REPORT

Natural Environment Level 1/2 Report

Proposed Lanci Pit Expansion

Submitted to:

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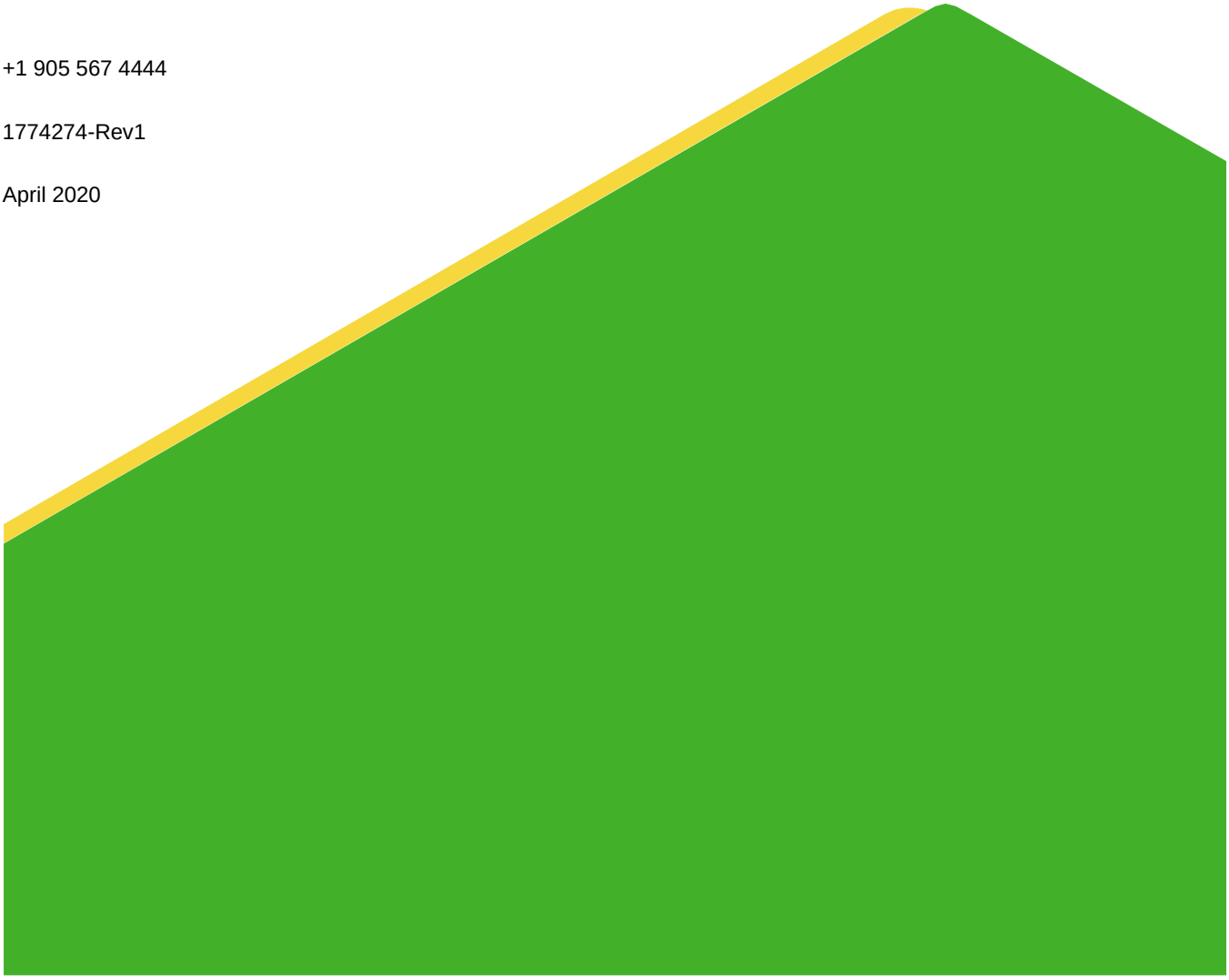
1774274-Rev1

April 2020



Distribution List

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by CBM Aggregates (CBM), a division of St. Marys Cement (Canada) (SMC) to complete technical studies to accompany the application for a new Category 1, Class “A” licence (Pit Below Water) under the *Aggregate Resources Act* (ARA) on Part of Lot 25, Concession 1, Township of Puslinch, Wellington County, Ontario (Figure 1).

1.1 Purpose

This report specifically addresses the requirements of a Natural Environment Level 1 and Level 2 (NEL 1/2) Technical Report (Aggregate Resources of Ontario Provincial Standards, Section 2.2) that will accompany the application for a Category 1, Class “A” Pit Below Water. A Terms of Reference (ToR) outlining the assessments to be completed as part of the NEL 1/2 and the hydrogeological level 1/2 technical studies was submitted to the Ministry of Natural Resources and Forestry (MNRF) Guelph District, the Township of Puslinch (the Township) and the County of Wellington (the County) (Appendix A). This report also meets the requirements of an Environmental Impact Assessment (EIA) for the Township and the County.

For the purpose of this report, the following definitions are used:

Site (Figure 2) - the total land area within the property owned by CBM that is proposed for licensing under the ARA. The site is approximately 14.8 hectares (ha).

Extraction Limit (Figure 2) – The total area within the site in which aggregate is proposed for extraction. The total area of the Extraction Limit is approximately 10.2 ha. The extraction limits are detailed on the Site Plans as part of the Planning Report (MHBC 2020).

Study Area (Figure 2) - The study area for the NEL 1/2 assessment is defined in the Aggregate Resources of Ontario Provincial Standards, Sections 2.2.3 and 2.2.4 as the site and surrounding 120 m. Because the predicted groundwater drawdown is not expected to extend beyond the site boundaries (Golder 2019) and there are no sensitive natural features beyond 120 m that have potential to be influenced by the proposed extraction, the study area was not extended beyond 120 m.

The purpose of this report is to assess potential environmental impacts of the proposed aggregate extraction on the site with respect to the following:

- The environmental features and functions in the study area;
- The influence of extraction on the surrounding natural environment; and,
- The rehabilitation potential of the site after extraction.

1.2 Site and Adjacent Lands

1.2.1 Site Description

The site is located on the west side of Sideroad 25 South in a rural setting in the Township of Puslinch. The site is composed of three separate lots, two of which have residents and are currently occupied by tenants. The majority of the site is covered by woodland, including deciduous forest, coniferous and mixed plantations, and open coniferous woodland (Figure 2).

1.2.2 Adjacent Lands

There are several active aggregate extraction sites in the area including Dufferin Aggregates Mill Creek Pit to the west and CBM's Puslinch Pit to the east. The existing Lanci Pit is located immediately to the north of the site (Category 1 Class A – Below Water) and encompasses an area of 24.7 ha with 21.1 ha approved for aggregate extraction.

There is deciduous forest south of the site, and a regenerating coniferous woodland southwest of the site. There are also rural residences surrounded by mixed forest to the southeast of the site (Figure 2).

2.0 ENVIRONMENTAL POLICY CONTEXT

The site is located in the Township of Puslinch and the County of Wellington. Documents reviewed to gain an understanding of the natural heritage features and regulations that are relevant to the proposed site and study area consisted of the following:

- The ARA (Ontario 1990) and the Provincial Standards of Ontario – Category 1 – Class A Pit/Quarry Above/Below Water (MNR 1997)
- The Provincial Policy Statement (MMAH 2014)
- The *Fisheries Act* (Canada 1985)
- The *Migratory Birds Convention Act* (Canada 1994)
- The *Species at Risk Act* (Canada 2002)
- The *Endangered Species Act* (Ontario 2007)
- The Growth Plan for the Greater Golden Horseshoe (MMAH 2019)
- The County of Wellington Official Plan (2017)
- The Grand River Conservation Authority Reg. 150/06 Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses (Ontario 2006)

An overview of the above noted legislation and policy documents are discussed in Sections 2.1 to 2.8.

2.1 Aggregate Resources Act

Applicants are required under the ARA Provincial Standards to prepare a Level 1 Natural Environment Technical Report and, where significant natural environment features occur on, or in proximity (i.e., within 120 m, or the estimated area of groundwater drawdown) to the proposed operation, a Level 2 Natural Environment Report is required. Significant natural heritage features are defined in the PPS (MMAH 2014) with guidance from supporting technical manuals prepared by the Ministry of Natural Resources and Forestry (MNR 2000; MNR 2010; MNRF 2015). A Level 2 Natural Environment Technical Report, identifying the particular features and functions of the designated natural environment feature(s), the nature of the potential negative impacts of the extractive operation, the proposed mitigation of those effects and the nature and magnitude of any residual effects is also required to satisfy the ARA Provincial Standards (MNR 1997). As well, the proposed rehabilitation of the

extraction area, and any prescriptions for that rehabilitation, are identified and discussed in the Level 1 and, if necessary, the Level 2 Natural Environment Technical Reports.

2.2 Provincial Policy Statement

The PPS was issued under Section 3 of *The Planning Act*. The natural heritage policies of the PPS (MMAH 2014) indicate that:

- 2.1.1 Natural features and areas shall be protected for the long-term
- 2.1.2 The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features
- 2.1.3 Natural heritage systems shall be identified in Ecoregions 6E and 7E, recognizing that natural heritage systems will vary in size and form in settlement areas, rural areas, and prime agricultural areas
- 2.1.4 Development and site alteration shall not be permitted in:
    a) significant wetlands in Ecoregions 5E, 6E, and 7E
    b) significant coastal wetlands
- 2.1.5 Unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions, development and site alteration shall not be permitted in:
    a) significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E, and 7E
    b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River)
    c) significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River)
    d) significant wildlife habitat
    e) significant areas of natural and scientific interest
    f) coastal wetlands in Ecoregions 5E, 6E, and 7E that are not subject to policy 2.1.4(b)
- 2.1.6 Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements
- 2.1.7 Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements
- 2.1.8 Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.3, 2.1.4 and 2.1.5 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions

2.3 Fisheries Act

The purpose of the *Fisheries Act* (Canada 1985) is to maintain healthy, sustainable and productive Canadian fisheries through the prevention of pollution and the protection of fish and their habitat. All projects undertaking work in or near-water must comply with the provisions of the *Fisheries Act*.

Measures to protect fish habitat include avoiding in-water work (i.e., below the high-water mark) and work on the banks or shoreline of watercourse/waterbody, as well maintaining riparian vegetation. Any project that is unable to avoid impacts to fish or fish habitat will require a project review (DFO 2019). If it is determined through the Fisheries and Oceans Canada (DFO) review process that the project will result in death of fish or the harmful alteration, disruption or destruction of fish habitat (HADD), an authorization under the *Fisheries Act* is required. This includes Projects that have the potential to obstruct fish passage or impacts flows.

Proponents of projects requiring a *Fisheries Act* Authorization are required to also submit a Habitat Offsetting Plan, which provides details of how the death of fish and/or HADD to fish habitat will be offset, as well as outlining associated costs and monitoring commitments. Proponents also have a duty to notify DFO of any unforeseen activities that cause harm to fish and outline the steps taken to address them.

2.4 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (MBCA) (Canada 1994) prohibits the killing or capturing of migratory birds, as well as any damage, destruction, removal or disturbance of active nests. It also allows the Canadian government to pass and enforce regulations to protect various species of migratory birds, as well as their habitats. While Environment and Climate Change Canada (ECCC) can issue permits allowing the destruction of nests for scientific or agricultural purposes, or to prevent damage being caused by birds, it does not typically allow for permits in the case of industrial or construction activities.

2.5 Species at Risk

2.5.1 Species at Risk Act (SARA)

At a federal level, SAR designations for species occurring in Canada are initially determined by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). If approved by the federal Minister of the Environment and Climate Change, species are added to the federal List of Wildlife Species at Risk (Canada 2002). Species that are included on Schedule 1 as endangered or threatened are afforded protection of critical habitat on federal lands under the *Species at Risk Act* (SARA). On private or provincially-owned lands, only aquatic species listed as endangered, threatened or extirpated and migratory birds are protected under SARA, unless ordered by the Governor in Council.

2.5.2 Endangered Species Act (ESA)

SAR designations for species in Ontario are initially determined by the Committee on the Status of Species at Risk in Ontario (COSSARO), and if approved by the provincial Minister of Environment, Conservation and Parks, species are added to the provincial ESA which came into effect June 30, 2008 (Ontario 2007). The legislation prohibits the killing or harming of species identified as endangered or threatened in the various schedules to the Act. The ESA also provides habitat protection to all species listed as threatened or endangered. As of June 30, 2008, the Species at Risk in Ontario (SARO) List is contained in Ontario Regulation (O. Reg.) 230/08.

Subsection 9(1) of the ESA prohibits the killing, harming or harassing of species identified as ‘endangered’ or ‘threatened’ in the various schedules to the Act. Subsection 10(1) (a) of the ESA states that “*No person shall*

damage or destroy the habitat of a species that is listed on the SARO list as an endangered or threatened species".

General habitat protection is provided, by the ESA, to all threatened and endangered species. Species-specific habitat protection is only afforded to those species for which a habitat regulation has been prepared and passed into law as a regulation of the ESA. The ESA has a permitting and registration process where alterations to the habitat of protected species may be considered.

2.6 Growth Plan for the Greater Golden Horseshoe

The Growth Plan for the Greater Golden Horseshoe was issued under *The Places to Grow Act* (MMAH 2019). The Growth Plan is intended, in coordination with other provincial plans, to establish a unique land use planning framework for the Greater Golder Horseshoe that supports the achievement of complete communities, a thriving economy, clean and healthy environment and social equity (MMAH 2019). A Natural Heritage System (NHS) for the Greater Golder Horseshoe was developed and mapped under the Growth Plan in February 2018, which will support planning for the protection of the region's natural heritage and biodiversity. The Growth Plan is discussed further at length in the Planning Report (MHBC 2020) in relation to the application.

Growth Plan policies require that new mineral aggregate operations within the NHS demonstrate how connectivity between key natural heritage and key hydrologic features will be maintained, how any key natural heritage and key hydrologic features that are lost can be replaced, how the water resource system will be protected and how rehabilitation requirements will be satisfied (Section 4.2.8 (b)). New mineral aggregate operations within the NHS are not permitted within significant wetlands, habitat of endangered or threatened species, or significant woodlands (with some exceptions for young plantations and early successional habitat) (Section 4.2.8 (a)).

An application to expand an existing mineral aggregate operation may be permitted within the NHS, including within key natural heritage or key hydrologic features and associated vegetation protection zones, as long as the decision is consistent with PPS policies (MMAH 2014) and rehabilitation requirements of the Growth Plan are satisfied (Section 4.2.8 (c)).

The entire study area is located within the NHS of the Growth Plan as approved in February 2018. However, the proposed licence application is an expansion of an existing extraction operation and is therefore not subject to the environmental prohibitions outlined in Growth Plan 4.2.8.2 (a). Regardless of the Growth Plan NHS mapping, the proposed extraction area has been delineated to avoid and protect adjacent significant natural features. County of Wellington

2.7 County of Wellington

Schedule A7 (Puslinch) of the County's Official Plan (OP) delineates the County's Greenlands System, which includes wetlands, environmentally sensitive areas, waterbodies, Areas of Natural and Scientific Interest (ANSI), woodlands, habitat of endangered or threatened species, fish habitat and floodplains/hazardous lands (Wellington 2017). The Greenlands System overlaps the southern portion of the site and study area outside of the proposed extraction area. Policies related to each applicable natural feature within the study area is discussed in Section 5.0.

Based on recent mapping completed by the GRCA on behalf of the County, the proposed extraction area is located outside of the County's Natural Heritage System (September 2018). This recent mapping has been prepared to help the County conform with the Growth Plan requirements by providing a scientific basis for refinements to the Growth Plan Natural Heritage System mapping.

2.8 Grand River Conservation Authority

The study area is located within the jurisdiction of the GRCA. However, there are no areas regulated by Ontario Regulation 150/06 under the *Conservation Authorities Act* (Ontario 2011) on the site or in the study area (GRCA 2019). Because this project is under the purview of the ARA, permits from the GRCA will not be required.

3.0 DESCRIPTION OF PROPOSED DEVELOPMENT

Access to the proposed Lanci Pit Expansion will be from the north through the existing Lanci Pit. Above water extraction will occur in a north to south direction with front end loaders and/or excavators, followed by below water extraction with a dragline in a south to north direction. .

The total depth of extraction will correspond with the surface of the underlying fine-grained material/bedrock contact, with a pit floor elevation of ±293.5 metres above sea level (masl). Ultimately, the lake created on the site (the south lake) will be connected to the existing lake on the Lanci Pit (the north lake).

No washing or processing of aggregate will take place on the site, as material will be moved to the adjacent Aberfoyle South Pit operation for processing, consistent with current operations at the existing Lanci Pit. In addition, there will be no dewatering. Groundwater will be passively interacted with through the following mechanisms as part of extraction activities:

- An equivalent volume of water will be required to replace the volume of aggregate excavated from below water while the dragline is operating
- Material extracted below the water table is left in windrow piles to allow for water to drain and infiltrate back into the groundwater system, allowing for recharge to occur
- A small percentage of the water removed during extraction, typically on the order of 2% to 3% (based on previous experience and industry studies), will be retained within the pore space of the aggregate

During extraction, there will be no direct off-site discharge of water as all internal drainage will be directed to the excavation. Following rehabilitation, all drainage on-site will be directed towards a permanent pond created on-site (MHBC 2020).

4.0 METHODS

4.1 Background Review

The investigation of existing conditions in the study area included a background information search and literature review to gather data about the local area and provide context for the evaluation of the natural features, including the following:

- Natural Heritage Information Centre (NHIC) database, maintained by the MNRF (NHIC 2019)
- Land Information Ontario (LIO) geospatial data (MNRF 2019a)
- Species at Risk Public Registry (ECCC 2019)
- Species at Risk in Ontario (SARO) List (MNRF 2019b)

- Breeding Bird Atlas of Ontario (OBBA) (Cadman et al. 2007)
- Atlas of the Mammals of Ontario (Dobbyn 1994)
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2019)
- Bat Conservation International (BCI) range maps (BCI 2019)
- Ontario Butterfly Atlas (Jones et al. 2019)
- eBird species maps (eBird 2019)
- MNRF LIO Aquatic Resources Area Layer (MNRF 2019c)
- MNRF Fish On-Line (MNRF 2019d)
- County of Wellington Official Plan (2017)
- MNRF Natural Heritage and SAR Information Request (M. Thompson, pers. comm., 2017a)
- Mapping of a Natural Heritage System in the County of Wellington (GRCA 2018)
- Wellington County Natural Heritage System Interactive Mapping Tool (Wellington 2018)
- Significant Plant List and Significant Wildlife List for Wellington County, included in the City of Guelph Natural Heritage Strategy (Dougan and Associates 2009)
- Mill Creek Cumulative Impact Assessment 2005, Township of Puslinch, Ontario (Golder 2006)
- Draft Grand River Characterization Report (LESPRTT 2008)
- GRCA Watershed Information: Grand River Information Network (GRCA 2019)
- Aerial imagery

To develop an understanding of the drainage patterns, ecological communities and potential natural heritage features that may be affected by the proposed aggregate development, MNRF LIO data were used to create base layer mapping for the study area. A geographic query of the NHIC database was conducted to identify element occurrences of any natural heritage features, including wetlands, ANSIs, life science sites, rare vegetation communities, rare species (i.e., species ranked S1-S3 by NHIC), regionally significant or rare species, species designated under the ESA or SARA, and other natural heritage features within the study area.

4.2 SAR Screening

SAR considered for this report include those species listed in the ESA and SARA. An assessment was conducted to determine which SAR had potential habitat in the study area. A screening of all SAR which have the potential to be found in the vicinity of the study area was conducted first as a desktop exercise using the sources listed in Section 4.1. Species with ranges overlapping the study area, or recent occurrence records in the vicinity, were screened by comparing their habitat requirements to habitat conditions in the study area.

The potential for the species to occur was determined through a probability of occurrence. A ranking of low indicates no suitable habitat availability for that species in the study area and no specimens identified. Moderate probability indicates more potential for the species to occur, as suitable habitat appeared to be present in the

study area, but no occurrence of the species has been recorded. Alternatively, a moderate probability could indicate an observation of a species, but there is no suitable habitat on the site or in the study area. High potential indicates a known species record in the study area (including during the field surveys or background data review) and good quality habitat is present.

Searches were conducted during all field surveys for suitable habitats and signs of all SAR identified through the desktop screening. If the potential for the species to occur in the study area was moderate or high, the screening was refined based on the results of the field surveys. Any habitat identified during the field surveys with potential to provide suitable conditions for additional SAR not already identified through the desktop screening was also assessed and recorded. All probability ratings were updated based on the results of the field surveys.

4.3 Field Surveys

The habitats and communities on the site were characterized through field surveys. The following sections outline the methods used for each of the field surveys on the site. During all surveys, area searches were conducted and additional incidental wildlife, plant, and habitat observations were recorded. Searches were also conducted to document the presence or absence of suitable habitat, based on habitat preferences, for those species identified in the desktop SAR screening described above. The dates when all surveys were conducted are included in Table 1.

Table 1: Summary of Field Surveys Conducted on the Proposed Lanci Pit Expansion Site in 2017

Date	Type of Survey
May 26, 2017	Breeding Bird Survey (BBS) #1, General Wildlife Survey
June 2, 2017	Bat Habitat Assessment, General Wildlife Survey
June 8, 2017	Bat Active Monitoring Survey, General Wildlife Survey
June 14-July 6, 2017	Bat Acoustic Survey (Stationary Detectors)
July 5, 2017	BBS#2, General Wildlife Survey
July 25, 2017	Ecological Land Classification, Botanical Inventory, General Wildlife Survey

4.3.1 Plant Community Surveys and Botanical Inventory

Plant communities on the site and in the study area were first delineated at a desktop level using high-resolution aerial imagery, then ground-truthed in the field (where accessible) using the Ecological Land Classification (ELC) system for southern Ontario (Lee et al. 1998). These inventories were carried out by systematically traversing the site and study area, where accessible, for a thorough survey of species and communities. Information on dominant plant species and plant community structure and composition was recorded in order to better define and refine the plant community polygons.

The botanical inventory included area searches in all naturally-occurring habitats on the site. The searches were conducted by systematically walking through all habitats in a meandering fashion, generally paralleling the principal (long) axis of a natural area, where feasible, and examining the full width of the area. Lists of all plant species identified during all the field surveys were compiled.

The Regionally-defined significant woodland boundary, as mapped in the Wellington County Natural Heritage System (Wellington 2018), was refined and delineated in the field using handheld Global Positioning System (GPS) technology.

4.3.2 Breeding Bird Survey

Breeding bird point count surveys for songbirds and other diurnal birds were conducted at two stations on the site (Figure 2). Surveys followed protocols from the Canadian Breeding Bird Survey (Downes and Collins 2003), and the OBBA (Cadman et al. 2007). Point count stations were established in representative habitats on the Site and were spaced a minimum of 250 m apart. Surveys were conducted between 30 minutes before sunrise and 10:00 am to encompass the period of maximum bird song.

Each station consisted of a circle with a 100 m radius from the centre point (where the observer stands), and each point count was 10 minutes in duration, and was separated into survey windows of 0-3, 3-5, and 5-10 minutes. All birds seen or heard were noted on pre-printed datasheets and observations were made regarding sex, age and notable behaviour, when possible. Birds heard or seen outside of the 100 m radius were also noted using methods from the OBBA, including estimated distance (where possible).

4.3.3 Bat Survey

Field survey methods were based on the MNRF guidance document, *Survey Protocol for Species at Risk Bats within Treed Habitats* (MNRF 2017). The proposed survey methodology was submitted to the Guelph district MNRF for review and comment on May 18, 2017, and was subsequently approved on June 8, 2017 (M. Thompson, pers. comm., 2017b). A copy of the approved methodology is provided in Appendix A. Bat surveys consisted of three components:

1) a habitat assessment to identify maternity roost potential on the site

2) active monitoring to identify the areas of highest-quality habitat

3) an acoustic survey to identify the bat community (i.e., species) on site

Specific methods for each survey type are described below.

4.3.3.1 Habitat Assessment

An assessment of potential suitable habitat (including high-level plant community classification, snag density estimates, and average tree diameter) was conducted on the site. In addition to the overall habitat assessment, potential individual maternity roosts were identified and assessed. Data collected for individual roosts included tree species, height, diameter-at-breast height (DBH), snag class and description of suitable habitat features (e.g., cavity, peeling bark). The results of this analysis were used to identify which areas (i.e., plant communities) on the site have the highest quality potential maternity roost habitat. These areas were then targeted for active monitoring.

4.3.3.2 Active Monitoring Survey

Active monitoring was conducted in three areas of the site, including the deciduous forest (FOD5-4 and FOD3-1) in the southern portion of the site, the cultural woodland (CUW-A) in the eastern portion of the site, and the naturalized plantation (CUP2) in the north-central portion of the site (Figure 2). Surveys were conducted between one half hour before sunset and one half-hour after sunset (i.e., the time period when bats emerge from roosts). Two biologists walked slowly around the targeted habitat and recorded bat activity with handheld Echo Meter

Touch (EMT) detectors. Using the real-time sonogram display, the biologists distinguished between lower frequency bats, eastern red bat (*Lasiurus borealis*) and 40 kHz Myotis. The locations and time of detection of any 40 kHz Myotis bats (i.e., indicative of potential SAR bats) was recorded along with behavioural observations and notes on habitat and proximity to potential roost trees. All bat recordings collected during active monitoring was analysed according to the methods described below in Section 4.3.3.4.

4.3.3.3 Acoustic Survey

Based on the findings of the habitat assessment (identifying high quality bat maternity roost habitat and individual roost features) and the active monitoring survey (identifying which habitat areas had high bat activity), four locations on the site were selected that demonstrated the highest potential to support roosting bats. A passive full-spectrum bat detector was placed in each location near to suitable roost features (i.e., snag tree, rock pile, etc.) (Table 2; Figure 2). All four detectors were within 120 m to 215 m of the large aggregate ponds to the east and west of the site, which may be used for foraging by bats. The detectors were programmed to record between a half hour before sunset and a half hour after sunset. Detectors at stations 1 and 2 recorded for a total of 12 nights, while detectors at stations 3 and 4 recorded for a total of 11 nights.

Table 2: Location and Habitat Descriptions for Acoustic Survey Stations on the Proposed Lanci Pit Expansion Site, 2017

Acoustic Survey Station	Location and Habitat Description
1	At the edge of the open cultural woodland (CUW-A) in the east-central portion of the site, within 30 m of an old concrete foundation.
2	In the deciduous forest (FOD5-4) at the southwest corner of the site near suitable snag and cavity trees.
3	In the western portion of the mixed plantation (CUP2) in the central portion of the site.
4	In the eastern portion of the mixed plantation (CUP2) in the central portion of the site.

4.3.3.4 Data Analysis and Assessment

Acoustic data from both the active monitoring and acoustic survey was filtered in Sonobat Data Wizard to remove noise files, and the high grade noise scrubber setting was used. The data was analyzed and auto-classified using SonoBat 4.2.1 nnE. The Sonobat program is specifically intended for discrimination of bats to the species level wherever possible, and validation of the species-level classification was conducted by Golder's bat acoustic specialist. The results of the species classification were tallied on a per-night basis for each station for each species or species group. Once automated classification was complete, a subset of the files was reviewed (QA/QC'd) by an experienced and qualified bat acoustic specialist using the SonoVet tool. All recordings identified as high frequency calls were reviewed and a subset of the low frequency calls were also reviewed (see the percentage manually reviewed table for Qa/Qc percentages). For calls that were auto-classified to species by SonoBat but not reviewed, the SonoBat classification was accepted.

Bat passes cannot always be identified to species level. This can be due to either poor quality of the recording (i.e., high signal to noise ratio), or ambiguity of the call type. Some bat species have very similar calls and all bats have variability in their call repertoires. Some bat calls are quite diagnostic and can be confidently identified to species while other bat passes can only be identified to a Genus or to a group of species.

4.3.4 General Wildlife Survey

General wildlife surveys included track and sign surveys, area searches, and incidental observations, concurrent with all other field surveys. The full range of habitats across the site were searched, with special attention paid to edge habitats and other areas where mammals might be active. Areas of exposed substrate such as sand or mud were located and examined for any visible tracks. Any wildlife (including mammals, butterflies, and dragonflies) seen and identified were recorded. When encountered, tracks and other signs (e.g., tracks, scats, hair, tree scrapes, etc.) were identified to a species, if possible, and recorded. Observations of wildlife species or signs during all field surveys were recorded.

Visual encounter surveys for reptiles and amphibians, as well as reptile and amphibian habitat (with a focus on SAR) were conducted on the site. All suitable habitats for reptiles and amphibians were searched (e.g., flipping logs and other types of cover objects, observations in piles of rocks) and all reptiles and amphibians observed were identified and recorded.

4.4 Analysis of Significance and Sensitivity and Impact Assessment

An assessment was conducted to determine if any significant environmental features or SAR exist, or have moderate or high potential to exist, on the site or in the study area and assess whether the development would negatively impact surrounding significant natural heritage features or SAR. Preventative, mitigative and remedial measures were considered in assessing the net effects of the proposed extraction operation on the surrounding ecosystem.

5.0 EXISTING CONDITIONS

5.1 Ecosystem Setting and Regional Context

The study area is located in Ecoregion 6E (Lake Simcoe – Rideau), which covers just over 6% of southern Ontario (Crins et al. 2009). Ecoregion 6E is underlain by bedrock of dolomite and limestone, and is characterized by gently rolling surface terrain interspersed by drumlin fields and moraines. Soils are primarily mineral-based and dominated by Gray Brown Luvisols and Melanic Brunisols. The majority of the region is covered by cropland or pasture (57%), with 16% covered by forest and 4% covered by water (Crins et al. 2009).

The study area is located in the Horseshoe Moraines physiographic region. The Horseshoe Moraines region has two distinct landforms consisting of kames (stony ridges) and sand and gravel terraces of valley floors (Chapman and Putnam 1984). The surficial geology of the site is mapped as outwash gravel (Karrow 1987), which is part of the ‘Spillway’ physiographic landform (Chapman and Putnam 1984), and is adjacent to the Galt Moraine consisting of Wentworth Till at surface (sandy silt till deposit). The County OP depicts the southern half of the site as being within the Galt Moraine (Wellington 2017).

5.2 Hydrogeology

Based on borehole drilling conducted on the site, the ground surface at the site ranges in elevation from approximately 310 masl (metres above sea level) in the central portion of the site to 323 masl in the southeast corner of the site.

The water levels in the wells and staff gauges installed on the site were observed to vary seasonally by approximately ±0.5 to 0.7 m over the monitoring period (i.e., June 2017 to May 2019). The trend in water level

elevations in each monitoring well was similar over the monitoring period, with higher water levels measured in spring and lower levels during the winter. Based on the inferred groundwater contours and flow direction for June 2017 (the month with the maximum recorded groundwater elevation over the monitoring period) and December 2017 (month with the minimum recorded groundwater elevation over the monitoring period), the groundwater flow direction is inferred to be towards the west-southwest.

The highest groundwater temperatures measured between June 2017 and May 2019 ranged from 11 to 12.5°C, while the lowest groundwater temperatures measured ranged from 8.8 to 9.0°C. As expected, the temperature variations due to seasonal conditions were generally more pronounced at shallow depths, with more consistent temperatures at depth.

A more detailed discussion of hydrogeological conditions is provided in a separate report, entitled Hydrogeological Level 1 and 2 Assessment for the Proposed Lanci Pit Expansion (Golder 2020).

5.3 Surface Water Resources

The study area is located in the Middle Grand River watershed, and the Mill Creek subwatershed (GRCA 2019). There are no surface water features on the site. Off-site, within the study area, there are anthropogenically-created ponds associated with aggregate operations to the north, west and east of the site (Figure 1).

Mill Creek, a sensitive coldwater stream (LESPRTT 2008), is located approximately 1.7 km west of the site. Although the creek is outside of the study area (and outside of the groundwater zone of influence), the potential cumulative impacts of an additional below-water extraction operation in the subwatershed must be considered in the context of the broader local study area (GRCA 2010).

A more detailed discussion of surface water resources is provided in a separate report, entitled Hydrogeological Level 1 and 2 Assessment for the Proposed Lanci Pit Expansion (Golder 2020).

5.4 Vegetation

5.4.1 Regional Setting

The study area is located in the Great Lakes – St. Lawrence Forest Region and the Huron-Ontario subregion (Rowe 1972). The natural upland forest cover in this region is dominated by sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), basswood (*Tilia americana*), white ash (*Fraxinus americana*), white oak (*Quercus alba*), bur oak (*Quercus macrocarpa),* eastern hemlock (*Tsuga canadensis*) and eastern white pine (*Pinus strobus*). The lowland areas are characterized by forests of silver maple (*Acer saccharinum*), white elm (*Ulmus americana*), red elm (*Ulmus rubra),* black ash (*Fraxinus nigra*) and eastern white cedar (*Thuja occidentalis*) (Rowe 1972).

5.4.2 Plant Communities

Based on the field surveys conducted, seven ELC community types were identified on the site, including coniferous and mixed plantation, deciduous forest, and open woodland. Six additional ELC community types were identified off-site, within the study area. The ELC communities are shown on Figure 2 and are briefly described in Table 3.

Table 3: Plant Communities within the Proposed Lanci Pit Expansion Study Area

ELC Community	Field Description	SRANK[a]
Plant Communities on the Site		
FOD5-4 Sugar Maple – Ironwood Deciduous Forest	A mature deciduous forest in the southwest corner of the site. The canopy layer was closed and dominated by sugar maple, American beech and ironwood (*Ostrya virginiana*), in association with white pine, white elm, white birch (*Betula papyrifera*), and trembling aspen (*Populus tremuloides*). The understory was moderate and composed of saplings of the canopy species, in addition to Tartarian honeysuckle (*Lonicera tatarica*). A large gap between the canopy and understory layers provided an open, uncluttered space for wildlife movement. Ground cover was sparse and composed of species such as enchanter's nightshade (*Circaea lutetiana*), wild leek (*Allium tricoccum*), white trillium (*Trillium grandiflorum*), herb-robert (*Geranium robertianum*), wood sorrel (*Oxalis stricta*), blue cohosh (*Caulophyllum* sp.) and wild columbine (*Aquilegia canadensis*). The northern edge of this forest was younger and characterized by regrowth following disturbance. There were numerous large trees measuring between 25 cm and 50 cm in diameter, with the occasional tree greater than 50 cm in diameter. Snags were occasional, and there was abundant deadfall.	S5
FOD3-1 Poplar Deciduous Forest	Three small areas of deciduous forest in the southeast corner of the site. Canopy cover was moderate to dense and dominated by trembling aspen with white pine, white ash, sugar maple, black walnut (*Juglans nigra*), and black cherry (*Prunus serotina*). The understory was also moderate to dense and composed of Tartarian honeysuckle, common buckthorn (*Rhamnus cathartica*) and gray dogwood (*Cornus foemina*). Ground cover was moderate and dominated by terrestrial grasses and goldenrods. Trees generally measured between 25 cm and 50 cm in diameter, with occasional snags and abundant small deadfall (i.e., less than 25 cm in diameter).	S5
WOC Scots Pine Coniferous Woodland	An open coniferous woodland at the north end of the site and study area, dominated by scots pine (*Pinus sylvestris*) with associates of white cedar, black walnut, white oak, black cherry, red pine (*Pinus resinosa*), European larch (*Larix decidua*), and white spruce (*Picea glauca*). The understory was moderate and dominated by Tartarian honeysuckle, with white cedar, white spruce, common buckthorn, black raspberry (*Rubus occidentalis*), Virginia creeper (*Parthenocissus quinquefolia*), riverbank grape (*Vitis riparia*). Ground cover was dense and dominated by terrestrial grasses in association with colonizing meadow species such as goldenrods, wild carrot (*Daucus carota*), ox-eye daisy (*Leucanthemum vulgare*), Philadelphia fleabane (*Erigeron philadelphicus*), Viper's bugloss (*Echium vulgare*), strawberry (*Fragaria virginiana*), and common milkweed (*Asclepias syriaca*). The eastern portion of the community adjacent to Sideroad 25 had a more open canopy and a more pronounced meadow component. Overall, trees were immature and small (less than 25 cm in diameter) with few to no snags or deadfall. A narrow coniferous hedgerow composed of white cedar bisected the eastern portion of the community.	n/a

ELC Community	Field Description	SRANK[a]
CUP2 Naturalized Scots Pine-Deciduous Mixed Plantation	Located in the north-central portion of the site, this plantation was partially naturalized with canopy species of scots pine, white pine, white spruce, European larch, black cherry, white ash, basswood and Norway spruce (*Picea abies*). The understory was moderate to dense and composed of gray dogwood, Tartarian honeysuckle, common buckthorn, and red cedar. Ground cover was dense and composed of species such as goldenrods, blue cohosh, wild carrot, Virginia creeper, moss, enchanter's nightshade and heal-all (*Prunella vulgaris*). The eastern portion of the community was older, with larger trees (up to 50 cm in diameter) and a closed canopy. The deciduous component was also more prevalent in the eastern portion. The western portion of the community was younger and may have been more recently disturbed or cut, with trees generally measuring between 20 cm and 30 cm in diameter.	n/a
CUP3-2 White Pine Coniferous Plantation	A dense plantation of white pine in the south-central portion of the site, with trees generally measuring less than 25 cm in diameter and planted very close together. Understory and ground cover were both sparse, with a dense layer of needle litter and hummocky topography.	n/a
CUP3-3 Scots Pine Coniferous Plantation	A coniferous plantation located in the east-central portion of the site. The plantation was dominated by scots pine with associates of sugar maple, white pine, white cedar, Tartarian honeysuckle and common buckthorn. Ground cover was nearly 100% and dominated by terrestrial grasses and goldenrods, with other colonizing meadow species such as ox-eye daisy, wild carrot, heal-all, Philadelphia fleabane, Vipers bugloss, bird's-foot trefoil (*Lotus corniculatus*), red clover (*Trifolium pratense*), and white sweet clover (*Melilotus alba*). Trees were young, immature and small (less than 25 cm in diameter), with few to no snags or deadfall.	n/a
CUW-A / CUM Open Cultural Woodland / Cultural Meadow	A woodland / meadow community surrounding an old homestead along the east-central site boundary. There were scattered trees and shrubs including trembling aspen, white pine, basswood, white ash, white spruce, common buckthorn, Tartarian honeysuckle, Norway spruce, and staghorn sumac (*Rhus typhina*). Ground cover was dense and dominated by terrestrial grasses and goldenrods. Trees were generally immature and small (less than 25 cm in diameter), with the occasional larger tree (25-50 cm in diameter). Snags and deadfall were rare.	n/a
Plant Communities off-Site, within the Study Area		
FOD Deciduous Forest	An extensive area of deciduous forest off-site in the southern portion of the study area.	n/a
FOM Mixed Forest	An area of mixed forest off-site, in the southeast corner of the study area.	n/a

ELC Community	Field Description	SRANK[a]
CUP3 Coniferous Plantation	An area of coniferous plantation off-site, in the southwest corner of the study area.	n/a
CUW-B Open Coniferous Cultural Woodland	A woodland located off-site, in the western portion of the study area, characterized by immature coniferous trees with an open canopy.	n/a
OAO Open Aquatic	Anthropogenically created pit ponds associated with adjacent aggregate operations off-site, in the northern, western and eastern portions of the study area.	n/a
DIST Disturbed	Areas licensed as part of adjacent aggregate operations off-site, in the northern, western and eastern portions of the study area.	n/a
RES Residential	Areas of residential property containing anthropogenic structures (e.g., house, garage) and that were cleared and actively managed both on the site and in the study area.	n/a

[a] An SRank is a provincial –level rank indicating the conservation status of a species or plant community and is assigned by the NHIC in Ontario (NHIC 2019). SRanks are not legal designations but are used to prioritize protection efforts in the Province. SRanks for plant communities in Ontario are defined in the Significant Wildlife Habitat Technical Guide (MNR 2000). Ranks 1-3 are considered extremely rare to uncommon in Ontario; Ranks 4 and 5 are considered to be common and widespread. n/a indicates a community that has not been ranked, which often applies to anthropogenic, culturally-influenced or high-level ELC communities (i.e., FOD).

5.4.3 Vascular Plants

A total of 54 vascular plant species and one non-vascular moss species were identified during the botanical surveys completed on the site (Appendix B). Of these, 67% are native species, and 29% are exotic species. The remaining 4% (two plants) were unable to be identified to the species level due to plant condition (i.e., browsed).

Significant and Sensitive Species

All of the plant species identified through the botanical, or other, surveys are secure and common, widespread and abundant in Ontario and globally (S4 or S5; G5), or are unranked alien species (SNA; GNR). None of the plant species identified in the desktop SAR screening as having ranges which overlap the study area were found during the botanical, or other, field surveys (Appendix C). No regionally significant or rare plant species (Dougan and Associates 2009) were identified on the site during field surveys.

5.5 Wildlife

5.5.1 Breeding Birds

A total of 31 bird species were observed during breeding bird, or other, surveys conducted on the site (Appendix D). Ovenbird (*Seiurus aurocapilla*), black-capped chickadee (*Poecile atricapillus*), American robin (*Turdus migratorius*), American goldfinch (*Spinus tristis*) and red-eyed vireo (*Vireo olivaceus*) were the most common bird species observed during the surveys. Ovenbird and red-eyed vireo are characteristic breeders in large forest tracts, while black-capped chickadee, American robin, and American goldfinch breed in open woodlands and are common in residential yards (Cornell 2015).

Significant and Sensitive Species

All of the bird species identified through the breeding bird, or other, surveys are secure and common, widespread and abundant in Ontario and globally (S4 or S5; G5). Two of the bird species observed during field surveys are designated under the ESA: bank swallow and wood thrush.

Bank swallow, designated threatened under the ESA, was observed flying over the site during breeding bird surveys. Bank swallow is also considered a locally significant species within the County (Dougan and Associates 2009). Bank swallow breeds in a variety of natural and anthropogenic habitats (e.g., lake bluffs, stream banks, sand and gravel pits) located near open foraging sites such as waterbodies, fields, wetlands and riparian woods. Forested areas are generally avoided (Garrison 1999). No suitable nesting habitat was identified on the site. Although there are several active aggregate pits adjacent to the site which may contain stockpiles for nesting, there are no stockpiles within the study area. Off-site, within the study area, the aggregate ponds to the north, east and west of the site may also provide suitable foraging habitat. Bank swallow is discussed further in Section 6.1.

Wood thrush was also observed on the site during breeding bird surveys. Wood thrush breeds in moist, deciduous or mixed forest that are often previously disturbed, with a dense deciduous undergrowth and with tall trees for singing perches (COSEWIC 2012). Two males were observed singing in the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2). Based on this observation, wood thrush is considered a possible breeder on the site according to the OBBA (Cadman et al. 2007). Wood thrush is discussed further in Section 6.7.

Eleven other species observed during field surveys are considered locally significant within the County (Dougan and Associates 2009): ovenbird, Baltimore oriole (*Icterus galbula*), eastern towhee (*Pipilo erythrophthalmus*), field sparrow (*Spizella pusilla*), northern flicker (*Colaptes auratus*), pine warbler (*Setophaga pinus*), red-breasted

nuthatch (*Sitta canadensis*), rose-breasted grosbeak (*Pheucticus ludovicianus*), red-bellied woodpecker (*Melanerpes carolinus*), scarlet tanager (*Piranga olivacea*), and blue-winged warbler (*Vermivora cyanoptera*). In addition to being locally significant, red-bellied woodpecker and scarlet tanager are also considered rare in the County (Dougan and Associates 2009).

Ovenbird was observed on the site during breeding bird surveys. This species breeds in large, mature deciduous or mixed forest with a closed canopy (Porneluzi 2011). Ovenbird was observed singing in the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2), and is considered a probable breeder on the site (Cadman et al. 2007).

Rose-breasted grosbeak was observed on the site during breeding bird surveys. Rose-breasted grosbeak breeds in a variety of habitats, including deciduous and mixed woodlands and is often found near the shrubby ecotones of woodlands and adjacent open habitats (Wyatt and Francis 2002). A male was observed singing in both the open coniferous woodland (WOC) in the northern portion of the site and study area and the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2), and is considered a probable breeder on the site (Cadman et al. 2007).

Northern flicker was observed on the site during breeding bird surveys. Northern flicker breeds in open woodland, savannah, and in forest edges (Wiebe and Moore 2017). A single male was observed calling in the open coniferous woodland (WOC) in the northern portion of the site (Figure 2), and is considered a possible breeder on the site (Cadman et al. 2007).

Red-breasted nuthatch was observed on the site during breeding bird surveys. Red-breasted nuthatch breeds in mature stands of coniferous forest (Ghalambor and Martin 1999). A single male was observed calling in the open coniferous woodland (WOC) at the north end of the site (Figure 2), and is considered a possible breeder on the site (Cadman et al. 2007).

Red-bellied woodpecker was observed on the site during breeding bird surveys. Red-bellied woodpecker is a forest generalist, but is often associated with deciduous forest habitat (Miller et al. 2019). A single male was observed calling in the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2), and is considered a possible breeder on the site (Cadman et al. 2007).

Scarlet tanager was observed on the site during breeding bird surveys. Scarlet tanager breeds in a verity of deciduous and mixed forests, particularly where oak (*Quercus* spp.) is common (Mowbray 1999). A single male was observed calling in the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2), and is considered a possible breeder on the site (Cadman et al. 2007).

Eastern towhee, which is associated with edge habitats with dense shrub or small tree cover (Greenlaw 2015), was observed on the site during breeding bird surveys. Two male eastern towhees were observed singing in the open coniferous woodland (WOC) and in the deciduous forest (FOD5-4) on the site during breeding bird surveys. This species is unlikely to breed in the dense cover of the deciduous forest (FOD5-4), but may breed in the open coniferous woodland (WOC), or the western portion of the naturalized scots pine-deciduous mixed plantation (CUP2) on the site (Figure 2).

A male pine warbler was observed singing within the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2) during breeding bird surveys. However, pine warbler typically breeds in upland pine and pine-hardwood forests (Rodewald et al. 2013), and is unlikely to breed or nest in the deciduous forest on the site. Pine

warbler may breed in the adjacent pine-dominated habitats on the site, including the white pine plantation (CUP3-2), scots pine planation (CUP3-3) or naturalized scots pine-deciduous mixed plantation (CUP2) (Figure 2).

Although a male Baltimore oriole was observed singing in the open coniferous woodland (WOC) in the northern portion of the site and study area (Figure 2) during breeding bird surveys, this species has a strong preference for deciduous-dominated communities, and is typically associated with woodland edges and open areas with scattered trees (Rising and Flood 1998). Baltimore oriole is more likely to breed in the western portion of the naturalized scots pine-deciduous mixed plantation (CUP2) on the site (Figure 2).

Although a male field sparrow was observed singing in the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2) during breeding bird surveys, this species typically breeds in successional old fields or woodland openings (Carey et al. 2008). The deciduous forest (FOD5-4) has a closed canopy and does not provide suitable breeding conditions for this species. However, the open coniferous cultural woodland (CUW-B) off-site, within the southwestern portion of the study area (Figure 2) may provide suitable breeding habitat for field sparrow.

Blue-winged warbler was observed in the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2) during breeding bird surveys. However, blue-winged warbler typically breeds in dense thicket or shrubland habitats (Gill et al. 2001). There is no thicket or shrubland habitat on the site or in the study area to provide suitable breeding conditions, and breeding was not confirmed on the site.

Ovenbird, rose-breasted grosbeak, northern flicker, red-breasted nuthatch, red-bellied woodpecker, scarlet tanager, eastern towhee, pine warbler, Baltimore oriole, field sparrow and blue-winged warbler are discussed further in Section 6.7.

5.5.2 Bats

5.5.2.1 Habitat Assessment

Based on the habitat assessment, three general areas of the site were assessed to have potential to provide suitable maternity roost habitat for bats. These areas include:

- Deciduous forest (FOD5-4 and FOD3-1) at the south end of the site
- Open cultural woodland (CUW-A) in the east-central portion of the site
- Naturalized scots pine-deciduous mixed plantation (CUP2) in the central portion of the site

These three areas contained a high density of large diameter (i.e., greater than 30 cm in diameter at breast height [DBH]) trees or snags with cavities, peeling bark, or leaf clumps / squirrel nests that may provide roosting habitat for tree-roosting SAR bats, including little brown myotis, northern myotis (*Myotis septentrionalis*) and tri-colored bat (*Perimyotis subflavus*) (ECCC 2015).

In addition to the treed areas, several features were identified on the site with potential to provide maternity roosting habitat for eastern small-footed myotis, which is not known to roost in trees and prefers rock piles, bedrock crevices and talus slopes (Humphrey 2017). Several small rock piles scattered throughout the site, and one larger boulder pile was observed in the northwest corner of the site. There is also an old rock fence line traversing the central portion of the coniferous plantation (CUP3-3), and an old concrete foundation in the cultural woodland (CUW-A) in the east-central portion of the site (Figure 2).

These broad areas were targeted for the active monitoring survey to help refine areas of higher potential habitat for detailed acoustic monitoring in the third stage of bat surveys.

5.5.2.2 Active Monitoring

A single bat, identified as little brown myotis, was detected both visually and by the handheld EMT in the deciduous forest (FOD3-1) in the southeast corner of the site (Figure 2). The bat was observed flying along the edge of the driveway adjacent to the deciduous forest (FOD3-1), and may have been feeding in the forest opening along the driveway. Three other bat passes were recorded in this area including a pass classified as unknown myotis species and three passes classified as big brown bat (*Eptesicus fuscus*) or silver-haired bat (*Lasionycteris noctivagans*).

5.5.2.3 Acoustic Survey

In total, five bat species were identified during the acoustic survey. Additional bat passes were identified as unknown myotis species, high frequency unknown species, low frequency unknown species and big brown bat or silver-haired bat passes. The mean bat passes per night with standard deviation for all bat species at the stationary detectors is included in Table 4. The total and maximum number of passes of myotis species is provided in Table 5.

Table 4: Mean (Standard Deviation) Bat Passes per Night at Acoustic Monitoring Stations from June 14 – July 6, 2017[1]

Station	# of Nights Surveyed	Total Passes per Night (all bats)	Bat Species or Call Frequency Type										
			HiF total[2]	LoF total[2]	LoF Unknown Species[3]	HiF Unknown Species[4]	Hoary Bat	Silver-haired Bat	Big Brown Bat	Big Brown or Silver-haired Bat	Unknown Myotis	Little Brown Myotis	Small-footed Myotis
1	12	21.75(12.85)	9.17(12.1)	12.58(5.28)	0.5(1)	0.17(0.58)	4.67(2.93)	3(1.81)	1.83(1.85)	2.58(2.19)	1.92(1.93)	0.5(0.67)	6.58(10.76)
2	12	32.83(16.9)	1.33(1.56)	31.5(16.35)	9.58(7.59)	0(0)	3.58(3.26)	4.5(3.15)	5.33(7.68)	8.5(6.46)	0.42(0.67)	0.75(0.97)	0.17(0.39)
3	11	14(13.31)	0.18(0.4)	13.82(13.44)	1.18(1.78)	0.18(0.4)	2.27(2.53)	6.18(7.8)	2.27(2.15)	1.91(1.51)	0(0)	0(0)	0(0)
4	11	86.45(40.64)	2.82(2.04)	83.64(40.47)	32.18(14.06)	0.36(0.67)	6(2.37)	10.64(5.14)	18.36(15.66)	16.45(11.72)	1.91(1.92)	0.18(0.4)	0.36(0.81)

[1] - Results presented in the format of X (Y), where X = mean number of bat passes per night and Y = standard deviation

[2] - HiF = High Frequency; LoF = Low Frequency

[3] - Recordings classified as bats with low frequency calls but could not be classified to the species level, typically including hoary bat, big brown bat and silver-haired bat

[4] - Recordings classified as bats with high frequency calls but could not be classified to the species level, typically including red bat, tricolored bat and all bats in the myotis genera

Table 5: Total Passes and Maximum Passes within One Night for SAR Bats at Acoustic Monitoring Stations from June 14 – July 6, 2017

Station	Bat Species or Call Frequency Type							
	Total Unknown HiF[1]	Max Unknown HiF[1]	Total Myotis Species	Max Myotis Species	Total Little Brown Myotis	Max Little Brown Myotis	Total Eastern Small-footed Myotis	Max Eastern Small-footed Myotis
1	2	2	23	5	6	2	79	35
2	0	0	5	2	9	3	2	1
3	2	1	0	0	0	0	0	0
4	4	2	21	5	2	1	4	2

[1] - HiF = High Frequency; LoF = Low Frequency

Overall, the level of bat activity at all the stations was low to moderate, compared to other sites in southern Ontario. Bat activity on the site ranged from a minimum of 14 passes per night (recorded at station 3) to a maximum of about 86 passes per night (recorded at station 4). The most frequently recorded bat species across all stations on the site was (in order) big brown bat, silver-haired bat, hoary bat (*Lasiurus cinereus*), eastern small-footed myotis, and little brown myotis.

Little brown myotis, eastern small-footed myotis and an unknown Myotis species were recorded at stations 1, 2 and 4. Unknown high-frequency bat species passes (potentially indicative of Myotis species) were also recorded at stations 1, 3, and 4. Northern myotis or tri-colored bat were not recorded at any of the stations. Although, no confirmed SAR bat passes were recorded at station 3, the two high frequency bat species are likely SAR bat passes.

The number of bat passages recorded by a detector may include multiple passes by the same bat individual and therefore are only indicative of presence/absence, rather than the number of bats that are potentially using the study area. The results of the acoustic survey, combined with the habitat assessment, indicate that there is a moderate potential for bat maternity roost habitat in the mixed forest (B108) on the Site and in the Study Area.

Significant and Sensitive Species

The majority of bat species observed during the field surveys are secure and common in Ontario (S4). One species (eastern small-footed myotis) is ranked S2S3 (imperiled to vulnerable). One species (big brown bat) is secure and common globally (G5), one species (eastern small-footed myotis) is apparently secure globally (G4), one species (little brown myotis) is vulnerable globally (G3), and two species (hoary bat and silver-haired bat) are considered vulnerable to apparently secure globally (G3G4) (Appendix D).

Eastern small-footed myotis is designated endangered under the ESA and is also considered locally significant and rare within the County (Dougan and Associates 2009). A total of 85 passes recorded at stations 1, 2 and 4 were confirmed as eastern small-footed myotis with 93% of the passes recorded at station 1 near the old concrete foundation and concrete rubble piles, in the southeast portion of the site (Figure 2). An additional 49 bat passes were unable to be attributed to a specific species (due to the quality or ambiguity of the recording) and identified as unknown myotis. Because only two myotis species were recorded on the site (i.e., little brown myotis and eastern small-footed myotis), and the number of eastern small-footed myotis recordings was more than double the number of recordings of little brown myotis, it is considered likely that many of the unknown myotis passes are also eastern small-footed myotis.

Little brown myotis is also designated endangered under the ESA. A total of 17 passes were confirmed as little brown myotis. The highest activity was recorded in the southern portion of the site at station 1 (6 bats) and station 2 (9 bats) (Figure 2).

Although northern myotis and tri-colored bat, both designated endangered under the ESA, use similar maternity roost habitat as little brown myotis, neither species was recorded on the site during acoustic surveys, and there is low potential for either species to occur on the site. No adverse impacts to northern myotis or tri-colored bat are expected as a result of the proposed extraction, and no further analysis is warranted.

Eastern small-footed myotis and little brown myotis are discussed further in Section 6.1.

5.5.3 Other Wildlife

Two mammals and one amphibian species were observed during field surveys conducted on the site (Appendix D).

Significant and Sensitive Species

All three species are secure and common in Ontario and globally (S5; G5) (Appendix D). No other wildlife SAR or regionally significant or rare wildlife species were observed on the site or in the study area.

6.0 ASSESSMENT OF SIGNIFICANT NATURAL HERITAGE FEATURES

This section assesses the natural heritage features and functions (as outlined in Section 2.0) located within the study area. The following sources were used during the assessment of features:

- Natural Heritage Reference Manual (NHRM; MNR 2010)
- Significant Wildlife Habitat Technical Guide (SWHTG; MNR 2000)
- Significant Wildlife Habitat Mitigation Support Tool (SWHMiST; MNRF 2014)
- Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF 2015)

6.1 Habitat of Endangered or Threatened Species

The MNRF designates “significant” or critical habitat that is necessary for the maintenance, survival, and/or recovery of naturally occurring or reintroduced populations of endangered and threatened species, and where those areas of occurrence are occupied or habitually occupied by the species during all or any part(s) of their life cycles.

Two species designated endangered under the ESA (eastern small-footed myotis and little brown myotis) and one species designated threatened under the ESA (bank swallow) were observed on the site during field surveys.

Although bank swallow was observed flying over the site during field surveys, no suitable nesting habitat was identified on the site or within the study area. Foraging habitat off-site within the study area will not be altered or removed, and bank swallow is not expected to be impacted as a result of the proposed extraction. Further analysis is not warranted.

A relatively high number of eastern small-footed myotis passes were recorded during acoustic surveys on the site compared to other sites in southern Ontario. The majority of passes were recorded near the old concrete foundation and concrete rubble piles, in the southeast portion of the site (Figure 2). This area was identified as having the best potential to provide maternity roosting sites for this species. Other rock piles scattered throughout the site, and the old rock fence line traversing the central portion of the coniferous plantation (CUP3-3) (Figure 2), may also provide suitable habitat. Stations 2 and 4 were located in proximity to rock piles and eastern small-footed myotis passes were recorded at both stations. Based on the number of eastern small footed myotis passes recorded, and the presence of suitable roosting habitat, the site is considered likely maternity roost habitat for this species. Because suitable roosting habitat will be removed as part of the proposed extraction, eastern small-footed myotis is carried forward to the impact assessment (Section 7.1).

Potential habitat for little brown myotis was identified on the site and in the study area in the deciduous forest (FOD5-4) in the southwest portion of the site (Figure 2). The level of little brown myotis activity recorded across all four stations on the site is relatively low compared to other sites in southern Ontario with similar moderate to high quality habitat, indicating there is low potential for this species to use habitat on the site for maternity roosting. In addition, extraction will be setback approximately 5 m from the deciduous forest where the highest little brown myotis activity was recorded. With the implementation of appropriate best management practices, no adverse impacts to little brown myotis individuals or habitat are expected. Further analysis is not warranted.

No other species designated threatened or endangered under the ESA were assessed to have a moderate or high potential to occur on the site or in the study area based on the results of the field surveys and SAR screening (Appendix C).

6.2 Fish Habitat

There are no surface water features on the site. Off-site, within the study area, there are anthropogenic ponds to the north, east and west of the site. However, these are constructed features associated with aggregate extraction that are not known to contain fish, nor are they hydrologically connected to any fish-bearing waterbody.

Mill Creek and its tributaries are known to support several fish species such as creek chub (*Semotilus atromaculatus*), rock bass (*Ambloplites rupestris*), fathead minnow (*Pimephales promelas*), white sucker (*Catostomus commersonii*), brook stickleback (*Culaea inconstans*), rainbow darter (*Etheostoma caeruleum*), central mudminnow (*Umbra limi*), common shiner (*Luxilus cornutus*), bluntnose minnow (*Pimephales notatus*), blacknose dace (*Rhinichthys atratulus*). It also supports sensitive coldwater species such as brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis fontinalis*) (MNRF 2018d).

In 2005, a cumulative impact assessment was conducted to assess the potential local effects of the numerous existing below-water aggregate operations within the Mill Creek subwatershed (Golder 2006). The assessment considered impacts of aggregate extraction on stream flow, stream temperature and sensitive fish populations (including brook trout and brown trout) in Mill Creek (Golder 2006). The assessment concluded that there were no detectable adverse effects of the existing aggregate extraction on these parameters in Mill Creek (Golder 2006).

Based on the water balance assessment (Golder 2019) completed for the proposed expansion, no adverse effects on baseflow contributions are expected to downgradient surface water receivers as a result of extraction. In addition, prior studies and evidence from on-site groundwater temperature collections (thermal plume originating from adjacent CBM Puslinch Pit) suggest that thermal plumes originating from the proposed Lanci Pit operations will not migrate greater than 250 m downstream. No aquatic habitat (including Mill Creek) lie within these distances and off-site migration of a thermal plume will not cause any adverse impacts, especially given the location of other ponds to the west, north and east. Based on this assessment, the proposed extraction is not expected to contribute any additional cumulative impacts within the Mill Creek subwatershed. Overall no adverse impacts to surface watercourses in the vicinity of the site, including Mill Creek are predicted. Further analysis is not warranted.

6.3 Significant Wetlands

Significant wetlands are areas identified as provincially significant by the MNRF using evaluation procedures established by the Province, as amended from time to time (MMAH 2014). Wetlands are assessed based on a range of criteria, including biology, hydrology, societal value and special features (MNRF 2019e).

There are no PSWs, or other unevaluated wetlands, on the site or in the study area. Further analysis is not warranted.

6.4 Significant Woodlands

Woodlands can vary in their level of significance at the local, regional and provincial levels. Significant woodlands are an area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history (MMAH 2014). Where local municipalities have not defined or mapped significant woodlands, these features are to be identified using criteria established by the MNRF as included in the Natural Heritage Reference Manual (NHRM) for Policy 2.3 of the PPS (MNR 2010). The County's OP (Wellington 2017) defines and maps significant woodlands within the County and was therefore used to identify and assess significant woodlands within the study area.

According to the County's OP (Wellington 2017), significant woodlands in the Rural System are defined as natural woodlands that are 4 ha or larger, or plantations over 10 ha, in size. Significant woodlands are mapped as part of the Greenlands system on Schedule A7 of the County's OP (Wellington 2017). According to Schedule A7, the deciduous forest at the south end of the site (i.e., generally corresponding to the FOD5-4 and areas of FOD3-1 south of the residential driveway) and deciduous forest off-site, in the southern portion of the study area (i.e., FOD) (Figure 2) are part of the Greenlands system.

These same areas of deciduous forest (generally FOD5-4, FOD3-1 and FOD) are mapped as a Significant Woodland in the Rural System in the Wellington County Natural Heritage System mapping (Wellington 2018). Significant woodland mapping in the Rural System was based on woodlands meeting any of the following ecological threshold criteria (GRCA 2018):

- Greater than 4 ha in size and greater than 30 m in width
- Woodlands of any size contained by, or within 30 m of, another natural heritage component (meeting threshold criteria)
- Woodlands containing a rare vegetation community or species (i.e., ranked S1-S3 or G1-G3)
- Woodlands containing 10+ trees/ha greater than 100 years old, or
- Woodlands containing 10+ trees/ha greater than 50 cm in diameter

Although there are areas of plantation (CUP3-3, CUP3-2 and CUP2) contiguous with the northern boundary of the mapped significant woodland on site, the combined area of plantation is less than 10 ha and does not meet County criteria as defined in the OP (Wellington 2017) to be considered part of the significant woodland unit. Furthermore, the plantation (CUP3-3) immediately adjacent to the significant woodland boundary is immature with an open canopy and represents a gap in the continuity of the canopy structure with the mature deciduous forest (FOD5-4) to the south. These plantation units are also not mapped as part of the Greenlands system according to

Schedule A7 of the County's OP (Wellington 2017), nor are they mapped as a Significant Woodland in the County's Natural Heritage System mapping (Wellington 2018).

The edge of the significant woodland was verified in the field and delineated with a handheld GPS. The majority of the field-verified woodland edge coincided with the County's mapping. There were some minor discrepancies between the two edges in the southeastern corner of the site. These discrepancies were discussed with the County and Township and both agencies agreed that changes to the mapped edge were permitted based on the field assessment. The boundary followed the edge of the mature deciduous forest on the site, which generally corresponded to the sugar maple-ironwood deciduous forest (FOD5-4) and the poplar deciduous forest (FOD3-1) south of the hydro corridor (Figure 1). The portion of poplar deciduous forest (FOD3-1) north of the hydro corridor was younger, with smaller trees, a more open canopy and had a higher component of trembling aspen compared to the community south of the hydro corridor, suggesting recent influence from disturbance (e.g., clearing). Further, the gap created by the hydro corridor and driveway results in a discontinuous canopy between the two FOD3-1 units and indicates they should be treated as separate woodland features.

The small hump in the significant woodland edge that extends north of the driveway is intended to encompass a small remnant area of mature forest that is separated from the southern FOD3-1 unit by a narrower gap measuring less than 20 m created by the driveway only. The boundary of the significant woodland and associated dripline in the southern portion of the site may be reviewed in the future in conjunction with additional fieldwork.

The proposed extraction boundary will be set back approximately 5 m from the dripline of the significant woodland, which is generally located in the southern portion of the proposed licence area of the site (Figure 2). This recommended setback distance is based on the distance required for protection of the anchor and transport roots. Anchor roots, located under the dripline of a tree, are the largest component of the root system and are connected to long transport roots. The anchor and transport roots compose the main structural framework for trees. Cutting of these roots can lead to destabilization of the tree and cause it to fall over. The third component of the root system, feeder roots, are non-woody roots that extend from the transport roots and form fans of slender roots that absorb air, water and nutrients for the tree (Toronto 2016).

Municipalities such as the City of Toronto (Toronto 2016), City of Guelph (Guelph 2018) and Centre Wellington (Centre Wellington 2018) recommend minimum tree protection distances based on the tree DBH, which can extend up to 6 m from the tree trunk for trees measuring up to 100 cm DBH. Larger protection distances are recommended for woodland or ravine features where the combined root network may be larger. Protection distances for woodland or ravine features may extend up to 12 m from the outside of the tree trunk for trees measuring up to 100 cm DBH (Toronto 2016; Guelph 2018).

The significant woodland on the site is composed of mature trees generally measuring between 30 cm and 60 cm DBH with some larger individuals. For trees measuring up to 60 cm DBH at the edge of woodland, the recommended protection distance is the dripline or 7.2 m from the tree trunk (whichever is greater). The dripline is defined as the outermost extent of the crown. The dripline for large, mature trees (such as those that occur at the edge of the significant woodland on site) may extend several metres from the trunk of the tree. Therefore, the combined distance of the dripline and the 5 m setback from the dripline edge would be generally larger than the recommended minimum protection distance.

With the implementation of best management practices (Section 8.2.1), no adverse impacts on the significant woodland are expected due to the proposed extraction. Further analysis is not warranted.

6.5 Significant Valleylands

Significant valleylands should be defined and designated by the planning authority. General guidelines for determining significance of these features are presented in the Natural Heritage Reference Manual (NHRM) for Policy 2.3 of the PPS (MNR 2010). Recommended criteria for designating significant valleylands under the PPS include prominence as a distinctive landform, degree of naturalness, importance of its ecological functions, restoration potential, and historical and cultural values.

There are no significant valleylands on the site or in the study area. Further analysis is not warranted.

6.6 Significant Areas of Natural and Scientific Interest

Significant ANSIs are areas identified as provincially significant by the MNRF using evaluation procedures established by the Province, as amended from time to time.

There are no ANSIs on the site. Off-site, within the study area, there is one ANSI (known as the Galt Moraine Earth Science ANSI) located 120 m east of the site (Figure 1). Because the ANSI is an Earth Science ANSI off-site, outside the predicted groundwater zone of influence, it is not expected to be adversely impacted by the proposed extraction. Further analysis is not warranted.

6.7 Significant Wildlife Habitat

Significant wildlife habitat (SWH) is one of the more complicated natural heritage features to identify and evaluate. The NHRM includes criteria and guidelines for designating SWH. There are two other documents, the Significant Wildlife Habitat Technical Guide (SWHTG) and the Significant Wildlife Habitat Mitigation Support Tool (SWHMiST) (MNR 2000 and MNRF 2014), that can be used to help decide what areas and features should be considered significant wildlife habitat. These documents were used as reference material for this study.

There are four general types of significant wildlife habitat: seasonal concentration areas, migration corridors, rare or specialized habitats, and species of conservation concern. The specific habitats considered in this report are evaluated based on the criteria outlined in the Ecoregion 6E Criterion Schedule (MNRF 2015). All types of SWH are discussed below in relation to the Site and the proposed extraction.

6.7.1 Seasonal Concentration Areas

Seasonal concentration areas are those areas where large numbers of a species congregate at one particular time of the year. Examples include deer yards, amphibian breeding habitat, bird nesting colonies, bat hibernacula, raptor roosts, and passerine migration concentrations. If a SAR, or if a large proportion of the population may be lost if significant portions of the habitat are altered, all examples of certain seasonal concentration areas may be designated.

The SWHTG (MNR 2000) and Ecoregion 6E Criterion Schedule (MNRF 2015) identifies the following 12 types of seasonal concentrations of animals that may be considered significant wildlife habitat:

- winter deer yards and congregation areas
- colonial bird nesting sites
- waterfowl stopover and staging areas
- shorebird migratory stopover areas

- landbird migratory stopover areas
- raptor winter feeding and roosting areas
- reptile hibernacula
- turtle wintering areas
- bat hibernacula
- bat maternity colonies
- bat migratory stopover areas
- migratory butterfly stopover areas

There are no large, non-agricultural open fields in the study area to provide terrestrial waterfowl stopover or staging areas. No shorebird migratory or aquatic waterfowl stopover areas were identified in the study area during field surveys. There are no large areas of forest with adjacent meadow habitat in the study area to support raptor wintering areas. No exposed bedrock that extend below the frost line that would support bat or reptile hibernacula were identified in the study area during field surveys. No colonial bird nesting sites were identified in the study area during field surveys. There are no designated deer winter yards or winter congregation areas on the site or in the study area. Because the study area is further than 5 km from Lake Ontario, migratory butterfly stopover areas and landbird migratory stopover areas are not applicable.

6.7.2 Migration Corridors

The SWHTG (MNR 2000) defines animal movement corridors as elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another. This is generally in response to different seasonal habitat requirements. For example, trails used by deer to move to wintering areas or areas used by amphibians between breeding and summer habitat. To qualify as significant wildlife habitat, these corridors would be a critical link between habitats that are regularly used by wildlife.

There are no mapped corridors on the site. The study area is located at the northern edge of a large natural heritage system feature (i.e., the Greenlands System as mapped by the County) (Figure 1). The areas to the north, east and west of the site are pit ponds associated with aggregate extraction operations, and provide limited wildlife habitat. There are no areas of specialized habitat, such as wetlands, watercourses or small ponds, to the north of the site that would support critical life stages for wildlife using forested habitats to the south. The pit ponds are an existing barrier to movement that generally encourages wildlife movement in an east-west direction across the southern portion of the site. The deciduous forest (FOD5-4, FOD3-1, FOD) in the southern portion of the site and study area is part of the east-west corridor in the study area. A small portion of the northern tip of the corridor, corresponding to the poplar deciduous forest (FOD3-1) north of the hydro corridor and driveway (Figure 2), will be removed as part of the proposed extraction. The area to be removed is restricted to the northern portion of the corridor. As such, the overall function of any movement corridor across the southern end of the site and study area will be unaffected. Further, the portion of the corridor to be retained on the site is part of the significant woodland is considered of higher quality in terms of form and function (i.e., larger, mature trees with higher canopy cover and diversity of species).

The site does not provide any critical linkage function, or general movement function, in the north-south direction, and the proposed extraction will have a negligible impact to the east-west movement corridor function of the regional natural heritage system. Further analysis is not warranted.

6.7.3 Specialized Habitats

Specialized habitats are microhabitats that provide a critical resource to some groups of wildlife. Examples include salt licks for ungulates and groundwater seeps for wild turkeys.

The SWHTG (MNR 2000) and Ecoregion 6E Criterion Schedule (MNRF 2015) defines seven specialized habitats that may be considered SWH. They are:

- habitat for area-sensitive species
- amphibian breeding habitat (woodlands and wetlands)
- turtle nesting habitat
- specialized raptor nesting habitat
- waterfowl nesting areas
- bald eagle and osprey habitat
- seeps and springs

No seeps or springs, or suitable amphibian breeding habitat, were identified on the site or in the study area during field surveys. No bald eagle or osprey individuals, and no nests, were observed during field surveys. No suitable wetland habitat was identified on the site or in the study area to support waterfowl and no consideration of waterfowl nesting habitat is required. Although there are pit ponds in the study area to the north, east and west of the site, these ponds are considered unsuitable for turtles due to the pond depth and lack of aquatic vegetation and soft substrates, in addition to the active extraction that is taking place at each pond location. Because there is no aquatic habitat for turtles within the study area, consideration of turtle nesting habitat is not required.

The deciduous forest on site and in the study area (FOD5-4, FOD3-1 south of the hydro corridor, FOD) is contiguous with an extensive forest system that extends to the south, west and east of the study area that may support area sensitive breeding bird species. Two area sensitive bird species that use deciduous forest habitat were observed on the site during breeding bird surveys: ovenbird and scarlet tanager. As discussed in Section 5.6.1, ovenbird was assessed to be a probable breeder and scarlet tanager was assessed to be a possible breeder in the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2). There is no interior forest habitat (defined as forest at least 100 m from the edge) on the site to support these species. Off-site, within the study area, interior forest habitat is available beginning approximately 45 m to the south of the southern site boundary (Figure 2). This interior forest habitat may also provide suitable woodland raptor nesting habitat. However, none of the indicator raptor species were observed during any of the field surveys.
The proposed extraction boundary will be set back approximately 5 m from the northern edge of the deciduous forest (FOD5-4 and FOD3-1 south of the hydro corridor) on site (Figure 1). As such, no change to the amount of interior forest habitat available in the study area is expected, and no adverse impacts to ovenbird, scarlet tanager, or woodland raptors are expected as a result of the proposed extraction. Further analysis is not warranted.

A third area sensitive bird species, red-breasted nuthatch, was observed on the site during breeding bird surveys, and was assessed to be a possible breeder within the coniferous woodland (WOC) at the north end of the site (Figure 2). There is no interior coniferous forest habitat on the site or in the study area to support this species. There are large tracts of mixed and coniferous forest to the south and east of the study area which may support breeding habitat for this species. Although there is no interior forest habitat on the site, the coniferous woodland may still support this species. Approximately 1.4 ha (29%) of suitable habitat is expected to be removed as a result of the proposed extraction. However, there is additional habitat in the surrounding local landscape that likely provides higher quality conditions (i.e., interior forest habitat) for breeding. Removal of a minimal amount of habitat on the site is not expected to have any adverse impacts on the regional breeding population of red-breasted nuthatch. In addition, the implementation of best management practices (Section 8.2.1) will prevent adverse impacts to any individuals using habitat on the site. Further analysis is not warranted.

6.7.4 Rare Habitat

This category includes vegetation communities that are considered rare in the province. Generally, communities assigned an SRANK of S1 to S3 (extremely rare to rare-uncommon) by the NHIC could qualify. It is assumed that these habitats are at risk and that they are also more likely to support rare species and other features that are considered significant.

No rare vegetation communities were identified on the site or in the study area during the field surveys. No further analysis is warranted.

6.7.5 Habitat for Species of Conservation Concern

Habitat for species of conservation concern (SOCC) includes habitat for three groups of species:

- Species that are rare, those whose populations are significantly declining, or have a high percentage of their global population in Ontario
- Species listed as special concern under the ESA
- Species listed as threatened or endangered under SARA

Rare species are considered at five levels: globally rare, nationally rare, provincially rare, regionally rare, and locally rare (i.e., in the municipality). This is also the order of priority that should be attached to the importance of maintaining species. Some species have been identified as being susceptible to certain activities, and their presence may result in an area being designated significant wildlife habitat. Examples include species vulnerable to forest fragmentation and species such as woodland raptors that may be vulnerable to forest management or human disturbance. The final group of species of conservation concern includes species that have a high proportion of their global population in Ontario. Although they may be common in Ontario, they are found in low numbers in other jurisdictions.

The SWHTG (MNR 2000) and Ecoregion 6E Criterion Schedule (MNRF 2015) defines five specialized habitats that may be considered SWH. They are:

- marsh bird breeding habitat
- open country bird breeding habitat
- shrub/early successional bird breeding habitat

- terrestrial crayfish
- special concern and rare wildlife species

No marsh, open country or shrub/early successional bird breeding habitat was identified on the site or in the study area during field surveys. No habitat for terrestrial crayfish was identified on the site or in the study area during field surveys.

One species designated special concern under the ESA (wood thrush), and nine locally significant species (ovenbird, rose-breasted grosbeak, northern flicker, red-breasted nuthatch, red-bellied woodpecker, scarlet tanager, eastern towhee, pine warbler, and Baltimore oriole) were observed on the site during breeding bird surveys. Ovenbird, red-breasted nuthatch and scarlet tanager are discussed above in Section 6.7.3. Two additional species designated special concern under the ESA were assessed to have moderate potential to occur on the site or in the study area based on the availability of suitable habitat (Appendix C): monarch and yellow-banded bumble bee (*Bombus terricola*).

Wood thrush and red-bellied woodpecker may breed in the deciduous forest (FOD5-4) in the southwest corner of the site (Figure 2). The proposed extraction boundary will be set back approximately 5 m from the edge of the deciduous forest habitat (i.e., FOD5-4) on the site. With the implementation of best management practices (Section 8.2.1), no adverse impacts on wood thrush and red-bellied woodpecker are expected due to the proposed extraction. Further analysis is not warranted.

Several of the locally significant bird species may breed in the open coniferous woodland (WOC), white pine plantation (CUP3-2), scots pine planation (CUP3-3) or naturalized scots pine-deciduous mixed plantation (CUP2) on the site (Figure 2). Based on the proposed extraction boundary, potential suitable habitat for the following species is expected to be removed: rose-breasted grosbeak, eastern towhee, northern flicker, pine warbler, and Baltimore oriole. However, potential suitable habitat on the site represents a small proportion of available suitable habitat within the study area and local landscape. Other areas of potential suitable habitat in the study area and surrounding local landscape can support any breeding pairs that may be displaced from the site. No adverse impacts on the breeding populations of rose-breasted grosbeak, northern flicker, eastern towhee, pine warbler, or Baltimore oriole in the County are expected due to the proposed extraction. In addition, the implementation of best management practices (Section 8.2.1) will prevent adverse impacts to any individuals using habitat on the site. Further analysis is not warranted.

Field sparrow, a locally significant bird species, may breed in the open coniferous cultural woodland (CUW-B) off-site, within the southwestern portion of the study area (Figure 2). The coniferous cultural woodland (CUW-B) is not within the proposed extraction area and no adverse impacts to field sparrow individuals or habitat are expected as a result of the proposed extraction. Further analysis is not warranted.

Although blue-winged warbler, a locally significant bird species, was observed on the site, there is no suitable breeding habitat on the site or within the study area. Because there is no breeding habitat on the site, no adverse impacts to blue-winged warbler is expected as a result of the proposed extraction. Further analysis is not warranted.

Monarch, designated special concern under the ESA and SARA, is found throughout the northern and southern regions of the province. This butterfly is found wherever there are milkweed (*Asclepius* spp.) plants for its caterpillars and wildflowers that supply a nectar source for adults. It is often found on abandoned farmland, meadows, open wetlands, prairies and roadsides, but also in city gardens and parks (COSEWIC 2010).

Open meadow areas, woodland openings and residential gardens in the east-central portion of the site, as well as roadside ditches, berms, and residential areas off-site, within the study area, may provide suitable foraging habitat for this species. In addition, common milkweed was observed on the site during field surveys and may support monarch reproduction. However, areas of suitable habitat on the site are small and isolated, and unlikely to support a large concentration of monarch individuals. A small portion of potential suitable habitat in the study area is expected to be removed as a result of the proposed extraction. There is abundant similar habitat in the surrounding landscape, and loss of minimal habitat on site is not expected to impact the regional population of monarch. Further analysis is not warranted.

Yellow-banded bumble bee, designated special concern under the ESA and not designated under SARA, is a forage and habitat generalist. Mixed woodlands are commonly used for nesting and overwintering, but it also occupies various open habitats including native grasslands, farmlands and urban areas. Nest sites are mostly abandoned rodent burrows (COSEWIC 2015). Areas of coniferous and deciduous forest throughout the site and southern portion of the study area may provide suitable nesting and overwintering habitat for this species. No mammal burrows were observed on the site during field surveys. A small area of potential suitable habitat in the study area is expected to be removed as a result of the proposed extraction. There is abundant similar habitat in the surrounding landscape, and loss of minimal habitat on site is not expected to impact the regional population of yellow-banded bumble bee. Further analysis is not warranted.

7.0 IMPACT ANALYSIS

7.1 Threatened and Endangered Species

Eastern small-footed myotis was observed on the site during field surveys and suitable maternity roost habitat features, including rock piles and a concrete foundation, were also identified on the site. Eastern small-footed myotis maternity roost habitat will be removed as part of the proposed extraction. An Information Gathering Form (IGF) will be prepared and submitted as part of ongoing consultation with the Ministry of Environment, Conservation and Parks (MECP) to discuss mitigation and/or permitting options for eastern small-footed myotis on the site.

8.0 REHABILITATION / MITIGATION / MONITORING

8.1 Rehabilitation Concept

The post-extraction rehabilitation plan has been designed to fit into the overall regional context and complement the existing topography and terrestrial and aquatic features in the area. Because the extraction is below-water, the overall final rehabilitation plan will consist of a lake surrounded by nearshore, riparian and upland habitats. Proposed rehabilitation of the extraction area will proceed progressively through the site (MHBC 2020).

The proposed final rehabilitation plan includes the creation of a pond (average annual water level of approximately 306 masl) including shallow shoreline areas and shoreline wetland areas. Shallow shoreline widths and depths will be varied to promote maximum diversity within the habitat for fish and wildlife. The natural influx of external organic matter (i.e., leaf litter) will be promoted along shoreline areas through management of forest edges and minimization of cleared areas between the extraction area and the deciduous forest to the south.

All plantings included in the rehabilitation plan will be locally native, non-invasive species that create habitat in the short term and promote natural succession processes. Aquatic plants will include shrubs such as red-osier dogwood (*Cornus sericea*) and slender willow (*Salix petiolaris*), and herbaceous plants such as water plantain (*Alisma plantago-aquatica*), lake sedge (*Carex lacustris*), swamp milkweed (*Asclepias incarnata*), softstem bulrush (*Schoenoplectus tabernaemontani*), and common cattail (*Typha* spp.). Shallow wetland habitats will be created through construction of submerged benches, approximately 0.25 to 0.75 m deep. Shallow emergent marsh vegetation (i.e., herbaceous species listed above) will be planted in water ±0.15 m deep and extend ±5 m from the shore and be interspersed with cover structures (e.g., boulders and root wads) in the shallow shoreline wetland areas. Organic material and topsoil will be added to the shoreline areas to promote shoreline vegetation. Basking logs, nesting platforms and boxes will be created for turtle, waterfowl and swallows respectively.

Side slopes will be rough graded to a 3:1 aspect to ensure stability. The slopes will be seeded with a mix of grasses and legumes consisting of native, non-invasive species. The side slopes will also be planted with trees to compensate for the loss of plantation area on the site. Trees should include a mixture of deciduous and coniferous species common to the local landscape, such as sugar maple, white pine, trembling aspen, American basswood, American beech, white cedar, white elm, and black cherry. It is recommended that ash (*Fraxinus* spp.) species in rehabilitation plantings be avoided due to the invasion of emerald ash borer.

8.2 Mitigation

8.2.1 General Best Management Practices

Standard Best Management Practices to mitigate damage to the adjacent natural features include the following:

- To comply with the MBCA, avoid removal of vegetation during the active season for breeding birds (April 15 – August 15), unless construction disturbance is preceded by a nesting survey conducted by a qualified biologist. If any active nests are found during the nesting survey, a buffer will be installed around the nest to protect against disturbance. Vegetation within the protection buffer cannot be removed until the young have fledged the nest.
- Consult with the MECP on permitting requirements for removal of habitat for eastern small-footed myotis. Additional conditions related to mitigation or monitoring may be stipulated as part of a permit under the ESA or MECP approval.
- Implement standard best management practices, including sediment and erosion controls, spill prevention, etc. during the construction phase of the project.

8.2.2 Significant Woodland

The following mitigation measures are recommended to minimize adverse impacts on the significant woodland at the southern end of the site:

- A 5 m setback from the dripline of the significant woodland will be established, reflecting the extraction area as presented on the Operations Plan of the Site Plans (MHBC 2020). This setback will be demarcated clearly in the field prior to commencement of operations. The boundary of the significant woodland and associated dripline may be reviewed in the future in conjunction with additional fieldwork.
- If gradients indicate there is potential for runoff to enter the significant woodland, implementation of sediment and erosion controls will occur prior to commencement of operations to prevent the runoff of suspended solids into the woodland, and prevent encroachment into the woodland during vegetation clearing in the setback area. In particular, in areas where potential runoff exists, in addition to the demarcation of the dripline, silt fencing (or similar) will be installed along the dripline of the significant woodland in those areas prior to commencement of activities on the site, including site preparation and vegetation clearing.
- Where installed, silt fencing will be maintained for the duration of the operations phase adjacent to the woodland and will include regular inspections for signs of damage or deterioration.
- Following rehabilitation of the southern portion of the site, any silt fencing or other erosion/sediment controls that had been installed, will be removed from the site.
- To avoid compacting the soil in the setback area (which can negatively impact tree roots) the use of heavy machinery should be minimized, particularly during wet periods (e.g., spring) when soil may already be saturated.

9.0 SUMMARY AND RECOMMENDATIONS

The proposed expansion of the existing Lanci Pit has been assessed for potential ecological impacts under the ARA Provincial Standards (Section 2.1), the Provincial Policy Statement (Section 2.2), Growth Plan for the Greater Golden Horseshoe (Section 2.6), policies of the County of Wellington (Section 2.7), as well as other relevant legislation, including the MBCA (Section 2.4) and ESA (Section 2.5).

Based on these analyses, it is expected that there will be no negative impacts to the significant natural features and functions in the Study Area. In addition, an ecologically based rehabilitation plan and preventive mitigation measures that will enhance the natural heritage system have been developed. These conclusions are based on the following recommendations:

- Sediment and erosion control measures will be installed along the dripline of the significant woodland in the southern portion of the site, in areas where runoff has the potential to enter the woodland, prior to commencement of activities (e.g., site preparation) and will be actively monitored and maintained for the duration of the proposed operations. Following rehabilitation of the southern portion of the site, the control measures will be removed.
- Soil compaction in the 5 m setback area from the dripline of the significant woodland will be avoided or minimized.
- General best management practices will be implemented, including:

  - To comply with the MBCA, avoid removal of vegetation during the active season for breeding birds (April 15 – August 15), unless construction disturbance is preceded by a nesting survey conducted by a qualified biologist. If any active nests are found during the nesting survey, a buffer will be installed around the nest to protect against disturbance. Vegetation within the protection buffer cannot be removed until the young have fledged the nest.
  - Consult with the MECP on permitting requirements for removal of habitat for eastern small-footed myotis. Additional conditions related to mitigation or monitoring may be stipulated as part of a permit under the ESA or MECP approval.
  - Implement standard best management practices, including sediment and erosion controls, spill prevention, etc. during the construction phase of the project.
- Permitting and/or mitigation requirements for eastern small-footed myotis will be determined in consultation with the MECP.
- The Site will be rehabilitated in accordance with the requirements of the rehabilitation plan developed with ecological concepts outlined in this report.

10.0 SITE PLAN NOTES

The following notes will be included on the Site Plan for the proposed Lanci Pit Expansion:

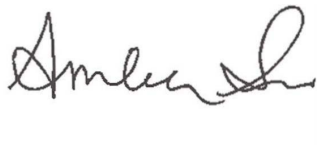
- Sediment and erosion control measures will be installed along the dripline of the significant woodland in the southern portion of the site, in areas where runoff has the potential to enter the woodland, prior to commencement of activities (e.g., site preparation) and will be actively monitored and maintained for the duration of the proposed operations. Following rehabilitation of the southern portion of the site, the control measures will be removed.
- Soil compaction in the 5 m setback area from the dripline of the significant woodland will be avoided or minimized.
- To comply with the *Migratory Birds Convention Act*, avoid removal of vegetation during the active season for breeding birds (April 15 – August 15), unless construction disturbance is preceded by a nesting survey conducted by a qualified biologist. If any active nests are found during the nesting survey, a buffer will be installed around the nest to protect against disturbance. Vegetation within the protection buffer cannot be removed until the young have fledged the nest.

11.0 CLOSURE

We trust this report meets your current needs. If you have any further questions regarding this report, please contact the undersigned. Curriculum Vitae are provided in Appendix E.

Signature Page

Golder Associates Ltd.



Amber Sabourin, HBSc (Env)
Ecologist

Heather Melcher, MSc
Principal, Senior Ecologist

AVS/HM/mp

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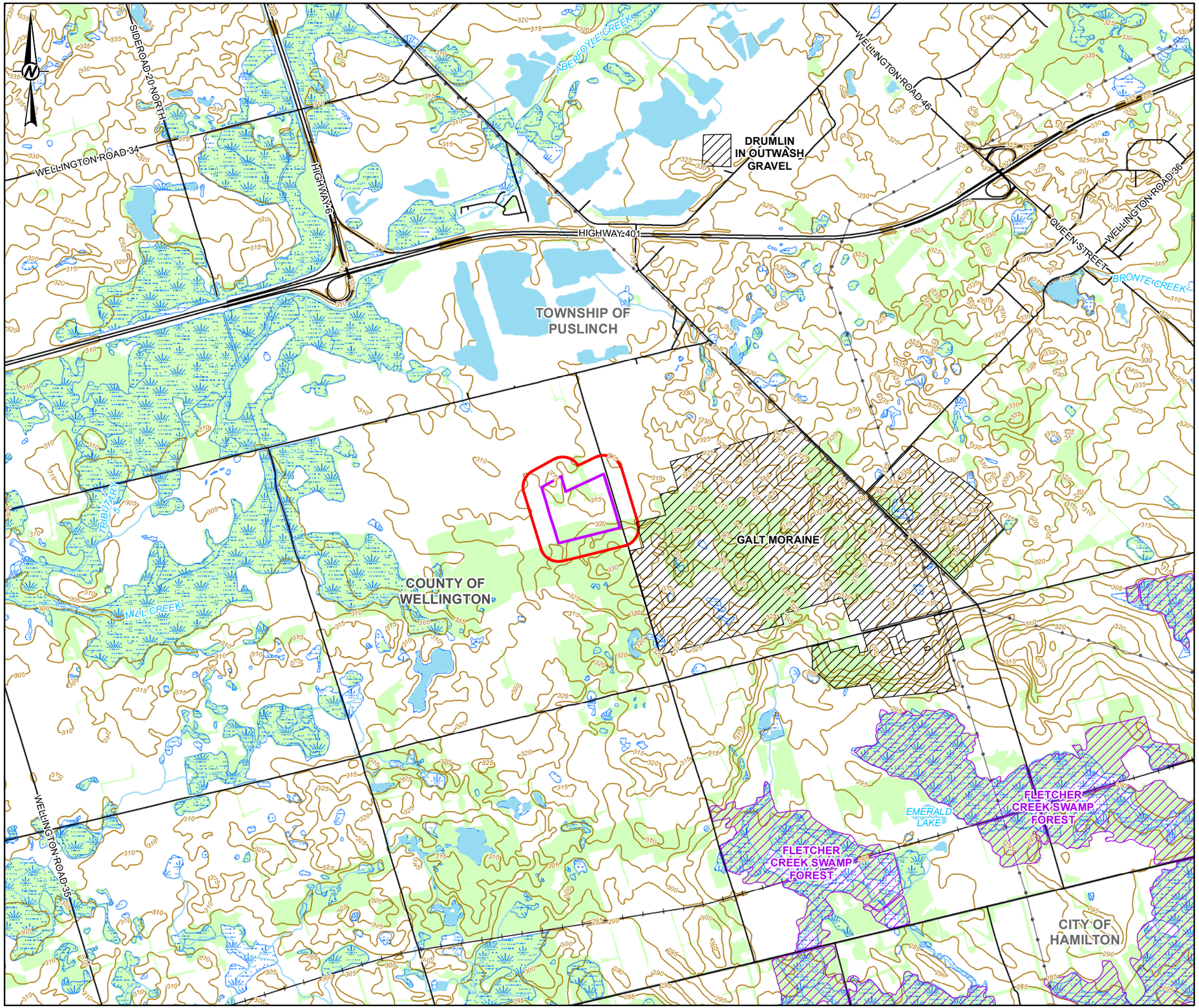
FIGURES



LEGEND

- Road
- Railway
- Utility Line
- Watercourse
- Contours (m)
- Waterbody
- Municipal Boundary
- Wetland
- Wooded Area
- ANSI, Earth Science
- ANSI, Life Science
- Study Area
- Licence Area Boundary

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NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

BASE DATA - MNR LIO, OBTAINED 2017
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BASE IMAGERY
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM: UTM ZONE 17N

CLIENT
ST. MARYS CEMENT INC. (CANADA)

PROJECT
LANCI PIT EXPANSION

TITLE
SITE LOCATION PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2020-01-27
DESIGNED	JT
PREPARED	MM/SO
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
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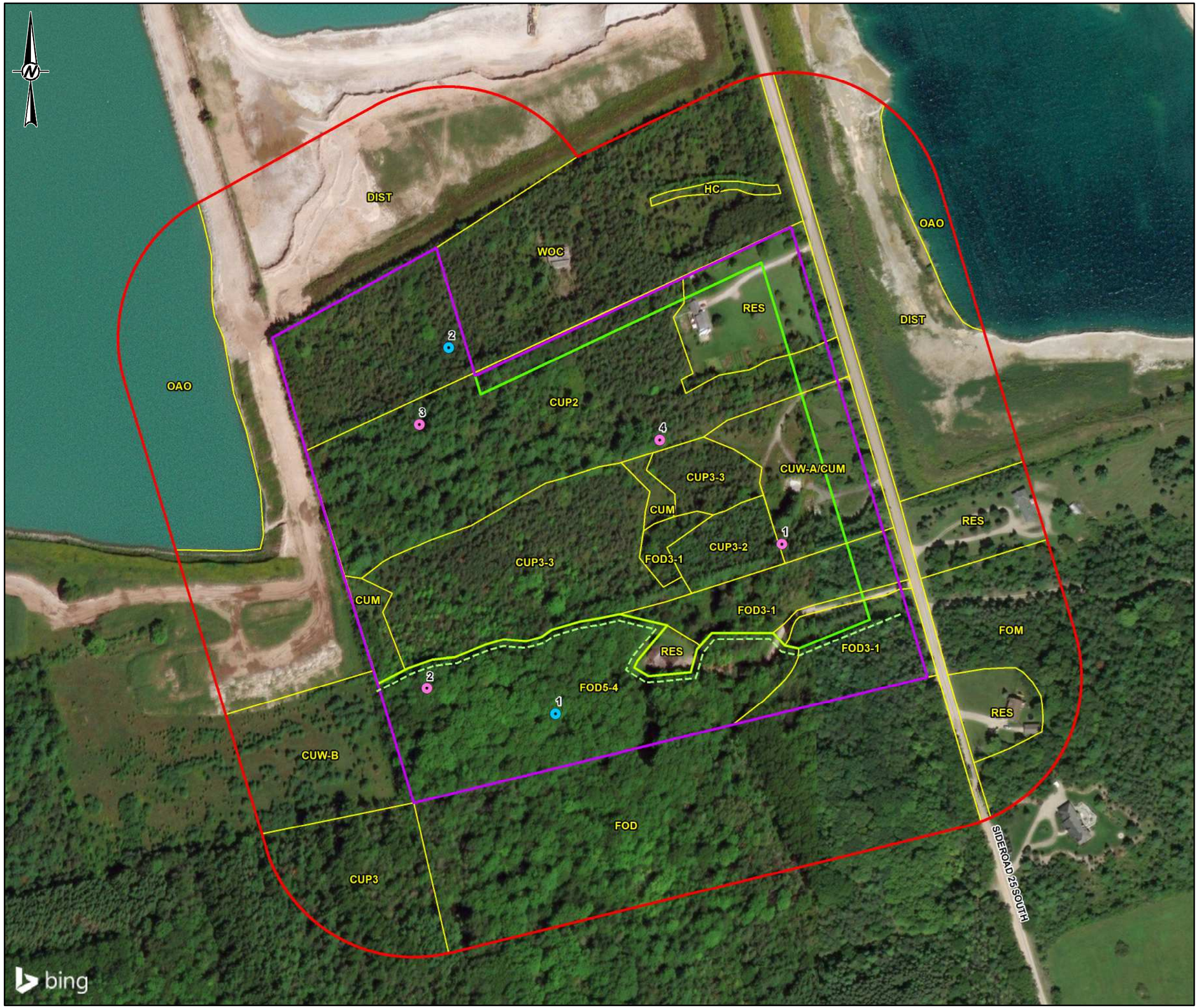

LEGEND

- Breeding Bird Survey
- Stationary Bat Detector
- Significant Woodlot Boundary
- Ecological Land Classification (ELC)
- Extraction Area Boundary
- Licence Area Boundary
- Study Area

ELC Code	ELC Community
FOD5-4	Sugar Maple – Ironwood Deciduous Forest
FOD3-1	Poplar Deciduous Forest
WOC	Scots Pine Coniferous Woodland
CUP2	Naturalized Scots Pine-Deciduous Mixed Plantation
CUP3-2	White Pine Coniferous Plantation
CUP3-3	Scots Pine Coniferous Plantation
CUW-A	Cultural Woodland
CUM	Cultural Meadow
RES	Residential
HC	White Cedar Coniferous Hedgerow
DIST	Disturbed
OAO	Open Aquatic
CUW-B	Open Coniferous Cultural Woodland
CUP3	Coniferous Plantation
FOD	Deciduous Forest
FOM	Mixed Forest

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1:3,000 METRES

REFERENCE(S)

1. BASE DATA - MNRF LIO, 2018
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ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY, © QUEENS PRINTER 2018
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DIGITALGLOBE ©CNES (2019) DISTRIBUTION AIRBUS DS
3. PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83 COORDINATE SYSTEM:UTM ZONE 17

CLIENT
ST. MARYS CEMENT INC. (CANADA)

PROJECT
LANCI PIT EXPANSION

TITLE
ECOLOGICAL LAND CLASSIFICATION

CONSULTANT
GOLDER

YYYY-MM-DD	2020-01-26
DESIGNED	PR
PREPARED	SO
REVIEWED	AS
APPROVED	HM

PROJECT NO.	CONTROL	REV.	FIGURE
1774274	0001	1	2

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APPENDIX A

Study Design

July 13, 2018 Project No. 1774274

Stephen May
CBM Aggregates
55 Industrial Street
Toronto, Ontario
M4G 3W9

TERMS OF REFERENCE FOR NATURAL ENVIRONMENT AND HYDROGEOLOGY TECHNICAL STUDIES IN SUPPORT OF LICENSING THE EXTENSION OF OPERATIONS AT THE CBM LANCI PIT, ABERFOYLE, ONTARIO

Dear Mr. May:

Golder Associates Ltd. (Golder) has been retained by CBM Aggregates Inc. (CBM), a division of Votorantim Cimentos North America (VCNA) to carry out technical studies in support of an application to the Ministry of Natural Resources and Forestry (MNRF) for a new below the water table licence under the Aggregate Resources Act (ARA) for the extension of the existing Lanci Pit near Aberfoyle, Ontario (the site).

The technical studies for the ARA licence application will include a number of disciplines, including hydrogeology, surface water, and natural environment.

The technical requirements of these supporting studies are outlined in the document titled Aggregate Resources Act of Ontario, Provincial Standards, Version 1.0 (Provincial Standards). Golder's proposed approach to the project has been developed to meet the general requirements of the Provincial Standards.

The above studies will be integrated to ensure that any key linkages between the hydrogeological and hydrological components, and the receiving natural environment features, are holistically evaluated to support the completion of the potential impact assessments for the proposed expansion of the pit and the development of appropriate mitigation measures, if required.

We respectfully request that you review this Terms of Reference for the proposed water resource and natural environment technical studies and provide comments as appropriate.

Integrated Water Resource Assessment

The following provides the proposed scope of the water resources program consisting of hydrogeology (groundwater) and hydrology (surface water) components.

Hydrogeology

The program for hydrogeology consists of the following:

- Data review (monitoring reports to date and published geologic reports);
- Review of Ministry of Environment, Conservation and Parks (MOECP) water well records (formerly Ministry of Environment and Climate Change) and door to door survey of residences and businesses within one kilometre of the site;
- Site characterization:
  - Borehole drilling, grain size analysis, and monitoring well installation;
  - Baseline groundwater quality monitoring (general water quality parameters including major ions, metals and petroleum hydrocarbons);
  - Hydraulic conductivity characterization (single well response tests);
  - Groundwater monitoring program (dataloggers to record water level and temperature hourly and downloaded quarterly);
- Analysis and qualitative impact assessment; and
- Level 1/2 Hydrogeology Technical Report.

Surface Water Resources

An assessment of surface water resources in the area of the proposed expansion, as well as adjoining areas that may be affected by proposed expansion, will be completed to allow for quantification of potential effects. The surface water resources assessment consists of the following:

- Background review of the available information pertaining to within approximately 500 metres of the site. the information reviewed will consist of:
  i) Aerial photographs and topographic, physiographic, and geologic mapping;
  ii) Published water resources reports; and
  iii) Any existing permits or monitoring reports from the site.
- Site visit to identify and confirm drainage features and catchment boundaries adjacent to the pit. The site reconnaissance is also used to corroborate the findings of the information review and identify local features that were not apparent from the background review.

- A water budget and pit water balance using a Thornthwaite water budget tool, developed for the existing pit footprint area (footprint) and the proposed expansion lands. The Thorthwaite water budget information will be used to develop an annual pit water balance for the existing operation. A future pit water balance will be estimated by including future footprint and land-use information.
- An effects assessment on features within the catchment of the pit expansion that documents the magnitude and significance of expected changes in the water budget of the pit expansion.
- A report that describes the surface water assessments, including a description of existing and proposed conditions and expected effects, and will ultimately be included as an appendix into the Level 1 and 2 Hydrogeology Technical Report.

Natural Environment Assessment

Golder is undertaking a work program for a Natural Environment Level 1 and 2 Assessment in order to evaluate the natural features in the vicinity of the site. Golder will assess the potential impacts of the proposed below water extraction on those features and their ecological functions and, if necessary, recommend measures to prevent or mitigate negative impacts on any significant features. The proposed program consists of the following:

- Background data compilation and review of existing documents and information sources which will be focused on designated features in the vicinity of the site;
- Species at Risk screening focussing on those species listed under the Ontario Endangered Species Act (ESA) and federal Species at Risk Act (SARA);
- Field surveys including:
  - i) Plant community assessment based on Ecological Land Classification;
  - ii) Botanical inventory;
  - iii) Two breeding bird surveys;
  - iv) Bat habitat, exit surveys and acoustic surveys using a bat survey protocol approved by the MNRF;
  - v) Wildlife habitat assessment and general wildlife surveys (Visual Encounter Surveys);
- Analysis of the data collected in conjunction with the background data compilation and integration with the hydrogeological and surface water studies to complete a potential impact assessment; and
- Natural Environment Level 1 and 2 Technical Report.

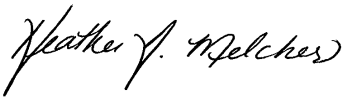
Closing

We trust this Terms of Reference meets with your approval. If you have any questions or comments, please do not hesitate to contact the undersigned.

Yours sincerely,

Golder Associates Ltd.

Amber Sabourin, B.Sc. (Hons)
Ecologist



Heather Melcher, M.Sc.
Associate, Senior Ecologist

HM/AVS/AS/JR/CD/wlm

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May 18, 2017 Project No. 1774274

Melinda Thompson, Management Biologist
Ontario Ministry of Natural Resources and Forestry - Guelph District Office
Melinda Thompson, Management Biologist
1 Stone Road West
Guelph, Ontario
N1G 4Y2

PROPOSED BAT SURVEY STUDY DESIGN FOR THE PROPOSED CBM LANCI PIT EXTENSION, ABERFOYLE, ONTARIO

Dear Ms. Thompson:

Golder Associates Ltd. (Golder) has been retained by CBM Aggregates Canada (CBM), a division of St. Mary's Cement, to conduct natural heritage studies in support of a licence application for expansion of the Lanci Pit, located in Aberfoyle, Ontario (the site). Golder submitted a Request for Information to the Guelph District Office of the Ontario Ministry of Natural Resources and Forestry (MNRF) on April 20, 2017 to request information on species at risk (SAR) and a meeting to discuss applying the Guelph District Bat Protocols to the site. The MNRF responded on April 28, 2017, and requested that Golder submit a proposed study design for comment before a meeting would be organized.

The site is approximately 18.5 ha in size and composed of four land parcels. The majority of the site is covered by coniferous plantation and forest. Deciduous forest covers most of the southernmost parcel of the site. Based on an initial site reconnaissance conducted in December 2016, the western end of the coniferous plantations are more naturalized than the eastern portions.

Based on preliminary field work and a desktop assessment, tri-colored bat (*Perimyotis subflavus*), little brown myotis (*Myotis lucifugus*), and northern myotis (*Myotis septentrionalis*) have potential to use habitat on the site. This letter outlines the proposed study design for surveying for endangered bat species under the *Endangered Species Act* on the site.

Methods

Habitat Assessment

An assessment of potential suitable habitat (including plant community classification, snag density estimates, and average tree diameter at breast height) will be conducted in May or early June. In addition to the overall habitat assessment, particular attention will be paid to documenting potential maternity roosts as described in the Guelph District MNRF *Survey Protocol for Species at Risk Bats within Treed Habitats: Little Brown Myotis, Northern Myotis & Tri-Colored Bat* (MNRF 2017) Based on the site reconnaissance and aerial imagery, it is anticipated that the deciduous forest in the southern end of the site will have the highest potential to provide suitable maternity roost habitat.

Golder Associates Ltd.
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Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Acoustic Monitoring

Following the habitat assessment, active monitoring will be conducted in the areas identified to have the highest quality potential maternity roost habitat on site during one night in June. Monitoring will take place between one half hour before sunset and one half hour after sunset (i.e., the time period when bats emerge from roosts). Two qualified biologists will walk slowly around the targeted habitat on site and record bat activity with handheld Echo Meter Touch (EMT) detectors. Using the real-time sonogram display, the biologists will distinguish between lower frequency bats, eastern red bat (*Lasiurus borealis*) and 40 kHz Myotis. The locations and time of detection of any 40 kHz Myotis bats will be recorded along with behavioural observations and notes on habitat and proximity to potential roost trees. All bat recordings collected during active monitoring will be analysed according to the methods described below.

Based on the findings of the habitat assessment and the active monitoring, up to four passive full-spectrum bat detector will be deployed in the best potential maternity roost habitat on the site, as identified during the active monitoring. The detectors will record nightly for at least 10 nights during the month of June or early July, when pregnant or lactating female bats would be near their maternity roosts. The detectors will be programmed to start recording one half hour before sunset and will record for a total duration of one hour. Based on previous studies completed within the Guelph District to date, it is assumed that four stationary detectors will be sufficient. However, the number and location of stationary detectors will be confirmed following the habitat assessment to be completed in May/June.

Data Analysis and Assessment

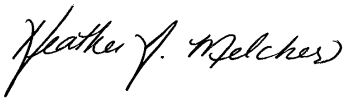
The data will be filtered in Kaleidoscope® to remove noise files and then the species identification will be conducted using the automated Sonobat NNE® program. Any recordings identified as a Myotis or a high frequency pass by Sonobat will be reviewed manually by a qualified bat acoustics specialist to verify the species.

If SAR bats are recorded within suitable maternity roost habitat during either the active or passive monitoring surveys it will be assumed that the plant community where the SAR bats were detected is roosting habitat for that species.

We trust that the proposed methods outlined in this letter provides sufficient information for the Guelph District MNRF to review. We look forward to discussing the study design with you further.

Sincerely,

GOLDER ASSOCIATES LTD.



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https://golderassociates.sharepoint.com/sites/11897g/shared documents/06 technical work/natural environment/bats/1774274-r-rev0-cbm lanci pit_bat study design-2017may18.docx

APPENDIX B

Vascular Plant List

Vascular Plant List

Scientific Name	Common Name	Origin[a]	S Rank[b]	G Rank[b]	ESA[c]
Trees (18 taxa)					
Abies balsamea	Balsam fir	N	S5	G5	—
Acer saccharum	Sugar maple	N	S5	G5	—
Betula papyrifera	White birch	N	S5	G5	—
Fagus grandifolia	Beech	N	S4	G5	—
Fraxinus americana	White ash	N	S4	G5	—
Juglans nigra	Black walnut	N	S4?	G5	—
Larix decidua	European larch	I	SNA	G5	—
Ostrya virginiana	Hop-hornbream (Ironwood)	N	S5	G5	—
Picea abies	Norway spruce	I	SNA	G5	—
Picea glauca	White spruce	N	S5	G5	—
Pinus resinosa	Red pine	N	S5	G5	—
Pinus strobus	White pine	N	S5	G5	—
Pinus sylvestris	Scots pine	I	SNA	GNR	—
Populus tremuloides	Trembling aspen	N	S5	G5	—
Prunus serotina	Black cherry	N	S5	G5	—
Quercus alba	White oak	N	S5	G5	—
Robinia pseudoacacia	Black locust	I	SNA	G5	—
Thuja occidentalis	Eastern white cedar	N	S5	G5	—
Tilia americana	Basswood	N	S5	G5	—
Ulmus americana	White elm	N	S5	G5	—
Small trees, shrubs and woody vines (6 taxa)					
Cornus foemina	Gray dogwood	N	S5	G5?	—
Juniperus virginiana	Eastern red cedar	N	S5	G5	—
Lonicera tatarica	Tartarian honeysuckle	I	SNA	GNR	—
Parthenocissus quinquefolia	Virginia creeper	N	S4?	G5	—
Rhamnus cathartica	Common buckthorn	I	SNA	GNR	—
Rhus typhina	Staghorn sumac	N	S5	G5	—
Rubus occidentalis	Black raspberry	N	S5	G5	—
Vitis riparia	Riverbank grape	N	S5	G5	—
Graminoids (2 taxa)					
Calamagrostis canadensis	Canada blue-joint	N	S5	G5T5	—
Carex sp.	Sedge sp.	—	—	—	—
Forbs (25 taxa)					
Allium tricoccum	Wild leek	N	S4	G5	—
Aquilegia canadensis	Wild columbine	N	S5	G5	—
Asarum canadense	Wild ginger	N	S5	G5	—
Asclepias syriaca	Common milkweed	N	S5	G5	—
Asparagus officinalis	Asparagus	I	SNA	G5?	—
Caulophyllum sp.	Blue cohosh	N	S5	G5	—
Centaurea stoebe	Spotted knapweed	I	SNA	GNR	—
Circaea canadensis	Enchanter's nightshade	N	S5	G5T5	—
Daucus carota	Wild carrot	I	SNA	GNR	—
Echium vulgare	Viper's bugloss	I	SNA	GNR	—
Erigeron philadelphicus	Philadelphia fleabane	N	S5	G5	—
Erythronium americanum	Yellow trout-lily	N	S5	G5	—
Fragaria virginiana	Common strawberry	N	SU	G5T5	—
Geranium robertianum	Herb-robert	N	S5	G5	—
Hypericum perforatum	Common St. John's-wort	I	SNA	GNR	—

Vascular Plant List

Scientific Name	Common Name	Origin[a]	S Rank[b]	G Rank[b]	ESA[c]
Iris versicolor	Blue-flag	N	S5	G5	—
Leucanthemum vulgare	Ox-eye daisy	I	SNA	GNR	—
Lotus corniculatus	Bird's-foot trefoil	I	SNA	GNR	—
Melilotus alba	White sweet clover	I	SNA	G5	—
Oxalis stricta	Yellow wood-sorrel	N	S5	G5	—
Prunella vulgaris	Heal-all	I	SNA	G5TU	—
Solidago juncea	Early goldenrod	N	S5	G5	—
Trifolium pratense	Red clover	I	SNA	GNR	—
Trillium grandiflorum	White trillium	N	S5	G5	—
Mosses (1 taxon)					
—	Unknown moss	—	—	—	—

[a] Origin: N = Native; (N) = Native but not in study area region; I = Introduced.

[b] Ranks based upon determinations made by the Natural Heritage Information Centre (2007).
G = Global; S = Provincial; Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.
E = Exotic; Q = Taxonomic questions not fully resolved; T = sub-specific taxon (taxa) present in the province.

[c] Status: F = Federal; P = Provincial; R = Regional (MNRF Southern Region); L = Local (County of Wellington).
END= Endangered; SC = Special Concern; THR = Threatened; UN = Undetermined.

APPENDIX C

Species at Risk Screening

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Amphibian	Jefferson salamander	*Ambystoma jeffersonianum*	END	END	END	S2	In Ontario, Jefferson salamander is found only in southern Ontario, along southern portions of the Niagara Escarpment and western portions of the Oak Ridges Moraine. Jefferson salamander prefers moist, well-drained deciduous and mixed forests with a closed canopy. It overwinters underground in mammal burrows and rock fissures, and moves to vernal pools and ephemeral wetlands in the early spring to breed. Breeding ponds are typically located in or near to forested habitats, and contain submerged debris (i.e. sticks, vegetation) for egg attachment sites. Ephemeral breeding pools need to have water until at least mid-summer (mid to late July) (Environment Canada 2016).	Low	There are no ponds to provide suitable breeding habitat on the site or in the study area.
Amphibian	Jefferson X Blue-spotted salamander, Jefferson genome dominates	*Ambystoma hybrid pop. 1*	—	—	—	S2	In Ontario, Jefferson x blue-spotted salamander prefers moist, well-drained deciduous and mixed forests with a closed canopy. It overwinters underground in mammal burrows and rock fissures, and moves to vernal pools and ephemeral wetlands in the early spring to breed. Breeding ponds are typically located in or near to forested habitats, and contain submerged debris (i.e. sticks, vegetation) for egg attachment sites. Ephemeral breeding pools need to have water until at least mid-summer (mid to late July) (Environment Canada 2016).	Low	There are no ponds to provide suitable breeding habitat on the site or in the study area.
Amphibian	Western chorus frog - Great Lakes St. Lawrence / Canadian Shield population	*Pseudacris triseriata*	—	THR	THR	S3	In Ontario, habitat of this amphibian species typically consists of marshes or wooded wetlands, particularly those with dense shrub layers and grasses, as this species is a poor climber. They will breed in almost any fishless pond including roadside ditches, gravel pits and flooded swales in meadows. This species hibernates in terrestrial habitats under rocks, dead trees or leaves, in loose soil or in animal burrows. During hibernation, this species is tolerant of flooding (Environment Canada 2015b).	Low	There are no wetlands or suitable aquatic habitat to support breeding on the site or in the study area.
Arthropod	Monarch	*Danaus plexippus*	SC	SC	END	S2N, S4B	In Ontario, monarch is found throughout the northern and southern regions of the province. This butterfly is found wherever there are milkweed (*Asclepius* spp.) plants for its caterpillars and wildflowers that supply a nectar source for adults. It is often found on abandoned farmland, meadows, open wetlands, prairies and roadsides, but also in city gardens and parks. Important staging areas during migration occur along the north shores of the Great Lakes (COSEWIC 2010).	Moderate	Open meadow areas in the east-central portion of the site may provide suitable foraging habitat for this species. In addition, milkweed was observed on the site during field surveys.
Arthropod	Rusty-patched bumble bee	*Bombus affinis*	END	END	END	S1	In Ontario, rusty-patched bumble bee is found in areas from the southern Great Lakes – St. Lawrence forest region southwards into the Carolinian forest. It is a habitat generalist, but it is typically found in open habitats, such as mixed farmland, savannah, marshes, sand dunes, urban and lightly wooded areas. It is cold –tolerant and can be found at high elevations. Most recent sightings in Ontario have been in oak savannah habitat with well-drained, sandy soils and moderately open canopy. It requires an abundance of flowering plants for forage. This species most often builds nests underground in old rodent burrows, but also in hollow tree stumps and fallen dead wood (Colla and Taylor-Pindar 2011). The only recent sightings in Ontario are from the Pinery Provincial Park.	Low	This species is only known to occur within Pinery Provincial Park in southwestern Ontario.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Arthropod	West Virginia white	*Pieris virginiensis*	SC	—	—	S3	In Ontario, west Virginia white is found primarily in the central and southern regions of the province. This butterfly lives in moist, mature, deciduous and mixed woodlands, and the caterpillars feed only on the leaves of toothwort (*Cardamine* spp.), which are small, spring-blooming plants of the forest floor. These woodland habitats are typically maple-beech-birch dominated. This species is associated with woodlands growing on calcareous bedrock or thin soils over bedrock (Burke 2013).	Low	Although there are wooded areas throughout the site and south portion of the study area, no host plants were observed during field surveys.
Arthropod	Yellow-banded bumble bee	*Bombus terricola*	SC	SC	SC	S2	This species is a forage and habitat generalist. Mixed woodlands are commonly used for nesting and overwintering, but it also occupies various open habitats including native grasslands, farmlands and urban areas. It is an early emerging species, making it likely an important pollinator of early blooming wild flowering plants (e.g. wild blueberry) and agricultural crops (e.g., apple). Nest sites are mostly abandoned rodent burrows (COSEWIC 2015).	Moderate	Wooded areas throughout the site and south portion of the study area may provide suitable nesting and overwintering habitat for this species.
Bird	Bald eagle	*Haliaeetus leucocephalus*	SC	—	NAR	S2N, S4B	In Ontario, bald eagle nests are typically found near the shorelines of lakes or large rivers, often on forested islands. The large, conspicuous nests are typically found in large super-canopy trees along water bodies (Buehler 2000).	Low	There is no suitable shoreline habitat on the site or in the study area to support nesting.
Bird	Bank swallow	*Riparia riparia*	THR	THR	THR	S4B	In Ontario, bank swallow breeds in a variety of natural and anthropogenic habitats, including lake bluffs, stream and river banks, sand and gravel pits, and roadcuts. Nests are generally built in a vertical or near-vertical bank. Breeding sites are typically located near open foraging sites such as rivers, lakes, grasslands, agricultural fields, wetlands and riparian woods. Forested areas are generally avoided (Garrison 1999).	High	There are no suitable vertical banks for nesting on the site. However, there may be suitable stockpiles in the adjacent aggregate pits in the study area. In addition, bank swallow were observed flying over the site during field surveys.
Bird	Barn swallow	*Hirundo rustica*	THR	THR	THR	S4B	In Ontario, barn swallow breeds in areas that contain a suitable nesting structure, open areas for foraging, and a body of water. This species nests in human made structures including barns, buildings, sheds, bridges, and culverts. . . Preferred foraging habitat includes grassy fields, pastures, agricultural cropland, lake and river shorelines, cleared right-of-ways, and wetlands (COSEWIC 2011a). Mud nests are fastened to vertical walls or built on a ledge underneath an overhang. Suitable nests from previous years are reused (Brown and Brown 1999).	Low	There are no suitable structures for nesting on the site or in the study area. In addition, no individuals were observed during field surveys.
Bird	Black tern	*Chlidonias niger*	SC	—	NAR	S3B	In Ontario, black tern breeds in freshwater marshlands where it forms small colonies. It prefers marshes or marsh complexes greater than 20 ha in area and which are not surrounded by wooded area. Black terns are sensitive to the presence of agricultural activities. The black tern nests in wetlands with an even combination of open water and emergent vegetation, and still waters of 0.5-1.2 m deep. Preferred nest sites have short dense vegetation or tall sparse vegetation often consisting of cattails, bulrushes and occasionally burreed or other marshland plants. Black terns also require posts or snags for perching (Weseloh 2007).	Low	There are no wetlands on the site or in the study area to provide suitable breeding habitat.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Bird	Bobolink	*Dolichonyx oryzivorus*	THR	THR	THR	S4B	In Ontario, bobolink breeds in grasslands or graminoid dominated hayfields with tall vegetation (Gabhauer 2007). Bobolink prefers grassland habitat with a forb component and a moderate litter layer. They have low tolerance for presence of woody vegetation and are sensitive to frequent mowing within the breeding season. They are most abundant in established, but regularly maintained, hayfields, but also breed in lightly grazed pastures, old or fallow fields, cultural meadows and newly planted hayfields. Their nest is woven from grasses and forbs. It is built on the ground, in dense vegetation, usually under the cover of one or more forbs (Renfrew et al. 2015).	Low	There is no suitable open grassland habitat on the site or in the study area. In addition, no individuals were observed during field surveys.
Bird	Canada warbler	*Cardellina canadensis*	SC	THR	THR	S4B	In Ontario, breeding habitat for Canada warbler consists of moist mixed forests with a well-developed shrubby understory. This includes low-lying areas such as cedar and alder swamps, and riparian thickets (McLaren 2007). It is also found in densely vegetated regenerating forest openings. Suitable habitat often contains a developed moss layer and an uneven forest floor. Nests are well concealed on or near the ground in dense shrub or fern cover, often in stumps, fallen logs, overhanging stream banks or mossy hummocks (Reitsma et al. 2010).	Low	There is no suitable mixed forest or riparian habitat on the site or in the study area to provide nesting habitat. In addition, no individuals were observed during field surveys.
Bird	Chimney swift	*Chaetura pelagica*	THR	THR	THR	S4B, S4N	In Ontario, chimney swift breeding habitat is varied and includes urban, suburban, rural and wooded sites. They are most commonly associated with towns and cities with large concentrations of chimneys. Preferred nesting sites are dark, sheltered spots with a vertical surface to which the bird can grip. Unused chimneys are the primary nesting and roosting structure, but other anthropogenic structures and large diameter cavity trees are also used (COSEWIC 2007).	Low	There are no suitable chimney structures on the site or in the study area. Although there may be suitable large diameter trees on the site or in the study area to provide natural nesting sites, no individuals were observed during field surveys.
Bird	Common nighthawk	*Chordeiles minor*	SC	THR	SC	S4B	In Ontario, these aerial foragers require areas with large open habitat. This includes farmland, open woodlands, clearcuts, burns, rock outcrops, alvars, bogs, fens, prairies, gravel pits and gravel rooftops in cities (Sandilands 2007)	Low	Although the open meadow on site may provide suitable nesting habitat, there are no occurrence records in the vicinity of the study area. No evidence of nesting was observed during field surveys.
Bird	Eastern meadowlark	*Sturnella magna*	THR	THR	THR	S4B	In Ontario, eastern meadowlark breeds in pastures, hayfields, meadows and old fields. . . Eastern meadowlark prefers moderately tall grasslands with abundant litter cover, high grass proportion, and a forb component (Hull 2003). They prefer well drained sites or slopes, and sites with different cover layers (Roseberry and Klimstra 1970).	Low	There is no suitable open grassland habitat on the site or in the study area. In addition, no individuals were observed during field surveys.
Bird	Eastern wood-pewee	*Contopus virens*	SC	SC	SC	S4B	In Ontario, eastern wood-pewee inhabits a wide variety of wooded upland and lowland habitats, including deciduous, coniferous, or mixed forests. It occurs most frequently in forests with some degree of openness. Intermediate-aged forests with a relatively sparse midstory are preferred. In younger forests with a relatively dense midstory, it tends to inhabit the edges. Also occurs in anthropogenic habitats providing an open forested aspect such as parks and suburban neighborhoods. Nest is constructed atop a horizontal branch, 1-2 m above the ground, in a wide variety of deciduous and coniferous trees (COSEWIC 2012a).	Low	Although there may be suitable forest habitat on the site and in the study area, no individuals were observed during field surveys.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Bird	Golden-winged warbler	*Vermivora chrysoptera*	SC	THR	THR	S4B	In Ontario, golden-winged warbler breeds in regenerating scrub habitat with dense ground cover and a patchwork of shrubs, usually surrounded by forest. Their preferred habitat is characteristic of a successional landscape associated with natural or anthropogenic disturbance such as rights-of-way, and field edges or openings resulting from logging or burning. The nest of the golden-winged warbler is built on the ground at the base of a shrub or leafy plant, often at the shaded edge of the forest or at the edge of a forest opening (Confer et al. 2011).	Low	There is no suitable scrub habitat on the site or in the study area. In addition, no individuals were observed during field surveys.
Bird	Grasshopper sparrow *pratensis* subspecies	*Ammodramus savannarum* (*pratensis* subspecies)	SC	SC	SC	S4B	In Ontario, grasshopper sparrow is found in medium to large grasslands with low herbaceous cover and few shrubs. It also uses a wide variety of agricultural fields, including cereal crops and pastures. Close-grazed pastures and limestone plains (e.g. Carden and Napanee Plains) support highest density of this bird in the province (COSEWIC 2013).	Low	There is no suitable open grassland habitat on the site or in the study area. In addition, no individuals were observed during field surveys.
Bird	Henslow's sparrow	*Ammodramus henslowii*	END	END	END	SHB	In Ontario, Henslow's sparrow breeds in large grasslands with low disturbance, such as lightly grazed and ungrazed pastures, fallow hayfields, grassy swales in open farmland, and wet meadows. Preferred habitat contains tall, dense grass cover, typically over 30 cm high, with a high percentage of ground cover, and a thick mat of dead plant material.Henslow's sparrow generally avoids areas with emergent woody shrubs or trees, and fence lines. Areas of standing water or ephemerally wet patches appear to be important. This species breeds more frequently in patches of habitat greater than 30 ha and preferably greater than 100 ha (COSEWIC 2011b).	Low	There is no suitable open grassland habitat on the site or in the study area. In addition, no individuals were observed during field surveys.
Bird	Red-headed woodpecker	*Melanerpes erythrocephalus*	SC	THR	END	S4B	In Ontario, red-headed woodpecker breeds in open, deciduous woodlands or woodland edges and are often found in parks, cemeteries, golf courses, orchards and savannahs (Woodliffe 2007). They may also breed in forest clearings or open agricultural areas provided that large trees are available for nesting. They prefer forests with little or no understory vegetation. They are often associated with beech or oak forests, beaver ponds and swamp forests where snags are numerous. Nests are excavated in the trunks of large dead trees (Smith et al. 2000).	Low	The deciduous woodland in the south portion of the site and study area does not provide the open structure preferred by this species. In addition, no individuals were observed during field surveys.
Bird	Wood thrush	*Hylocichla mustelina*	SC	THR	THR	S4B	In Ontario, wood thrush breeds in moist, deciduous hardwood or mixed stands that are often previously disturbed, with a dense deciduous undergrowth and with tall trees for singing perches. This species selects nesting sites with the following characteristics: lower elevations with trees less than 16 m in height, a closed canopy cover (>70 %), a high variety of deciduous tree species, moderate subcanopy and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter (COSEWIC 2012d).	High	There is suitable forest habitat on the site and in the study area to provide breeding habitat. In addition, this species was observed on the site during field surveys.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Fish	Black redhorse	*Moxostoma duquesnei*	THR	—	THR	S2	In Ontario, black redhorse is limited to only six watersheds. In the Lake Huron drainage, it is found in the Bayfield River, Maitland River and Ausable River watersheds. In the Lake Erie drainage, it is known from the Catfish Creek and Grand River watersheds. It is also present in the Thames River watershed in the Lake St. Clair drainage. The Catfish Creek population is considered extirpated. The black redhorse is a species of freshwater fish endemic to Ontario. Habitats are typically found in moderately sized to large rivers and streams with moderate flows. It is rarely found associated with aquatic vegetation. Preferred substrates include rubble, gravel, sand, boulders and silt. In summer, this fish species generally prefers pools, and they overwinter in deeper pools. Spring spawning has been observed in riffle habitats, over substrates ranging from fine gravel to large cobble, and at water temperatures between 15°C and 21°C (COSEWIC 2005).	Low	There is no suitable aquatic habitat on the site or in the study area.
Fish	Eastern sand darter	*Ammocrypta pellucida*	END	THR	THR	S2	In Ontario, eastern sand darter is a warmwater species that is found in Lakes Erie and St. Clair, as well as the Thames River, Big Creek, Grand River and East Sydenham River. The eastern sand darter is a translucent and elongated freshwater fish. This fish favours sandy bottoms of streams and rivers as well as sandy shoals in lakes. It frequents water over limestone bottoms covered with a thin layer of mud and is found in riffles over rubble and gravel, and silted sand bottoms. Females may spawn more than once in a breeding season, typically in sandy areas with slow moving water (COSEWIC 2009).	Low	There is no suitable aquatic habitat on the site or in the study area.
Fish	Redside dace	*Clinostomus elongatus*	END	END	END	S2	In Ontario, redside dace, a small coolwater species common in the USA but less so in Canada, is found in tributaries of western Lake Ontario, Lake Erie, Lake Huron and Lake Simcoe. They are found in pools and slow-moving areas of small headwater streams with clear to turbid water. Overhanging grasses, shrubs, and undercut banks, are an important part of their habitat, as are instream boulders and large woody debris. Preferred substrates are variable and include silt, sand, gravel and boulders. Spawning occurs in shallow riffle areas (Redside Dace Recovery Team 2010).	Low	There is no suitable aquatic habitat on the site or in the study area.
Fish	Silver shiner	*Notropis photogenis*	THR	—	THR	S2S3	In Ontario, silver shiner is found in the Thames and Grand Rivers, and it has been recently reported in Bronte Creek and Sixteen Mile Creek which flow into Lake Ontario. They prefer moderately-flowing sections of larger streams with clear water and moderate currents. Usual substrates include gravel, rubble, boulder, and sand. Aquatic vegetation may be present or absent. The silver shiner most frequently occurs in deep, swift riffles and faster currents of pools below riffles. Spawning habitat is suggested to occur in relatively deep riffles (COSEWIC 2011c).	Low	There is no suitable aquatic habitat on the site or in the study area.
Mammal	Gray fox	*Urocyon cinereoargenteus*	THR	THR	THR	S1	While the Ontario range of this species extends across much of southern and southeastern Ontario, the only known population in the province is on Pelee Island, with very rare sightings elsewhere in the province at points close to the border with the United States. This species inhabits deciduous forests and marshes, and will den in a variety of features including rock outcroppings, hollow trees, burrows or brush piles, usually where dense brush provides cover and in close proximity to water. This species is considered a habitat generalist (COSEWIC 2002).	Low	This species is currently only known to occur on Pelee Island.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Mammal	Eastern small-footed myotis	*Myotis leibii*	END	—	—	S2S3	This species is not known to roost within trees, but there is very little known about its roosting habits. The species generally roosts on the ground under rocks, in rock crevices, talus slopes and rock piles. It occasionally inhabits buildings. Areas near the entrances of caves or abandoned mines may be used for hibernaculum, where the conditions are drafty with low humidity, and may be subfreezing (Humphrey 2017)	High	Several rock piles on the site, in addition to an old building foundation, may provide suitable roosting habitat for this species. In addition, this species was detected in high numbers during bat monitoring surveys. There are no suitable hibernacula on the site or in the study area.
Mammal	Little brown myotis	*Myotis lucifugus*	END	END	END	S4	In Ontario, this specie's range is extensive and covers much of the province. It will roost in both natural and man-made structures. Roosting colonies require a number of large dead trees, in specific stages of decay and that project above the canopy in relatively open areas. May form nursery colonies in the attics of buildings within 1 km of water. Caves or abandoned mines may be used as hibernacula, but high humidity and stable above freezing temperatures are required (Environment Canada 2015a).	Moderate	The deciduous forest in the southern portion of the site and study area may provide suitable maternity roost habitat. Although this species was detected during bat monitoring surveys, the activity level was low and indicated a low potential for use of available maternity roost habitat. There are no suitable hibernacula on the site or in the study area.
Mammal	Northern myotis	*Myotis septentrionalis*	END	END	END	S3	In Ontario, this species' range is extensive and covers much of the province. It will usually roost in hollows, crevices, and under loose bark of mature trees. Roosts may be established in the main trunk or a large branch of either living or dead trees. Caves or abandoned mines may be used as hibernacula, but high humidity and stable above freezing temperatures are required (Environment Canada 2015a).	Low	Although there is potentially suitable forest habitat on the site to provide maternity roost habitat, this species was not detected during bat monitoring surveys. There are no suitable hibernacula on the site or in the study area.
Mammal	Tri-colored bat	*Perimyotis subflavus*	END	END	END	S3?	In Ontario, tri-colored bat may roost in foliage, in clumps of old leaves, hanging moss or squirrel nests. They are occasionally found in buildings although there are no records of this in Canada. They typically feed over aquatic areas with an affinity to large-bodied water and will likely roost in close proximity to these. Hibernation sites are found deep within caves or mines in areas of relatively warm temperatures. These bats have strong roost fidelity to their winter hibernation sites and may choose the exact same spot in a cave or mine from year to year (Environment Canada 2015a).	Low	Although there is potentially suitable forest habitat on the site to provide maternity roost habitat, this species was not detected during bat monitoring surveys. There are no suitable hibernacula on the site or in the study area.
Mollusc	Rainbow	*Villosa iris*	SC	—	SC	S2S3	In Ontario, the rainbow mussel is found in shallow, well- oxygenated waters of small to medium-sized rivers and sometimes lakes. It is most abundant in waters less than 1 m deep. Preferred substrates are cobble, gravel, sand and occasionally mud (COSEWIC 2006).	Low	There is no suitable aquatic habitat on the site or in the study area.
Mollusc	Round pigtoe	*Pleurobema sintoxia*	END	END	END	S1	In Ontario, round pigtoe is found in medium to large rivers, and occasionally in lakes. In smaller rivers, this species is often found in areas of moderate flow below riffles, and buried in substrates of gravel, cobble and boulder. In larger rivers, it is found in mud, sand and gravel at varying depths. It also occurs on sand and gravel bars (Morris and Burridge 2010).	Low	There is no suitable aquatic habitat on the site or in the study area.
Mollusc	Wavy-rayed lampmussel	*Lampsilis fasciola*	THR	END	SC	S1	In Ontario, wavy-rayed lampmussel inhabits clear, medium-sized rivers and streams, with steady flow and stable substrate. It is typically found in clean sand or gravel substrates, often stabilized with cobble or boulders, in and around riffle areas up to 1 m in depth. It may also be found in large creeks and rivers (Morris 2011).	Low	There is no suitable aquatic habitat on the site or in the study area.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Reptile	Blanding's turtle - Great Lakes / St. Lawrence population	*Emydoidea blandingii*	THR	THR	END	S3	In Ontario, Blanding's turtle will use a range of aquatic habitats, but favor those with shallow, standing or slow-moving water, rich nutrient levels, organic substrates and abundant aquatic vegetation. They will use rivers, but prefer slow-moving currents and are likely only transients in this type of habitat. This species is known to travel great distances over land in the spring in order to reach nesting sites, which can include dry conifer or mixed forests, partially vegetated fields, and roadsides. Suitable nesting substrates include organic soils, sands, gravel and cobble. They hibernate underwater and infrequently under debris close to water bodies (COSEWIC 2005).	Low	There is no suitable aquatic habitat on the site or in the study area.
Reptile	Eastern ribbonsnake - Great Lakes population	*Thamnophis sauritius*	SC	SC	SC	S4	In Ontario, eastern ribbonsnake is semi-aquatic, and is rarely found far from shallow ponds, marshes, bogs, streams or swamps bordered by dense vegetation. They prefer sunny locations and bask in low shrub branches. Hibernation occurs in mammal burrows, rock fissures or even ant mounds (COSEWIC 2012b).	Low	There are no wetlands or streams on the site or in the study area.
Reptile	Milksnake	*Lampropeltis triangulum*	NAR	SC	SC	S4	In Ontario, milksnake uses a wide range of habitats including prairies, pastures, hayfields, wetlands and various forest types, and is well-known in rural areas where it frequents older buildings.Proximity to water and cover enhances habitat suitability. Hibernation takes place in mammal burrows, hollow logs, gravel or soil banks, and old foundations (COSEWIC 2014).	Moderate	Woodland areas throughout the site and study area may provide suitable habitat for this species.
Reptile	Northern map turtle	*Graptemys geographica*	SC	SC	SC	S3	In Ontario, the northern map turtle prefers large waterbodies with slow-moving currents, soft substrates, and abundant aquatic vegetation. Ideal stretches of shoreline contain suitable basking sites, such as rocks and logs. . . Along Lakes Erie and Ontario, this species occurs in marsh habitat and undeveloped shorelines. It is also found in small to large rivers with slow to moderate flow. Hibernation takes place in soft substrates under deep water (COSEWIC 2012c).	Low	There is no suitable aquatic habitat on the site or in the study area.
Reptile	Snapping turtle	*Chelydra serpentina*	SC	SC	SC	S3	In Ontario, snapping turtle uses a wide range of waterbodies, but shows preference for areas with shallow, slow-moving water, soft substrates and dense aquatic vegetation. Hibernation takes place in soft substrates under water. . . Nesting sites consist of sand or gravel banks along waterways or roadways (COSEWIC 2008).	Low	There is no suitable aquatic habitat on the site or in the study area.
Vascular Plant	American chestnut	*Castanea dentata*	END	END	END	S1S2	In Ontario, American chestnut occurs in mixed or deciduous forests in the Carolinian zone (Farrar 1995). It is often found in communities with dense canopy cover and often associated with oak and maple. This tree grows primarily on acidic, sand or gravel soils (Boland et al. 2012).	Low	Although there may be suitable woodland habitat on the site and in the study area, no individuals were observed during field surveys.
Vascular Plant	American ginseng	*Panax quinquefolius*	END	END	END	S2	In Ontario, American ginseng is found in moist, undisturbed and relatively mature deciduous woods often dominated by sugar maple. It is commonly found on well-drained, south-facing slopes. American ginseng grows under closed canopies in neutral, loamy soils (COSEWIC 2000).	Low	The woodlands on site do not provide suitable conditions to support growth of American ginseng. In addition, no individuals were observed during field surveys.
Vascular Plant	American hart's-tongue fern	*Asplenium scolopendrium*	SC	SC	SC	S3	In Ontario, hart's-tongue fern grows on thin calcareous soils on or near dolomitic limestone of the Niagara Escarpment, and occasionally on open talus/scree slopes. Most populations are found on steep, moderately moist slopes that face north to northeast and are under a hardwood canopy cover (Environment Canada 2013).	Low	There are no steep moist slopes to provide suitable habitat on the site or in the study area. In addition, no individuals were observed during field surveys.

Taxon	Common Name	Scientific Name	Endangered Species Act[1]	Species at Risk Act (Sch 1)[2]	COSEWIC[3]	Provincial (SRank)[4]	Habitat Requirements[5]	Potential to Occur on Site or in the Study Area	Rationale for Potential to Occur on Site or in the Study Area
Vascular Plant	Butternut	*Juglans cinerea*	END	END	END	S2?	In Ontario, butternut is found along stream banks, on wooded valley slopes, and in deciduous and mixed forests. It is commonly associated with beech, maple, oak and hickory (Voss and Reznicek 2012). Butternut prefers moist, fertile, well-drained soils, but can also be found in rocky limestone soils. This species is shade intolerant (Farrar 1995).	Low	Although there may be suitable woodland habitat on the site, no individuals were observed during field surveys.
Vascular Plant	False hop sedge	*Carex lupuliformis*	END	END	END	S1	In Ontario, false hop sedge occurs in marshes, riverine swamps, borders of vernal pools, and wet depressions of forests. It occasionally occurs in shallow water or very wet floodplain forests. Usually grows under a moderately open canopy but can tolerate high levels of sunshine. Substrates are calcareous or neutral and include moist wet mucks, silt loams, or alluvial deposits with a sandy texture (Environment Canada 2014).	Low	There is no wetland or floodplain forests to provide suitable habitat on the site or in the study area. In addition, no individuals were observed during field surveys.

[1] *Endangered Species Act (ESA),* 2007 (O.Reg 242/08 last amended 27 March 2018 as O.Reg 219/18). Species at Risk in Ontario List, 2007 (O.Reg 230/08 last amended 1 Aug 2018 as O. Reg 404/18, s. 1.); Schedule 1 (Extirpated - EXP), Schedule 2 (Endangered - END), Schedule 3 (Threatened - THR), Schedule 4 (Special Concern - SC)

[2] *Species at Risk Act* (SARA), 2002. Schedule 1 (Last amended 21 May 2019); Part 1 (Extirpated), Part 2 (Endangered), Part 3 (Threatened), Part 4 (Special Concern)

[3] Committee on the Status of Endangered Wildlife in Canada (COSEWIC) http://www.cosewic.gc.ca/

[4] Provincial Ranks (SRANK) are Rarity Ranks assigned to a species or ecological communities, by the Natural Heritage Information Centre (NHIC). These ranks are not legal designations. SRANKS are evaluated by NHIC on a continual basis and updated lists produced annually. SX (Presumed Extirpated), SH (Possibly Extirpated - Historical), S1 (Critically Imperiled), S2 (Imperiled), S3 (Vulnerable), S4 (Apparently Secure), S5 (Secure), SNA (Not Applicable), S#S# (Range Rank), S? (Not ranked yet), SAB (Breeding Accident), SAN (Non-breeding Accident). Last assessed November 2017.

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APPENDIX D

Wildlife Species List

Wildlife Species List

Common Name	Scientific Name	SRANK[a]	GRANK[a]	Status[b]
Birds				
American Crow	*Corvus brachyrhynchos*	S5B	G5	—
American Goldfinch	*Spinus tristis*	S5B	G5	—
American Robin	*Turdus migratorius*	S5B	G5	—
Baltimore Oriole	*Icterus galbula*	S4B	G5	L=S
Bank Swallow	***Riparia riparia***	**S4B**	**G5**	**F=THR; P=THR; L=S**
Black-capped Chickadee	*Poecile atricapillus*	S5	G5	—
Blue Jay	*Cyanocitta cristata*	S5	G5	—
Blue-winged Warbler	*Vermivora cyanoptera*	S4B	G5	L=S
Canada Goose	*Branta canadensis*	S5	G5	—
Cedar Waxwing	*Bombycilla cedrorum*	S5B	G5	—
Downy Woodpecker	*Picoides pubescens*	S5	G5	—
Eastern Phoebe	*Sayornis phoebe*	S5B	G5	—
Eastern Towhee	*Pipilo erythrophthalmus*	S4B	G5	L=S
Field Sparrow	*Spizella pusilla*	S4B	G5	L=S
Gray Catbird	*Dumetella carolinensis*	S4B	G5	—
Indigo Bunting	*Passerina cyanea*	S4B	G5	—
Northern Cardinal	*Cardinalis cardinalis*	S5	G5	—
Northern Flicker	*Colaptes auratus*	S4B	G5	L=S
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S4B	G5	—
Ovenbird	*Seiurus aurocapilla*	S4B	G5	L=S
Pine Warbler	*Setophaga pinus*	S5B	G5	L=S
Red-bellied Woodpecker	*Melanerpes carolinus*	S4	G5	L=S,R
Red-breasted Nuthatch	*Sitta canadensis*	S5	G5	L=S
Red-eyed Vireo	*Vireo olivaceus*	S5B	G5	—
Red-winged Blackbird	*Agelaius phoeniceus*	S4	G5	—
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	S4B	G5	L=S
Ruffed Grouse	*Bonasa umbellus*	S4	G5	—
Scarlet Tanager	*Piranga olivacea*	S4B	G5	L=S,R
Song Sparrow	*Melospiza melodia*	S5B	G5	—
White-breasted Nuthatch	*Sitta carolinensis*	S5	G5	—
Wood Thrush	***Hylocichla mustelina***	**S4B**	**G4**	**F=THR; P=SC; L=S**
Mammals				
Big Brown Bat	*Eptesicus fuscus*	S4	G5	—
Eastern Small-footed Myotis	***Myotis leibii***	**S2S3**	**G4**	**P=END; L=S,R**
Hoary Bat	*Lasiurus cinereus*	S4	G3G4	—
Little Brown Myotis	***Myotis lucifugus***	**S4**	**G3**	**F=END; P=END**
Red Squirrel	*Tamiasciurus hudsonicus*	S5	G5	—
Silver-haired Bat	*Lasionycteris noctivagans*	S4	G3G4	—
White-tailed Deer	*Odocoileus virginianus*	S5	G5	—
Amphibians				
Gray Treefrog	*Hyla versicolor*	S5	G5	—

[a] Ranks based upon determinations made by the Ontario Natural Heritage Information Centre
G = Global; S = Provincial; Ranks 1-3 are considered imperiled or rare; Ranks 4 and 5 are considered secure.
SNA = Not applicable for Ontario Ranking (e.g. Exotic species)

[b] Status: F = Federal; P = Provincial; R = Regional (MNRF Southern Region); L = Local (County of Wellington).
END= Endangered; SC = Special Concern; THR = Threatened; UN = Undetermined.

Bolded text indicates species at risk.

APPENDIX E

Curriculum Vitae

Education

M.Sc. Applied Marine Science, University of Plymouth, Devon, UK, 1998

B.Sc. (Honours) Biology, Laurentian University, Sudbury, Ontario, 1996

Certifications

PADI Master Scuba Diver Trainer, 2000

Small Craft Boat Operator, 2003

Small Non-pleasure Vessel Basic Safety - MED A3, 2011

Canadian Red Cross First Aid and CPR, 2012

WHMIS Training, 1990, 2001, 2004

Professional Affiliations

Professional Association of Diving Instructors (PADI)

Director, Ontario Stone Sand and Gravel Association (OSSGA) Board of Directors

HEATHER MELCHER

Principal/Senior Ecologist

PROFESSIONAL SUMMARY

Heather Melcher is a Principal, Senior Ecologist and Project Manager/Director with Golder Associates. Heather has over 18 years of experience working in a number of sectors including transportation, oil and gas, transmission, land development, power, aggregates and mining. Her experience lies in designing, managing and carrying out environmental impact assessments within provincial and federal frameworks and environmental land use policies for projects of various size and complexity. She leads a team of ecologists and multi-disciplinary project teams to holistically assess potential project impacts through integration of components. Heather works closely with provincial and federal agencies to help her clients navigate changing planning and species at risk (SAR) legislation. Heather has experience developing rehabilitation plans for disturbed sites and biodiversity plans that integrate the ecology of a smaller site into the regional system as well as developing compensation habitat plans and mitigation plans for SAR. Heather is also a recognized expert witness for Local Planning Appeal Tribunal (LPAT) hearings in Ontario.

PROJECT EXPERIENCE – CONSTRUCTION MATERIALS

EWL Ltd., Gordon Lake Quarry and Borrow Area

Kenora, Ontario, Canada

Natural environment component lead for permit applications under the Aggregate Resources Act (ARA). The aggregate areas are in support of rehabilitation activities associated with the decommissioning of the former Gordon-Werner Lake Mine. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting data and integrating with hydrogeological and surface water data, and producing a Natural Environment Level 1/2 (NEL 1/2) technical report. Responsible for negotiations with the Ministry of Natural Resources and Forestry (MNRF) and Ministry of Environment, Conservation and Parks (MECP) regarding woodland caribou and SAR bats, preparation and submission of online permitting forms under the Endangered Species Act (ESA), development of mitigation plans and coordination with construction team.

Cavanagh Construction Ltd., Henderson II Quarry

Ottawa, Ontario, Canada

Natural environment component lead for a below water quarry licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting data and integrating with hydrogeological and surface water data, working with the planner in developing a rehabilitation plan, attending agency and public meetings as well producing an NEL 1/2 report and municipal EIS report. Responsible for

negotiations with the MNRF regarding SAR issues and developing compensation plans.

Scotian Materials Limited
Halifax, Nova Scotia

Senior Technical Lead (biophysical) for the provincial environmental assessment to support the expansion of an existing quarry. Studies completed to support the project included fish and fish habitat, species at risk, flora and fauna and wetland surveys. The technical lead for the impact assessment for the natural environment and the completion of supporting permit/approval applications. Scope included the completion of wetland and wildlife management plans.

Tackaberry Sand and Gravel Ltd., Perth Quarry
Perth, Ontario, Canada

Natural environment component lead for a below water quarry licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting data and integrating with hydrogeological and surface water data, working with the planner in developing a rehabilitation plan, attending agency and public meetings as well producing an NEL 1/2 report and Environmental Impact Statement report for the municipality. Responsible for negotiations with the MNRF regarding SAR issues and developing compensation plans for the removal of SAR habitat. Worked with Rideau Valley Conservation Authority and Mississippi Valley conservation Authority on headwater drainage feature assessment and mitigation plans.

Greenfield Aggregates Sherk Pit
Waterloo, Ontario, Canada

Natural environment component lead for a below water pit licence application under the ARA. Responsibilities included terrestrial and aquatic data analysis, interpretation and integration with hydrogeological and surface water data, working with the planner to develop a rehabilitation plan as well as producing an NEL 1/2 report and municipal EIS report. Responsibilities also included responding to public and agency comments following submission.

Lafarge Canada Inc., French Settlement Pit
Ottawa, Ontario, Canada

Natural environment component lead for a below water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with hydrogeological and surface water data, working with the planner to develop a progressive and final rehabilitation plan (natural conditions) as well as producing an NEL 1/2 report and municipal EIS report. Consulted with regulatory agencies and attended public open houses.

Lafarge Canada Inc., Sunningdale Pit

London, Ontario, Canada

Natural environment component lead for a below water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with hydrogeological and surface water data, working with the planner to develop a progressive and final rehabilitation plan (natural conditions) as well as producing an NEL 1/2 report and EIS. Consulted with regulatory agencies and attended public open houses. Developed mitigation and habitat compensation plans under the ESA for barn swallow.

Lafarge Canada Inc., Limebeer Pit
Caledon, Ontario, Canada

Project manager and natural environment component lead for a below water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with hydrogeological and surface water data, working with the planner to develop a progressive and final rehabilitation plan (natural conditions) as well as producing an NEL 1/2 report and EIS. Consulted with regulatory agencies, attended public open houses, and addressed agency and public comments. Project manager roles and responsibilities included coordinating and managing the activities and budgets of a multi-disciplinary team including hydrogeologists, groundwater modelling experts, surface water engineers, and noise and air quality specialists.

Lafarge Canada Inc., Avening Pit Extension
Creemore, Ontario, Canada

Project manager and natural environment component lead for an above water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with hydrogeological and surface water data, working with the planner and the agricultural sub-consultant to develop a progressive and final rehabilitation plan (agricultural conditions) as well as producing an NEL 1/2 report and EIS. Project manager roles and responsibilities included coordinating and managing the activities and budgets of a multi-disciplinary team including hydrogeologists, surface water engineers, and noise and air quality specialists.

Lafarge Canada Inc., McGill Pit
Kemptville, Ontario, Canada

Natural environment component lead for a below water pit licence application under the ARA. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting data and integrating with hydrogeological and surface water data, working with the planner in developing progressive and final rehabilitation plans, attending agency and public meetings and producing an NEL 1/2 report and municipal Environmental Impact Study (EIS) report. Responsible for negotiations with the MNRF regarding SAR issues

and developing mitigation and habitat compensation plans for butternut. Participated in an Ontario Municipal Board (OMB) hearing as an expert witness.

Colacem Cement Plant
L'Orignal, Ontario, Canada

Natural environment component lead for the Colacem Cement Plant assessment. Responsibilities included designing and coordinating aquatic and terrestrial field data collection and analysis, interpreting and integrating with physical resource data, liaising with the planner and developing an EIS for the municipal approval process. Worked with MNRF and South Nation Conservation on significant natural heritage feature and SAR issues and with Fisheries and Oceans Canada (DFO) on a Fisheries Act authorization for removal of fish habitat. Currently preparing for participation in a LPAT (formerly the OMB) hearing as an expert witness.

Floyd Preston Ltd.
Eastern Ontario, Canada

Natural environment component lead for a quarry licence application in eastern Ontario. Liaised with client, coordinated field data collection, mentored intermediate staff in data analysis and interpretation and prepared an NEL 1 report.

PROJECT EXPERIENCE – SPECIES AT RISK

EWL Management Ltd Madawaska Mine Decommissioning
Faraday, Ontario, Canada

Natural environment component lead for SAR permitting for bats, including little brown myotis (*Myotis lucifugus*), northern myotis (*Myotis septentrionalis*) and tricolor bat (*Perimyotis subflavus*). Responsibilities included submission of online permitting documents under the ESA, consultation with the MNRF and MECP, development of a mitigation plan and providing direction to the construction team.

TransCanada - Various Sites in Ontario
Ontario, Canada

Natural environment component lead for annual SAR and migratory bird monitoring at numerous sites across Ontario since 2012. In support of TransCanada's right-of-way maintenance brushing program. Provide SAR advice and liaise with MNRF to develop construction monitoring protocols for SAR and migratory birds. Lead crews to complete monitoring on an annual basis.

Lafarge Canada Ltd.
Various Locations, Ontario, Canada

Natural environment component lead for annual SAR monitoring and reporting at aggregate sites across Ontario following registration. Species surveys

include Blanding's turtle, loggerhead shrike, least bittern and gray ratsnake. Developed survey protocols with several MNRF district offices and lead crews to complete monitoring.

Leader Resources Services Ltd.
Various Locations, Ontario, Canada

Project manager for a number of wind power projects under the Ontario Renewable Energy Approvals Act (REA). Worked with the client and the MNRF to develop protocols and coordinate field surveys. Completed and submitted ESA permitting applications and compensation plans.

Lafarge Canada Ltd.
Various Locations, Ontario, Canada

Project manager and natural environment component lead for a number of licence applications for proposed new and expanded aggregate extraction operations (pits and quarries) in Ontario under the ARA. Responsibilities included developing survey protocols, negotiating with the MNRF, registering for activities under the ESA (Notice of Activity), completing Information Gathering Forms (IGF), preparing and submitting permit applications and developing compensation plans.

PROJECT EXPERIENCE – TRANSMISSION

Hydro One Circuit B5C/B6C Line Refurbishment EA
Westover to Burlington, Ontario, Canada

Natural environment component lead for a provincial Class Environmental Assessment for a 40 km line refurbishment. Responsibilities included designing the field program (terrestrial and aquatic), analyzing data, integrating the ecological data with other physical resource discipline data, completing the effects assessment, consulting with regulatory agencies including two district MNRF offices, Hamilton Conservation Authority, Conservation Halton, Grand River Conservation Authority, Niagara Escarpment Commission, and participating in the public consultation process. Provided input into alternatives assessment for temporary hydro line bypass.

Wataynikaneyap Power Phase 2 Transmission Line
Northwestern Ontario, Canada

Senior advisor and technical reviewer for the wildlife component of permitting. Worked with the permitting lead and the wildlife component lead to design field programs, consult and negotiate with the MNRF and Environment and Climate Change Canada/Canadian Wildlife Service (ECCC/CWS), and prepare technical supporting documents for permitting and permit applications under the ESA, the Public Lands Act, and the federal Species at Risk Act (SARA). Key responsibilities included providing senior leadership and technical guidance and review for all deliverables.

Nextbridge East-West Tie Transmission Line
Wawa to Thunder Bay, Ontario, Canada

Senior advisor and technical reviewer for wildlife permitting for the construction and operation of a 450 km transmission corridor. Worked with the permitting lead and the wildlife component lead to design field programs, consult and negotiate with the MNRF and ECCC/CWS, and prepare technical supporting documents for permitting and permit applications under the ESA, the Public Lands Act, and the SARA. Key responsibilities included providing senior leadership and technical guidance and review for all deliverables.

PROJECT EXPERIENCE – TRANSPORTATION

MTO Calamity Creek Highway 11 Culvert Replacement Group 'C' Class EA
Temiskaming, Ontario, Canada

Acting environmental manager for the replacement of the Calamity Creek Culvert (47-273/C) located on Highway 11 in the City of Temiskaming Shores, District of Temiskaming. Responsibilities included regular liaison with the MTO, the contractor and Golder's internal team including ecologists, surface water engineers, archaeologists, cultural heritage specialists, and hydrogeologists. Deliverables included a Consultation Plan, an Environmental Screening Document (ESD), which documented the results of all factor-specific environmental studies and consultation undertaken for the project, and an Environmental Management Plan (EMP), which detailed how the environmental mitigation and monitoring commitments made in the ESD would be implemented during construction.

Ninth Line Municipal Class EA
Halton Region, Ontario, Canada

Senior natural environment technical lead. Responsibilities included leading a team of ecologists and overseeing field collection of terrestrial and aquatic data, analysis and interpretation, liaising with prime engineering firm and agencies including the municipality, senior technical review of natural environment study report.

Regional Road 57 Municipal Class EA
Clarington, Ontario, Canada

Senior natural environment technical lead. Responsibilities included leading a team of ecologists and field collection of terrestrial and aquatic data, analysis and interpretation, liaising with prime engineering firm and agencies, senior technical review of natural environment study report.

Markham GO Station Road Realignment Municipal Class EA
Markham, Ontario, Canada

Senior natural environment technical lead. Responsibilities included leading a team of ecologists and overseeing field collection of terrestrial and aquatic data,

analysis and interpretation, liaising with prime engineering firm and agencies, senior technical review of natural environment study report.

PROJECT EXPERIENCE – WASTE

Capital Region Resource Recovery Centre (CRRRC)

Ottawa, Ontario, Canada

Natural environment component lead for a provincial EA for a resource recovery centre on a 175 hectare site), including a landfill, contaminated soil management and recycling components. Responsibilities included designing the field program (terrestrial and aquatic), analysing data, integrating the ecological data with other discipline data, completing the effects assessment, consulting with regulatory agencies including the Conservation Authority, MNRF and DFO on habitat and species concerns, working with the client and engineering team on the project design, watercourse crossings, reviewing the stormwater management plan and participating in the public consultation process.

PROJECT EXPERIENCE – RENEWABLE ENERGY

Trillium Power Wind Corporation

Lake Ontario, Ontario, Canada

Project manager and natural environment lead for an offshore wind power project in Lake Ontario under O. Reg. 359/09 Renewable Energy Approvals (REA). Responsibilities included coordinating and managing a multi-disciplinary team including noise specialists, biologists, archaeologists, public consultation specialists, aboriginal engagement specialists, visual impact assessment specialists and geophysicists. Designing and leading a team of biologists to carry out terrestrial and aquatic field surveys, including avian, bat and fisheries assessments. Led provincial and federal agency consultation and participated in public open houses. Impact assessment and reporting, designed to satisfy both provincial and federal (CEAA) requirements, was underway when the project was curtailed.

Leader Resources Services Corporation

Various Locations, Ontario, Canada

Project manager and project director/senior technical advisor for four wind farm projects under O. Reg. 359/09 REA in Huron County, Ontario. Responsibilities included coordinating and managing a multi-disciplinary team including noise specialists, natural heritage specialists, archaeologists, cultural heritage specialists, public consultation specialists and aboriginal engagement specialists. Led regulatory agency consultation specifically regarding SAR, avian and bat issues, and participated in public open houses. Directed and reviewed all baseline natural environment impact assessment, mitigation and

monitoring reporting, including species at risk, waterbodies, and wildlife/habitat (with a focus on birds and bats). Completed REA-specific project reports.

Mann Engineering/EffiSolar
Various Locations, Ontario, Canada

Natural heritage component lead for four 10 MW ground-mounted PV solar farms in southeastern Ontario under O. Reg. 359/09 REA. Designed and coordinated field programs for terrestrial and aquatic ecosystems, including SAR. Completed impact assessment, mitigation and monitoring plans and reports. Led provincial agency consultation.

SkyPower Corp.
Various Locations, Ontario, Canada

Project manager for eight wind power park projects in Renfrew County, Prince Edward County and Parry Island, Ontario. Designed and coordinated natural environment field programs, including terrestrial (avian, bats, SAR, wildlife/habitats) and aquatic. Responsible for managing a multi-disciplinary team including hydrogeologists, biologists, surface water engineers, noise and air quality experts, socio-economic and public consultation coordinators. Led provincial agency consultation and organized public open houses. Completed natural environment impact assessment, mitigation and monitoring plans and reports as well as REA-specific project reports.

Algonquin Power
Amherst Island, Ontario, Canada

Project manager and natural environment component lead for wind power project in Prince Edward County. Designed and coordinated field programs for terrestrial (avian, bats, SAR) and aquatic ecosystems. Managed a multi-disciplinary team including hydrogeologists, biologists, surface water engineers, noise and air quality experts, socio-economic and public consultation coordinators. Led provincial and federal agency consultation. Completed natural environment impact assessment, mitigation and monitoring plans and reports as well as REA-specific project reports.

SkyPower Corp.
Various Locations, Ontario, Canada

Project manager for four solar power projects across Ontario, including Napanee and Norfolk. Designed, coordinated and conducted field programs and data collection. Coordinated and managed the activities of a multi-disciplinary team including noise, archaeology, and surface water. Completed screening reports to provincial and municipal standards.

OptiSolar Inc.
Various Locations, Ontario, Canada

Project manager for three solar power projects across Ontario, including Sarnia, Tilbury and Petrolia. Designed, coordinated and conducted field

programs and data collection, coordinated and managed the activities of a multi-disciplinary team including noise, archaeology, surface water, traffic and natural environment. Completed screening reports to provincial and municipal standards.

PROJECT EXPERIENCE – NUCLEAR

Canadian Waste Management Office (NWMO) Deep Geologic Repository (DGR) Project Follow-up Monitoring
Kincardine, Ontario, Canada

Project manager and senior technical lead for follow-up wildlife and vegetation monitoring at the DGR site. The scope of work included SAR turtle visual encounter surveys (VES; also known as basking surveys), SAR snake emergence and egg-laying surveys, and rare plant surveys.

Canadian Nuclear Laboratories (CNL) Whiteshell Research and Development Complex Decommissioning EA
Pinawa, Manitoba, Canada

Natural environment component lead for a federal EA. Responsibilities included obtaining and analysing terrestrial and aquatic data including for species at risk, providing recommendations for additional permitting and mitigation for potential effects to wildlife and sensitive habitats, working with CNL on construction designs and developing technical reports.

Canadian Nuclear Laboratories (CNL) Port Hope Remediation
Port Hope, Ontario, Canada

Natural environment component lead for permitting for remediation of Port Hope Harbour, Ganaraska River and other watercourses in Port Hope. Responsibilities included liaising with the Ganaraska River Conservation Authority, MNRF, DFO, and Canadian Nuclear Safety Commission and preparing applications and obtaining permits for dredging, bank stabilization, sediment remediation and removal and work on Crown lands.

Bruce Power Units 3&4 Restart
Kincardine, Ontario, Canada

Worked with a team to establish Valued Ecosystem Components and appropriate study areas. Coordinated bioscience field technicians and interpreted data on fish impingement, entrainment, fishing pressure and temperature and velocity effects on aquatic habitat and biota, including bass spawning surveys. Worked with a team of biologists to determine the potential for warm water discharges to affect waterfowl use of nearby areas, and evaluated effects on the white-tailed deer population due to vehicle strikes. Prepared technical reports.

Pickering Nuclear 'A' Return to Service Follow-up and Monitoring
Pickering, Ontario, Canada

Coordinated aquatic field technicians and interpreted data on impingement, entrainment, fishing pressure, waterfowl surveys, and temperature and velocity effects on aquatic habitat and biota, including bass spawning surveys. Worked with a team of biologists to evaluate the effects of wildlife-vehicle interactions on nearby roadways on terrestrial biota populations. Prepared annual monitoring reports.

PROJECT EXPERIENCE – MINING

EWL Management Ltd. Dyno Mine Rehabilitation

Bancroft, Ontario, Canada

Natural environment component lead for an environmental and health risk assessment of decommissioned uranium mine. Worked with a multi-disciplinary team including surface water engineers, geotechnical engineers, and risk specialists. Designed and coordinated bioscience field technicians to carry out the natural environment workplan. Tasks included fish habitat assessment and characterization of the aquatic environment, and collection of benthic, fish, sediment and aquatic plant tissue samples in affected and reference lakes and watercourses in support of the human health and ecological risk assessment. In addition, collection of small mammal and plant tissue samples and characterization of wildlife habitat was included. Responsible for analysis and interpretation of data, as well as report preparation and liaising with stakeholders and government agencies.

EWL Management Ltd. Coldstream \ Mine Rehabilitation

Thunder Bay, Ontario, Canada

Natural environment component lead for an environmental and health risk assessment of a decommissioned copper mine. Worked with a multi-disciplinary team including surface water engineers, geotechnical engineers, and risk specialists. Designed and coordinated bioscience field technicians to carry out the natural environment work plan. Tasks included fish habitat assessment and characterization of the aquatic environment, and collection of benthic, fish, sediment and aquatic plant tissue samples in affected and reference lakes and watercourses in support of the human health and ecological risk assessment. In addition, collection of plant tissue samples and characterization of wildlife habitat was included. Responsible for analysis and interpretation of data, as well as report preparation and liaising with stakeholders and government agencies.

PROJECT EXPERIENCE – OIL AND GAS

Enbridge Bayview Avenue Pipeline Replacement

Ontario, Canada

Natural environment component lead for pipeline replacement project. Coordinated SAR screening, natural heritage feature mapping, site investigations, impact assessment, tree inventory, DFO self-assessment,

consultation with MECP, registration of activities (NoA) under the *Endangered Species Act* and development of mitigation plan. Worked with team to obtain Toronto and Region Conservation Authority (TRCA) permits.

Enbridge Pipelines Inc. Line 9
Southern Ontario, Canada

Project manager for natural environment component of pipeline maintenance project in southern Ontario. Coordinated SAR screening and natural heritage feature mapping, site investigations, identification of permit requirements and constraint mapping in support of brushing and other maintenance activities.

TransCanada Bear Creek Rehabilitation
Ontario, Canada

Natural environment component lead for Bear Creek rehabilitation following washout and exposure of the pipeline in the creek bed. Completed baseline existing conditions reporting including fish and fish habitat, SAR and riparian habitat to meet Conservation Authority, MNRF and DFO requirements. Worked with Golder's hydrology team to obtain Conservation Authority permits, develop a rehabilitation plan suitable for the existing conditions and fish community, and recommended appropriate mitigation during construction.

TransCanada Greater Golden Horseshoe Facilities Modifications
Ontario, Canada

Natural environment component lead for an environmental and socio-economic assessment for modifications to a number of facilities under the National Energy Board (NEB). Responsibilities included designing the field program (vegetation, wetlands, wildlife, fish and fish habitat), analysing data, completing the baseline and effects assessment, liaising with agencies and permitting.

TransCanada Eastern Mainline Project
Ontario, Canada

Vegetation and wetland component lead for an environmental and socio-economic assessment for a 392 km new construction pipeline in southern Ontario under the National Energy Board (NEB). Responsibilities included designing the field program, analysing data, completing the baseline and effects assessment, liaising and negotiating with the MNRF, Environment and Climate Change Canada (ECCC) and local Conservation Authorities, preparing permit applications, and addressing Information Requests (IRs).

TransCanada Parkway West Connection
Milton, Ontario, Canada

Natural environment component lead for an environmental and socio-economic assessment for a new pipeline connection under the NEB. Responsibilities included designing the field program (vegetation, wetlands, wildlife, fish and fish

habitat), analysing data, completing the baseline and effects assessment, liaising with agencies and permitting.

TransCanada Vaughan Mainline Extension
Ontario, Canada

Senior technical reviewer and advisor for the vegetation, wetland and wildlife components for an environmental and socio-economic assessment for a new construction pipeline in southern Ontario under the NEB. Responsible for liaising with all agencies, developing environmental protection plans, designing and coordinating baseline, construction and post-construction monitoring programs.

TransCanada Kings North Connection
Ontario, Canada

Senior technical reviewer and advisor for the vegetation, wetland and wildlife components for an environmental and socio-economic assessment for a new construction pipeline in southern Ontario under the NEB. Responsible for liaising with all agencies, developing environmental protection plans, compensation habitat for SAR, designing and coordinating baseline, construction and post-construction monitoring programs.

TransCanada LNG Facility
Trois Rivieres, Quebec, Canada

Aquatic technical component lead. Designed and conducted inland fisheries field programs for a liquefied natural gas facility and associated distribution pipelines. The programs included aquatic habitat assessments of all watercourse pipeline crossings, and an assessment of habitat and water quality of inland lakes in the vicinity of the facility. Interpreted data and prepared technical reports.

Education

H.B.Sc (Env) Honours Environmental Biology Co-op, University of Guelph, Guelph, Ontario, 2012

Certifications

Pleasure Craft Operator Card, 2010

Ecological Land Classification for southern Ontario (Ministry of Natural Resources and Forestry), 2014

Ontario Wetland Evaluation System (Ministry of Natural Resources and Forestry), 2017

Electrofishing, 2017

WHMIS, 2017

First Aid and CPR Level C, 2017

Federal Reliability Clearance, 2018

Butternut Health Assessor (Ministry of Natural Resources and Forestry), 2019

Golder Associates Ltd. – Mississauga

Ecologist

Amber is an Ecologist and Project Manager with 9 years of experience in terrestrial ecology. She has skills in Ontario flora and fauna identification, species at risk screenings, terrestrial habitat assessments and environmental impact assessments. Amber's experience lies in the design and management of terrestrial field programs, and project management for natural environment components of projects. Amber has experience working in numerous sectors, with a focus in the power, aggregate, oil and gas, land development and mining sectors. Amber also works extensively with the *Endangered Species Act* (ESA) and *Species at Risk Act* (SARA) and associated regulations, and leads Golder's internal Species at Risk Working Group. She has led numerous field programs to support permitting under the ESA and the compilation of terrestrial baseline reports. Her field experience includes completing assessments for significant wildlife habitat, Ecological Land Classification (ELC), wetland delineation and evaluations, herpetofaunal surveys, butternut health assessments, and bat maternity roost habitat surveys.

Employment History

Golder Associates Ltd. – Mississauga, Ontario
Ecologist (2012 to Present)

Responsibilities include project management, field data collection and analysis, and preparation of environmental assessment reports, screening reports, and natural environment reports for private and public sectors, including land development, aggregate, and power. Development, implementation and coordination of field programs, coordination and management of project budgets for natural environment teams, and management of an internal Species at Risk Grouping Work.

City of Guelph – Guelph, Ontario
Conservation and Efficiency Program Assist (Co-op) (September 2009 to December 2009)

Responsible for monitoring an information line related to two City rebate programs, verifying applications, and updating rebate qualifications for the City website. Conducted presentations in the Upper Grand District School Board to educate students on water conservation and protection through interactive learning. Participated in a pilot program monitoring the water quality of grey water systems installed in local residences, including water sampling, analysis, tracking of results, and compilation of a report for the City.

Environment Canada - Canadian Wildlife Service – Burlington, Ontario
Wildlife Toxicology Technician (Co-op) (January 2009 to April 2009)

Independently managed a study exposing tadpoles of the African clawed frog to treated wastewater effluent from the Hamilton Sewage Treatment Plant in a flow-through facility, including animal care, experimental procedure and endpoint measurements. Performed field collection of European starling eggs for use in environmental toxicology monitoring program.

PROJECT EXPERIENCE – AGGREGATES

Queenston Quarry Reclamation Company, Queenston Quarry Redevelopment Project Niagara-on-the-Lake, Ontario, Canada	Project Manager for proposed re-development of the former Queenston Quarry. Responsibilities included coordinating field data collection and analysis, interpreting data, and preparing an Environmental Impact Study report for the Niagara Escarpment Commission. Responsible for negotiations and discussions with the MNRF regarding SAR issues and developing appropriate mitigation measures.
Fowler Construction Ltd., Fleming Quarry Expansion Washago, Ontario, Canada	Conducted natural heritage studies for a proposed below water quarry license application under the ARA, including a due diligence assessment. Surveys included turtle visual encounter surveys to target Blanding's turtle and spotted turtle, anuran call count surveys, and fish community sampling and fish habitat assessments.
EWL Management Ltd., Northern Ontario Quarry and Pit Project Northern Ontario, Canada	Managed, coordinated and led the 2016 field program to conduct eastern whip-poor-will, anuran call count, and acoustic bat monitoring surveys for the proposed borrow area and quarry site. Collected and analysed field data in cooperation with other disciplines to prepare the Level I & II Natural Environment Technical Reports as part of two licence applications under the ARA. Worked with the client and MNRF to develop mitigation and compensation plans for species at risk, including woodland caribou and bats.
Ontario Ministry of Transportation - Northern Ontario Pit/Quarry Permits Northern Ontario, Canada	Prepared the Level I & II Natural Environment Technical reports to support four permit applications for aggregate extraction under the provincial ARA.
Scotian Materials - Goffs Quarry Expansion Environmental Assessment Halifax, Nova Scotia, Canada	Conducted natural heritage studies for a proposed quarry expansion project, including preparation of an Environmental Impact Study report as part of the Environmental Assessment Registration Document. Conducted field surveys, including botanical inventory and plant community classification using the Forest Ecosystem Classification system for Nova Scotia, rapid fish habitat assessments, wildlife and SAR habitat assessments, and wetland surveys in accordance with the Nova Scotia Wetland Evaluation Technique.
Colacem Cement Plant L'Orignal, Ontario, Canada	Prepared an Environmental Impact Statement for the municipal approval process for the proposed construction of a cement plant. Responsibilities included coordinating field data collection, analysis and interpretation of data, and preparation of the Environmental Impact Statement report. Also prepared and submitted a Request for Project Review to Fisheries and Oceans Canada for impacts to fish habitat.
Lafarge Canada Inc. Various Locations, Ontario, Canada	Prepared and submitted the Notice of Activity forms for seven (7) aggregate operations (pit and quarry) in southern Ontario to support the transition of existing exemption agreements under the Endangered Species Act to the new protocol of Registration of Activities. Also prepared mitigation plans for each site as part of the agreements.

Lafarge Canada Inc., Sunningdale Pit London, Ontario, Canada	Prepared the Level I & II Natural Environment Technical Report to accompany the licence application for aggregate extraction under the provincial ARA. Project Manager for annual monitoring of barn swallow compensation structures installed as part of the Notice of Activity under the ESA for the project. Project management responsibilities involved coordination of field surveys to assess use of the structures, preparation of a mitigation plan, and preparation of annual monitoring reports.
Lafarge Canada Inc., Limebeer Pit Caledon, Ontario, Canada	Performed anuran call count and egg mass surveys, as well as turtle nesting surveys, in support of a proposed aggregate licence under the ARA. Prepared the Level I & II Natural Environment Technical report as part of the successful licence application.
Lafarge Canada Inc., Avening Extension Pit Creemore, Ontario, Canada	Performed anuran call count surveys and egg mass searches as part of a proposed expansion to a currently licenced and operating aggregate pit. Prepared the Level I & II Natural Environment Technical report to support the licence expansion application. Also prepared and submitted permitting documents, including a DFO Request for Project Review under the Fisheries Act, and a Notice of Activity under the ESA.
Lafarge Canada - Species at Risk Monitoring Various Locations, Ontario, Canada	Conducted Blanding's turtle basking and nesting surveys in accordance with the Ministry of Natural Resources and Forestry guidelines at several licenced and operational aggregate pits in southern Ontario as part of required SAR monitoring.

PROJECT EXPERIENCE – ECOLOGY

CIMA, Consumer's Drive Extension Whitby, Ontario, Canada	Conducted a wetland evaluation using the Ontario Wetland Evaluation System (OWES) to evaluate the potential for a wetland on site to be complexed with an existing Provincially Significant Wetland to the south. Terrestrial communities on the site were also delineated and classified using the ELC system for southern Ontario. Helped prepare the wetland evaluation report for submission to the Ministry of Natural Resources and Forestry.
Wetland Evaluation Belleville, Ontario, Canada	Project manager for a wetland evaluation project on a proposed subdivision development site. Conducted a wetland evaluation using OWES to evaluate the potential for four wetland units to be complexed with an adjacent Provincially Significant Wetland, and prepared the wetland evaluation report for submission to the Ministry of Natural Resources and Forestry.
Emery / Metrus, Levi Creek Constructed Wetland Monitoring Mississauga, Ontario, Canada	Conducted post-construction environmental monitoring of a constructed wetland adjacent to residential development. Monitoring was conducted for both terrestrial and wetland components, and included anuran surveys, vegetation plot monitoring following the Credit Valley Conservation's vegetation plot technique guidelines, and qualitative wildlife habitat assessments. Prepared the monitoring report for submission to the Credit Valley Conservation Authority and Fisheries and Oceans Canada.

Scoped Subwatershed Study
Central Elgin, Ontario, Canada

Conducted a natural heritage assessment as part of a scoped subwatershed study in the Lower Kettle Creek subwatershed with the objective to provide a framework to guide future land use and development. Completed field surveys, including assessments for ELC communities, wildlife and SAR habitat, and rapid watercourse and fish habitat. Helped compile the scoped subwatershed study report, including recommendations on environmental targets and management strategies.

Ecological Risk Assessment
Nobel, Ontario, Canada

Component Lead for an ecological risk assessment comparing wildlife communities on a former industrial site to a reference site to help analyse potential development options and develop ecological risk-management measures for the site. Responsibilities included designing and coordinating the field study program, analysis of data using the Jaccard Index to evaluate community similarity, and preparation of the ecological assessment report.

Ontario Ministry of Natural Resources and Forestry - Vascular Plants at Risk
Peterborough, Ontario, Canada

Compiled peer-reviewed literature and information to assist the Ministry of Natural Resources and Forestry with development of policies and practices under the Endangered Species Act for 63 vascular plant species at risk (SAR) in Ontario.

PROJECT EXPERIENCE – SPECIES AT RISK

Canadian Nuclear Laboratories (CNL) Port Hope Remediation
Port Hope, Ontario, Canada

Responsible for coordinating species at risk screenings and field work to verify existing habitat conditions in areas proposed for remediation. Provided recommendations on mitigation measures, species-specific surveys to confirm use, and permitting requirements under the ESA.

American Ginseng Monitoring Program
Simcoe County, Ontario, Canada

Conducted population surveys of American ginseng, designated endangered under the Endangered Species Act, as part of an annual monitoring program between 2015 and 2018.

Municipality of Chatham-Kent, Ontario Certified Site Ready Program
Chatham, Ontario, Canada

Natural environment component lead for an “Investment Ready” property designation under the Ontario Certified Site Ready Program. As part of the program designation process, a SAR screening and site reconnaissance was completed for two properties to identify potential SAR constraints for future development opportunities.

TC Energy
Various Locations, Ontario, Canada

Project Manager for the TC Energy Eastern Region (Ontario) pipeline integrity program. Responsibilities include coordinating and managing desktop natural environment and SAR screenings, liaising with the local Conservation Authority to identify and obtain potential permits, and SAR and avian nesting surveys across Ontario as part of pipeline maintenance activities.

CBM Aggregates (a division of St. Marys Cement Canada) – Butternut Health Assessments Ontario, Canada	Managed and coordinated the completion of Butternut Health Assessments for various sites in southern Ontario, including successful submission of Butternut Health Assessment Reports and Notice of Butternut Impact registrations under the ESA. Also prepared Butternut Planting Plans as part of the registration.
Digram Developments Caledon Inc., Barn Swallow Monitoring Caledon, Ontario, Canada	Coordinated and managed an annual barn swallow monitoring program of compensation structures at a land development site in Caledon. Prepared the mitigation plan and annual monitoring reports, as required as part of the Notice of Activity registration process under the ESA.

PROJECT EXPERIENCE – ENVIRONMENTAL ASSESSMENT

Clarksburg Master Servicing Plan Clarksburg, Ontario, Canada	Natural Environment Component Lead for a Class Environmental Assessment of a water and wastewater master servicing plan. Responsibilities included coordination of terrestrial data collection, analysis and interpretation of data, and preparation of the Natural Environment Report.
Town of Blue Mountains Water Supply Master Plan Blue Mountains, Ontario, Canada	Natural Environment Component Lead for a Schedule B Municipal Class Environmental Assessment. Responsibilities included coordination of terrestrial data collection, analysis and interpretation of data, and preparation of an Environmental Impact Study report.
City of Markham Victoria Square Blvd Improvements Markham, Ontario, Canada	Natural Environment Component Lead for a Schedule C Class Environmental Assessment related to planned road improvements. Responsibilities included coordination and collection of field data, analysis and interpretation of data, and preparation of the Natural Environment Report.
Tlicho All-Weather Road Project Northwest Territories, Canada	Completed the baseline description and effects assessment for wildlife Valued Components (VCs) as part of the Adequacy Statement Response for the Environmental Assessment. Also provided responses to agency and stakeholder Information Requests as part of the review of the Environmental Assessment.
City of Cambridge, Zone 1W Project Cambridge, Ontario, Canada	Project manager for a Class B Environmental Assessment for the Cambridge Pressure Zone 1W project. Responsibilities included coordination of field data collection, data analysis and interpretation, and preparation of a Natural Environment Report.
HydroOne Networks Inc., B5C/B6C Line Refurbishment Project Burlington, Ontario, Canada	Coordinated and led terrestrial field surveys to support the Environmental Assessment for a 24 km stretch of hydro corridor proposed for refurbishments. Completed ELC assessment and mapping, botanical inventory, SAR surveys and wildlife habitat assessments in cooperation with a First Nations assistant. Also completed a rare plant survey and mapping for a target species (New Jersey Tea).

Region of Peel – East to West Wastewater Diversion Strategy Project
Mississauga, Ontario, Canada

Natural Environment Component Lead for a municipal class Environmental Assessment. Responsibilities included coordination of terrestrial data collection, analysis and interpretation of data, and preparation of the Natural Environment Report.

PROJECT EXPERIENCE – TRANSPORTATION/RAIL

HDR Inc., Downtown Rapid Transit Expansion Study
Toronto, Ontario, Canada

Prepared the natural environment component of the Environmental Project Report as part of a Transit Project Assessment Process Environmental Assessment for the Downtown Relief Line project, including evaluation of existing conditions, identification of impacts and recommendation of mitigation and contingency measures. Coordinated and developed responses to agency and stakeholder comments related to natural environment in the Environmental Project Report.

Markham GO Station Road Realignment – Transit Project Environmental Assessment
Markham, Ontario, Canada

Prepared a Natural Environment Report, including detailed impact assessment, as part of a Transit Project Assessment Process for proposed improvements and road alignment associated with the Markham GO station.

Canadian National Railway Company - Credit River Bridge Replacement Post-Construction Monitoring
Georgetown, Ontario, Canada

Completed Year 1 and 2 of the post-construction vegetation monitoring program associated with the restoration of the Credit River Valley following a railway bridge replacement. Prepared the monitoring report for submission to the Credit Valley Conservation Authority and Fisheries and Oceans Canada.

Canadian National Railway Company
Northern Ontario, Canada

Conducted desktop environmental evaluation reports for siding extensions at six sites in northern Ontario. Each evaluation included a desktop level constraints analysis for species at risk, natural areas, terrestrial features, wildlife and aquatic features and fish habitat. The environmental evaluation report summarized each potential environmental constraint and identified applicable mitigation measures.

PROJECT EXPERIENCE – OIL & GAS

Syncrude Canada - Beaver Creek Monitoring Program
Fort McMurray, Alberta, Canada

Prepared the annual water report summarizing the results of surface water quality and toxicity testing conducted in Beaver Creek downstream of the Mildred Lake Settling Basin in 2012, 2013 and 2014. Performed the analysis and interpretation of trends in water quality data collected over two to three sampling periods each year.

TC Energy - Eastern Mainline Project
Ontario, Canada

Coordinated and led the terrestrial field program for baseline data collection in 2014 to accompany the National Energy Board filing for twining of a pipeline between Whitby and Brockville in Ontario. Also coordinated and led the terrestrial SAR field program, targeting amphibians, birds and reptiles, along the proposed route in 2015 in support of SAR permitting.

Canadian National Resources Limited, Cold Lake Oil Response Project
Cold Lake, Alberta, Canada

Conducted wildlife inventory, monitoring and determent activities as part of the response to a bitumen release in northern Alberta. Activities included amphibian pit-fall trapping and release, construction monitoring and mitigation, waterfowl trapping, bird surveys, and preparation of daily monitoring reports.

PROJECT EXPERIENCE – MINING

Cliffs Chromite Project
James Bay Lowlands, Ontario, Canada

Conducted Northeastern Ontario Forest Ecosystem Classification (FEC) surveys in remote locations along proposed transportation corridor alternatives for proposed mining project.

Osisko Hammond Reef Gold Project
Atikokan, Ontario, Canada

Completed baseline data collection to support the Environmental and Social Impact Assessment for a proposed gold mine. Surveys included avian, turtle and anuran surveys, surveys to identify and delineate potential areas of wild rice colonies, as well as toxicological sampling of local vascular plant species and soil.

PROJECT EXPERIENCE – LAND DEVELOPMENT

Hopewell Developments Inc., Matheson Boulevard Commercial Development
Mississauga, Ontario, Canada

Project Manager for a commercial development site adjacent to Little Etobicoke Creek. Conducted a desktop assessment of existing environmental features, assessed potential impacts, and prepared an Environmental Impact Study report. Also identified mitigation measures and provided input into the planting plan for a buffer required by the Toronto and Region Conservation Authority.

Simcoe County Landfill Closures
Simcoe County, Ontario, Canada

Provided natural environment services for various landfill closure sites across Simcoe County, including preparation and submission of scoped Environmental Impact Studies and restoration plans. Also engaged in consultation with the Nottawasaga Valley Conservation Authority (NVCA) to determine Terms of Reference, permitting requirements and restoration requirements, and attended a site visit with NVCA to delineate wetland boundaries.

Biddle and Associates Ltd., Northglen Residential Subdivision Development
Clarington, Ontario, Canada

Natural environment component lead on a dewatering monitoring program at a residential subdivision development in compliance with a Permit to Take Water. Responsibilities included designing, coordinating and managing a wetland vegetation monitoring program for a swamp adjacent to the development. Interpreted data and prepared a baseline report and subsequent monitoring reports during the dewatering phase.

Residential Development Township of Springwater, Ontario, Canada	Project Manager and Natural Environment Component Lead for an Environmental Impact Study of a single-residence development. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, conducting ELC, wildlife habitat and botanical inventory surveys, interpreting data, and producing an Environmental Impact Study report for the township and conservation authority.
Residential Development Flamborough, Ontario, Canada	Project Manager for an Environmental Impact Study for proposed residential development. Responsibilities included preparing a Terms of Reference, coordinating and implementing field data collection and analysis, conducting ELC, botanical inventory and amphibian call count surveys, interpreting data, as well as producing an Environmental Impact Study report for the municipality and conservation authority.
Residential Development Nobleton, Ontario, Canada	Project Manager and Natural Environment Component Lead for an Environmental Impact Study of single-residence development. Responsibilities included coordinating aquatic and terrestrial field data collection and analysis, interpreting data, attending agency meetings, as well as producing an Environmental Impact Study report for the municipality and conservation authority.
Elemental Architects - Tomken Road Natural Heritage Study Mississauga, Ontario, Canada	Prepared a scoped Environmental Impact Statement to support a commercial development site plan approval with the City of Mississauga
Barrie Landfill Barrie, Ontario, Canada	Conducted a tree inventory as part of the environmental assessment for construction of a stormwater pond at the Barrie Landfill.

PROJECT EXPERIENCE – POWER

OPG Deep Geologic Repository Ecological Surveys Tiverton, Ontario, Canada	Conducted ecological surveys for the proposed Low and Intermediate Level Waste Deep Geologic Repository Project on the Bruce Power site. Conducted field surveys including rare plant survey, turtle visual encounter surveys, and snake visual encounter surveys, and helped compile the annual report outlining survey results.
NextEra Canada Development and Acquisitions Inc. Battery Energy Storage Facility Elmira, Ontario, Canada	Conducted the Natural Heritage Assessment to support permitting for the proposed Solid Battery Energy Storage Systems project in Elmira, including a SAR screening, site reconnaissance, preparation of a constraints analysis and identification of permit requirements under the ESA and Conservation Authorities Act.
Disco Road Organics Processing Facility Toronto, Ontario, Canada	Prepared the Records Review and Site Investigation reports to support the natural heritage portion of a Renewable Energy Approval.

Majestic and Mayer Wind Energy Project Bruce County, Ontario, Canada	Prepared updates to the Records Review, Site Investigation, Evaluation of Significance, and Environmental Effects Monitoring Plan reports to support the natural heritage portion of a Renewable Energy Approval.
Churchill Wind Energy Project Lambton County, Ontario, Canada	Performed site investigations of overall natural heritage, including ELC and habitat mapping, and bat maternity roost surveys, to support Natural Heritage Assessment portion of Renewable Energy Approval for proposed wind project.
Clarington Wind Energy Project Clarington, Ontario, Canada	Performed evening bat acoustic monitoring surveys to identify bat maternity roosts as part of the Natural Heritage Assessment portion of Renewable Energy Approval for proposed wind project.
Arran Wind Farm Project County of Bruce, Ontario, Canada	Performed site investigations of overall natural heritage, including ELC and habitat mapping, and bat maternity roost surveys, to support Natural Heritage Assessment portion of Renewable Energy Approval for proposed wind project.
Twenty-Two Degrees Wind Farm Project County of Huron, Ontario, Canada	Performed site investigations of overall natural heritage, including ELC and habitat mapping, and bat maternity roost surveys, to support Natural Heritage Assessment portion of Renewable Energy Approval for proposed wind project.
Camlachie Wind Farm Project Camlachie, Ontario, Canada	Conducted site investigations of overall natural heritage to support the natural heritage portion of a Renewable Energy Approval, including wildlife habitat identification, vegetation and habitat mapping, and bat maternity roosting and acoustic surveys.
Armow Wind Farm Project Bruce County, Ontario, Canada	Performed site investigations of overall natural heritage to support the natural heritage portion of a Renewable Energy Approval, including wildlife habitat identification, vegetation and habitat mapping, and bat maternity roosting and acoustic surveys.
Summerhaven Wind Farm Project Haldimand County, Ontario, Canada	Performed site investigations as part of natural heritage assessments to support a Renewable Energy Approval for proposed wind project. Site investigations included wildlife habitat identification, vegetation and habitat mapping, and bat maternity roosting and acoustic surveys.

TRAINING

Surface Miner Training
2012

Argo Safe Operation Course
2012

Defensive Driver Training
Canadian Pro Drivers, 2015

Rail Safe
2019

PROFESSIONAL AFFILIATIONS

Ontario Stone Sand and Gravel Association Ecology Committee

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