCDC 2015); and Wood Thrush and Bank Swallow identified as "Threatened" by COSEWIC.

Some of the bird species are unlikely to occur due to the absence of suitable habitat. Little natural forest was left in the study area due to recent logging activity, although regenerating forests around the margin are medium-aged and uniform in height and some patchy mature deciduous forest occurs in the vicinity. Eastern Wood Pewee is not expected to be found at the site due to the absence of mature deciduous forest on the site generally. Treed and shrubby grassy swamps around bog/fen wetlands are typical habitat for Canada Warbler, but the treed swamp located immediately beyond on the south border of the study area did not contain habitat suitable for this species; neither Canada Warbler nor Eastern Wood Pewee were heard in surveys. Suitable habitat was not found at the site for the remaining species of conservation concern identified as having been recorded within a five-kilometer radius of the site (ACCDC 2015). Barn Swallow typically occupies buildings in the vicinity of open and wet areas such as fields, marshes and open water, none of which occur at the quarry site. Suitable habitat for Olive-Sided Flycatcher—treed (black spruce) sphagnum bogs and wetlands surrounded by mature softwood forest stands—does not occur at the site. Bank Swallow requires exposed banks, which also were not found at the site. Rusty Blackbird, which uses wetlands around lake edges, bogs, swamps and edges of fens, is also not likely to occur at the site because of lack of suitable habitat. Wood Thrush breed in deciduous and mixed forests and potentially could occur in forests around the margins of the site. Rose-breasted Grosbeak and Tree

Swallow—two species with conservation concern elsewhere in Canada and listed in *The General Status of Species in Canada*—were found at the site, but both are Secure, provincially.

Other animals of conservation concern include Little Brown and Northern Long-Eared bats, which are currently federally listed as "Endangered" under SARA, but are not documented as occurring at the study site. Both species are generally found in similar forested areas, which they use as foraging habitat. Wood Turtle, a federally-listed species and "Threatened" in Nova Scotia, is documented as occurring within the watershed of the study area and documented habitat occurs in neighbouring areas east and north of the study site (S. Weseloh-McKeane, NS Museum of Natural History, personal communication, 2016; Significant Species & Habitat Database). This species usually occurs along mature rivers and there are no records within five kilometres of the study area (ACCDC 2015).

A small number of federally- or provincially-listed plant species of concern have been found or reported within five kilometres of the study area (ACCDC 2015) and one plant species of conservation concern—the Large Round-leaved Orchid (*Platanthera macrophylla*)—was found at one location immediately north of the present pit area (Map A-4)(See Section 4.2.1). The species is Yellow-listed provincially, and has a sub-national S2 rank.). Two plant species, however, currently have general status within Nova Scotia as Sensitive (Yellow)—Pale Jewelweed (*Impatiens pallida*) and White-stemmed Pondweed (*Potamogeton praelongus*)); and Golden Alexanders (*Zizia aurea*) has a general status rank of "May be at Risk" (Red) (Table 5) (ACCDC 2015; Nova Scotia Museum of Natural History 2015). Pale Jewelweed (Sensitive) grows in calcareous woods and meadows, which are not found at the quarry site. White-stemmed Pondweed (Sensitive) is found in deeper parts of lakes. Golden Alexanders grows in open, disturbed woodland areas with generally wet soil and is unlikely to occur here. Apart from the Large Round-leaved Orchid, no plant species with federal or provincial legal status, or general status in Nova Scotia were observed during the fall 2015 and summer 2016 botanical survey (Appendix B). A list of plants and animals of concern within a 100-kilometer radius of the study site are included in Appendix C.

Table 5. Records of species of concern within a 5 km radius of Loch Katrine Quarry, Guysborough County. Atlantic Canada Conservation Data Centre (ACCDC) Database, September 2015.

Family/Scientific Name		Common Name	Rank			
			Nova Scotia General Status of Wild Species Rankings (numerical)[1]		ACCDC[2] Rankings	
			Provincial	National (Not Available)	SPROT[3]	GRANK, SRANK, NPROT[4]
Plants						
Apiaceae	*Zizia aurea*	Golden Alexanders	2	-	-	G5, S1, -
Balsaminaceae	*Impatiens pallida*	Pale Jewelweed	3	-	-	G5, S2, -
Potamogetonaceae	*Potamogeton praelongus*	White-stemmed Pondweed	3	-	-	G5, S3?, -
Ranunculaceae	*Ranunculus gmelinii*	Gmelin's Water Buttercup	4	-	-	G4, S3, -
Animals-Birds						
Ardeidae	*Botaurus lentiginosus*	American Bittern	3	-	-	G4, S3S4B, -
Cardinalidae	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	3	-	-	G5, S3S4B, -
Corvidae	*Perisoreus canadensis*	Gray Jay	3	-	-	G5, S3S4, -
Cuculidae	*Coccyzus erythropthalmus*	Black-billed Cuckoo	2	-	-	G5, S3?B, -
Fringillidae	*Carduelis pinus*	Pine Siskin	3	-	-	G5, S3S4B/S5N, -
Gaviidae	*Gavia immer*	Common Loon	2	-	-	G5, S3B/S4N, NAR
Hirundinidae	*Hirundo rustica*	Barn Swallow	1	-	Endangered	G5, S3B, T
	Petrochelidon pyrrhonota	Cliff Swallow	2	-	-	G5, S3B, -
	Riparia riparia	Bank Swallow	2	-	-	G5, S3B, T
Icteridae	*Euphagus carolinus*	Rusty Blackbird	2	-	Endangered	G4, S2S3B, SC
Mimidae	*Dumetella carolinensis*	Gray Catbird	2	-	-	G5, S3B, -
Paridae	*Poecile hudsonica*	Boreal Chickadee	3	-	-	G5, S3, -
Picidae	*Picoides arcticus*	Black-backed Woodpecker	3	-	-	G5, S3S4, -

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Family/Scientific Name		Common Name	Rank			
			Nova Scotia General Status of Wild Species Rankings (numerical)[1]		ACCDC[2] Rankings	
			Provincial	National (Not Available)	SPROT[3]	GRANK, SRANK, NPROT[4]
Parulidae	*Oreothlypis peregrina*	Tennessee Warbler	3	-	-	G5, S3S4B,-
	Wilsonia canadensis	Canada Warbler	1	-	Endangered	G5, S3B, T
Podicipedidae	*Podilymbus podiceps*	Pied-billed Grebe	3	-	-	G5, S3B, -
Scolopacidae	*Actitis macularius*	Spotted Sandpiper	3	-	-	G5, S3S4B, -
	Gallinago delicata	Wilson's Snipe	3	-	-	G5, S3S4B, -
Turdidae	*Hylocichla mustelina*	Wood Thrush	5	-	-	G5, S1B, T
Tyrannidae	*Tyrannus tyrannus*	Eastern Kingbird	3	-	-	G5, S3S4B, -
	Contopus cooperi	Olive-sided Flycatcher	1	-	Threatened	G4, S3B, T
	Sayornis phoebe	Eastern Phoebe	3	-	-	G5, S3S4B, -
	Contopus virens	Eastern Wood-Pewee	3	-	Vulnerable	G5, S3S4B, SC
Other						
Nymphalinae	*Euphydryas phaeton*	Baltimore Checkerspot	4	-	-	G4, S3, -
	Lethe anthedon	Northern Pearly-Eye	4	-	-	G5, S3, -
	Polygonia faunus	Green Coma	4	-	-	G5, S3, -
	Polygonia progne	Grey Comma	4	-	-	G4G5, S3S4, -
Pieridae	*Pieris oleracea*	Mustard White	3	-	-	G4G5, S2, -
Unionidae	*Alasmidonta undulata*	Triangle Floater	4	-	-	G4, S2S3, -
	Lampsilis radiata	Eastern Lampmussel	3	-	-	G5, S2, -

1. Nova Scotia General Status of Wild Species Rank listed for Nova Scotia: 1=At Risk; 2=May be at Risk; 3=Sensitive; 4=Secure 5=Undetermined; 6=Not Assessed; 7=Exotic; 8=Accidental.
2. Atlantic Canada Conservation Data Centre (ACCDC).
3. SPROT=Provincial Rank/Status of Taxon.
4. 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.

Table 5. Records of species of concern within a 5 km radius of Loch Katrine Quarry, Guysborough County. Atlantic Canada Conservation Data Centre (ACCDC) Database, September 2015.

Family/Scientific Name	Common Name	Rank			
		Nova Scotia General Status of Wild Species Rankings (numerical)[1]		ACCDC[2] Rankings	
		Provincial	National (Not Available)	SPROT[3]	GRANK, SRANK, NPROT[4]

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.

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.

<u>SRANK, Sub-National (Provincial) Rarity Ranks</u>

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

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Family/Scientific Name	Common Name	Rank			
		Nova Scotia General Status of Wild Species Rankings (numerical)[1]		ACCDC[2] Rankings	
		Provincial	National (Not Available)	SPROT[3]	GRANK, SRANK, NPROT[4]

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.

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.

Table 6. Provincially listed plant species of concern with potential to occur in the vicinity of the project site. Nova Scotia Museum records (S. Weseloh Mckeane, Nova Scotia Museum of Natural History, pers. comm., 2015).

Scientific Name	Common Name	NS General Status of Wild Species (numerical)[1]; SPROT (Provincial GS Rank)[2]	ACCDC [3] Rankings (GRANK, SRANK, NPROT)[4]
PLANTS			
Botrychium lanceolatum	Lanceleaf grapefern	-, - (Sensitive)	-, S2S3, -
Carex bebbii	Bebb's Sedge	-, - (Sensitive)	-, S2, -
Eleocharis flavescens	Yellow Spikerush	-, - (Sensitive)	-, S2S3, -
Floerkea proserpinacoides	False Mermaid	-, - (Sensitive)	-, S2, -
Impatiens pallida	Pale Jewelweed	-, - (Sensitive)	-, S2, -
Iris prismatica	Slender Blue Flag	-, - (May be at Risk)	-, S1, -
Laportea canadensis	Canada Wood Nettle	-, - (Sensitive)	-, S3, -
Lilium canadense	Canada Lily	-, - (May be at Risk)	-, S2, -
Potamogeton nodosus	Long-leaved Pondweed	-, - (May be at Risk)	-, S1, -
Potamogeton obtusifolius	Blunt-leaved Pondweed	-, - (Secure)	-, S3, -
Triosteum aurantiacum	Orange-fruited Tinker's Weed	-, - (Sensitive)	-, S2S3, -
Zizia aurea	Golden Alexander	-, - (May be at Risk)	-, S1, -
BIRDS			
Anas discors	Blue-winged Teal	-, - (May be at Risk)	-, S3B, -
Botaurus lentiginosus	American Bittern	3, - (Sensitive)	G4, S3S4B, -
Carduelis pinus	Pine Siskin	3, - (Sensitive)	G5, S3S4B/S5N, -
Cardellina canadensis	Canada Warbler	1, Endangered (At Risk)	G5, S3B, T
Coccyzus erythropthalmus	Black-billed Cuckoo	2, - (May Be At Risk)	G5, S3?B,-
Contopus cooperi	Olive-sided Flycatcher	1, T (At Risk)	G4, S3B, T
Dolichonyx oryzivorus	Bobolink	3, Vulnerable (Sensitive)	-, S3S4B, T
Dumetella carolinensis	Gray Catbird	2, -(May Be At Risk)	G5, S3B, -
Empidonax flaviventris	Yellow-bellied Flycatcher	-, -(Sensitive)	-, S3S4B, -
Euphagus carolinus	Rusty Blackbird	2, Endangered (May Be At Risk)	-, S2S3B, SC
Gallinago delicata	Wilson's Snipe	3, - (Sensitive)	-, S3S4B, -
Gavia immer	Common Loon	2, - (May Be At Risk)	G5, S3B S4N, NAR
Hirundo rustica	Barn Swallow	3, Endangered (At Risk)	G5, S3B, T
Oreothlypis peregrina	Tennessee Warbler	3, -, -	G5, S3S4B, -
Perisoreus canadensis	Gray Jay	3, - (Sensitive)	-, S3S4, -
Petrochelidon pyrrhonota	Cliff Swallow	2, - (May Be At Risk)	G5, S3B, -
Pheucticus ludovicianus	Rose-breasted Grosbeak	3, -(Sensitive)	-, S3S4B, -
Picoides arcticus	Black-backed Woodpecker	-, -, (Sensitive)	-, S3S4, -
Podilymbus podiceps	Pied-billed Grebe	-, -, (Sensitive)	G5, S3B, -
Poecile hudsonicus	Boreal Chickadee	3, - (Sensitive)	G5, S3, -
Regulus calendula	Ruby-crowned Kinglet	-, -(-)	--
Regulus satrapa	Golden-crowned Kinglet	3, - (-)	--
Setophaga castanea	Bay-breasted Warbler	-, -(-)	--
Setophaga tigrina	Cape May Warbler	-, -(-)	--

Table 6. Provincially listed plant species of concern with potential to occur in the vicinity of the project site.
Nova Scotia Museum records (S. Weseloh Mckeane, Nova Scotia Museum of Natural History, pers. comm., 2015).

Scientific Name	Common Name	NS General Status of Wild Species (numerical)[1]; SPROT (Provincial GS Rank)[2]	ACCDC [3] Rankings (GRANK, SRANK, NPROT)[4]
Tachycineta bicolor	Tree Swallow	--	--
Tyrannus tyrannus	Eastern Kingbird	-, - (Sensitive)	-, S3S4B, -
OTHER			
Glyptemys insculpta	Wood Turtle	-, Threatened (Sensitive)	-, S2, T
Myotis lucifugus	Little Brown Bat	-, Endangered (At Risk)	-, S1, E
Myotis septentrionalis	Northern Long-eared Bat	-, Endangered (At Risk)	-, S1, E

1. 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).
2.SPROT=Provincial Rank/status of taxon & Provincial GS Rank.
3. Atlantic Canada Conservation Data Centre (ACCDC).
4. GRANK, Global rarity rank of species, using CDC/Nature Serve methods; SRANK, Sub-National (Provincial) Rarity Rank-; NPROT, National conservation status of species, as designated by COSEWIC.

4.2.10 NATURAL AREAS & WILDERNESS

The Loch Katrine area, including neighbouring communities in both the Antigonish and Guysborough Counties, are rural areas which have been settled and exposed to resource development for hundreds of years, and in which few areas of wilderness remain. Today, the study area has low population density, made up of many who live in the vicinity but commute outside the area to work, and who use adjacent areas for recreation, personal use of resources, and for cottages and summer homes. 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. While there are few areas in the vicinity of Loch Katrine that haven't been touched by human activity, in particular forestry and logging, and the clearing of agricultural land, the landscape retains a natural character and is 'wild' in many ways, including the low population density, vegetated scenery, and the presence of wild animals such as coyotes, Black Bear, and deer, and other wildlife nearly everywhere. Forest has been used as a resource in past, and regenerated stands and general absence of development, give a natural appearance, which is shared and appreciated by residents and the many tourists that visit the counties. Rural life in Nova Scotia includes frequent encounters with wildlife, and nature is part of daily life.

4.3 HUMAN USES OF THE ENVIRONMENT

4.3.1 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 consult with the Mi'kmaq concerning their activities. Dexter Construction has contacted First Nations representatives concerning the present Loch Katrine Quarry expansion project. The nearest Mi'kmaq community to Loch Katrine is Paqtnkek Mi'kmaq Nation, located 24 kilometers east of Antigonish in Antigonish County. The early Paqtnkek held the local bay (St Georges Bay) and its resources in high regard and value to their way of life. The Loch Katrine quarry study area was once part of a Mi'kmaq territory called Eskikewa'kik[4] that was traditionally used by the Mi'kmaq for encampment. The valley in which South River lies, and joins Antigonish and Guysborough Counties, may have been an important transportation route (Cultural Resource Management Group, 2016). Presently, no significant Mi'kmaq cultural activities occur in or around the study area although traditional fishing and hunting continues in the general area.

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 people 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 represents Mi'kmaq. 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, 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 and the Mi'kmaq Confederacy of PEI in Charlottetown is 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.

4.3.2 POPULATION AND ECONOMY

Local economies in both Antigonish and Guysborough counties, which share a boundary immediately north of the quarry, are tied to farming and forestry, and their communities face some of the same challenges as elsewhere in rural Nova Scotia, including lack of economic growth and an aging population

4 Eskikewa'kik means, "skin dressers territory".

(Nova Scotia Open Data Portal 2016). Both Guysborough and Antigonish Counties have predominantly rural populations with low population densities—approximately 14 and two per square kilometre respectively. The population in Guysborough continues to decline, while Antigonish County shows an increasing trend over the past half decade (Statistics Canada 2011 Census)(Nova Scotia Federation of Agriculture 2011). Agriculture is the major contributing sector to the economy overall. However, in both counties, employment in health care, education and construction are important sources of income in addition to the resource industries that include agriculture, forestry, fishing and hunting (Nova Scotia Open Data Portal 2016). A local resident indicated that most permanent residents commuted to larger centres such as Antigonish and Guysborough Counties for work and services (C. Kennedy, 2016, personal communication). Median gross household income for Antigonish County is approximately $75,850, and $53,000 for Guysborough County—comparable and lower, respectively, than the median family income for Nova Scotia ($72,300) (Statistics Canada Online 2016; Nova Scotia Open Data Portal 2016).

4.3.3 WATER SUPPLY AND RESIDENTIAL WELLS

There are no drilled or dug wells documented in the Nova Scotia well log database occurring within one kilometer of the study site (Kennedy and Fisher 2013). However, both dug wells and water withdrawn by lakeshore residents from South River Lake are the most likely main water sources for residences in the area. The South River watershed, in which Loch Katrine Quarry is situated, is not part of a municipal water supply system. South River is the water source for Fraser's Mills Hatchery, and also likely would be used from time to time for agriculture (e.g. livestock watering, irrigation).

4.3.4 LAND USE

Land in the vicinity of the quarry is predominantly rural residential but includes forestry, agricultural, commercial use (e.g. quarries) as well as home-operated businesses. Population density is not high in the area, and most of the homes are located around lakes (e.g. South River Lake). A handful of residences are also located along Highway 316 and South River Lake Road, both of which are corridors for rural residential and commercial development and main travel routes between Antigonish and Guysborough counties. Activities and establishments along Highway 316 in the vicinity of the quarry include farms (hay, grain and livestock), a lumber mill, a fish hatchery (Fraser's Mills Hatchery), a cemetery, and industrial services business establishments (e.g. Maritime Directional Limited). The majority of the land in the vicinity is privately owned with several parcels of Crown land in the general vicinity (Map A-3).

4.3.5 HUNTING AND TRAPPING

The Loch Katrine quarry site is expected to support wildlife species characteristic of Antigonish and Guysborough Counties, and Nova Scotia in general. The study area may experience hunting or trapping activity, which takes place generally in the vicinity of the quarry, and in particular a deer-wintering area has been identified surrounding the property (M. Pulsifer, Department of Natural Resources, personal

communication 2016; NS Significant Species & Habitats Database 2016). A summary of reported harvests for Black Bear, deer, upland game, and furbearer species in both counties is presented in Table 7.

Snowshoe Hare, Ruffed Grouse, muskrat and beaver are among the most trapped or hunted upland game and furbearers for both counties. Deer hunting is common for both Guysborough and Antigonish Counties; however reported deer harvests are low compared to other counties, with Guysborough ranking 13th, followed by Antigonish at 14th out of eighteen (Table 6). Black Bear harvest is also relatively low for both counties, making up less than one percent of harvests for Nova Scotia as a whole, with Antigonish County ranked 11th and Guysborough County 13th (Table 6).

Table 7. Summary of combined wildlife harvested in Guysborough and Antigonish Counties, Nova Scotia.

Animal	Total Reported Harvest by County		Percentage (%) of Total Provincial Harvest		Total Reported Harvest for Nova Scotia
	Guysborough	Antigonish	Guysborough	Antigonish	
Large Mammals (2010-2015)					
Deer	2018	1400	3.5	2.4	58,119
Upland Game (2009-2015)					
Snowshoe Hare	30,833	13,753	0.1	3.2	428,682
Ruffed Grouse	26,958	8757	0.1	3.7	236,153
Ring-necked Pheasant	1038	237	0.03	0.8	30,771
Fur Harvest (2009-2015)					
Beaver	872	1,084	3.2	4.0	27,260
Muskrat	1,064	7,912	1.1	8.4	94,441
Otter	356	104	12.5	3.7	2,842
Mink	180	326	1.8	3.3	9,873
Bobcat	309	319	5.5	5.7	5,615
Fox	55	117	1.6	3.4	3,454
Racoon	140	757	0.9	5.0	15,209
Skunk	3	24	0.9	7.1	337
Squirrel	174	475	1.6	4.4	10,910
Weasel	256	596	4.7	10.9	5,487
Coyote	497	734	3.6	5.4	13,634
Lynx	1	0	1.7	0.0	60
Marten	0	1	0.0	2.2	46
Fisher	29	51	2.8	5.0	1,020
Bear Harvest (2010-2015)					
Black Bear	62	91	0.04	0.05	1,763

Source: Nova Scotia Department of Natural Resources, Wildlife Division, Harvest Statistics. http://novascotia.ca/natr/hunt/stats-index.asp; Accessed June 2016.

4.3.6 FORESTRY

Forestry is one of the main land uses in Antigonish and Guysborough Counties and has been, and is presently important in the Loch Katrine area. Roughly 18% of Guysborough County's workforce is in natural resources (including forestry) with between 250 and 300 full-time jobs in the forest industry. Typical activities include harvesting, trucking, road building, and silviculture. The natural resources sector is comparatively less important in Antigonish County, with a workforce participation of 7.2% (Nova Scotia Open Data Portal 2016) but the local importance (i.e. in the Loch Katrine area) is probably similar. A significant amount of Nova Scotia's forestry products are sourced from the northeastern region of Nova Scotia, which includes Antigonish and Guysborough Counties (pulpwood ~50%; lumber ~41%; and whole tree chips ~74%). Approximately 30% of the wood received by Nova Scotia's pulp and paper mills comes from Guysborough County; over half of which is softwood, and the remainder is mixed and hardwood. (Municipality of the District of Guysborough, Accessed Online, 2016). Approximately 67% of the land comprising Antigonish County is designated forest.

4.3.7 RECREATIONAL, COMMERCIAL, AND MI'KMAQ FISHING

Recreational fishing provides an important resource and pastime for residents of Guysborough and Antigonish counties. South River and South River Lake, which are less than two kilometres west of the quarry, are used for recreational fishing for the area, and Mi'kmaq individual's likely use the resource as well. South River is stocked with trout, and supports Brown, Speckled and Rainbow Trout, and recreational fishing is permitted all along South River downstream of the bridge at the outlet of South River Lake. There are no commercial fisheries in the vicinity of Loch Katrine Quarry.

4.3.8 HISTORICAL, ARCHAEOLOGICAL AND PALAEONTOLOGICAL RESOURCES

Mi'kmaq originally occupied the area (2500 years ago) before the first French settlers (in the mid to late 1600's) with Europeans entering the area in the late-1700s to early 1800s. Historical use of the area by Mi'kmaq consisted of hunting for moose and other resources as well as serving as a transportation route to and from shorelines. With the exception of a screening of the site done for the quarry (Cultural Resource Management (CRM) Group Ltd. 2016), no historical/cultural studies have been done in the area, and there are no records of archaeological sites or historical structures in the vicinity of the study area (S. Weseloh-Mckeane, Coordinator, Special Places, personnel communication, 2015; CRM 2016). CRM (2016) determined, based on site reconnaissance, topography and other features of the Loch Katrine quarry site, that the study area has low potential for either Native (both pre-contact and historic) or Euro-Canadian archaeological resources. Plant fossils have been found in the area in Devonian-aged rocks of the Hoppenderry Formation located about 10 kilometers northeast of the quarry (S. Weseloh-Mckeane, Coordinator, Special Places, personnel communication, 2015).

4.3.9 PARKS AND PROTECTED AREAS

Local residents and visitors of the Antigonish and Guysborough Counties access lakes, rivers and forest areas within the vicinity of the quarry study site for outdoor recreation such as boating (eg. kayaking and canoeing), camping, hiking and snowshoeing, swimming, as well as hunting and fishing (Nova Scotia Department of Environment, Online, 2016). There are wilderness or protected areas within the general area of the quarry site including: Ogden Round Lake Wilderness Area (designated); Giants Lake Wilderness Area (pending designation); South River Nature Reserve (pending designation); Lochiel Lake Provincial Park (designated); and Lochaber Provincial Park and Park Reserve (designated) (Figure 25).

Ogden Round Lake Wilderness Area is located in Guysborough County approximately 15 kilometers east of the quarry site. The area covers 5,490 hectares and provides protection for local watersheds including portions of eight tertiary watersheds; a mixture of young and mature soft- and hardwood undisturbed forest on rich soil; and a variety of unique landforms and valuable habitat for local species in the Mulgrave Hills natural landscape. This regionally significant wilderness area provides good opportunities for recreational use such as hiking, fishing and paddling the larger lakes. Presently, on the northwest boundary of the existing wilderness area, an additional 134-hectare study area is pending designation.

Giants Lake Wilderness Area is a 3,644-hectare area currently pending designation as a protected area. The west boundary of the area is approximately three kilometres east of the Loch Katrine quarry site. The area surrounds a large area of rare old-growth tolerant hardwood forest and a former sugar bush (maple syrup) site. This area is considered important recreationally as it is frequently accessed year-round for camping, hiking, picnicking, canoeing, swimming, hunting and trapping (Figure 25).

The South River Nature Reserve consists of three areas located on the floodplain of South River and is pending designation as a protected area (Figure 25). The areas are approximately six, twelve and thirteen kilometres north of the quarry site along the west side of South River. The floodplain is a productive and rich area providing important habitat for plant and animal species of conservation concern including Black Ash, White Spruce (and intolerant hardwood), and Wood Turtle.

Approximately 12 kilometers west of the study site is a small day-use provincial park located on Lochiel Lake. Lochiel Lake Provincial Park is a recreationally valuable area used by residents and visitors for outdoor activities including nature-walks, lake access and carry-in boating, fishing, and snowshoeing (Figure 25). Another small day-use provincial park called Lochaber Provincial Park and Park Reserve is located on the east side of Lochaber lake, approximately seven kilometers west of the quarry study site (Figure 25).

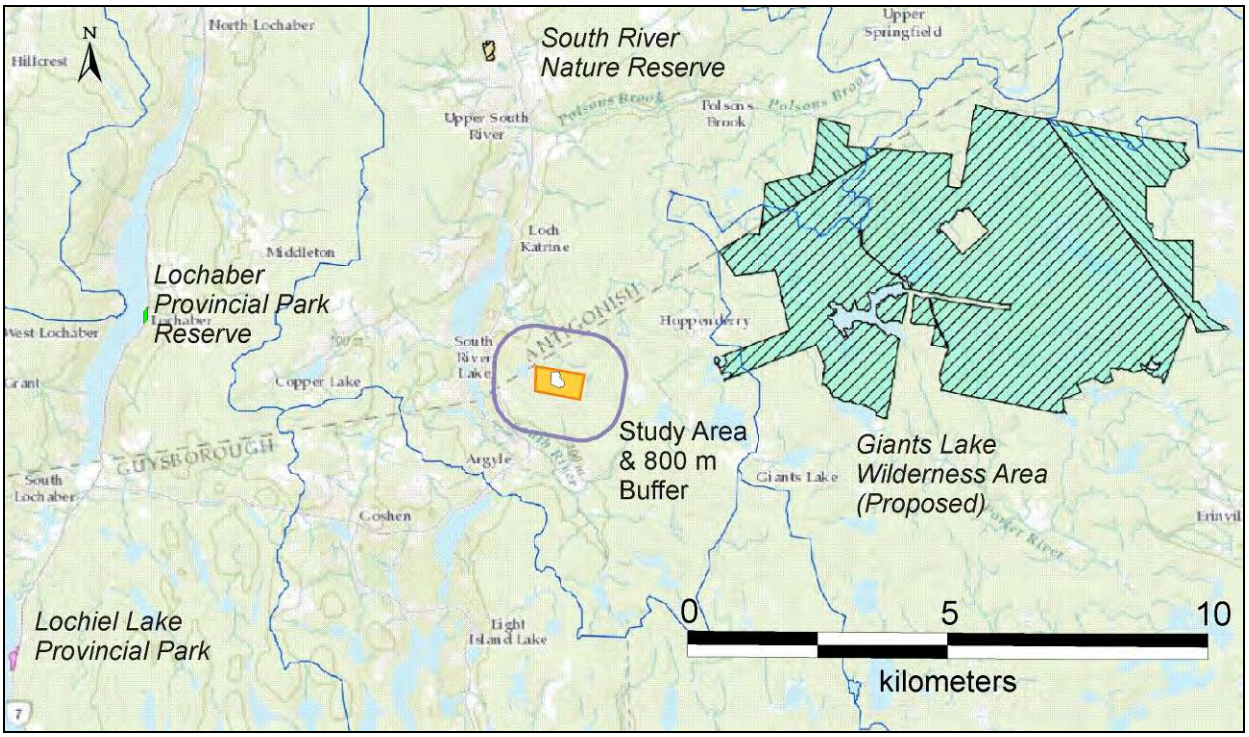

Figure 25. Parks and protected areas in the vicinity of Loch Katrine Quarry.

4.3.10 RECREATIONAL/CULTURAL FEATURES

Local residents and visitors of the Antigonish and Guysborough Counties access the surrounding forest, lakes and rivers within the vicinity of the quarry study site for outdoor recreation such as boating (eg. kayaking and canoeing), camping, hiking and snowshoeing, swimming, as well as hunting and fishing (Nova Scotia Department of Environment, Online, 2016). Existing woods roads and other small side roads allow woodland access, and designated park reserves provide outdoor recreation opportunities (Figure 25). One local resident indicated that walking is a frequent activity (C. Kennedy, personal communication, 2016). There are no notable recreation or cultural businesses in the area, with the exception of Fraser's Mills Hatchery visitor center, which emphasizes the importance of recreational fishing as a popular pastime for the area and in Nova Scotia.

4.3.11 RESIDENTIAL USE

Residences are present in an overall low density, either spread along main roads; concentrated in recreational areas such as around South River Lake; or in communities (e.g. Goshen, Argyle) having a relatively higher density of homes. One residence (a summer cottage at 154 Highway 316, PID 01280965) is located within 800 meters of the existing quarry (MapA-3) and agreements for quarry operations have been previously established with the owners. Two residences exist within 800 meters of the current study area (437 South River Lake Road, PID 35079805; 23 South River Lake Road, PID 35020130). Agreements and accommodation for these residences in relation to quarry activities have been established and will be implemented accordingly. In addition, other residential properties in the

broader surrounding area are used for small businesses, such as MacDonald's Convenience Store (3899 Highway 316, St. Andrews). The nearest communities – Goshen, Argyle and Loch Katrine – have limited amenities, and consequently residents typically travel to Antigonish for shopping and other activities, or to St. Andrews for convenience purchases.

4.3.12 COMMERCIAL/INDUSTRIAL DEVELOPMENT

Commercial establishments in the vicinity of the study area and neighbouring areas include Fraser Mills Hatchery (3593 Highway 316, Saint Andrews), Maritime Directional Ltd (4475 Highway 316), and Scotia Pallets (21101 Highway 316). Industrial development in the area is minimal. A competing road builder operates a wayside quarry located about one kilometer north/northeast of the Loch Katrine Quarry and two unidentified sand and gravel pits are located approximately three kilometers east of the site (Map A-2). No other industrial developments are noted for the neighbouring area.

4.3.13 TOURISM AND VIEWSCAPE

Highway 316 and South River Lake Road are important—though minor—travel routes for tourists, and lake properties in the general vicinity are owned by summer residents from elsewhere in Nova Scotia or around the world. Loch Katrine Quarry is not visible from either Highway 316 or South River Lake Road. (Figure 27), and access roads are inconspicuous (Figures 18 & 26). The general vicinity of the site is expected to be visited by low numbers of tourists enroute to parks and wilderness areas, and to the Frasers Mills Fish Hatchery.

Figure 26. Entrance to Loch Katrine quarry access road on Highway 316 looking south (June 15 2016).

Figure 27. View of the Loch Katrine quarry from west access road (June 15 2016). Quarry is behind woods at the top elevation of the access road.

4.3.14 TRANSPORTATION

Highway 316 is a connector highway that runs through Antigonish County from Upper South River, to Half Island Cove, Guysborough County. The sections of highway that include Loch Katrine Quarry (Section 17 and 20) have an annual average daily traffic (AADT) of between 430 and 470 vehicles (Nova Scotia Open Data Portal 2016). Traffic is expected to be generally local; however Highway 316 is promoted as a travel route for tourists to explore the interior regions of Antigonish and Guysborough Counties. When in operation, the quarry will contribute truck traffic and some heavy equipment traffic (e.g. crushers, asphalt trucks etc.) in the vicinity of the site, typically in the summer / fall construction season, consistent with previous operational traffic activity. Access to the quarry from Highway 316 is open with good sight lines (Figure 26) and is not expected to create safety concerns.

5 ENVIRONMENTAL IMPACTS, SIGNIFICANCE, AND MITIGATION

5.1 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)[5], 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.

5.2 VALUED ENVIRONMENTAL COMPONENTS

The list of Valued Environmental Components considered for the assessment, and interactions with project components, are presented in Table 8. The environmental effects and potential impacts of the project along with their significance and suggested mitigations are outlined in the following and are summarized in Tables 9 & 10.

5 Valued Environmental Components (VECs) are features or things in the environment, which are important either ecologically, socially, economically or culturally. The environmental assessment addresses potential impacts of the project on each VEC identified. To do so 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.

Table 8. Valued Environmental Components (VECs) for Loch Katrine Quarry Expansion.	
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	Land Use and Value
Wetlands	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

5.3 SOCIOECONOMIC IMPACTS

5.3.1 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 (T. Gaudet, KMKNO, personal communication 2014). 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 Section 4.3.1. In more recent times, treaties made with the British and continued through Canadian law have maintained their rights. The location of the quarry, which is inland in Guysborough County and bordering the Antigonish-Guysborough County line on Highway 316, would have been used for encampment and a likely transportation route as Mi'kmaq migrated between areas seasonally; however there is low potential for occurrence of archaeological resources at the site (Cultural Resource Management Group 2016).

Operation of the Loch Katrine Quarry will use land that would otherwise be occupied by terrestrial ecosystems and not likely 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 shall be used to 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 there are no likely cumulative effects of other activities in the area; consequently none of these effects are considered significant.

5.3.2 RECREATIONAL ACTIVITIES

Recreational use and nature appreciation of the environment in the vicinity of the site consists principally of walking/hiking, camping, hunting, fishing, and general enjoyment of home-based recreation (eg. gardening). 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.

5.3.3 TOURISM AND VIEWSCAPE

The quarry would have little influence on tourism and viewscape. The property is located approximately one kilometer from Highway 316, and is not currently visible from the highway or from South River Lake Road, and the access roads are nondescript and similar to other minor roads in the area. Truck and equipment traffic accessing and exiting onto Highway 316 is expected to be the main interaction with tourists. This traffic is expected 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. The quarry access road entrance on Highway 316 has good sightlines and is well maintained. During periods of site activity, signage is provided to alert travelers of the entrance on Highway 316. Overall the impacts on viewscape and tourism are expected to be negligible.

5.3.4 RECREATIONAL, COMMERCIAL & MI'KMAQ FISHING

Fishing by visitors and local residents, including from Mi'kmaq communities in the area, may occur from time to time in South River and South River Lake. As the Loch Katrine quarry has been in operation for many years, and the future scope of activities are not expected to change, no changes in flow regime or water quality in these waterways are expected as a result of the quarry operation. Water quality of the runoff from the quarry is likely to be good for salmonids (versus the low pH found normally in surface waters at the site), 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 fishing is expected.

5.3.5 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. The area was not settled by Europeans until late in the 17th century and not intensely settled until more recently. Consequently the project is not likely to discover or disturb cultural/historical/archaeological features.

5.3.6 LAND USE AND VALUE

Forestry, mixed agriculture, hunting and trapping, as well as small rural-residential properties, are the major land uses in the vicinity of the site and study area, as well as adjacent lands. The land on the site is not suitable for agriculture or subsurface mining, and aggregate production and forestry are among the only potential commercial uses of the area. The area has a low to moderate value for wind energy extraction. Areas not required for the quarry will be preserved if possible to assist in maintaining forest ecosystems for forestry production, and to buffer adjacent areas from quarry activities. Quarry activities are not expected to impact existing residential, agricultural, industrial or conservation and scientific use of nearby areas. As the quarry has been in operation for many years and the scope and frequency of activities are not expected to change from past use, residential property values in the Loch Katrine area are not expected to change significantly. The existing quarry has been operating at the site with little to no impact on the local residential and farm community, while providing economic development and a source of aggregate for local construction projects.

5.3.7 TRANSPORTATION

The quarry generates a low level of truck traffic on the 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. Suitable signage for truck and equipment operators, as well as the surrounding communities, would help avoid dangerous situations at the intersection, particularly on South River Lake Road. Overall the impact of the project on transportation and safety is expected to be minimal.

5.3.8 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, which some residents may find objectionable. The property is located approximately one kilometer from Highway 316 and is not visible. Normal traffic noise on Highway 316 would likely exceed any noise coming from the quarry for homes located nearby. Residents of homes along Highway 316 in the vicinity of the quarry have indicated that there were no problems associated with the quarry. Activities at the quarry would be limited in time seasonally (approximately March to November) and during the day, although nighttime operations, but not blasting, will be required under some circumstances. Traffic volumes from the site would be moderate, and high frequency of truck traffic would be an irregular occurrence, depending on the supply requirements for particular projects. Dust from operations is unlikely to reach residential areas. Dust generation could be moderate due to the exposed high location of the site, but measures to control dust will be implemented and the adjoining forest areas would act as a buffer between the quarry and offsite receptors. Quarry activities such as blasting, are not expected to impact residential wells, as they are located at a significant distance from the site. 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 is unlikely to be a serious disturbance to local 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 Company Limited to address complaints and concerns.

5.3.9 COMMERCIAL/INDUSTRIAL USE

There are no major commercial operations in the area with the exception of Fraser's Mill Hatchery and some small businesses (eg. Scotia Pallets). Blasting at the quarry site will not likely affect the operations of these businesses and the quarry contributes to net economic benefit in the community through supporting local trucking operations and providing access to aggregate and other quarry products.

5.3.10 WATER SUPPLIES AND RESIDENTIAL WELLS

Residents of the adjacent communities use wells or lake water for water supply. Quarry activities are not expected to impact residential wells, as they are located at a sufficient distance to avoid impacts from quarry operations, in particular occasional blasting events. A groundwater monitoring program will be established to verify if there are any changes in the water quality or quantity in the area. Groundwater recharge generated by the quarry is of high quality (low conductivity and dissolved solids and neutral in pH). Best management practices for operations will be undertaken to eliminate the potential for any contamination of aquifers at the site. There are no municipal water supplies in the area.

5.3.11 PARKS AND PROTECTED AREAS

The quarry site is not expected to be visible from the proposed Giants Lake Wilderness Area (approximately three kilometres distant) or from Lochiel Provincial Park, South River Nature Reserve or Lochaber Provincial Park Reserve. Occasional blasting could likely be heard from those sites, but the occurrence is brief, and distant, and not likely to be a significant concern to visitors/users of those areas.

5.3.12 RESOURCE USE—FORESTRY, HUNTING & TRAPPING

Use of the land for a quarry will remove the potential for logging the site for a long time, 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 from logging in the area 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 in the Loch Katrine area.

5.4 BIOPHYSICAL IMPACTS—IMPACTS OF THE PROJECT ON THE ENVIRONMENT

5.4.1 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 (eg. earth movers, crushers), rock drilling and blasting, operation of an asphalt plant, as well as onsite routine operations contribute to increased dust and particulate levels. Noise levels can impact human use and enjoyment of the environment. Dust emissions during the construction phase will 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. 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. An environmental protection plan will be put in place and followed during all phases of operations.

Exhaust emissions will be generated from the operation of vehicles and equipment. An asphalt plant may generate air-borne odours that can be detected at a distance from the site; however prevailing winds are generally from the southwest to northwest and the general direction of travel of such emissions would be into unpopulated areas. Given 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, and the company will ensure that they do not exceed those specified in the Nova Scotia Pit and Quarry Guidelines. Blasting is expected to occur infrequently (1-2 times per year).

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

5.4.2 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 elsewhere on the property, or in adjacent areas. The amount of recharge area involved in project activities is extremely small in relation to the overall size of the aquifers in the

Loch Katrine area; and for the same reason, the effect on overall groundwater flow patterns will be small. The overall impact on hydrogeology at the site is therefore expected to be negligible.

5.4.3 HYDROLOGY

Expansion of the quarry will result in an artificial and managed regime of surface water movement and runoff at the site, mainly near the quarry and entering the watershed of MacNaughton's Brook north of the site. Runoff from the quarry will be managed to ensure that it meets acceptable environmental standards. Exposed surfaces on the quarry and on access roads lead to more sudden, 'flashy' runoff patterns during rainfall events. A berm at the foot of the slope on the north side has been in place for some time to reduce the impact of sudden runoff from the quarry. The flow management system in place appears to be adequate to manage the flow in a natural way and minimize damage to the local landscape.

5.4.4 WATER QUALITY

Water quality downstream of the site is important for fish habitat in the lower watersheds, which includes MacNaughton's Brook and South River. Quality of water leaving the site and entering surface or groundwater is high, due both to the onsite flow management and the low-contaminant characteristics of the bedrock, which is mainly conglomerate, metamorphic rocks, and basalt. Quarry rock is within acceptable limits for sulphur and acid-generating potential. Blasting is not expected to result in groundwater quality changes, particularly with efforts to reduce releases of other chemicals such as nitrates used in blasting. Forest clearing and grubbing activities can lead to releases of fines from the soil, resulting locally in elevated suspended sediment levels but slopes in the area are gradual. Release of other contaminants such as oils and lubricants from operating equipment, as well as contaminants which may be found in material, such as recycled asphalt, which may be stored at the site, will also be moderated by the lack of abrupt slopes, but is also expected to be mitigated by normal precautions on equipment operations and fuelling locations, and measures to reduce runoff from storage piles. 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). Impact of the quarry on water quality in adjacent streams and other waters is expected to be negligible.

5.4.5 FRESHWATER AQUATIC ENVIRONMENTS

The only permanent streams at the site are located outside of the study area to the north and east. Presently the quarry diverts some runoff towards the north, which formerly ran more gradually as surface runoff and groundwater flow to the south. As the quarry develops, the main operating area may move over the study area, and potentially surface runoff may be diverted into the stream to the east. In either case, the quantities of runoff arising from the site in future 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 downstream habitat.

5.4.6 WETLANDS

Two small artificial wetlands created by the surface drainage from the present pit will continue to be present until the flow patterns change as the quarry grows. These are not expected to require an approval if they are disturbed as the quarry grows. The northeastern pond/marsh wetland (0.1 ha) will be affected further as quarry development approaches and the source of recharge (which is assumed to be surface runoff into a depression in the area) is reduced. This pond/wetland has also been recently affected by the logging of the surroundings, likely leading at least temporarily to changes due to increased sedimentation and nutrient input, as well as drying, compared to its earlier condition. If the quarry expansion requires removal of the pond, an approval for wetland alteration will be required from Nova Scotia Environment. Swamp wetlands along and outside the property boundary to the south may experience a reduction in surface water flow as the quarry develops, due to diversion of surface flow to other areas. The reduction in water supply; as well the permanent change in temperature and hydrological conditions in the vicinity of the active quarry, have the potential to change the plant and ecosystem characteristics through changes to nutrient input, dust, emissions, temperature regime etc. These wetlands are not pristine, and have been impacted by logging, and show rutting caused by heavy equipment. Longterm gradual changes to plant communities are difficult to detect and monitor. Measures can be taken to maintain the hydrological regime, reduce nutrient inputs, and adequately buffer the wetlands, to attempt to maintain the existing wetlands.

5.4.7 FISH AND FISH HABITAT

None of the proposed project activities will physically impact potentially fish bearing streams on the north or east sides of the project site. Forested buffers will be left in place to help to maintain temperatures, inputs of nutrients, and provide a source of leaves and woody debris. Blasting occurs infrequently at the site and is sufficiently separated from streams leaving the site to eliminate harm to fish. Water quality typically 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.

5.4.8 FLORA AND FAUNA AND HABITAT

The existing terrestrial ecosystem (plants and animals) will be removed in areas covered by the footprint of the quarry. With time, areas no longer suitable for quarry operations will be remediated, according to agreements made with the Nova Scotia government 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. 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. Several species of migratory birds are in decline in Nova Scotia, in particular interior forest birds, which rely on large expanses and continuity of intact forest. Other wildlife species need large areas of undisturbed forest to live and reproduce naturally. Occurrence of logging activity in past and the network of woods roads and trails, not associated with the project, already influence movement patterns of wildlife. Expansion of the Loch Katrine 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; employees should be educated on the need to check areas for activity and nests 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. If possible, 24-hour operations in August to early September should be avoided and lighting used at the site should focus downward and below the normal horizon, to limit visibility by birds and insects from a distance.

5.4.9 SPECIES AT RISK

The local occurrence of Yellow-listed Large Round-Leaf Orchid immediately north of the present pit area is an immediate concern. This species is considered rare; however the status may be due to insufficient surveys having been done in this type of habitat. Expansion of the quarry into this part of the study area should not be undertaken until a survey is conducted to determine the distribution of the species at the site and in similar conditions both on-site and nearby. Common Nighthawk, a ground-nesting endangered bird 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. Lights during night operations during migration periods (May-June, August-September) would attract various bird species and insects, which could include species at risk. If possible, 24-hour operations during migrations should be avoided and lighting used at the site should focus downward and below the normal horizon, to limit visibility from a distance.

5.4.10 NATURAL AREAS & WILDERNESS

Natural areas at the site are appreciated by locals and tourists alike, while regenerating forests at the site are important in supporting wildlife populations, and nearby undeveloped areas are appreciated by society as a whole, evidenced by their designation for parks and protected areas. The immediate vicinity of the Loch Katrine Quarry, is not pristine, having been used repeatedly for resource extraction—in particular for forestry, but aggregate extraction and agriculture have also been a part in the mix of activities in the area. South River Lake is an important natural area in the immediate vicinity, for local

residents. Several natural areas are located in relatively close by and in particular the Giants Lake Wilderness Area is proposed about 10 km east of the site; Ogden Round Lake Wilderness Area (designated); Giants Lake Wilderness Area (pending designation); South River Nature Reserve (pending designation); Lochiel Lake Provincial Park (designated); and Lochaber Provincial Park and Park Reserve (designated). The quarry has a small footprint in the landscape and will not affect naturalness and character of the forest landscape in these natural areas or in the adjacent South River Lake and South River watershed. Efforts should be made to minimize the footprint and effects of the quarry, in particular to reduce traffic, noise, dust and light from quarry operations. Activities at the quarry will be carried out with a view to minimizing impacts of the quarry and associated infrastructure, such as roads, on the adjacent natural environment at the site and ensuring that as much as possible of the quarry is restored in future. 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.

6 IMPACTS OF THE ENVIRONMENT ON THE PROJECT

The operating quarry will not be impacted in general by weather, including high rainfall and precipitation, through its nature and design, which includes site water management. 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.

7 CUMULATIVE EFFECTS

All the potential impacts of the quarry operation (dust, noise, lights, blasting, traffic volume) may be compounded by the operations of the smaller competitor operated wayside quarry to the north, however since site operations are not expected to increase in frequency or scope from past use, the cumulative effect of both quarries is not expected to increase from past levels. Additionally, it is unlikely that both quarries would be operating at the same time, as there are unlikely to be multiple large construction projects occurring concurrently in the area that would necessitate both sites being active. The two quarries are comparatively small, and produce relatively small aggregate volumes annually, and the expected rate of production is expected to remain at current levels[6].

[6] Effects of operations of nearby competing wayside quarry were not assessed. We assumed that the production volume and longevity of the quarry would remain similar to that at present.

Table 9. Potential interactions between project activities and operations and Valued Environmental Components (VECs) for Loch Katrine Quarry expansion.

General Category of VEC	Biophysical								Socioeconomic										
Project Component (potential interactions shown by ✓)	Air Quality, Noise and Light	Groundwater & Hydrology	Water Quality	Aquatic Environments and Wetlands	Natural Areas & Wilderness	Fish and Fish Habitat	Flora & Fauna Species & Habitat	Species at Risk	Mi'kmaq	Cultural/Historical	Recreation, Tourism & Viewscape	Residential Use	Recreational, Commercial & Mi'kmaq Fishing	Water Supplies/ Residential Wells	Land Use and Value	Transportation	Commercial /Industrial Use	Parks & Protected Areas	Forestry Hunting /Trapping
Construction																			
Site Acquisition, Use/Removal of Resources	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓
Site Clearing/Grubbing	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓		✓				✓	✓
Drilling	✓	✓			✓			✓			✓	✓		✓				✓	
Blasting	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		✓				✓	
Lights	✓				✓		✓	✓			✓	✓						✓	
Operation																			
Moving/Transporting Rock and Product	✓				✓		✓				✓	✓			✓	✓	✓	✓	
Crushing	✓				✓						✓	✓						✓	
Washing		✓	✓	✓		✓													
Lights	✓				✓		✓	✓			✓	✓						✓	
Site Runoff Management		✓	✓	✓		✓							✓	✓					
Portable Asphalt Plant	✓				✓		✓				✓	✓						✓	
Onsite Materials Storage			✓	✓										✓					
Accidents (Fires/Oil & Fuel Spills)	✓	✓	✓	✓	✓	✓	✓				✓	✓		✓				✓	✓

Table 10. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
BIOPHYSICAL COMPONENTS						
Air Quality, Noise & Light	Construction	Noise and dust from heavy equipment during logging and grubbing.	Significant	Negative	Schedule activity to avoid peak periods of use by residents in the local community. Take steps to reduce noise sources such as engine braking.	Not significant.
		Drilling and blasting.	Significant	Negative	Monitor noise levels and undertake to avoid exceedences of regulatory levels.	Not significant.
		Light from the quarry can be seen in neighbouring areas.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the quarry during night operations.	Not significant.
	Operation	Drilling and blasting; equipment for moving rock; crusher; heavy equipment operation; air-borne emissions from asphalt plant.	Significant	Negative	Monitor noise levels and undertake to avoid exceedences of regulatory levels. Institute measures for dust control. Monitor and maintain asphalt plant to minimize emissions.	Not significant.
		Light from the quarry can be seen in neighbouring areas.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the quarry at night.	Not significant.
Groundwater/ Hydrology	Construction	Forest and soil removal changes surface and ground water flow levels and patterns.	Negligible	Negative	Use site runoff management to minimize impacts. Likely changes in groundwater and runoff patterns will be small.	Not significant.
	Operation	Blasting fractures bedrock, disturbs till, and changes groundwater flow patterns.	Significant	Negative	Drilled wells in bedrock and surface wells can be disturbed. Monitor groundwater quality and movement to determine changes.	Not significant.

Table 10. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
	Operation	Quarry and work areas change surface water flows. Increased peak stormwater flows. Washing product creates silt-laden surface flows.	Significant	Negative	Onsite water management to moderate extreme surface water runoff and suspended sediment levels; measures to maintain normal flow regime.	Not significant.
	Operation	Accidental hydrocarbon spills and blasting residues contaminate groundwater.	Significant	Negative	Measures to minimize danger of spills; onsite emergency numbers, spill kits etc. Avoid refueling near watercourses.	Not significant.
Water Quality	Construction	Altered surface water flows and turbidity in watershed flowages.	Negligible	Negative	Erosion and sedimentation controls in work areas. Onsite water management to moderate surface water runoff and suspended sediment levels.	Not significant.
	Operation	Dust & suspended sediment from operations potentially enters local watershed. Chemicals (e.g. nitrates) from explosives entering runoff.	Significant	Negative	Onsite dust control and water management to moderate surface water runoff and suspended sediment levels. Erosion & sedimentation controls. Closely monitor chemical residues after blasting.	Not significant.
	Operation	Water chemistry changes in runoff from materials stored on site.	Negligible	Negative	Best management practice allows leaving piles exposed to the environment. Monitor settling ponds; storm-water management.	Not significant.

Table 10. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
Natural Areas & Wilderness	Construction & Operation	Presence of quarry, emissions, dust etc, detracts from public perception of wild quality of area.	Negligible	Negative	Area affected is small in relation to remaining natural areas, and previous development has occurred in the area, diminishing value of natural areas and wilderness. Attempt to minimize footprint and avoid damage to areas that contribute most to supporting the natural ecosystem and enhancing values. Manage releases of dust and light, and control noise.	Not significant.
Freshwater Aquatic Environments	Construction	Occurrences of high suspended sediments and nutrient levels from grubbings, road construction, and locally diverted flows.	Negligible	Negative	Preserve wooded buffer areas adjacent to wetlands and watercourses. Onsite water management and sedimentation controls to moderate surface water runoff and suspended sediment levels.	Not significant.
	Operation	Retention of runoff for aggregate washing. Evaporation from pit floor and exposed surfaces. Lower normal flows in watercourses adjacent to site.	Negligible	Negative	Maintain forested buffers. Onsite water management to store additional wash water during off peak season. Minimize unvegetated areas.	Not significant.
	Operation	Higher peak flows and suspended sediment during activities.	Significant	Negative	Onsite water management to store wash water during off peak season. Preserve woodland in buffer areas of quarry.	Not significant.
	Operation	Runoff from access roads.	Negligible	Negative	Use of ditching and artificial channels, to carry peak flows and additional site runoff. Sedimentation controls.	Not significant.
	Operation	Releases of chemicals from blasting and runoff from materials stored on site.	Negligible	Negative	Isolate and treat runoff from work areas and stored materials piles.	Not significant.

Table 10. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
	Construction & Operation	Routine releases and accidental spills of hydrocarbons on site.	Significant	Negative	Provide pollution prevention and emergency measures.	Not significant.
Wetlands	Construction	Grubbing, road construction, pit preparation	Significant	Negative	Avoid work and/or development near northeast pond wetland and maintain buffer on south boundary. If unavoidable, delineate wetlands and compensate for loss. Maintain natural hydrological regime of wetlands during construction.	Not significant.
	Operation	Dust, nutrient inputs from runoff, changes to hydrology, changes to forest communities.	Negligible	Negative.	Maintain a significant forest buffer; maintain hydrological regime. Maintain wetlands created by quarry runoff to improve quality of water leaving the site.	Not significant.
Fish & Fish Habitat	Construction	Change runoff patterns at site in local and adjacent watersheds.	Negligible	Negative	Avoid the major wetlands and associated watercourses. Maintain forested buffer around wetlands and streams.	Not significant.
	Operation	Site runoff management and water use affects hydrological and groundwater regime.	Negligible	Negative	Ensure the runoff from the site is managed to maintain a supply wetlands and watercourses.	Not significant.
	Construction & Operation	Nominal releases of oils, hydraulic fluids etc. from operating equipment. Accidental spills of hydrocarbons on site.	Negligible	Negative	Maintain equipment to minimize loss of lubricants and fuels. Provide pollution prevention and emergency measures.	Not significant.

Table 10. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
	Operation	Accidental spills into watercourses in Loch Katrine area from truck highway accidents.	Negligible	Negative	Recommend truck traffic use safe driving practices and reduce speed in vicinity of quarry and intersection on Highway 316 & South River Lake Road. Provide pollution prevention and emergency measures.	Not significant.
Terrestrial Flora & Fauna & Habitat	Construction	Removal of Existing Communities	Negligible	Negative	Restore damaged and unused parts of the site (e.g. grubbings and waste rock piles) as soon as possible. Long-term site rehabilitation plan developed with NSE. Cut forest short term only as needed to expand quarry.	Not significant.
	Construction & Operation	Accidental releases, contamination of habitat.	Significant	Negative	Provide pollution prevention and emergency measures & response capability. Remediate any permanent areas affected by spills.	Not significant.
		Artificial light from operations influences movements of birds and insects.	Significant	Negative	Use directional lighting with downward focus to minimize light leaving the quarry.	Not significant.
		Removal of potential forest and wildlife resource (i.e. wildlife habitat)	Negligible	Negative	Small area affected relative to total available. Minimize footprint of quarry. Restore and rehabilitate areas not used. Leave mature standing trees where possible as nest cavities.	Not significant.
		Quarry affects wildlife movement patterns and connectivity of habitats.	Significant	Negative.	Restoration should include consideration for wildlife movement through the restored site.	Not significant.
Species at Risk	Construction	Plant species at risk (Large Round-Leaved Orchid) in the proposed footprint of the quarry.	Significant	Negative	Survey for additional occurrences of species. Develop management plan. Minimize footprint and maintain as much natural (uncut) natural vegetation as possible.	Not significant.

Table 10. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
	Operation	Sound from blasting can harm bats and birds.	Negligible	Negative	Minimize blasting activity and concentrate in spring and fall (outside breeding and migratory periods) when species are absent.	Not significant.
		Light influences movements of species at risk birds migrating overland.	Significant	Negative	Use directional lighting with downward and lateral focus to minimize light leaving the quarry.	Not significant.
		Open areas and grubbings piles occupied by nesting species such as nighthawks.	Significant	Negative	Educate personnel to look for bird life prior to activities; periodically conduct nesting bird survey at site to identify bird issues.	Not significant.
SOCIOECONOMIC COMPONENTS						
Mi'kmaq	Construction and Operation	Any land use conflicts with Mi'kmaq Right to Use Land	Significant	Neutral	Consult with Mi'kmaq in developing quarry.	Not significant.
		Contamination and alteration of flow regime of streams may affect fish populations potentially used by Mi'kmaq.	Negligible	Negative	Employ surface water monitoring program. Use Best Management Practices for quarries. Avoid accidental releases of contaminants. Avoid vehicle accidents.	Not significant.
Archaeological, Cultural and Historical Significance	Construction	Expansion may affect undiscovered artifacts.	Not significant	Negligible	Unlikely that artifacts occur at site. Minimize project footprint.	Not significant.
Recreation	Construction & Operation	Quarry traffic & activities affects local light recreation (e.g. walking and cycling).	Not significant	Negative	Users will be aware of activity at quarry but will not be otherwise impacted by it. Access roads gated to prevent unauthorized use.	Not significant.
Tourism and Viewscape	Construction & Operation	Presence of quarry affects public perception of wilderness values.	Negligible	Negative	Quarry cannot be seen from road. Maintain a clean operation. Rehabilitate areas no longer needed for activity and future development.	Not significant.

Table 10. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
Residential Use	Construction & Operation	Noise; light pollution; dust; odours; operation of trucks and transportation of heavy equipment.	Significant	Negative	Use best management practices to reduce disturbance to nearby residents. Inform residents about quarry operations. Provide community with safety information for truck traffic on Highway 316 and South River Lake Road.	Not significant.
Recreational and Mi'kmaq Hunting and Fishing	Construction & Operation	Accidental hydrocarbon spills and blasting residues contaminate surface waters.	Negligible	Negative	Provide pollution prevention, emergency measures & response capability. Identify and control contaminant releases.	Not significant.
	Construction	Loss of forested area under quarry footprint.	Not significant	Negative	Rehabilitate areas no longer needed for activity and future development. Minimize cutting outside quarry footprint.	Not significant.
Water Supplies & Residential Wells	Construction and Operation	Blasting potentially impacts local aquifers.	Not significant	Negative	Develop groundwater-monitoring plan in consultation with NSE.	Not significant.
Land Use and Value	Construction & Operation	Removal of potential forest and wildlife resource (e.g. forestry & trapping).	Not significant	Negative	Small area affected relative to total land available. Minimize footprint of quarry. Restore and rehabilitate areas not used.	Not significant.
Transportation	Operation	Wear on highway	Negligible	Negative	Current levels low and will not increase.	Not significant.
	Operation	Collisions with trucks and equipment on Highway 316.	Not significant	No Change	Use good directional signs for slow moving vehicles, and speed policy in vicinity of quarry. Safety training for truck drivers.	Not significant
Industrial & Commercial Use	Operation	Competition with other Quarries	Negligible	Neutral	Quarry operations are in a competitive environment; cooperate if possible.	Not significant.
Resource Use Forestry, Hunting & Trapping	Construction & Operation	Removes woodland; game habitat.	Not significant	Negative	Relatively small area is used.	Not significant.

Table 10. Summary of impacts and mitigation on Valued Environmental Components, Loch Katrine Quarry Expansion.

VEC	Project Component	Nature of Effect	Significance	Nature of Impact	Mitigation	Significance after Mitigation
Parks and Protected areas	Construction & Operation	Giants Lake Wilderness Area, Ogden Round Lake Wilderness Area, Lochaber Provincial Park Reserve, Lochiel Lake Provincial Park	Not significant	Neutral	Employ best management practices for all aspects of quarry operation, in particular control of light, dust and particulate emissions, and odours leaving the site.	Not significant.

8 MONITORING

Monitoring of hydrological conditions at the site, as well as water quality monitoring, may be conducted to ensure conditions have been maintained by quarry operations. Routine monitoring of noise levels will be done if required by NS Environment. Onsite groundwater monitoring may be conducted, at the request of NSE.

9 PUBLIC CONSULTATION

In addition to contacts already made in developing this assessment and in conducting operations in Loch Katrine, the Proponent will undertake to consult with locals, municipal, and provincial government officials, and the Mi'kmaq about the project and its implications; as well as the plans for using the resources at the site in an environmentally acceptable manner.

10 PERSONAL COMMUNICATIONS

Mr. Carl Kennedy, resident, Loch Katrine, Nova Scotia
Mr. Sean Weseloh-McKeane, NS Museum of Natural History, Coordinator, Special Places.

11 REFERENCES

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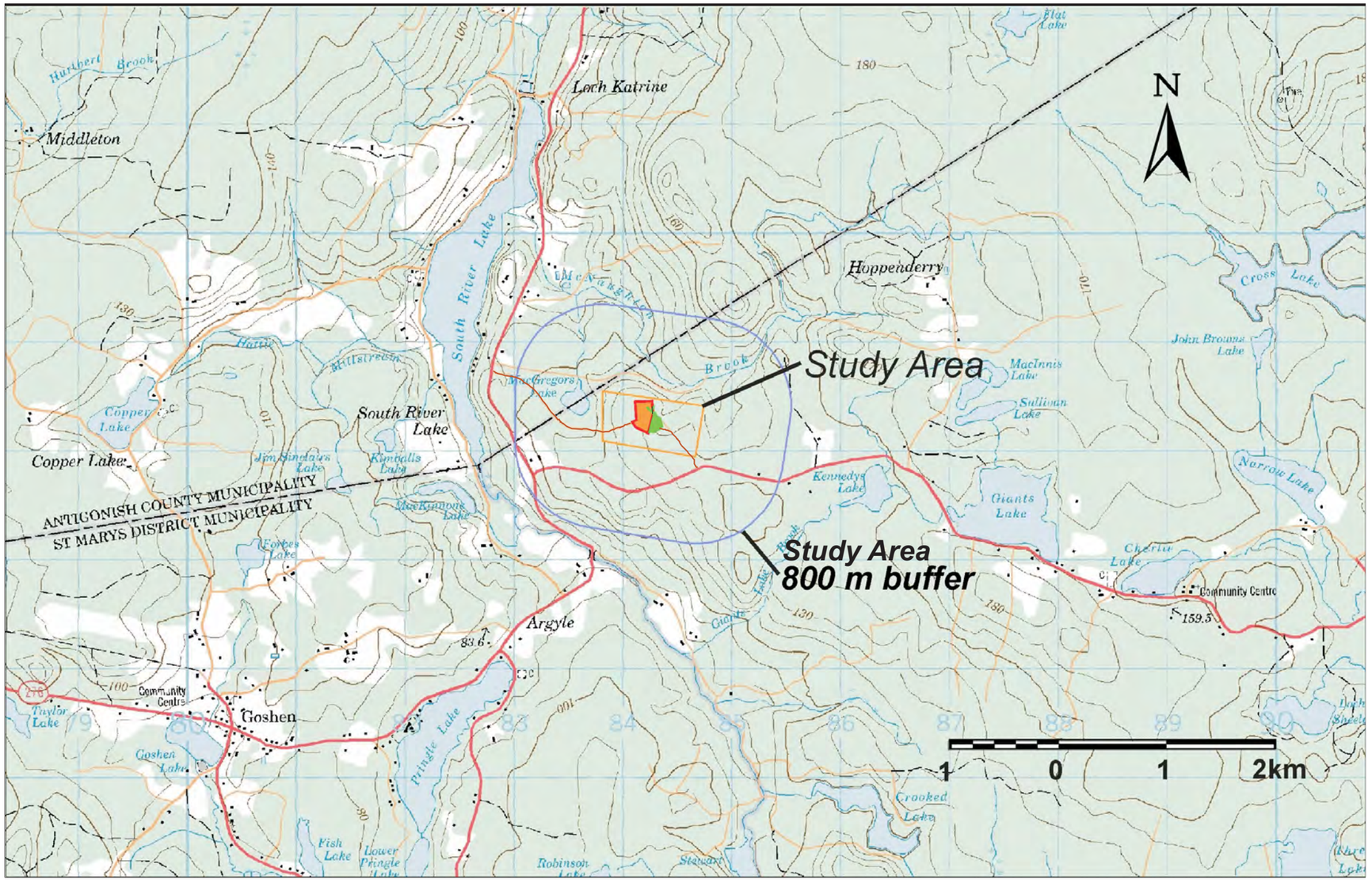
12 LIMITING CONDITIONS

The American Society for Testing and Materials Standards of Practice and the Canadian Standards Association state that no environmental assessment can wholly eliminate uncertainty regarding the recognition of potential environmental liabilities. The intent of the assessment is to reduce, but not eliminate, uncertainty regarding projects, giving reasonable limits of time and costs.

The conclusions of this report are based in part on the information provided by others, which is assumed to be correct. The potential exists that unexpected environmental conditions may be encountered at the site and with the project, not specifically investigated. Should this occur, the proponent and regulatory authorities must be notified so that we may decide if modifications to our conclusions are necessary.

The findings of this investigation are based on research and investigations carried out in September 2015-August 2016 and the generally accepted assessment practices of our industry. No other warranty is made.

APPENDIX A
MAPS



THE MUNICIPAL GROUP OF COMPANIES

LOCH KATRINE QUARRY EXPANSION

Loch Katrine, Guysborough County, Nova Scotia

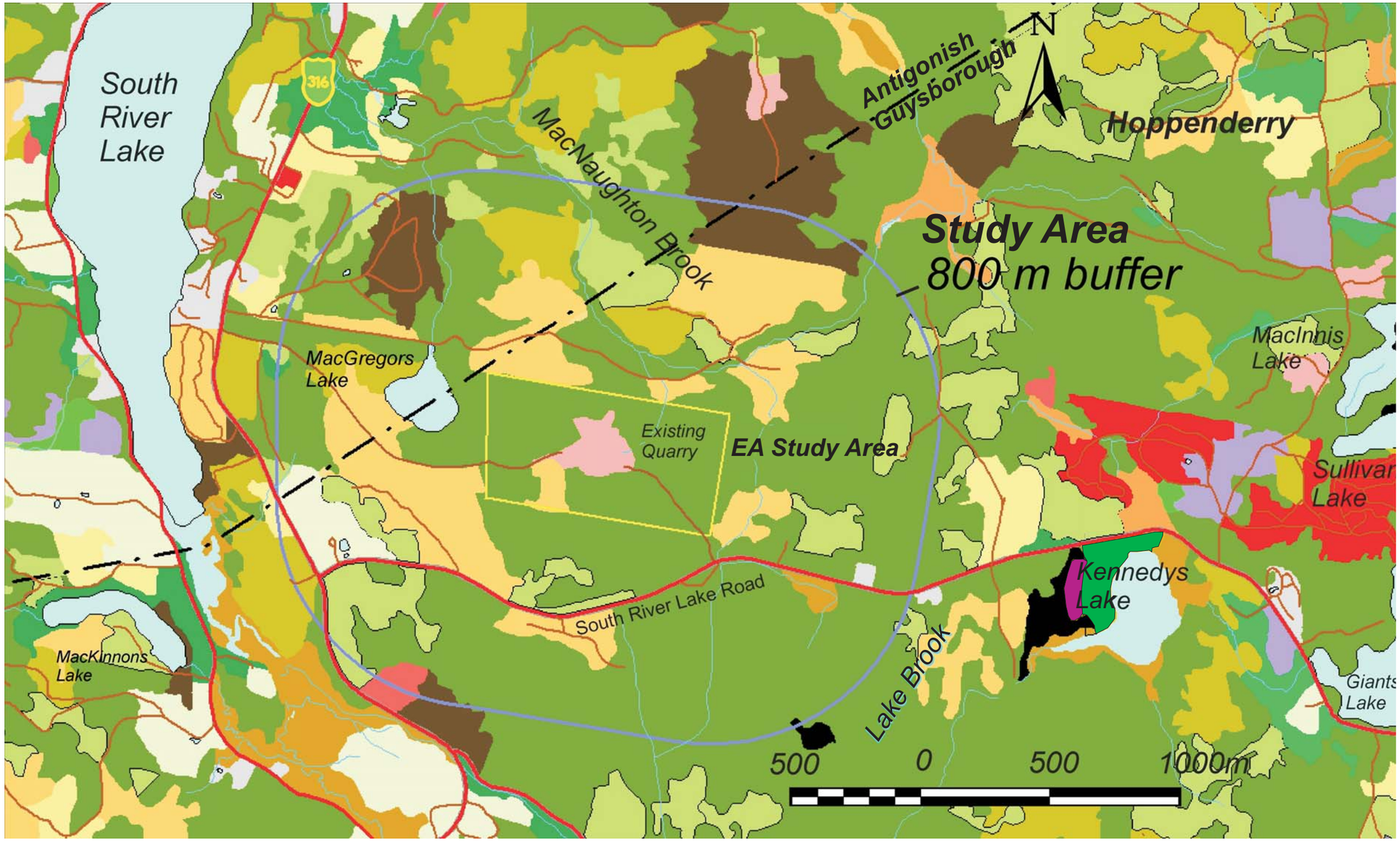
Site Location

- Existing 4 ha Approval
- Study Area
- Restored Area
- 800 m Buffer

Municipal Enterprises Ltd
Bedford, Nova Scotia

Map by:
Envirosphere Consultants Ltd.
June 2016

Map A-1



THE MUNICIPAL GROUP OF COMPANIES

LOCH KATRINE QUARRY EXPANSION
Guysborough County, N.S.

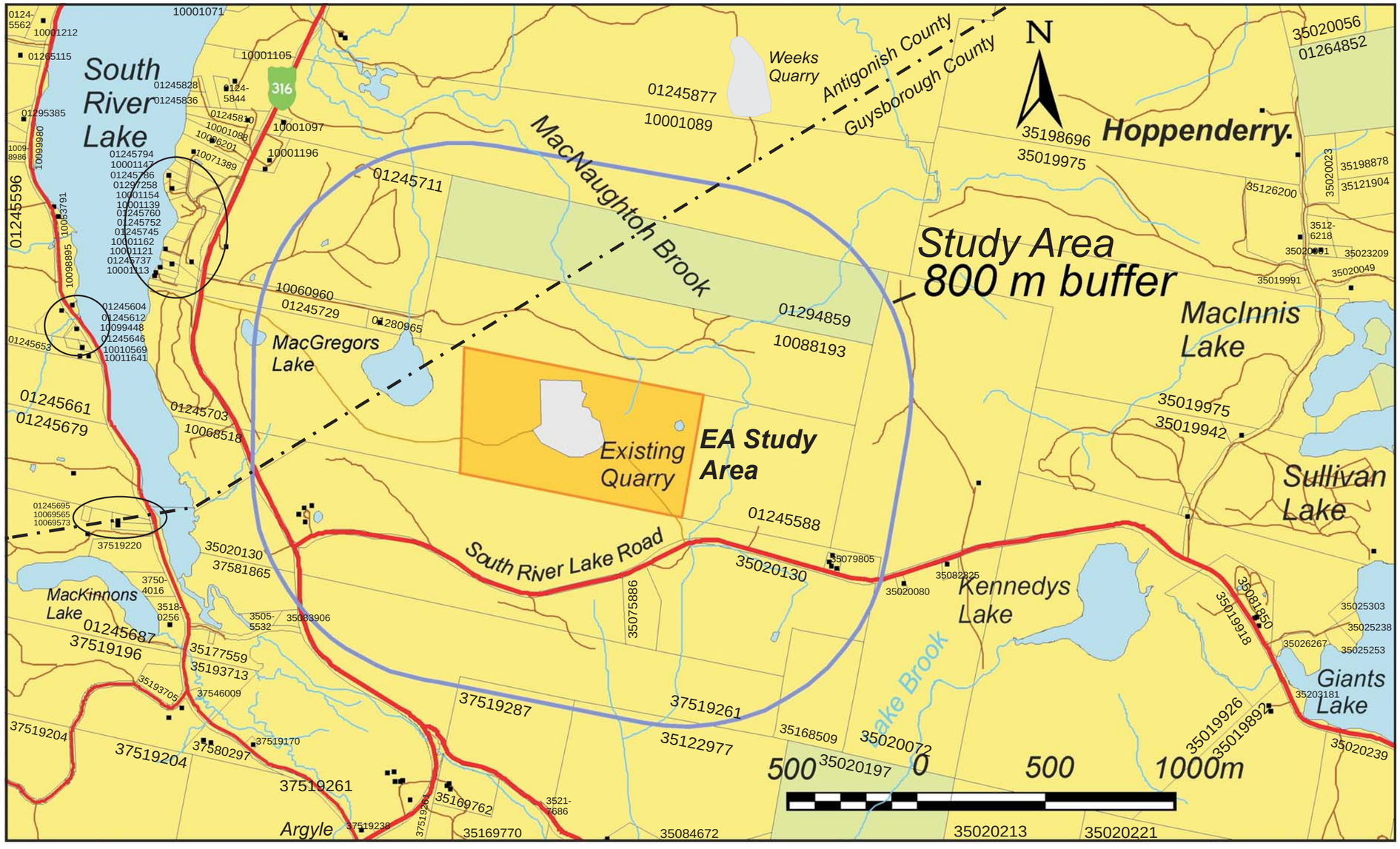
Land Use Classification
(based on NS Forestry Inventory, 2006)

- Agriculture
- Treated
- Urban
- Wetlands General
- Brush
- Inland Water
- Natural Stand
- Alders
- Old Field
- Partial Depletion
- Treed Bog
- Gravel Pit
- Clear Cut
- Blueberries
- Christmas Trees

- Trunk Highway
- Secondary Roads & Trails

Map by:
Envirosphere Consultants Limited.
Windsor, Nova Scotia, August 2016

Map A-2



THE MUNICIPAL GROUP OF COMPANIES

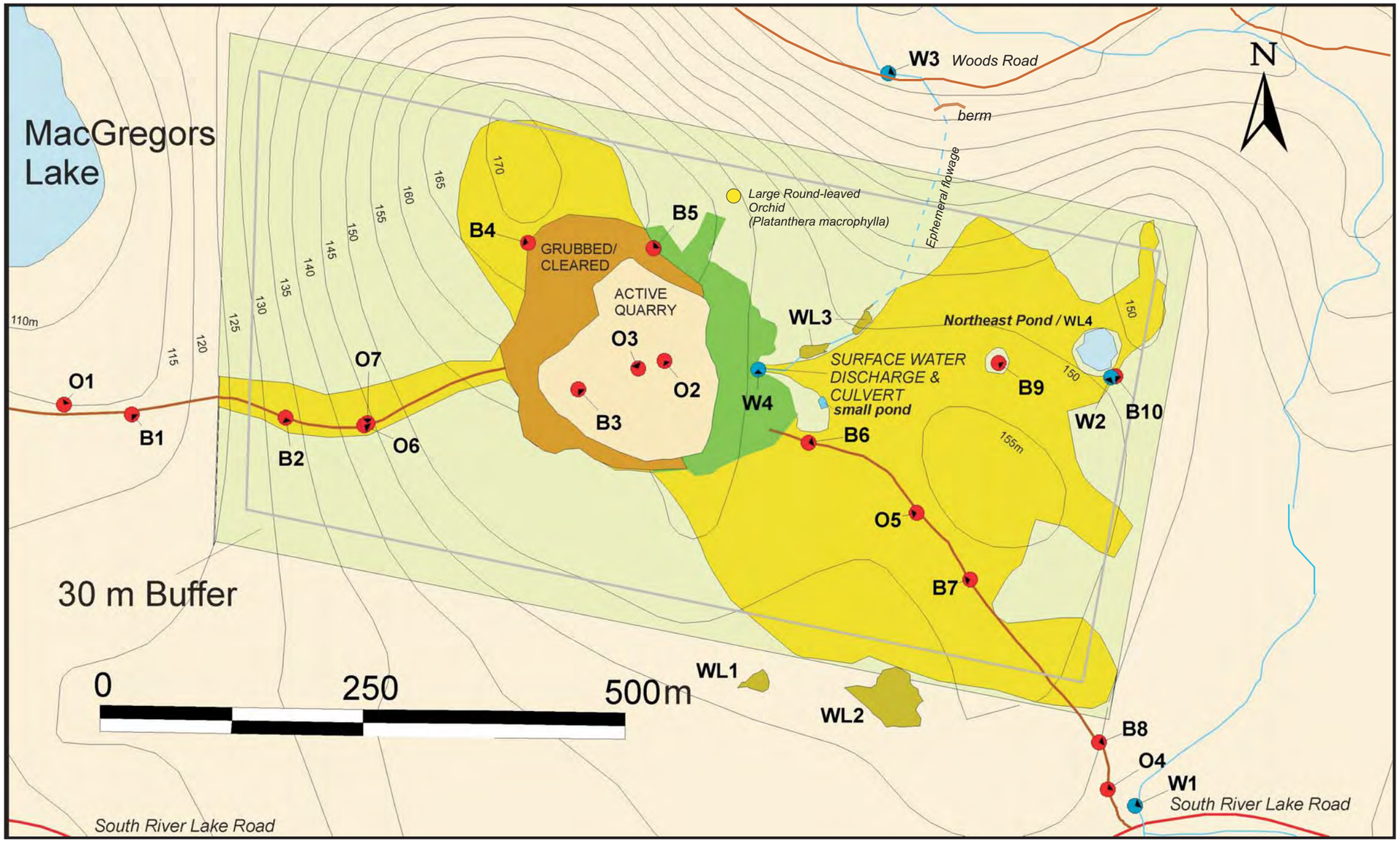
LOCH KATRINE QUARRY EXPANSION
Loch Katrine, Guysborough County, Nova Scotia

Property Ownership

- Crown Land
- Existing Quarry
- EA Study Area
- Property Boundaries
- Major Roads
- Minor Roads / Trails
- Quarry 800 m Buffer

Map by:
Envirosphere Consultants Limited
August 2016

Map A-3



THE MUNICIPAL GROUP OF COMPANIES

LOCH KATRINE QUARRY EXPANSION
Loch Katrine, Guysborough County

Site Features, Sampling Locations, Wetlands & Contours

- Forested
- Recently Cut
- Active Quarry
- Grubbed/Cleared
- Restored Area
- Visited Wetlands
- Trunk Highway
- Access Roads & Trails
- Contours (5 m)
- Flowages/Watercourses
- Water Sample
- Bird Observation Sites
  O= *Owls;* B = *General*

Map by:
Envirosphere Consultants Limited
Windsor, N.S. August 2016

Map A-4

APPENDIX B
WETLAND/BOTANTICAL SURVEYS

Fall 2015 & Spring / Early Summer 2016

Loch Katrine Quarry Botanical Survey

Ruth E. Newell B.Sc. (Hons.), MSc.

November 10, 2015

Loch Katrine Quarry Botanical Survey

Introduction

A vascular plant survey for a proposed quarry expansion in Loch Katrine, Guysborough County, Nova Scotia was conducted on October 16th, 2015. The survey was carried out by botanist, Ruth E. Newell, B.Sc. (Hons.), M.Sc.

The existing quarry is located approximately 1 km east of the south end of Loch Katrine Lake and Hwy 316 (20T 584228mE, 5028264mN).

An area of approximately 42.5 ha surrounding the existing quarry (Fig. 1) was surveyed by foot. All vascular plants observed were documented and are listed by habitat together with their abundance and status ranks (Nova Scotia General Status Ranks and Atlantic Canada Conservation Data Centre Sub-national Status Ranks) in TABLE 1.

Atlantic Canada Conservation Data Centre (ACCDC) species ranks and Nova Scotia General Status Ranks are defined in APPENDIX 1.

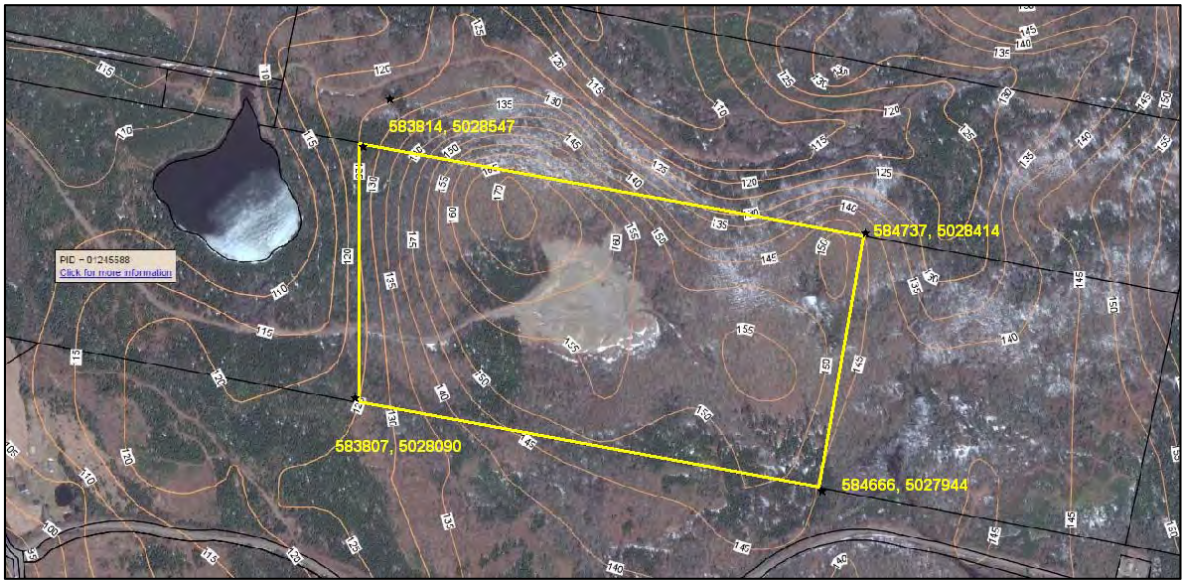


Fig. 1. Loch Katrine quarry with area surveyed encompassed within the yellow lines.

Results

Upon arriving at the site it was discovered that a significant amount of clear-cutting had been carried out on the south, east and west sides of the existing quarry (Figs. 2 & 3). The clearcutting is not present in Figure 1.

Remaining uncut forest habitat included coniferous, mixed and deciduous woodland to the south of the existing quarry and primarily deciduous woodland on the east, north and west sides of the existing quarry.

Fig. 2. Clear cut in southeast corner of survey area.

Fig. 3. Clear cut to the east of the existing quarry.

Habitat Descriptions

Coniferous/Mixed Forest

Primarily coniferous and mixed deciduous/coniferous woodlands occur mostly to the south of the existing quarry (Figs. 4 & 5). The three most prevalent tree species present throughout this area include Balsam Fir (*Abies balsamea*), Red Maple (*Acer rubrum*) and Yellow Birch (*Betula lutea*). Lesser amounts of Sugar Maple (*Acer saccharum*) and White Spruce (*Picea glauca*) are also present together with White Ash (*Fraxinus americana*) saplings. Various commonly occurring herbaceous species were observed including Bunchberry (*Cornus canadensis*), Wood Aster (*Oclemena acuminata*), Rough Goldenrod (*Solidago rugosa*), Wild Lily-of-the-valley (*Maianthemum canadense*), Starflower (*Trientalis borealis*), Goldthread (*Coptis trifolia*) and Heal-all (*Prunella vulgaris*). Common ferns present include Sensitive Fern (*Onoclea sensibilis*), Christmas Fern (*Polystichum acrostichoides*), Evergreen Wood Fern (*Dryopteris intermedia*), New York Fern (*Thelypteris noveboracensis*), Cinnamon Fern (*Osmunda cinnamomea*), Lady Fern (*Athyrium filx-femina*) and Beech Fern (*Phegopteris connectilis*). Common mosses included Sphagnum mosses (*Sphagnum* spp.) in the wetter areas, and Schreber's Moss (*Pleurozium schreberi*) and Stair-step Moss (*Hylocomium splendens*) in the drier areas.

Fig. 4. Mixed woodland south of the existing quarry.

Fig. 5. Coniferous woodland south of the existing quarry.

Deciduous Forest

Deciduous woodland is found in varying degrees on all four sides of the existing quarry (Fig. 6). The deciduous woodland occurring in the north east corner of the survey area appeared to be the most mature and richest in terms of soil and plant species present. This area also had the only stream observed on the property as well as fairly extensive wooded seepage areas (Figs. 7 & 8).

Tree species occurring more or less throughout deciduous woodland habitat include Sugar Maple (*Acer saccharum*), Moose Maple (*Acer pensylvanicum*), Yellow Birch (*Betula lutea*), American Beech (*Fagus grandifolia*), Red Maple (*Acer rubrum*), White Birch (*Betula papyrifera*) and Balsam Fir (*Abies balsamea*). White Ash (*Fraxinus americana*) was present primarily as saplings.

Deciduous woodland habitat has many of the same commonly occurring herbaceous plant species that the coniferous/mixed woodland areas have as for example Starflower (*Trientalis borealis*), Bunchberry (*Cornus canadensis*), Wood Aster (*Oclemena acuminata*), Wild Lily-of-the valley (*Maianthemum canadense*) and Goldthread (*Coptis trifolia*). Herbaceous species found in the deciduous woodland that were not observed in the previously described habitats include Wood Sorrel (*Oxalis montana*), Wild Sarsasparilla (*Aralia nudicaulis*), White Baneberry (*Actaea pachypoda*), Toothwort (*Cardamine diphylla*), Eastern Rough Sedge (*Carex scabrata*), Slender Wood-reed (*Cinna latifolia*), Silvery False Spleenwort (*Deparia acrostichoides),* Spotted Coralroot (*Corallorhiza maculata*), and Bellwort (*Uvularia sessilifolia*).

Fig. 6. Deciduous woodland in the northeast corner of the survey area.

Fig. 7. Small stream in the deciduous woodland in the northeast corner of the survey area.

Fig. 8. One of several large seepage areas in deciduous woodland in the northeast corner of the survey area. Eastern Rough Sedge (*Carex scabrata*) is abundant in these wet areas.

Clearcuts

Areas that had been recently clear-cut were generally not surveyed. Only a few of the more common species in these areas were documented. These include: Wool Grass Bulrush (*Scirpus cyperinus*), Rough Bentgrass (*Agrostis scabra*), Narrow-leaved Goldenrod (*Euthamia graminifolia*), Canada Goldenrod (*Soldago canadensis*), Wild Raspberry (*Rubus strigosus*), Sallow Sedge (*Carex lurida*), Tear Thumb (*Polygonum sagitatum*) and Fringed Bindweed (*Polygonum cilinode*). All of these species are GREEN-listed in Nova Scotia, i.e. they are considered secure.

Discussion

No species listed under federal species-at-risk legislation (http://www.registrelep-sararegistry.gc.ca/) were observed during this vascular plant survey.

No species listed under provincial species-at-risk legislation (http://novascotia.ca/natr/wildlife/biodiversity/species-list.asp) were observed during this vascular plant survey.

All species observed have a Nova Scotia general status of either GREEN (secure) or non-native (exotic) *with one exception*. One plant of Large Round-leaved Orchid (*Platanthera macrophylla*) (Fig.9) was observed in deciduous woodland habitat near the north edge of the existing quarry (20T 0584300, 5028426) (Fig. 10). This is a YELLOW-listed, i.e., sensitive species; in the province of Nova Scotia (yellow-listed species are not believed to be at risk of immediate extirpation or extinction but may require special attention or protection to prevent them from becoming at risk). The Atlantic Canada Conservation Data Centre has assigned a sub-national rank of S2 to Large Round-leaved Orchid in Nova Scotia indicating that there is some concern about this species. The ACCDC definition for the S2 Rank is: imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province (http://www.accdc.com/).

Fig. 9. Large Round-leaved Orchid (*Platanthera macrophylla*) in deciduous woodland just north of the existing quarry (Fig. 10).

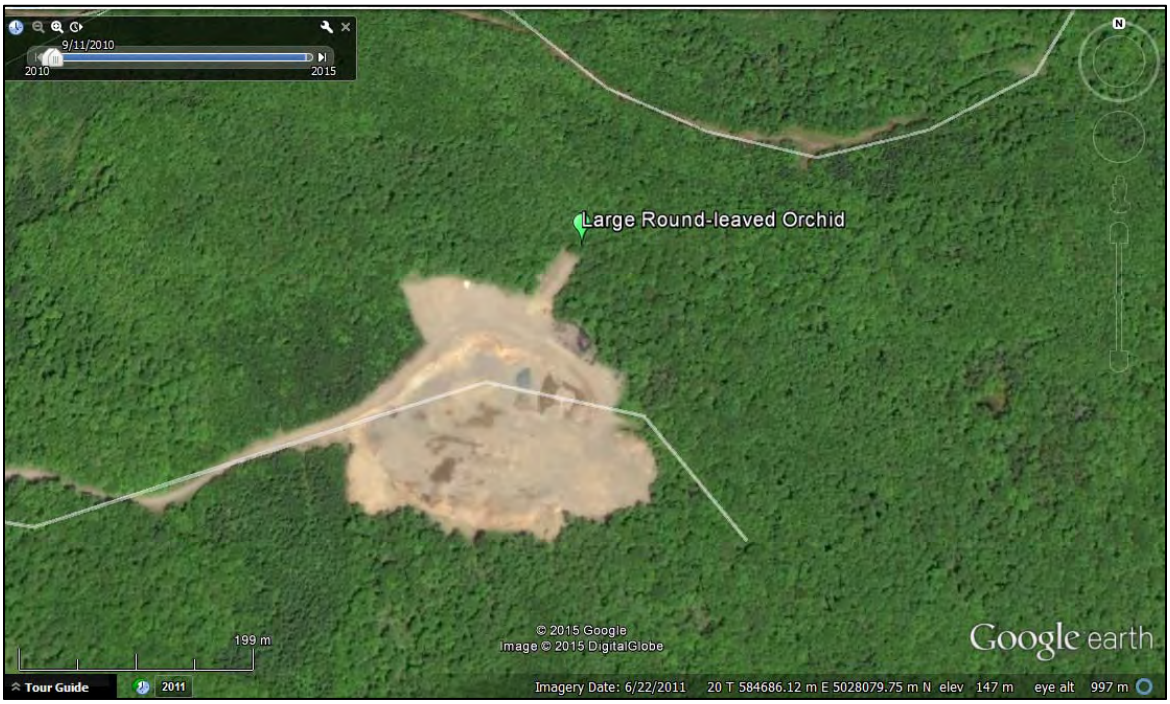


Fig. 10. Location of the Large Round-leaved Orchid (*Platanthera macrophylla*) shown in Fig. 9.

Recommendations:

This survey was conducted late in the growing season and therefore a number of the early flowering/fruiting species would have died back by the time this survey was conducted. A second survey in late spring or early summer is recommended in order to complete the documentation of the local flora.

TABLE 1. Plant species observed during the survey, their status ranks, the habitats where they occurred and their abundance within each habitat, in the study area for the Municipal Enterprises, Loch Katrine Quarry expansion, October 16, 2015

Latin Name	**Common Name**	**Coniferous and Mixed Woodland**	**Deciduous Woodland**	**NS General Status Rank (see APPENDIX for rank definitions)**	**ACCDC Sub-national Status Rank (see APPENDIX for rank definitions)**
Abies balsamea	Balsam Fir	common	uncommon	Green	S5
Acer pensylvanicum	Moose Maple	-	occasional	Green	S5
Acer rubrum	Red Maple	common	occasional	Green	S5
Acer saccharum	Sugar Maple	uncommon	common	Green	
Actaea pachypoda	White Baneberry	-	uncommon	Green	S4
Aralia nudicaulis	Wild Sarsasparilla	-	uncommon	Green	S5
Athyrium filix-femina	Lady Fern	occasional	occasional	Green	S5
Betula lutea	Yellow Birch	scattered	common	Green	S5
Betula papyrifera	White Birch	-	uncommon	Green	S5
Cardamine diphylla	Toothwort	-	uncommon	Green	S4
Carex novae-angliae	New England sedge	-	occasional	Green	S5
Carex scabrata	Eastern Rough Sedge	-	locally abundant	Green	S5
Chrysosplenium americanum	Golden Saxifrage	locally common	locally common	Green	S5
Cinna latifolia	Slender Wood-reed	-	scattered	Green	S5
Clematis virginana	Virgin's Bower	uncommon	uncommon	Green	S5
Clintonia borealis	Clintonia	occasional	occasional	Green	S5
Coptis trifolia	Goldthread	occasional	occasional	Green	S5

Latin Name	Common Name	Coniferous and Mixed Woodland	Deciduous Woodland	NS General Status Rank (see APPENDIX for rank definitions)	ACCDC Sub-national Status Rank (see APPENDIX for rank definitions)
Corallorhiza maculata	Spotted Coral-root	-	rare	Green	S4
Cornus canadensis	Bunchberry	occasional	occasional	Green	S5
Corylus cornuta	Beaked Hazelnut	-	uncommon	Green	S5
Dennstaedtia punctilobula	Hay-scented Fern	-	locally abundant	Green	S5
Deparia acrostichoides	Silvery False Spleenwort	-	scattered to common	Green	S4
Doellingeria umbellata	Tall White Aster	occasional	-	Green	S5
Dryopteris intermedia	Evergreen Wood Fern	occasional	occasional	Green	S5
Equisetum sylvaticum	Woodland Horsetail	uncommon	-	Green	S5
Fagus grandifolia	American Beech	-	occasional to scattered	Green	S5
Fragaria virginiana	Wild Strawberry	uncommon		Green	S5
Fraxinus americana	White Ash	occasional (as saplings)	uncommon (as saplings)	Green	S5
Galium asprellum	Rough Bedstraw	occasional	-	Green	S5
Glyceria striata	Fowl Mannagrass	-	occasional	Green	S5
Huperzia lucidula	Shining Firmoss	-	uncommon	Green	S5
Impatiens capensis	Spotted Touch-me-not	occasional	occasional	Green	S5
Linnaea borealis	Twinflower	-	occasional	Green	S5
Lonicera canadensis	Canada Honeysuckle	-	uncommon	Green	S5
Luzula sp.	A wood rush	occasional	occasional	-	-
Lycopus uniflorus	Water Horehound	occasional	-	Green	S5
Maianthemum canadense	Wild Lily-of-the-valley	occasional to scattered	occasional	Green	S5
Mitella nuda	Naked Miterwort	uncommon	-	Green	S5

Latin Name	**Common Name**	**Coniferous and Mixed Woodland**	**Deciduous Woodland**	**NS General Status Rank (see APPENDIX for rank definitions)**	**ACCDC Sub-national Status Rank (see APPENDIX for rank definitions)**
Nabalus sp.	a rattlesnake-root	-	occasional	-	-
Oclemena acuminata (=*Aster acuminatus*)	Wood Aster	occasional to scattered	occasional to scattered	Green	S5
Onoclea sensibilis	Sensitive Fern	occasional	occasional	Green	S5
Osmunda cinnamomea	Cinnamon Fern	occasional	occasional	Green	S5
Osmunda claytoniana	Interrupted Fern	uncommon	-	Green	S5
Oxalis montana	Northern Wood Sorrel	-	occasional	Green	S5
Packera aurea	Golden Groundsel	uncommon	-	Green	S4
Phegopteris connectilis	Beech Fern	occasional to scattrered	occasional	Green	S5
Picea glauca	White Spruce	uncommon	-	Green	S5
Platanthera macrophylla	**Large-leaved Bog Orchid**	**-**	**rare (1 plant observed)**	**Yellow**	**S2**
Platanthera sp.	an orchid	uncommon	-	-	-
Polystichum acrostichoides	Christmas Fern	occasional	uncommon to occasional	Green	S5
Prunella vulgaris	Heal-all	scattered	-	Green	S5
Pyrola elliptica	Elliptic-leaved Shinleaf	-	uncommon	Green	S5
Ranunculus recurvatus	Hooked Crowfoot	uncommon	-	Green	S4
Ranunculus repens	Creeping Buttercup	-	occasional	Non-native	SNA
Rubus pubescens	Dewberry	occasional	occasional	Green	S5
Sambucus sp.	an elderberry	-	uncommon	-	-
Scutellaria lateriflora	Mad Dog Skullcap	occasional	uncommon to occasional	Green	S5
Solidago rugosa	Rough Goldenrod	occasional	-	Green	S4

Latin Name	Common Name	Coniferous and Mixed Woodland	Deciduous Woodland	NS General Status Rank (see APPENDIX for rank definitions)	ACCDC Sub-national Status Rank (see APPENDIX for rank definitions)
Taxus canadensis	Canada Yew	uncommon	-	Green	S5
Theypteris noveboracensis	New York Fern	occasional	occasional to scattered	Green	S5
Trientalis borealis	Starflower	occasional	occasional	Green	S5
Uvularia sessifolia	Bellwort	-	uncommon	Green	S4S5
Viola selkirkii	Great-spurred Violet	occasional	occasional	Green	S4

APPENDIX

Atlantic Canada Conservation Data Centre Sub-national Element Rank Definitions
(http://www.accdc.com/)

The following definitions refer to species and community ranks at sub-national (provincial) levels. Sub-national ranks are specific to a province. Therefore, a species that is common (S4) in New Brunswick, could be ranked as extremely rare (S1) in Prince Edward Island.

S-rank	Definition
SX	**Presumed Extirpated** - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
S1	**Critically Imperiled** - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2	**Imperiled** - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.
S3	**Vulnerable** - Vulnerable in 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.
S4	**Apparently Secure** - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	**Secure** - Common, widespread, and abundant in the province.
SNR	**Unranked** - Nation or state/province conservation status not yet assessed.
SU	**Unrankable** - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	**Not Applicable** - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#	**Range Rank** - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
Not Provided	Species is not known to occur in the province.

Nova Scotia General Status of Wild Species Definitions
(http://www.wildspecies.ca/home.cfm?lang=e)

RED (At Risk)	**Species for which a formal, detailed risk assessment (COSEWIC status assessment or provincial or territorial equivalent) has been completed and that have been determined to be at risk of extirpation or extinction (i.e. Endangered or Threatened).**

ORANGE (May Be At Risk)	**Species that may be at risk of extirpation or extinction and are therefore candidates for a detailed risk assessment by COSEWIC, or provincial or territorial equivalents.**
YELLOW (Sensitive)	**Species that are not believed to be at risk of immediate extirpation or extinction but may require special attention or protection to prevent them from becoming at risk.**
GREEN (Secure)	**Species that are not believed to belong in the categories Extinct, Extirpated, At Risk, May Be At Risk, Sensitive, Accidental or Exotic. This category includes some species that show a trend of decline in numbers in Canada but remain relatively widespread or abundant.**
Exotic	**Species that have been moved beyond their natural range as a result of human activity. In this report, Exotic species have been purposefully excluded from all other categories.**

Loch Katrine Botanical Survey (June 7, 2016)

Ruth E. Newell B.Sc. (Hons.), M.Sc.

July 28, 2016

Loch Katrine Quarry Botanical Survey (June 7, 2016)

Introduction

A follow up late spring/early summer botanical survey of vascular plants was conducted at a proposed quarry expansion in Loch Katrine, Guysborough County, Nova Scotia, on June 7, 2016, as recommended in a report stemming from an earlier botanical survey conducted by botanist Ruth E. Newell, on October 16th, 2015. The current survey was recommended for the purpose of documenting early flowering and fruiting plant species that would not be readily evident in October or would be more difficult to identify accurately late in the growing season. This spring/early summer survey was also conducted by Ruth E. Newell, B.Sc. (Hons.), M.Sc.

This current survey was conducted on foot and the primary areas surveyed were targeted based on the potential for the occurrence of species of significance as determined from the earlier survey. These areas included the moderately rich mature deciduous woodland in the northeast corner/quadrant of the property; and deciduous woodland to the north and west of the existing quarry. Additionally, two small wet areas were surveyed. These were not previously examined during the October survey (Figs. 1, 2, 3, 4, 5 & 6).

Much of the remaining habitat on the property has been clear cut.

All vascular plants observed during the current survey that were not observed during the fall survey are listed in TABLE 1 of the Appendix. The habitats in which these species were found and their Atlantic Canada Conservation Data Centre and General Status ranks are also provided in TABLE 1. Definitions for these status ranks are provided in this report but are also available on the Atlantic Canada Conservation Data Centre (ACCDC) website (http://www.accdc.com/) and on the General Status Ranks of Wild Species in Canada website (please note that the 2010 Wild Species of Canada Report is only available by e-mailing the following address: ec.especessauvages-wildspecies.ec@canada.ca; the next version of Wild Species, due to be available later in 2016, will utilize the same ranking system as used by the ACCDC).

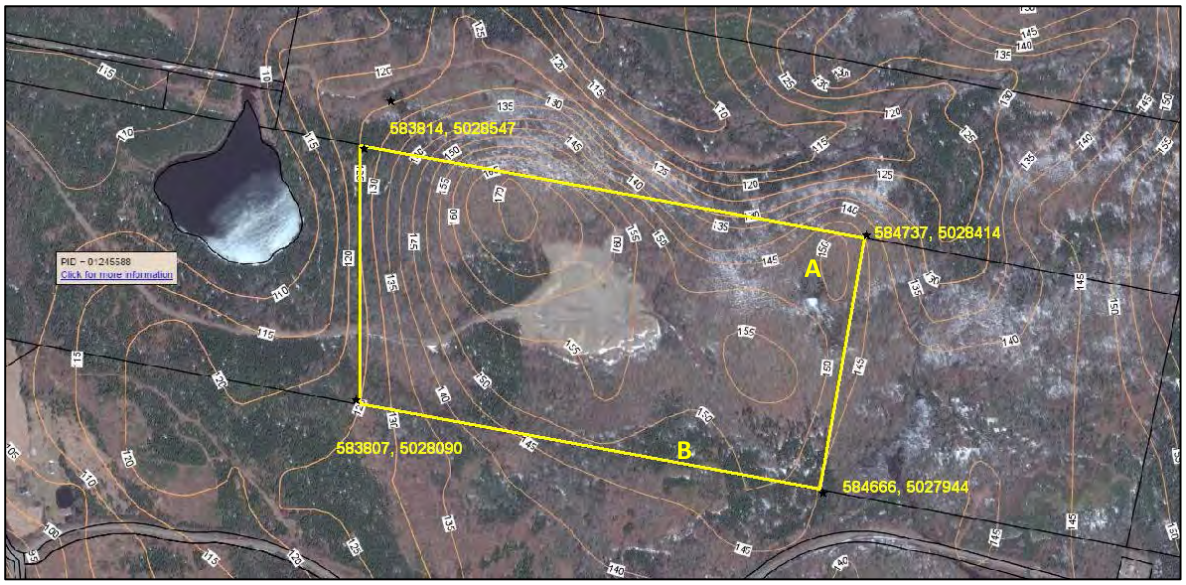


Figure 1. Locations of two wet areas on the Loch Katrine Quarry property. “A” marks a small shallow pond. “B” marks a small wet area along the southern boundary line.

Results

Vascular plant species not previously documented in moderately rich mature deciduous woodland (Fig. 2) in the northeast quadrant of the property are listed in TABLE 1. See the habitat description for this habitat in the fall report (Loch Katrine Quarry Botanical Survey, Ruth E. Newell, November 10, 2015).

A small, shallow, possibly seasonal pond occurs in the northeastern quadrant of the property (45.40304°N, -061.91862°W) (Figs. 1, 3 & 4). Graminoids, i.e., grass-like species, including various grasses, sedges and rushes, are dominant both in the pond and immediately surrounding the pond. Other species occurring in the vicinity of the pond *include Yellow Birch (Betula lutea), Beech (Fagus grandifolia), Red Maple (Acer rubrum), Bunchberry (Cornus* canadensis), Wild Lily-of-the-valley (*Maianthemum canadense*), Cinnamon Fern (*Osmunda cinnamomea*), several wood ferns (*Dryopteris* spp.), Sensitive Fern (*Onoclea sensibilis*) and Starflower (*Trientalis borealis*). Sphagnum mosses (*Sphagnum* ssp.) are abundant around the edges of the pond. Some graminoid species could not be identified due to the lack of flowering and/or fruiting structures. The woodland immediately surrounding this pond has been clearcut leaving only a very thin fringe of trees surrounding the pond (Fig. 3).

Figure. 2. Deciduous woodland in northeastern quadrant of survey area.

A fairly limited in extent wet area located along the southern boundary of the designated quarry expansion area was also surveyed (45.40026°N, -061.9204°W) (Figs. 1, 5 & 6). Common graminoid species included Two-seeded Sedge (*Carex disperma*), Hoary Sedge (*Carex canescens,* Bristly-stalked Sedge (*Carex leptalea*) and Brownish Sedge (*Carex brunnescens*). Other common plant species present include Dewberry (*Rubus pubescens*), Sphagnum mosses (*Sphagnum* spp.), Cinnamon Fern (*Osmunda cinnmomea*), Goldthread (*Coptis trifolia*), Marsh Blue Violet (Viola *cucullata*), etc. Some grass and sedge species present in this wet area could not be identified due to the lack of flowers and/or fruit.

Additional vascular plants species were also documented from several clearcut areas. These are listed in TABLE 1 of the APPENDIX.

Figure 3. Small, shallow pond located in the northeast quadrant of the survey area (green vegetated area in the distance, surrounded by a clearcut).

Figure 4. Small pond occurring in the northeast corner of the property. A variety of grass, rush and sedge species and Cinnamon Fern (*Osmunda cinnamomea*) occur within and in the immediate vicinity of the pond.

Figure 5. Open, wet habitat along the southern boundary of the survey area.

Figure 6. A treed section of the wet area occurring along the southern property boundary.

Discussion

As with the fall survey, no species listed under either federal species-at-risk legislation (SARA) or provincial species-at-risk- legislation (Nova Scotia Endangered Species Act) were observed during the spring survey on the quarry property.

All new species recorded during the spring survey have a Nova Scotia general status rank of GREEN meaning they are considered secure within the province of Nova Scotia. Atlantic Canada Conservation Data Centre status ranks ranged from S4 to S5 also indicating that they are not species of conservation concern (S4 = **Apparently Secure** - Uncommon but not rare; some cause for long-term concern due to declines or other factors; S5 = **Secure** - Common, widespread, and abundant in the province).

APPENDIX

TABLE 1. Vascular plant species that were not previously observed at Loch Katrine Quarry during the initial survey on Oct. 16, 2015.

Latin Name / Common Name	**Habitats**				**Status Ranks**	
	Clearcuts	**Deciduous Woodland**	**Small Pond (northeast quadrant of survey area)**	**Small Wet Area (along southern boundary line)**	**Nova Scotia General Status Rank***	**ACCDC** Subnational Status Rank**
Alnus incana ssp. *rugosa* / Speckled Alder				x	GREEN	S5
Carex arctata / Drooping Woodland Sedge	x	x	x		GREEN	S5
Carex brunnescens / Brownish Sedge				x	GREEN	S5
Carex canescens / Hoary Sedge				x	GREEN	S5
Carex communis / Fibrous-rooted Sedge	x	x			GREEN	S5

Latin Name / Common Name	Habitats				Status Ranks	
	Clearcuts	**Deciduous Woodland**	**Small Pond (northeast quadrant of survey area)**	**Small Wet Area (along southern boundary line)**	**Nova Scotia General Status Rank***	**ACCDC** Subnational Status Rank**
Carex disperma / Two-seeded Sedge		x		x	GREEN	S5
Carex intumescens / Bladder Sedge			x		GREEN	S5
Carex leptalea / Bristly-stalked Sedge				x	GREEN	S5
Carex leptonervia / Finely-nerved Sedge		x			GREEN	S5
Claytonia caroliniana / Carolina Spring Beauty		x			GREEN	S4
Corallorhiza trifida / Early Coralroot				x	GREEN	S4
Dryopteris carthusiana / Spinulose Wood Fern			x	x	GREEN	S5
Eutrochium maculatum / Spotted Joe Pye Weed				x	GREEN	S5
Juncus effusus / Soft Rush			x		GREEN	S5
Lycopodium clavatum / Running Clubmoss				x	GREEN	S5
Panax trifolius / Dwarf Ginseng		x			GREEN	S4
*Platanthera sp. (*non-flowering) / a Bog Orchid				x	-	-

Latin Name / Common Name	**Habitats**				**Status Ranks**	
	Clearcuts	**Deciduous Woodland**	**Small Pond (northeast quadrant of survey area)**	**Small Wet Area (along southern boundary line)**	**Nova Scotia General Status Rank***	**ACCDC** Subnational Status Rank**
Poa alsodes / Grove Bluegrass		x			GREEN	S4
Poa saltuensis / Open Woodland Bluegrass		x			GREEN	S5
Polygonatum pubescens / Hairy Solomon's-seal		x			GREEN	S4S5
Nabalus sp. / a rattlesnake-root (not a species at risk)				x	GREEN	S5
Sambucus racemosa ssp. pubens / Red Elderberry	x				GREEN	S5
Maianthemum racemosum / False Solomon's-seal		x			GREEN	S5
Stellaria borealis / Boreal Stitchwort				x	GREEN	S4
Streptopus lanceolatus / Rose Twisted-stalk		x			GREEN	S5
Thelypteris palustris / Marsh Fern				x	GREEN	S5
Thelypteris simulata / Massachusetts Fern				x	GREEN	S4

Latin Name / Common Name	Habitats				Status Ranks	
	Clearcuts	Deciduous Woodland	Small Pond (northeast quadrant of survey area)	Small Wet Area (along southern boundary line)	Nova Scotia General Status Rank*	ACCDC** Subnational Status Rank
Trillium cernuum / Nodding Trillium		x			GREEN	S4
Trillium undulatum / Painted Trillium		x			GREEN	S5
Typha latifolia / Broad-leaved Cattail				x	GREEN	S5
Viola cucullata / Marsh Blue Violet				x	GREEN	S5

*The Nova Scotia general status ranks are based on the ranks used in the 2010 Wild Species of Canada Report (available at ec.especessauvages-wildspecies.ec@canada.ca); the next version of Wild Species, due out later in 2016, will use the same ranking system as used by the ACCDC); a general status rank of GREEN indicates that a species is considered secure within a province.

ACCDC: Atlantic Canada Conservation Data Centre (http://www.accdc.com/); explanation of status ranks found in table: S4 = **Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors; S5 = **Secure** - Common, widespread, and abundant in the province

APPENDIX C
ATLANTIC CANADA CONSERVATION DATA CENTRE REPORT

Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada Atlantique

DATA REPORT 5446: Loch Katrine, NS

Prepared 25 September 2015
by J. Churchill, Data Manager

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

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

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

1.1 DATA LIST

Included datasets:

Filename	Contents
LochKatrineNS_5446ob.xls	All Rare and legally protected *Flora and Fauna* within 5 km of your study area
LochKatrineNS_5446ob100km.xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
LochKatrineNS_5446ma.xls	All *Managed Areas* in your study area

1.2 RESTRICTIONS

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

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

1.3 ADDITIONAL INFORMATION

The attached file DataDictionary 2.1.pdf provides metadata for the data provided.

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

Plants, Lichens, Ranking Methods, All other Inquiries
Sean Blaney, Senior Scientist, Executive Director
Tel: (506) 364-2658
sblaney@mta.ca

Animals (Fauna)
John Klymko, Zoologist
Tel: (506) 364-2660
jklymko@mta.ca

Plant Communities
Sarah Robinson , Community Ecologist
Tel: (506) 364-2664
srobinson@mta.ca

Data Management, GIS
James Churchill, Data Manager
Tel: (902) 679-6146
jlchurchill@mta.ca

Billing
Jean Breau
Tel: (506) 364-2657
jrbreau@mta.ca

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

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Stewart Lusk, Natural Resources: (506) 453-7110.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Sherman Boates, NSDNR: (902) 679-6146. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NSDNR Regional Biologist:

Western: Duncan Bayne
(902) 648-3536
baynedz@gov.ns.ca

Western: Donald Sam
(902) 634-7525
samdx@gov.ns.ca

Central: Shavonne Meyer
(902) 893-6353
meyersj@gov.ns.ca

Central: Kimberly George
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georgeka@gov.ns.ca

Eastern: Mark Pulsifer
(902) 863-7523
pulsifmd@gov.ns.ca

Eastern: Donald Anderson
(902) 295-3949
andersdg@gov.ns.ca

Eastern: Terry Power
(902) 563-3370
powertd@gov.ns.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Rosemary Curley, PEI Dept. of Agriculture and Forestry: (902) 368-4807.

2.0 RARE AND ENDANGERED SPECIES

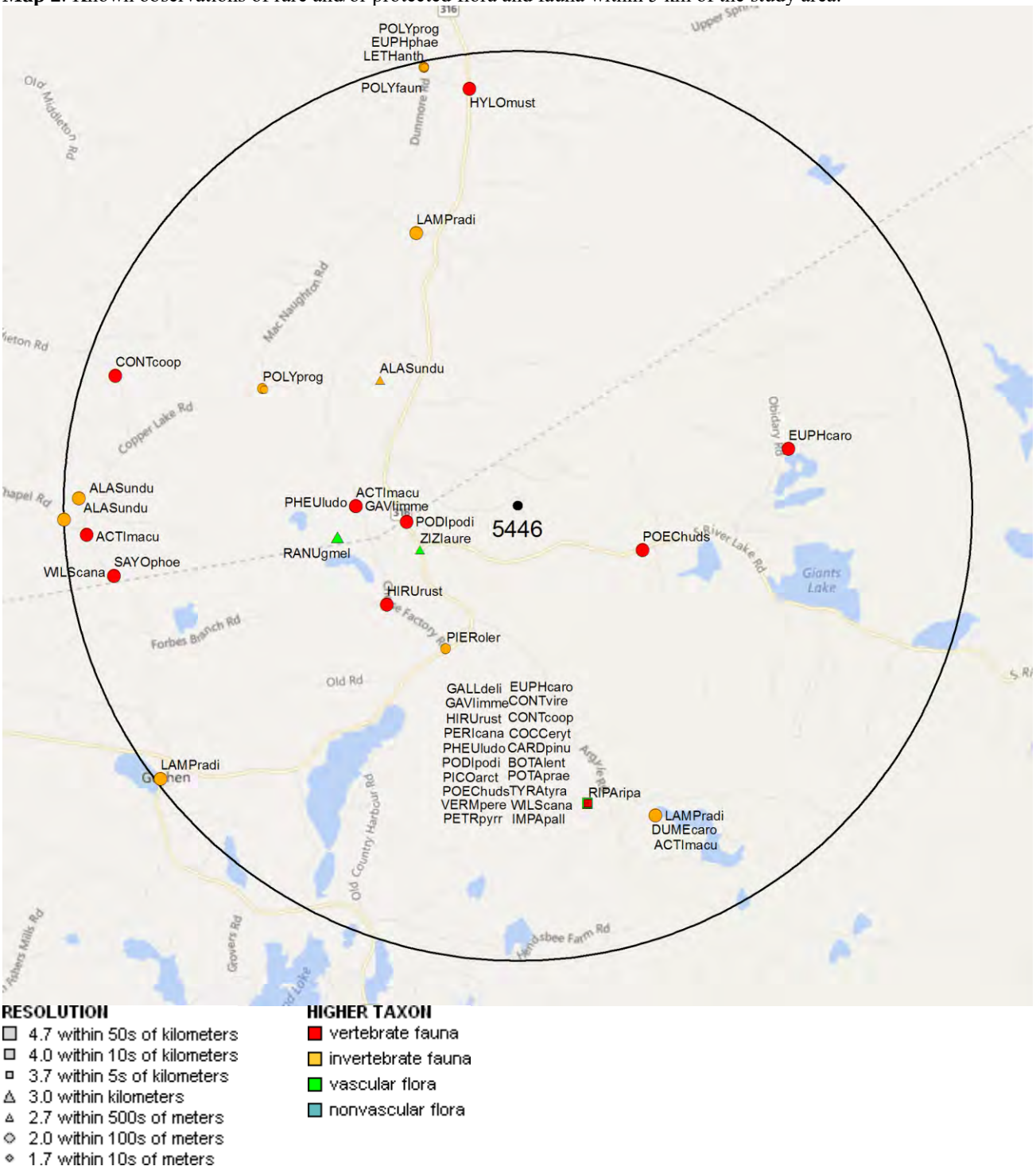
2.1 FLORA

A 5 km buffer around the study area contains 4 records of 4 vascular, no records of nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

A 5 km buffer around the study area contains 54 records of 23 vertebrate, 14 records of 7 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within 5 km of the study area.

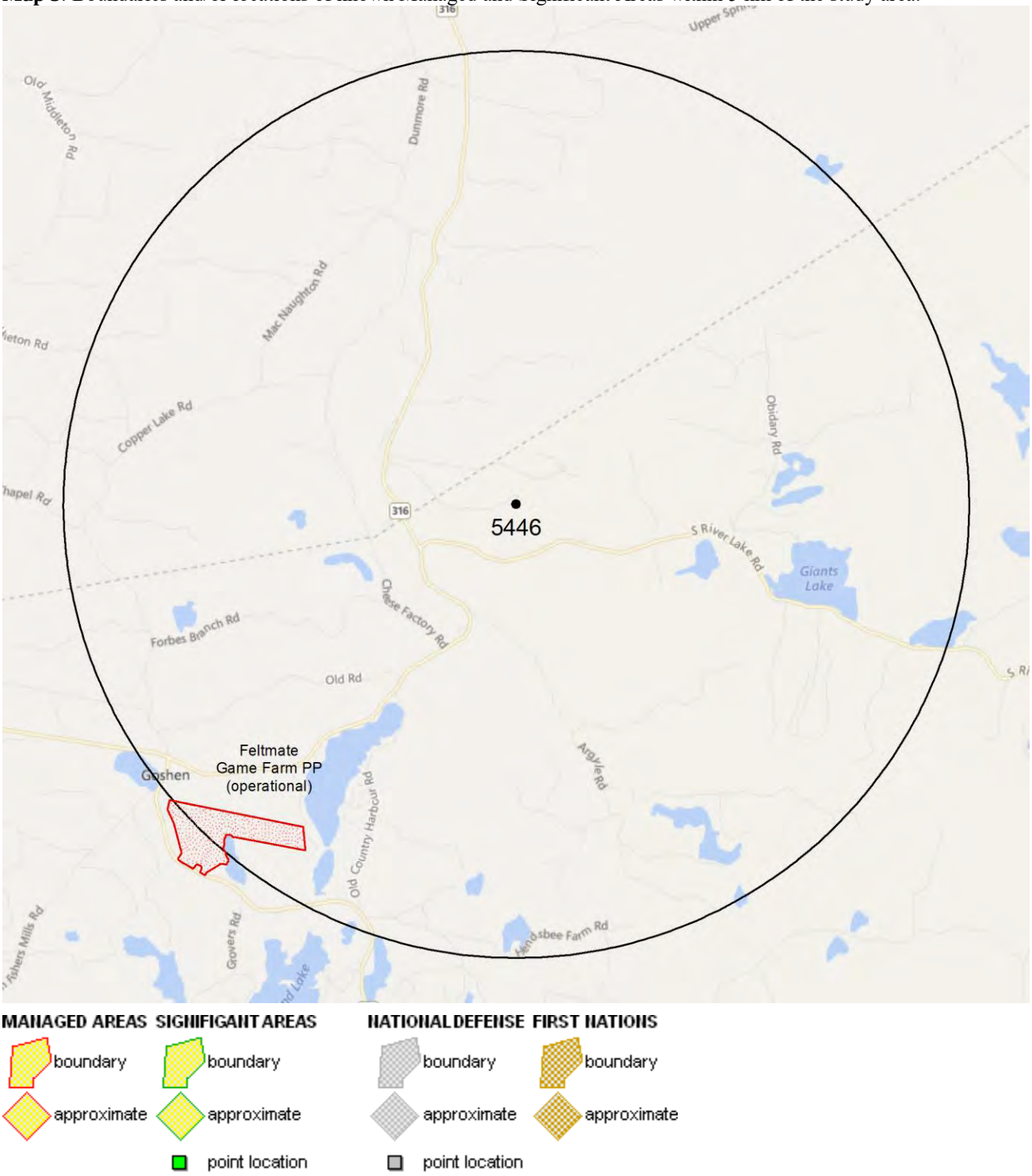


3.0 SPECIAL AREAS

3.1 MANAGED AREAS
The GIS scan identified 1 managed area in the vicinity of the study area (Map 3 and attached file: *ma*.xls)

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

Map 3: Boundaries and/or locations of known Managed and Significant Areas within 5 km of the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding "location-sensitive" species, section 4.3) within the 5 km-buffered area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community.

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Zizia aurea*	Golden Alexanders				S1	2 May Be At Risk	1	1.2 ± 0.0
P	*Impatiens pallida*	Pale Jewelweed				S2	3 Sensitive	1	3.4 ± 7.0
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	1	2.0 ± 2.0
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3?	3 Sensitive	1	3.4 ± 10.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Hylocichla mustelina*	Wood Thrush	Threatened			S1B	5 Undetermined	1	4.6 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Threatened		Endangered	S3B	1 At Risk	6	1.8 ± 0.0
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Endangered	S3B	1 At Risk	2	3.4 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3B	1 At Risk	2	3.4 ± 7.0
A	*Riparia riparia*	Bank Swallow	Threatened			S3B	2 May Be At Risk	1	3.4 ± 7.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2S3B	2 May Be At Risk	2	3.0 ± 0.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern		Vulnerable	S3S4B	3 Sensitive	1	3.4 ± 7.0
A	*Gavia immer*	Common Loon	Not At Risk			S3B,S4N	2 May Be At Risk	5	1.8 ± 0.0
A	*Poecile hudsonica*	Boreal Chickadee				S3	3 Sensitive	4	1.5 ± 0.0
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3?B	2 May Be At Risk	2	3.4 ± 7.0
A	*Podilymbus podiceps*	Pied-billed Grebe				S3B	3 Sensitive	3	1.2 ± 0.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S3B	2 May Be At Risk	1	3.4 ± 7.0
A	*Dumetella carolinensis*	Gray Catbird				S3B	2 May Be At Risk	1	3.4 ± 7.0
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	3 Sensitive	1	3.4 ± 7.0
A	*Perisoreus canadensis*	Gray Jay				S3S4	3 Sensitive	1	3.4 ± 7.0
A	*Botaurus lentiginosus*	American Bittern				S3S4B	3 Sensitive	5	3.4 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	3 Sensitive	4	1.8 ± 0.0
A	*Gallinago delicata*	Wilson's Snipe				S3S4B	3 Sensitive	3	3.4 ± 7.0
A	*Sayornis phoebe*	Eastern Phoebe				S3S4B	3 Sensitive	2	4.5 ± 0.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	3 Sensitive	1	3.4 ± 7.0
A	*Vermivora peregrina*	Tennessee Warbler				S3S4B	3 Sensitive	2	3.4 ± 7.0
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3S4B	3 Sensitive	3	1.8 ± 0.0
A	*Carduelis pinus*	Pine Siskin				S3S4B,S5N	3 Sensitive	1	3.4 ± 7.0
I	*Pieris oleracea*	Mustard White				S2	3 Sensitive	1	1.8 ± 0.0
I	*Lampsilis radiata*	Eastern Lampmussel				S2	3 Sensitive	3	3.2 ± 0.0
I	*Alasmidonta undulata*	Triangle Floater				S2S3	4 Secure	3	2.0 ± 0.0
I	*Euphydryas phaeton*	Baltimore Checkerspot				S3	4 Secure	1	4.9 ± 0.0
I	*Polygonia faunus*	Green Comma				S3	4 Secure	1	4.9 ± 0.0
I	*Lethe anthedon*	Northern Pearly-Eye				S3	4 Secure	1	4.9 ± 0.0
I	*Polygonia progne*	Grey Comma				S3S4	4 Secure	4	3.1 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting a 5 km buffer of your study area are indicated below with "YES".

Nova Scotia

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within 5 km of Study Site?
Fraxinus nigra	Black Ash		Threatened	No
Emydoidea blandingii	*Blanding's Turtle - Nova Scotia pop.*	Endangered	Vulnerable	No
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	No
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Vulnerable	No
Bat Hibernaculum		[Endangered][1]	[Endangered][1]	No

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

4.4 SOURCE BIBLIOGRAPHY

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

# recs	CITATION
50	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
7	Klymko, J.J.D. 2012. Maritimes Butterfly Atlas, 2010 and 2011 records. Atlantic Canada Conservation Data Centre, 6318 recs.
4	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
4	Pulsifer, M.D. 2002. NS Freshwater Mussel Fieldwork. Nova Scotia Dept Natural Resources, 369 recs.
2	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
1	Klymko, J.J.D. 2014. Maritimes Butterfly Atlas, 2012 submissions. Atlantic Canada Conservation Data Centre, 8552 records.
1	Newell, R. E. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University. 2013.
1	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
1	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J; ONHIC, 487 recs.
1	Staff, DNR 2007. Restricted & Limited Use Land Database (RLUL).
1	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 11731 records of 118 vertebrate and 445 records of 59 invertebrate fauna; 3833 records of 324 vascular, 411 records of 37 nonvascular flora (attached: *ob100km.xls).

Rare and/or endangered taxa within the 100 km-buffered area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	26	22.2 ± 0.0
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered		S1	1 At Risk	24	86.9 ± 1.0
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B	1 At Risk	701	26.7 ± 7.0
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	1 At Risk	61	37.8 ± 0.0
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered		S2	2 May Be At Risk	5	71.5 ± 0.0
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered		Endangered	S2S3M	1 At Risk	13	27.5 ± 0.0
A	*Caprimulgus vociferus*	Whip-Poor-Will	Threatened	Threatened	Threatened	S1?B	1 At Risk	2	28.3 ± 7.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Hylocichla mustelina*	Wood Thrush	Threatened			S1B	5 Undetermined	19	4.6 ± 0.0
A	*Sturnella magna*	Eastern Meadowlark	Threatened			S1B	3 Sensitive	2	49.3 ± 0.0
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Endangered	S1S2B	1 At Risk	1	85.1 ± 7.0
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2	3 Sensitive	131	14.0 ± 0.0
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Endangered	S2S3B	1 At Risk	94	11.3 ± 7.0
A	*Hirundo rustica*	Barn Swallow	Threatened		Endangered	S3B	1 At Risk	547	1.8 ± 0.0
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Endangered	S3B	1 At Risk	495	3.4 ± 7.0
A	*Chordeiles minor*	Common Nighthawk	Threatened	Threatened	Threatened	S3B	1 At Risk	214	9.8 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3B	1 At Risk	682	3.4 ± 7.0
A	*Riparia riparia*	Bank Swallow	Threatened			S3B	2 May Be At Risk	227	3.4 ± 7.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened		Vulnerable	S3S4B	3 Sensitive	287	6.8 ± 7.0
A	*Morone saxatilis pop. 1*	Striped Bass- Southern Gulf of St Lawrence pop.	Special Concern			S1	2 May Be At Risk	1	25.7 ± 1.0
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Vulnerable	S1B	3 Sensitive	2	46.7 ± 0.0
A	*Passerculus sandwichensis princeps*	Savannah Sparrow princeps ssp	Special Concern	Special Concern		S1B	3 Sensitive	2	35.0 ± 7.0
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern		S1N	1 At Risk	2	64.2 ± 0.0
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern		S1S2	2 May Be At Risk	4	31.2 ± 7.0
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S2N	1 At Risk	33	51.7 ± 10.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Endangered	S2S3B	2 May Be At Risk	177	3.0 ± 0.0
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Vulnerable	S3	3 Sensitive	16	8.4 ± 0.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern		Vulnerable	S3S4B	3 Sensitive	311	3.4 ± 7.0
A	*Tryngites subruficollis*	Buff-breasted Sandpiper	Special Concern			SNA	8 Accidental	1	98.4 ± 0.0
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S1	1 At Risk	6	67.5 ± 1.0
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S1	3 Sensitive	3	96.7 ± 0.0
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1?B,SNAN	5 Undetermined	2	69.4 ± 0.0
A	*Fulica americana*	American Coot	Not At Risk			S1B	5 Undetermined	2	84.7 ± 7.0
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1B	5 Undetermined	7	12.2 ± 0.0
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		1	95.6 ± 100.0
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S3	4 Secure	13	34.7 ± 0.0
A	*Buteo jamaicensis*	Red-tailed Hawk	Not At Risk			S3B	4 Secure	3	82.9 ± 7.0
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	3 Sensitive	351	26.7 ± 7.0
A	*Sialia sialis*	Eastern Bluebird	Not At Risk			S3B	3 Sensitive	18	11.4 ± 7.0
A	*Gavia immer*	Common Loon	Not At Risk			S3B,S4N	2 May Be At Risk	533	1.8 ± 0.0
A	*Accipiter gentilis*	Northern Goshawk	Not At Risk			S3S4	4 Secure	55	19.9 ± 7.0
A	*Puma concolor pop. 1*	Cougar - Eastern pop.	Data Deficient			SH	5 Undetermined	33	13.3 ± 1.0
A	*Martes americana*	American Marten			Endangered	S1	1 At Risk	1	98.1 ± 1.0
A	*Alces americanus*	Moose			Endangered	S1	1 At Risk	29	30.9 ± 1.0
A	*Dryocopus pileatus*	Pileated Woodpecker				S1	3 Sensitive	5	95.7 ± 0.0
A	*Sitta carolinensis*	White-breasted Nuthatch				S1	2 May Be At Risk	1	96.9 ± 7.0
A	*Sorex palustris*	American Water Shrew				S1?	4 Secure	1	92.4 ± 0.0
A	*Toxostoma rufum*	Brown Thrasher				S1?B	5 Undetermined	4	28.8 ± 0.0
A	*Vireo gilvus*	Warbling Vireo				S1?B	5 Undetermined	6	26.7 ± 7.0
A	*Tringa solitaria*	Solitary Sandpiper				S1?B,S4S5M	4 Secure	7	11.3 ± 7.0
A	*Larus delawarensis*	Ring-billed Gull				S1?B,S5N	4 Secure	15	44.4 ± 0.0
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1B	2 May Be At Risk	1	36.7 ± 7.0
A	*Gallinula chloropus*	Common Moorhen				S1B	5 Undetermined	2	93.1 ± 7.0
A	*Haematopus palliatus*	American Oystercatcher				S1B	5 Undetermined	7	70.8 ± 7.0
A	*Progne subis*	Purple Martin				S1B	2 May Be At Risk	3	42.0 ± 0.0
A	*Fratercula arctica*	Atlantic Puffin				S1B,S4S5N	3 Sensitive	2	60.8 ± 7.0
A	*Calidris minutilla*	Least Sandpiper				S1B,S5M	4 Secure	62	25.0 ± 0.0
A	*Picoides dorsalis*	American Three-toed Woodpecker				S1S2	5 Undetermined	6	11.3 ± 7.0
A	*Passerina cyanea*	Indigo Bunting				S1S2B	5 Undetermined	4	19.9 ± 7.0
A	*Eremophila alpestris*	Horned Lark				S1S2B,S4N	4 Secure	1	80.2 ± 7.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Charadrius semipalmatus*	Semipalmated Plover				S1S2B,S5M	4 Secure	123	25.0 ± 0.0
A	*Asio otus*	Long-eared Owl				S2	2 May Be At Risk	24	5.0 ± 0.0
A	*Salmo salar*	Atlantic Salmon				S2	2 May Be At Risk	72	14.7 ± 50.0
A	*Microtus chrotorrhinus*	Rock Vole				S2	4 Secure	10	96.7 ± 0.0
A	*Vireo philadelphicus*	Philadelphia Vireo				S2?B	5 Undetermined	21	28.3 ± 7.0
A	*Anas acuta*	Northern Pintail				S2B	2 May Be At Risk	4	22.2 ± 1.0
A	*Anas strepera*	Gadwall				S2B	2 May Be At Risk	2	25.3 ± 0.0
A	*Rallus limicola*	Virginia Rail				S2B	5 Undetermined	10	19.1 ± 7.0
A	*Empidonax traillii*	Willow Flycatcher				S2B	3 Sensitive	4	25.0 ± 0.0
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2B	2 May Be At Risk	2	71.2 ± 7.0
A	*Piranga olivacea*	Scarlet Tanager				S2B	5 Undetermined	7	20.4 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak				S2B,S4N	3 Sensitive	12	91.2 ± 7.0
A	*Bucephala clangula*	Common Goldeneye				S2B,S5N	4 Secure	114	28.9 ± 4.0
A	*Sorex hoyi*	American Pygmy Shrew				S2S3	4 Secure	1	99.8 ± 5.0
A	*Tringa semipalmata*	Willet				S2S3B	2 May Be At Risk	371	19.7 ± 7.0
A	*Pooecetes gramineus*	Vesper Sparrow				S2S3B	2 May Be At Risk	17	11.3 ± 7.0
A	*Molothrus ater*	Brown-headed Cowbird				S2S3B	4 Secure	46	11.3 ± 7.0
A	*Icterus galbula*	Baltimore Oriole				S2S3B	2 May Be At Risk	30	9.8 ± 7.0
A	*Phalacrocorax carbo*	Great Cormorant				S3	3 Sensitive	126	36.1 ± 0.0
A	*Poecile hudsonica*	Boreal Chickadee				S3	3 Sensitive	554	1.5 ± 0.0
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3?B	2 May Be At Risk	54	3.4 ± 7.0
A	*Dendroica tigrina*	Cape May Warbler				S3?B	3 Sensitive	77	6.8 ± 7.0
A	*Pinicola enucleator*	Pine Grosbeak				S3?B,S5N	2 May Be At Risk	81	11.3 ± 7.0
A	*Podilymbus podiceps*	Pied-billed Grebe				S3B	3 Sensitive	45	1.2 ± 0.0
A	*Anas discors*	Blue-winged Teal				S3B	2 May Be At Risk	89	11.3 ± 7.0
A	*Sterna paradisaea*	Arctic Tern				S3B	2 May Be At Risk	81	25.1 ± 7.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S3B	2 May Be At Risk	117	3.4 ± 7.0
A	*Dumetella carolinensis*	Gray Catbird				S3B	2 May Be At Risk	192	3.4 ± 7.0
A	*Mimus polyglottos*	Northern Mockingbird				S3B	4 Secure	17	28.3 ± 7.0
A	*Seiurus noveboracensis*	Northern Waterthrush				S3B	4 Secure	6	89.2 ± 7.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S3B,S5M	3 Sensitive	194	13.3 ± 7.0
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5N	4 Secure	111	22.1 ± 0.0
A	*Larus argentatus*	Herring Gull				S3B,S5N	4 Secure	21	77.4 ± 7.0
A	*Branta bernicla*	Brant				S3M	3 Sensitive	1	52.8 ± 16.0
A	*Pluvialis dominica*	American Golden-Plover				S3M	3 Sensitive	11	27.5 ± 0.0
A	*Numenius phaeopus hudsonicus*	Hudsonian Whimbrel				S3M	3 Sensitive	26	27.5 ± 0.0
A	*Limosa haemastica*	Hudsonian Godwit				S3M	3 Sensitive	4	27.5 ± 0.0
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	3 Sensitive	102	25.0 ± 0.0
A	*Calidris maritima*	Purple Sandpiper				S3N	3 Sensitive	29	38.8 ± 9.0
A	*Cepphus grylle*	Black Guillemot				S3S4	4 Secure	76	25.3 ± 0.0
A	*Picoides arcticus*	Black-backed Woodpecker				S3S4	3 Sensitive	92	3.4 ± 7.0
A	*Perisoreus canadensis*	Gray Jay				S3S4	3 Sensitive	318	3.4 ± 7.0
A	*Cardinalis cardinalis*	Northern Cardinal				S3S4	4 Secure	9	41.5 ± 7.0
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	4 Secure	4	96.7 ± 0.0
A	*Botaurus lentiginosus*	American Bittern				S3S4B	3 Sensitive	164	3.4 ± 7.0
A	*Charadrius vociferus*	Killdeer				S3S4B	3 Sensitive	208	6.8 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B	3 Sensitive	476	1.8 ± 0.0
A	*Gallinago delicata*	Wilson's Snipe				S3S4B	3 Sensitive	315	3.4 ± 7.0
A	*Empidonax flaviventris*	Yellow-bellied Flycatcher				S3S4B	3 Sensitive	542	6.8 ± 7.0
A	*Sayornis phoebe*	Eastern Phoebe				S3S4B	3 Sensitive	93	4.5 ± 0.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	3 Sensitive	116	3.4 ± 7.0
A	*Vermivora peregrina*	Tennessee Warbler				S3S4B	3 Sensitive	196	3.4 ± 7.0
A	*Dendroica castanea*	Bay-breasted Warbler				S3S4B	3 Sensitive	329	6.8 ± 7.0
A	*Dendroica striata*	Blackpoll Warbler				S3S4B	3 Sensitive	94	31.2 ± 7.0
A	*Wilsonia pusilla*	Wilson's Warbler				S3S4B	3 Sensitive	63	12.7 ± 7.0
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3S4B	3 Sensitive	220	1.8 ± 0.0
A	*Passerella iliaca*	Fox Sparrow				S3S4B	4 Secure	87	9.8 ± 7.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Carduelis pinus*	Pine Siskin				S3S4B,S5N	3 Sensitive	243	3.4 ± 7.0
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	14	51.2 ± 0.0
I	*Alasmidonta varicosa*	Brook Floater	Special Concern		Threatened	S1S2	3 Sensitive	8	8.4 ± 0.0
I	*Danaus plexippus*	Monarch	Special Concern	Special Concern		S2B	3 Sensitive	26	6.1 ± 0.0
I	*Lycaena dorcas*	Dorcas Copper				S1	6 Not Assessed	11	93.8 ± 0.0
I	*Satyrium acadica*	Acadian Hairstreak				S1	5 Undetermined	6	69.3 ± 1.0
I	*Polygonia gracilis*	Hoary Comma				S1	3 Sensitive	1	60.8 ± 1.0
I	*Oeneis jutta*	Jutta Arctic				S1	2 May Be At Risk	9	12.8 ± 0.0
I	*Ophiogomphus aspersus*	Brook Snaketail				S1	2 May Be At Risk	5	62.9 ± 0.0
I	*Ophiogomphus mainensis*	Maine Snaketail				S1	2 May Be At Risk	2	25.5 ± 0.0
I	*Aeshna subarctica*	Subarctic Darner				S1	2 May Be At Risk	1	84.8 ± 1.0
I	*Dorocordulia lepida*	Petite Emerald				S1	2 May Be At Risk	3	84.8 ± 1.0
I	*Neurocordulia michaeli*	Broadtailed Shadowdragon				S1		26	20.2 ± 0.0
I	*Enallagma aspersum*	Azure Bluet				S1	2 May Be At Risk	5	81.3 ± 0.0
I	*Chromagrion conditum*	Aurora Damsel				S1	2 May Be At Risk	1	90.0 ± 1.0
I	*Callophrys lanoraieensis*	Bog Elfin				S1S2	2 May Be At Risk	1	80.4 ± 0.0
I	*Nymphalis l-album*	Compton Tortoiseshell				S1S2	4 Secure	1	93.7 ± 1.0
I	*Thorybes pylades*	Northern Cloudywing				S2	3 Sensitive	13	5.1 ± 0.0
I	*Amblyscirtes hegon*	Pepper and Salt Skipper				S2	4 Secure	3	31.1 ± 0.0
I	*Amblyscirtes vialis*	Common Roadside-Skipper				S2	4 Secure	4	57.0 ± 2.0
I	*Pieris oleracea*	Mustard White				S2	3 Sensitive	36	1.8 ± 0.0
I	*Lycaena dospassosi*	Salt Marsh Copper				S2	1 At Risk	2	74.4 ± 0.0
I	*Callophrys henrici*	Henry's Elfin				S2	4 Secure	1	12.8 ± 0.0
I	*Strymon melinus*	Grey Hairstreak				S2	4 Secure	1	79.3 ± 0.0
I	*Gomphus descriptus*	Harpoon Clubtail				S2	3 Sensitive	16	62.9 ± 0.0
I	*Gomphus spicatus*	Dusky Clubtail				S2	2 May Be At Risk	1	98.9 ± 0.0
I	*Leucorrhinia glacialis*	Crimson-Ringed Whiteface				S2	3 Sensitive	6	81.3 ± 0.0
I	*Lestes eurinus*	Amber-Winged Spreadwing				S2	2 May Be At Risk	3	84.8 ± 1.0
I	*Lampsilis radiata*	Eastern Lampmussel				S2	3 Sensitive	23	3.2 ± 0.0
I	*Pantala hymenaea*	Spot-Winged Glider				S2B	3 Sensitive	1	26.8 ± 1.0
I	*Erynnis juvenalis*	Juvenal's Duskywing				S2S3	4 Secure	1	21.9 ± 1.0
I	*Alasmidonta undulata*	Triangle Floater				S2S3	4 Secure	10	2.0 ± 0.0
I	*Hesperia comma*	Common Branded Skipper				S3	4 Secure	18	7.5 ± 0.0
I	*Euphyes vestris*	Dun Skipper				S3	3 Sensitive	2	86.9 ± 0.0
I	*Lycaena hyllus*	Bronze Copper				S3	3 Sensitive	1	88.7 ± 0.0
I	*Satyrium liparops*	Striped Hairstreak				S3	5 Undetermined	1	99.9 ± 0.0
I	*Euphydryas phaeton*	Baltimore Checkerspot				S3	4 Secure	13	4.9 ± 0.0
I	*Polygonia faunus*	Green Comma				S3	4 Secure	8	4.9 ± 0.0
I	*Lethe anthedon*	Northern Pearly-Eye				S3	4 Secure	17	4.9 ± 0.0
I	*Lanthus parvulus*	Northern Pygmy Clubtail				S3	4 Secure	28	15.8 ± 0.0
I	*Ophiogomphus carolus*	Riffle Snaketail				S3	4 Secure	33	28.4 ± 1.0
I	*Aeshna clepsydra*	Mottled Darner				S3	4 Secure	3	48.2 ± 1.0
I	*Aeshna constricta*	Lance-Tipped Darner				S3	4 Secure	1	68.9 ± 1.0
I	*Aeshna eremita*	Lake Darner				S3	4 Secure	7	81.3 ± 0.0
I	*Boyeria grafiana*	Ocellated Darner				S3	3 Sensitive	4	48.2 ± 1.0
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	3 Sensitive	3	52.9 ± 0.0
I	*Dorocordulia libera*	Racket-Tailed Emerald				S3	3 Sensitive	4	81.3 ± 0.0
I	*Somatochlora elongata*	Ski-Tailed Emerald				S3	4 Secure	1	90.0 ± 1.0
I	*Somatochlora walshii*	Brush-Tipped Emerald				S3	4 Secure	1	84.8 ± 1.0
I	*Nannothemis bella*	Elfin Skimmer				S3	4 Secure	3	52.9 ± 0.0
I	*Sympetrum danae*	Black Meadowhawk				S3	3 Sensitive	8	11.0 ± 1.0
I	*Sympetrum semicinctum*	Band-Winged Meadowhawk				S3	3 Sensitive	1	98.9 ± 0.0
I	*Nehalennia gracilis*	Sphagnum Sprite				S3	3 Sensitive	8	84.8 ± 1.0
I	*Amphiagrion saucium*	Eastern Red Damsel				S3	4 Secure	5	80.4 ± 0.0
I	*Polygonia interrogationis*	Question Mark				S3B	4 Secure	25	5.7 ± 0.0
I	*Vanessa virginiensis*	American Lady				S3B	8 Accidental	3	86.0 ± 0.0
I	*Feniseca tarquinius*	Harvester				S3S4	4 Secure	1	73.2 ± 1.0

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I	*Callophrys polios*	Hoary Elfin				S3S4	4 Secure	1	29.1 ± 1.0
I	*Speyeria cybele cybele*	Great Spangled Fritillary				S3S4	4 Secure	1	30.5 ± 0.0
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3S4	4 Secure	3	13.3 ± 100.0
I	*Polygonia progne*	Grey Comma				S3S4	4 Secure	14	3.1 ± 0.0
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered		Endangered	S1S2	2 May Be At Risk	1	87.4 ± 0.0
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	S1S2	1 At Risk	308	14.9 ± 0.0
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened			S1S2	2 May Be At Risk	1	41.1 ± 1.0
N	*Sclerophora peronella (Nova Scotia pop.)*	Frosted Glass-whiskers Lichen - Nova Scotia pop.	Special Concern	Special Concern		S1?		7	54.2 ± 0.0
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Vulnerable	S2	4 Secure	32	27.3 ± 0.0
N	*Ditrichum rhynchostegium*	a Moss				S1	2 May Be At Risk	1	99.0 ± 0.0
N	*Pohlia filum*	a Moss				S1?	5 Undetermined	1	99.0 ± 0.0
N	*Fuscopannaria leucosticta*	Rimmed Shingles Lichen				S1S2	2 May Be At Risk	4	57.8 ± 0.0
N	*Leptogium subtile*	Appressed Jellyskin Lichen				S1S3	3 Sensitive	1	56.0 ± 0.0
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S2?	3 Sensitive	1	25.2 ± 3.0
N	*Conardia compacta*	Coast Creeping Moss				S2?	3 Sensitive	1	87.7 ± 2.0
N	*Platydictya jungermannioides*	False Willow Moss				S2?	3 Sensitive	1	75.0 ± 0.0
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2?	3 Sensitive	7	93.9 ± 5.0
N	*Zygodon conoideus*	a Moss				S2?	3 Sensitive	1	71.5 ± 5.0
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				S2?	3 Sensitive	1	60.5 ± 0.0
N	*Calliergon giganteum*	Giant Spear Moss				S2S3	3 Sensitive	1	99.2 ± 0.0
N	*Ephemerum serratum*	a Moss				S2S3	3 Sensitive	1	85.9 ± 3.0
N	*Leucodon andrewsianus*	a Moss				S2S3	3 Sensitive	2	60.5 ± 0.0
N	*Pleuridium subulatum*	a Moss				S2S3	3 Sensitive	1	87.3 ± 10.0
N	*Sphagnum teres*	Rigid Peat Moss				S2S3	3 Sensitive	1	93.9 ± 5.0
N	*Sphagnum wulfianum*	Wulf's Peat Moss				S2S3	3 Sensitive	3	88.2 ± 0.0
N	*Limprichtia revolvens*	a Moss				S2S3	3 Sensitive	1	96.3 ± 0.0
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S2S3	3 Sensitive	1	96.8 ± 0.0
N	*Leptogium teretiusculum*	Beaded Jellyskin Lichen				S2S3	3 Sensitive	1	56.0 ± 0.0
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S2S3	3 Sensitive	8	40.5 ± 0.0
N	*Physconia detersa*	Bottlebrush Frost Lichen				S2S3	3 Sensitive	1	90.5 ± 0.0
N	*Usnea mutabilis*	Bloody Beard Lichen				S2S3	3 Sensitive	1	75.8 ± 0.0
N	*Peltigera collina*	Tree Pelt Lichen				S2S3	3 Sensitive	3	33.5 ± 0.0
N	*Cladina stygia*	Black-footed Reindeer Lichen				S2S3	3 Sensitive	2	91.3 ± 0.0
N	*Sphagnum capillifolium*	Northern Peatmoss				S2S4	5 Undetermined	1	83.4 ± 0.0
N	*Sphagnum compactum*	Compact Peat Moss				S2S4	5 Undetermined	1	83.4 ± 0.0
N	*Sphagnum russowii*	Russow's Peat Moss				S2S4	5 Undetermined	3	83.4 ± 0.0
N	*Trematodon ambiguus*	a Moss				S2S4	5 Undetermined	1	99.0 ± 0.0
N	*Anzia colpodes*	Black-foam Lichen				S3?	3 Sensitive	2	90.5 ± 0.0
N	*Sticta fuliginosa*	Peppered Moon Lichen				S3?	3 Sensitive	6	57.6 ± 0.0
N	*Nephroma bellum*	Naked Kidney Lichen				S3?	3 Sensitive	1	76.5 ± 0.0
N	*Collema furfuraceum*	Blistered Tarpaper Lichen				S3?	3 Sensitive	1	61.1 ± 0.0
P	*Bartonia paniculata ssp. paniculata*	Branched Bartonia	Threatened	Threatened		SNA		1	73.0 ± 10.0
P	*Juncus caesariensis*	New Jersey Rush	Special Concern	Special Concern	Vulnerable	S2	3 Sensitive	43	96.0 ± 0.0
P	*Floerkea proserpinacoides*	False Mermaidweed	Not At Risk			S2	3 Sensitive	17	17.1 ± 1.0
P	*Salix candida*	Sage Willow			Endangered	S1	2 May Be At Risk	34	95.0 ± 0.0
P	*Thuja occidentalis*	Eastern White Cedar			Vulnerable	S1	At Risk	2	28.3 ± 7.0
P	*Angelica lucida*	Seaside Angelica				S1	2 May Be At Risk	1	88.6 ± 0.0
P	*Sanicula odorata*	Clustered Sanicle				S1	2 May Be At Risk	5	66.6 ± 0.0
P	*Zizia aurea*	Golden Alexanders				S1	2 May Be At Risk	41	1.2 ± 0.0
P	*Antennaria parlinii*	a Pussytoes				S1	2 May Be At Risk	1	89.0 ± 0.0
P	*Antennaria howellii ssp. canadensis*	Howell's Pussytoes				S1	2 May Be At Risk	1	100.0 ± 1.0
P	*Arnica lonchophylla*	Northern Arnica				S1	2 May Be At Risk	1	75.7 ± 7.0
P	*Symphyotrichum subulatum (non-Bathurst pop)*	Annual Saltmarsh Aster				S1	2 May Be At Risk	3	84.7 ± 0.0
P	*Bidens hyperborea*	Estuary Beggarticks				S1	2 May Be At Risk	1	27.5 ± 1.0

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P	*Erigeron annuus*	Annual Fleabane				S1	5 Undetermined	1	79.3 ± 5.0
P	*Pseudognaphalium obtusifolium*	Eastern Cudweed				S1	2 May Be At Risk	1	97.9 ± 1.0
P	*Hieracium umbellatum*	Umbellate Hawkweed				S1	3 Sensitive	1	92.6 ± 5.0
P	*Solidago juncea*	Early Goldenrod				S1	2 May Be At Risk	1	98.4 ± 0.0
P	*Ageratina altissima*	White Snakeroot				S1	2 May Be At Risk	2	26.7 ± 7.0
P	*Barbarea orthoceras*	American Yellow Rocket				S1	2 May Be At Risk	7	27.8 ± 0.0
P	*Cardamine pratensis var. angustifolia*	Cuckoo Flower				S1	2 May Be At Risk	2	77.7 ± 0.0
P	*Cochlearia tridactylites*	Limestone Scurvy-grass				S1	2 May Be At Risk	12	54.9 ± 0.0
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2 May Be At Risk	1	85.0 ± 2.0
P	*Suaeda maritima ssp. richii*	White Sea-blite				S1	5 Undetermined	4	32.6 ± 1.0
P	*Hudsonia tomentosa*	Woolly Beach-heath				S1	2 May Be At Risk	6	28.6 ± 1.0
P	*Hypericum mutilum*	Dwarf St John's-wort				S1	2 May Be At Risk	1	91.9 ± 0.0
P	*Desmodium canadense*	Canada Tick-trefoil				S1	2 May Be At Risk	19	59.6 ± 0.0
P	*Myriophyllum heterophyllum*	Variable-leaved Water Milfoil				S1	5 Undetermined	1	92.2 ± 0.0
P	*Hamamelis virginiana*	American Witch-Hazel				S1	2 May Be At Risk	4	86.5 ± 0.0
P	*Nymphaea odorata*	Fragrant Water-lily				S1	2 May Be At Risk	2	84.3 ± 0.0
P	*Polygonum viviparum*	Alpine Bistort				S1	2 May Be At Risk	1	85.6 ± 1.0
P	*Montia fontana*	Water Blinks				S1	2 May Be At Risk	2	50.1 ± 3.0
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S1	Undetermined	1	33.1 ± 1.0
P	*Pilea pumila*	Dwarf Clearweed				S1	2 May Be At Risk	2	44.0 ± 6.0
P	*Carex alopecoidea*	Foxtail Sedge				S1	2 May Be At Risk	2	28.1 ± 0.0
P	*Carex argyrantha*	Silvery-flowered Sedge				S1	2 May Be At Risk	1	90.7 ± 5.0
P	*Carex comosa*	Bearded Sedge				S1	2 May Be At Risk	1	98.2 ± 0.0
P	*Carex garberi*	Garber's Sedge				S1	2 May Be At Risk	4	88.8 ± 0.0
P	*Carex granularis*	Limestone Meadow Sedge				S1	May Be At Risk	20	96.2 ± 0.0
P	*Carex gynocrates*	Northern Bog Sedge				S1	2 May Be At Risk	4	83.3 ± 0.0
P	*Carex haydenii*	Hayden's Sedge				S1	2 May Be At Risk	1	30.3 ± 5.0
P	*Carex pellita*	Woolly Sedge				S1	2 May Be At Risk	10	59.5 ± 0.0
P	*Carex livida var. radicaulis*	Livid Sedge				S1	2 May Be At Risk	22	87.8 ± 5.0
P	*Carex plantaginea*	Plantain-Leaved Sedge				S1	2 May Be At Risk	1	74.5 ± 0.0
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S1	2 May Be At Risk	3	50.0 ± 1.0
P	*Carex tincta*	Tinged Sedge				S1	2 May Be At Risk	2	28.1 ± 1.0
P	*Carex viridula var. saxilittoralis*	Greenish Sedge				S1	May Be At Risk	4	88.2 ± 0.0
P	*Carex viridula var. elatior*	Greenish Sedge				S1	2 May Be At Risk	16	95.2 ± 0.0
P	*Carex wiegandii*	Wiegand's Sedge				S1	2 May Be At Risk	1	86.9 ± 5.0
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	6	21.9 ± 0.0
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S1	2 May Be At Risk	10	28.3 ± 10.0
P	*Eleocharis erythropoda*	Red-stemmed Spikerush				S1	May Be At Risk	1	89.5 ± 0.0
P	*Rhynchospora capillacea*	Slender Beakrush				S1	2 May Be At Risk	4	90.1 ± 1.0
P	*Eriocaulon aquaticum*	White Buttons				S1	2 May Be At Risk	1	81.5 ± 1.0
P	*Iris prismatica*	Slender Blue Flag				S1	2 May Be At Risk	2	13.8 ± 1.0
P	*Juncus vaseyi*	Vasey Rush				S1	2 May Be At Risk	1	93.1 ± 0.0
P	*Allium tricoccum*	Wild Leek				S1	2 May Be At Risk	8	89.8 ± 0.0
P	*Triantha glutinosa*	Sticky False-Asphodel				S1	2 May Be At Risk	10	95.1 ± 0.0
P	*Malaxis brachypoda*	White Adder's-Mouth				S1	2 May Be At Risk	1	35.0 ± 7.0
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S1	2 May Be At Risk	2	99.2 ± 1.0
P	*Bromus latiglumis*	Broad-Glumed Brome				S1	2 May Be At Risk	39	60.0 ± 0.0
P	*Catabrosa aquatica var. laurentiana*	Water Whorl Grass				S1	2 May Be At Risk	3	98.7 ± 5.0
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1	2 May Be At Risk	37	60.0 ± 0.0
P	*Elymus wiegandii*	Wiegand's Wild Rye				S1	2 May Be At Risk	16	53.0 ± 0.0
P	*Elymus hystrix var. bigeloviana*	Spreading Wild Rye				S1	2 May Be At Risk	1	52.1 ± 1.0
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	2 May Be At Risk	1	45.2 ± 5.0
P	*Potamogeton vaseyi*	Vasey's Pondweed				S1	2 May Be At Risk	1	85.0 ± 0.0
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S1	2 May Be At Risk	5	89.4 ± 1.0
P	*Equisetum palustre*	Marsh Horsetail				S1	2 May Be At Risk	8	80.1 ± 0.0
P	*Solidago hispida*	Hairy Goldenrod				S1?	2 May Be At Risk	1	54.5 ± 7.0
P	*Humulus lupulus var. lupuloides*	Common Hop				S1?	5 Undetermined	1	87.3 ± 5.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Crataegus robinsonii*	Robinson's Hawthorn				S1?	5 Undetermined	2	56.0 ± 50.0
P	*Crataegus submollis*	Quebec Hawthorn				S1?	5 Undetermined	2	32.9 ± 7.0
P	*Rubus flagellaris*	Northern Dewberry				S1?	5 Undetermined	2	72.8 ± 5.0
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S1?	5 Undetermined	1	86.9 ± 5.0
P	*Dichanthelium acuminatum var. lindheimeri*	Woolly Panic Grass				S1?	5 Undetermined	1	56.7 ± 0.0
P	*Fraxinus nigra*	Black Ash			Threatened	S1S2	At Risk	38	11.2 ± 0.0
P	*Rhus typhina*	Staghorn Sumac				S1S2	2 May Be At Risk	1	84.4 ± 5.0
P	*Rudbeckia laciniata*	Cut-Leaved Coneflower				S1S2	May Be At Risk	7	15.3 ± 0.0
P	*Chenopodium rubrum*	Red Pigweed				S1S2	May Be At Risk	6	36.7 ± 7.0
P	*Cornus suecica*	Swedish Bunchberry				S1S2	3 Sensitive	1	75.2 ± 6.0
P	*Viburnum lantanoides*	Hobblebush				S1S2	2 May Be At Risk	3	92.1 ± 0.0
P	*Anemone virginiana var. alba*	Virginia Anemone				S1S2	3 Sensitive	10	84.3 ± 0.0
P	*Hepatica nobilis var. obtusa*	Round-lobed Hepatica				S1S2	May Be At Risk	4	82.9 ± 0.0
P	*Rubus vermontanus*	Vermont Blackberry				S1S2	5 Undetermined	1	86.7 ± 3.0
P	*Parnassia palustris var. parviflora*	Marsh Grass-of-Parnassus				S1S2	May Be At Risk	9	44.1 ± 1.0
P	*Gratiola neglecta*	Clammy Hedge-Hyssop				S1S2	3 Sensitive	2	96.9 ± 0.0
P	*Carex lasiocarpa var. americana*	Slender Sedge				S1S2	2 May Be At Risk	1	92.1 ± 0.0
P	*Carex recta*	Estuary Sedge				S1S2	3 Sensitive	1	99.1 ± 0.0
P	*Juncus greenei*	Greene's Rush				S1S2	2 May Be At Risk	1	28.6 ± 1.0
P	*Juncus alpinoarticulatus ssp. nodulosus*	Richardson's Rush				S1S2	2 May Be At Risk	8	72.5 ± 5.0
P	*Dichanthelium depauperatum*	Starved Panic Grass				S1S2	2 May Be At Risk	3	90.7 ± 0.0
P	*Sparganium hyperboreum*	Northern Burreed				S1S2	3 Sensitive	3	35.7 ± 0.0
P	*Cryptogramma stelleri*	Steller's Rockbrake				S1S2	May Be At Risk	17	85.4 ± 0.0
P	*Lycopodium obscurum*	Flat-branched Tree-clubmoss				S1S2	2 May Be At Risk	15	79.1 ± 0.0
P	*Selaginella selaginoides*	Low Spikemoss				S1S2	May Be At Risk	2	92.5 ± 0.0
P	*Carex vacillans*	Estuarine Sedge				S1S3	5 Undetermined	2	28.1 ± 0.0
P	*Conioselinum chinense*	Chinese Hemlock-parsley				S2	3 Sensitive	1	77.6 ± 5.0
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	May Be At Risk	17	11.2 ± 0.0
P	*Panax trifolius*	Dwarf Ginseng				S2	2 May Be At Risk	1	96.5 ± 5.0
P	*Erigeron philadelphicus*	Philadelphia Fleabane				S2	3 Sensitive	7	28.3 ± 7.0
P	*Eupatorium perfoliatum*	Common Boneset				S2	3 Sensitive	1	91.7 ± 0.0
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S2	2 May Be At Risk	2	91.5 ± 1.0
P	*Hieracium robinsonii*	Robinson's Hawkweed				S2	3 Sensitive	1	90.6 ± 7.0
P	*Senecio pseudoarnica*	Seabeach Ragwort				S2	3 Sensitive	15	45.1 ± 0.0
P	*Symphyotrichum ciliolatum*	Fringed Blue Aster				S2	Sensitive	3	9.8 ± 7.0
P	*Impatiens pallida*	Pale Jewelweed				S2	3 Sensitive	8	3.4 ± 7.0
P	*Caulophyllum thalictroides*	Blue Cohosh				S2	2 May Be At Risk	45	11.1 ± 0.0
P	*Betula borealis*	Northern Birch				S2	3 Sensitive	1	92.0 ± 7.0
P	*Betula michauxii*	Michaux's Dwarf Birch				S2	3 Sensitive	15	32.2 ± 0.0
P	*Arabis drummondii*	Drummond's Rockcress				S2	3 Sensitive	4	94.4 ± 0.0
P	*Cardamine parviflora var. arenicola*	Small-flowered Bittercress				S2	3 Sensitive	3	92.0 ± 0.0
P	*Draba arabisans*	Rock Whitlow-Grass				S2	3 Sensitive	3	89.2 ± 1.0
P	*Lobelia kalmii*	Brook Lobelia				S2	May Be At Risk	40	74.7 ± 0.0
P	*Stellaria humifusa*	Saltmarsh Starwort				S2	3 Sensitive	5	42.7 ± 0.0
P	*Stellaria longifolia*	Long-leaved Starwort				S2	Sensitive	8	61.3 ± 0.0
P	*Crassula aquatica*	Water Pygmyweed				S2	3 Sensitive	2	85.1 ± 7.0
P	*Corema conradii*	Broom Crowberry				S2	3 Sensitive	2	86.9 ± 4.0
P	*Gaylussacia bigeloviana*	Dwarf Huckleberry				S2	4 Secure	3	84.3 ± 1.0
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S2	3 Sensitive	7	12.5 ± 0.0
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S2	3 Sensitive	1	88.5 ± 0.0
P	*Hippuris vulgaris*	Common Mare's-Tail				S2	3 Sensitive	1	85.3 ± 3.0
P	*Utricularia minor*	Lesser Bladderwort				S2	3 Sensitive	1	84.7 ± 5.0
P	*Oenothera fruticosa ssp. glauca*	Narrow-leaved Evening Primrose				S2	5 Undetermined	2	69.7 ± 7.0
P	*Polygonum arifolium*	Halberd-leaved Tearthumb				S2	3 Sensitive	1	89.6 ± 1.0
P	*Rumex salicifolius var. mexicanus*	Triangular-valve Dock				S2	3 Sensitive	4	61.5 ± 6.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Primula mistassinica*	Mistassini Primrose				S2	3 Sensitive	15	80.3 ± 7.0
P	*Actaea pachypoda*	White Baneberry				S2	2 May Be At Risk	1	97.1 ± 0.0
P	*Anemone canadensis*	Canada Anemone				S2	2 May Be At Risk	2	41.8 ± 1.0
P	*Anemone quinquefolia*	Wood Anemone				S2	3 Sensitive	6	20.6 ± 0.0
P	*Anemone virginiana*	Virginia Anemone				S2	3 Sensitive	28	22.7 ± 0.0
P	*Caltha palustris*	Yellow Marsh Marigold				S2	3 Sensitive	2	50.2 ± 0.0
P	*Rubus chamaemorus*	Cloudberry				S2	4 Secure	1	84.7 ± 5.0
P	*Galium labradoricum*	Labrador Bedstraw				S2	3 Sensitive	40	87.7 ± 0.0
P	*Salix pedicellaris*	Bog Willow				S2	3 Sensitive	47	69.7 ± 7.0
P	*Comandra umbellata*	Bastard's Toadflax				S2	2 May Be At Risk	10	27.4 ± 5.0
P	*Saxifraga paniculata ssp. neogaea*	White Mountain Saxifrage				S2	3 Sensitive	1	83.8 ± 7.0
P	*Tiarella cordifolia*	Heart-leaved Foamflower				S2	3 Sensitive	212	59.3 ± 7.0
P	*Limosella australis*	Southern Mudwort				S2	3 Sensitive	5	84.8 ± 0.0
P	*Viola nephrophylla*	Northern Bog Violet				S2	3 Sensitive	8	59.7 ± 0.0
P	*Pinus resinosa*	Red Pine				S2	3 Sensitive	1	87.3 ± 5.0
P	*Carex atratiformis*	Scabrous Black Sedge				S2	3 Sensitive	2	89.6 ± 1.0
P	*Carex bebbii*	Bebb's Sedge				S2	Sensitive	24	16.7 ± 10.0
P	*Carex hystericina*	Porcupine Sedge				S2	2 May Be At Risk	34	28.5 ± 0.0
P	*Carex tenera*	Tender Sedge				S2	Sensitive	5	38.8 ± 1.0
P	*Carex tuckermanii*	Tuckerman's Sedge				S2	Sensitive	1	73.3 ± 0.0
P	*Dulichium arundinaceum*	Three-Way Sedge				S2	3 Sensitive	1	81.5 ± 1.0
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S2	Sensitive	17	75.4 ± 0.0
P	*Eriophorum gracile*	Slender Cottongrass				S2	3 Sensitive	1	38.5 ± 1.0
P	*Trichophorum caespitosum*	Tufted Clubrush				S2	3 Sensitive	1	91.1 ± 0.0
P	*Juncus stygius ssp. americanus*	Moor Rush				S2	Sensitive	22	92.3 ± 1.0
P	*Allium schoenoprasum var. sibiricum*	Wild Chives				S2	2 May Be At Risk	1	72.7 ± 7.0
P	*Lilium canadense*	Canada Lily				S2	May Be At Risk	62	11.0 ± 0.0
P	*Cypripedium parviflorum var. pubescens*	Yellow Lady's-slipper				S2	3 Sensitive	4	46.3 ± 0.0
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	3 Sensitive	1	86.8 ± 0.0
P	*Cypripedium reginae*	Showy Lady's-Slipper				S2	2 May Be At Risk	105	43.2 ± 0.0
P	*Platanthera blephariglottis*	White Fringed Orchid				S2	3 Sensitive	1	88.4 ± 5.0
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S2	3 Sensitive	8	89.5 ± 7.0
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S2	3 Sensitive	7	88.8 ± 5.0
P	*Platanthera aquilonis*	Tall Northern Green Orchid				S2	3 Sensitive	3	91.4 ± 1.0
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	May Be At Risk	44	59.4 ± 1.0
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	Sensitive	4	61.5 ± 7.0
P	*Elymus trachycaulus*	Slender Wild Rye				S2	3 Sensitive	1	91.8 ± 0.0
P	*Muhlenbergia mexicana*	Mexican Muhly				S2	5 Undetermined	3	90.6 ± 0.0
P	*Potamogeton friesii*	Fries' Pondweed				S2	2 May Be At Risk	6	61.8 ± 0.0
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	May Be At Risk	8	18.3 ± 1.0
P	*Asplenium trichomanes-ramosum*	Green Spleenwort				S2	3 Sensitive	19	55.2 ± 0.0
P	*Woodwardia virginica*	Virginia Chain Fern				S2	2 May Be At Risk	2	84.4 ± 0.0
P	*Dryopteris fragrans var. remotiuscula*	Fragrant Wood Fern				S2	3 Sensitive	2	44.1 ± 7.0
P	*Polystichum lonchitis*	Northern Holly Fern				S2	3 Sensitive	5	75.2 ± 5.0
P	*Woodsia glabella*	Smooth Cliff Fern				S2	3 Sensitive	2	89.4 ± 0.0
P	*Botrychium multifidum*	Leathery Moonwort				S2	2 May Be At Risk	1	98.1 ± 5.0
P	*Hieracium canadense*	Canada Hawkweed				S2?	5 Undetermined	1	92.5 ± 3.0
P	*Symphyotrichum boreale*	Boreal Aster				S2?	3 Sensitive	27	79.8 ± 0.0
P	*Betula papyrifera var. cordifolia*	Heart-leaved Birch				S2?	5 Undetermined	1	99.8 ± 6.0
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2?	Undetermined	5	26.7 ± 7.0
P	*Epilobium coloratum*	Purple-veined Willowherb				S2?	3 Sensitive	3	29.7 ± 0.0
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S2?	5 Undetermined	1	47.7 ± 1.0
P	*Eleocharis ovata*	Ovate Spikerush				S2?	3 Sensitive	4	20.7 ± 0.0
P	*Scirpus pedicellatus*	Stalked Bulrush				S2?	Sensitive	7	28.5 ± 0.0
P	*Juncus canadensis*	Canada Rush				S2?	3 Sensitive	2	88.4 ± 5.0
P	*Potamogeton pulcher*	Spotted Pondweed			Vulnerable	S2S3	Sensitive	3	86.2 ± 2.0
P	*Betula pumila*	Bog Birch				S2S3	3 Sensitive	8	96.4 ± 0.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Honckenya peploides ssp. robusta*	Seabeach Sandwort				S2S3	3 Sensitive	1	87.9 ± 5.0
P	*Sagina nodosa*	Knotted Pearlwort				S2S3	4 Secure	7	43.2 ± 1.0
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2S3	4 Secure	4	86.6 ± 0.0
P	*Stellaria borealis*	Boreal Stitchwort				S2S3	2 May Be At Risk	1	89.8 ± 5.0
P	*Ceratophyllum echinatum*	Prickly Hornwort				S2S3	Sensitive	2	90.3 ± 0.0
P	*Hypericum dissimulatum*	Disguised St John's-wort				S2S3	3 Sensitive	1	32.9 ± 1.0
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2S3	Sensitive	124	10.9 ± 0.0
P	*Shepherdia canadensis*	Soapberry				S2S3	Sensitive	9	77.5 ± 0.0
P	*Empetrum eamesii ssp. atropurpureum*	Pink Crowberry				S2S3	3 Sensitive	1	73.1 ± 3.0
P	*Chamaesyce polygonifolia*	Seaside Spurge				S2S3	Sensitive	10	32.0 ± 0.0
P	*Halenia deflexa*	Spurred Gentian				S2S3	3 Sensitive	23	29.1 ± 1.0
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	3 Sensitive	3	44.1 ± 5.0
P	*Polygala sanguinea*	Blood Milkwort				S2S3	3 Sensitive	6	60.3 ± 1.0
P	*Polygonum buxiforme*	Small's Knotweed				S2S3	5 Undetermined	1	60.4 ± 0.0
P	*Polygonum punctatum*	Dotted Smartweed				S2S3	3 Sensitive	1	84.7 ± 0.0
P	*Polygonum raii*	Sharp-fruited Knotweed				S2S3	5 Undetermined	5	34.7 ± 1.0
P	*Plantago rugelii*	Rugel's Plantain				S2S3	Secure	2	66.3 ± 0.0
P	*Potentilla canadensis*	Canada Cinquefoil				S2S3	Sensitive	1	60.8 ± 2.0
P	*Galium aparine*	Common Bedstraw				S2S3	Sensitive	14	22.5 ± 0.0
P	*Salix pellita*	Satiny Willow				S2S3	Sensitive	2	47.4 ± 1.0
P	*Veronica serpyllifolia ssp. humifusa*	Thyme-Leaved Speedwell				S2S3	Sensitive	1	35.7 ± 0.0
P	*Carex adusta*	Lesser Brown Sedge				S2S3	3 Sensitive	1	45.2 ± 5.0
P	*Carex hirtifolia*	Pubescent Sedge				S2S3	Sensitive	29	11.0 ± 0.0
P	*Carex stricta*	Tussock Sedge				S2S3	2 May Be At Risk	3	92.0 ± 0.0
P	*Carex trisperma var. billingsii*	Three-Seed Sedge				S2S3	3 Sensitive	2	91.2 ± 0.0
P	*Carex tonsa*	Deep Green Sedge				S2S3	3 Sensitive	1	91.3 ± 0.0
P	*Eleocharis olivacea*	Yellow Spikerush				S2S3	3 Sensitive	5	14.1 ± 0.0
P	*Eleocharis parvula*	Dwarf Spikerush				S2S3	3 Sensitive	1	84.8 ± 0.0
P	*Elodea canadensis*	Canada Waterweed				S2S3	Secure	1	95.9 ± 0.0
P	*Juncus filiformis*	Thread Rush				S2S3	3 Sensitive	2	81.5 ± 1.0
P	*Juncus trifidus*	Highland Rush				S2S3	Sensitive	1	99.0 ± 0.0
P	*Cypripedium parviflorum*	Yellow Lady's-slipper				S2S3	3 Sensitive	47	22.7 ± 0.0
P	*Malaxis unifolia*	Green Adder's-Mouth				S2S3	3 Sensitive	1	99.8 ± 5.0
P	*Spiranthes romanzoffiana*	Hooded Ladies'-Tresses				S2S3	3 Sensitive	1	97.1 ± 5.0
P	*Poa glauca*	Glaucous Blue Grass				S2S3	3 Sensitive	8	89.2 ± 1.0
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	Sensitive	1	96.2 ± 0.0
P	*Stuckenia filiformis ssp. alpina*	Thread-leaved Pondweed				S2S3	Sensitive	13	61.2 ± 0.0
P	*Potamogeton zosteriformis*	Flat-stemmed Pondweed				S2S3	Sensitive	10	87.4 ± 7.0
P	*Lycopodium hickeyi*	Hickey's Tree-clubmoss				S2S3	2 May Be At Risk	1	97.6 ± 0.0
P	*Lycopodium lagopus*	One-cone clubmoss				S2S3	3 Sensitive	1	96.7 ± 0.0
P	*Lycopodiella inundata*	Northern Bog Clubmoss				S2S3	4 Secure	1	91.6 ± 0.0
P	*Botrychium lanceolatum var. angustisegmentum*	Lance-Leaf Grape-Fern				S2S3	3 Sensitive	7	50.5 ± 0.0
P	*Botrychium simplex*	Least Moonwort				S2S3	3 Sensitive	3	47.5 ± 1.0
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	1	91.6 ± 0.0
P	*Angelica atropurpurea*	Purple-stemmed Angelica				S3	Secure	28	59.4 ± 0.0
P	*Angelica sylvestris*	Woodland Angelica				S3	Secure	1	98.3 ± 1.0
P	*Bidens connata*	Purple-stemmed Beggarticks				S3	3 Sensitive	1	84.7 ± 0.0
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	3 Sensitive	19	22.7 ± 0.0
P	*Hieracium paniculatum*	Panicled Hawkweed				S3	4 Secure	6	86.2 ± 0.0
P	*Megalodonta beckii*	Water Beggarticks				S3	Secure	8	13.3 ± 0.0
P	*Packera paupercula*	Balsam Groundsel				S3	4 Secure	61	22.7 ± 0.0
P	*Xanthium strumarium var. canadense*	Rough Cocklebur				S3	4 Secure	6	83.2 ± 3.0
P	*Eurybia radula*	Low Rough Aster				S3	3 Sensitive	1	91.7 ± 0.0
P	*Campanula aparinoides*	Marsh Bellflower				S3	3 Sensitive	27	16.1 ± 0.0
P	*Viburnum edule*	Squashberry				S3	3 Sensitive	2	83.6 ± 0.0
P	*Vaccinium boreale*	Northern Blueberry				S3	Sensitive	5	47.7 ± 1.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Vaccinium caespitosum*	Dwarf Bilberry				S3	Secure	53	20.2 ± 0.0
P	*Vaccinium vitis-idaea ssp. minus*	Mountain Cranberry				S3	4 Secure	1	86.4 ± 5.0
P	*Bartonia virginica*	Yellow Bartonia				S3	4 Secure	1	86.8 ± 0.0
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	4 Secure	14	60.7 ± 0.0
P	*Proserpinaca palustris var. crebra*	Marsh Mermaidweed				S3	4 Secure	26	60.6 ± 0.0
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S3	Secure	2	67.4 ± 1.0
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	23	22.1 ± 0.0
P	*Decodon verticillatus*	Swamp Loosestrife				S3	Secure	1	82.2 ± 7.0
P	*Epilobium strictum*	Downy Willowherb				S3	3 Sensitive	7	24.3 ± 0.0
P	*Polygonum pensylvanicum*	Pennsylvania Smartweed				S3	4 Secure	16	22.0 ± 0.0
P	*Polygonum scandens*	Climbing False Buckwheat				S3	3 Sensitive	33	12.6 ± 0.0
P	*Samolus valerandi ssp. parviflorus*	Seaside Brookweed				S3	Sensitive	6	22.1 ± 0.0
P	*Moneses uniflora*	One-flowered Wintergreen				S3	4 Secure	3	84.4 ± 3.0
P	*Pyrola asarifolia*	Pink Pyrola				S3	4 Secure	6	75.6 ± 0.0
P	*Pyrola minor*	Lesser Pyrola				S3	Sensitive	3	90.5 ± 2.0
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	42	2.0 ± 2.0
P	*Rhamnus alnifolia*	Alder-leaved Buckthorn				S3	Secure	157	60.2 ± 0.0
P	*Agrimonia gryposepala*	Hooked Agrimony				S3	4 Secure	165	10.8 ± 0.0
P	*Galium kamtschaticum*	Northern Wild Licorice				S3	4 Secure	4	88.1 ± 1.0
P	*Salix petiolaris*	Meadow Willow				S3	4 Secure	20	76.4 ± 0.0
P	*Geocaulon lividum*	Northern Comandra				S3	Secure	4	45.3 ± 2.0
P	*Lindernia dubia*	Yellow-seeded False Pimperel				S3	Secure	11	60.1 ± 0.0
P	*Laportea canadensis*	Canada Wood Nettle				S3	3 Sensitive	23	10.7 ± 3.0
P	*Verbena hastata*	Blue Vervain				S3	Secure	55	10.8 ± 0.0
P	*Viola renifolia*	Kidney-leaved White Violet				S3	4 Secure	1	96.8 ± 3.0
P	*Carex eburnea*	Bristle-leaved Sedge				S3	3 Sensitive	42	25.0 ± 0.0
P	*Carex lupulina*	Hop Sedge				S3	4 Secure	13	19.8 ± 6.0
P	*Carex rosea*	Rosy Sedge				S3	4 Secure	9	10.5 ± 0.0
P	*Schoenoplectus pungens*	Three-square Bulrush				S3	3 Sensitive	2	19.7 ± 5.0
P	*Juncus subcaudatus var. planisepalus*	Woods-Rush				S3	3 Sensitive	5	45.1 ± 5.0
P	*Juncus dudleyi*	Dudley's Rush				S3	Secure	85	20.6 ± 0.0
P	*Calopogon tuberosus*	Tuberous Grass Pink				S3	4 Secure	2	81.5 ± 1.0
P	*Goodyera repens*	Lesser Rattlesnake-plantain				S3	3 Sensitive	10	62.6 ± 0.0
P	*Listera australis*	Southern Twayblade				S3	Secure	37	20.7 ± 0.0
P	*Platanthera clavellata*	Club Spur Orchid				S3	3 Sensitive	2	86.4 ± 5.0
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	4 Secure	71	6.3 ± 5.0
P	*Platanthera hookeri*	Hooker's Orchid				S3	4 Secure	3	31.3 ± 0.0
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	4 Secure	14	80.6 ± 0.0
P	*Alopecurus aequalis*	Short-awned Foxtail				S3	Secure	4	24.4 ± 1.0
P	*Dichanthelium clandestinum*	Deer-tongue Panic Grass				S3	4 Secure	79	19.8 ± 0.0
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	Secure	16	15.7 ± 5.0
P	*Sparganium natans*	Small Burreed				S3	4 Secure	6	5.9 ± 0.0
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3	Secure	3	46.1 ± 0.0
P	*Equisetum pratense*	Meadow Horsetail				S3	Sensitive	10	71.0 ± 0.0
P	*Equisetum variegatum*	Variegated Horsetail				S3	4 Secure	38	31.2 ± 0.0
P	*Isoetes acadiensis*	Acadian Quillwort				S3	3 Sensitive	1	57.2 ± 1.0
P	*Huperzia appalachiana*	Appalachian Fir-Clubmoss				S3	Sensitive	1	80.5 ± 1.0
P	*Botrychium dissectum*	Cut-leaved Moonwort				S3	4 Secure	4	19.5 ± 1.0
P	*Schizaea pusilla*	Little Curlygrass Fern				S3	4 Secure	4	32.8 ± 0.0
P	*Asclepias incarnata ssp. pulchra*	Swamp Milkweed				S3?	Undetermined	6	79.8 ± 0.0
P	*Lactuca canadensis*	Canada Lettuce				S3?	3 Sensitive	2	86.0 ± 3.0
P	*Amelanchier stolonifera*	Running Serviceberry				S3?	4 Secure	4	27.3 ± 5.0
P	*Amelanchier laevis*	Smooth Serviceberry				S3?	5 Undetermined	2	84.0 ± 1.0
P	*Carex cryptolepis*	Hidden-scaled Sedge				S3?	4 Secure	13	34.3 ± 1.0
P	*Carex tribuloides*	Blunt Broom Sedge				S3?	4 Secure	3	17.9 ± 5.0
P	*Carex foenea*	Fernald's Hay Sedge				S3?	4 Secure	1	37.6 ± 0.0
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3?	Undetermined	16	60.5 ± 0.0

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3?	3 Sensitive	9	3.4 ± 10.0
P	*Lycopodium sabinifolium*	Ground-Fir				S3?	4 Secure	7	26.2 ± 5.0
P	*Lycopodium sitchense*	Sitka Clubmoss				S3?	4 Secure	3	19.9 ± 1.0
P	*Lycopodium tristachyum*	Blue Groundcedar				S3?	3 Sensitive	9	86.4 ± 5.0
P	*Polypodium appalachianum*	Appalachian Polypody				S3?	5 Undetermined	6	81.3 ± 0.0
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	Secure	7	63.8 ± 2.0
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	4 Secure	8	88.3 ± 0.0
P	*Sanguinaria canadensis*	Bloodroot				S3S4	4 Secure	114	10.0 ± 5.0
P	*Polygonum fowleri*	Fowler's Knotweed				S3S4	Secure	2	27.4 ± 0.0
P	*Rumex maritimus*	Sea-Side Dock				S3S4		8	64.4 ± 0.0
P	*Rumex maritimus var. fueginus*	Tierra del Fuego Dock				S3S4	4 Secure	5	86.2 ± 0.0
P	*Fragaria vesca ssp. americana*	Woodland Strawberry				S3S4	Secure	42	25.0 ± 0.0
P	*Tsuga canadensis*	Eastern Hemlock				S3S4	4 Secure	7	86.1 ± 3.0
P	*Carex pallescens*	Pale Sedge				S3S4	4 Secure	1	99.5 ± 3.0
P	*Eleocharis obtusa*	Blunt Spikerush				S3S4	4 Secure	3	83.9 ± 3.0
P	*Eriophorum chamissonis*	Russet Cotton-Grass				S3S4	4 Secure	6	42.9 ± 5.0
P	*Juncus acuminatus*	Sharp-Fruit Rush				S3S4	Secure	3	87.7 ± 0.0
P	*Juncus nodosus*	Knotted Rush				S3S4	4 Secure	4	84.4 ± 3.0
P	*Luzula parviflora*	Small-flowered Woodrush				S3S4	4 Secure	2	27.8 ± 0.0
P	*Spirodela polyrrhiza*	Great Duckweed				S3S4	4 Secure	1	85.7 ± 0.0
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	4 Secure	9	72.1 ± 1.0
P	*Panicum tuckermanii*	Tuckerman's Panic Grass				S3S4	Secure	1	76.6 ± 0.0
P	*Trisetum spicatum*	Narrow False Oats				S3S4	4 Secure	9	59.9 ± 0.0
P	*Cystopteris bulbifera*	Bulblet Bladder Fern				S3S4	4 Secure	136	22.7 ± 0.0
P	*Equisetum hyemale var. affine*	Common Scouring-rush				S3S4	4 Secure	19	28.6 ± 1.0
P	*Equisetum scirpoides*	Dwarf Scouring-Rush				S3S4	4 Secure	35	70.8 ± 0.0
P	*Lycopodium complanatum*	Northern Clubmoss				S3S4	4 Secure	5	76.5 ± 0.0
P	*Solidago simplex var. randii*	Sticky Goldenrod				SH	0.1 Extirpated	2	34.5 ± 5.0
P	*Viola canadensis*	Canada Violet				SH	Extirpated	2	85.6 ± 0.0

5.1 SOURCE BIBLIOGRAPHY (100 km)

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

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APPENDIX D
NOVA SCOTIA MUSEUM REPORT
HERITAGE AND BIOLOGICAL RESOURCES

NOVA SCOTIA

Communities, Culture & Heritage

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October 22, 2015

Heather Levy
Envirosphere Consultants Ltd
PO Box 2906 Unit 5 – 120 Morison Dr.
Windsor, NS B0N 2T0

Dear Ms. Levy:

RE: Environmental Screening 15-09-25
Loch Katrine Quarry Expansion

Further to your request of September 25, 2015 staff at Communities, Culture and Heritage has reviewed their files for reference to the presence of natural and heritage resources in the study area. Please be aware that the information is not comprehensive, and may include varying degrees of accuracy with respect to the precise location and condition of natural resources.

It should be noted that the amount and degree of disturbance from previous developments could have a significant role in establishing the presence, absence or condition of natural and heritage resources in this area.

Archaeology

Given this is an expansion project and there are no recorded sites on file in the vicinity or wider area, and given the study area does not intersect with a watercourse, it is ascribe low archaeological potential. Historic maps do not indicate settlement. It is not recommended at this time that an assessment for archaeological resources takes place.

Botany

Staff has reviewed the records for plant species-at-risk. The following plants are known from the vicinity of Loch Katrine and should be considered prior to any development.

Botrychium lanceolatum (provincially Yellow-listed)
Carex bebbii (provincially Orange-listed)
Eleocharis flavescens (provincially Yellow-listed)
Floerkea proserpinacoides (provincially Yellow-listed)
Impatiens pallida (provincially Yellow-listed)
Iris prismatica (provincially Orange-listed)
Laportea canadensis (provincially Yellow-listed)
Lilium canadense (provincially Yellow-listed)
Potamogeton nodosus (provincially Orange-listed)
Potamogeton obtusifolius (provincially Yellow-listed)
Triosteum aurantiacum (provincially Yellow-listed)
Zizia aurea (provincially Orange-listed)

The presence/absence of the above species should be determined when identification is certain and the results should be stated in the final report.

Zoology

Staff has reviewed the zoological records for species of concern for the site indicated and there are no records of species of concern for the foot-printed site or immediate area around the site.

However, there are records of the following species with conservation status in the general area.

Within this and adjacent watershed, there are records of Wood Turtle (*Glyptemys insculpta*).

Although their populations are significantly diminished due to White Nose Syndrome, the proponent should be cognizant of the use (in the past) of these habitats for foraging by Little Brown Bats (*Myotis lucifugus*) and Northern Long-eared bats (*Myotis septentrionalis*).

There are nesting records or probable nesting records for the following bird species of concern in the general area:

Blue-winged Teal
Wilson's Snipe
American Bittern
Black-billed Cuckoo
Common Loon
Rose-breasted Grosbeak
Gray Jay
Pine Siskin
Barn Swallow
Cliff Swallow
Tree Swallow
Bobolink
Rusty Blackbird
Gray Catbird
Boreal Chickadee
Bay-breasted Warbler
Cape May Warbler
Tennessee Warbler
Canada Warbler
Ruby-crowned Kinglet
Golden-crowned Kinglet
Olive-sided Flycatcher
Yellow-bellied Flycatcher
Eastern Kingbird
Black-backed Woodpecker
Pied-billed Grebe

NOVA SCOTIA

Communities, Culture & Heritage

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Palaeontology

This work will disrupt Devonian-aged rocks of the Hoppenderry Formation, units known as DGHb and DGHr (NSDNR Open File Map 1998-001, White and Barr). DGHb consists of basalt with minor lapilli tuff, and rear grey-green siltstone. DGHr consists of flow-banded and spherulitic rhyolite, and felsic lithic crystal lapilli tuff.

No recent reports of fossils in the area are known, but Fletcher and Faribault (1887) in the Annual Report of the Geological and Natural History Survey of Canada (p. 54) report plant fossils in the area. From the description, the fossils appear to be Carboniferous in age and are common plant fossils (ferns, *Sigillaria* sp.).

If you have any questions, please contact me at 424-6475.

Sincerely,

Sean Weseloh-McKeane
Coordinator, Special Places

Enclosure

APPENDIX E
LABORATORY RESULTS
TSS & pH

Envirosphere Consultants Limited

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PO Box 2906, Unit 5
Windsor, NS B0N 2T0

Environmental Sample Analysis Report

Report Date: 20-Jun-16 Report Number: A0576

Lab #	Sample ID	Sample Details	Sample Material	Date Received	Date Analyzed	pH	Type of Sample	Detection Limit	Sample Comments
L2016-28	CRM	Reference Standard	CRM	6/11/2016	6/11/2016	7.0	STD	0.1	7.01 +/- 0.01
L2016-28	W1	Stream southeast of site	Stream water	6/11/2016	6/11/2016	6.7	REG	0.1	
L2016-28	W2	Northeast Forest Pond	Pond Water	6/11/2016	6/11/2016	5.9	REG	0.1	Forest pond
L2016-28	W3	Flowage leaving north border of site	Stream Water	6/11/2016	6/11/2016	7.5	REG	0.1	North flowage
L2016-28	W3	Flowage leaving north border of site	Stream Water	6/11/2016	6/11/2016	7.5	DUP	0.1	
L2016-28	W4	Drainage culvert from quarry	Stream Water	6/11/2016	6/11/2016	7.2	REG	0.1	Drainage from quarry area

Name of Analyst: P. Stewart Analyses reviewed by: HL Director / Lab Manager (circle one)

This laboratory applies standard practice in conformance with ISO/IEC 17025:2005, "General Requirements for the Competence of Testing and Calibration Laboratories".

Validation Range: 3-10 units The results in this report relate only to the items tested. More information is available upon request.

The quality of the results is dependent on the quality of sample provided.

Comment: Samples for pH should be kept cool until delivery to the lab unless the samples are analyzed immediately. Preferably samples should be analyzed within 24 hours. Hach manual recommends filling bottle completely and capping tightly; cooling to 4°C for storage and analyzing within 6 hours. If this can't be done, Hach manual recommends reporting the holding time with results.

Method: Standard Methods for the Examination of Water and Wastewater 22nd Edition. 2012 and online version., 4500-HB. Electrometric measurement of pH. ECL Method 8, pH.

Type of Sample: REG = regular; STD = standard; DUP = duplicate; CRM = certified reference material.

Sample Comments: BDL = Below Detection limit; QR = Qualified result; NR = No result, damaged or insufficient sample; MAC = Maximum Allowable Concentration.

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Windsor, NS B0N 2T0

Environmental Sample Analysis Report

Report Date: 20-Jun-16 Report Number: A0577

Lab #	Sample ID	Sample Details	Sample Material	Date Received	Date Analyzed	TSS (mg/L)	Type of Sample	Detection Limit	Sample Comments
L2016-28	W1	Stream southeast of site	Stream water	6/11/2016	6/17/2016	19.5	REG	0.5 mg/L	
L2016-28	W2	Northeast Forest Pond	Pond Water	6/11/2016	6/17/2016	1.0	REG	0.5 mg/L	Forest pond
L2016-28	W3	Flowage leaving north border of site	Stream Water	6/11/2016	6/17/2016	4.5	REG	0.5 mg/L	North flowage
L2016-28	W4	Drainage culvert from quarry	Stream Water	6/11/2016	6/17/2016	2.0	REG	0.5 mg/L	Drainage from quarry area
L2016-28	W4 (DUP)	Drainage culvert from quarry	Stream Water	6/11/2016	6/17/2016	2.0	DUP	0.5 mg/L	Drainage from quarry area
L2016-28	CRM	Reference Standard	CRM	6/11/2016	6/17/2016	212.0	STD	0.5 mg/L	CRM = 211 mg/L
L2016-28	Blank		dH20	6/11/2016	6/17/2016	<0.5	BLANK	0.5 mg/L	

Name of Analyst: Heather Lay Analyses reviewed by: B Director / Lab Manager (circle one)

This laboratory applies standard practice in conformance with ISO/IEC 17025:2005, "General Requirements for the Competence of Testing and Calibration Laboratories".

Validation Range: 1-1000 mg/L The results in this report relate only to the items tested. More information is available upon request.

The quality of the results is dependent on the quality of sample provided.

Samples for TSS analysis should be kept cool until delivery to the lab unless they are analyzed immediately. A minimum sample volume of 500 ml is preferred. Place sample in a clean plastic container free of cracks or contamination. Fill the bottle to the top and then cap. Samples should reach the lab within 24 hours of sampling, but will be accepted up to 7 days.

Methods: Modified from Standard Methods for the Examination of Water and Wastewater 22nd Edition. 2012 and online version. 2540D. Total Suspended Solids. ECL method 3, Total Suspended Solids.

Type of Sample: REG = regular; STD = standard; DUP = duplicate; CRM = certified reference material.

Sample Comments: BDL = Below Detection limit; QR = Qualified result; NR = No result, damaged or insufficient sample; MAC = Maximum Allowable Concentration.