# Level 1 and 2 Natural Environment Technical Report (NETR) and Environmental Impact Assessment (EIA)

## Dufferin Aggregates Milton Quarry East Extension (MQEE)

**December 2021**

Prepared for:

**Dufferin Aggregates**

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## PART 1: LEVEL 1 REPORT

## 1.0 INTRODUCTION

### 1.1 Background

Goodban Ecological Consulting Inc. (GEC) was retained by Dufferin Aggregates, a division of CRH Canada Group Inc. (Dufferin), to prepare a Natural Environment Level 1 and 2 Technical Report and Environmental Impact Assessment (EIA) for a licence application for their proposed Milton Quarry East Extension (MQEE). The proposed quarry extension lands are located in Part of Lot 12, Concession 1, Geographic Township of Esquesing, Town of Halton Hills, Regional Municipality of Halton (**Figure 1**).

The proposed extension of the Milton Quarry, referred to as the Milton Quarry East Extension (MQEE), represents a proposed licence area of 30.2 ha and a proposed extraction area of approximately 15.9 hectares. The MQEE is contiguous with the existing East Cell and separated from the existing North Quarry by the Nassagaweya-Esquesing Townline (Townline). The proposed MQEE would be extracted as an extension to the existing East Cell (**Figure 2**). The maximum potential dolostone reserve (including both the Amabel and underlying Reynales Formations) in the proposed MQEE is approximately 15 million tonnes.

The 30.2 ha proposed licence area primarily contains large open fields that were formerly in agricultural use. The surrounding land contains forested areas, most of which form part of the 706.4 ha Halton Forest North ANSI. There are a number of wetlands located within the forest that form part of the provincially significant Halton Escarpment Wetland Complex and there is a small unevaluated wetland within the open field area. The Halton Forest, which covers around 35 $km^2$, consists of the Halton Forest South, Halton Forest North and Speyside Forest ANSIs. The Halton Forest North ANSI provides habitat for a number of species at risk, including Butternut (*Juglans cinerea*), American Ginseng (*Panax quinquefolius*), Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population).

The proposed MQEE mining plan involves removing the common setback and expanding the East Cell into the MQEE extraction area. Dewatering of the combined extraction cell will continue in order for quarry operations to occur under typical dry quarry floor conditions. Water-dependent natural features in the vicinity of the proposed MQEE will be protected and, in some cases enhanced over existing conditions, by the recharge of water to the groundwater flow system and diffuse discharge to two wetlands (Wetlands U1 and W36). Dufferin has already committed to integrate the MQEE into the state-of-the-art Water Management System (WMS) and Adaptive Environmental Management and Protection Plan (AMP) that are already in place and have been operating at the Milton Quarry and Milton Quarry Extension since 2007. The Water Management System has effectively maintained groundwater levels around the perimeter of the Milton Quarry Extension, thereby protecting surrounding water resources including water-dependent natural features.

An Ecological Enhancement Plan (EEP) will cover approximately 10.55 ha of Dufferin land that will not be extracted. Ecological enhancements will include reforestation using native species well suited to the local landscape, management of existing woody vegetation in some areas and the placement of habitat features such as rock piles, stumps/root wads and other woody debris. The implementation of the EEP will expand the adjacent Significant Woodland, which will provide an overall benefit to the Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population), as well as many other forest-dwelling wildlife species.

The rehabilitation of the proposed 15.9 ha MQEE extraction area will be integrated with the existing rehabilitation plan for the East Cell and the EEP described above. The MQEE rehabilitation plan includes a lake, a large sheltered wetland, exposed cliff faces, reforestation areas and terrestrial linkages with the surrounding landscape that will be created within the area proposed to be extracted. As there is a shortfall of available soils on the subject lands, Dufferin is proposing to import clean soil similar to the current approvals for the existing Milton Quarry. The expanded East Cell will be filled with water to allow for more passive maintenance of the groundwater flow regime and associated water-dependent natural features in the long-term.

## 1.2 Natural Environment Level 1 and 2 Technical Report Requirements under the Aggregate Resources Act (ARA)

The requirements for a Natural Environment Technical Report are provided in the document titled *Aggregate Resources of Ontario: Technical Reports and Information Standards* (OMNRF August 2020).

The Natural Environment Technical Report must identify any of the following natural heritage features and areas that exist on the site and within 120 metres of the site:

- Habitat of endangered species and threatened species
- Significant wetlands and other coastal wetlands in Ecoregions 5E, 6E and 7E
- Significant woodlands
- Significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary’s River)
- Significant wildlife habitat
- Significant areas of natural and scientific interest
- Fish habitat

- Within the area of one or more provincial plan(s), any key natural heritage features not listed above

Where any of the natural features or areas listed above have been identified, the Natural Environment Technical Report must identify and evaluate any potential negative impacts on the natural features or areas, including their ecological functions, and it must also identify any proposed preventative, mitigative or remedial measures. The report must also indicate if the site or any of the features listed above are located within a natural heritage system that has been identified by a municipality in ecoregions 6E and 7E or by the province as part of a provincial plan. For this purpose, “provincial plan” means any one of the following plans:

- Oak Ridges Moraine Conservation Plan
- Greenbelt Plan
- A Place to Grow: Growth Plan for the Greater Golden Horseshoe
- Niagara Escarpment Plan
- Lake Simcoe Protection Plan

For the MQEE, the applicable provincial plan is the Niagara Escarpment Plan (NEP).

### 1.3 Environmental Impact Assessment (EIA)

In addition to the ARA requirements listed above in **Section 1.2**, the Level 1 and 2 Natural Environment Technical Report (NETR) and Environmental Impact Assessment (EIA) will address the relevant legislative and policy components of the following Acts and Plans:

- *Endangered Species Act (ESA 2007);*
- Provincial Policy Statement (2020);
- Niagara Escarpment Plan (2017);
- Halton Region Official Plan (2015); and,
- Town of Halton Hills Official Plan (2019).

The relevant policies under each plan were identified in the Terms of Reference for a Level 1 and 2 Natural Environment Technical Report (NETR) and Environmental Impact Assessment (EIA) - Dufferin Aggregates Milton Quarry East Extension, prepared by GEC (March 26, 2021).

It is noted that Section 2.9 of the Niagara Escarpment Plan (NEP) states that mineral aggregate operations may be permitted in key natural heritage features and any vegetation protection zone (VPZ) associated therewith, except for wetlands and significant woodlands, that are not young plantation or early successional habitat (as defined by the MNRF).

The NEP also states that mineral aggregate operations may be permitted in a key natural heritage feature or its VPZ, which is solely the habitat of endangered or threatened species and not any other key natural heritage feature, provided it is in compliance with the Endangered Species Act, 2007.

Based on a review of the Niagara Escarpment Plan (NEP), Region of Halton Official Plan (RHOP) and the Town of Halton Hills Official Plan (HHOP) the proposed extraction area is:

- An "Identified Mineral Resource Area" in the RHOP.
- Designated Escarpment Rural Area in the NEP and HHOP and predominately designated "Agricultural Area" in the RHOP. Each of these land use designations have an objective to provide for new mineral aggregate operations. See Figures 3, 4a and 4b.
- Outside of the Provincial and Local Natural Heritage System. See Figures 5a and 5b.
- Predominately outside of the Regional Natural Heritage System except for a small woodland located in the northwest corner of the subject site. This woodland has been evaluated in this Natural Environment Technical Report based on Provincial and Regional criteria and it is not considered a Significant Woodland.

The following approvals would be required before extraction could commence at the proposed Milton Quarry East Extension:

- Aggregate Resources Act Licence for the extension.
- Aggregate Resources Act, Site Plan Amendments for the existing Milton Quarry and Milton Quarry Extension to integrate the operations.
- Niagara Escarpment Plan Amendment and Development Permit for the proposed Milton Quarry East Extension, existing Milton Quarry and Milton Quarry Extension. The amendment and development permit for the existing quarry is to allow for the aggregate from the extension to be processed at the existing quarry.
- Region of Halton Official Plan Amendment for the extension.
- Town of Halton Hills Official Plan Amendment for the extension.
- Endangered Species Act 17(2)(c) "Overall Benefit" Permit for the extension. At least 3.99 ha of the proposed extraction area and most of the surrounding lands is considered habitat for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population).

- Amendments to the existing Permit to Take Water and Environmental Compliance Approval to add the extension lands.

### 1.4 Organization of this Report

This Natural Environment Level 1 and 2 Technical Report and EIA is organized under the following headings:

- 2.0 Level 1 Report
- 3.0 Level 1 Conclusions and Recommendation
- 4.0 Introduction to the Level 2 Report
- 5.0 Existing Conditions
- 6.0 Habitat of Endangered Species and Threatened Species
- 7.0 Significant Wetlands in Ecoregion 6E
- 8.0 Significant Woodlands in Ecoregion 6E
- 9.0 Significant Wildlife Habitat
- 10.0 Significant Areas of Natural and Scientific Interest (ANSI)
- 11.0 Fish Habitat
- 12.0 Summary of Significant Natural Heritage Features
- 13.0 Mitigation to Protect Water-dependent Natural Features
- 14.0 Ecological Enhancement Plan (EEP) for lands that will not be extracted
- 15.0 Description of the Proposed Extraction, Operational Plan and Rehabilitation Plan
- 16.0 Potential Effects on Significant Natural Heritage Features
- 17.0 Environmental Impact Assessment (EIA)
- 18.0 Summary and Recommendations
- 19.0 Literature Cited

## 2.0 LEVEL 1 REPORT

**Figure 6** (MQEE Air Photo Base Plan) and **Figure 7** (Site Surface Water Drainage) provide the reader with the basic site context. Other than along Townline, the proposed licence boundary generally follows the Significant Woodland boundary as shown on **Figure 6**. The Natural Environment Study Area extends to at least 120 m beyond the licence limit, as required by the ARA standards (**Figure 8**). The study area has been extended beyond 120 m from the proposed licence limit in some areas, in order to include the first tier of wetlands within the forest.

## 2.1 Level 1 Methods

The Level 1 assessment involved a review of available background information and ecological field surveys from 2018 to 2021. The details of the field surveys are provided below in **Section 4.1**.

Background information sources were consulted as appropriate, including the following:

- Conservation Halton Database. Mapping of hazards, wetlands, watercourses, steep slopes, fish survey stations and plant/wildlife observation data.
- Ecoplans Limited. 2000. Dufferin Aggregates Milton Quarry Extension – Environmental Impact Assessment. Ecoplans Limited, Kitchener, Ontario. 86 pp + figures + appendices.
- Goodban Ecological Consulting Inc. (GEC). 2008 – 2020. Annual wetland monitoring reports for the Milton Quarry Extension from 2007 to 2020.
- Goodban Ecological Consulting Inc. (GEC). 2019 & 2020. Year-end WSCA reports for minnow trapping surveys for salamanders.
- Natural Heritage Information Centre (NHIC) Database.
- Region of Halton. 2020. 2019/2020 Forest Inventory Plot Location Map – Halton Region Forest *Cox*. Halton Region Forest Tree and Botanical Inventory Excel spreadsheet.
- Riley, J.L., J.V. Jalava and S. Varga. 1996. Ecological Survey of the Niagara Escarpment Biosphere Reserve. Volume I. Significant Natural Areas. Volume II. Technical Appendices. Ontario Ministry of Natural Resources, Southcentral Region, Peterborough, Ontario. Open File Site Report SR 9601. v + 629 pp., vii + 310 pp.

## 2.2 Habitat of Endangered and Threatened Species

A total of seven (7) Endangered species and four (4) Threatened species were confirmed within the MQEE study area during the fieldwork between 2018 and 2021, as follows:

*Vascular Plants*

- Butternut (Endangered)

*Amphibians*

- Jefferson Salamander (Endangered)
- Unisexual Ambystoma (Jefferson Salamander dependent population) (Endangered)

*Birds*

- Barn Swallow (Threatened)
- Bobolink (Threatened)
- Chimney Swift (Threatened)
- Eastern Meadowlark (Threatened)

*Mammals*

- Eastern Small-footed Myotis (Endangered)
- Little Brown Myotis (Endangered)
- Northern Myotis (Endangered)
- Tri-colored Bat (Endangered)

Endangered and Threatened species and their habitats are discussed in **Sections 5.3.2**, **5.4**, and **6.0**. The potential effects of the proposed MQEE on habitats of Endangered and Threatened species are discussed in **Section 16.1**.

## 2.3 Significant Wetlands and Significant Coastal Wetlands

A review of Land Information Ontario (LIO) and Conservation Halton online natural heritage mapping indicates that there are Significant Wetlands on lands adjacent to the proposed licence area. Most of the wetlands identified within the study area are included in the provincially significant Halton Escarpment Wetland Complex. No significant wetlands occur within the proposed extraction area.

Because the study area is distant from the shorelines of the Great Lakes, there are no Significant Coastal Wetlands present.

Significant Wetlands are discussed in **Sections 5.5** and **7.0**. The potential effects of the proposed MQEE on Significant Wetlands are discussed in **Section 16.2**.

## 2.4 Significant Woodlands

As shown on **Figures 4a**, **4b**, **5a** and **5b**, portions of the study area are mapped as part of the Provincial, Regional and Local Greenlands Systems. No Significant Woodlands occur within the proposed extraction footprint.

Significant Woodlands are discussed in **Section 8.0**. The potential effects of the proposed MQEE on Significant Woodlands are discussed in **Section 16.3**.

## 2.5 Significant Valleylands

No Significant Valleylands have been identified within the study area. There are no valley features within the study area.

## 2.6 Significant Wildlife Habitat

The following categories of Significant Wildlife Habitat were identified within the study area:

- Area-Sensitive Bird Breeding Habitat (Woodland)
- Amphibian Breeding Habitat (Woodland)
- Seeps & Springs
- Habitats of Special Concern Bird Species

No Significant Wildlife Habitat occurs within the proposed extraction area. Significant Wildlife Habitat is discussed in **Section 9.0**. The potential effects of the proposed MQEE on Significant Wildlife Habitat are discussed in **Section 16.4**.

## 2.7 Significant Areas of Natural and Scientific Interest (ANSI)

Most of the main forested area located adjacent to the proposed licence area is within the 706.4 ha provincially significant Halton Forest North Area of Natural and Scientific Interest (ANSI). No ANSI's occur within the proposed extraction area.

Significant ANSIs are discussed in **Section 10.0**. The potential effects of the proposed MQEE on Significant ANSIs are discussed in **Section 16.5**.

## 2.8 Fish Habitat

There is a hydrological connection between Wetland W41 and the large beaver pond downgradient in Wetland W44 (see **Figure 6**). Baitfish were observed in W44 by GEC in 2002.

There is potential indirect Fish Habitat within the study area but it is located outside of the proposed extraction area. Fish Habitat is discussed in **Section 11.0**. The potential effects of the proposed MQEE on Fish Habitat is discussed in **Section 16.6**.

# 3.0 LEVEL 1 CONCLUSIONS AND RECOMMENDATIONS

The following natural heritage features occur within the proposed extraction area:

- Habitat of Endangered and Threatened Species

The following natural heritage features occur within the study area, outside of the extraction area.

- Habitat of Endangered and Threatened Species
- Significant Wetlands
- Significant Woodlands
- Significant Wildlife Habitat
- Significant Areas of Natural and Scientific Interest
- Potential Indirect Fish Habitat

The features and functions of these six (6) types of natural heritage features are described in more detail in the Level 2 report that is presented below. In addition, the proposed MQEE is described and its potential effects upon these features and their functions is discussed.

## PART 2: LEVEL 2 REPORT

## 4.0 INTRODUCTION TO THE LEVEL 2 REPORT

The Level 1 report determined that a Level 2 report is required and that it should identify the significant features and functions associated with the Habitat of Endangered Species and Threatened Species, Significant Woodlands, Significant Wildlife Habitat, Significant Areas of Natural and Scientific Interest and Potential Indirect Fish Habitat.

The Level 2 report summarizes the methods that were undertaken to complete the analysis, presents the results of botanical and wildlife inventories, characterizes the significant features and functions of the natural heritage features, summarizes the proposed extraction and rehabilitation of the MQEE, and analyzes the potential effects of the proposed MQEE on the significant natural heritage features. The final sections of this report identify mitigation measures required to minimize impacts and presents a summary of the report and its conclusions.

This section describes the methods used to conduct the detailed surveys of vegetation, flora and wildlife from 2018 to 2021 and outlines the resulting natural environment input provided to the proposed extraction footprint, operational plan, Ecological Enhancement Plan (EEP) and rehabilitation plan.

**Table 1** provides a summary of the various site visits that were completed from 2018 and 2021. The table provides the following information, as appropriate: date, survey type/purpose, observer, timing of survey visit and weather conditions.

## 4.1 Vegetation and Flora

### 4.1.1 Vegetation Communities (ELC Units)

Vegetation community polygons were first identified on aerial photography and then verified in the field. Vegetation community types were mapped and described generally following the Ecological Land Classification (ELC) for Southern Ontario (Lee at al. 1998). Field surveys were undertaken in 2019, 2020 and 2021.

The results of the vegetation community surveys are described in **Section 5.3.1**.

### 4.1.2 Vascular Plants

The flora of the study area was characterized through detailed botanical surveys of more sensitive habitats and general surveys of more disturbed habitats. Survey information is provided in **Table 1**. Surveys were completed during the 2019, 2020 and 2021 growing seasons by A. Goodban.

Vascular plant species status was assessed for Ontario (Oldham and Brinker 2009) and Halton Region (Crins et al. 2006).

Particular attention was paid to surveying the flora of the proposed extraction area, the proposed water management system footprint and the first tier of wetlands adjacent to the proposed extraction area.

The results of the botanical surveys are described in **Section 5.3.2**. Scientific names are provided the first time a plant species is referred to in this report.

### 4.1.3 Species at Risk (SAR) Plants

Focused surveys for Butternut and American Ginseng were completed in 2020 and 2021 by A. Goodban. Searches for Butternut were focused on the proposed extraction area and the proposed water management system footprint. Searches for American Ginseng were focused on the forested areas, particularly those areas that are less disturbed and/or contain bedrock outcrops.

The results of the botanical surveys are described in **Section 5.3.2**.

### 4.1.4 Tree Density Survey

Tree density surveys were completed by A. Goodban and J. Jackson in select areas within the proposed extraction footprint, to determine if a particular area meets the *Forestry Act* woodland definition using stem density values, as required by the Halton

Region Official Plan (2015), and to determine if a particular area is an *early successional* woodland as defined by MNRF.

The tree density surveys were completed using circular plots, the size of which were selected based on the size of the overall community as well as variability of species and density within the feature and ranged between a 4 m and 15 m radii. Trees within plots were tallied by species and categorized as having a diameter at breast height (dbh) of > 20 cm, 13 - 20 cm, 6 - 12 cm or ≤ 5 cm.

The results of the tree density surveys are discussed in **Section 8.0**.

#### 4.1.5 Significant Woodland Boundary Delineation and Staking

The boundary of the Significant Woodland was staked by A. Goodban and J. Jackson on November 29 and December 6, 2020, in those areas where the woodland edge is in proximity to the proposed extraction footprint and water management system footprint. The staked boundary was surveyed in by GHD's surveyor and plotted on the figures in this report. Elsewhere the boundary was defined through air photo interpretation by A. Goodban.

The staked boundaries may be reviewed in the field with the Region of Halton's forester.

Significant Woodland boundaries are discussed in **Section 8.0**.

#### 4.1.6 Wetland U1 Boundary Delineation and Staking

The boundary of Wetland U1 was delineated and staked by A. Goodban on June 28, 2020.

The staked boundary may be reviewed with Conservation Halton staff at the appropriate time of year (e.g., June – September).

The Wetland U1 boundary is discussed in **Section 5.5.1**.

### 4.2 Wildlife

#### 4.2.1 Amphibians

*Salamander Surveys*

As part of the ecological work related to the Milton Quarry Extension application, surveys for mole salamanders were completed across a wide area in the vicinity of the original Extension in the late 1990's and 2002. Those surveys focused on checking potentially suitable breeding pools for the presence of Jefferson Salamander Complex egg masses. For each pool containing egg masses, several would be collected and transported to the University of Guelph to be raised and tissue samples were used for genetic identification. The small Wetland U1 in the open field was not surveyed as part of the late 1990's and 2002 salamander surveys.

Minnow trapping for salamanders in selected wetlands was completed by A. Goodban during spring 2019 and 2020. The following wetland pools were sampled:

- U1 2019 & 2020
- W17 2019
- W36 2019 & 2020
- W41 2019
- W46a 2020
- W46b 2019 & 2020
- W46c 2019
- W46d 2019

The pools that were sampled are shown on **Figure 9a**.

Sampling of adult salamanders involved the setting of minnow traps in suitable pools within wetlands within the MQEE study area on mild, rainy evenings when salamanders are most likely to be moving to breeding pools. The dates for minnow trapping are provided in **Table 1**. The weather forecast was monitored regularly starting in late March. Field reconnaissance was undertaken to monitor ice cover on potential breeding ponds and snow depths within the forest.

Unbaited minnow traps (maximum mesh size of 0.64 cm) were used to capture adult

salamanders within selected wetlands. Each trap was marked with flagging tape and the ownership of the trap. Each trap was tied to a suitable anchor on the bank, using nylon rope.

The traps were checked early the following morning. The minnow traps were removed from the pools on nights when no/minimal salamander movement was anticipated.

Jefferson Complex salamanders captured in traps were released where they were captured after tissue samples (tail tips) have been collected. Sampling involved the removal of a small portion of the tail (not exceeding 5 mm). Tail tips were removed using a single-edged disposable razor blade or scalpel which was sterilized with 70% ethyl alcohol between each specimen. Handling of each salamander was kept to the absolute minimum. Samples were placed in vials containing 70% ethyl alcohol and sent to Dr. Bogart at the University of Guelph for genetic analysis. An MNRF Jefferson Salamander Presence/Absence Form was filled out and a copy was submitted with the samples to Dr. Bogart. Each sample was labeled with the pond number where the sample was collected, sample number and date of collection. The UTM coordinates of the capture location, the date the sample was collected, the names of the collectors, and the permit numbers for the Scientific Wildlife Collector's Authorization and the permit under the Endangered Species Act and the Animal Care Protocol number were recorded on the data forms.

Minnow trapping surveys were completed during spring 2019 and 2020 under the following authorizations:

- ESA 17(2)(b) permit or online registration (MECP);
- Wildlife Scientific Collector's Authorization (MNRF); and,
- Animal Care Protocol (MNRF).

The results of the salamander surveys are discussed in **Section 5.4.2**.

*Amphibian Call Count Surveys*

Song Meter SM4 units were deployed by A. Goodban at selected wetlands in 2019 and 2020, from around the time of the spring thaw until late June (approximately 75 nights). Monitoring stations are shown on **Figure 9a**. Recordings were made in 10-minute sessions commencing 30 minutes, 90 minutes and 150 minutes after sunset.

Recordings were analyzed to begin establishing baseline conditions for amphibian breeding activity and as part of the site characterization and assessment. Hourly data from the Milton Quarry Weather Station (e.g., temperature, precipitation) was used to identify optimal conditions for amphibian breeding activity. Data from evenings with good frog call activity was analyzed and call intensity was assessed using the following criteria:

- Level 1 - Individuals can be counted, calls not overlapping.
- Level 2 – Individual calls overlapping.
- Level 3 – Full chorus.

The aim of the surveys was to confirm the diversity of frogs and toads using a particular wetland for breeding activity, and to determine the peak calling intensity for each species if possible.

The results of the amphibian call count surveys are discussed in **Section 5.4.2**.

### 4.2.2 Reptiles

Locations of potential snake hibernacula within the proposed extraction area and the proposed water management system footprint were surveyed several times during early periods of warm weather (e.g., April and May). Snake visual encounter surveys were conducted on mild spring mornings (i.e., minimum 8°C on sunny days or 15°C on overcast days, no greater than 25°C) between 8 am and 5 pm. Survey information is provided in **Table 1**.

Target sites included rock outcrops and fissures, and rock/stone piles along field boundaries. Otherwise, snakes were surveyed on an opportunistic basis.

The results of the reptile surveys are discussed in **Section 5.4.3**.

### 4.2.3 Breeding Birds

Surveys completed for grassland birds, forest birds and marsh birds are described below. Point count stations are shown on **Figure 9b.** Survey details are provided in **Table 1**.

*Grassland Birds*

Breeding bird surveys of the grassland areas were completed in both 2019 and 2020, on three separate mornings each year, following the OMNR's (2011) *Survey Methodology under the Endangered Species Act, 2007: Dolichonyx oryzivorus (Bobolink)*.

OMNR's survey protocol for Bobolink has the following requirements:

- Set up point count stations to provide good coverage. Observers can use a wandering transect survey between point count stations.
- Complete *at least* 3 sets of point count surveys. The surveys should occur between the last week in May and the first week in July, with each survey separated from the previous one by at least a week.
- Surveys should start around dawn and continue until no later than 10 am. The observer will undertake 10 minutes of observations and listening at each point count station. Record information on all Bobolink and Eastern Meadowlark observed or heard. Nest searches should be avoided.
- Record notes on habitat characteristics including broad descriptors (e.g., field, hedgerow, fenceline), vegetation height, dominant species, proportions of grasses versus broadleaved plants, and depth of thatch layer.

*Forest Birds*

Breeding bird surveys were completed in primarily forested habitats on three separate mornings during the breeding season in 2020. The focal area was the forested habitats between the edge of the open fields and the first tier of wetlands to the east and south of the proposed extraction area. Point count stations were set up to provide good coverage of the area and the various habitats. A wandering transect survey was completed when moving between point count stations.

Three sets of point count surveys were completed in 2020. The surveys occurred between the last week in May and the first week in July, with each survey separated from the previous one by at least a week. Surveys started around dawn and continued until no later than 10 am (approximately). Ten minutes of observations and listening was completed at each point count station.

Breeding birds were surveyed by 10-minute stationary point counts generally following the Second Ontario Breeding Bird Atlas methodology (Cadman et al. 2007), which called for 5-minute point counts. All species and daily numbers of individuals were recorded during each of the site visits.

All bird species that were observed on the proposed licence area and adjacent lands were recorded. A species was considered to be breeding unless there was convincing evidence to the contrary. The breeding evidence codes from the Second Ontario Breeding Bird Atlas (Cadman 2007) were applied only if there was suitable breeding habitat within the study area.

*Marsh Birds*

The Marsh Monitoring Bird Survey Protocol (MMP) bird surveys were completed for two stations (M1, M2) in Wetland W41 during the 2021 breeding season. The MMP uses a fixed-distance point count method to collect data on bird species. Fixed-distance point counts require a surveyor to stand at a focal point recording all species within or outside a 100 m semicircle radius. Each station was surveyed twice using the standard 15-minute listening period (5 minutes of passive listening, then 5 mins of playback of 5 marsh obligate bird species and ending with 5 mins of passive listening).

Meyer et. al. (2006) state that MMP surveys should occur only in marsh habitat (i.e., greater than 50 percent non-woody emergent plants interspersed with shallow open water). No wetlands within the study area met these criteria. The MMP surveys were completed for small marsh pockets within the larger Wetland W41 to address peer reviewer comments received in May 2021.

The results of the breeding bird surveys are discussed in **Section 5.4.4**.

### 4.2.4 Bats

A reconnaissance-level site visit was made by A. Goodban and A. Sandilands on May 2, 2021 to determine the potential for the proposed MQEE to provide bat roosting habitat. Two general areas were defined as having some potential: Woodland B in the west corner of the proposed extension and Hedgerow CUHa along the existing access road along the northwest side. A small hedgerow (CUHb) also extends southeastward from the northern Hedgerow CUHa.

For Woodland B, it was decided that the OMNRF (2017) protocol should be used. This consists of characterizing and mapping all cavity trees $\geq$ 25 cm diameter at breast height (DBH) and conducting an acoustical survey. The acoustical survey should be conducted on 10 suitable nights when the temperature is at least 10°C, there is no rain, and the wind is light. The survey may be shortened if maternity roosts are confirmed prior to completion of nocturnal surveys. Surveys should start at dusk and continue for 5 hours. Bat detectors should be deployed at the rate of 4 per 1 ha of woodland. Areas with a density of 10 or more cavities per ha may be considered high quality potential habitat.

The cavity tree search was conducted on May 9, 2021 by A. Goodban prior to leaf-out in both Woodland B and Hedgerows CUHa and CUHb. Every tree that met the minimum size criterion of 25 cm DBH was searched for cavities. Every tree that qualified under the size criterion was searched for features that had potential to provide a roost. These included cavities, splits in the trunk or large limbs, and loose bark. If any of these features were found, regardless of how likely they were to support a roost, additional information was collected. This included the species of tree, its DBH, its location to approximately 5 m accuracy, and its stage of decay (Watt and Caceres 1999). A photograph was taken of each tree for which detailed data were collected. For each tree, it was determined if it was one of the tallest trees present; if it had cavities, scars, or woodpecker holes; if it had the largest DBH in the community; if the cavity or crevice was more than 10 m from the ground; if it was within the area of highest densities of snags; if it had large areas of loose, peeling bark; and if the canopy was open. These parameters are consistent with the recommendations provided by OMNRF (2017) for surveying for potential roosts for the Little Brown Myotis and Northern Myotis.

The approach to identifying potential roost trees was quite conservative. All Black Cherries were considered to have large amounts of loose, peeling bark. This is a natural condition for these trees but their potential to provide a maternal roost is actually extremely low in the absence of cavities. All other trees with some loose bark were considered potential roost trees although their potential to provide this habitat is extremely low for most species of bats.

The appropriate method for surveying for potential bat usage of the isolated cavity trees within the hedgerows was a more difficult decision. Exit surveys are often recommended whereby observers start watching cavity trees around sunset until after dark to look for bats leaving cavities. This method has been frequently used but rarely provides any meaningful information. Unless bats are silhouetted against the sky when they leave the cavity, they are almost impossible to see. Netting has also been suggested, but even the capture of bats near a cavity is not necessarily proof that they used the cavity as a roost. At a roost near Cambridge where all captured adult female

Little Brown Myotis were PIT-tagged and monitored over a period of 5 years, 23.1% of the tagged bats never used the roost. All bats were initially captured within 10 m of the roost (A. Sandilands, unpublished data). For the isolated cavity trees, the decision was made to do the more rigorous acoustical surveys using the same protocol as in Woodland B.

Four detectors were deployed in Woodland B between June 6 and 20, 2021. After Woodland B was surveyed, the detectors were moved to the hedgerows between June 20 and 27, 2021. The timing of the acoustical survey was consistent with the recommended time window of June 1-30 (OMNRF 2017).

The detectors used were Wildlife Acoustics SM4BAT FS units. The following settings were used:

- Gain = 12 dB
- 16K High Filter ON
- Sample rate 256k
- Min duration 1.5 ms
- Min trigger freq 16 kHz
- Trigger level 12 dB
- Trigger window 3 s
- Max length 00m:15s

Detectors were located near the largest cavity trees and where there was a concentration of cavities. **Figures 10a** and **10b** show where the detectors were situated in relation to cavity trees. A 30-m radius is indicated around them to show the approximate maximum area of detection by the bat detectors. This demonstrates that the detectors covered all of Woodland B and that there was overlap in the coverage by the detectors. This was particularly true for Detector 09, which overlapped broadly with the coverage areas of Detectors 08 and 10. Consequently, it is probable that many bats were recorded multiple times.

**Figures 10a** and **10b** also show the locations of the Control Valve (CV) Huts that are part of the Water Management System (WMS) for the existing Milton Quarry Extension. These huts may influence bat usage of the general area. They are illuminated at night with a safety light on the front and therefore attract large numbers of insects and foraging bats. Several bats have been observed around these huts on occasions when other nocturnal surveys such as amphibian call counts were being conducted.

The detectors were programmed to start collecting data from half an hour before sunset until 5 hours after dusk. The protocols suggest starting the detectors at dusk, but there is often some bat activity at or even slightly before sunset. The detectors saved the bat calls as WAV files.

The Kaleidoscope 3.1.7 program was used to initially separate bat calls from noise. Bat call files were also analyzed by the program and either ascribed to species or listed as No Identification. It identifies calls predominantly on the maximum, minimum, and average frequencies of the calls, but also uses other metrics. It suggests the most likely identification as well as other possibilities. A high proportion of files were not identified by the program.

The WAV files were converted to Analook files. This allows the researcher to see the sonogram of the calls and make a more accurate identification. All files that the program automatically identified were checked to ensure that the identification was correct and all unidentified files were examined to see if the call could be identified.

After identification, files were put into folders for each of the species detected and for each of the detectors. Information for Woodland B and the hedgerows was kept separate.

Sunset times during the acoustical survey period were obtained for the month of June for Acton from Environment Canada (see **Table 2**). Hourly data from the Milton Quarry Weather Station were downloaded to determine which nights were suitable for conducting acoustical surveys according to the protocols.

Despite the large amount of data that were collected, professional judgement is required to determine the likelihood that a cavity or a general location in a woodlot is functioning as a bat maternity roost. Presence of a calling bat is not an indication of a roost on its own. It is highly unlikely that a 10-night long acoustical survey could be conducted anywhere in southern Ontario without recording endangered bat species. Despite recent declines in bats, they are still relatively common and forage over considerable distances (2 to 5 km from the roost). Consequently, factors such as when species typically leave the roost and their preferred roosting and foraging habitat were taken into account when considering the potential for areas to function as a maternity roost. With acoustical surveys, it is not possible to distinguish between the calls of the sexes, so results may be confounded by male usage of an area.

Another issue of lesser importance is that it is not always possible to correctly identify the bat that made the call. The three myotis species are an example. The Little Brown Myotis has the lowest high frequency in its call, the Eastern Small-footed Myotis is intermediate, and the Northern Myotis has the highest frequencies. During a feeding buzz, the frequency of a Little Brown Myotis may approach that of an Eastern Small-footed Myotis. Northern Myotis often use lower frequencies when they are foraging in the open, so their calls may look almost identical to those of the Eastern Small-footed Myotis. The Kaleidoscope program identified many calls as those of the

Eastern Small-footed Myotis but many of these were determined to be Northern Myotis calls when they were evaluated visually. It is likely that a high proportion of the remaining calls that are identified as Eastern Small-footed Myotis are actually those of Northern Myotis. Nonetheless, there is potential for the Eastern Small-footed Myotis to be present. To err on the conservative side, the Eastern Small-footed Myotis identifications made by Kaleidoscope were accepted for those that were not obviously Northern Myotis.

The Big Brown and Silver-haired Bat calls are also difficult to differentiate. The identification of Silver-haired Bat calls was restricted to those that had a constant lower frequency of about 27 kHz, consistent with other studies. As a result, several of the calls identified as Silver-haired Bat by Kaleidoscope were reclassified as those of Big Brown Bat, and vice versa.

Although there are undoubtedly a few errors in the identification of calls, the important thing is that the possible errors are within categories. All the myotis that might be confused are endangered species and the other two that may be confused are not at risk. The small proportion of calls that may be misidentified do not affect the results or conclusions.

The results of the bat acoustic surveys are discussed in **Section 5.4.5**.

### 4.2.5 Other Wildlife Groups

Observations of other wildlife groups such as dragonflies, damselflies, butterflies and mammals were made in conjunction with the other ecological field surveys described above.

Winter wildlife surveys were completed in January and February 2020.

Scientific names of wildlife species are provided in **Tables 4** and **9**.

### 4.2.6 Wetlands

GHD has established a comprehensive groundwater and surface water monitoring network at the Milton Quarry and the MQEE study area. Key wetlands within the Natural Environment Study Area have been instrumented with staff gauges and transducers, and groundwater monitoring wells have been installed in proximity to wetlands. The water resources monitoring network is shown on **Figure 6**. GEC worked closely with GHD to identify suitable water resources monitoring locations. Data collected by GHD and included in their *Geology & Water Resources Assessment Report* (GHD 2021) are relied on by GEC as part of the wetland characterization (**Section 5.5**) and impact assessment (**Section 16.2**).

GEC reviewed a set of historical air photos from 1947, 1954, 1965, 1979, 1989, 1995 and 1999.

Wetlands U1, W36, W41, W46, W56 and V2 are discussed in **Section 5.5**.

# 5.0 EXISTING CONDITIONS

## 5.1 Terrain Setting

The information provided below in **Sections 5.1.1** to **5.1.3** was adapted from GHD's (2021) *Geology & Water Resources Assessment Report* (Sections 2.3 to 2.5).

### 5.1.1 Physiography and Climate

The proposed MQEE is located in the north section of the Flamborough Plain physiographic region and near the adjacent Horseshoe Moraines physiographic region (Chapman and Putnam 1984) (**Figure 11**). The Flamborough Plain region is an extensive limestone (dolostone) plain that extends from just south of Acton to near St. George to the south southwest. The overburden is relatively thin and bedrock exposures occur in many areas.

The Niagara Escarpment physiographic region occurs approximately 600 m to the east of the MQEE licence area, although the boundary between the two physiographic regions is subtle. Some northwest/southeast trending drumlins also occur to the northwest of the MQEE study area.

Overburden present in the area generally comprises bouldery glacial till, sand and gravel and, in association with large wetlands, organic soils. Within the MQEE study area bedrock outcrops occur extensively within the Halton Forest North ANSI.

### 5.1.2 Geology

*Overburden*

The proposed MQEE and surrounding area is located within an extensive Bedrock Drift Complex (Karrow 1991) (**Figure 12**). This discontinuous complex is primarily comprised of thin bouldery till that is variable in thickness. The till is often sufficiently thick to mask the bedrock topography. Areas with extensive dolostone bedrock outcrops and thin drift occurs north and east of the proposed MQEE, where the topography is often bedrock-controlled. Areas of stoney-sandy Wentworth Till and silt to clayey silt Halton Till overlie the bedrock. Organic deposits are associated with wetlands in the area.

The bedrock outcropping and thin stoney overburden limits agricultural uses in the vicinity and this is the main reason that the 35 $km^2$ Halton Forest exists today.

*Bedrock*

The study area is underlain by Paleozoic sedimentary rocks of Silurian and older Ordovician ages. These Paleozoic sedimentary rocks form the Michigan Basin. The bedrock formations of the Michigan Basin gently dip (decline in elevation) to the southwest at a rate of approximately 4 to 9 m per km toward the centre of the Basin in Michigan. The Niagara Escarpment is the eastern limit of the Michigan Basin. The study area and the surrounding area above the Escarpment is underlain by the Amabel Formation of Middle Silurian age (Karrow 1991).

The Niagara Escarpment occurs to the east of the proposed MQEE and forms the major bedrock and topographic feature in the area. Its origin is due to the differential weathering and erosion of easily weathered and eroded thick shale formations which underlie the more massive and erosion-resistant Amabel dolostone caprock. The relief of the Escarpment varies up to around 50 to 60 m, and the vertical cliffs lessen in height and scale northwards towards Limehouse.

Some re-entrant valleys occur in the area, including the Campbellville Re-entrant located west of Milton which forms a ramp up the Escarpment that is followed today by Highway 401 (Karrow 1991). The smaller Acton Re-entrant is located to the north of the MQEE, extending into Acton from Limehouse and containing Black Creek. The Milton Outlier is located south southeast of the proposed MQEE and Highway 401, and consists of an isolated knob of elevated bedrock capped with erosion-resistant Amabel dolostone. The Milton Outlier is the result of erosion by a glaciofluvial system.

The Escarpment cuts through the bedrock strata from the Amabel caprock down to the Queenston Formation. The Escarpment cliff face is primarily comprised of the Amabel caprock. The underlying Reynales, Cabot Head, Manitoulin, and Whirlpool Formations are present in the study area but are truncated to the east by the Niagara Escarpment.

The underlying red shale bedrock which is exposed below the Escarpment is the Queenston Formation.

### 5.1.3 Hydrology and Hydrogeology

*Hydrology*

The regional surface water system and watershed boundaries are shown on **Figure 13**.

The proposed MQEE is located within the Sixteen Mile Creek watershed. The watershed is situated primarily within the Region of Halton with a small portion in the Region of Peel. The creek system has three main branches which have been named the West, Middle and East Sixteen Mile Creek and it outlets into Lake Ontario in Oakville.

The proposed MQEE is located within the headwaters of the West Sixteen Mile Creek, the headwaters of which are above the Niagara Escarpment southwest of Acton. The Creek hydrology differs considerably above and below the Escarpment due to changes in topography, geology, surficial soils, land use, channel gradient and incision, and regulation by reservoirs.

The headwaters of the West Sixteen Mile Creek contain many depressed, poorly drained areas, as well as on-line ponds (man-made and beaver) and riparian wetlands, all of which enhance infiltration and evapotranspiration and dampen the storm runoff response.

The West Sixteen Mile Creek above the Escarpment has a number of tributaries. These tributaries have been named the Sixth Line Tributary, Fifth Line Tributary, Fourth Line Tributary, Hilton Falls Reservoir Tributary, and Campbellville Pond Tributary, as shown on **Figure 13**.

The general direction of surface drainage for the MQEE study area is east and southeast towards the Hilton Falls Reservoir Tributary (HFRT) and the Main Quarry. Drainage is generally poor with the majority of surface water directly infiltrating or pooling before infiltrating, or being lost through evapotranspiration. The HFRT has a larger pooled area within Wetland W44 which is the result of decades of Beaver activity. There are several old beaver dams downstream from the W44 Beaver pond, where the HFRT is intermittent and reinfiltrates or flows overland into the Main Quarry during high water periods. There is no direct connection with the HFRT where it receives quarry discharge on the east side of Sixth Line.

*Hydrogeology*

Within the study area the groundwater flow regime is dominated by the Amabel Aquifer. The Amabel Aquifer forms the eastern portion of the Guelph Amabel Aquifer which extends from the Niagara Peninsula to the Bruce Peninsula.

The area above the Niagara Escarpment can generally be interpreted as an area of high groundwater recharge. The infiltration of precipitation to the Amabel Formation is aided by the thin and relatively permeable overburden cover and complex topography in many areas. The Amabel Aquifer is generally unconfined in the study area, typically with a water table within 10 m of the bedrock surface (GHD 2021).

Generally, the Amabel acts as a single hydrostratigraphic unit because of the high amount of vertical interconnection. Groundwater flow is primarily horizontal within the Amabel due to the underlying Cabot Head shale which forms a competent lower permeability aquitard which limits groundwater flow to the lower formations (GHD 2021).

The Reynales Formation is very thin relative to the overlying and underlying Amabel and Cabot Head Formations (respectively) and generally has hydraulic properties ranging between those of the adjacent formations. The Reynales is therefore not highly significant in terms of the overall groundwater flow system and it is considered as part of the Amabel Aquifer by GHD (2021).

Groundwater in the Amabel Aquifer discharges to regional and local features. Regional groundwater flow within the bedrock aquifer occurs in a more or less southeast direction towards the Escarpment and the edge of the Amabel formation (**Figure 14**). The groundwater elevation information presented on **Figure 14** represents the information derived from historical water well records in 2000 by GHD (then CRA) prior to extraction of the North Quarry, West Cell, or East Cell and alteration of the associated flow regime.

Groundwater flow which reaches the Escarpment may follow one of several pathways:

- Discharge as a spring from the Escarpment face or lower talus slope; or,
- Discharge through the subsurface via vertical fracturing of the Amabel and underlying formations near the Escarpment, or through talus at the Escarpment to groundwater flow systems below the Escarpment; or,
- Discharge through the subsurface (as above) where the Escarpment face is buried (i.e., where the Amabel subcrops rather than outcrops) (GHD 2021).

Above the Escarpment, some groundwater discharges to local springs, ponds, wetlands and watercourses. Much of this groundwater discharge is seasonal in nature. Due to the general proximity of the water table to ground surface and the thin overburden soil, the groundwater flow patterns generally mimic the surface water flow patterns, which is controlled by topography (GHD 2021).

Local variations in the flow patterns occur as a result of groundwater-surface water interactions related to creeks, ponds, and wetlands, along with current dewatering operations conducted to allow dolostone quarrying in the Acton and Milton areas. These local patterns include groundwater highs or mounds associated with local recharge and discharge areas (GHD 2021).

In the vicinity of the proposed MQEE, groundwater flow within the Amabel Aquifer is generally south from the groundwater mound located east of the East Cell. Further east, the groundwater flow moves towards the southeast and east, discharging locally to wetlands, tributary creeks above the Escarpment, or the Escarpment itself (GHD 2021).

Groundwater elevation contours are shown for spring and fall 2020, as shown on **Figures 15** and **16**. These monitoring events generally represent the seasonal high (spring) and low (fall) groundwater periods. The groundwater elevations are flatter in the south part of the mound with the gradient steepening towards the wetlands to the east and even more so towards the existing quarry (GHD 2021).

In each set of groundwater contours similar groundwater flow patterns are evident with the fall groundwater levels (**Figure 16**) being 1 to 7 m lower than those in the spring (**Figure 15**). In April 2020 the peak elevation near BH70 was approximately 340 m AMSL, dropping to approximately 336 m AMSL by October 2020. Groundwater elevations in discharge areas can vary more or less than this amount depending upon how the discharge feature interacts with the groundwater flow system. **Figure 17** presents an isopach of the groundwater level decline from April to October 2020 (GHD 2021).

Groundwater elevations fluctuate dramatically during the year based on seasonal effects except in some discharge areas where a relatively consistent surface water levels dampen these fluctuations (**Figure 17**). The highest water levels typically occur during the spring freshet (March and April) although sometimes a major winter melt event can result in a spike in groundwater levels before the freshet. Following the spring peak, groundwater levels generally decline through the rest of the year to the late fall or even the following winter. The October 2020 conditions were within the range of other fall water levels. The lowest seasonal water levels observed in recent years occur in December or January at levels as much as 7 m (or more) below seasonal highs (GHD 2021).

GHD report that some of the groundwater elevations in the northwestern group of monitoring wells exhibit an influence or control from the East Cell recharge system operation (e.g., OW71-08, BH71, 78S/D-20) or East Cell dewatering (e.g., OW3-80 and OW3-3-II). In the more southerly and distant monitoring wells (OW69-08, BH65, and BH66) the monitoring data do not indicate any appreciable influence associated with quarry operations; however, some older (pre monitoring) influence may have occurred at BH64 (GHD 2021).

*Quarry Zone of Influence*

The groundwater drawdown zone of influence from the existing Milton Quarry and the potential zone of influence varies due to a number of factors. GHD (2021) report that the influence from quarry dewatering in the absence of mitigation has been observed at distances greater than 500 m in some areas depending upon hydrogeologic conditions. The actual extent of the zone of influence will depend upon a number of factors, including:

- Bedrock hydraulic characteristics;
- Depth of dewatering;
- Existing groundwater discharge (dewatering) features - both natural and man made;
- Climatic and seasonal variations; and,
- Mitigation measures.

In order to address the variability of the potential zone of influence of the proposed MQEE dewatering, a proactive and conservative approach incorporating the proven groundwater recharge mitigation measures has been adopted. This approach will prevent drawdown from extending out to water-dependent natural features that might otherwise be negatively affected (GHD 2021). Effectively, the zone of drawdown influence will be limited to less than the distance to nearby wetlands, with the exception of Wetland U1 which will be mitigated and enhanced by the proposed mitigation measures (diffuse discharge) as described in **Section 13.0**.

#### 5.1.4 Soils

Gillespie et al. (1971) mapped the soils in most of the proposed MQEE licence area as *Dumfries loam – shallow phase*. The Dumfries soils have developed on coarse textured tills and generally have a loam texture. The Dumfries-shallow phase is described as an irregular, stoney area of Dumfries soil generally with less than 90 cm of soil overlying limestone/dolostone bedrock.

Gillespie et al. (1971) mapped the soils in the forested areas as *Farmington loam – rocky phase*. The Farmington soils have formed on a thin layer of glacial drift typically less than 30 cm deep, overlying limestone/dolostone bedrock. The rocky phase occurs close to the Escarpment, where erosion has produced uneven microrelief with many dolostone outcrops and soil depths can vary from 0 to 60 cm. This phase is unsuitable for agriculture, hence the extensive forests in this vicinity.

Dumfries-rocky phase usually occurs in association with Farmington-rocky phase soils and it is separated from the latter due to the greater depth of soil material.

Organic soils over bedrock are associated with most of the wetlands within the study area.

The Agricultural Impact Assessment prepared by DBH Soil Services Inc. (2021) reported the same soil types described above. They completed an onsite soil reconnaissance survey on March 25, 2021, to determine if the boundaries illustrated in the Provincial dataset for soils are correct for the study area. The reconnaissance soil survey confirmed the Provincial soils data and mapping are correct.

### 5.2 Aquatic Habitat

There is a hydrological connection between Wetland W41 and the large beaver pond downgradient in Wetland W44 (see **Figure 6**). The drainage path from W41 to W42 to W44 is diffuse and includes several obstacles to potential fish movement. W42 was identified as a confirmed breeding pool for Unisexual Ambystoma (Jefferson Salamander dependent population) and Spotted Salamander in 2003. Salamander breeding pools typically do not support fish populations. Baitfish were observed in W44 by GEC in 2002. Wetland W44 could, potentially, still support populations of Brook Stickleback (*Culaea inconstans*) and Central Mudminnow (*Umbra limi*) even though the water is choked with aquatic and wetland vegetation and appearing stagnant. The HF-1 Tributary is blocked by several large Beaver dams downstream and only intermittent flows reach the Main Quarry where the tributary is truncated, so there is no direct connection to any fish habitat downstream towards the Hilton Falls Reservoir.

Fish Habitat is discussed in **Section 11.0**. The potential effects of the proposed MQEE on Fish Habitat is discussed in **Section 16.6**.

## 5.3 Terrestrial Habitat

### 5.3.1 Vegetation Communities

Summary descriptions of vegetation communities are provided in **Table 3**. Vegetation communities (ELC Units) are shown on **Figure 18**. In the vegetation community descriptions provided below, non-native/introduced vascular plant taxa are denoted with a plus sign in parentheses (+). Representative photographs of the main vegetation community types in the MQEE study area are provided in **Attachment B1**.

Community descriptions are provided below under the following headings:

- Terrestrial Community Types
- Wetland Community Types
- Terrestrial – Cultural Community Types

*Terrestrial Community Types*

The main forest block within the MQEE study area is part of the Halton Forest North ANSI. Most of the forest is dominated by Sugar Maple (*Acer saccharum*). Other frequent associates include Basswood (*Tilia americana*), Bitternut Hickory (*Carya cordiformis*), Red Oak (*Quercus rubra*), Black Cherry (*Prunus serotina*), Ironwood (*Ostrya virginiana*), White Birch (*Betula papyrifera*), White Pine (*Pinus strobus*), White Cedar (*Thuja occidentalis*) and Eastern Hemlock (*Tsuga canadensis*). White Ash (*Fraxinus americana*) was formerly codominant with Sugar Maple, but the remaining ash trees are in severe decline due to the Emerald Ash Borer (*Agrilus planipennis*) infestation and there are many standing dead trees and recent deadfalls. Dolostone outcrops are widespread in some areas and the topography is often complex and bedrock-controlled.

Within the main forest block, outside the proposed extraction area, there are few supercanopy trees and older forest patches, but there are now many snags and fallen logs as a result of the Emerald Ash Borer invasion and the ongoing decline of ash trees.

The forest is mostly intermediate-aged, reflecting a history of selective cutting; some areas were clear-cut in the past and probably grazed. There are a few more mature patches, usually located in areas of rugged terrain where logging access is more difficult. In areas that were selectively cut in the past, there are many canopy gaps that has resulted in a dense layer of ash-maple regeneration and tall shrubs such as Alternate-leaved Dogwood (*Cornus alternifolia*) and Chokecherry (*Prunus virginiana*). The forest ground flora is relatively rich in areas with bedrock outcrops, likely due to lighter grazing pressure in the past. The remnants of old barbed wire fences can be found far from the open field areas, indicating past grazing activity in the forest. Most of the trees are in the 10-24 cm dbh and 25-50 cm dbh size ranges.

The following main dry to fresh Sugar Maple deciduous forest types are mapped on **Figure 18**:

- FOD5-1 Dry-Fresh Sugar Maple Deciduous Forest Type
- FOD5-3 Dry-Fresh Sugar Maple – Oak Deciduous Forest Type
- FOD5-5 Dry-Fresh Sugar Maple – Hickory Deciduous Forest Type

Besides the dominant tree species, units were also subdivided based on logging history, topography, extent of dolostone outcrops, moisture regime, etc.

Successional stands occur in areas that were heavily logged in the past or formerly used for grazing. These areas are mapped as Dry-Fresh Poplar Deciduous Forest Type (FOD3-1). The main tree species are Trembling Aspen (*Populus tremuloides*) and Bigtooth Aspen (*Populus grandidentata*), with Sugar Maple, White Ash, White Birch, hawthorns (*Crataegus* spp.), Common Buckthorn (*Rhamnus cathartica* +) and Staghorn Sumac (*Rhus typhina*).

There are two small woodland features located within the proposed MQEE extraction area, identified as Woodlands A and B. Each woodland is briefly described below.

Woodland A is a small, relatively young (30 years old) 1.18 ha feature located on the northeast side of Townline, opposite the northeast end of the Cox Tract. It was classified by GEC as Mixed Forest (FOM), although some parts appear to be Coniferous Plantation (CUP3). The trees growing in Woodland A are a mix of Scots Pine (*Pinus sylvestris* +), Red Pine (*Pinus resinosa*), Trembling Aspen and Green Ash (*Fraxinus pennsylvanica*), with a few scattered Black Walnut (*Juglans nigra*) and White Birch. Some of the Scots Pine (+) and Red Pine, and almost all of the Black Walnut are growing in rows, but others appear to be natural regeneration. Woodland A is discussed in more detail in **Section 8.1**.

Woodland B is located immediately northeast of Townline, just south of the East Cell licence limit. It is 0.68 ha in size. A rural residence was formerly located just beyond the southeast end of the woodlot. Woodland B was classified as a Dry-Fresh Sugar Maple –

Hickory Deciduous Forest Type (FOD5-5). Woodland B is intermediate in age with an average DBH of approximately 35 cm. The dominant trees are a mix of Sugar Maple, Bitternut Hickory, declining/dead White Ash, Black Cherry and Red Oak. Many of the Bitternut Hickory are damaged, presumably from the 2013 ice storm. The hickories that are forest-grown are tall with few lower branches and a small crown, with the ice storm resulting in crown dieback/damage. The canopy closure is approximately 60% and there are large gaps in the canopy. Woodland B is discussed in more detail in **Section 8.2**.

The forested northeast end of the Cox Tract is located within the MQEE study area. It covers approximately 8.23 ha. This area was quite open with few trees in 1947, but fairly dense patches of young conifers are clearly evident on the 1954 imagery. The planting occurred in 1951. The vegetation communities found at the northeast end of the Cox Tract include the following types:

- Red Pine Coniferous Plantation Type (CUP3-1) – Cox Tract
- Scots Pine Coniferous Plantation Type (CUP3-3) – Cox Tract
- Dry-Fresh Poplar Deciduous Forest Type (FOD3-1) – Cox Tract

Descriptions of the conifer plantations (CUP3-1, CUP3-3) are provided under the heading *Terrestrial – Cultural Community Types* below.

Unit FOD3-1a in the Cox Tract is strongly dominated by Trembling Aspen. Other tree species include declining/dead White Ash, White Birch and Red Pine. The trees are mainly in the 10-24 cm dbh and 25-50 cm dbh size ranges.

*Wetland Community Types*

There are a number of wetlands within the MQEE study area, all of which are outside the proposed extraction area. **Section 5.5** provides more detail on Wetlands V2, U1, W36, W41, W46a-f and W56, with brief summary descriptions provided below. With the exception of Wetland U1 all of the wetlands are located within the main forest block, most of which is within the Halton Forest North ANSI.

Wetland U1 is a small 0.22 ha Reed Canary Grass Mineral Meadow Marsh (MAM2-2), with a small patch of Green Ash Mineral Deciduous Swamp (SWD2-2). Reed Canary Grass (*Phalaris arundinacea*) forms dense swards in the more open portion of U1.

Wetland V2 is a small 0.24 ha isolated wetland with a deciduous swamp fringe dominated by Swamp Maple (*Acer* X *freemanii*) and, formerly, Green Ash. The feature is mapped as Swamp Maple Organic Deciduous Swamp (SWD6-3). Seasonal water levels are maintained in Wetland by via diffuse discharge from the existing Water Management System (WMS). The Swamp Maples are mainly in the 25-50 cm dbh size range.

Wetland W36 is approximately 1.73 ha in size and only the uppermost portion, in the vicinity of SG57 and SG58, is still vernally flooded on a regular basis. The vegetation in Wetland W36 is mainly Swamp Maple Organic Deciduous Swamp (SWD6-3) that is mostly in a dewatered condition at present. Except in the areas that still exhibit vernal pooling, dense tangles of brambles (*Rubus idaeus* ssp. *melanolasius, R. occidentalis*) and Riverbank Grape (*Vitis riparia*) have formed due to the past changes to wetland hydrology. The trees are mainly in the 25-50 cm dbh size range.

Wetland W41 is the largest wetland within the MQEE natural environment study area, covering 2.78 ha. The trees are mainly in the 10-24 cm dbh and 25-50 cm dbh size ranges. The main wetland vegetation community types in Wetland W41 are as follows:

- Swamp Maple – Conifer Organic Mixed Swamp Type (SWM5-2)
- Swamp Maple Organic Deciduous Swamp Type (SWD6-3)
- Yellow Birch Organic Deciduous Swamp Type (SWD7-2)

Wetland W46 is a series of small seasonal pools located north and northeast of the northeast part of Wetland 41. Within the study area six wetland pockets are identified as W46a to W46f, which vary in size from 0.01 ha to 0.12 ha. The wetland community types are mainly Swamp Maple Organic Deciduous Swamp (SWD6-3) where vernal pools are relatively deep and Red Maple Organic Deciduous Swamp (SWD6-1) where vernal pools are smaller and shallower. Organic soils may be relatively thin over bedrock in some areas. Besides Swamp Maple and Red Maple, other tree species include White Cedar, Yellow Birch (*Betula alleghaniensis*), Silver Maple (*Acer saccharinum*) and declining/dead Green Ash. The trees are mainly around the pool margins or on hummocks. The trees are mostly in the 25-50 cm dbh size range, with a few larger trees.

W56 is a Red Maple Mineral Deciduous Swamp Type (SWD3-1). Besides Red Maple, other tree species include Yellow Birch, dead/declining Green Ash, White Elm (*Ulmus americana*) and, on old tip-up mounds or hummocks, Basswood. The trees are mainly in the 25-50 cm dbh size range.

*Terrestrial – Cultural Community Types*

The vegetation of areas that were formerly in agricultural use are generally classified as *cultural* community types, because they are of anthropogenic origin. The cultural community types described below include conifer plantations (CUP3), shrub thickets (CUT1), cultural savannah (CUS1), hedgerows (CUH) and old field meadows (CUM1-1).

A portion of the northeast end of the Cox Tract is mapped as Red Pine Coniferous Plantation Type (CUP3-1). Red Pine is the main tree species in this unit, with Sugar Maple, Black Cherry and Red Oak as frequent associates. Other trees include declining/dead White Ash, Basswood, European Larch (*Larix decidua* +), Trembling Aspen, White Pine and Black Walnut. Common Buckthorn (+) and Alternate-leaved Dogwood are common in the regeneration layer. Most trees are in the 10-36 cm dbh size range, with a few larger trees.

Another portion of the northeast end of the Cox Tract is mapped as Scots Pine Coniferous Plantation Type (CUP3-3). Scots Pine (+) is the main tree species in Unit CUP3-3, with Black Cherry, Red Pine, Sugar Maple and Basswood as frequent associates. Common Buckthorn (+) is common in the regeneration layer. Most trees are in the 10-36 cm dbh size range, with some larger trees mainly up to 50 cm dbh in size.

At the north end of the proposed licence area, close to the site of a former farmstead, an area is mapped as Mineral Cultural Woodland Ecosite (CUW1). This is a variable unit that includes patches of fairly young Trembling Aspen, with some White Ash and Sugar Maple regeneration, scattered White Elm, White Pine and Basswood. There are patches of Staghorn Sumac, Common Buckthorn (+) and hawthorns (*Crataegus* spp.), as well as more open patches of old field vegetation. Tree cover varies from around 30% to 50%.

One former agricultural area gradually being invaded by woody vegetation is mapped as Mineral Cultural Savannah Ecosite (CUS1a). Tree cover varies, but it is generally around 20-30%. The main tree species are Red Pine, Scots Pine (+), White Ash, Green Ash, Trembling Aspen and White Elm. The trees are generally quite young. Shrub cover is around 10%. The main shrub species are Common Buckthorn (+), Dotted Hawthorn (*Crataegus punctata*), Staghorn Sumac, Gray Dogwood (*Cornus racemosa*), Red-osier Dogwood (*Cornus sericea*) and Common Blackberry (*Rubus alleghaniensis*). The main groundcover species are Smooth Brome (*Bromus inermis* +), Quack Grass (*Elymus repens* +), Kentucky Bluegrass (*Poa pratensis* +), Timothy (*Phleum pratense* +), Orchard Grass (*Dactylis glomerata* +), Red Clover (*Trifolium pratense* +), White Clover (*Trifolium repens* +), Common St. John's-wort (*Hypericum perforatum* +), New England Aster (*Symphyotrichum novae-angliae*), White Heath Aster (*Symphyotrichum ericoides*), Bird Vetch (*Vicia cracca* +) and Tall Goldenrod (*Solidago altissima*).

Several small patches were mapped as Mineral Cultural Thicket Ecosite (CUT1). The thickets are dominated mainly by Red-osier Dogwood, with Staghorn Sumac, Poison Ivy (*Toxicodendron radicans* var. *rydbergii*) and Wild Red Raspberry (*Rubus idaeus* ssp. *strigosus*). The thickets are associated with ditches that formerly conveyed some water during the spring period. No water was observed in the ditches during the 2018-2021 ecological surveys and these areas are now dry. The groundcovers are mainly weedy upland species.

Small patches of Staghorn Sumac Cultural Thicket Type (CUT1-1) occur in a few areas. The main shrub is Staghorn Sumac (*Rhus typhina*). Other shrub species include Common Buckthorn (+), hawthorns and Round-leaved Dogwood (*Cornus rugosa*).

Two treed hedgerow features are mapped on **Figure 18** as Units CUHa and CUHb. Unit CUHa is the hedgerow feature along the common boundary between the East Cell and the MQEE. The trees are mainly Red Oak and Sugar Maple, with occasional Black Cherry, White Birch, Bigtooth Aspen, dead/dying White Ash, Basswood and Bitternut Hickory. Tall shrubs are mainly Chokecherry and Common Buckthorn (+). The trees in Unit CUHa range in size from 20 to 60 cm dbh.

Unit CUHb is a discontinuous hedgerow that is perpendicular to Unit CUHa. The trees are mainly Trembling Aspen, Bigtooth Aspen, Black Cherry, White Birch, dead/dying White Ash, Basswood, White Elm and Red Oak. The trees in Unit CUHb range in size from 20 to 35 cm dbh.

The open portions of the MQEE study area are primarily Dry-Moist Old Field Meadow Type (CUM1-1) that were formerly in agricultural use for row crops and hay, and for pasture. The main groundcover species are Smooth Brome (+), Kentucky Bluegrass (+), Timothy (+), Orchard Grass (+), New England Aster, White Heath Aster, Bird Vetch (+) and Tall Goldenrod.

Old fields with deeper soils were ploughed in early September 2020 to prepare for the required archaeological investigations for the proposed MQEE licence area. Following completion of the archaeological work, the ploughed fields were then disked and seeded with the following seed mix:

- 30% Orchard Grass (*Dactylis glomerata* +)
- 30% Timothy (*Phleum pratense* +)
- 20% Canada Bluegrass (*Poa compressa* +)
- 15% Kentucky Bluegrass (*Poa pratensis* +)
- 3% Red Clover (*Trifolium pratense* +)
- 2% White Clover (*Trifolium repens* +)

Reestablishment of old field groundcovers was slow early in the 2021 growing season due to the drier than normal conditions. As the season progressed, the grasses gradually became established.

Some old fields contain some woody regeneration, but contain less than 25% shrub cover and 25% tree cover. The trees are generally quite young. Typical woody species include young White Ash, Trembling Aspen, White Pine, Common Buckthorn (+), hawthorns, Staghorn Sumac and Gray Dogwood.

The various old field areas are mapped on **Figure 18**. Old fields with shallower soils, that were not ploughed in late 2020, are mapped as CUM1-1a. Old fields with deeper soils that were ploughed in late 2020 are mapped as CUM1-1b. Old fields with some woody regeneration, and not ploughed in late 2020, are mapped as CUM1-1c.

### 5.3.2 Plant Species

A total of 466 vascular plant taxa were recorded during the ecological field surveys. One-hundred and twenty-five taxa, 26.8% of the flora, are considered non-native and introduced in southern Ontario. A vascular plant checklist is provided in **Attachment C**.

One Endangered plant species, Butternut, was recorded from several locations within the MQEE study area. Butternut is discussed further in **Sections 6.1.1** and **16.1.1**.

One species generally restricted to the Niagara Escarpment and limestone river valleys was recorded, Walking Fern (*Asplenium rhizophyllum*) (Riley 1989). Other small ferns growing on some moss-covered dolostone outcrops and large boulders include Rock Polypody (*Polypodium virginianum*), Limestone Maidenhair Spleenwort (*Asplenium trichomanes* ssp. *quadrivalens*) and Steller's Rockbrake (*Cryptogramma stelleri*). The latter species is rare in Halton (Crins et al. 2006); approximately 20 plants grow in Unit FOD5b, in a rocky area to the east of Wetland W41. Steller's Rockbrake was first observed by GEC in this vicinity in 2004.

Several invasive species are well established in some portions of the MQEE study area, including Garlic Mustard (+), Wood Avens (*Geum urbanum* +), Dame's Rocket (*Hesperis matronalis* +) and Common Buckthorn (+).

## 5.4 Wildlife

This section presents the results of the wildlife surveys under the following headings: invertebrates, amphibians, reptiles, birds and mammals.

### 5.4.1 Invertebrates

A total of 26 invertebrate species were recorded during the field surveys. A species list is provided in **Table 4**. The invertebrates observed included 11 odonate species and 15 butterfly species.

The odonates that were observed are all common to abundant in southern Ontario. The Black Saddlebags has an S-rank of S4 indicating that it is common and apparently secure in the province. The remaining odonates have an S-rank of S5 indicating that they are very common to abundant and secure in the province. All of the odonates were listed as regionally common species by Rothfels (2006), except for the Lancet Clubtail which was listed as regionally uncommon.

The butterflies that were observed are all common to abundant in southern Ontario. The Silver-spotted Skipper, Wild Indigo Dusky-wing and Monarch all have an S-rank of S4 indicating that they are common and apparently secure in the province.

Wild Indigo Dusky-wing is listed as a *Rare Permanent Resident* in Halton Region by Wormington (2006). The first Halton record of this species was from 2003 and several other locations were found shortly afterwards, indicating this species had recently colonized parts of Halton. Wild Indigo (*Baptisia tinctoria*) and related plant species are the typical larval food-plants. Wild Indigo is a species of tallgrass prairies, oak savannah and open sandy woods that is now in decline, with a restricted distribution in southern Ontario. Wild Indigo Dusky-wing now also utilizes Crown Vetch (*Coronilla varia* +) as a larval food plant. Crown Vetch was commonly used as a groundcover along highways and it is now widespread in southern Ontario; it grows in patches within the old field areas within the MQEE licence area. More than 30 records of Wild Indigo Duskywing from Halton Region have been posted on iNaturalist, indicating that this species is no longer rare in Halton.

The Monarch is listed common in Halton Region; it is listed as Special Concern in Ontario. The larval host plant Common Milkweed (*Asclepias syriaca*) occurs in the field areas in relatively low numbers. Habitat loss and fragmentation at overwintering sites in central Mexico where forests are being logged and converted into agricultural fields and pastures are the main threat to Ontario's Monarchs. Pesticide and herbicide use throughout the Monarch's range may hamper the recovery of this species.

### 5.4.2 Amphibians

#### 5.4.2.1 Salamanders

The minnow trapping surveys completed in 2019 and 2020 confirmed the presence of Jefferson Salamander, Unisexual Ambystoma (Jefferson Salamander dependent population) and Spotted Salamander at various breeding pools within the MQEE study area, all of which are located outside of the proposed extraction area. The pools where minnow trapping for salamanders was completed in 2019 and/or 2020 are shown on **Figure 9a**. The capture summaries for 2019 and 2020 are shown in **Tables 5** and **6**, respectively. A total of 60 Jefferson Salamander Complex and 230 Spotted Salamanders were captured. A total of 28 tail tips were collected from Jefferson Salamander Complex individuals for genetic analysis. The results of the genetic work completed by Dr. James Bogart at the University of Guelph are provided in **Table 7**. Of the 28 tail tips collected, 9 were Jefferson Salamander or JJ while 19 were Unisexual Ambystoma (Jefferson Salamander dependent population) or LJJ.

During the 2019 and 2020 minnow trapping surveys, Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) were captured in the following wetlands: U1, W17a, W36, W41 and W46a. The use of Wetland V2 by Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) has been confirmed each year since 2009 through a combination of egg mass surveys, larval surveys, drift fences and pitfall traps, etc.

Eastern Redback Salamander and Red-spotted Newt (Red Eft) were regularly observed in forested uplands during other ecological surveys and monitoring.

The combination of extensive deciduous forests dominated by Sugar Maple, numerous bedrock outcrops, large amounts of woody debris on the forest floor and wetlands with vernal pools all serve to provide excellent habitat for salamanders.

Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) are discussed further in **Sections 6.1.2** and **16.1.2**.

#### 5.4.2.2 Frogs and Toads

Song Meter SM4 units were deployed in selected wetlands to monitor amphibian call activity during the spring and early summer, at the locations shown on **Figure 9a**. Amphibian call count data for Wetlands U1, W36 and W46a are provided in **Table 8a**. Amphibian call count data for Wetlands V2 and W41 are provided in **Table 8b**.

Wetland U1 was only surveyed in 2019, when water levels were relatively high in early spring. Wetland U1 had very low water levels in spring 2020 and it was observed to be dry in spring 2021.

The main species recorded within the study area during the amphibian call counts are Spring Peeper, Wood Frog and Gray Treefrog. Other species recorded in the call counts were American Toad and Green Frog. Northern Leopard Frog was also observed in Wetland W41. See **Table 4** for the amphibian species checklist.

Wetlands V2 and W41 had full choruses of Wood Frog, Spring Peeper and Gray Treefrog in some years; this is discussed further in **Section 9.2.2**.

### 5.4.3 Reptiles

A large Snapping Turtle was observed on June 6, 2020. It was moving away from the turning circle at the southeast end of the dirt road portion of Townline Road. This Snapping Turtle was more than 400 m away from the Main Quarry Reservoir and more than 500 m away from the nearest wetland within the MQEE study area that would contain standing water at that time. Snapping Turtle is listed as Special Concern in Ontario. This occurrence is discussed further in **Section 9.3.1**.

Four (4) snake species were observed within the MQEE study area, as listed in **Table 4**. Snakes observed included Eastern Gartersnake, Northern Watersnake, Dekay's Brown Snake and Eastern Milksnake. An Eastern Gartersnake was observed near Wetland U1. A Northern Watersnake was observed at the edge of Wetland W41. Dekay's Brown Snake and Eastern Milksnake were observed in the rocky deciduous forest near Wetland W41. Observations were limited to single individuals.

### 5.4.4 Birds

A list of the breeding birds observed within the MQEE study area from 2019 to 2021 is provided in **Table 9**. Point count stations are shown on **Figure 9b** and point count data are provided in **Attachment D**.

A total of 90 bird species were recorded during the 2019 to 2021 breeding bird surveys. Eighty-one (81) species were possible, probable or confirmed breeders.

In the forested area the five most frequently recorded species were Red-eyed Vireo, Wood Thrush, American Robin, Eastern Wood-Pewee and Rose-breasted Grosbeak. The most frequently recorded species at the point counts were Red-eyed Vireo, Wood Thrush, American Robin, Eastern Wood-Pewee and American Crow.

In the grassland and thicket areas the five most frequently recorded species were Song Sparrow, Field Sparrow, Red-winged Blackbird, Eastern Meadowlark and American Goldfinch.

#### 5.4.4.1 Threatened Bird Species

Two grassland bird species listed as Threatened in Ontario were recorded from the open fields in 2019 and 2020: Bobolink and Eastern Meadowlark. Two aerial insectivores listed as Threatened in Ontario (Barn Swallow and Chimney Swift) were recorded flying over the open fields in 2019 and/or 2020. Each species is briefly discussed below.

- Bobolink

During the 2019 surveys multiple Bobolinks were recorded during each of the three visits, for a total of 20 birds. Three separate territories were identified, using OMNRF's (2018a) General Habitat Description for Bobolink.

There was a decrease and probable absence of breeding Bobolinks in the open fields in 2020, where a single displaying male was observed from four point count stations over the first two visits. No females were recorded in 2020.

- Eastern Meadowlark

In 2019 multiple Eastern Meadowlarks were recorded during each of the three visits.

Six territories were identified, using OMNRF's (2018b) General Habitat Description for Eastern Meadowlark.

In 2020 more Eastern Meadowlarks were recorded on point counts compared to 2019, but four territories were identified.

- Barn Swallow

An individual Barn Swallow was observed foraging over the open field area on June 16 and 30, 2019, and June 28, 2020.

On June 16, 2019, a single Barn Swallow was foraging over Station F3 (<100m). On June 30, 2019, a single Barn Swallow was foraging over Station F7 (>100m).

On June 28, 2020, a single Barn Swallow was observed foraging over Station F1. Since the bird was foraging widely, (both <100m and >100m) it is listed in Appendix D (Point Count Data) for both survey distances as a 0.

No breeding evidence was observed for Barn Swallow in 2019 and 2020.

- Chimney Swift

On May 30, 2020, one Chimney Swift was observed foraging over the southwest end of the open field, within approximately 50 m of Townline. This observation was made on a wandering transect between Point Count Stations.

Threatened bird species are discussed further in **Sections 6.1.3** and **16.1**.

#### 5.4.4.2 Special Concern Bird Species

Four bird species listed as Special Concern in Ontario were recorded from the MQEE study area: Eastern Wood-Pewee, Wood Thrush, Grasshopper Sparrow and Peregrine Falcon. Each species is briefly discussed below.

- Eastern Wood-Pewee

Eastern Wood-Pewee is widespread in the wooded portions of the study area. During the 2020 breeding bird surveys Eastern Wood-Pewee was found to be the most common species of flycatcher. It is widespread within the mature deciduous forest.

- Wood Thrush

Wood Thrush is widespread in the wooded portions of the study area. During the 2020 breeding bird surveys Wood Thrush was the second most recorded species in the main forest block, second only to the Red-eyed Vireo. It is widespread within the mature deciduous forest.

- Grasshopper Sparrow

During the 2019 breeding bird surveys only one individual Grasshopper Sparrow was observed singing on June 30 in the grasslands between Stations F4 and F7.

During the 2020 breeding bird surveys a single singing Grasshopper Sparrow was observed on each visit. It was first noted just south of Station F3 on May 31. It was then noted on June 7 and 28 within 100 m of Station F4. Applying the OBBA breeding evidence criteria for “T” (Permanent territory presumed through registration of territorial song, or the occurrence of an adult bird, at the same place, in breeding habitat, on at least two days a week or more apart, during its breeding season.), it was considered a probable breeder in 2020. At most there was one pair of Grasshopper Sparrows present in 2020.

- Peregrine Falcon

A Peregrine Falcon was heard calling from near the south corner of the East Cell on June 7, 2020. It was determined that there was an active nest on a small ledge midway up the quarry face at the limit of extraction along Townline. One adult Peregrine Falcon was observed at the nest and a second bird was in a tree overlooking the quarry face. On June 28, 2020 one adult was observed at the nest along with one chick and the second adult was observed in the same tree. Regular quarry activities including drilling, blasting, loading of rock trucks, running pumps, etc. were all underway during the 2020 breeding season. The nest site was approximately 90 m from the common boundary between the East Cell and the MQEE licence area.

In 2021 the area in the vicinity of the 2020 nest was monitored. It was noted that the narrow ledge on the cliff had broken away but there were several other potential nesting sites closer to the common boundary with the MQEE. No birds were observed on March 25 or April 10, but one Peregrine Falcon was observed in a nearby tree on May 2. The East Cell excavation was visited on May 2, so that the quarry face could be readily observed from below. While one Peregrine was in the general area, it was not apparent if there was an active nest. On June 20 one Peregrine Falcon was observed perched midway up the quarry face when a second Peregrine was heard nearby. It was determined that there was a nest in a small hole in the face approximately 25 m above the quarry floor, with the second Peregrine tending to the nest. Both birds were observed and one was noted to have been banded, while the other had not.

Special Concern bird species are discussed further in **Sections 9.3.1** and **16.4.4**.

#### 5.4.4.3 Area-sensitive Bird Species (Woodland)

The following bird species considered area-sensitive species by OMNRF (2015) were recorded from the main forested areas:

- Black-throated Blue Warbler
- Ovenbird
- Scarlet Tanager

- Veery
- Winter Wren
- Yellow-bellied Sapsucker

Area-sensitive (Woodland) bird breeding habitat is discussed further in **Sections 9.2.2** and **16.4.3**.

#### 5.4.4.4 Rare in Halton Region (McIlveen 2006)

Six bird species listed as rare in Halton Region (McIlveen 2006) were recorded from the MQEE natural environment study area. The Osprey was not breeding within the study area, but the other five species are probable or confirmed breeders.

- Yellow-billed Cuckoo

Yellow-billed Cuckoo was recorded from six of the seven "field/grassland" point count stations and eight of 13 "woodland" point count stations. This species is likely increasing in numbers due to the explosion in Ldd Moth (*Lymantria dispar*) populations in southern Ontario and within the MQEE study area. Large numbers of Ldd Moth caterpillars were observed in some portions of the study area.

- Osprey

Single Ospreys were observed flying overhead on June 16, 2019, and June 7, 2020. On both occasions the Osprey was not observed carrying fish, so they may be coming from offsite to fish in the reservoir and lake in the Main Quarry.

Osprey was not considered to be nesting within the MQEE natural environment study area.

- Yellow-throated Vireo

Yellow-throated Vireo was identified as a probable breeder in the east end of the Cox Tract on June 28 and July 4, 2020, near Townline Road (Stations W13 and F4), and as a possible breeder at Stations W6, W7 and W8 near Wetland W41 on July 4, 2020.

This species is usually found in areas with a relatively high regional forest cover and large mature deciduous trees (James 2007).

There were three records of Yellow-throated Vireo for 10km square 17TNJ82 during the first Ontario Breeding Bird Atlas (OBBA) from 1981-1982, three records during the second OBBA (2002-2005) and 13 so far during the first year (2020) of the third OBBA. In Halton Region Yellow-throated Vireo records are concentrated around the Halton Forest.

- Common Raven

Common Ravens are becoming more widespread in southern Ontario and they are common at the Milton Quarry. Ravens nest regularly on the cliffs created through quarrying, even in the active East Cell of the Milton Quarry Extension. They are regularly observed in urban Milton by GEC.

- Hooded Warbler

The Hooded Warbler was located at three locations during the 2020 breeding bird survey. One individual was seen or heard during all of the 2020 survey visits at the property boundary with the East Cell, approximately 110 m east of Wetland V2.

During each woodland point count survey, one singing Hooded Warbler was detected at Station W2.

Only July 4, 2020, at Station W11, two singing Hooded Warblers were heard with one being seen.

The extensive forests in the area provide suitable habitat for the Hooded Warbler. In areas where there has been selective logging in the past or ice storm damage, dense patches of Alternate-leaved Dogwood, Chokecherry and deciduous tree regeneration have developed where there are gaps in the tree canopy, providing excellent habitat for the Hooded Warbler.

- Black-throated Blue Warbler

The Black-throated Blue Warbler was recorded at five of the 13 “woodland” point count stations. As described above, dense patches of Alternate-leaved Dogwood, Chokecherry and deciduous tree regeneration have formed where there are canopy gaps, providing good habitat for the Black-throated Blue Warbler.

### 5.4.5 Mammals

#### 5.4.5.1 Bats

*Woodland B and Cavity Tree Assessment*

Woodland B is an upland deciduous forest 0.68 ha in area. It is intermediate in age with an average DBH of approximately 35 cm. The dominant trees are a mix of Sugar Maple, Bitternut Hickory, declining White Ash, Black Cherry, and Red Oak. Many of the Bitternut Hickory are damaged, presumably from the 2013 ice storm. Those in the forest are tall with few lower branches and a small crown with dieback. The canopy closure is approximately 60% and there are large gaps in the canopy. The locations where Detectors 07, 08, and 09 were situated are all close to gaps in forest cover, as are the nearby cavity trees. Detector 10 was situated near the north end of a large opening in Woodland B and it is also close to a CV Hut. There are some subcanopy trees, but it is generally open enough so that bats can fly freely under the canopy.

The area where Detector 07 was located, along with 3 of the cavity trees, is not part of Woodland B. This is a small copse of trees that is connected to the southeast corner of Woodland B but predominantly separated from it by a large opening that used to contain a residence.

A total of 13 cavity trees were surveyed in or adjacent to Woodland B (**Table 10**); 3 of these were outside of the woodlot in the vicinity of where Detector 07 was located. There were five cavity trees in the hedgerows (**Table 11**). The locations of the bat detectors and the cavity trees are shown on **Figures 10a** and **10b**.

Eight of the 13 potential roost trees in or adjacent to Woodland B had cavities whereas 7 had loose or exfoliating bark. Only one tree had a cavity that was more than 10 m from the ground. Most potential roost trees were relatively small with a DBH of <45 cm, which tends to be the minimum size for most roost trees (depending upon the species). Three trees were present with a DBH >45 cm: one each with sizes of 46, 48, and 52 cm DBH. Bats prefer to roost in trees with decay classes of 1-3 (OMNR 2017). Four of the potential roost trees were in this category.

Three of the 5 potential roost trees in the hedgerows had cavities and 3 had loose or exfoliating bark. No trees had cavities above 10 m from the ground but one had exfoliating bark that extended to 12 m. Two of the trees had a DBH larger than 50 cm (52 and 58 cm). Four of the five trees were in decay classes of 1-3.

*Bat Acoustical Survey*

A review of the weather data from the Milton Quarry Weather Station revealed that the weather was consistently good during the period when the detectors were deployed in Woodland B. Temperatures were consistently above 10°C and there was no rain during the surveys, although some occurred during some days. When the hedgerow was being sampled, the temperature dropped below 10°C on June 22$^{nd}$ and June 23$^{rd}$. On June 22, the temperature was 10.73°C at 2300 h and gradually dropped to 7.36°C at 0300 h on June 23. Rain occurred during sampling periods at the hedgerow on June 18-19, June 21, and June 25-26. On June 18, 11.43 mm of rain fell at midnight and an additional 1.27 mm fell through 0100 h on June 19. On June 21, rain occurred from 0100 h until 0300 h when a total of 3.302 mm fell. On June 25-26, rain started at 2100 h and continued until 0300h when a total of 16.854 mm of rain fell.

The decline in temperature below 10°C starting around midnight on June 22 is not considered to have any effect on the results. Bats typically leave the roost well before this. Even on cooler nights, bats still have to leave the roost to forage for themselves and their pups. At the roost near Cambridge, temperature was not correlated with the number of calls recorded on a bat detector near the roost, and calls were recorded at temperatures as low as 1.6°C (Morningstar and Sandilands 2016). In eastern Ontario, Barclay (1982) found that foraging of the Little Brown Myotis was not inhibited by temperatures as low as 5°C. At lower temperatures, they still left the roost for their early evening foraging bout, but returned to the roost early and stayed all night until just before dawn. Consequently, the drop in temperature to 7.36 in the early morning of June 23 should not affect the results of the acoustic survey. The number of calls recorded on this night represented 14.4% of all calls, similar to what would be expected by chance (14.3%).

The rain on June 25-26 occurred during the entire sampling period and was relatively heavy. The number of calls recorded on this night represented 1.1% of all calls, apparently significantly less than expected. Consequently, this night is not considered a suitable survey night. These limited data were still included in the analysis.

For the acoustical surveys, there were 14 suitable nights of data for Woodland B and 6 for the hedgerows.

The visual analysis of the bat calls in Analook was highly successful in reducing the number of unidentified calls. Kaleidoscope recorded 2,509 calls as unidentified whereas only 28 calls were considered unidentifiable using Analook.

The presence of all eight bat species that regularly occur in Ontario was confirmed. This includes four species that are listed as endangered and four that are not at risk. **Table 12** summarizes the number of calls of each species recorded overall, and in Woodland B and hedgerows. Overall, the most calls were those of Little Brown Myotis, Northern Myotis, and Big Brown Bat in decreasing order of abundance. Eastern Small-footed Myotis, Hoary Bat, and Silver-haired Bat occurred regularly but in much smaller numbers. Red Bats were uncommon and Tri-colored Bats were rare, with only 2 calls recorded.

There were differences in the bat communities detected at Woodland B and within the hedgerows. The woodlot population was similar to the overall population. In the hedgerows, the Big Brown Bat was recorded more frequently than the Little Brown Myotis. Hoary Bats and Silver-haired Bats occurred regularly in smaller numbers. Northern Myotis, Eastern Small-footed Myotis, and Red Bat were rare and the Tri-colored Bat was not recorded. In Woodland B, Little Brown Myotis calls represented 47.9% of calls compared with 9.2% for the Big Brown Bat; in the hedgerows, Little Brown Myotis calls represented 27.8% of all calls compared with 53.2% for the Big Brown Bat.

**Table 13** shows the number of calls recorded by each of the detectors in Woodland B and also provides the mean number of calls each night. Results for Detector 07 were different from the others. Big Brown Bat calls constituted more than 85% of the calls at this location with the Little Brown Myotis representing only 8.6% of calls. Little Brown and Northern Myotis calls dominated at the other three locations with Big Brown Bat calls representing only 5-10% of the total. Results from Detector 07 are similar to the overall results for hedgerows supporting the vegetation community mapping that determined that this area is not part of a forest community type, at least from a bat perspective. The mean number of calls recorded per night was considerably lower at Detector 07 (7.5) than at other stations (27-96). Highest numbers of calls were documented at Detectors 09 and 10 and these were dominated by Little Brown and Northern Myotis calls.

**Table 14** provides the same information for the detectors when they were deployed in the hedgerows. There were differences in the species composition among the detectors. Calls recorded by Detectors 07 and 08 were dominated by those of the Big Brown Bat whereas calls at Detectors 09 and 10 reported a few more Little Brown Myotis calls than Big Brown Bat calls. Detector 07 was deployed in the northwest-southeast oriented hedgerow (CUHb) in predominantly open habitat, the preferred foraging habitat of the Big Brown Bat. The fewest overall calls and mean number of calls per night were also lowest at Detector 07. Detectors 09 and 10 were closer to Wetland V2 than Detector 08. The Little Brown Myotis prefers to forage above water, so these detectors may have recorded this species as it travelled to and from this pond.

The mean number of calls recorded per night was generally higher within Woodland B than the hedgerows. An exception was Detector 08 in the hedgerow which had nightly call numbers comparable to those within Woodland B; it was located in between CV Huts 320 and 321 (see **Figure 10a**).

The Small-footed Myotis and Tri-colored Bat were not listed for Halton by Dwyer et al. (2006), although it was noted that a detailed mammal inventory was not undertaken for the Halton Natural Areas Inventory (NAI).

#### 5.4.5.2 Other Mammals

In addition to the eight bat species discussed above, an additional 14 species of mammals were observed within the MQEE study area, for an overall total of 22 mammal species. Mammal species are listed in **Table 4**. This is likely an under-representation of the diversity of mammals at the site, due to the cryptic nature of some species. Bats aside, all of the other mammals are common in Halton Region with the exception of Woodland Jumping Mouse which is uncommon. This species was observed in rich, rocky Sugar Maple deciduous forest beside the spring and seepage zone at the north end of Wetland W41.

## 5.5 Wetland Characterization

This section provides details on Wetlands U1, W36, W41, W46, W56 and V2. For the first five wetlands, details are provided under the following headings: overview, groundwater and surface water interactions, vegetation communities and wildlife. Wetland V2 has been thoroughally studied and enhanced in association with the existing quarry and it is discussed in Section 5.5.6.

Hydrographs are provided on **Figures 19** to **23**. GHD's groundwater and surface water monitoring network is shown on **Figure 6** in relation to the Halton Forest North ANSI and the various wetlands of interest. The details on groundwater and surface water interactions are adapted from Section 6.8 of GHD's (2021) *Geology & Water Resources Assessment Report.*

Wetlands V2, W36, W41 and W46 all form part of the provincially significant Halton Escarpment Wetland Complex. Wetlands U1 appears as an "unevaluated wetland" on the Land Information Ontario (LIO) mapping, while W56 is not shown on the LIO mapping.

### 5.5.1 Wetland U1

#### 5.5.1.1 U1 - Overview

Wetland U1 is a small 0.22 ha seasonal wetland located 50+ m northeast of the proposed MQEE extraction area. It is within the zone of influence of the Main Quarry and North Quarry, so the spring high water level and hydroperiod are reduced relative to historic conditions. GEC reviewed a series of historical air photos from 1947, 1954, 1965, 1979 and 1989. In 1947 Wetland U1 was apparently used as wet pasture, with no woody vegetation being evident on the imagery. U1 is almost imperceptible on the 1954 and 1965 imagery, indicating that it continued to be used as wet pasture. By 1979 trees and shrubs were growing in/around Wetland U1, indicating that grazing had ceased by that time. Conditions were similar in 1989 and a ditch had been constructed to the south of the wetland. In 1989 the Main Quarry extraction area was approximately 1.5 km away from Wetland U1. Extraction in the Main Quarry adjacent to the Cox Tract occurred in the late 1990s. Site preparation for the North Quarry began in 1998.

Halton Region's Greenlands mapping also shows a much smaller polygon, presumably wetland, immediately northwest of Wetland U1. This feature is separated from Wetland U1 by an old driveway leading to a former farmstead on higher ground. The driveway was constructed with dolostone rubble and overburden; it is becoming overgrown. Field surveys completed by GEC from 2018 to 2021 indicate that this second wetland feature does not exist. Beside the old farm lane there is a single Crack Willow (*Salix* X *fragilis* +) and a few Trembling Aspen, along with small tangles of Red-osier Dogwood, Common

Buckthorn (+) and Staghorn Sumac. This feature is very small, covering around 0.045 ha and it was not observed to contain any standing water between 2018 and 2021.

#### 5.5.1.2 U1 – Groundwater & Surface Water Interactions

Wetland U1 was instrumented by GHD with a staff gauge (SG66) and a monitoring well nest (OW78S/D-20) immediately to the southwest in early 2020 and water level data are provided on **Figure 19**.

GEC made some general water level observations in 2019, when a minnow trapping survey for salamanders was completed and a Song Meter SM4 Unit was deployed to record calls of frogs and toads. Standing water covered much of Wetland U1 on April 6. By June 8 there was a smaller pool at least 30 cm deep in the grove of Green Ash trees at the southeast (lower) end of Wetland U1. On June 30 no standing water was observed and this appeared to have been the case for at least one week.

GHD's examination of the available water level information from 2020 indicated that Wetland U1 had a low spring water level and a very short hydroperiod, drying out as early as late April and confirmed by GHD to be dry on May 13, 2020. This is consistent with GEC's field observations during the minnow trapping survey. On March 19/20, 2020, there was only a small pool of water in U1. At that time the water was not deep enough to completely submerge a minnow trap; the water was approximately 20 cm deep. GHD report that the groundwater level immediately southwest of the pool at monitoring well OW78S/D 20 reached a peak water level of approximately 337.1 m AMSL in early April 2020, but it was consistently below the bottom elevation of U1 (ground surface minima = 337.34 m AMSL). The upgradient groundwater levels may have been similar or slightly higher than the Wetland U1 elevation based on the groundwater level at OW3 2-II3, but this is uncertain given the distance from this monitoring well to Wetland U1 (GHD 2021).

In 2021, lower groundwater and surface water levels occurred as a result of climatic conditions. GEC observed Wetland U1 to be completely dry on March 25, 2021, but the hydrograph on **Figure 19** shows very shallow standing water was briefly present before and after that date. GHD confirmed U1 to be dry on May 12, 2021. At no time was the groundwater level at OW78S/D-20 or OW3-2-II above the base of the wetland in 2021 (GHD 2021).

Wetland U1 is located approximately 580 m north of the Main Quarry and approximately 440 northeast of the North Quarry. GHD interprets Wetland U1 to be within the historic zone of influence of quarry dewatering. Given this, Wetland U1 area may have experienced higher groundwater levels and a greater degree of groundwater support and interaction in the past. Such a past interaction with groundwater would explain the previous excavation of a drainage ditch leading south away from Wetland U1 (GHD 2021), as well as the observations regarding amphibians described below. The old ditch was not observed by GEC to convey water during any of the site visits made between 2019 and 2021, nor by GHD in 2020 and 2021.

#### 5.5.1.3 U1 – Vegetation and Wildlife

Wetland U1 is a small Reed Canary Grass Mineral Meadow Marsh (MAM2-2), with a small patch of Green Ash Mineral Deciduous Swamp (SWD2-2) and Narrow-leaved Cattails (*Typha angustifolia*) at the south end where springtime water depths appear to be the deepest. There is a fringe of old shrub willows (*Salix* spp.) and Red-osier Dogwood at the historic seasonal high-water mark. Reed Canary Grass may have increased due to lower water levels in Wetland U1.

Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) were captured during minnow trapping surveys conducted in spring 2019 and 2020. Eight (8) Jefferson Salamander Complex individuals were captured in 2019 and 20 were captured in 2020. A single Spotted Salamander was captured during the 2020 survey.

From spring 2019 to spring 2021, amphibian call count surveys using a Song Meter SM4 unit were only completed in U1 in 2019, because the water level was very low in 2020 and no standing water at all was observed on March 25, 2021. In 2019 a full chorus of Spring Peeper was recorded, as well as low numbers of Wood Frog, American Toad and Gray Treefrog.

Under existing conditions, the hydroperiod of Wetland U1 is far too short to support the successful reproduction of amphibians, even the early breeders such as Wood Frog and Spring Peeper. At present, Wetland U1 functions as an ecological trap, where salamanders, frogs and toads use it as breeding habitat when water is present in the spring, only for the water to draw down before the larvae/tadpoles have matured enough to transform into terrestrial juveniles, resulting in their mortality.

### 5.5.2 Wetland W36

#### 5.5.2.1 W36 - Overview

Conditions in W36 appeared to be similar from 1947 to 1979, based on a review of aerial photographs. By 1979 some adjacent areas to the west had been disturbed as part of the Sheridan College Heavy Equipment School, which was formerly based in the Main Quarry next to the Cox Tract. By 1989, activities at the Heavy Equipment School continued and a pond had been constructed into W36 within the Main Quarry, presumably to handle the flows from upgradient during the spring freshet and allow the school to operate. In 1989, extraction in the Main Quarry was still more than 600 m away from Wetland W36. The pond construction and subsequent extraction in the Main Quarry removed the lower half of Wetland W36 by the early 1990s.

At present, Wetland W36 is approximately 1.73 ha in size and only the uppermost portion, in the vicinity of SG 57 and SG 58, is still vernally flooded on a regular basis. However, the vernal pools are within 430 m of the Main Quarry and within the zone of influence. The spring high water levels and hydroperiod in the vernal pool area are likely reduced relative to historic conditions. Downgradient from the vernal pools, no standing water was observed in Wetland W36 during any of the ecological field surveys from 2019 to 2021.

At its closest point, Wetland W36 is approximately 110 m from the MQEE extraction limit. The upper instrumented pools where surface water has been observed are approximately 160 m to 220 m away from the MQEE extraction limit.

#### 5.5.2.2 W36 – Groundwater & Surface Water Interactions

Wetland W36 is a shallow vernal pool drainage system located east and southeast of the proposed MQEE extraction area. W36 was originally instrumented with a staff gauge (SG5) and a monitoring well nest immediately to the north in 1999 and monitored from 1999 to 2006. Additional staff gauges SG57 and SG58 were installed in the upper portion of W36 in winter 2020, as well as monitoring well OW82-20, and monitoring was re-initiated. An additional monitoring well, OW83-21, was installed to the northwest of SG57 and SG58 in early 2021 (GHD 2021). The data collected since early 2020 are presented on **Figure 20**.

GEC made some general water level observations at the upper portion of W36 in 2019, when a minnow trapping survey for salamanders was completed and a Song Meter SM4 Unit was deployed to record calls of frogs and toads. The highest water level observed by GEC in the vicinity of SG58 was observed on April 7 and 8, 2019. Standing water was still evident on June 30, 2019, water depth was estimated at 15-20 cm in the deepest portion of the vernal pool.

GHD's examination of the available water level information reveals that the wetland had a short hydroperiod in 2020, drying out by early to mid June. The groundwater level at BH64, immediately west of the wetland, reached a peak water level of approximately 332.0 m AMSL in March and April 2020, which is approximately the base of the wetland in that vicinity (SG5). No surface water was observed in this area at that time. The groundwater level at BH64 was consistently below the bottom of the vernal pool areas located upgradient in Wetland W36 but west of SG57 and SG58. The ground surface in deeper areas of these vernal pool areas is approximately 332.4 to 332.5 m AMSL as represented by staff gauges SG57 and SG58. The groundwater levels to the northwest of the northeast end of Wetland W36 is higher than at BH64 based on the pattern of groundwater flow in the area and demonstrated by the subsequent installation of monitoring well OW83-21, as shown on **Figure 20** (GHD 2021).

On March 25, 2021, GEC observed SG57 to be dry and SG58 had shallow water.

GHD reported that surface water pooled in the upper two pool areas at SG57 and SG58 within Wetland W36, so the rise of the groundwater level above the base of the wetland pools as shown at monitoring well OW83-21 increased surface water levels at SG57/SG58 in late March (GHD 2021). These pools dried out by late May, 2021. The area around SG5 and BH64 was consistently observed to be dry in spring 2021.

GHD note that groundwater flow discharge to the northern (uppermost) part of Wetland W36 is interpreted to occur during high groundwater level periods. If sufficient groundwater and precipitation should accumulate in the Wetland W36 pool areas in the vicinity of SG57 and SG58, they may overflow to the south down the W36 drainage path towards the Main Quarry. Water present in the wetland is likely lost to evapotranspiration and infiltration to groundwater. No surface water flow has been observed reaching the Main Quarry to the south.

Wetland W36 is located with the historic zone of influence of the Milton Quarry and the distance from the Main Quarry to SG5 and BH64 is 270+ m. The distance from the Main Quarry to SG57 and SG58 is approximately 430 m. GHD's review of available long-term monitoring data such as at monitoring well MW4 at the edge of the Main Quarry demonstrate the dewatering influence of the quarry development. The water level available at MW4 (installed in 1990) and BH64 (installed in 1999) show that the influence on groundwater support for Wetland W36 had occurred prior to 1999 (GHD 2021). This explains the generally dry conditions in Wetland W36 downgradient of the vernal pools in the vicinity of SG57 and SG58, along the wetland drainage path extending to the Main Quarry to the southwest.

#### 5.5.2.3 W36 – Vegetation and Wildlife

The vegetation in Wetland W36 is mainly Swamp Maple Organic Deciduous Swamp (SWD6-3) that is mostly in a dewatered condition at present. Only the uppermost section of W36, at the north end, exhibits some vernal pooling. The main trees are Swamp Maple, Silver Maple, declining/dead Green Ash, White Cedar, Yellow Birch and White Elm. Shrubs include Red-osier Dogwood, Nannyberry (*Viburnum lentago*) and Common Buckthorn (+). Except in the areas that still exhibit vernal pooling, dense tangles of brambles (*Rubus idaeus* ssp. *melanolasius, R. occidentalis*) and Riverbank Grape have formed due to the past changes to wetland hydrology. Some of the main groundcover species are nettles, including Canada Wood Nettle (*Laportea canadensis*), Small-spike False Nettle (*Boehmeria cylindrica*), Slender Stinging Nettle (*Urtica gracilis*) and Canada Clearweed (*Pilea pumila*). Other common groundcovers include Garlic Mustard (*Alliaria petiolata* +), Spotted Jewelweed (*Impatiens capensis*), and Fowl Manna Grass (*Glyceria striata*).

Near SG57 and SG58, in the area that still experiences vernal pooling, cover of brambles is much reduced. Here the groundcovers are mainly Small-spike False Nettle, Canada Clearweed, Reed Canary Grass and Bittersweet Nightshade (*Solanum dulcamara* +).

Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) were captured during minnow trapping surveys conducted in spring 2019 and 2020. Five (5) Jefferson Salamander Complex individuals were captured in 2019 and one was captured in 2020. Seven (7) Spotted Salamanders were captured during the 2020 survey.

Each spring from 2019 to 2021, amphibian call count surveys were completed using a Song Meter SM4 unit. Two early breeders, Wood Frog and Spring Peeper, were recorded each spring. Call intensity was greatest in spring 2019, which was the wettest of the three years, with Level 2 call intensity being recorded for both Wood Frog and Spring Peeper.

Under existing conditions, in those areas of Wetland W36 that still exhibit some vernal pooling, the hydroperiod is too short to support the successful reproduction of amphibians, except for early breeders such as Wood Frog and Spring Peeper in years such as 2019. Wetland W36 appears to function as an ecological trap for those salamanders which use the pools as breeding habitat when water is present in the spring, only for the water to draw down before the larvae/tadpoles have matured enough to transform into terrestrial juveniles. Salamander larvae need the pools to persist into late July – early August, at least, and this does not appear to be the case in the upper portion of Wetland W36.

### 5.5.3 Wetland W41

#### 5.5.3.1 W41 - Overview

Wetland W41 is a 2.78 ha wetland located 285+ m east of the proposed MQEE extraction area at the closest point. It is approximately 600 m from the Main Quarry and 660 m from the North Quarry, at the closest points. W41 is approximately 595 m from the East Cell and there are recharge wells operating between the East Cell and this wetland. GEC reviewed a series of historical air photos from 1947, 1954, 1965, 1979 and 1989, and the current imagery, and very little change was evident from 1947 to the present.

Ecological monitoring of Wetland W41 has been ongoing since 2002. Water resources and wetland ecology monitoring data have been reported annually to the agencies since 2007, as part of the monitoring requirements of the Adaptive Environmental Management and Protection Plan (AMP). A synthesis of ecological monitoring data from 2013 to 2018 was provided by GEC in the *Milton Quarry Extension AMP: Wetland Ecology 5-Year Review Report (2013-2018)*.

#### 5.5.3.2 W41 – Groundwater & Surface Water Interactions

Wetland W41 is the largest wetland within the MQEE natural environment study area and it is a varied wetland feature. There is a perennial seepage zone with a seasonal spring at the north end of W41, flowing into the wetland near staff gauge SG61. Water from W41 drains out to the east and southeast via a series of connected wetland pools in Wetland 42, and it eventually outlets to Wetland W44 which contains a large Beaver pond (see **Figure 6**). Wetland W41 contains seasonally and perennially flooded areas as well as pockets of deeper organics where there is little standing water evident.

The spring flows from (and around) a small pipe emerging from under a side trail of the Bruce Trail. Flow emerges from the pipe and surrounding granular material during higher water periods. The pipe was installed for unknown reasons prior to Dufferin's ownership of the property, but it was likely related to trail users. The pipe was not in place ca. 2007. During lower water level periods, discharge to W41 is via seepage from the surrounding material only and there is no flow from the pipe.

Wetland W41 was originally instrumented at its southwest limit with a staff gauge (SG6), drive point (DP6) and monitoring wells (BH65 and BH66) in 1999 and monitoring has been ongoing since that time. Additional staff gauges SG59, SG60, and SG61, were added in winter 2020, along with monitoring well OW81-20 to the west, and monitoring was expanded to cover these locations (GHD 2021).

The data collected from 2020 onwards are presented on **Figure 21** and **Figure 22** for the southern and northern areas of Wetland W41, respectively.

Examination of the available 2020 water level information for the southern area of Wetland W41 on **Figure 21** indicates that the southern and central area of the wetland has a longer hydroperiod than the uppermost portion of Wetland W36, extending to the beginning of July and re-wetting at various times during the summer and early fall in 2020 before becoming continuously wet as groundwater levels to the north rose in October 2020. The groundwater level at monitoring well BH65 is clearly higher than the surface water level indicating groundwater discharge to the wetland during more than half of the year, including winter, spring, summer, and into September in at least some areas (GHD 2021).

It is useful to consider the climatic conditions in 2020 for context. Excluding January, the total precipitation for the balance of 2020 was 720 mm which is 77 mm less than the long-term average of 797 mm for the same period. In general, conditions through the spring and early summer (April through July) were very dry with a 28 percent reduction in precipitation observed relative to average. Above average precipitation of 117 mm was recorded in August relative to the mean of 70 mm.

The data history for staff gauge SG6 extends back to 1999. A review of the year-over-year hydrograph shows that at this staff gauge, standing water typically persists at least into mid-July and often into August and early-mid September. At this location W41 usually starts to refill towards the end of the year.

In 2021, the pools in the southern and central areas of Wetland W41 retained water through the winter and spring 2021. On July 24 and August 2, 2021, GEC observed standing water in the vicinity of SG6 and SG59, and elsewhere in W41.

Examination of the available water level information for the northern area of Wetland W41, on **Figure 22**, shows that the north area of the wetland has a perennial hydroperiod due to the spring/seep emanating adjacent to SG61. The groundwater levels at monitoring wells to the west, northwest and north (OW81-20, OW80-20, and OW69-08, respectively) are all consistently above the wetland and spring/seep elevation which is consistent with the discharge of groundwater to the west and north sides of Wetland W41 (GHD 2021).

Water was observed slowly flowing out of Wetland W41 by GEC on July 24, and GEC and GHD on August 2, 2021. The flow emanates from a stand of Yellow Birch and White Cedar with deep organic soils and it forms a narrow wetland swale approximately 0.3 m wide. Surface water is discontinuous upgradient of the swale that outlets from Wetland W41. Iron precipitate was observed where the flow of water starts.

Monitoring well BH66 is located east of the north end of Wetland W41 and this well exhibits a groundwater level that is consistently 2 to 4 m below that of the wetland surface water elevations, as shown on **Figure 22**. These conditions indicate that some of the water in Wetland W41 is likely infiltrating to the east side and moving further southeast as groundwater flow (GHD 2021).

#### 5.5.3.3 W41 – Vegetation and Wildlife

The main wetland vegetation community types in Wetland W41 are as follows:

- Swamp Maple – Conifer Organic Mixed Swamp Type (SWM5-2)
- Swamp Maple Organic Deciduous Swamp (SWD6-3)
- Yellow Birch Organic Deciduous Swamp (SWD7-2)

There are some small pockets of cattail marsh within the treed swamp communities, both at the north end (in association with the seep/spring near SG61) and at the south end in areas that have deeper standing water in the spring period.

Black Ash (*Fraxinus nigra*) grows in Wetland W41. Most of the trees are dead or in severe decline due to infestations of the Emerald Ash Borer. There are still numerous seedlings and saplings still growing in W41. This species has been listed as Threatened in Canada by the Committee on the Status of Endangered Wildlife in Canada

(COSEWIC) and it was designated at Threatened by Environment and Climate Change Canada in November 2018. The main threat to Black Ash is the Emerald Ash Borer.

Most of Wetland W41 has greater than 60% canopy closure. The trees are a mix of Swamp Maple, White Cedar, Black Ash, Green Ash, Red Maple, Yellow Birch, Eastern Hemlock, Balsam Fir (*Abies balsamea*) and White Elm. The ash trees are declining or dead due to infestation by the Emerald Ash Borer.

Typical groundcovers in Wetland W41 include Cyperus-like Sedge (*Carex pseudo-cyperus*), beggar's-ticks (*Bidens cernua, B. frondosa, B. tripartita*), Green-fruited Bur-reed (*Sparganium emersum*), Climbing Nightshade (+), Marsh Fern (*Thelypteris palustris*), Bulbous Water-hemlock (*Cicuta bulbifera*), Rice Cut Grass (*Leersia oryzoides*), Inland Sedge (*Carex interior*), Spotted Water-hemlock (*Cicuta maculata*), Dwarf Raspberry (*Rubus pubescens*), Purple-stemmed Aster (*Symphyotrichum puniceum*), beggar's-ticks, Water-parsnip (*Sium suave*), Panicled Aster (*Symphyotrichum lanceolatum*), Sensitive Fern (*Onoclea sensibilis*), Cinnamon Fern (*Osmundastrum cinnamomeum*), Common Cattail (*Typha latifolia*), Spotted Jewelweed, Water-horehound (*Lycopus uniflorus*), Small-spike False Nettle, Rough Goldenrod (*Solidago rugosa*), Star Duckweed (*Lemna trisulca*) and Common Duckweed (*Lemna minor*).

Jefferson Salamander complex egg masses and Spotted Salamander egg masses have been observed in W41 each year from 2004 to 2021. In 2019, a minnow trapping survey for salamanders in W41 captured 3 Jefferson Salamander Complex individuals and 168 Spotted Salamanders. Genetic analysis of two tail-tip tissue samples identified them as Unisexual Ambystoma (Jefferson Salamander dependent population) (LJJ).

Amphibian call count surveys were completed using a Song Meter SM4 unit. Amphibian call count data for W41 from 2013 to 2018 are provided in **Table 15**. Amphibian call count data for W41 from 2019 to 2021 are provided in **Table 8b**.

Generally similar levels of frog call activity were recorded from 2013 to 2021. Calls from the following species were heard regularly during this period: American Toad, Gray Treefrog, Northern Leopard Frog, Spring Peeper and Wood Frog. A few Green Frogs were heard in 2017.

The hydroperiod of Wetland W41 is long enough to support the reproduction of a diverse mix of frogs, toads and salamanders.

### 5.5.4 Wetland W46

#### 5.5.4.1 W46 - Overview

Wetland W46 is a series of small intermittent pools located north and northeast of the northeast part of Wetland 41. Within the study area six wetland pockets are identified as W46a to W46f on **Figure 6**.

The area of each wetland is provided below:

- W46a = 0.12 ha
- W46b = 0.04 ha
- W46c = 0.11 ha
- W46d = 0.07 ha
- W46e = 0.015 ha
- W46f = 0.01 ha

The wetland community types are Swamp Maple Organic Deciduous Swamp (SWD6-3) where vernal pools are relatively deep and Red Maple Organic Deciduous Swamp (SWD6-1) where vernal pools are smaller and shallower. Organic soils may be relatively thin over bedrock in some areas. The Wetland W46 complex is situated in very rugged terrain in the deciduous forest, with complex topography and extensive bedrock outcropping. The topography around the wetland pockets is almost entirely bedrock-controlled. Some wetlands are isolated, while some have hydrological connections during high water periods. Groundwater interflow in the thin overburden and weathered bedrock appears to also occur. Large vernal pools occur in W46a and W46b, while the others have smaller vernal pools and more extensive groundcovers.

#### 5.5.4.2 W46 – Groundwater & Surface Water Interactions

In consultation with GEC, GHD installed staff gauge SG63 in W46a and staff gauge SG62 in W46b in the winter of 2020, as shown on **Figure 6**, and monitoring commenced at these locations. The data collected from 2020 onwards are presented on **Figure 22**.

In 2020 the W46a pool (SG63) dried out in early September in 2020, but water levels had been relatively low since mid-July. W46a started to re-wet later by mid-October 2020. In 2021, W46a contained water through July and on August 2 GEC observed standing water in the vicinity of SG63 and most of the feature that looked as if it would persist for weeks at least.

GEC had observed relatively deep standing water in W46b on April 7, 2019. The outlet from W46b was blocked by a fallen log and organics and some diffuse overland flow towards W41 was noted.

GEC observed lower water levels in W46b on March 29, 2020. GHD's water level data showed that W46b was almost dry by early May 2020.

In 2021 GHD's water level data showed that W46b experienced very low water levels and it was almost dry by mid-May. W46b was observed to be dry by GEC on August 2, 2021.

It is probable that there is a relatively direct groundwater-surface water interaction at the Wetland W46 pools due to the bedrock-controlled terrain and the pool water elevations while between upgradient and downgradient groundwater levels most of the time (GHD 2021).

Monitoring well BH66 is located southeast of the cluster of small wetlands that make up W46 and this well exhibits a groundwater level that is consistently 2.5 to 4 m below that of the wetland surface water elevations in W46a and W46b, as shown on **Figure 22**. These conditions indicate that some of the water in W46a and W46b is likely infiltrating and moving further south towards the north end of W41 and southeast towards BH66 as groundwater flow (GHD 2021).

#### 5.5.4.3 W46 – Vegetation and Wildlife

The wetland community types are Swamp Maple Organic Deciduous Swamp (SWD6-3) where vernal pools are relatively deep and Red Maple Organic Deciduous Swamp (SWD6-1) where vernal pools are smaller and shallower. Besides Swamp Maple and Red Maple, other tree species include White Cedar, Yellow Birch, Silver Maple and declining/dead Green Ash. The trees are mainly around the pool margins or on hummocks.

Minnow trapping surveys for salamanders were completed in 2019 (W46b, W46c & W46d) and 2020 (W46a, W46b). The results are provided in **Tables 5** and **6** and summarized below:

- W46a (2020): 1 Jefferson Salamander Complex (LJJ); 7 Spotted Salamander
- W46b (2019): No captures
- W46b (2020): 12 Spotted Salamander
- W46c (2019): 15 Spotted Salamander
- W46d (2019): 14 Spotted Salamander

Amphibian call count surveys were completed during spring and early summer 2021, using a Song Meter SM4 unit. Survey data are provided in **Table 8a**. Wood Frog and Spring Peeper were recorded. A full chorus of Wood Frogs was recorded on March 30, 2021.

The hydroperiod of Wetland W46a is sufficient to support the reproduction of early breeding frogs and mole salamanders. Wetland W46b appears to dry up too early to support reproduction of amphibians.

### 5.5.5 Wetland W56

#### 5.5.5.1 W56 - Overview

Wetland W56 is a small 0.21 ha feature that contains ephemeral vernal pools. This wetland was not mapped by MNRF and it is “unevaluated”.

#### 5.5.5.2 W56 – Groundwater & Surface Water Interactions

Wetland W56 is an isolated wetland feature that exhibits shallow vernal pooling with a very short hydroperiod, hence the characterization as ephemeral vernal pools. W56 is located beside the unopened First Line road allowance. It is approximately 500 m from the proposed MQEE extraction limit.

Wetland W56 was instrumented with staff gauge SG64 during the winter of 2020. At the same time, monitoring wells OW79S/D-20 and OW80-20 were installed to the west and southwest of Wetland W56, respectively. Monitoring well OW69-08 was installed immediately northeast of Wetland W56 in 2008 and it has been monitored since that time. The data collected since early 2020 are presented on **Figure 23** (GHD 2021).

The hydrograph for Wetland W56 shows that this feature experienced only brief periods where shallow standing water was present during early spring 2020 (March and April) and possibly in February and March of 2021.

Groundwater levels to the west and southwest of Wetland W56 at OW79S/D-20 and OW80-20 are higher than the wetland during the winter and spring monitoring period, indicating the potential for groundwater discharge to Wetland W56. These groundwater levels dropped below the base of the wetland in the summer and fall of 2020. Immediately northeast of Wetland W56, the groundwater level at monitoring well OW69-08 (20 m) is briefly above the base of Wetland W56 during periods in March 2020; however, it is consistently below the surface water level in Wetland W56 (when surface water is present) in 2020 and 2021 (GHD 2021).

The observed groundwater and surface water levels indicate that Wetland W56 may receive very limited groundwater discharge from the north and west during high groundwater level periods. W56 may be more influenced by snowmelt and precipitation events. Water that does accumulate in Wetland W56 infiltrates to groundwater to the east and southeast, or is lost through evapotranspiration during the growing season (GHD 2021).

#### 5.5.5.3 W56 – Vegetation and Wildlife

W56 is a Red Maple Mineral Deciduous Swamp Type (SWD3-1). Besides Red Maple, other tree species include Yellow Birch, dead/declining Green Ash, White Elm and, on old tip-up mounds or hummocks, Basswood. Typical groundcovers in Wetland W56 include Fowl Manna Grass, Sensitive Fern, Ostrich Fern (*Matteuccia struthiopteris*), Small-spike False Nettle, sedges (e.g., *Carex bebbii, C. intumescens, C. lupulina*), Clearweed, Spotted Jewelweed and Rough Goldenrod.

The observed very shallow water depths and limited hydroperiod were not sufficient to warrant surveys of breeding amphibians, such as mole salamanders, frogs and toads. Wetland W56 does not support amphibian breeding functions.

### 5.5.6 Wetland V2

Wetland V2 is a 0.24 ha isolated wetland with a deciduous swamp fringe dominated by Swamp Maple and, formerly, Green Ash. This wetland was identified as a Jefferson Salamander breeding pool in 2002. Wetland V2 has been the focus of considerable interest since 2002, so an extended summary covering conditions between 2002 and 2018 was provided by GEC in the *Milton Quarry Extension AMP: Wetland Ecology 5-Year Review Report (2013-2018)*.

<u>Wetland V2 – pre-2009</u>

During the period prior to 2009, Wetland V2 appeared to have undergone a trend towards drier conditions in terms of spring high water levels and reduced hydroperiod. In 2008, the hydroperiod was extended due to the wetter-than-normal climatic conditions.

The margins of Wetland V2 were being invaded by weedy upland species such as Garlic Mustard (+) and Herb-robert (*Geranium robertianum* +) during this drier period. The centre of the wetland was becoming dominated by Reed Canary Grass at the expense of other wetland species such as Water-parsnip and beggar's-ticks.

Salamander egg masses (Jefferson Salamander complex and Spotted Salamander) were observed in V2 each year from 2004 to 2008, but generally the wetland appeared to dry up too soon to allow for successful transformation of salamander larvae to terrestrial juveniles. In 2008, the hydroperiod was longer (i.e., into August), although the water depths were shallow throughout the season (15-30 cm deep). Declining levels of frog call activity were observed over the period 2004 to 2008 and typically only low call intensity of Spring Peeper and Wood Frog was detected.

Wetland V2 - 2009-2011

After discussions regarding the hydroperiod of V2 in 2008, in early 2009 Dufferin proposed to MOE, MNR, and NEC that they would implement temporary measures to maintain the seasonal hydroperiod in the wetland until such time as the Extension long-term water management system (including the East Cell Recharge System) was in place and providing mitigation. During a field visit on April 6, 2009, MNR requested that Dufferin immediately implement such temporary mitigation measures (i.e., the direct discharge of water) to raise the water level in Wetland V2 and continue the temporary mitigation measures to maintain a seasonal hydroperiod.

Dufferin immediately implemented the requested temporary mitigation measures as requested by MNR, initially by using the site water truck to supply water to V2 and subsequently using a temporary above-ground pipe connection to the watermain of the existing Water Management System (WMS), operating for the North Quarry. Prior to the addition of water, the Wetland V2 water level was approximately 339.88 m AMSL. The water level was increased approximately 0.4 m to 340.28 m AMSL on April 9, 2009 when MNR returned to the site for a follow-up visit to evaluate the effectiveness of the temporary measures. Per agreements with MNR, the temporary V2 mitigation system was operated to maintain a water level of approximately 340.25 AMSL (or approximately 70 cm deep at the staff gauge) over the period of April through July, after which the water level was allowed to gradually decrease until August 21, 2009 when the temporary mitigation measures were discontinued for 2009. Similar measures remained in place for the 2010 field season.

The long-term mitigation system was installed in 2010 and it has been operating to augment surface water levels in V2 since spring 2011 consistent with the intent of the Extension mitigation plans and AMP.

Wetland V2 – 2012

In addition to the regular AMP wetland monitoring and mitigation operation, detailed ecological and water resources investigations were completed at V2 in 2012 in collaboration with MNR.

The investigations included:

- adult salamander migration survey;
- partial salamander egg mass survey;
- larval salamander survey;
- water temperature and dissolved oxygen monitoring; and,

- a tracer test to investigate groundwater movement patterns.

A detailed report entitled *Results of 2012 Investigation Program at Wetland V2* (CRA and Goodban Ecological Consulting Inc. 2013) was provided in Appendix R of the 2012 Annual Monitoring Report for the Milton Quarry (CRA 2013).

Wetland V2 – 2013-2021

As a result of the ice storm in December 2013, many of the Swamp Maple (*Acer* X *freemanii*) and Green Ash (*Fraxinus pennsylvanica*) trees ringing V2 lost limbs and branches, many of which fell into the main pool. The addition of woody debris to V2 has provided additional egg attachment sites for salamanders, which had appeared to be limited in parts of V2 during the more detailed 2012 egg mass survey.

Infestation of Green Ash by the Emerald Ash Borer has resulted in considerable tree dieback and mortality around the margins of Wetland V2. Woody species such as Wild Red Raspberry that formerly were encroaching into the central pool have been significantly reduced since mitigation commenced in 2009. Reed Canary Grass has been significantly reduced and more conservative wetland plant species such as Tuckerman's Sedge (*Carex tuckermanii*) have increased around the pool margins.

Cover in the main pool by floating-leaved aquatic plants such as Common Duckweed, Star Duckweed and the liverwort Slender Riccia (*Riccia fluitans*) varies considerably from year to year, ranging from 20% to 90% depending on the year.

Generally similar levels of frog call activity were recorded from 2013 to 2018. Calls from the following species were heard each year during this period: American Toad, Gray Treefrog, Green Frog, Northern Leopard Frog, Spring Peeper and Wood Frog. Species diversity and calling intensity increased relative to the period from 2004 to 2008, i.e., prior to the commencement of mitigation. Amphibian call count data for V2 from 2013 to 2018 are provided in **Table 15**. Amphibian call count data for V2 from 2019 to 2021 are provided in **Table 8b**. A similar suite of species and call intensities were recorded from 2019 to 2021, consistent with the period from 2009 to 2018.

Thousands of Fairy Shrimp (*Eubranchipus* sp.), caddisfly (order Trichoptera) larvae and other benthic organisms were observed in the water column in April and May each year from 2009 to 2021. Many adult and juvenile Wood Frogs, and juvenile Northern Leopard Frogs, were observed in mid-to-late summer.

Jefferson Salamander complex egg masses and Spotted Salamander egg masses were observed in V2 each year from 2013 to 2021. A silt fence was installed in December 2013 around the extraction limit near W2, intended to prevent adult salamanders and juveniles from moving into the extraction area and this was in operation until extraction in proximity to V2 was completed. Since the commencement of surface water augmentation in 2009, the hydroperiod of Wetland V2 has been of sufficient duration to allow the successful transformation of aquatic salamander larvae into terrestrial metamorphs/juveniles. A range of Jefferson Salamander and Unisexual Ambystoma age classes were captured at the silt fences from 2014 to 2019 including a number of juveniles.

Ecological conditions in Wetland V2 have been enhanced considerably since the implementation of diffuse discharge mitigation measures in 2009.

## 6.0 HABITAT OF ENDANGERED AND THREATENED SPECIES

This section of the report deals with species that are designated endangered or threatened in Ontario and protected under the ESA. Species that are designated endangered or threatened in Canada and protected under the *Species at Risk Act* (SARA), but not protected under the ESA, are discussed under Significant Wildlife Habitat.

In addition to discussing endangered and threatened species that were detected during the inventories, some other species that were not observed are also discussed. These are species that have been identified by the NHIC as having been confirmed within the general vicinity of the site. The potential for them to occur and for regulated habitat for any species to extend onto the subject lands is discussed.

### 6.1 Confirmed Endangered and Threatened Species

A total of seven (7) Endangered species and four (4) Threatened species were confirmed in the study area during the fieldwork between 2018 and 2021, as follows:

- Butternut (Endangered)
- Jefferson Salamander (Endangered)
- Unisexual Ambystoma (Jefferson Salamander dependent population) (Endangered)
- Barn Swallow (Threatened)
- Bobolink (Threatened)
- Chimney Swift (Threatened)
- Eastern Meadowlark (Threatened)
- Eastern Small-footed Myotis (Endangered)
- Little Brown Myotis (Endangered)
- Northern Myotis (Endangered)
- Tri-colored Bat (Endangered)

Endangered and Threatened species and their habitats are discussed below under the following headings:

- 6.1.1 Butternut
- 6.1.2 Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population)
- 6.1.3 Birds
- 6.1.4 Bats

The potential effects of the proposed MQEE on habitats of Endangered and Threatened species are discussed in **Section 16.1**.

### 6.1.1 Butternut

During the 2019-2021 field surveys, Butternut trees and seedlings were identified within the MQEE study area (**Figure 24**). Although still relatively common in southern Ontario, especially above the Niagara Escarpment, Butternut is listed as Endangered in Ontario due to its rapid population decline resulting from a fungal disease called Butternut Canker (*Sirococcus clavigignenti-juglandacearum*). Within the MQEE study area, a number of Butternut trees have fallen down in recent years, apparently due to this disease.

Five live Butternuts were observed at the locations shown on **Figure 24**: one tree (BN02) and four seedlings (BN01, BN03-BN05). One seedling (BN01) is located within the East Cell licence limit and it would be removed as part of the MQEE.

The potential effects of the proposed MQEE on Butternut are discussed in **Section 16.1.1**.

### 6.1.2 Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population)

#### 6.1.2.1 Background on Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population)

The Halton Forest is a stronghold in Ontario for the Jefferson Salamander and related Unisexual Ambystoma (Jefferson Salamander dependent population). Jefferson Salamander populations typically are found in coexistence with unisexual individuals that are primarily polyploid with a predominance of Jefferson Salamander chromosomes. The presence of eggs of Unisexual Ambystoma (Jefferson Salamander dependent population) indicates the presence of a breeding pure male Jefferson Salamander, which is required as a sperm donor to initiate egg development of the Unisexual Ambystoma. Both the 'pure' diploid Jefferson Salamander (JJ) and Unisexual

Ambystoma (e.g., LJJ, LJJJ) are listed as Endangered in Ontario and they are afforded protection under Ontario's *Endangered Species Act (ESA 2007)*.

The Jefferson Salamander is primarily a forest-dwelling species and it requires vernal pools and wetlands as breeding habitat. Adults migrate early each spring to breeding pools and then return to their foraging and hibernation habitat after spending up to a few weeks in the pools. Jefferson Salamanders may cross open field habitats to reach their breeding pool if the open fields separate the pool from their forested foraging and hibernation habitat. They spend much of their time underground in small mammal burrows, in fissures and voids within dolostone outcrops and under woody debris on the forest floor. For a given breeding pool, 90% of the adults using the pool would be found in suitable forested habitat within 300 m of the pool during the rest of the year. Eggs start to hatch within 2 to 4 weeks (depending primarily on water temperature). Hatchlings are 10 to 14 millimetres in total length. The transformation from larvae to adults normally occurs in July and August, when juveniles move out of the pond and seek shelter in the forest litter. However, the duration of the larval stage can vary and may even extend into early September. Year to year variations in snowpack and precipitation may result in pools drying up too soon in some years, meaning recruitment may only occur in certain years. Jefferson Salamanders are long-lived, with individuals reaching more than 30 years in age, and populations can be resilient to such variable reproductive output.

#### 6.1.2.2 Jefferson Salamander & Unisexual Ambystoma Breeding Pools within the MQEE Study Area

Within the MQEE study area, outside of the proposed extraction area, there are confirmed breeding pools for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) are shown on **Figure 25**:

- Wetland U1 (2019/2020)
- Wetland V2 (2001, 2009-2021)
- Wetland W36 (2019/2020)
- Wetland W41 (2019)
- Wetland W46a (2020)

Beyond the MQEE study area, some additional confirmed breeding pools for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) are shown on **Figure 25**. Most of these additional confirmed pools were identified as such based on the results of egg mass surveys conducted in 2002.

#### 6.1.2.3 Jefferson Salamander Habitat Regulation

This section provides an overview of the Jefferson Salamander Habitat Regulation.

*Ontario Regulation 242/08, Section 28 - Jefferson Salamander Habitat*

The Ministry of Environment, Conservation and Parks (MECP) identifies Jefferson Salamander habitat by applying Section 28 of Ontario Regulation 242/08, which reads as follows:

**28.** For the purpose of clause (a) of the definition of "habitat" in subsection 2 (1) of the Act, the following areas are prescribed as the habitat of the Jefferson salamander:

1. In the City of Hamilton, the counties of Brant, Dufferin, Elgin, Grey, Haldimand, Norfolk and Wellington and the regional municipalities of Halton, Niagara, Peel, Waterloo and York,

> i. a wetland, pond or vernal or other temporary pool that is being used by a Jefferson salamander or Jefferson dominated polyploid or was used by a Jefferson salamander or Jefferson dominated polyploid at any time during the previous five years,
>
> ii. an area that is within 300 metres of a wetland, pond or vernal or other temporary pool described in subparagraph i and that provides suitable foraging, dispersal, migration or hibernation conditions for Jefferson salamanders or Jefferson dominated polyploids,
>
> iii. a wetland, pond or vernal or other temporary pool that,
>
>> A. would provide suitable breeding conditions for Jefferson salamanders or Jefferson dominated polyploids,
>>
>> B. is within one kilometre of an area described in subparagraph i, and
>>
>> C. is connected to the area described in subparagraph i by an area described in subparagraph iv, and
>
> iv. an area that provides suitable conditions for Jefferson salamanders or Jefferson dominated polyploids to disperse and is within one kilometre of an area described in subparagraph i. O. Reg. 436/09, s. 1.

The application of the Jefferson Salamander habitat regulation is dependent on the identification of confirmed breeding pools (subsection i of the regulation). As described above, breeding pools used by Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) within and adjacent to the MQEE study area are mapped on **Figure 25**.

Under subsection ii of the regulation, areas within 300 m of confirmed breeding pools that provide suitable foraging, dispersal, migration, or hibernation conditions for Jefferson Salamanders or Ambystoma Unisexual (Jefferson Salamander dependent population) are mapped as Jefferson Salamander Habitat. Foraging and hibernation habitat typically comprises deciduous or mixed forests, but open areas may be crossed by Jefferson Salamanders and Ambystoma Unisexual (Jefferson Salamander dependent population) to migrate to/from breeding pools or to disperse into new habitats.

Subsection iii of the regulation deals with pools that provide suitable breeding conditions for Jefferson Salamanders and Unisexual Ambystoma (Jefferson Salamander dependent population). The Aurora District office of the former Ministry of Natural Resources and Forestry (MNRF) has previously used the following criteria to identify "suitable" pools for Jefferson Salamander:

- suitable hydroperiod;
- amphibian breeding (by any species);
- lack of predatory fish;
- egg attachment sites present; and,
- located within 1 km of a confirmed Jefferson Salamander breeding pool, connected by suitable habitat for dispersal.

Subsection iv of the regulation deals with lands that are suitable for dispersal and located within 1 km of a confirmed Jefferson Salamander breeding pool.

#### 6.1.2.4 GEC's Application of the Jefferson Salamander Habitat Regulation to the MQEE Study Area

This section describes GEC's application of the Jefferson Salamander Habitat Regulation to the MQEE study area, as shown on **Figure 26**.

The first step is to identify confirmed breeding pools of Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population), as shown on **Figures 25** and **26** and listed above in **Section 6.1.2.3**.

The second step is to identify areas within 300 m of confirmed breeding pools that provide suitable foraging and hibernation habitat. These areas correspond to the forested areas shown in orange tint on **Figure 26**. The forested areas also provide suitable migration habitat where salamanders move to and from breeding pools during the breeding season in early spring. Similarly, the forested areas provide excellent conditions for juvenile dispersal.

The third step was to identify areas around Wetland U1 that are suitable for migration between U1 and the forested habitats within 300 m of the breeding pools. These areas correspond to the forested areas shown in light green tint on **Figure 26**. Wetland U1 is located in open country with relatively few trees. The open fields around Wetland U1 would be considered migration habitat because the adult salamanders using this pool would primarily be using the forested habitats for foraging and hibernation. Wetland U1 is approximately 115 m away from forest to the northwest, 115 away from forest to the northeast, and approximately 220 m from forest to the southeast. The area shown in green tint would not function as dispersal habitat related to Wetland U1, because under existing conditions this pool does not contain water for a long enough period, i.e., its hydroperiod is too short, and no juveniles emanate from this feature. However, the area shown in light green tint on **Figure 26** could potentially function as dispersal habitat for juveniles moving away from Wetland V2, which has had a suitable hydroperiod every year since mitigation commenced in 2009.

There are no suitable breeding pools within the MQEE extraction area nor in the Cox Tract, so the southwest boundary of the area mapped as migration habitat (and potentially dispersal habitat) is set between the edges of the forested areas around Wetlands V2 and W36, which are approximately 650 m apart from each other (i.e., within 1 km of each other). The outer limits of dispersal habitat between confirmed Jefferson Salamander and Unisexual Ambystoma breeding pools are shown on **Figure 26** with purple lines, which were set by drawing straight lines between breeding pools and then applying a 100 m offset. The limit of the migration and potential dispersal habitat was adjusted on **Figure 26** to fit the forested habitats in proximity to Wetland V2 and the upper portion of Wetland 36. At the same time, it should be noted that the area shown in light green tint on **Figure 26** is not ideal dispersal habitat because juveniles would have to traverse large open field habitats with few trees, where they would be more susceptible to predation and desiccation.

There are a few pools in the forest that may be suitable pools for breeding by Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population), such as W46c and W46d where Spotted Salamanders were captured during the minnow trapping surveys. However, these pools do not affect the habitat mapping, because W46a is a confirmed breeding pool and the surrounding forest is mapped as foraging and hibernation habitat.

The determination of what constitutes habitat for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population), based on the Jefferson Salamander Habitat Regulation, is the responsibility of the Ministry of Environment, Conservation and Parks (MECP), Species at Risk Branch (SARB).

The potential effects of the proposed MQEE on Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) and their habitats are discussed in **Section 16.1.2**.

### 6.1.3 Birds

- Bobolink and Eastern Meadowlark

As described above in **Section 5.4.4.1**, in 2019 and 2020 Bobolink and Eastern Meadowlark were recorded from some of the open field areas within the proposed MQEE licence area.

The general habitat description for Bobolink (MECP 2021a) identifies three categories of habitat as follows:

1. The nest and the area within 10 m of the nest.
2. The area between 10 m and 60 m of the nest or centre of approximated defended territory.
3. The area of continuous suitable habitat between 60 m and 300 m of the nest or approximated centre of defended territory.

Habitat mapping for Bobolink is provided on **Figure 27**.

The general habitat description for Eastern Meadowlark (MECP 2021b) identifies three categories of habitat as follows:

1. The nest and the area within 10 m of the nest.
2. The area between 10 m and 100 m of the nest or centre of approximated defended territory.
3. The area of continuous suitable habitat between 100 m and 300 m of the nest or approximated centre of defended territory.

In 2019 multiple Eastern Meadowlarks were recorded during each of the three visits.

Habitat mapping for Eastern Meadowlark is provided on **Figure 27**.

Combined Bobolink and Eastern Meadowlark habitat mapping is also provided on **Figure 27**. On the figure 60 m radius circles are shown for Bobolink and 100 m circles are shown for Eastern Meadowlark, and the Category 2 habitat for each species occurs where the circles overlap with the yellow stippled area representing suitable habitat for both species. An open area to the north is excluded because it is partially treed and almost surrounded by forest. A cultural savannah area at the south end is excluded because of the tree cover. No Bobolink or Eastern Meadowlark were observed in either area that was excluded. Approximately 18.7 ha is considered habitat for Bobolink and Eastern Meadowlark, based on the 2019-2020 survey results and the general habitat descriptions for both species.

- Barn Swallow

The general habitat description for Barn Swallow (MECP 2021c) identifies three categories as follows:

1. Nest
2. The area within 5 m of the nest
3. The area between 5 m and 200 m of the nest

The only structures within the MQEE study area are the Control Valve (CV) Huts which are spaced along the East Cell watermain access road. These structures are not suitable as nesting sites for Barn Swallows. They are box-like concrete structures with no overhangs that might provide shelter and no ledges or other suitable features that would allow for nest-building. GEC has been onsite regularly since the East Cell Water Management System (WMS) was constructed in 2011 and no bird nests have been observed on the CV Huts since then. GEC also recently consulted with staff responsible for the operation of the WMS, who reported no signs of birds nesting on the CV Huts. Since there is no nesting habitat in the general vicinity, there is no habitat for Barn Swallow under the general habitat description.

- Chimney Swift

The general habitat description for Chimney Swift (MECP 2021d) identifies three categories of habitat as follows:

1. Human-made nest/roost, or a natural nest/roost cavity and the area within 90 m of the natural cavity
2. Not applicable to this species
3. Not applicable to this species

There is no human made chimney or other structure within the MQEE study area that is suitable as a Chimney Swift nest site. Although now apparently quite rare, swifts may use hollow (living or dead) large diameter cavity trees/snags within mature and old growth forests as nest/roost sites. The trees or snags that are used are usually greater than 50 cm DBH (COSEWIC 2018). There are no suitable nest/roost trees within the proposed extraction area, but some may exist within the adjacent forest.

The single observation of Chimney Swift made on May 30, 2020, could represent a very late migrant or a relatively early breeder.

The potential effects of the proposed MQEE on Bobolink and Eastern Meadowlark habitat are discussed in **Section 16.1.3.**

### 6.1.4 Bats

Four endangered bat species were documented during the bat acoustical study completed in June 2021: Little Brown Myotis, Northern Myotis, Eastern Small-footed Myotis, and Tri-colored Bat.

For the three myotis species, a summary of their relevant biology and behaviour is presented prior to presenting the results. The summaries provide a discussion on the potential for Woodland B and hedgerows to provide maternal roosting habitat for the species. Finally, a discussion is provided on the significance of the habitat for the species.

#### 6.1.4.1 Little Brown Myotis

*Roosting Ecology and Behaviour – Little Brown Myotis*

In human-settled areas such as southern Ontario, the Little Brown Myotis greatly prefers to roost in or on buildings or other anthropogenic features during the period when females are pregnant and caring for pups. Maternity colonies now occur most commonly in buildings and less in suitable natural habitats (van Zyll de Jong 1985). Near Cambridge, radio-tracked Little Brown Myotis used tree roosts predominantly after the young were independent (Sandilands and Morningstar in prep.).

Nonetheless, some Little Brown Myotis roost in trees and other natural cavities and crevices during the maternal season. Even in building roosts that have been used traditionally for several decades, females frequently switch roosts within a year even during the maternal season. Very limited site fidelity is exhibited for tree roosts which are often only used for one or two nights (Fabianek et al. 2015; Fenton 1970; Jung et al. 2004).

For maternal roosting in forests, the Little Brown Myotis has definite habitat preferences. Preferred woodlands include those that are very mature or old growth with limited subcanopy and very large trees and an abundance of cavity trees. Younger forests are used if there are gaps in the canopy with a cluster of cavity trees associated with the gaps. The clustering of suitable cavity trees is important because several individuals of this species often roost together and frequently move among the cavities (Jung et al. 1999; Olson and Barclay 2013). Near Sudbury, the Little Brown Myotis used canopy trees that were as tall, or taller, than the forest canopy and appeared to avoid snags that were in the subcanopy. Occupied cavity trees were surrounded by a low density of small trees 7.5-15 cm DBH (Jung et al. 2004).

The Little Brown Myotis has specific requirements for cavity trees. It seldom uses cavities that are less than 10 m above the ground. It also tends to mostly use cavities in larger trees. Large cavities are important because the roost must be warmer than the ambient temperature to allow rapid development of the fetus and pup. Roosts typically have a temperature of 32°C or higher (Anthony et al. 1981; Barclay 1982). In trees, this can usually only be attained in larger cavities where several bats can huddle together to thermoregulate. Consequently, usually only large trees are selected for roosting. Most roosts are situated in trees 45 to 50 cm DBH and larger whereas those as small as 25 cm DBH are rarely used (Olson and Barclay 2013).

Another factor that influences roost selection is the proximity of good foraging habitat. The Little Brown Myotis preferentially forages over water where it is present, but woodland edges are also favoured. Females prefer to roost close to their primary foraging areas to minimize time and energy in capturing and delivering food to the pup in the roost. Several studies have demonstrated that this species roosts closer to water than random (Adams and Thibault 2006; Kalcounis-Rüppell et al. 2005; Thomas et al. 2021). In the Cambridge study area, roosts averaged 66 m from water compared with 559 m for random sites (Sandilands and Morningstar in prep.).

Little Brown Myotis usually leave the roost at or very shortly after sunset. At the Cambridge site, there was a general exodus around sunset, or even slightly before that, with most movement out of the roost completed by half an hour later (Sandilands and Morningstar in prep.). Henry et al. (2002) reported that some bats did not leave the roost until an hour after sunset. Similar to other studies, the results were somewhat confounded because some bats returned to the roost before that. Females commence foraging as soon as they leave the roost. Those with pups return to feed them, usually around midnight and one or two more times during the night. They also go on another foraging trip just before dawn. So, there may be movement in and out of the roost all night. This is particularly true of roosts in buildings. Bats that are not using the roost as a maternal site may enter around midnight and rest until shortly before dawn before going on their next foraging bout.

All these factors help to determine if a recorded call represents a bat that may be using the area as a maternal roost. The suitability of the habitat and the time that the call was made must both be considered. Interpretation may be difficult due to the presence of roosting males or females that are not in a reproductive condition, as well as bats that are simply foraging.

*Potential for Woodland B to Provide Maternal Roosting Habitat for Little Brown Myotis*

The structure of Woodland B is suitable for Little Brown Myotis roosting. The canopy is open with gaps and there are a number of potential roosts within it. It is also good foraging habitat. There is an abundance of forest edge and the internal canopy gaps are also suitable for foraging. The open canopy with a lack of a tall subcanopy allows bats to travel under the canopy unhindered by vegetation. The Little Brown Myotis does not regularly forage under forest canopy, but may in this case due to the small size of

Woodland B and the large openings within it. Woodland B is not close to a pond, with Pond V2 being the closest, some 350 m away. Most roosts are in close proximity to water where females can travel back and forth between the roost and foraging site with minimal energy expenditure. The presence of the CV huts with their abundant insect populations may compensate in part for the lack of a close source of water.

The quality of the cavities within Woodland B is generally low for the Little Brown Myotis. It prefers cavities that are more than 10 m from the ground in trees 45 cm DBH or larger, although it may occasionally use smaller trees and lower cavities. Only one cavity was more than 10 m above ground (14 m), although two others were 10 m up. Only two cavity trees had a DBH of 45 cm or greater, and these were also trees with cavities at or above 10 m. Thus, there were only two high quality cavity trees within Woodland B. The potentially good cavity trees were Numbers 101 and 104. Both are in areas of Woodland B where they are more distant from internal gaps in the forest and forest edge. The Cambridge population of Little Brown Myotis selected roosts that were easily accessible such as supercanopy pines as well as maples and oaks at the very edge of woodlots or in hedgerows (Sandilands and Morningstar in prep.). This does not mean that these two cavities in Woodland B will not be used as roosts, but diminishes the probability.

The cavities in the copse of trees where Detector 07 was located were all unsuitable, being quite low in small trees.

Although there are potentially two good roost trees within Woodland B, there is no concentration of roost trees as is generally preferred by the Little Brown Myotis. The Little Brown Myotis generally roosts communally in clusters of roosts and frequently moves among them during the maternal period.

**Table 16** summarizes the number of bat calls recorded by the detectors in Woodland B within an hour of sunset. In some other surveys it has been found that bats often exit roosts near sunset or even earlier rather than waiting until dusk. Bats may also leave roosts in wooded areas earlier because it gets darker sooner.

The results from this study have confirmed this, with bats detected as early as 6 minutes before sunset. A total of 175 bat calls were recorded in Woodland B from before sunset until dusk. Therefore, the general exodus from roosts was around sunset rather than at dusk.

The small copse of trees loosely connected to Woodland B where Detector 07 was located had little bat activity in the hour after sunset. Only 4 calls were recorded during this period over the 14 nights and they tended to be later in the evening. This supports the conclusions about the habitat and quality of cavities in this area that it is generally unsuitable for roosting Little Brown Myotis. The acoustical survey confirmed that there were no roosts in this area.

There was limited detection of Little Brown Myotis early in the evenings at Detector 08. Although there was a total of 34 recorded calls within an hour of sunset, only 11 occurred within a half hour of sunset when most emergences from roosts should occur. In addition to being relatively sparse, the records were sporadic. No bats were detected within a half hour of sunset on 5 of the 14 nights; no bats were detected within an hour of sunset on 1 night. It is concluded that there is no evidence of Little Brown Myotis roosting in the vicinity of this detector.

Detector 09 recorded the most calls within an hour of sunset (189), including several that were at or slightly before sunset. On most nights, some were detected early in the evening, but there were some nights when the first records occurred later. These probably represented bats that had already emerged somewhere else and were simply foraging in the area. Bats were not detected early at this site on June 8, 16, 17, and 19, about 29% of sampling nights. Despite having the largest number of calls within an hour of sunset, activity was not particularly high. The mean number of calls within an hour after sunset recorded nightly was only 13.5 with a mean of only 8.4 within a half hour after sunset. In addition, some of the calls may have represented multiple calls by a single bat. One of the best potential roost trees (104) is near where this detector was deployed.

Females that have pups return to the roost between 0000 and 0100 h to feed them. If a roost is present, there should be calls very early in the evening as well as around midnight. In the case of Detector 09, this occurred on 9 of the 14 nights. The results for Detector 09 are not definitive and it is possible that very small numbers of Little Brown Myotis roosted in this area on an occasional basis.

Detector 10 recorded about a third of the number of calls (61) within an hour of sunset as did Detector 09. Calls were detected as early as 6 minutes before sunset. Early recordings of bats were sporadic in nature, with none detected within half an hour of sunset on June 8, 14, 15, 16, or 17, 36% of the sampling nights. Numbers were consistently low with a mean of 4.4 recordings per night within an hour of sunset and 3.2 within a half hour of sunset. Both early morning and after-midnight calls occurred on 7 of the 14 sampling nights. It is possible that one or two Little Brown Myotis occasionally roosts in the vicinity of this detector.

Although the early recordings prior to sunset suggest that bats are leaving a nearby roost, this is not necessarily the case. At another site in open habitat where there was no potential for roosts to occur, calling Little Brown Myotis were documented as early as 2 minutes before sunset (Goodban Ecological Consulting Inc. and Gray Owl Environmental Inc. 2017).

*Potential for the Hedgerows to Provide Maternal Roosting Habitat for Little Brown Myotis*

The hedgerows have limited potential to support maternal roosts of the Little Brown Myotis. Only 5 cavity trees were present and only 1 of these had potential roosting habitat (peeling bark) more than 10 m from the ground. For those trees with cavities, the cavities were only 3 to 8 m above ground.

**Table 17** summarizes the number of Little Brown Myotis calls recorded in the hedgerows at each detector within 1 hour of sunset. Detector 07 did not record any calls during this period so it definitely is not functioning as a roost.

Detector 08 had 26 records of bat calls within an hour of sunset, a mean of 4.3 per night. Sixteen of these occurred within a half hour of sunset and only 10 occurred within 15 minutes of sunset. There was no pattern to the early evening calls, with calls near sunset occurring on only two nights.

Both Detector 09 and Detector 10 had 15 records of Little Brown Myotis calls, a mean of 2.5 per night. Similarly, there was no pattern to the early evening calls. Early calls were documented in 3 of 6 nights at Detector 09 with only 2 nights with consecutive early calls. The exact pattern occurred at Detector 10 on the same nights.

When early evening calls occurred, they were single records well spaced in time. In addition, bats were often detected at Detectors 09 and 10 within a few seconds of each other. This suggests that these records were of bats flying along the hedgerow foraging or travelling to foraging areas.

It is concluded that the hedgerows do not provide roosting habitat for the Little Brown Myotis. Records of calls were obtained in the hedgerows as early as 6 minutes before sunset, similar to within Woodland B. This indicates that this bat may already be out foraging by this time.

*Discussion – Little Brown Myotis*

The hedgerows do not provide any habitat for roosting Little Brown Myotis.

Woodland B is considered marginal roosting habitat for the Little Brown Myotis. This is because of the relatively small size of most of the cavity trees, the fact that few cavities were as high as generally preferred by this species, and that there is no clustering of suitable cavities that can be used by a colony of Little Brown Myotis. Only 2 cavity trees were suitable when all of this species' preferences for cavities were considered.

An analysis of the calls indicated that there was some potential for Woodland B to support maternal roosts of the Little Brown Myotis on a sporadic basis. This was based on the presence of calls before or shortly after sunset combined with those after midnight when females should be returning to feed pups. These results are very conservative because they are confounded by foraging bats that may occur very early in the morning as well as after midnight.

#### 6.1.4.2 Northern Myotis

*Roosting Ecology and Behaviour – Northern Myotis*

Unlike the Little Brown Myotis which commonly roosts in isolated trees, the Northern Myotis typically roosts under the canopy of deciduous and mixed forests. Roosts are most often in large cavities and cracks in trees that can accommodate numerous bats, but it may also roost under extensive sheets of exfoliating bark. It selects large trees for roosting. In Michigan, the mean DBH of roost trees was 65 cm and the mean height of roosts above ground was 10.7 m (Broders and Forbes 2004; Foster and Kurta 1999; Garroway and Broders 2008; Henderson and Broders 2008). Similar to the Little Brown Myotis, the Northern Myotis frequently switches roost sites and roosts tend to be clustered together (Caceres and Barclay 2000).

The Northern Myotis differs from the Little Brown Myotis in its foraging habitat preferences. It prefers to forage under the forest canopy, down to a height of 1 to 3 m above ground, and often gleans insects from twigs. It is much less likely to occur in open habitats, but may forage above ponds (van Zyll de Jong 1985).

*Potential for Woodland B to Provide Maternal Roosting Habitat for Northern Myotis*

Woodland B is generally unsuitable for roosting Northern Myotis. It requires mature forests and roosts in very large trees. In contrast, Woodland B is intermediate in age and none of the trees even approach the mean size of trees that it selects for roosts.

Woodland B is good foraging habitat for the Northern Myotis. This species preferentially forages under the tree canopy of forests. The lack of a tall subcanopy in Woodland B allows it to forage unconstrained by vegetation. Its preference for foraging under the canopy is demonstrated in the number of calls recorded by the various detectors. Only one was detected by Detector 07 which is a small copse of trees, whereas it was common to abundant at the recorders within Woodland B.

The acoustical survey confirmed that the Northern Myotis was not roosting within Woodland B. At all detectors combined, only 64 calls were recorded by 15 minutes after sunset (out of a total of 1,024 calls). The earliest (and only) early record at Detector 08 was 7 minutes after sunset; 4 minutes after sunset at Detector 09, and 2 minutes before sunset at Detector 10 were the respective earliest records. The majority of records were 10 minutes or more after sunset.

The earliest recorded time for the Northern Myotis was 4 minutes later than the earliest Little Brown Myotis record. Most Northern Myotis records occurred after the Little Brown Myotis had been out foraging for at least 10 minutes.

Results indicate that the Northern Myotis is travelling from distant roosting areas to forage within Woodland B.

*Potential for the Hedgerows to Provide Maternal Roosting Habitat for Northern Myotis*

The Northern Myotis is not known to roost in isolated trees outside of woodlands, so the hedgerows do not provide roosting habitat for this species. In addition, the cavity trees in the hedgerows are much smaller than this species prefers.

The hedgerows do not provide maternal roosting habitat for the Northern Myotis.

#### 6.1.4.3 Eastern Small-footed Myotis

*Roosting Ecology and Behaviour – Eastern Small-footed Myotis*

Limited study has been conducted on the Eastern Small-footed Myotis, so there is little information about its ecology. Unlike other Ontario species of bats, the Eastern Small-footed Myotis roosts predominantly in crevices and cracks within rocks (Humphrey 2017; van Zyll de Jong 1985). In West Virginia, it roosted at ground level in talus slopes and rock fields (Johnson et al. 2011). It has also been reported roosting in crevices in bridges (Thomson 2013) and rarely in trees (Thomson 2013) and buildings (Hitchcock 1955).

*Potential for the Proposed Extension to Provide Maternal Roosting Habitat for Eastern Small-footed Myotis*

There is no potential for the proposed extension to provide maternal roosting habitat for the Eastern Small-footed Myotis. There are no bedrock outcroppings in Woodland B or anywhere within the proposed extraction area, although some field stones have been piled in old fence lines.

Bedrock outcrops are widespread and common throughout the Halton Forest North Area of Natural and Scientific Interest (ANSI), as well as throughout much of the 35 $km^2$ Halton Forest. These are likely the source of the Eastern Small-footed Myotis detected during this study. It is also probable that some of the bat calls identified as Eastern Small-footed Myotis were actually Northern Myotis. The Eastern Small-footed Myotis was not common in the study area with a mean of 7 calls per night and this number is probably inflated.

#### 6.1.4.4 Tri-colored Bat

The Tri-colored Bat roosts mostly in trees in dead or alive leaf clusters, in arboreal lichens, and also in buildings, usually in association with the Little Brown Myotis (Humphrey and Fotherby 2019).

Only two calls of the Tri-colored Bat were documented, both in Woodland B by Detector 08. They occurred on different nights, with one recorded on June 17 and the other on June 19. Both records were after midnight at 0019 h and 0051 h.

The timing of these calls is much later than would be expected of a bat at a maternal roost. It is most likely that these records were of a foraging bat in each case. It is concluded that there is no maternal roosting habitat present for the Tri-colored Bat. It is also not significant foraging habitat, given that only a single call was recorded on two different nights.

#### 6.1.4.5 Summary of Habitat of Endangered Bat Species

Four endangered bat species were documented during the study: Little Brown Myotis, Northern Myotis, Eastern Small-footed Myotis, and Tri-colored Bat.

It is concluded that there is no maternal roosting habitat within the proposed extension for the latter three species. The Northern Myotis foraged commonly in the area, but there were no suitable roost trees available for it and the acoustic survey confirmed that it was documented later in the evening than the Little Brown Myotis, suggesting that it travelled from more distant roosts. The Eastern Small-footed Myotis roosts almost exclusively in cracks and crevices of rocks on the ground, habitat that is absent within the MQEE extraction area. Only two isolated records of the Tri-colored Bat were obtained, both after midnight. These bats were simply flying by or foraging within the area.

The hedgerows did not provide any roosting habitat for the Little Brown Myotis, nor did the small copse of trees south of Woodland B. There were only two cavity trees within Woodland B that appeared suitable as maternal roosts for this species. Results of the acoustical survey were equivocal. It is possible that roosting occurred within Woodland B on a sporadic basis. This is based on the occurrence of early evening records that may be associated with bats leaving a roost coupled with records shortly after midnight that may represent females returning to the roost to feed their pups. These results may be influenced by bats that are simply foraging at these periods. In addition, the sex of the bats cannot be determined by the calls and it is possible that males may roost within Woodland B.

A conservative approach has been taken and it is concluded that a portion of Woodland B may occasionally provide maternal roosting habitat for the Little Brown

Myotis. Only two cavity trees (CT101 and CT104) met all the criteria for a suitable cavity. The potential effects of the proposed MQEE on Little Brown Myotis maternal roosting habitat are discussed in **Section 16.1.4**.

## 6.2 Unconfirmed Endangered and Threatened Species

The NHIC database contains records of a “Restricted Species” and Redside Dace (*Clinostomus elongatus*) from the general vicinity of the MQEE study area.

The “Restricted Species” is likely American Ginseng (*Panax quinquefolius*). This species is Endangered in Ontario. GEC has observed American Ginseng in the local area over the years, but not within the MQEE study area.

Redside Dace occurs in pools and slow-moving areas of small streams and headwaters with a gravel bottom. There is no suitable habitat for Redside Dace in the MQEE study area.

## 6.3 Summary of Habitat of Endangered and Threatened Species

Habitats of the following Endangered and Threatened Species were confirmed within the MQEE study area:

- Butternut (Endangered)
- Jefferson Salamander (Endangered)
- Unisexual Ambystoma (Jefferson Salamander dependent population) (Endangered)
- Chimney Swift (Threatened)
- Bobolink (Threatened)
- Eastern Meadowlark (Threatened)

Four species of Endangered bats were recorded from the MQEE study area: Eastern Small-footed Myotis; Little Brown Myotis, Northern Myotis and Tri-colored Bat. A conservative approach to identifying habitat has been taken and it is concluded that a portion of Woodland B may occasionally provide maternal roosting habitat for the Little Brown Myotis. Only two cavity trees (CT101 and CT104) met all the criteria for a suitable cavity tree.

The potential effects of the proposed MQEE on habitats of Endangered and Threatened species are discussed in **Section 16.1**.

# 7.0 SIGNIFICANT WETLANDS IN ECOREGION 6E

Significant Wetlands and Unevaluated Wetlands are shown on **Figure 6** and others in this report. The mapping from within the MQEE study area (see **Figure 8**) is based on available Land Information Ontario (LIO) wetland mapping with refinements made by GEC based on field investigations and the use of aerial photography and topographic mapping layers. Outside of the MQEE study area, LIO wetland mapping is relied upon.

Within the MQEE study area, Wetlands V2, W36, W41 and W46a-f are Provincially Significant Wetlands. Wetland U1 was mapped as Unevaluated Wetlands. Wetland W56 was not mapped by LIO.

Wetland U1 presently lacks a suitable springtime high water level and hydroperiod of suitable duration to support amphibian breeding. Under existing conditions, GEC would not ordinarily recommend its inclusion within the Halton Escarpment Wetland Complex because it functions as an ecological trap for breeding frogs, toads and salamanders. However, GEC has recommended retaining Wetland U1 with a 50 m buffer to the extraction limit since there was breeding evidence for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) in 2019 and 2020. As described later in **Sections 13.0** and **16.2**, the wetland hydrology in Wetland U1 will be enhanced over existing conditions using the Water Management System (WMS). This will result in higher springtime water levels and a hydroperiod that is optimal for the successful reproduction of amphibians, including the Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population).

Wetland W56 is a small, minor feature with a short, ephemeral hydroperiod. GEC would not ordinarily recommend its inclusion within the Halton Escarpment Wetland Complex. W56 is located within the Significant Woodland and it will be protected from any dewatering influences from the MQEE through mitigation via the WMS, as described later in **Sections 13.0** and **16.2**.

The potential effects of the proposed MQEE on wetlands are discussed in **Section 16.2**.

## 8.0 SIGNIFICANT WOODLANDS IN ECOREGION 6E

Discussion on woodlands is provided below under the following headings: Woodland A, Woodland B and Significant Woodlands in the MQEE study area. Refer to **Figures 28** to **30**.

GEC considered provincial criteria for defining significant woodlands, along with the following Regional Official Plan Policies:

**277.** SIGNIFICANT WOODLAND means a *Woodland* 0.5 ha or larger determined through a *Watershed Plan*, a Sub-watershed Study or a site-specific Environmental Impact Assessment to meet one or more of the four following criteria:

(1) the *Woodland* contains forest patches over 99 years old,

(2) the patch size of the *Woodland* is 2 ha or larger if it is located in the Urban Area, or 4 ha or larger if it is located outside the Urban Area but below the *Escarpment Brow*, or 10 ha or larger if it is located outside the Urban Area but above the *Escarpment Brow*,

(3) the *Woodland* has an interior core area of 4 ha or larger, measured 100m from the edge, or

(4) the *Woodland* is wholly or partially within 50 m of a *major creek or certain headwater creek* or within 150m of the *Escarpment Brow*.

**295.** WOODLAND means land with at least: 1000 *trees* of any size per ha, or 750 *trees* over 5 cm in diameter per ha, or 500 *trees* over 12 cm in diameter per ha, or 250 *trees* over 20 cm in diameter per ha but does not include an active cultivated fruit or nut orchard, a Christmas *tree* plantation, a plantation certified by the *Region*, a *tree* nursery, or a narrow linear strip of *trees* that defines a laneway or a boundary between fields. For the purpose of this definition, all measurements of the *trees* are to be taken at 1.37 m from the ground and *trees* in regenerating fields must have achieved that height to be counted.

Regional Official Plan Section 295 is based on the *Forestry Act* (1990) definition of "woodlands."

GEC also considered Section 2.9 of the Niagara Escarpment Plan (2017):

2.9 Mineral Aggregate Resources

The objective is to ensure that mineral aggregate operations and their accessory uses are compatible with the Escarpment environment and to support a variety of approaches to rehabilitation of the natural environment and provide for re-designation to land use designations compatible with the adjacent land uses.

1. Notwithstanding Part 2.7.2 and subject to compliance with all other relevant policies of this Plan, mineral aggregate operations, wayside pits and quarries, and any accessory use and accessory facility thereto, may be permitted in key natural heritage features and any vegetation protection zone associated therewith, except for:

a) wetlands;

b) significant woodlands, that are not young plantation or early successional habitat (as defined by the Ministry of Natural Resources and Forestry).

The definition of "early successional habitat" used by GEC is from the Greenbelt Plan 2005 - Technical Definitions and Criteria for Key Natural Heritage Features in the Natural Heritage System of the Protected Countryside Area

## 8.1 Woodland A

Woodland A is a small 1.18 ha feature located on the northeast side of Townline, opposite the northeast end of the Cox Tract. The boundary of Woodland A is mapped on **Figure 28**.

The trees growing in Woodland A are a mix of Scots Pine (+), Red Pine, Trembling Aspen and Green Ash, with a few scattered Black Walnut and White Birch. Some of the Scots Pine (+) and Red Pine, and almost all of the Black Walnut are growing in rows, but others appear to be natural regeneration. The conifer species were planted in the Cox Tract circa 1950, providing an upwind seed source for Scots Pine and Red Pine. There are some more open, scrubby patches within this unit. It was classified by GEC as Mixed Forest (FOM), although some parts appear to be Coniferous Plantation (CUP3). The site history and unusual mix of dominant tree species does easily fit into the ELC system of vegetation community classification. Groundcovers are sparse under the dense conifers and weedy in more open patches.

Woodland A does not appear at all on the 1989 air photo and the general area lacked trees at that time. A few trees are evident on the 1995 air photo and even more appear on the 1999 air photo. This indicates that Woodland A is less than 30 years old and most of it is younger than that.

Tree density plots were sampled in Woodland A by J. Jackson and A. Goodban on October 30 and November 8, 2020. The purpose of the plot sampling was to determine if the feature met the *Forestry Act* definition of *woodland*, consistent with Section 295 of the Regional Official Plan, and to determine if it constitutes *early successional habitat* as defined by MNRF. The results of the tree density plot sampling are provided in **Table 18**. Nine (9) plots with a radius of 4 or 5 m were sampled and all trees within each plot were tallied. Trees were tallied in the following diameter classes: 0-5 cm, 6-9 cm, 10-12 cm, 13-20 cm, 21-24 cm and 25+ cm. The majority of the trees tallied were in the smallest diameter class (0-5 cm), with 149 trees being tallied. Nineteen (19) trees were in the 6-9 cm diameter class, eight (8) were in the 10-12 cm class, 16 were in the 13-20 cm class, one was in the 21-24 cm class and three were 25+ cm. Woodland A is clearly a young stand of trees.

**Table 19a** presents the tree density analysis, where the number of trees per plot was extrapolated to give the number of trees per hectare, for various size classes. For each size class within a given plot, it is indicated whether the *Forestry Act* definition of *woodland* is met. **Table 19b** presents the tree density summary for the following size classes: any size, 6+ cm, 13+ cm and 21+ cm. The "any size" category and the 6+ cm category satisfied the woodland definition but the larger size classes did not, because only five (5) trees 21+ cm were tallied amongst the nine (9) plots. In summary, Woodland A does meet the *Forestry Act* definition of *woodland*.

The Niagara Escarpment Plan makes reference to woodlands that are *early successional habitat*. To determine whether Woodland A constitutes *early successional habitat*, the definition provided in the *Greenbelt Plan 2005: Technical Definitions and Criteria for Key Natural Heritage Features in the Natural Heritage System of the Protected Countryside Area* (OMNR 2012) was used. The Greenbelt Plan definition of *early successional habitat* is based on the earlier *Paper 7 – Identification and Protection of Significant Woodlands* from the Oak Ridges Moraine Conservation Plan Technical Paper Series.

The definition of *early successional habitat* is provided below:

> *"Early successional habitat", for the purposes of Section 4.3.2.3a of the Greenbelt Plan, is a previously non-wooded, currently regenerating area in which:*
>
> *(a) there is less than 2 square metres of basal area per hectare in trees that are 10 centimetres or more in diameter from any species listed in Table A; and*
>
> *(b) there is less than 2 square metres of basal area per hectare in trees that are 25 centimetres or more in diameter from any combination of species listed in Table A of this technical paper plus white ash (Fraxinus americana), black cherry (Prunus serotina), white-cedar (Thuja occidentalis), white elm (Ulmus americana) or red elm (Ulmus rubra).*

There is no "Table A" in the Greenbelt Plan 2005: Technical Definitions and Criteria for Key Natural Heritage Features in the Natural Heritage System of the Protected Countryside Area document. However, Appendix D of that document does list the following as late successional or site-restricted tree species:

*Abies balsamea* - Balsam Fir
*Acer nigrum* - Black Maple
*Acer pensylvanicum* - Striped Maple
*Acer rubrum* - Red Maple
*Acer saccharinum* - Silver Maple
*Acer saccharum* - Sugar Maple
*Asimina triloba* - Pawpaw
*Betula alleghaniensis* - Yellow Birch
*Betula lenta* – Black Birch
*Carpinus caroliniana* - Blue-beech
*Carya cordiformis* - Bitternut Hickory
*Carya glabra* – Pignut Hickory
*Carya laciniosa* – Shellbark Hickory
*Carya ovata* - Shagbark Hickory
*Castanea dentata* – American Chestnut
*Celtis occidentalis* - Hackberry

*Cephalanthus occidentalis* - Buttonbush
*Cornus florida* – Flowering Dogwood
*Euonymus atropurpurea* – Wahoo Burning-bush
*Fagus grandifolia* - Beech
*Fraxinus nigra* - Black Ash
*Juglans cinerea* - Butternut
*Juglans nigra* - Black Walnut
*Larix laricina* - Tamarack
*Liriodendron tulipifera* – Tulip-tree
*Magnolia acuminata* – Cucumber Magnolia
*Malus coronaria* – Wild Crabapple
*Morus rubra* – Red Mulberry
*Nyssa sylvatica* – Black Gum
*Ostrya virginiana* - Hop-hornbeam
*Picea glauca* - White Spruce
*Picea mariana* - Black Spruce
*Pinus resinosa* - Red Pine
*Pinus strobus* - White Pine
*Quercus alba* - White Oak
*Platanus occidentalis* – Sycamore
*Ptelea trifoliata* – Hoptree
*Quercus alba* – White Oak
*Quercus bicolor* – Swamp White Oak
*Quercus ellipsoidalis* – Hill's Oak
*Quercus macrocarpa* - Bur Oak
*Quercus muehlenbergii* – Chinquapin Oak
*Quercus palustris* – Pin Oak
*Quercus rubra* - Red Oak
*Quercus shumardii* – Shumard Oak
*Quercus velutina* - Black Oak
*Sassafras albidum* - Sassafras
*Sorbus americana* - American Mountain-ash
*Staphylea trifolia* - Bladdernut
*Tilia americana* - Basswood
*Tsuga canadensis* - Hemlock
*Ulmus thomasii* - Rock Elm

The only species listed above that were sampled in Woodland A are Black Walnut and Red Pine. The Black Walnut appear to have been planted, as do some of the Red Pine. Only one Black Walnut in the 6-9 cm diameter class was recorded in Plot 9. Four Red Pine were tallied in two of the nine plots: one in the 0-5 cm size class, one in the 6-9 cm size class and two in the 13-20 cm size class. This means that only two trees from Table 1 were recorded in Woodland A that were greater than 10 cm diameter at breast height (dbh). If the two trees are both considered to be 20 cm dbh, the basal area per hectare would be approximately 1.3 square meters which satisfies part a) of the *early successional habitat* definition. It should also be noted that Red Pine are not native to this part of southern Ontario, Red Pine was planted in the Cox Tract in 1951 and may have subsequently been planted in Woodland A (post-1989) or seeds were carried from the Cox Tract on the wind. For trees greater than 25 cm dbh, on four were tallied and they were all Scots Pine (+). This means there was 0 square meters of basal area of species listed in Table 1, plus White Ash, Black Cherry, White Cedar, White Elm and Red Elm, so this satisfies part b) of the *early successional habitat* definition. Thus, it is concluded that Woodland A qualifies as *early successional habitat*.

The Cox Tract haul road crossing is between 29 and 31 m wide, which means the northeast end of the Cox Tract is considered a separate woodland, consistent with the Natural Heritage Reference Manual (OMNR 2010). The Manual states that *"Woodland areas are considered to be generally continuous even if intersected by narrow gaps 20 m or less in width between crown edges."* Since the haul road is approximately 30 m wide, the northeast end of the Cox Tract is a separate woodland that is 8.23 ha in size (including a former acoustic berm that is not treed). If the 1.18 ha Woodland A were considered contiguous with the northeast end of the Cox Tract, the total woodland size would be 9.41 ha which is below the 10 ha size threshold in the Region of Halton's definition of Significant Woodland above the Escarpment.

With regard to Woodland A, in summary:

- Woodland A meets the *Forestry Act* definition of *woodland*;
- Woodland A is considered *early successional habitat* as defined by OMNR; and,
- Woodland A would not be considered a Significant Woodland, even if Woodland A is considered to be contiguous with the northeast end of the Cox Tract.

It is also noted that the northeast end of the Cox Tract is identified as Significant Wildlife Habitat for Special Concern Bird Species in **Section 9.3.1** of this report, so that area would still qualify as a Key Feature in the Regional Natural Heritage System.

## 8.2 Woodland B and Hedgerow

The boundary of Woodland B is mapped on **Figure 29**. Woodland B and the treed hedgerow (CUHa) along the common boundary between the MQEE licence area and the East Cell are both mapped as part of the Region of Halton's Natural Heritage System (Map 1G of the Regional Official Plan).

*Woodland B*

Woodland B is located immediately northeast of Townline, just south of the East Cell licence limit. It is 0.68 ha in size. A rural residence was formerly located just beyond the southeast end of the feature mapped on **Figure 29**.

Woodland B is an upland deciduous forest 0.68 ha in area. It was classified as a Dry-Fresh Sugar Maple – Hickory Deciduous Forest Type (FOD5-5). Woodland B is intermediate in age with an average DBH of approximately 35 cm. The dominant trees are a mix of Sugar Maple, Bitternut Hickory, declining/dead White Ash, Black Cherry and Red Oak. Many of the Bitternut Hickory are damaged, presumably from the 2013 ice storm. The hickories that are forest-grown are tall with few lower branches and a small crown. The canopy closure is approximately 60% and there are large gaps in the canopy. At the southeast end, invasive groundcovers such as Periwinkle (*Vinca minor* +) and Variegated Goutweed (*Aegopodium podagraria* +) carpet some areas in the woodland, being relics of the former residential use.

At present Woodland B is 0.68 ha in size, as shown on **Figure 29**. In GEC's opinion this feature meets the Woodland definition in Regional Official Plan Section 295.

In order to be considered a Significant Woodland it is necessary for Woodland B to meet at least one or more of the four criteria from Regional Official Plan Policy 277 listed below in *italics*. GEC has assessed Woodland B with respect to the four criteria and the evaluation is provided for each criterion:

- *1) The Woodland contains forest patches over 99 years old.*

Woodland B is intermediate in age and the trees had an average DBH of approximately 35 cm. There are a few larger Sugar Maple and Red Oak up to 52 cm DBH. There are no forest patches over 99 years old. Woodland B does not satisfy this criterion for woodland significance.

- *(2) The patch size of the Woodland is 10 ha or larger if it is located outside the Urban Area but above the Escarpment Brow.*

Woodland A is 0.68 ha in size, as mapped on **Figure 29**. The hedgerow along the common boundary between the MQEE and East Cell is not a woodland and is not included in this area calculation (see discussion below under “Hedgerow [CUHa]”). The woodland does not satisfy this criterion for woodland significance because it is less than 10 ha in size.

- (3) the Woodland has an interior core area of 4 ha or larger, measured 100m from the edge, or

Woodland B does not contain any “interior core area”, because it is only 55-60 m wide. The entire feature is only 0.68 ha in size. Woodland B does not satisfy this criterion for woodland significance.

- (4) the Woodland is wholly or partially within 50 m of a major creek or certain headwater creek or within 150m of the Escarpment Brow.

Woodland B is not located within 50 m of a major creek or certain headwater creek, nor is it within 150 m of the Escarpment Brow. The Escarpment face is approximately 1.45 km east northeast of Woodland B. Woodland B does not satisfy this criterion for woodland significance.

In summary, Woodland B does not meet any of the Region’s four criteria for woodland significance or provincial criteria for significance. In GEC’s opinion this feature is not a Significant Woodland.

*Hedgerow (CUHa)*

The hedgerow along the common boundary between the MQEE licence area and the East Cell should not be identified as a Key Feature in the Regional Natural Heritage System because ROP Policy 295 states that “Woodland … does not include … a narrow linear strip of trees that defines a laneway or a boundary between fields." The narrow hedgerow along the common boundary is a linear strip of trees along the property line that historically defined the boundary between the two properties, along an old laneway and between two fields. Hedgerows are not considered woodlands. Further, the Natural Heritage Reference Manual (OMNR 2010) recommends minimum widths for identifying Significant Woodlands in Section 7.3.2, where the following is stated:

> *"Minimum patch width: This width is intended to exclude relatively narrow linear treed areas such as hedgerows. The minimum average width for significance can be related to the woodland size threshold being applied. For example, a minimum 40 metre average width where the size threshold is 4 hectares or less can be increased to a 60 m width where the size threshold is 10 hectares or more."*

For the Acton Quarry Extension, the Region of Halton's forester applied a minimum woodland width of 60 m when identifying Significant Woodlands, as described in a letter from the Region to the NEC dated December 1, 2011.

### 8.3 Significant Woodlands within the MQEE Study Area

The Significant Woodland that is located within the MQEE study area, outside of the proposed extraction area, is part of the 706 ha Halton Forest North life science ANSI which, in turn, is part of larger 35 $km^2$ Halton Forest which also includes the Halton Forest South ANSI and Speyside Forest ANSI.

The boundary of the Significant Woodland was staked by A. Goodban and J. Jackson on November 29 and December 6, 2020, in those areas where the woodland edge is in proximity to the proposed extraction footprint and water management system footprint.

Areas of ash regeneration were excluded in those circumstances where the density of other species would not meet the woodland definition. This approach was taken by the Region's forester in other cases.

The staked boundary was surveyed in by GHD's surveyor and used on the figures in this report. Elsewhere the boundary was mapped based on field observations and air photo interpretation by GEC. The Significant Woodland Boundary is mapped on **Figure 30** and on other figures in this report.

The staked boundaries may be reviewed in the field with the Region of Halton's forester.

The potential effects of the proposed MQEE on Significant Woodlands are discussed in **Section 16.3**.

## 9.0 SIGNIFICANT WILDLIFE HABITAT (SWH)

The primary resource for determining what qualifies as Significant Wildlife Habitat is the Significant Wildlife Habitat Technical Guide (SWHTG) prepared by OMNR (2000). OMNRF (2015) has also prepared Significant Wildlife Habitat Ecoregion Criteria Schedules (SWHECS) that may be used to assist in determining what constitutes Significant Wildlife Habitat. The Natural Heritage Reference Manual (NHRM) (OMNR 2010) states that the SWHECS are a resource that may be used to determine which features qualify as Significant Wildlife Habitat, but that the SWHTG "is still the authoritative source for the identification and evaluation of Significant Wildlife Habitat".

For the purposes of this study, GEC has relied predominantly upon the SWHTG to determine what constitutes Significant Wildlife Habitat. As stated above, this is consistent with the recommendations in the NHRM. There are also several significant problems with the SWHECS that provide additional rationale for not using it. It is inconsistent with some of the key planning policy and support documents, including the Provincial Policy Statement, the NHRM, and the SWHTG. In addition, the scientific credibility of the SWHECS is questionable. It is not defensible to identify a single threshold for significance for a feature over an area as large and diverse as an ecoregion; in some cases, the same threshold has been used for the entire province. In contrast, the Region of Halton has different criteria for the identification of Significant Woodlands depending upon whether a woodland is above or below the Escarpment Brow. In addition, the SWHECS are designed to be used at a larger scale than the SWHTG and are therefore less relevant. The SWHECS are used at the scale of ecoregions whereas the SWHTG is used at the scale of individual municipalities. This is important because the mandate for Significant Wildlife Habitat rests with planning authorities and not the MNRF (now MNDMNRF). Nevertheless, GEC has applied the SWHECS when it is appropriate to do so (e.g., Bat Maternity Colonies, Amphibian Breeding Habitat [Woodland], Woodland Area-sensitive Bird Breeding Habitat).

The NHRM and the SWHTG identify four main types of Significant Wildlife Habitat: seasonal concentrations of animals; rare and specialized habitats for wildlife; habitats of species of conservation concern; and animal movement corridors. These are discussed below in relation to the natural features within the MQEE study area.

### 9.1 Seasonal Concentrations of Animals

The SWHTG identifies 14 types of seasonal concentrations of animals that may be considered Significant Wildlife Habitat, as follows:

- Winter deer yards
- Moose late winter habitat
- Colonial bird nesting sites

- Waterfowl stopover and staging areas
- Waterfowl nesting areas
- Shorebird migratory stopover areas
- Landbird migratory stopover areas
- Raptor winter feeding and roosting areas
- Wild Turkey winter range
- Turkey Vulture summer roosting areas
- Reptile hibernacula
- bat hibernacula
- Bullfrog concentration areas
- Migratory butterfly stopover areas

Each of the 14 types of seasonal concentrations of animals are discussed below in **Section 9.1.1** (Seasonal Concentration of Animals – SWHTG).

Bat maternity colonies were not considered Significant Wildlife Habitat by the Significant Wildlife Habitat Technical Guide (SWHTG; OMNR 2000) but they are by the Significant Wildlife Habitat Ecoregion Criteria Schedules (SWHECS; OMNRF 2015). Bat maternity colonies are discussed in detail in **Section 9.1.2** (Bat Maternity Colonies).

### 9.1.1 Seasonal Concentrations of Animals - SWHTG

*Winter Deer Yards*

The MNRF has not identified any winter deer yards as occurring in this general area. White-tailed Deer typically yard in dense coniferous forests that are adjacent to rich food supplies such as corn fields in the agricultural south, or areas with abundant deciduous shrubs in more northern areas. In the south, deer often do not yard because weather conditions such as deep snow are not limiting to them. No signs of deer yarding were observed within the MQEE study area.

*Moose Late Winter Habitat*

The MQEE study area is well south of the range of the Moose (*Alces alces*).

*Colonial Bird Nesting Areas*

Colonial nesting birds include certain species of herons, gulls, terns, and swallows. No herons, gulls, or terns nested within the study area. Colonial swallows are limited to those species that nest in natural situations and are predominantly Bank Swallows (*Riparia riparia*) and Cliff Swallows (*Petrochelidon pyrrhonota*). Barn Swallows nest colonially, but rarely in natural habitats such as cliffs. No colonial bird nesting areas were observed within the MQEE study area.

*Waterfowl Stopover and Staging Areas*

In spring and autumn, large numbers of waterfowl may stop and stage at wetlands or even flooded agricultural fields to replenish their reserves prior to resuming migration. There was no evidence of waterfowl staging at the site. Three species of waterfowl were observed (Canada Goose, Mallard and Wood Duck), all in low numbers and primarily during the breeding season.

It is concluded that the MQEE study area does not provide significant habitat as a waterfowl stopover and staging area.

*Waterfowl Nesting Areas*

According to the SWHTG, most significant waterfowl nesting areas are relatively large undisturbed upland areas adjacent to abundant ponds and wetlands. Wetlands V2, W41 and W46a and associated upland areas are the only potential nesting habitat.

Considering the low numbers of breeding waterfowl, it is concluded that there are no significant waterfowl nesting areas within the MQEE study area.

*Shorebird Migratory Stopover Areas*

Shorebirds also stop over at key areas to refuel during migration. These sites typically have soft, wet substrates that support an abundance of invertebrates. For certain species, wet agricultural fields may be important stopover areas.

No migratory shorebirds were observed at the site. The Killdeer and Spotted Sandpiper were the only shorebird species that were observed, and these were breeding species. There is generally no good habitat for staging shorebirds present. It is concluded that there are no significant shorebird migratory stopover areas within the MQEE study area.

*Landbird Migratory Stopover Areas*

The most important landbird migratory stopover areas occur within 5 km of the shorelines of a Great Lake. The MQEE study area is approximately 27 km from Lake Ontario. It is concluded that the area is not a significant landbird migratory stopover site.

*Raptor Winter Feeding and Roosting Areas*

Raptor winter foraging areas include meadows, pastures, hayfields, and open fields that support abundant populations of small mammals such as mice and voles. Scattered trees for perching are also required for most species. Winter wildlife surveys were completed on January 16 and February 21, 2020, and only a single Red-tailed Hawk was observed in the open fields on January 16. It is concluded that the MQEE study area does not provide significant raptor winter feeding and roosting areas.

*Wild Turkey Winter Range*

In winter, Wild Turkeys typically remain close to dense coniferous cover and select tall conifers for roosting in at night. High-quality Wild Turkey winter habitat typically includes seeps or springs. These provide a source of food and water.

At this latitude, the Wild Turkey may not restrict its movement to small areas because snow cover may not be limiting. The forested portions of the MQEE study area supports only scattered conifers such as Eastern Hemlock and White Pine. There are seeps and a spring associated with Wetland W41, but this is the only notable example within the MQEE study area. The seeps and spring associated with Wetland W41 are identified by GEC as Significant Wildlife Habitat; they are discussed below under *Seeps and Springs*.

It is concluded that the MQEE study area does not provide significant winter habitat for the Wild Turkey.

*Turkey Vulture Summer Roosting Areas*

Turkey Vultures prefer to roost on cliffs or tall dead trees where they can easily take flight. Suitable roosting areas may support dozens or even hundreds of vultures.

Turkey Vultures were observed on quarry faces and in dead trees near the faces. GEC did not identify these areas as Significant Wildlife Habitat for Turkey Vulture Summer Roosting Areas because they are within the existing licenced areas in the Milton Quarry Extension and the North Quarry.

*Reptile Hibernacula*

Wintering areas for both turtles and snakes may qualify as Significant Wildlife Habitat.

During the ecological surveys completed between 2019 and 2021, only a single Snapping Turtle was observed. It was observed on June 6, 2020, moving northeast from the turning circle at the southeast end of the driveable portion of Townline, towards the forest. It was more than 500 m from the nearest wetland in the MQEE study area, Wetland W41, and approximately 380 m northeast of the reservoir in the Main Quarry.

Snake surveys were completed on suitable days between late March and May each year between 2019 and 2021. Four snake species were observed, but the observations were limited to single individuals of a single species. No concentrations of snakes or mix of snake species were observed during the snake surveys. Dolostone outcrops occur extensively in the Halton Forest and some may be suitable as snake hibernacula, where snakes can get below the frost line through fissures and weathered bedrock.

No significant wintering areas for turtles or snakes were identified during the ecological surveys.

*Bat Hibernacula*

Most bat species hibernate in caves or abandoned mines. The exception is the Big Brown Bat that may hibernate in buildings, but buildings are not typically considered Significant Wildlife Habitat for overwintering bats. Hibernacula for this species in buildings typically occur where it also roosts at other times of the year.

There is no habitat present for hibernating bats within the MQEE study area.

*Bullfrog Concentration Areas*

The bullfrog was not recorded from the MQEE study area.

*Migratory Butterfly Stopover Areas*

Migratory butterfly stopover areas are restricted to areas within 5 km of the shoreline of a Great Lake. The MQEE study area is approximately 27 km away from Lake Ontario.

### 9.1.2 Bat Maternity Colonies

Four not-at-risk bat species were detected during the survey. These included the Big Brown Bat, Hoary Bat, Silver-haired Bat, and Red Bat. Bat maternity colonies were not considered Significant Wildlife Habitat by the Significant Wildlife Habitat Technical Guide (SWHTG; OMNR 2000) but they are by the Significant Wildlife Habitat Ecoregion Criteria Schedules (SWHECS; OMNRF 2015).

The SWHECS provide criteria for only the Big Brown and Silver-haired Bats. Maternal roosting habitat for the Hoary and Red Bats is not considered Significant Wildlife Habitat. Even if their habitat could be designated significant, there is no significant roosting habitat for either of these species within the study area. Both species were relatively uncommon within the study area and there was no indication that either of them roosted on site. There were more Hoary Bats than Silver-haired Bat calls. A Hoary Bat call even early in the evening may not be indicative of a roosting bat. This species travels considerable distances with limited site fidelity. It has been demonstrated moving more than 250 km in a single night in southern Ontario (Morningstar and Sandilands 2019).

According to the SWHECS, only those roosts found within woodlots may qualify as Significant Wildlife Habitat. Habitat criteria for identifying potential maternity colonies include mature deciduous or mixed forests with more than 10 large diameter (<25 cm DBH) cavity trees. Woodland B is only intermediate in age, but for the purpose of the analysis it is considered old enough to meet the age criterion.

*Big Brown Bat*

The 4 detectors in Woodland B recorded a total of 39 Big Brown Bat calls that occurred within 30 minutes of sunset. Eighteen of these were recorded by Detector 07 which is not part of Woodland B. The total number of earlier calls within Woodland B was only 21 over the 14-night survey period (an average of 1.5 per night). The Big Brown Bat was sporadic in occurrence and was not detected earlier in the evening on some nights.

The earliest that a Big Brown Bat was recorded was 7 minutes after sunset, 13 minutes later than the first Little Brown Myotis records. This disparity was not because the Big Brown Bat emerges from roosts later than the Little Brown Myotis. van Zyll de Jong (1985) reported that it exited roosts early and Banfield (1974) noted that it was often seen flying in broad daylight.

Most recordings of the Big Brown Bat were 15 minutes or more after sunset. This indicates that these bats were simply foraging in the area and did not roost in Woodland B.

To qualify as Significant Wildlife Habitat for a maternal roosting colony, more than 10 Big Brown Bats must be using the area as a roost (OMNRF 2015). The data indicate that it is highly unlikely that any Big Brown Bats ever roosted within Woodland B. This conclusion is based on the facts that there was no concentration of early-evening calls and no calls were detected on some nights. Overall numbers of calls were also low. Within Woodland B, a maximum of 3 calls were detected on a single night within a half hour after sunset; mostly a single record was obtained on nights when it was present.

Woodland B does not qualify as Significant Wildlife Habitat as a maternal roosting colony for the Big Brown Bat.

*Silver-haired Bat*

OMNR (2015) provided additional criteria for determining if there was potential for a wooded area to provide maternal roosting habitat for the Silver-haired Bat. It prefers older forests with at least 21 snags per ha. Woodland B does not appear to meet these criteria. It is not an older forest and its snag density is only 15 per ha. The data are analyzed below despite the fact that Woodland B does not meet the general criteria for Silver-haired Bat Significant Wildlife Habitat.

The 4 detectors in Woodland B recorded a total 32 Silver-haired Bat calls, of which 29 were in the woodlot proper. All records were later than 30 minutes after sunset and often 2 or 3 hours later. It was sporadic in occurrence and completely absent most nights. This bat is one of the earliest to emerge from the roost (Banfield 1974), so the absence of early calls is not because it is late to emerge.

It is concluded that Woodland B is unsuitable habitat for roosting Silver-haired Bats and that there is no significant wildlife habitat present for this species.

*Conclusion*

There is no Significant Wildlife Habitat for roosting bats within the proposed MQEE.

## 9.2 Rare or Specialized Habitat

### 9.2.1 Rare Habitats

Rare habitats are considered to be those vegetation communities that are considered rare in Ontario. Generally, these are communities that have been ascribed an S-rank of S1 to S3 by the NHIC.

All of the vegetation communities within the study area are either common in Ontario or anthropogenic in origin. There are no rare habitats present.

### 9.2.2 Specialized Habitats

The SWHTG defines 14 specialized habitats that may be considered Significant Wildlife Habitat. They include:

- habitat for area-sensitive species;
- forests providing a high diversity of habitats;
- old-growth or mature forest stands;
- foraging areas with abundant mast;
- amphibian woodland breeding ponds;
- turtle nesting habitat;
- specialized raptor nesting habitat;
- moose calving areas;
- moose aquatic feeding areas;
- mineral licks;
- mink, otter, marten, and fisher denning sites;
- highly diverse areas;
- cliffs; and
- seeps and springs.

Each of these specialized habitats is discussed further below.

*Habitat for Area-Sensitive Species*

Large, natural blocks of mature woodland habitat are important habitats for area-sensitive woodland songbirds. These habitats are typically large (>30 ha) and mature (>60 years old) forest stands or woodlots (OMNRF 2015).

The 2020 woodland breeding bird surveys revealed the presence of breeding bird species that are considered area sensitive by certain authorities. The area mapped on **Figure 31** as candidate SWH for Woodland Area-sensitive Bird Breeding Habitat is habitat for the following six area sensitive bird species listed in the Ecoregion Criteria Schedules (OMNRF 2015):

- Black-throated Blue Warbler
- Ovenbird
- Scarlet Tanager
- Veery
- Winter Wren
- Yellow-bellied Sapsucker

The area mapped as Significant Woodland on **Figure 30** is part of the 706.4 ha Halton Forest North ANSI, which in turn is part of the 35 $km^2$ Halton Forest. OMNRF (2015) recommends identifying SWH for woodland area-sensitive breeding bird habitat when the presence of nesting or breeding pairs of three or more of the listed bird species is confirmed. In this case, six of the listed area sensitive bird species were identified during the breeding season.

It is concluded that the areas mapped on **Figure 31** are Significant Wildlife Habitat for Area-sensitive Woodland Breeding Birds.

*Forests Providing a High Diversity of Habitats*

Forests that are generally considered to provide a high diversity of habitats are those with a wide variety of vegetation communities and dominant tree cover. According to the SWHTG, these contain older forest stands with cavities for wildlife, very tall supercanopy trees, important habitat for birds of prey, have numerous vertical layers of vegetation, and have fallen logs.

This is a subjective category of Significant Wildlife Habitat that is not recognized by the SWHECS as Significant Wildlife Habitat.

Within the main forest block, there are few supercanopy trees and older forest stands, but there are now many snags and fallen logs as a result of the Emerald Ash Borer invasion and the ongoing decline of ash trees. In areas that were selectively cut in the past, there are canopy gaps that have resulted in a dense layer of ash-maple regeneration and tall shrubs such as Alternate-leaved Dogwood and Chokecherry.

It is concluded that the site does not support forests providing a high diversity of habitats. In any case, the main forest block is identified as a Significant Woodland, Significant ANSI and some areas are identified as Significant Wildlife Habitat for other reasons.

*Old-Growth or Mature Forest Stands*

The main forest block does contain old-growth or exceptionally mature forest stands. Most of these lands were logged in the past, with selective harvesting in the late 1990s and some clear-cuts in the 1940s. There are some clusters of older trees, primarily in areas with more rugged terrain where it is more difficult to remove felled trees.

In GEC's opinion the main forest block does not qualify as Significant Wildlife Habitat for old-growth or mature forest stands.

*Foraging Areas with Abundant Mast*

This is another category of Significant Wildlife Habitat that is not recognized by the SWHECS. It was intended primarily for large mammals such as Black Bears (*Ursus americanus*) and White-tailed Deer, with less of an emphasis on other species.

Important trees that produce hard mast include large Beech (*Fagus grandifolia*) and oak (*Quercus* spp.) and hickory (*Carya* spp.) trees. These are important to Black Bear and White-tailed Deer, as well as Wild Turkeys, Blue Jays, and squirrels. The main forest block is dominated by mainly Sugar Maple, with limited representation of Beech. There are some patches of Bitternut Hickory and Red Oak, with the former being more prevalent but rarely are they the dominant species.

Consequently, there is relatively limited hard mast available for wildlife.

Important soft-mast producing trees include Black Cherry, Mountain-ash (*Sorbus* spp.), and Apple (*Malus coronaria, M. pumila* +); all of these species are relatively uncommon or absent within the study area. Some shrubs may be important in providing fruit for wildlife, such as blueberries (*Vaccinium* spp.) and raspberries/blackberries (*Rubus* spp.). No blueberries occur within the MQEE study area. Raspberries and blackberries are present but there are no large concentrations of these.

It is concluded that the MQEE study area does not provide significant habitat for species that forage on mast.

*Amphibian Woodland Breeding Ponds*

The SWHECS criteria (OMNR 2015) for Amphibian Breeding Habitat (Woodland) are the following:

<u>Wildlife Species</u>

- Eastern Newt, Blue-spotted Salamander, Spotted Salamander, Gray Treefrog, Spring Peeper, Western Chorus Frog and Wood Frog.

<u>Habitat Criteria</u>

- Presence of a wetland, pond or woodland pool (including vernal pools) >500m$^2$ (about 25m diameter) within or adjacent (within 120m) to a woodland (no minimum size).
- Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat.

<u>Defining Criteria</u>

- Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog species with Call Level Codes of L3.

Wetlands W41 and W46a are all considered Significant Wildlife Habitat for Amphibian Breeding Habitat (Woodland). All three of these wetlands supported Spotted Salamander, Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) and full choruses of frog species, as described above in **Section 5.4.2** and as listed below:

- W41: Spotted Salamander, Unisexual Ambystoma (Jefferson Salamander dependent population), Wood Frog (L3), Spring Peeper (L3) and Gray Treefrog (L3).
- W46a: Spotted Salamander, Unisexual Ambystoma (Jefferson Salamander dependent population), Wood Frog (L3) and Spring Peeper (L2).
- V2: Spotted Salamander, Jefferson Salamander, Unisexual Ambystoma (Jefferson Salamander dependent population), Wood Frog (L3), Spring Peeper (L3) and Gray Treefrog (L3).

Wetlands W41 and W46a are mapped on **Figure 32**. The identification of Significant Wildlife Habitat for Amphibian Breeding Habitat (Woodland) is academic, because the selected wetlands are Jefferson Salamander breeding pools and Significant Wetlands.

*Turtle Nesting Habitat*

No evidence of turtle nesting was found during the ecological surveys from 2019 to 2021. The MQEE study area appears to support very low numbers of turtles, so at least some nesting may occur. Considering the general scarcity of turtles in the area and the fact that no evidence of turtle nesting was found, no Significant Wildlife Habitat for turtle nesting has been identified.

*Specialized Raptor Nesting Habitat*

Specialized raptors include those that nest and forage within forest habitats or require open bodies of water, or large grasslands. These include the Red-shouldered Hawk (*Buteo lineatus*), Barred Owl (*Strix varia*), Osprey, and Short-eared Owl (*Asio otus*). Of these species, only the Osprey was observed in the MQEE study area and there was no evidence of it nesting.

*Moose Calving Areas*

The study area is well south of the range of the Moose, so there are no calving areas within the MQEE study area.

*Moose Aquatic Feeding Areas*

There are no Moose in this general area and consequently no aquatic feeding areas for them occur in the MQEE study area.

*Mineral Licks*

There are no mineral licks within the MQEE study area.

*Mink, Otter, Marten, and Fisher Denning Areas*

There are no known Mink (*Neogale vison*), Otter (*Lontra canadensis*), Marten (*Martes americana*), or Fisher (*Pekania pennanti*) denning areas within the study area. It is outside of the range of the Marten and peripheral to the range of the Otter and Fisher.

*Highly Diverse Areas*

This is another category of Significant Wildlife Habitat that is identified in the SWHTG but not recognized in the SWHECS. The evaluation criteria in Appendix Q of the SWHTG are rather vague as to what constitutes a highly diverse area. Generally, the study area is not particularly diverse in the habitats that are present. The proposed extraction area is dominated by fields that were formerly in agricultural use and the surrounding area is predominantly forested. GEC does not identify the site or portions of it as Significant Wildlife Habitat as a highly diverse area.

*Cliffs*

There are no natural cliffs within the MQEE study area. There are newly created cliff faces within the existing quarry and some of these provide nesting sites for Common Raven, Turkey Vulture, Peregrine Falcon, etc. Some cliffs will be retained as part of the Rehabilitation Plans for the Milton Quarry and Milton Quarry Extension.

*Seeps and Springs*

There is a perennial seepage zone with a seasonal spring at the north end of W41, flowing into the wetland near staff gauge SG61. Water also seeps out from Wetland W41 and drains to the east and southeast via a series of connected wetland pools in Wetland 42, and it eventually outlets to Wetland W44 which contains a large Beaver pond (see **Figure 33**). The spring flows from a small pipe emerging from under a side trail of the Bruce Trail. Flow emerges from the pipe and surrounding granular material during higher water periods. The pipe was not in place ca. 2007. During lower water level periods, discharge to W41 is via seepage from the surrounding material only and there is no flow from the pipe.

The seeps and springs associated with Wetland W41 are mapped as Significant Wildlife Habitat on **Figure 33**. These features provide certain wildlife species with year-round access to water.

## 9.3 Species of Conservation Concern

Three groups of wildlife may be considered Species of Conservation Concern:

- Species that have a significant proportion of their population in Ontario and that are rare in the planning area;
- Species that are exhibiting a statistically significant decline in Ontario; and
- Species that are rare or designated significant at some level.

*Species with a Significant Proportion of their Global Population in Ontario*

There are numerous species in Ontario that have limited representation outside of the province. Habitat for these species may be considered Significant Wildlife Habitat if the species is also rare or significantly declining within the planning area.

*Species Declining Significantly in Ontario*

With a few exceptions, good data on population trends are currently available only for birds. The NHIC has taken into account some of these declines in recent revisions to the S-ranks that it has ascribed various species. Some of the declining species have recently had their S-ranks changed from S5 (secure) to S4 (apparently secure) to reflect these declines.

*Species that are rare or designated as significant at some level*

Significance is defined at six levels:

- Globally significant (with a G-rank of G1 to G3);
- Nationally significant (designated Endangered, Threatened or Special Concern by the Committee on the Status of Endangered Wildlife in Canada). It is noted that the most recent version of the Natural Heritage Reference Manual does not recognize national designations and only those species with provincial designations are considered candidate Significant Wildlife Habitat;
- Provincially significant (with an S-rank of S1 to S3 and S3?, if the latter type of species is being tracked by the OMNRF; species designated Special Concern by the OMNRF);
- Regionally significant (within an Ecoregion, or within one of the old OMNR administrative regions);
- Locally significant (within an Ecodistrict); and,
- Within a planning authority's jurisdiction.

The above is the order of priority that should be given to protection of species of conservation concern.

The NHRM supercedes the SWHTG and it revises the groups of species that may be identified as Species of Conservation Concern under the PPS. Globally significant species are no longer recognized as qualifying as Significant Wildlife Habitat. The only nationally significant species that may be considered for Significant Wildlife Habitat are those that are listed as endangered or threatened under the *Species at Risk Act* (SARO) that do not have a provincial designation. Species listed as Special Concern nationally may not be considered as Significant Wildlife Habitat unless they are also considered Special Concern or have an S-rank of S1 to S3 in the province.

Of note is the fact that the Significant Wildlife Habitat Ecoregion Criteria Schedules (SWHECS) do not consider species that are rare at the global, national, regional, or local levels to qualify as Significant Wildlife Habitat. Only provincially significant species can qualify as Significant Wildlife Habitat when the SWHECS are used. GEC concurs that globally and nationally significant species that are not provincially significant should not be considered Significant Wildlife Habitat and this is consistent with the Natural Heritage Reference Manual. Consistent with the Significant Wildlife Habitat Technical Guide, GEC concurs that regionally and locally significant species may qualify as Significant Wildlife Habitat. The mandate for designating Significant Wildlife Habitat lies with local planning authorities and not the MNRF. Consequently, municipalities should be able to identify viable habitats of species that are significant within their jurisdiction as Significant Wildlife Habitat, at least in some circumstances.

### 9.3.1 Confirmed Rare or Significant Species

#### *Nationally and Provincially Rare or Significant Species*

- Black Ash (*Fraxinus nigra*) – Threatened (Nationally), S4

Black Ash grows in Wetland W41. Most of the trees are dead or in severe decline due to infestations of the Emerald Ash Borer. There are still numerous seedlings and saplings growing in W41. GEC has observed similar conditions in other organic swamps in the local area, with Black Ash trees declining, dead or suckering at the base, with seedlings and saplings still persisting.

This species is widespread in southern and central Ontario, growing on in wet acidic substrates. Ash trees are being severely affected by the Emerald Ash Borer, which now has populations throughout most of southern Ontario south of the Canadian Shield as well as around Sault Ste. Marie, Parry Sound and North Bay, and it is likely to continue to expand its range and kill even more ash trees. Ultimately, Black Ash may be less adversely affected than other Ontario ash species since its range extends further north, well beyond the current range of Emerald Ash Borer.

Wetland W41 is not considered Significant Wildlife Habitat for a species of conservation concern since Black Ash is in decline due to the Emerald Ash Borer and the habitat itself is not a limiting factor. Also, Black Ash is listed as Threatened nationally but it is not listed as Threatened in Ontario. Wetland W41 is already identified as a Provincially Significant Wetland, Habitat of Endangered Species and Significant Wildlife Habitat for Amphibian Breeding Habitat (Woodland).

- Monarch (*Danaus plexippus*) – Special Concern, S4BS2N

The Monarch was observed in the old field areas within the MQEE study area. Only one or two were observed on the occasions when it was detected. Common Milkweed (*Asclepias syriaca*) occurs in the study area but it is not widespread or abundant.

The S-rank for the Monarch indicates that it is not of particular concern during the breeding season, but that it is imperilled during its migration period. At this time, large numbers concentrate at staging areas prior to their flight across the Great Lakes. The site is not a significant stopover site for the Monarch; significant areas are located within 5 km of the Great Lakes (OMNR 2000). Significant staging areas support 100 to 500 monarchs per day (OMNRF 2015).

It is concluded that the MQEE study area does not support significant habitat for the Monarch.

- Snapping Turtle (*Chelydra serpentina*) – Special Concern, S4

As described in **Section 5.4.3**, one large Snapping Turtle was observed on June 6, 2020, moving away from the turning circle at the southeast end of the dirt road portion of Townline Road. This Snapping Turtle was a considerable distance from the nearest wetlands within the MQEE study area that would contain standing water at that time, so no specific wetland was identified as Significant Wildlife Habitat for the Snapping Turtle.

- Eastern Wood-Pewee (*Contopus virens*) – Special Concern, S4B

In Ontario the Eastern Wood-Pewee typically breeds in deciduous and mixed forests. It has a preference for open space near the nest, so it is often found near forest edges, clearings, water features and roadways (Peck and James 1987). The nest is usually built on a branch of a deciduous tree, well out from the trunk and usually high up (4.5 to 9 m) (Peck and James 1987). The Halton Forest is located within an area of relative high abundance for this species, which is in a band from Toronto to Wellington County and down to Long Point (McLaren 2007).

Within the MQEE study area, selective logging in the past has created suitable conditions for Eastern Wood-Pewee in the main forest block and the northeast end of the Cox Tract.

Since the habitat requirements of Eastern Wood-Pewee and Wood Thrush are similar, and they were often observed together, Significant Wildlife Habitat for both species is identified on **Figure 34**.

- Wood Thrush (*Hylocichla mustelina*) – Special Concern, S4B

In Ontario the Wood Thrush occupies woodlots as small as 3 ha. The presence of tall trees with a dense understorey are the main habitat requirements. The nest is typically built 2 to 5 m off the ground, usually within a dense patch of tall shrubs and/or saplings (Friesen 2007). Selective cutting in the past has produced ideal conditions for the Wood Thrush throughout much of the deciduous forest within the MQEE study area. Dense patches of regeneration are present, including Sugar Maple and White Ash saplings, and tall shrubs such as Alternate-leaved Dogwood and Chokecherry. Wood Thrush was also observed in the northeast end of the Cox Tract.

Since the habitat requirements of Eastern Wood-Pewee and Wood Thrush are similar, and they were often observed together, Significant Wildlife Habitat for both species is identified on **Figure 34**.

- Grasshopper Sparrow (*Ammodramus savannarum*) – Special Concern, S4B

During the 2019 breeding bird surveys only one individual Grasshopper Sparrow was observed singing on June 30 in the grasslands between Stations F4 and F7. The Grasshopper Sparrow was observed on one of the three breeding bird survey visits. This species is listed as Special Concern in Ontario and uncommon in Halton Region (McIlveen 2006).

During the 2020 breeding bird surveys a single singing Grasshopper Sparrow was observed on each of the three survey visits. It was first noted just south of Station F3 on May 31. It was then noted on June 7 and 28 within 100 m of Station F4. Grasshopper Sparrow was considered a probable breeder in 2020. At most there was one pair of Grasshopper Sparrows, but a second bird was never observed. The 2019 and 2020 observations were from a small section of the larger grassland area mapped as Bobolink and Eastern Meadowlark habitat on **Figure 27**.

The Grasshopper Sparrow prefers anthropogenic habitats such as hayfields and pastures, recently abandoned agricultural fields, grassed fields at airports, young plantations and restored mine and aggregate sites with herbaceous cover, provided the various habitat components are present (Savignac 2013). A variety of structural elements of the habitat are important, including moderate vegetation height (25-50 cm on average), relatively low bare soil cover, relatively large areas of dead and live herbaceous vegetation and a moderately thick litter layer. Perches, such as Common Mullein (*Verbascum thapsus*) and short scattered shrubs are often present (Savignac 2013). In southern Québec, Jobin et al. (2008) described the Grasshopper Sparrow's habitat as fields on poor, dry soils, sometimes recently abandoned, that are not grazed or regularly mown, and having a sparse and varied structure.

The Grasshopper Sparrow may also nest in annual row crops such as corn, wheat and barley, although densities are lower than in uncultivated habitats (Savignac 2013). Grassland habitats seldom used by the Eastern Grasshopper Sparrow include old fields where the density of small shrubs and other vegetation is too high, and "enriched" cropland, such as dense hayfields or intensively grazed seeded pasture with few perches (Wiens 1969).

The Grasshopper Sparrow has highly variable site fidelity from one year to another. The maximum return rate that has been recorded for adult males is 50%, but most estimates range from 15 to 35%. Birds may nest in one area within a general region in a given year and select another area the following year (Jones et al. 2010; Kaspari and O'Leary 1988; Savignac 2013; Vickery 2020).

There is no general habitat description for the Grasshopper Sparrow because its habitat is not protected under the Endangered Species Act (ESA). It has territory sizes that have been reported to range from 0.16 to 4.8 ha (Vickery 2020; Wiens 1969). Mean territory sizes range from 0.37 to 1.38 ha (Jones 2011; Smith 1963). For the 2019 and 2020 MQEE Grasshopper Sparrow observations, if a radius of 70 m around its activity centre was used the territory size would be slightly over 1.5 ha.

The fields were formerly in row crops and/or hay and the grass in the old fields was relatively tall and thick. In February 2020, GHD excavated a total of 33 test pits within the proposed extraction area and along the potential WMS alignment to determine the thickness and characteristics of the overburden. The test pit locations were seeded with a Timothy (+) and Orchard Grass (+) seed mix in April 2020, but some patches of bare soil persisted through the season. The test-pitting work may have created microhabitats suitable for Grasshopper Sparrow. In early September 2020 most of the open fields were ploughed to prepare the site for archaeological investigations that were completed in the fall of 2020. Subsequently the fields were disked and seeded with a hay seed mix before freeze-up. The ploughing of the fields and re-seeding activities are discussed in more detail in **Section 16.1.3**, in the context of Bobolink and Eastern Meadowlark habitat.

Considering that only a single pair of Grasshopper Sparrows, at most, used the old field habitat in 2019 and 2020, it is not considered Significant Wildlife Habitat for a species of conservation concern. There are opportunities for Dufferin to enhance existing habitat for Grasshopper Sparrow elsewhere on their land, in concert with the habitat enhancement work underway for Bobolink and Eastern Meadowlark elsewhere on Dufferin land, as discussed in **Section 16.1.3**.

- Peregrine Falcon (*Falco peregrinus*) – Special Concern, S3B

As described above in **Section 5.4.4.2**, Peregrine Falcons nested in the East Cell on the cliff beside Townline. Considering that the Peregrine Falcon is nesting within the approved Milton Quarry Extension in the active East Cell, which is not subject to a Planning Act application and the PPS, and that the nest location will most likely be under water once final rehabilitation conditions are achieved, the cliff is not considered to be Significant Wildlife Habitat for a Species of Conservation Concern. The Peregrine Falcon is protected under the Ontario *Fish and Wildlife Conservation Act (1994)* and recommendations aimed at minimizing disturbance during the nesting season are provided in **Section 15.2.4**.

### 9.3.2 Unconfirmed Rare or Significant Species

- Woodland Muhly (*Muhlenbergia sylvatica*) – S2?

Argus et al. (1982-1987) mapped Woodland Muhly from three southern Ontario sites, based on collections from Peel Region in 1970, Halton Region in 1979, and Leeds and Grenville County in 1982. It has since been found at a few additional sites, in southcentral and southeastern Ontario along rivers and streams. The Halton Region record is based on a collection by W.J. Crins in 1979. *Muhlenbergia sylvatica* was not observed during the 2019-2021 floristic surveys. GEC recorded the widespread and common *Muhlenbergia mexicana* var. *filiformis* in many areas of the MQEE study area.

- Weak Bluegrass (*Poa saltuensis* ssp. *languida*) – S3

Dore and McNeill (1980) mapped 15 Ontario stations, mostly in southern Ontario but with three records on Lake Superior. It is noow known to be more widespread in southern Ontario than as mapped by Dore and McNeill (1980), but still a quite local grass of open dry woods. Oldham and Brinker (2009) described Weak Bluegrass as a "widespread but infrequent woodland grass." They listed post-1990 records for Chatham-Kent, Elgin, Frontenac, Halton, Hamilton, Hastings, Lambton, Leeds, Middlesex, Muskoka, Norfolk, Peterborough, Simcoe, Waterloo and Wellington.

This record is based on a collection by W.J. Crins circa 1979. Weak Bluegrass was not observed within the MQEE study area during the 2019-2021 floristic surveys.

- West Virginia White (*Pieris virginiensis*) – Special Concern, S3

During an intensive survey in 1990 the West Virginia White was recorded at 64 sites in Ontario (Mainguy 1991). Abundance estimates indicate that this species is fairly common within its favoured locations (Mainguy 1991). The area above the Escarpment in Halton Region is one of the five centres of abundance in southern Ontario. The West Virginia White butterfly is a species of mature, rich deciduous and mixed forests.

Two-leaved Toothwort (*Cardamine diphylla*) is the primary host plant of the West Virginia White in southern Ontario. Toothworts stop growing by mid June and are completely withered shortly afterwards. The butterfly has a short flight period and egg stage, quick larval growth, and long hibernation of the pupae. Its life cycle closely matches that of the host plant (Burke 2013). In Halton Regional Forest flight times were observed to begin April 25, peaking about May 10 depending on weather conditions, and ending around May 20 to 25 (Mainguy 1991). This may vary from year to year depending on seasonal weather conditions.

Two-leaved Toothwort and Cut-leaved Toothwort (*Cardamine concatenata*) occur within the main forest block within the MQEE study area. Although not abundant, there are patches of both toothwort species in areas with a relatively closed tree canopy and dolostone outcrops. West Virginia White was not observed during the ecological field surveys, but this species may occur in the MQEE study area.

- Eastern Ribbonsnake (*Thamnophis sauritus*) – Special Concern, S4

The *Ontario Reptile and Amphibian Atlas* webpage for Eastern Ribbonsnake shows that the 10km square 17TNJ82, which contains the MQEE study area, has records from before 1999 and afterwards. A total of 11 records are listed for this square, from 1979 to 2019, with three records from 2017 and one from 2019.

The Eastern Ribbonsnake is mainly restricted to open wetlands such as marshes, bogs and fens, where it feeds mainly on amphibians and amphibian larvae, as well as small fish. The wetlands that Eastern Ribbonsnakes inhabit are usually near forests and they may rely on forested areas for overwintering and birthing sites.

Marsh wetlands are of limited occurrence within the MQEE study area and no Eastern Ribbonsnakes were observed during the ecological field surveys from 2019 to 2021.

- Canada Warbler (*Cardellina canadensis*) – Special Concern, S5B

Records of Canada Warbler from the general area are contained in the NHIC database. There were two records from the first Ontario Breeding Bird Atlas (OBBA – 1982- 1985) for 10km square 17TNJ82 and four records from the second OBBA (2003-2005). There are no records from the first year of the third OBBA (2021). The Canada Warbler is typically found in moist mixed forests with a well-developed understorey, particularly in habitats such as cedar woods and swamps, and alder thickets (McLaren 2007). Cedar stands are not extensive within the MQEE study area and there are no Speckled Alder (*Alnus incana* ssp. *rugosa*) thicket swamps present. Canada Warbler was not recorded during the 2020 breeding bird surveys in the forested areas, nor was it observed during any other ecological survey visits.

- Golden-winged Warbler (*Vermivora chrysoptera*) - Special Concern, S3B

Records of Golden-winged Warbler from the general area are contained in the NHIC database. There were three records from the first Ontario Breeding Bird Atlas (OBBA - 1981-82) for 10km square 17TNJ82 and three records from the second OBBA (2003-2005). There are no records from the first year of the third OBBA (2021). The Golden-winged Warbler prefers to nest in successional scrubby areas surrounded by forested areas (Vallender 2007). Some potentially suitable habitat is present in the MQEE study area but these areas were carefully surveyed three times through the breeding season in both 2019 and 2020 (six survey visits in total), and this species was not observed.

### ***Regionally Rare or Significant Species***

The source for the regionally significant bird species is an appendix in the Ontario Wetland Evaluation System, Southern Manual (OMNR 2013). The list of regionally rare bird species was last updated in 1999, prior to the second Ontario Breeding Bird Atlas, so it may be somewhat dated.

One bird species considered rare in Ecoregion 6, Sandhill Crane, was observed within the MQEE study area. This species was detected on one occasion and there was no breeding evidence.

***Species Considered Rare or Significant Within a Planning Authority's Jurisdiction***

Steller's Rockbrake (*Cryptogramma stelleri*) is listed as rare in Halton Region (Crins et al. 2006). Approximately 20 plants were observed growing on large moss-covered boulders in Unit FOD5b, to the east of Wetland W41. This area is already identified as Significant Woodland, Significant ANSI and habitat for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population).

Six bird species listed as rare in Halton Region (McIlveen 2006) were recorded from the MQEE natural environment study area. The Osprey was not breeding within the study area, but the other five species are probable or confirmed breeders. Since the Halton bird checklist was published in 2006 the local status of some species appears to have changed. For example, Yellow-billed Cuckoo is increasing in numbers due to the explosion in Gypsy Moth populations and the Common Raven has increased in numbers in southern Ontario, even occurring in urban areas.

The Yellow-throated Vireo, Hooded Warbler and Black-throated Blue Warbler all occurred in areas already identified as Significant Wildlife Habitat for Area-sensitive Bird Breeding Habitat (Woodland) and/or Habitats for Special Concern Bird Species. Black-throated Blue Warbler is one of the area-sensitive indicator species used in the SWHECS (OMNR 2015).

## 9.4 Animal Movement Corridors

The SWHTG defines animal movement corridors as elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another. To qualify as Significant Wildlife Habitat, these corridors should be a critical link between habitats that are regularly used by wildlife.

The SWHECS (OMNR 2015) identifies two specific types of animal movement corridors. Page 14 of the SWHECS states the following:

> *"Animal Movement Corridors should only be identified as SWH where: …a Confirmed or Candidate SWH has identified by MNRF or the planning authority based on documented evidence of a habitat identified within these Criterion Schedules or the Significant Wildlife Habitat Technical Guide. The identified wildlife habitats* [..in..] *Table 1.4.1 will have distinct passageways or rely on well defined natural features for movements between habitats required by the species to complete its life cycle."*

The SWHECS Table 1.4.1 identifies *Amphibian Movement Corridors* and *Deer Movement Corridors*.

For *Amphibian Movement Corridors* the Habitat Criteria indicate that these are movement corridors between breeding habitat and summer habitat (and hibernation/over-wintering habitat). Movement corridors must be determined when amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat – Wetland). The *Defining Criteria* include the note that corridors should comprise native vegetation, with several layers of vegetation. GEC did not identify SWH for *Amphibian Breeding Habitat (Wetland)*, which are typically isolated and more than 120 m from forested areas according to the SWHECS.

In **Section 9.2.2** of this report, GEC did determine that Wetlands W41 and W46a were SWH for *Amphibian Breeding Habitat (Woodland)* and the surrounding forest is already identified as Significant Woodland, Significant ANSI and habitat for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population).

For *Deer Movement Corridors*, the SWHECS states that movement corridor(s) must be determined when *Deer Wintering Habitat* is confirmed as SWH from Table 1.1 of the schedule. As described above in **Section 9.1.1**, no *Winter Deer Yards* occur within the MQEE study area.

It is concluded that there are no significant *Animal Movement Corridors* within the MQEE study area, as defined by the SWHTG and SWHECS.

Movement through the local area undoubtedly occurs by common species such as White-tailed Deer, Coyote, and a number of other common mammal species. These species were regularly observed within the MQEE study area and they also occur within rehabilitated areas within the Milton Quarry, where there are terrestrial linkages with the surrounding Escarpment landscape.

## 9.5 Summary of Significant Wildlife Habitat (SWH)

The following types of Significant Wildlife Habitat (SWH) were identified within the MQEE study area:

- Woodland Area-sensitive Bird Breeding Habitat (**Figure 31**);
- Amphibian Breeding Habitat (Woodland) (**Figure 32**);
- Seeps and Springs (**Figure 33**); and,
- Habitats of Special Concern Bird Species (**Figure 34**).

All of the Significant Wildlife Habitats listed above are mapped together on **Figure 35**.

The potential effects of the proposed MQEE on Significant Wildlife Habitat are discussed in **Section 16.4**.

## 10.0 SIGNIFICANT AREAS OF NATURAL AND SCIENTIFIC INTEREST (ANSI)

Most of the forested areas within the MQEE study area are part of the 706 ha provincially significant Halton Forest North life science Area of Natural and Scientific Interest (ANSI). The Halton Forest North ANSI, together with the Halton Forest South ANSI and Speyside Forest ANSI, encompass most of the 35 $km^2$ Halton Forest (see **Figure 36a**).

For the MQEE study area, the ANSI boundary as mapped by Land Information Ontario (LIO) is shown on **Figure 36b**. The ANSI boundary is very similar to the Significant Woodland boundary mapped on **Figure 30** by GEC.

A detailed Site Summary for the Halton Forest North ANSI was compiled by Jalava (1995). The Site Summary was included in the two volume *Ecological Survey of the Niagara Escarpment Biosphere Reserve* (Riley et al. 1996).

Sugar Maple forests are the main vegetation type on the escarpment plain. Other frequent associates include Basswood, Red Oak, Bitternut Hickory, Ironwood and White Pine. White Ash was formerly codominant with Sugar Maple, but the ash trees are in severe decline due to the Emerald Ash Borer infestation and there are many standing dead trees and recent deadfalls. Mixed forests dominated by Eastern Hemlock and/or White Cedar mainly occur closer to the escarpment rim, with Sugar Maple, White Birch, Ironwood, Red Oak and White Pine as frequent associates. White Birch stands are common at the southeast end of the ANSI and they are probably the result of fires in the past.

Wetlands occur commonly between bedrock ridges and those located on tributary systems often contain numerous Beaver ponds. Other wetlands occur as isolated or semi-isolated pockets within complex bedrock-controlled topography (GEC pers. obs.). The wetland communities include Silver Maple and Swamp Maple deciduous swamps, mixed swamps dominated by White Cedar with maples and Yellow Birch. Thicket swamps dominated by shrub willows and Red-osier Dogwood occur in some areas. Emergent marsh and meadow marsh communities also occur within the ANSI, often in association with Beaver-flooded systems.

The escarpment rim has some stands of White Cedar and mixed conifers, along with Round-leaved Dogwood thickets. The cliff communities include some stands of ancient White Cedar. Below the cliffs there are varied talus communities including White Cedar, White Cedar – White Birch, and Sugar Maple – White Ash (now declining/dead) stands (Jalava 1995; GEC pers. obs.).

Key excerpts from the Jalava (1995) Halton Forest North ANSI Site Summary are provided below:

> *Halton Forest North encompasses an area of almost five square km of escarpment plain forests and wetlands, as well as a 4 km stretch of east-facing escarpment rims, cliffs and slopes. The escarpment plain has numerous gently rolling ridges which tend to be hummocky in the northwestern portion of the site. A generally thin layer of rocky till covers the dolostone caprock of the Amabel Formation; scattered deeper soiled sections also occur, as do organic deposits in wetlands. Most of the escarpment slopes are covered in talus. A small moraine parallels the escarpment slopes along the site's eastern edge. Ice-contact deposits occur along the base of the escarpment slopes.*
>
> *The Halton Forest North has the best representation (4 km) of east-facing linear escarpment features in the Halton Section of the Niagara Escarpment, and high representation of bedrock plain and rim features. The site has the best representation in the section of mixed successional talus forests, as well as high representation of submerged and floating aquatics, mixed swamps, mesic broadleaf and mixed forests, successional broadleaf and mixed forests, moist open cliffs, mesic broadleaf talus forests, and broadleaf bedrock forests. This site should be considered as complementing the contiguous Halton Forest South site…*
>
> *The Halton Forest North is part of the largest continuous tract of forests and wetlands along the Niagara Escarpment south of Grey County. It is part of the largest woodland natural area within 100 km of Toronto and the largest natural area in Halton Region. It is also part of a 14 km naturally vegetated woodland corridor extending north to near the community of Limehouse and south to Hilton Falls. This regional woodland covers approximately 35 square km, providing refuge for a high diversity of species requiring large tracts of forest to maintain viable populations. The area includes important natural areas such as Halton Forest South and the Speyside Forest. The site provides ideal specialized habitat for the rare West Virginia White butterfly. Tree cover along the several small streams that originate in the site helps to maintain cool water temperatures and low turbidity in the watershed.*

The potential effects of the proposed MQEE on Significant Areas of Natural and Scientific Interest (ANSI) are discussed in **Section 16.5**.

## 11.0 FISH HABITAT

There is a hydrological connection between Wetland W41 and the large beaver pond downgradient in Wetland W44 (see **Figure 6**). The drainage path from W41 to W42 to W44 is diffuse and includes several obstacles to potential fish movement. W42 was identified as a confirmed breeding pool for Unisexual Ambystoma (Jefferson Salamander dependent population) and Spotted Salamander in 2003. Salamander breeding pools typically do not support fish populations. Baitfish were observed in W44 by GEC in 2002. Wetland W44 could, potentially, still support populations of Brook Stickleback (*Culaea inconstans*) and Central Mudminnow (*Umbra limi*) even though the water is choked with aquatic and wetland vegetation and appearing stagnant. The HF-1 Tributary is blocked by several large Beaver dams downstream and only intermittent flows reach the Main Quarry where the tributary is truncated, so there is no direct connection to any fish habitat downstream towards the Hilton Falls Reservoir.

Conservation Halton did not capture any fish above the Escarpment when they sampled the Speyside Tributary in Wetland W25, at St. Helena Lane and downstream on September 9, 1999. CH staff sampled at fish station SXM-249 "Speyside tributary – downstream of lane, across from Scotch Block" and captured "no fish". CH staff sampled at fish station SXM-250 "Upstream of Laneway on Speyside Tributary, across from Scotch Block" and captured "no fish".

Taking a cautious and conservative approach, the outlet from Wetland W41 is considered to be potential indirect fish habitat because the water and organic material coming out of Wetland W41 ends up, at least in part, in Wetland W44 which has been observed to support baitfish in the past.

The potential effects of the proposed MQEE on Fish Habitat are discussed in **Section 16.6**.

## 12.0 SUMMARY OF SIGNIFICANT NATURAL HERITAGE FEATURES

The following significant natural heritage features were identified within the MQEE study area:

Habitats of Endangered and Threatened Species:

- Butternut (Endangered)
- Jefferson Salamander (Endangered)
- Unisexual Ambystoma (Jefferson Salamander dependent population) (Endangered)
- Bobolink (Threatened)
- Chimney Swift (Threatened)
- Eastern Meadowlark (Threatened)
- Little Brown Myotis (Endangered)
- Significant Wetlands (Wetlands V2, W36, W41 and W46a-f)
- Significant Woodlands

- Significant Wildlife Habitat (SWH)
  - Woodland Area-sensitive Bird Breeding Habitat
  - Amphibian Breeding Habitat (Woodland)
  - Seeps and Springs
  - Habitats of Special Concern Bird Species
- Potential indirect Fish Habitat (outlet from Wetland W41)

The potential effects of the proposed MQEE on significant natural heritage features are discussed in **Section 16.0**.

## 13.0 MITIGATION TO PROTECT WATER-DEPENDENT NATURAL FEATURES

As noted earlier, the proposed MQEE mining plan involves removing the common setback and expanding the East Cell into the MQEE extraction area. Dewatering of the combined extraction cell will continue in order for operations to take place under typical dry quarry floor conditions. Water-dependent natural features in the vicinity of the proposed MQEE will be protected, and in some cases enhanced over existing conditions, by the recharge of water to the groundwater flow system and diffuse discharge to two wetlands (Wetlands U1 and W36). Dufferin has already committed to integrate the MQEE into the existing Water Management System (WMS) and Adaptive Environmental Management and Protection Plan (AMP) that are already in place and have been operating at the Milton Quarry and Milton Quarry Extension since 2007. The Water Management System has effectively maintained groundwater levels around the perimeter of the Milton Quarry Extension, thereby protecting surrounding water resources including water-dependent natural features (GHD 2021). The existing WMS is shown on **Figure 37**. The layout of the proposed MQEE WMS is shown on **Figure 38a**. A detail for *salamander excluders* is shown on **Figure 38b**.

**Section 13.1** provides an overview of the Adaptive Environmental Management and Protection Plan (AMP). **Section 13.2** provides details on the Water Management System (WMS).

### 13.1 Adaptive Environmental Management and Protection Plan (AMP)

#### 13.1.1 AMP Overview

The AMP was developed in support of the mitigation and management measures originally proposed for the Milton Quarry Extension (East Cell and West Cell). The AMP forms the framework for managing the implementation and operation of the mitigation measures to ensure that water resources and associated ecological features are protected.

Groundwater flow within the Amabel aquifer supports water resources in the general area, including private water supply wells, cold water fisheries, and wetlands. The AMP incorporates comprehensive mitigation measures to prevent any adverse effects on water resources from either a water quantity or water quality perspective. Under active quarry conditions, the operation of the WMS involves quarry dewatering, discharge of water to the Reservoir in the Main Quarry, and drawing water from the Reservoir for use in a groundwater recharge system based on a series of recharge (injection) wells along appropriate segments of the quarry perimeter in the North Quarry, West Cell and East Cell. The design of the groundwater recharge system is intended to generally maintain the natural groundwater levels in the vicinity of the wetlands and other water dependent features around the quarry and beyond. In addition to the groundwater recharge wells, the recharge system also provides a diffuse surface water discharge to support three onsite wetlands (V2, W7 and W8) located within the Extension Licence area (outside the extraction limits) (GHD 2020). The MQEE will be integrated into the existing WMS.

Quarry rehabilitation will involve the creation of three separate lakes created by extraction in three quarry cells (North Quarry Lake, West Cell Lake, East Cell Lake). The MQEE extraction area will be part of an expanded East Cell Lake under final rehabilitation conditions. Once these lakes attain their designed water levels, they will serve to passively maintain surrounding groundwater levels and associated water resources and water-dependent natural features. In accordance with approvals for the existing quarry, some active management of water will continue post-rehabilitation, to ensure the lakes are maintained at appropriate levels, the onsite wetlands are maintained, and it may also include some localized seasonal groundwater recharge along the eastern part of the quarry area to maintain spring high water levels in nearby wetlands (GHD 2020).

The purpose of the adaptive management approach is to recognize the inherent variability in the natural environment and to implement a flexible system of mitigation and monitoring to ensure the mitigation measures provide ongoing protection of water resources and water-dependent natural features. The AMP is based on the planned implementation of proven mitigation measures and an organized process of design, implementation, monitoring, evaluation, and optimization for the active quarry operation and rehabilitation periods (GHD 2020).

The AMP established the water resources monitoring program for the Milton Quarry Extension. The key performance monitoring aspect for the mitigation measures for the Milton Quarry Extension was and continues to be the maintenance of groundwater levels at defined trigger monitoring wells that ensure protection of the adjacent water resources and associated features (GHD 2020). The same approach will be taken for the MQEE.

The AMP includes measures to ensure the proactive establishment, demonstration, and verification of the WMS. A response action framework is defined to provide a structured response to any conditions where the target levels are not being suitably maintained, including Agency notification (GHD 2020).

As part of the existing quarry, target water levels are required for trigger wells and three onsite wetlands (V2, W7 and W8) to regulate the performance of the mitigation measures. The AMP establishes the protocol for defining appropriate target levels, as well as the methodology for adapting them in the future in response to changes in any relevant factors, including climate change. The target levels are defined on a seasonal basis and there are transition periods from season to season. The approach using groundwater recharge wells operated to maintain target water levels in trigger wells is consistent with the North Quarry Recharge Well System requirements although the AMP for the Milton Quarry Extension included further details for monitoring and mitigation operations for the West Cell (Phase 2) and East Cell (Phase 3) of the Milton Quarry Extension (GHD 2020). The same approach will be taken for the MQEE.

It is also necessary to ensure that the quality of recharged water is acceptable for the protection of adjacent water resources. Water quality monitoring and other supplemental monitoring programs are defined in the AMP to provide a comprehensive monitoring and evaluation program, which will be expanded to incorporate the MQEE.

#### 13.1.2 AMP Addendum

An addendum to the existing comprehensive AMP has been prepared to incorporate the addition of the proposed MQEE into the existing AMP program (GHD and GEC 2021). The AMP Addendum includes additions to the comprehensive monitoring and mitigation implementation system of the AMP. The layout of the WMS and the preliminary performance target monitoring locations are shown on **Figure 38a**. The Wetland U1 and Wetland W36 diffuse discharges and an initial set of recharge wells will be installed and verified to be effective prior to extraction below the water table. The recharge system will be constructed so that additional recharge wells may be readily added as necessary to maintain suitable seasonal groundwater levels to protect water resources (GHD 2021).

The mitigation measures planned for the proposed MQEE will provide appropriate protection of all water-dependent natural features as demonstrated by the ongoing successful performance of the same measures at the Milton Quarry. The implementation, operation, and monitoring of these mitigation measures will be carried out under the program established in the AMP Addendum. The AMP and AMP Addendum facilitate a careful process of monitoring, identification of concerns or unanticipated effects, and swift implementation of appropriate mitigative measures. This approach enables ongoing identification and management of potential contingency situations through continued monitoring and response actions (GHD 2021).

In the unexpected event that a need is determined for mitigation measures beyond those planned for the initial MQEE WMS implementation, various response actions and contingency measures are available. The following list prepared by GHD (2021) identifies many of the expected routine response actions as well as other actions that may be taken in a contingency scenario:

- Increasing or adjusting recharge flows to individual recharge wells;
- Increasing flow to recharge system by increasing flow (pressure) from recharge pumping station;
- Refurbish or replace existing recharge wells that are not performing adequately;
- Adding recharge wells (including possible use of inclined recharge wells) or diffuse discharges;
- Additional monitoring (e.g., additional water level monitoring locations or ecological monitoring) to further characterize conditions and evaluate potential changes to target levels and/or mitigation operation (including further automation);
- Increasing capacity of recharge system (e.g., adding control huts, local feeder water lines, increased watermain/feeder size, pumping station upgrade);
- Modify blasting activities in close proximity to recharge wells to minimize local effects of blast-induced fracturing beyond the quarry face;
- Localized grouting of high permeability bedrock features;
- Consider other possible means of supplying water to affected features (e.g., alternate recharge system alignment, recharge ponds, diffuse discharge to wetlands, or other means);
- Hydraulic buttress construction; and,
- Temporary or longer-term cessation of bedrock extraction below the water table in an affected area.

The AMP and AMP Addendum provide additional information on the applicability and implementation of all response actions and potential contingency measures if and as warranted (GHD 2021).

#### 13.1.3 AMP Addendum – Water Level Targets for Wetlands U1 and W36

The AMP Addendum includes both Performance and Supplemental monitoring consistent with the existing AMP. Performance monitoring will include groundwater levels at a series of Trigger Wells intended to protect the central and upper portion of Wetland W36, and Wetlands W41, W46a-f and W56, and the surface water levels in Wetlands U1 and W36. Proposed Trigger Wells have been proactively installed and they are shown with an open triangle on **Figure 38a**, including (from southwest to northeast): OW83-21, OW81-20, OW80-20, and OW79D-20. These locations will have target water levels and the recharge system operation will be adjusted to maintain these targets. The establishment and monitoring of target water levels for the MQEE will follow the same approach used for the existing quarry as required by the AMP. Groundwater target levels at trigger wells are discussed in detail in AMP Addendum Part II, Section B-2.

Surface water target levels for Wetland U1 and the upper portion of Wetland W36 are discussed in detail in AMP Addendum Part II, Section B-3 and a summary for each wetland is provided below.

*Wetland U1 – Surface Water Target Levels*

Preliminary target water levels for Wetland U1 are shown on **Figure 38c**. The seasonal water depths and hydroperiods are intended to provide optimal conditions for amphibian breeding and reproduction. Target species include Jefferson Salamander, Unisexual Ambystoma (Jefferson Salamander dependent population), Spotted Salamander, Wood Frog, Spring Peeper, Northern Leopard Frog, American Toad and Gray Treefrog. Wetland hydrology will be enhanced over existing conditions. This enhancement is demonstrated by the proposed targets levels that increase the pool depth and extend the hydroperiod experienced in recent years relative to the measured data as shown on **Figure 38c**.

For Wetland U1, the proposed target water levels are preliminary and dependent on overburden characteristics, depth to bedrock and actual outlet/overflow elevation. The target water levels shown on **Figure 38c** will be confirmed or updated in the Pre-Extraction Report, once the WMS verification testing is completed.

*Upper Portion of Wetland W36 – Groundwater and Surface Water Target Levels*

There are two areas of vernal pooling located in the upper portion of Wetland W36, in the vicinity of SG58 which is the uppermost, and SG57.

Downstream (southwest) of the SG57 pool area, Wetland W36 exhibits a more channelized character and an absence of surface water. Within the central segment of Wetland W36, there remains a low potential for groundwater interaction with the wetland (downstream of the SG57/SG58 pool areas to the vicinity of SG5). In the area of SG5, only occasional, short-duration water presence has been observed in the past and no surface water was observed in 2020 or 2021. In this area the mitigation objective will be to prevent drying of the wetland (e.g., drying of substrate) relative to existing conditions. The adjacent groundwater recharge well system and upstream diffuse discharges will be operated with the goals of preventing MQEE-induced drying and potentially enhancing wetland conditions. During the spring target period, BH64 will be employed as a supplemental monitoring well similar to existing supplemental monitoring locations BH65, BH66, and OW69-08 and the ecological conditions will be evaluated.

Further south (downstream) of SG5 in Wetland W36, the groundwater level is well below the base of the wetland and there is no potential for groundwater support or discharge to the wetland. Therefore, direct mitigation protection and associated monitoring is not proposed in this area.

Preliminary target water levels for the upper portion of Wetland W36 are shown on **Figures 38d** and **38e**. The seasonal water depths and hydroperiods are intended to provide optimal conditions for amphibian breeding and reproduction. Target species include Jefferson Salamander, Unisexual Ambystoma (Jefferson Salamander dependent population), Spotted Salamander, Wood Frog, Spring Peeper, Northern Leopard Frog, American Toad and Gray Treefrog. Wetland hydrology will be enhanced over existing conditions. This enhancement is demonstrated by the proposed targets levels that increase the pool depth and extend the hydroperiod experienced in recent years relative to the measured data as shown on **Figures 38d** and **38e**.

For the upper portion of Wetland W36, the proposed target water levels are preliminary and dependent on wetland microtopography in the SG58 and SG57 area. The target water levels shown on **Figures 38d** and **38e** will be confirmed or updated in the Pre-Extraction Report, once the WMS verification testing is completed.

### 13.1.4 Supplemental Monitoring – Wetland Ecology

Supplemental monitoring will include additional collection and analysis of information on water levels, water budget, and wetland ecology. This supplemental monitoring information will be used to ensure that all relevant aspects of water resources protection are appropriately considered. AMP Addendum Part II Section D provides the details of the proposed supplemental monitoring program.

The supplemental water level monitoring network is shown on **Figure 38f**. The wetland ecology monitoring network is shown on **Figure 38h**; the existing network will be expanded to include Wetlands W36, the north portion of Wetland W41, Wetlands W46a and W46b, and Wetland W56. Wetlands V2 and the south portion of Wetland W41 are already part of the existing quarry monitoring network.

Details on the wetland ecology monitoring network are provided in AMP Addendum Part II Section D 4.5. Similar to the existing quarry and AMP, the MQEE wetland ecology monitoring program will include the following components:

- Fixed-Point Photography
- General Wetland Field Reconnaissance
- Wetland Vegetation Communities
  - 10 m x 10 m Wetland Vegetation Monitoring Plots
  - Quantitative Photo-Monitoring (QPM)

- Amphibian Breeding Habitats
  - Amphibian Call Count Surveys
  - Salamander Egg Mass Surveys

It should be noted that the ecological monitoring methods to be applied will vary according to the characteristics of each particular wetland. The details are provided in the AMP Addendum.

### 13.2 Water Management System (WMS)

This report section is organized under the following headings:

- 13.2.1 WMS Overview
- 13.2.2 WMS Installation and Operating Experience at the Milton Quarry Extension
- 13.2.3 MQEE Water Resources Mitigation Approach
- 13.2.4 MQEE WMS Layout
- 13.2.5 MQEE WMS Establishment

#### 13.2.1 WMS Overview

The existing Milton Quarry WMS comprises the following main components:

- Sumps and water collection systems (pipes and/or ditches);
- Main Quarry Reservoir;
- Pumping Station;
- Watermains;
- Watermain driving access;
- Control Valve (CV) Huts;
- Feeder lines;
- Recharge wells; and,
- Diffuse discharges.

The layout of the existing Milton Quarry WMS is shown on **Figure 37**. The layout of the proposed MQEE WMS is shown on **Figure 38a**. A detail for *salamander excluders* is shown on **Figure 38b**.

Each quarry cell is dewatered using a main sump with local satellite sump/pumping and/or surface conveyance (e.g., ditch/culvert) as necessary. Water from the dewatering of quarry cells is pumped back to the Main Quarry Reservoir for storage and handling. Excess water is discharged via the Hilton Falls Reservoir Tributary (HFRT) near Sixth Line, in consultation with Conservation Halton (GHD 2021).

The WMS uses a permanent pumping station located at the northwest end of the Main Quarry Reservoir. The pumping station provides a centralized source of water for mitigation and discharge. The pumping station is the control centre for monitoring and operation of the overall WMS. The WMS has been installed to suit full-time, year-round operations, as necessary, including aspects such as: "Indoor" pumping station, buried watermains, firm (redundant) pumping capacity, above grade control/valve huts, remote data access, and alarm capabilities (GHD 2021).

Water is pumped from the reservoir into the watermain to maintain water pressure. CV Huts are connected to the watermain and each hut can individually control flows for up to four recharge wells and/or diffuse discharges. Feeder lines connect each CV Hut to individual recharge wells and/or diffuse discharges (GHD 2021).

Some WMS components such as the watermain and driving access, and CV Huts, are considered to be continuing disturbance or loss of habitat, whereas other components such as feeder lines are considered temporary disturbances that can be mitigated through restoration and naturalization over time.

The installation of watermains will require a 10 m wide disturbance zone. The footprint of a CV Hut is 36 $m^2$.

Following restoration of the disturbed area only the access road (approximately 4 m wide) and the CV Huts are considered continuing removal of habitat. The rest of the 10 m wide watermain disturbance zones will ultimately be re-vegetated, as is the case at the existing Milton Quarry Extension.

Feeder lines within Significant Woodlands, Significant Wetlands and buffers will be restricted to a 5 m wide disturbance zone. Outside of the features and buffers, a wider disturbance zone may be used to improve the efficiency of feeder line installation, and these areas will be promptly restored.

Recharge wells will be established to have a minimal practical area, usually disturbing approximately 25 $m^2$ or less during installation. In the long-term, the disturbed area at each recharge well will typically be less than 2 $m^2$.

The three diffuse discharges proposed for Wetlands U1 (1) and W36 (2) will generally each cover 5 $m^2$ to 10 $m^2$ or less, where existing grades will be maintained and weathered stone and woody debris will be used for cover.

### 13.2.2 WMS Installation and Operating Experience at the Milton Quarry Extension

At the Milton Quarry the WMS for the west side of the North Quarry was constructed in 2006-2007. The WMS for the West Cell of the Milton Quarry Extension was constructed in 2009 and the most of the East Cell WMS was constructed in 2010-2012.

On the west side of the North Quarry the WMS has operated since 2007 to maintain groundwater gradients towards the Sixth Line Tributary of the Sixteen Mile Creek, which is a coolwater Brook Trout stream. The WMS for the West Cell of the Milton Quarry Extension maintains seasonal groundwater elevations and gradients towards the Sixth Line Tributary and Wetland W5. The WMS for the East Cell of the Milton Quarry Extension maintains seasonal groundwater elevations and gradients towards the Sixth Line Tributary and numerous wetlands, some of which are Jefferson Salamander breeding pools.

There was considerable oversight of contractors during the WMS installation. The feeder line routes were selected by GEC, in consultation with engineering consultants and contractors. The basic approach used for the identification of feeder line routes and the selection of diffuse discharge and recharge well locations was as follows:

- Initially, as a desk-top exercise, the diffuse discharge locations and feeder lines necessary to connect to watermains located outside of ecological buffers, along with communication cables, were mapped approximately based on available mapping and aerial photography.
- Feeder line routes and diffuse discharge locations were refined based on a detailed field review by GEC.
- To the extent feasible, feeder line routes were selected:
  - In areas of existing or past disturbance;
  - Along existing farm lanes, accesses and skidder trails;
  - To avoid mature and/or specimen trees; and,
  - To avoid areas with dolostone outcrops, rich ground covers and other notable habitat features, etc.
- To the extent feasible, diffuse discharge and recharge well locations were selected:
  - In areas of existing or past disturbance;
  - Along farm lanes or skidder trails;
  - In areas with tolerant wetland vegetation (e.g., Reed Canary Grass, Red-osier Dogwood, etc.) or no/limited vegetation (i.e., bare ground);
  - To avoid mature and/or specimen trees; and,
  - To avoid areas with dolostone outcrops, rich ground covers and other notable habitat features, etc.

GEC provided Species at Risk (SAR) education and awareness training and explained the restrictions in place when working within forested habitats. GEC also visited work areas while contractors were working and follow-up site visits with the contractors and Dufferin staff were arranged to identify any restoration measures that were required. The contractors took considerable care when installing the diffuse discharges, recharge wells and feeder lines.

**Attachment B2** is a photo album that provides a series of representative photographs of the various WMS components for the West Cell and East Cell of the Milton Quarry Extension. This photo album provides the reader with a picture of how the various WMS components required for the MQEE will appear several years after installation and site restoration.

**Photo B2-1** shows a view of the East Cell driving access and watermain near Wetland V2, immediately after installation in late 2010. Disturbance is generally contained within a 10 m wide zone, but in the vicinity of Wetland V2 it was restricted to less than 8 m because it is not adjacent to the extraction area and the alignment was through a treed area. The access is generally between 4.0 and 4.5 m wide. The shoulders were treated with 15+ cm of fresh wood chips to curtail the spread of invasive plant species such as Garlic Mustard *(Alliaria petiolata* +*).*

**Photo B2-2** is a second view of the East Cell driving access and watermain near Wetland V2, taken on July 29, 2018 from the same vantage point as for **Photo B2-1**. Woody and herbaceous plants have become established within the previously disturbed area, along the shoulders and even down the middle of the driving access. The lightly travelled access road is essentially a *driving trail* that is 3.0 to 4.0 m wide in this area.

**Photos B2-3** and **B2-4** show two more views of the East Cell driving access taken on August 26, 2018. The shoulders and a strip down the middle of the access are vegetated.

**Photos B2-5** and **B2-6** show two views of Control Valve (CV) Huts. Vegetation becomes re-established around the CV Huts relatively quickly.

**Photos B2-7** and **B2-8** show two views of a feeder line alignment that follows an old driving trail, shortly after backfilling in 2012. **Photo B2-9** shows the same area after wood chip application, in May 2013. **Photos B2-10** to **B2-12** show the same area five and six years following site restoration. The alignment is lightly used for monitoring access but it is essentially re-vegetated.

**Photo B2-13** shows the feeder line to Recharge Well RW314D on November 14, 2012, after backfilling the buried feeder line. Extra feeder lines are typically buried at the same time; if additional recharge wells are subsequently required then less trenching will be necessary in the future. **Photo B2-14** shows the same view of buried feeder lines to Recharge Well RW317D taken on November 30, 2012, after restoration. The 15 to 20 cm deep layer of wood chips helps to prevent the establishment and spread of invasive groundcover species.

**Photo B2-15** shows a view of buried feeder lines leading to the RW317 series of wells, taken on May 31, 2012.

**Photos B2-16** to **B2-19** show views of feeder line alignments to West Cell Recharge Wells RW207A, RW206C and RW201B, taken 3 to 5 years after the feeder lines and recharge wells were installed and connected. In all cases, forest plants are becoming re-established and woody debris is beginning to accumulate.

**Photos B2-20** to **B2-22** show views of the feeder lines to Recharge Wells RW316B, RW316C and RW316D, taken on May 21, 2014, 3 years after the feeder lines were buried in 2011. Woody debris and Sugar Maple (*Acer saccharum*) seedlings show up clearly in these photos.

**Photo B2-23** shows the Wetland W7 Diffuse Discharge shortly after installation in 2010. **Photos B2-24** to **B2-28** show views of the Wetland W7 Diffuse Discharge in 2014, 2016 and 2017, ranging from 4 to 7 years after installation. The Diffuse Discharge is gradually overtaken by native wetland plant species and the gabion stone is becoming weathered, blending in with the surrounding wetland.

**Photo B2-29** shows Recharge Well RW316C shortly after installation in late 2012. A 15 to 20 cm deep layer of fresh wood chips was placed over the disturbed area surrounding the well and along the feeder line.

**Photos B2-30** to **B2-33** shows views of Recharge Wells RW201A, RW201C, RW206B and RW2017C, taken on May 21, 2014, which was approximately 5 years after installation and connection to the feeder lines. The photos show woody debris that has accumulated and re-establishment of forest plant species such as Sugar Maple, Chokecherry, Alternate-leaved Dogwood, Bracken (*Pteridium aquilinum*) and other forest ground cover species. It is difficult to pick out the recharge well in some of the photos.

**Photo B2-34** to **B2-38** show views of Recharge Wells RW302C, RW302D, RW308A, RW309 and RW316A, taken on May 21, 2014, which was approximately 3 years after their installation in 2011. In just 3 years, woody debris has started to accumulate and woody forest plant species such as Sugar Maple and Chokecherry are becoming established. Again, it is difficult to pick out the recharge well in a few of the photos.

The Milton Quarry Extension example illustrates how, with appropriate planning and oversight, WMS components such as diffuse discharges, recharge wells and feeder line alignments are quickly naturalized within a few years following installation. Similar results are anticipated for the proposed MQEE addition to the WMS.

### 13.2.3 MQEE Water Resources Mitigation Approach

Mitigation measures will be implemented in order to prevent negative effects on Wetland U1 and offsite wetlands (e.g., W36, W41, W46a-f, W56) as aggregate extraction proceeds on the MQEE. The implementation of these mitigation measures will provide an opportunity for certain wetlands, i.e., Wetlands U1 and W36, to be enhanced over existing conditions in terms of spring high water levels and hydroperiod duration. This will enhance the ecological function of these wetlands, especially with respect to amphibian breeding functions. In the past, Dufferin achieved similar enhancements through mitigation for Wetlands W5 and V2, as part of the mitigation measures for the Milton Quarry Extension. This was described in detail by GEC (2019) and GHD (2020) as part of the 5-Year AMP Review for the Milton Quarry Extension.

The mitigation measures for the MQEE will take the form of an extension of the existing interim mitigation measures (during quarrying and lake filling) and rehabilitation mitigation measures consistent with the approved and presently operating mitigation measures at the Milton Quarry. As described above, an addendum to the existing comprehensive AMP has been prepared to incorporate the addition of the proposed MQEE into the existing AMP program (GHD and GEC 2021).

There is little to no surface water runoff from the MQEE extraction area and therefore quarrying will not adversely affect surface water hydrology directly (i.e., runoff) with respect to quality or quantity (GHD 2021). In the absence of any mitigation, the flow of groundwater into the quarry, which is induced by the required dewatering below the water table, will reduce groundwater availability to water-dependent natural features in the vicinity. Therefore, the mitigation of potential groundwater influences is necessary and critical, and this is the primary focus of the proposed mitigation measures described below (GHD 2021).

The water-dependent natural features that have been identified for protection or enhancement by the proposed MQEE mitigation measures include:

- Wetland U1;
- Wetlands southeast to northeast of the MQEE area, including: W36, W41, W46a-f, and W56; and,
- Significant wetlands located more distant from the MQEE extraction area, and the Hilton Falls Reservoir Tributary and the Speyside Tributary.

Wetlands U1, W36, W41, W46a-f and W56 were characterized above in **Section 5.5**.

As described by GHD (2021), the primary mitigation design objectives for the project team (hydrogeologists, ecologists, and engineers, in particular) were to:

- Maintain the existing groundwater regime close to existing conditions during all critical periods for the natural features and organisms which are directly dependent on groundwater (refer to Natural Environment Report and AMP Addendum);
- Maximize the degree of "passivity" of the mitigation measures (i.e., minimize the complexity and degree of engineering works/controls required) over the long term;
- Ensure the mitigation measures are "adjustable" and responsive, and can be fine-tuned to adapt to specific needs over time, based on an integrated monitoring and contingency response program as described in the AMP Addendum; and,
- Consider functions and values of the environmental receptors in the context of the broader natural systems (GHD 2021).

The adjacent wetlands, which can be sensitive to minor changes in groundwater levels and hydroperiods, were the driving factor behind the need for active mitigation measures during extraction and lake-filling. Therefore, the main purpose of the mitigation measures is to maintain groundwater levels around the perimeter of the proposed MQEE and thereby protect surrounding water-dependent natural features. Maintaining groundwater levels adjacent to the extraction limits will ensure that the existing groundwater levels and flows are sustained for the adjacent water-dependent natural features (GHD 2021).

For Wetlands U1 and W36, some increase in spring high water levels and longer hydroperiods will enhance the ecological condition and function of these wetland features.

The wetland hydrology in Wetland U1 will be enhanced through the implementation of the proposed mitigation measures, i.e., the seasonal addition of water with a diffuse discharge from the WMS (see **Figure 38h**). This mitigation approach allows the water level to be raised to an optimum high springtime water level and then gradually drawn down, providing a hydroperiod of sufficient duration to support the successful reproduction of salamanders, frogs and toads. **Figure 38c** shows the seasonal water level targets for Wetland U1 that are proposed in the AMP Addendum.

The wetland hydrology in the central portion of Wetland W36 will be maintained through the use of recharge wells (as described above in **Section 13.1.3**) and, in the uppermost portion, enhanced through the seasonal addition of water to two pool areas around staff gauges SG57 and SG58 using individual diffuse discharges from the WMS, as shown on **Figure 38i** and described above in **Section 13.1.3**. As with Wetland U1, this mitigation approach allows the water level to be raised to an optimum high springtime water level and then gradually drawn down, providing a hydroperiod of sufficient duration to support the successful reproduction of salamanders, frogs and toads. It is not intended to create a continuous flow or discharge within Wetland W36 but, based on the micro-conditions and climatic inputs, some surface flow may occur along the feature, particularly during wet periods.

The proposed diffuse discharges include a granular bed located in a deeper area of the wetland pool fed by a buried feeder pipe extending from an adjacent watermain CV Hut as shown on **Figure 38a**. The diffuse discharges are camouflaged with weathered stone and woody debris. In the relatively short term, the diffuse discharges are covered by leaves and sticks, and wetland plants colonize some areas. This mitigation approach has been used successfully at the Milton Quarry Extension as demonstrated by the operating wetland diffuse discharges for Wetlands V2, W7, and W8 to the north of the MQEE area. This mitigation approach was further refined for the Acton Quarry mitigation system. The Acton Quarry Extension WMS has been approved by the agencies and seven of these wetland diffuse discharges have been constructed and two are in operation at the time of writing.

GHD (2021) outlined the mitigation measures which will be utilized for the proposed MQEE, which include:

- Progressive extraction and rehabilitation;
- Implementation of an interim groundwater recharge system;
- Implementation of a diffuse discharge system to maintain seasonal target water levels in Wetlands U1 and W36;
- Creation of an expanded East Cell Lake for quarry rehabilitation and passive groundwater recharge; and,
- Possible seasonal post-quarrying groundwater recharge system operation along the northeast-southeast perimeter of the MQEE consistent with the potential seasonal recharge approved for the East Cell.

The proposed interim recharge system for the MQEE is a simple extension of the existing system that is in place and operating effectively at the Milton Quarry as shown on **Figure 38a**. The extension of the WMS will provide recharge capacity to the northeast-southeast of the proposed MQEE area and replace the existing watermain located in the setback on the south side of the East Cell, since the setback will be removed as the quarry face advances onto the MQEE extraction area (GHD 2021).

The long-term rehabilitation condition for the Milton Quarry Extension will rely primarily upon passive lake-based mitigation to support groundwater levels and the associated water-dependent natural features. This rehabilitation approach will incorporate the MQEE by extending the East Cell Lake into the MQEE extraction area, along with the creation of terrestrial, wetland and aquatic habitats.

Once lake filling is complete under rehabilitation conditions, the overall groundwater recharge system will largely no longer be required as the lake system will passively provide the necessary groundwater recharge. Lake to lake transfers will be needed to maintain each lake at its optimal water level; this will involve the pumping of water from the Main Quarry Reservoir to the East Cell Lake with gravity flow to the West Cell Lake and North Quarry Lake. Some post-quarrying operation of the diffuse wetland discharges will likely be required on a seasonal basis to maintain the optimum hydroperiods for Wetland U1 and Wetland W36, similar to that which may be required for Wetlands V2, W7, and W8 around the East Cell. It is also possible that seasonal groundwater recharge may still be required to the east of the East Cell and the proposed MQEE to maintain optimum seasonal high groundwater levels to optimally support water resources in this area. The AMP and AMP Addendum include provisions to evaluate these considerations in detail as the rehabilitation program is implemented, to ensure that the long-term protection and enhancement of water-dependent natural features is achieved (GHD 2021).

The MQEE rehabilitation is discussed further in **Section 15.3**.

### 13.2.4 MQEE WMS Layout

The layout for the proposed MQEE portion of the WMS is shown on **Figure 38a**. Where the extraction limit is in proximity to the Significant Woodland boundary, a 10 m woodland buffer is applied and the watermain is accommodated within a 10 m wide zone immediately adjacent to the extraction limit. Thus, the minimum setback between the Significant Woodland boundary and the extraction limit is 20 m. Where possible, the watermain was routed so as to be even further away from the Significant Woodland limits.

Where the watermain and access road enters the habitat of Jefferson Salamander and Unisexual Ambystoma, *Salamander Excluders* will be set into the road base. A drawing of the Salamander Excluder is shown on **Figure 38b**. Essentially it is a metal trough that can be driven over. The trough is connected to the silt/exclusion fence at each end. This allows the access road to be used for WMS monitoring and maintenance, while maintaining a safe perimeter that will exclude salamanders from the extraction area. This is discussed further in **Section 15.2.3**.

As shown on **Figure 38a**, there are two locations where feeder lines are routed through the Significant Woodland. This was necessary for two reasons: first, to supply recharge wells that will be installed further away from the extraction limit, to reduce recirculation of recharge water back into the quarry excavation and improve the effectiveness of the mitigation; and second, to supply water to two diffuse discharges that will be located at the upper end of Wetland W36. The latter is necessary because recharge wells alone may not adequately raise the spring high water level and sufficiently extend the hydroperiod to achieve the proposed enhancement of Wetland W36 habitat.

The feeder line routes were selected and flagged by GEC, following the principles outlined above in **Section 13.2.2**. The routes were selected to avoid mature trees, dolostone outcrops, areas with intact native forest ground flora, rugged terrain, etc. If the route had to go through clusters of larger trees, the route was set where larger trees were either in decline, hazards (e.g., leaning) or otherwise defective. Where possible, the recharge well locations are sited outside of the minimum 10 m Significant Woodland buffer.

#### 13.2.5 MQEE WMS Establishment

The proposed MQEE WMS layout is shown on **Figure 38a** and the exact routing will be finalized in the field with a qualified ecologist to minimize ecological effects. Following issuance of an ARA licence, Dufferin will finalize the planned alignments for the work zones and will clear and maintain the areas at the appropriate time of year. In addition, existing access and drainage components such as culverts will be maintained consistent with normal land management practices.

This section outlines the various restrictions and design considerations that are recommended by GEC with respect to the establishment of the MQEE WMS, with the aim of minimizing negative effects on natural features and Species at Risk. Further discussion is also provided in **Section 16.0**.

*General Restrictions and Design Considerations*

The following restrictions, best practices and design considerations are recommended for the WMS installation in those areas that are outside of Significant Woodlands, Significant Wetlands and their buffers:

- A qualified ecologist will provide direction to Dufferin staff and contractors, as necessary, with respect to natural heritage features, species at risk, and their protection. Instruction will be provided with respect to “no-go” areas, such as ecological buffers, ecological enhancement areas, etc.
- The limits of the disturbance zones necessary for WMS installation will be clearly demarcated and silt/exclusion fencing will be installed as necessary along the edges of these zones at the outset of installation activity.
- If Bobolink and/or Eastern Meadowlark are confirmed to be present, removal of ground vegetation will be conducted outside of the grassland bird breeding season, i.e., April 1 to August 26. In areas located between Wetland U1 and the adjacent forested areas to the northwest, northeast and southeast, removal of ground vegetation will also avoid the salamander migration period, i.e., March 10 to May 10.
- Watermains and Control Valve Huts will be constructed outside the Wetland U1 buffer (50 m) and Signficant Woodland buffer (10 m).

- The watermain will generally be constructed within a 10 m wide disturbance zone which will not encroach into the buffers for Significant Woodlands or Significant Wetlands. The access road will generally have a maximum width of 4 m except as required for practical considerations such as corners, slopes, culverts, and areas for equipment access and turnarounds. Some additional areas may be required for staging and logistics purposes during WMS installation. All disturbed areas outside of the extraction area will be restored and seeded with a suitable seed mix.
- Control huts will be designed and located to minimize the overall number and footprint of huts to the extent practical. Typically, each hut will facilitate connection of at least four recharge wells or diffuse discharges. Additional huts may be added, if necessary, in a particular circumstance; however, the proposed network is considered generally adequate for anticipated conditions. Exterior lighting for huts will be minimized and use motion activation.
- Temporary disturbance for feeder line installation will generally be limited to a 5 m wide zone, although some exceptions may apply in order to increase efficiency of feeder line installation in open areas. The disturbed areas will be restored and allowed to regenerate such that, over time, it will be difficult to identify where feeder lines were buried. Restoration may involve placement of 15 cm of fresh wood chips or seeding with a suitable seed mix.
- Recharge wells will be established to have a minimal practical area, typically disturbing approximately 25 $m^2$ or less during installation. Silt fencing will be installed as necessary, to contain rock cuttings during drilling operations.
- Tree clearing, where required, will be conducted outside of the bird breeding season and bat active period, i.e., no tree-clearing from April 1 to October 31.
- Trees that are cut to clear the extraction area and the WMS footprint will be salvaged for ecological enhancement and rehabilitation purposes. Branches will either be cut up to make small brush piles or chipped for use in the restoration of WMS feeder lines. Logs will be cut up into 1.0 m to 1.5 m lengths and placed in various ecological enhancement areas (see **Section 14.0** below).
- Weathered rocks will be salvaged from fence lines and stone piles within the area to be disturbed/extracted. The salvaged material will be used to create habitat features for small wildlife, as well as for the diffuse discharges.
- Areas disturbed during WMS installation will be seeded with a suitable native seed mix.

*Significant Woodlands, Significant Wetlands and Buffers – Restrictions and Design Considerations*

The following restrictions, best practices and design considerations are recommended for the WMS installation within Significant Woodlands, Significant Wetlands and their buffers:

- Temporary disturbance for feeder line installation will be limited to a 5 m wide zone. The disturbed areas will be restored and allowed to regenerate such that, over time, it will be difficult to identify where feeder lines were buried and where diffuse discharges and recharge wells are located.
- The limits of the 5 m disturbance zones will be clearly demarcated and silt/exclusion fencing will be installed along the edges of these zones prior to the installation of feeder lines, recharge wells and diffuse discharges.
- The existing grades within woodlands and wetlands will be preserved as much as possible.
- The duration of disturbance will be minimized within natural heritage features.
- Tree clearing, where required, will be conducted outside of the bird breeding season and bat active period, i.e., no tree-clearing from April 1 to October 31.
- Timing of the installation of diffuse discharges, recharge wells and their feeder lines will be scheduled to avoid critical ecological periods, i.e., breeding periods for amphibians and birds, between March 10 to August 26. Installation of diffuse discharges should occur when water levels are low or features are dry, i.e., between August 26 to February 28.
- Trees that are cut to clear the WMS footprint will be salvaged for ecological enhancement purposes. Branches will either be cut up to make small brush piles or chipped for use in the restoration of WMS feeder lines. Logs will be cut up into 1.0 m to 1.5 m lengths and placed on the forest floor.
- Weathered rocks within the 5 m disturbance zone for feeder lines will be carefully placed on the adjacent forest floor or used for the diffuse discharges.
- Diffuse discharges (perforated pipe in stone bedding) will be established to have a minimal practical area, typically covering approximately 5 to 10 $m^2$ or less. In each location the diffuse discharge will be field fit to suit the wetland topography and minimize the footprint to the greatest extent practical while providing the intended mitigation function.
- Recharge wells will be established to have a minimal practical area, typically disturbing approximately 25 $m^2$ or less during installation. Silt fencing will be installed as necessary, to contain rock cuttings during drilling operations.
- Prior to working in sensitive areas, equipment will be sufficiently cleaned following applicable protocols to ensure invasive plant species are not introduced to an area.

- Fresh wood chips (minimum 15 cm deep) will be placed along the backfilled feeder line routes to prevent the spread of invasive plant species and the areas will be allowed to regenerate. Wood chip placement may occur following removal of silt/exclusion fencing.
- Where appropriate, a suitable native seed mix will be used along the edges of the feeder line routes. Seeds collected from suitable native species in the local landscape may also be utilized.
- WMS components will be designed with consideration for aesthetics, including the incorporation of available weathered stone and woody debris at diffuse discharge locations.
- Areas within the wetlands, woodlands, or their buffer zones that are temporarily disturbed by mitigation will be rehabilitated in accordance with recommendations from a qualified ecologist.

## 14.0 ECOLOGICAL ENHANCEMENT PLAN (EEP) FOR LANDS THAT WILL NOT BE EXTRACTED

Within the proposed MQEE licence area, an Ecological Enhancement Plan (EEP) will be implemented that covers approximately 10.55 ha of Dufferin land that will not be extracted. Ecological enhancements will include reforestation using native species well suited to the local landscape, management of existing woody vegetation in some areas and the placement of habitat features such as rock piles, stumps/root wads and other woody debris. Wetland U1 will also be enhanced by the addition of habitat features within the wetland and strategic woody plantings around the wetland margins. The implementation of the EEP will expand the Significant Woodland onsite, which in turn will provide an overall benefit to the Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population), as well as many other forest-dwelling wildlife species.

The various EEP Units are mapped on **Figure 39**. Summary descriptions for the EEP Unit are provided in **Table 20**. As shown on **Figure 39**, all of the ecological enhancements are contained within the proposed MQEE licence area. This differs from the EEP for the Acton Quarry Extension, which included Dufferin lands that were both outside and within the licence area. For the Acton Quarry Extension, there was a separate EEP legal agreement between Dufferin, the Region of Halton and the Town of Halton Hills, which covered those EEP Units located outside of the licence area. A similar legal agreement is not required for the MQEE because all EEP Units are within the licence area and the EEP requirements will be incorporated onto the Site Plans.

The Rehabilitation Plan will mainly apply to the Dufferin land that will be extracted. Details on the Rehabilitation Plan are provided in **Section 15.3**.

The Planning Summary Report will provide the rationale for the proposed MQEE licence boundary. Besides the extraction area, the larger licensed area encompasses most of the WMS footprint and the EEP Units that are proposed to expand Significant Woodlands, improve connectivity and provide an overall benefit to Jefferson

Salamander and Unisexual Ambystoma. The licence boundary will be fenced, which will serve to protect ecological enhancement areas from damage resulting from unauthorized access by hikers, ATV users and mountain-bikers. This is a common problem in the local area, above the Escarpment.

The implementation of the MQEE Ecological Enhancement Plan (EEP) will address two key requirements. First, since it is likely that an Endangered Species Act (ESA) 17(2)(c) “Overall Benefit” Permit will be required for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population), the proposed EEP will form a key part of the “Overall Benefit” package for these taxa. The ESA “Overall Benefit” Permit will be discussed in detail in **Sections 15.2.1** and **16.1.2**.

Second, with respect to new or expanded mineral aggregate operations, the Region of Halton Official Plan (ROP) policy direction is for proponents to pursue a “net environmental gain” approach. The Town of Halton Hills Official Plan has a similar policy direction. Section 110(7.2)d) of the Region of Halton Official Plan reads as follows:

> Where the proponent has satisfied the requirements of Sections 110(7.2)a) through 110(7.2)c) as applicable, require any application for a new or expanded *mineral aggregate operation* to consider a “net environmental gain” approach to the preservation and enhancement of the Greenbelt and/or Regional Natural Heritage System…

The MQEE Ecological Enhancement Plan (EEP) is discussed below under the following headings:

- 14.1 Goals and Principles for the MQEE Ecological Enhancement Plan (EEP) and Rehabilitation Plan
- 14.2 Tree-planting – Reforestation
- 14.3 Vegetation Management
- 14.4 Habitat Features
- 14.5 Wetland U1 Habitat Enhancements
- 14.6 Enhancement of Wetland Hydrology (Wetlands U1 and W36)
- 14.7 Disturbed Area Restoration
- 14.8 Ecological Enhancement Plan (EEP) Summary

The relevant ROP policies with respect to “net environmental gain” are discussed in **Section 17.0**.

The various EEP Units are mapped on **Figure 39**. Summary descriptions for the EEP Unit are provided in **Table 20**.

### 14.1 Goals and Principles for the MQEE Ecological Enhancement Plan (EEP) and Rehabilitation Plan

The Ecological Enhancement Plan (EEP) and Rehabilitation Plan for the MQEE have been designed to enhance the ecological features and functions of the Regional Greenlands System. Collectively, the plans provide:

- Immediate and short-term MQEE EEP measures that are integrated with the surrounding natural features;
- Progressive and final rehabilitation measures for the MQEE that are integrated with the East Cell Rehabilitation Plan, the MQEE EEP areas and the existing Cox Tract; and,
- Integration with the adjacent Main Quarry and North Quarry Rehabilitation Plans.

The MQEE EEP and Rehabilitation Plan will form part of part of a broader, landscape level restoration plan that integrates the rehabilitation of the various quarry cells with the surrounding natural Escarpment landscape.

The overall goal of the enhancement and rehabilitation measures proposed by Dufferin prior to, during and post extraction, is to ensure that the MQEE application results in an overall net gain to the Provincial, Regional and Local Natural Heritage System.

Goals and principles for the MQEE EEP and Rehabilitation Plan include the following:

- Increase in the spatial extent of the Provincial, Regional and Local Natural Heritage System.
- Increase in biological and habitat diversity.
- Enhancement of ecological system function.
- Enhancement of wildlife habitat.
- Enhancement of natural succession.
- Creation of new wetlands and woodlands.
- Establishment or enhancement of linkages between significant natural heritage features and areas.

## 14.2 Tree-planting – Reforestation

As part of the EEP, approximately 10.3 ha will be reforested. The reforestation approach is outlined below under the following headings:

- Woody species selections;
- Planting approach;
- Timing; and,
- Maintenance and monitoring.

### 14.2.1 Woody Species Selections

Reforestation strategies vary depending on site-specific environmental conditions such as aspect/sunlight, moisture regime, topographic position, and surrounding habitat types and their woody species composition. The woody species selected for planting and the forest types targeted are complementary to and reflective of the surrounding landscape. Tree planting will occur in open areas with little woody cover, as well as in areas where some tree and shrub establishment is occurring. The woody species selections for each EEP Unit are provided in **Table 20**.

Units TP-B1 to TP-B6 are buffer planting areas that will be planted in the first two years after licence issuance. The buffer planting areas are in proximity to the proposed MQEE extraction area and they provide a buffer for the Significant Woodland and/or other EEP planting areas. The species selected for this purpose are White Birch, White Cedar, White Pine and Trembling Aspen. These pioneering species have all colonized newly created cliff rim habitats at the Milton Quarry and Acton Quarry, along the edges of former extraction areas, and they are well suited as buffer plantings.

In some areas, faster-growing species such as White Birch and White Cedar were selected or used in increased proportions. In other areas, longer-lived species such as Bur Oak, Red Oak, Bitternut Hickory and Sugar Maple were selected.

In more sheltered areas such as Units TP-RB3 and TP-RB9, the proportion of Sugar Maple was increased and other species such as Ironwood were also added.

Around the edges of Wetland U1 (Unit WE1) and along an old ditch line (Unit TP-RB4), where conditions may be wetter than present once the WMS mitigation commences, wetland and facultative species have been selected. The species selected for this purpose are Swamp Maple, Silver Maple, White Cedar, Trembling Aspen, Balsam Poplar (*Populus balsamifera*) and Basswood.

Some tall shrub species such as Alternate-leaved Dogwood and Chokecherry will also be planted in some areas.

It is anticipated that using the species selections described above, the following target communities will develop over time:

- Dry-Fresh Cedar Coniferous Forest Ecosite (FOC2)
- Fresh-Moist White Cedar Coniferous Forest Ecosite (FOC4)
- Dry-Fresh White Cedar Mixed Forest Ecosite (FOM4)
- Fresh-Moist White Cedar - Hardwood Mixed Forest Ecosite (FOM7)
- Dry-Fresh Oak – Maple – Hickory Ecosite (FOD2)
- Dry Fresh Poplar – White Birch Deciduous Forest Ecosite (FOD3)
- Maple Mineral Deciduous Swamp Ecosite (SWD3)

### 14.2.2 Planting Approach

Prior to planting, any non-native woody species such as Common Buckthorn (+) and other non-desirable species (e.g., Manitoba Maple, ash regeneration, etc.) will be removed and stumps treated with herbicide to prevent re-sprouting. Suitable native woody regeneration will be retained. In some areas, control of herbaceous vegetation (e.g., field goldenrods) may be necessary to create suitable conditions for tree planting. Planting will occur during early spring or late fall, to minimize transplant shock, with spring planting being preferred. Nursery stock will be derived from local seed sources, i.e., from Seed Zone 34. However, if sufficient nursery stock is not available, stock from adjacent MNR Seed Zones may be utilized (e.g., Seed zones 32 and 37). Where possible, seed will be collected from the adjacent natural areas on Dufferin land, for propagation by their native plant nursery partners. In recent years, the trees planted at a number of Dufferin's southern Ontario sites were grown from locally-collected tree seeds. The nursery stock to be planted will generally be a mix of plugs and container-grown stock.

Areas proposed for tree-planting/reforestation will be planted at a density of 2000 trees/ha (2.0 x 2.5 m spacing) in order to maximize the probability that planted areas will meet woodland density targets in the short and long term. Natural tree regeneration will also contribute to the woodland density targets. Plantings will occur in nodes, with access routes being left open to allow access for maintenance (e.g., watering, weed control, etc.). Any remaining gaps will be planted once the original plantings have reached a "free-to-grow" condition (see below in *Maintenance and Monitoring*).

### 14.2.3 Timelines

The buffer planting areas TP-B1 to TP-B6 will be planted in Years 1 to 2 after licence issuance.

Planting areas TP-RA1 to TP-RA7 will be planted in Years 1 to 3 after licence issuance. These areas are intended to reforest the most direct links between Wetland U1 and Wetland V2, and between Wetland U1 and the Significant Woodland to the northeast and east.

Planting areas TP-RB1 to TP-RB9 will be planted in Years 1 to 5 after licence issuance. These areas are intended to reforest links between Wetland U1 and the Significant Woodland to the southeast.

Planting areas TP-M1 and TP-M2 include a vegetation management component, as described below in **Section 14.3**. These areas will be planted in Years 1 to 5 after licence issuance.

Tree-planting in and around Wetland U1 will be completed in Years 1 to 3 after licence issuance.

### 14.2.4 Maintenance and Monitoring

Competing herbaceous vegetation will be controlled by placing mulch or installing Cocodisc weed control mats around each planted tree or shrub (up to 50 cm radius of mulch around each planting, depending on conditions). Where access permits, plantings will be watered during dry periods (defined as a 14-day period between May and September with less than 25 mm of precipitation) until establishment has occurred (i.e., in Year 1 and 2 following planting).

Plantings shall be monitored at least annually until “free-to-grow” conditions have been achieved. “Free-to-grow” is a condition in which a forest is considered established based on a minimum stocking standard, a minimum height and freedom from competition that could impede growth. At the free-to-grow condition, the survival (stocking standard) of planted trees shall be a minimum of 80%. If survival is less than 80%, replacements will be planted in order to achieve a density of 1600 trees/ha. Once free-to-grow conditions are achieved any gaps left open for maintenance access will be planted at the same initial 2000 trees/ha density. For any replacement plantings, the species mix may be changed in order to utilize woody species with the highest survival rates for a particular area.

## 14.3 Vegetation Management

Units TP-M1 and TP-M2 contain old field vegetation, with some patches of woody vegetation. The existing woody vegetation will be managed to select for desirable species and individual trees and the remaining areas will be planted with suitable tree species.

Unit TP-M1 was mostly ploughed in late 2020 and then re-seeded. TP-M1 also contains patches of young Trembling Aspen, White Elm, White Ash, Black Cherry, Common Buckthorn (+) and hawthorns. This unit contains some dolostone outcrops.

Unit TP-M2 contains old field vegetation that was not ploughed in 2020 due to its shallow soil conditions. This unit also contains thickets of Staghorn Sumac and Roundleaf Dogwood, and some mature, open-grown Sugar Maple and Basswood. This unit contains a number of dolostone outcrops.

Vegetation management activities proposed for Units TP-M1 and TP-M2 include the following:

- Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration; remove defective stems;
- Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration);
- Interplant shade-tolerant species such as Sugar Maple in thinned out poplar-ash patches;
- Install habitat features: rock piles (25) and woody debris (25); and,
- Clean up old farm junk piles.

The tree species to be planted in Unit TP-M1 are Sugar Maple, White Birch, Basswood, White Cedar and White Pine.

The tree species to be planted in Unit TP-M2 are Bur Oak (*Quercus macrocarpa*), Red Oak, Sugar Maple, Basswood, Bitternut Hickory and White Pine.

### 14.4 Habitat Features

*Rock Piles*

Most of the former agricultural fields have had field stones removed over the years, so large areas contain relatively few rocks or rock piles, except where they had been deposited by the early farmers.

During clearing/stripping operations and WMS installation, boulders, rocks and cobbles will be salvaged and repurposed as rock piles in the various EEP Units. In addition, boulders, rocks and cobbles may be salvaged directly from the extraction area in order to meet the planting timelines. Rock piles will have a minimum footprint of 2 m x 2m and a minimum height of 1 m, to provide refuge habitat for snakes, amphibians, small mammals and other wildlife.

As a general guideline, rock piles should be established at a minimum density of 25 rock piles per hectare. Rock piles will be installed prior to any trees being planted in a given area.

*Woody Debris*

The removal of hedgerows CUHa and CUHb, and most of Woodland A and Woodland B, will provide a source of logs, stumps, root wads, branches, etc., that will be salvaged for use in the various EEP Units. Logs will be cut into shorter lengths (1 to 2 m) and placed in small random piles within the specified EEP Units. Root wads and stumps will be keyed into the ground. Branches will be cut up to form brush piles. Some woody material will be chipped and the fresh wood chips will be repurposed as mulch for use in the tree-planting operations. Some small wood chip piles may be placed in some EEP Units as potential egg-laying sites for certain snake species.

Where practical, woody debris piles and features will have a minimum footprint of 2 m x 2m and a minimum height of 1 m, to provide habitat for snakes, amphibians, small mammals and other wildlife.

As a general guideline, woody piles and features should be established at a minimum density of 25 woody debris piles/features per hectare. Woody debris piles/features will be installed prior to any trees being planted in a given area.

### 14.5 Wetland U1 Habitat Enhancements

At present, Wetland U1 is not a viable amphibian breeding pool because it lacks a sufficiently long hydroperiod. Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) were captured in U1 in both 2019 and 2020. The hydroperiod of Wetland U1 will be enhanced via mitigation through the WMS. The proposed habitat improvements will occur both within Wetland U1 and the land immediately adjacent. Implementation of the enhancement measures listed below will serve to increase the productivity of U1 for amphibian breeding, once the hydroperiod is restored:

- Remove undesirable woody vegetation (e.g., declining Red-osier Dogwood and shrub willows); thin out any White Ash regeneration;
- Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration);
- Plant Swamp Maple, Silver Maple and White Cedar around the edges of Wetland U1;
- Install habitat features: rock piles (10) and woody debris (10);
- Install egg mass attachment sites within Wetland U1 (e.g., small branches with fine twigs); and,
- Install some small clusters of rocks and woody debris within Wetland U1 to provide potential refuges for salamander larvae and juveniles.

### 14.6 Enhancement of Wetland Hydrology (Wetlands U1 and W36)

As described above in **Section 13.2.3**, the wetland hydrology in Wetlands U1 and W36 will be enhanced relative to existing conditions through the use of mitigation via the Water Management System (WMS). A diffuse discharge system will be used to maintain seasonal target water levels in Wetland U1 and the upper portion of Wetland W36. Wetland hydrology will be improved in terms of spring high water levels and hydroperiod. This will enhance the ecological function of these wetlands, especially with respect to amphibian breeding functions. In the past, Dufferin achieved similar enhancements through mitigation for Wetlands W5 and V2, and maintained wetland conditions in Wetlands W7 and W8, as part of the mitigation measures for the Milton Quarry Extension.

### 14.7 Disturbed Area Restoration (Unit DA1)

Unit DA1 is a small 0.062 ha disturbed area. It is a small excavation that contains water briefly in the spring. At times in the past, it was used as a “mud run” for off-road trucks and ATVs.

Unit DA1 will be restored by raising the grade in this area. Fill materials that will serve to create several potential snake hibernacula (e.g., mix of earth, rock rubble and woody debris). The feature will be capped with weathered rocks. A variation of the Toronto Zoo snake hibernaculum design will be used. Dufferin used a similar design to create a snake hibernaculum at the Mill Creek Pit in Puslinch Township.

Restoring Unit DA1 by filling the old excavation and creating several potential snake hibernaculum features will serve to:

- Discourage trespassers on ATVs;
- Prevent mole salamanders and other amphibians from being attracted to water that is only present for a short period in the springtime; and,
- Provide potential hibernation habitat for snakes and other wildlife.

This restoration work can be completed in conjunction with nearby WMS installation work when it is underway and heavy equipment will be available.

### 14.8 Ecological Enhancement Plan (EEP) Summary

The proposed MQEE Ecological Enhancement Plan (EEP) covers 10.55 ha of Dufferin land that will not be extracted, as shown on **Figure 39** and described on a unit-by-unit basis in **Table 20**.

Key elements of the MQEE EEP include the following:

- Tree-planting – Reforestation: 10.3 ha of land will be reforested as part of the EEP.
- Vegetation Management: Units TP-M1 and TP-M2 include patches of existing woody vegetation that will be managed, enhanced and interplanted with suitable native woody species.
- Habitat Features: Approximately 215 rock piles and 215 woody debris piles/features will be installed within the various EEP Units, as listed in **Table 20**.
- Wetland U1 Habitat Enhancements: Wetland U1 and the surrounding habitat will be enhanced through vegetation management, strategic woody plantings, installation of various habitat features, addition of egg attachment sites in the wetland,
- Enhancement of Wetland Hydrology (Wetlands U1 and W36): The WMS mitigation measures will be used to enhance wetland hydrology in Wetland U1 and the upper portion of Wetland W36.
- Disturbed Area Restoration: A 0.062 ha formerly excavated area will be restored and several potential snake hibernacula will be created.

The ecological enhancements described above are designed to complement the surrounding Provincial, Regional and Local Natural Heritage System and contribute towards an overall net ecological gain.

## 15.0 DESCRIPTION OF THE PROPOSED EXTRACTION, OPERATIONAL PLAN AND REHABILITATION PLAN

This section provides an overview of the proposed extraction, Operational Plan and Rehabilitation Plan for the MQEE. The details are provided on the MQEE Site Plans (MHBC 2021). This report section is organized under the following headings:

- 15.1 Description of Proposed Extraction and Operational Plan
- 15.2 Recommended Natural Environment Notes and Details for the Operational Plan
- 15.3 Rehabilitation Plan

### 15.1 Description of Proposed Extraction and Operational Plan

This section provides an overview of the Operational Plan for the proposed MQEE. Details are provided on the MQEE Site Plans (MHBC 2021) and a simplified version of the Operational Plan is provided on **Figure 40**.

The proposed MQEE extraction area will make available approximately 15 million tonnes of dolostone resource to the Milton Quarry. The proposed MQEE will be extracted in two phases. Aggregate extracted from the MQEE will be processed and shipped from the Main Quarry or the East Cell using existing internal haul routes. The existing entrance/exit on Dublin line will be used to ship aggregate to market using existing haul routes.

The proposed MQEE mining plan has been integrated with the existing Milton Quarry operations, and the East Cell extraction in particular, to minimize the overall disturbance from quarry operations. The proposed MQEE will be extracted as a southeastward extension of the East Cell and water resources mitigation will be provided by extending the WMS which is already in operation (see **Figure 38a**). Once aggregate extraction is completed, the proposed MQEE extraction footprint will be rehabilitated into lake, wetland and terrestrial features, all of which will be integrated with the contiguous East Cell Lake, the MQEE EEP areas, and the surrounding natural landscape, as described in **Section 15.3**.

The amount of overburden that will be made available from stripping operations in the MQEE extraction area is not sufficient for the creation of the proposed rehabilitation landforms described below in **Section 15.3**. As a result, Dufferin is proposing to import clean fill material, similar to the current approvals for the existing Milton Quarry. Importation of soil for rehabilitation will be in accordance with MNDMNRF and MECP requirements.

### 15.1.1 Quarry Phasing and Lifts

The proposed MQEE will be extracted in two phases as a continuation or extension of the East Cell extraction. The East Cell extraction will proceed southeastward, removing the common setback and rerouting of the WMS to the southeast of the MQEE extraction area as shown on **Figure 38a**.

The bulk of the bedrock resource is comprised of Amabel dolostone that will typically be removed by drilling and blasting in one or two lifts. The underlying Reynales dolostone may be extracted as a separate lower lift (by drilling and blasting or other excavation) and is included in the resource estimates.

The anticipated average annual extraction rate is 2.0 to 5.5 million tonnes per year, consistent with the hours of operation for the existing Milton Quarry.

Quarry operations will include first clearing and grubbing vegetation, followed by removal of topsoil and overburden. Bedrock extraction will occur by drilling and blasting the bedrock. Blasted rock will be transferred by truck to the existing primary crusher in the Main Quarry or be transferred by truck, loader, or conveyor to a portable primary crusher and processing plant that will be located in the active extraction cell. If the Main Quarry processing plant is removed when extraction commences in the proposed MQEE, then processing is proposed in the East Cell directly to the north of the proposed MQEE.

The active quarry area will be dewatered via a sump and piped discharge system in conjunction with the East Cell which is presently being dewatered. The sump(s) will be installed and modified as required to efficiently dewater the extraction area. Water will be collected and handled in the integrated WMS. Overall water consumption by extraction and processing operations is not expected to increase significantly from existing operations. The only extraction-related water demand in the proposed MQEE is the water used for dust control (GHD 2021).

Interim mitigation measures will be provided by extending the existing WMS recharge system to the south and east of the MQEE extraction area, as discussed above in **Section 13.2**. During the active quarry extraction and lake-filling period, the extended WMS will protect or enhance the water-dependent natural features to the east and southeast that would potentially be affected in the absence of mitigation water resources (GHD 2021).

### 15.1.2 Operations Water Management

The proposed MQEE operations will not result in significant additional consumptive water uses such as aggregate washing, as these activities will continue similar to past and current operations (GHD 2021). These operations may continue to occur in the Main Quarry area or be moved to the MQEE/East Cell area. The operations water handling components for the proposed MQEE involve:

- Quarry dewatering
- Surface water runoff control
- Dust control

These components are discussed below. The WMS and recharge system operations were described in **Section 13.0**.

#### 15.1.2.1 Quarry Dewatering

The extraction operations will be completed in a dry (dewatered) state, which requires the dewatering of the extraction area. The existing Permit To Take Water (PTTW) and Environmental Compliance Approval (ECA) will be amended as required (GHD 2021).

Infiltrating groundwater and precipitation water will be collected and diverted into the existing integrated WMS system and rehabilitation program for the Main Quarry, North Quarry, West Cell, and East Cell. Any excess water (i.e., not required for mitigation system storage or pumping) will be handled in an appropriate manner through the WMS to optimize the beneficial use of all available water (GHD 2021).

The active quarry area will be dewatered using sumps constructed through the quarry floor, into the top of the Cabot Head shale (up to approximately 5 m below the quarry floor). The sump(s) will be installed and modified as required to efficiently dewater the extraction area. Water will be pumped from the sump(s) and conveyed through a watermain to the WMS in the North Quarry or Main Quarry (GHD 2021).

#### 15.1.2.2 Surface Water Runoff Control

The proposed Extension lands are generally situated on topographically high areas (**Figures 6** and **7**). Surface water runoff patterns will therefore be primarily away from the extraction areas in their current direction. Stripping operations will include appropriate mitigative measures, such as berm construction, to prevent unwanted surface water runoff into the quarry (GHD 2021).

#### 15.1.2.3 Dust Control Water Consumption

The only extraction-related water consumption in the proposed Extension is water for dust control in the proposed Extension. Dust control is required for the working face area and haul route to the primary crusher and processing plant. Most dust control water is lost to evaporation (GHD 2021).

#### 15.1.2.4 Fuel/Maintenance Management and Spill Response Plan

Historical operating experience and aggregate operations data indicate that there is little to no potential risk of adverse effects resulting from fuel handling and maintenance activities at aggregate extraction operations, including at quarries (GHD 2021).

For the proposed MQEE, all fuel handling and equipment maintenance activities will be undertaken in such a manner to minimize the risk and magnitude of any potential release into the environment. Dufferin maintains, trains, and adheres to comprehensive Fuel Management and Spill Response Plans which are part of their Environmental Management System (GHD 2021).

There will be no bulk fuel storage in the proposed MQEE. Mobile equipment will be refueled in the Main Quarry. Non-mobile equipment (e.g., primary crusher) will be refueled using fuel trucks and any spills will be immediately cleaned up in accordance with the Spill Response Plan (GHD 2021).

Equipment maintenance will be performed at the Main Quarry Maintenance Facilities (or off-site) to the extent feasible. When maintenance must be conducted in the proposed MQEE, appropriate care will be taken and any spills will be immediately cleaned up in accordance with the Spill Response Plan (GHD 2021).

## 15.2 Recommended Natural Environment Notes and Details for the Operational Plan

### 15.2.1 Endangered Species Act (ESA 2007)

It is likely that MECP will require that Dufferin Aggregates apply for an Endangered Species Act (ESA) 17(2)(c) “Overall Benefit” Permit for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population). A portion of the MQEE extraction area may be considered habitat for these taxa and the footprint of the WMS is partly located in habitat for these taxa. The potential effects of the proposed MQEE on the Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) are discussed in **Section 16.1.2**. The relevant sections of Ontario Regulation 242/08 will be followed with respect to Butternut, Bobolink and Eastern Meadowlark, as discussed in **Sections 16.1.1** and **16.1.3**, respectively.

**Recommended Site Plan Note:**

> No development is permitted within the habitat of Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) unless authorized by an Endangered Species Act (ESA) Permit or other authorization from the Ministry of Environment, Conservation and Parks (MECP). A copy of the ESA Permit will be provided by the proponent to the Ministry of Northern Development, Mines, Natural Resources and Forestry (MNDMNRF) Aggregate Inspector.

### 15.2.2 Demarcation of Limits of Disturbance

As indicated above, a portion of the MQEE extraction area may be considered habitat for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) and the footprint of the WMS is partly located in habitat for these taxa, as shown on **Figure 26**. In the open field areas that will not be extracted a range of ecological enhancements are proposed as part of the Ecological Enhancement Plan (EEP), as described in **Section 14.0** and shown on **Figure 39**. Therefore, it is important that any quarry-related activities are restricted to the extraction area, the WMS footprint and some other small areas that will be used temporarily during WMS installation (e.g., for the staging of equipment and materials) and subsequently restored. The limits of disturbance must be clearly demarcated in the field with monument markers, construction fencing, etc., as necessary, to prevent encroachment into adjacent habitats and future ecological enhancement areas.

**Recommended Site Plan Notes:**

> The limit of extraction shall be clearly demarcated with monument markers (e.g., metal T-bars or equivalent) with maximum spacing of 20 m between markers. In

proximity to the Significant Woodland boundary and Ecological Enhancement Plan (EEP) areas, the maximum spacing of monument markers shall be 10 m and signage stating “Ecological Area – No Disturbance” or equivalent wording shall be installed.

The limits of disturbance for the WMS installation must be clearly demarcated, especially in the vicinity of the Significant Woodland, wetlands, buffer areas and EEP areas, prior to commencing WMS installation works.

### 15.2.3 Silt/Exclusion Fencing Layout and Salamander Excluder Locations

The recommended silt/exclusion fence layout is shown on **Figures 38a** and **39**. The silt/exclusion fencing is intended to serve two purposes: a) prevent/minimize the movement of sediment into areas that are to be protected; and, b) to prevent small wildlife such as salamanders, frogs, toads, snakes, etc. from encroaching into the extraction area. In particular, the silt/exclusion fencing is intended to prevent Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) from encroachment into the extraction area.

In areas where the extraction limit is 20 m from the Significant Woodland boundary, the silt/exclusion fencing is located along the edge of the 10 m minimum Significant Woodland buffer. Elsewhere the silt/exclusion fence is located along the limit of extraction. Where the exclusion perimeter crosses the watermain and access road, *Salamander Excluders* will be set into the road base. A drawing of the Salamander Excluder is shown on **Figure 38b**. Essentially it is a metal trough that can be driven over. The trough is connected to the silt/exclusion fence at each end. The Salamander Excluder is installed such that if a salamander falls into it, they can only get out on the “safe” side of the silt/exclusion fence. This allows the access road to be used for WMS monitoring and maintenance, while maintaining a safe perimeter that will exclude salamanders from the extraction area. The same approach was used for the East Cell, in proximity to Wetlands W7 and W8 and elsewhere.

The watermain access road between the two Salamander Excluders will only be used for WMS monitoring and maintenance, ecological enhancement works and ecological monitoring. It will not be used for operational purposes, i.e., it will not be used to transport overburden, explosives, drills, heavy equipment, etc. Signage will be erected at the two Salamander Excluders indicating these restrictions.

The exclusion fencing make take the form of heavy-duty silt fencing which must be periodically maintained and potentially replaced, or a more permanent form of wildlife fencing such as Animex Wildlife Fencing or equivalent.

**Recommended Site Plan Note:**

> Silt/Exclusion fencing will be installed per the layout shown on Natural Environment Technical Report (Goodban Ecological Consulting Inc. 2021) Figure 38a and Site Plan Operational Plan. Salamander Excluders will be installed at the locations shown on Natural Environment Technical Report (Goodban Ecological Consulting Inc. 2021) Figure 38a and Site Plan Operational Plan. Silt/Exclusion fencing may be heavy-duty silt fencing or Animex Wildlife Fencing or equivalent. The condition of the fencing must be monitored on a regular basis and it must be promptly repaired as necessary.
>
> The watermain access road located between the two Salamander Excluders shall only be used for WMS monitoring and maintenance, ecological enhancement works and ecological monitoring. It will not be used for operational purposes.

### 15.2.4 Timing of Tree-clearing and Stripping Operations

Stripping of topsoil will be timed to avoid the bird breeding season, particularly for Bobolink and Eastern Meadowlark. Stripping of topsoil should not occur between April 1 and August 26. It is recommended that the operator should schedule the stripping of topsoil and ground vegetation to avoid this period, to remain in compliance with Sections 9 (Species Protection) and 10 (Habitat Protection) of the Endangered Species Act. Stripping of overburden may occur during the bird breeding season, provided that the topsoil and ground vegetation had already been removed.

**Recommended Site Plan Note:**

> Tree-clearing will not occur during the active period for bats and the bird breeding season, i.e., no tree-clearing between April 1 and October 31. This will avoid potential contraventions of the Migratory Bird Convention Act and the Endangered Species Act.
>
> Stripping of topsoil and ground vegetation will not occur during the bird breeding season, i.e., no topsoil and ground vegetation stripping between April 1 and August 26. This will avoid potential contraventions of the Migratory Bird Convention Act and the Endangered Species Act. Stripping of overburden may occur during the bird breeding season, provided that the topsoil and ground vegetation have already been removed.

### 15.2.5 Salvage of Woody Material, Weathered Rock, etc.

Most of the former agricultural fields have had field stones removed over the years, so large areas contain relatively few rocks or rock piles, except where they had been deposited by the early farmers along fencelines and in individual piles. During clearing and stripping operations, boulders, rocks and cobbles will be salvaged and repurposed as rock piles in the various EEP Units and diffuse discharges. In addition, boulders, rocks and cobbles may be salvaged directly from the extraction area as stripping occurs.

The removal of hedgerows CUHa and CUHb, and most of Woodland A and Woodland B, provide a source of logs, stumps, root wads, branches, etc., that will be salvaged for use in the various Ecological Enhancement Plan (EEP) Units and future quarry rehabilitation.

The salvage of boulders, rocks and cobbles, and woody debris (logs, stumps, root wads, branches, etc.) will provide an essential source of materials to be used to create habitat features as part of the Ecological Enhancement Plan (EEP) and future quarry rehabilitation. These materials should be stockpiled within the extraction area.

**Recommended Site Plan Notes:**

> Boulders, rocks and cobbles will be salvaged from fencelines and stone piles within the extraction area. Weathered rocks will also be salvaged during stripping operations. This material will be stockpiled within the extraction area for use as part of the Ecological Enhancement Plan (EEP), diffuse discharges, and future quarry rehabilitation.
>
> Logs, stumps, root wads and branches will be salvaged during clearing and grubbing operations. Tree tops may be chipped. The salvaged woody material and wood chips will be stockpiled within the extraction area for use as part of the Ecological Enhancement Plan (EEP) and future quarry rehabilitation.

### 15.2.6 WMS Installation

A series of restrictions and design considerations for the installation of the Water Management System (WMS) are provided in **Section 13.2.5** of this report. These restrictions and design considerations are also included in the AMP Addendum.

**Recommended Site Plan Note:**

> The Water Management System (WMS) shall be installed consistent with the restrictions and design considerations provided in Section 13.2.5 of the Natural Environment Technical Report (Goodban Ecological Consulting Inc. 2021) and the AMP Addendum (GHD and Goodban Ecological Consulting Inc. 2021).

### 15.2.7 Ecological Enhancement Plan (EEP) Implementation

The details of the Ecological Enhancement Plan (EEP) are provided in **Section 14.0**, **Figure 39** and **Table 20** of this report. The EEP details are also provided on the Site Plans (MHBC 2021).

**Recommended Site Plan Note:**

> The Ecological Enhancement Plan (EEP) shall be implemented as per the details in the stand-alone Ecological Enhancement Plan (EEP) and Rehabilitation Plan Report (Goodban Ecological Consulting Inc. 2021), Natural Environment Report (Goodban Ecological Consulting Inc. 2021) Section 14.0, Figure 39 and Table 20, and Site Plan Rehabilitation Plan.

### 15.2.8 Blasting (Peregrine Falcon)

As described in **Sections 5.4.4.2** and **9.3.1** of this report, Peregrine Falcons nested at two separate locations on a cliff in the East Cell during the 2020 and 2021 breeding seasons. In 2021 the nest was located in proximity to the southeast quarry face which is near the common boundary with the MQEE property. There is a small ledge adjacent to and just below the 2021 nest site on the cliff, just in the corner of the face along Townline and the face parallel to the common boundary with the MQEE.

The Peregrine Falcon is listed as a Special Concern species in Ontario and it is protected under the Fish and Wildlife Conservation Act. The potential effects of the MQEE on the Peregrine Falcon are discussed in **Section 16.7**.

**Recommended Site Plan Notes for the MQEE:**

> Peregrine Falcon
>
> 1) Each year, between early April and mid May, a qualified ecologist will check to see if Peregrine Falcons are present and nesting within the area to be extracted.
>
> 2) In the event the qualified ecologist confirms Peregrine Falcons are nesting within the area to be extracted or within the adjacent CRH Licence ID No. 60862:
>
> a) Quarry personnel shall not walk within 100 m of an active falcon nest during the period April 15 to July 31 to the extent feasible.
>
> b) Quarry equipment (such as trucks and loaders) shall not be operated within 25 m of a nest between April 15 to July 31.

c) When extending the existing south face of the quarry southeastward into the MQEE extraction area, blasting shall not occur within 125 m of the nest while it is occupied and overpressure shall not exceed 140 dB. During the egg-laying and incubation period (April 20 to June 20), the ground vibration at the nest will not exceed 35 mm per second and overpressure shall not exceed 140 dB.

3) A qualified ecologist will confirm when the birds are no longer using the nest and then the restictions listed in note 2 above will no longer apply.

### 15.3 MQEE Rehabilitation Plan

This section describes the MQEE Rehabilitation Plan, under the following headings:

- 15.3.1 Rehabilitation – Water Resources;
- 15.3.2 Rehabilitation – Natural Environment; and,
- 15.3.3 MQEE Rehabilitation Plan Summary

#### 15.3.1 Rehabilitation – Water Resources

##### 15.3.1.1 Overview

From a water resource perspective, the objective of the rehabilitation plan is to create an end use that protects or enhances the existing water resources and water-dependent natural features with the minimum amount of active management or engineering works necessary to achieve this objective. To that end, the existing Milton Quarry Rehabilitation Plan includes the creation of three separate lakes in the North Quarry, West Cell, and East Cell. These three lakes are intended to provide passive support to the surrounding groundwater regime, minimizing the need for any actively-pumped recharge water in the long term (GHD 2021).

The rehabilitation of the MQEE will include the extension of the East Cell Lake area to include the MQEE extraction area as shown on **Figures 41** and **43**. Within the MQEE, overburden or other suitable fill will be placed to create a variety of landforms, shorelines and shallow water areas, wetlands and upland habitats. The lake will include exposed quarry wall areas, particularly in the east and southeast portions of the extraction area that will serve to support the groundwater levels in the adjacent area that includes a number of wetlands that are at least partially groundwater-dependent (GHD 2021).

During the lake filling period the recharge system will continue to operate to maintain groundwater levels within the MQEE study area and the water levels in Wetland U1 and the upper portion of Wetland W36. As the lake level rises during filling, the recirculation rate of water back into the quarry will be reduced due to the lowering of the hydraulic gradient between the recharge alignment and the quarry water level, thereby reducing the recharge system flow and reliance (GHD 2021).

#### 15.3.1.2 Background on Existing Approved Rehabilitation

As noted above, the existing approved Rehabilitation Plans for the Milton Quarry and the Milton Quarry Extension include the creation of three separate lakes in the North Quarry, West Cell, and East Cell. The water levels of the three lakes are set primarily to be protective of the Sixth Line Tributary and the associated wetlands to the west and north. The East Cell Lake is also intended to support groundwater levels to the northeast and east, to protect a number of groundwater-dependent wetlands. Once the three lakes are filled with water to the required levels, limited active mitigation will be necessary. This mitigation approach is embedded in the existing approvals and legal agreement requirements (GHD 2021). The existing requirements include:

- Seasonal pumping and gravity flow to maintain the three lake levels as well as managing dewatering flow from the east side of the Main Quarry and the North Quarry Lake, returning it to the Reservoir;
- Seasonal pumping to maintain the optimum water level and hydroperiod in the three onsite wetlands (V2, W7 and W8); and,
- Possible seasonal operation of a limited portion of the East Cell recharge well system to support wetlands to the northeast and east.

Maintaining the three lakes at controlled elevations via pumping and gravity flows will allow the passive mitigation of the Sixth Line Tributary system and Wetland W5 by maintaining the lakes at a higher elevation than those features. This control requires seasonal pumping to the East Cell Lake and controlled gravity overflow cascading to the West Cell and then the North Quarry. Any excess water in the North Quarry will be pumped back to the Main Quarry (GHD 2021).

The three onsite Wetlands V2, W7, and W8 are located within the Licence limit of the East Cell. These wetlands are in close proximity to the extraction limit and they are at elevations that are slightly above the planned East Cell Lake level. It is not anticipated that these wetlands will experience an optimal or desired water regime without some continued seasonal augmentation of water levels. Therefore, the Milton Quarry approvals provide for the continued use of the existing diffuse discharges following lake filling to ensure that the wetland hydrology of each of the onsite wetlands is maintained in an optimal fashion (GHD 2021).

Under the existing Milton Quarry plans and approvals, the wetlands located to the north and east of the East Cell will be partially mitigated by the creation of the three lakes, however the East Cell Lake level may not be high enough to fully mitigate all the wetlands, particularly those that are close to the East Cell and particularly during the spring and early summer period. The potential limitations include the relative elevations (i.e., the lake levels may not reach a sufficient elevation to support groundwater discharge to these features) and the dampening of seasonal water levels as discussed below. To fully mitigate the wetlands to the north and east under rehabilitation conditions, limited seasonal post-quarrying operation of the interim groundwater recharge system may be required in this area as a requirement of the existing approvals. This aspect will be evaluated in detail as part of the ongoing monitoring and mitigation program in accordance with the AMP as the quarry develops and the East Cell Lake filling is completed (GHD 2021).

Although, the lakes will tend to dampen the natural groundwater level fluctuations, the resultant natural seasonal fluctuations in the bedrock away from the lake may be great enough to allow ephemeral/intermittent flooding of the nearby wetlands once the lakes are full. This would allow the recharge well system to be discontinued without any significant change in function. However, this is difficult to forecast with confidence and, as such, contingency post-quarrying operation of the groundwater recharge system in this area is part of the existing quarry requirements and approvals (GHD 2021).

#### 15.3.1.3 MQEE Rehabilitation – Water Resources

As described above, the proposed MQEE Rehabilitation Plan is integrated with the existing approved Rehabilitation Plan for the East Cell. This lake-based rehabilitation plan includes the passive support of the surrounding groundwater levels with the East Cell Lake that has a regulated water level, the support and enhancement of the adjacent Wetland U1 and Wetland W36 through the seasonal use of the interim diffuse discharge mitigation, and the potential seasonal use of a limited portion of the recharge well system, similar to the approved East Cell requirements (GHD 2021).

The East Cell/MQEE lake will have a water level elevation of approximately 333 m AMSL. This is the approved lake level for the East Cell and it appears to be suitable for the proposed extension of the lake into the MQEE area. The AMP and AMP Addendum include provisions to review and refine this level, if warranted, prior to completion of final rehabilitation (GHD 2021).

The lake level will passively support the groundwater levels to the southeast and east of the proposed MQEE through the quarry walls exposed to the lake as well as leakage through fill material placed in the lake area. The planned strategic placement of the fill and the generally permeable nature of the quarry walls allow the lake level to suitably support groundwater levels (GHD 2021).

The proposed diffuse discharge recharge system will continue to be used on a seasonal basis to maintain an optimum water regime in Wetland U1 and the upper portion of

Wetland W36, to maintain and enhance the ecological function of these wetlands. This mitigation approach is similar to the long-term operations planned for Wetlands V2, W7, and W8 as part of the existing Milton Quarry requirements and approvals (GHD 2021).

Similar to the existing Milton Quarry rehabilitation, the passive groundwater level mitigation provided by the larger East Cell Lake may not result in the optimum high groundwater levels during the spring period that are necessary to support the ecological function of the nearby wetlands. Furthermore, the locations of the proposed MQEE recharge wells may be complementary to the existing recharge well locations associated with the East Cell and may benefit the operational effectiveness of any necessary recharge well operations for the existing quarry rehabilitation. Therefore, it is proposed to consider potential seasonal recharge well operation of some of the proposed MQEE interim recharge well system. The needs for any such operations would be very limited in terms of the duration, number of wells, and recharge flows relative to the requirements during the interim extraction and lake-filling period (GHD 2021).

Monitoring is proposed to continue beyond the interim (extraction and lake filling) period to ensure the protection of water resources and water-dependent natural features, and to assist in managing the lake level and control. These programs are identified in the AMP Addendum and will be reviewed and refined during the active quarry extraction and lake filling monitoring periods (GHD 2021).

### 15.3.2 Rehabilitation – Natural Environment

Large portions of the existing Milton Quarry have already been rehabilitated and designated Escarpment Natural Area and Escarpment Protection in the Niagara Escarpment Plan. The rehabilitation approach for these areas employed a variety of post extraction landforms to include cliffs, wooded area, and open lakes with islands and wetlands. The forest and wetland communities are complimentary to the surrounding escarpment landscape. To date, over 150,000 trees have been planted, many during the 26 annual Earth Day Events held at the site. Monitoring of the rehabilitated area has confirmed the presence of 340 species of vascular plants, 155 species of birds, including at least 61 species of breeding birds, 6 species of breeding amphibians, 34 species of butterflies, 30 species dragonflies and damselflies, and other wildlife species have been observed in the rehabilitated portions of the quarry.

The Ecological Enhancement Plan (EEP) and Rehabilitation Plan for the MQEE have been designed to enhance the ecological features and functions of the Provincial, Regional and Local Natural Heritage System. The goals and principles for the MQEE EEP and Rehabilitation Plan were provided above in **Section 14.1**. The MQEE Rehabilitation Plan is shown on **Figure 41a**, with rehabilitation details provided on **Figures 41b** and **41c**, as well as on the Site Plans (MHBC 2021).

As noted above, since there is a shortfall of available topsoil and overburden within the MQEE extraction area, Dufferin is proposing to import clean soil similar to the current approvals for the existing Milton Quarry.

The 15.9 ha extraction area will be rehabilitated to the following landforms, features and habitats:

- Deep Lake
- Wetlands
- Islands
- Reforestation
- Cliffs

Each of these rehabilitation elements are discussed below.

#### 15.3.2.1 Deep Lake

The extended East Cell Lake is designed to maintain passive movement of groundwater to support the water-dependent natural features surrounding the proposed MQEE. The lake will cover approximately 7.7 ha and it will incorporate aquatic features such as varied shorelines with shallow nearshore habitats and shoals to provide spawning and foraging habitat for fish and other wildlife. The deep-water areas will also provide habitat for a variety of top predator and game species that utilize deeper water habitats.

Deeper water cover will be provided by creating several reef shoals and treatment of the backfill slopes and quarry faces that will be submerged upon lake filling. The shoals will be created in deep water but will rise up to within 1-2 m of the lake surface, with various exposures. They will be comprised of boulder and cobble material, with cobble faces on the exposed ‘wave-washed’ northwest faces. The addition of submerged boulders, patches of cobble/smaller rock and boulders, logs and root masses shall also be included. The upper 5 m of some of the vertical quarry walls will be selectively blasted in some areas to create irregular faces and underwater shelves that will provide deeper water cover. Woody debris (e.g., large stumps), large boulders and rock clusters will be incorporated into the backfill slopes down to depths of approximately 5 m to provide cover in these areas.

#### 15.3.2.2 Wetlands

The shoreline wetlands will cover approximately 2.7 ha and they will be interconnected with terrestrial and aquatic habitats. The shoreline wetlands will have water depths ranging from areas that are seasonally inundated to permanently inundated areas up to 2.0 m deep in some locations.

The following are the target shoreline wetland and cove communities:

- Mineral Open Beach/Bar (BBO1)
- Willow Gravel Shrub Beach Type (BBS1-2)
- Mineral Shallow Marsh Ecosite (MAS2)
- Mixed Shallow Aquatic Ecosite (SAM1)
- Mineral Thicket Swamp Ecosite (SWT2)

The shallower wetlands (generally < 1.0 m) will predominantly be shallow marshes, meadow marshes or thicket swamp, covering approximately 1.5 ha. The marshes will support a mix of Narrow-leaved and Common Cattails, various sedges (e.g., *Carex* spp., *Eleocharis* spp., *Scirpus* spp. and *Schoenoplectus* spp.) and scattered shrubs (mainly *Salix* spp.). At greater depths floating-leaved and submergent aquatic species such as Pondweeds (*Potamogeton* spp.), Common Bladderwort (*Utricularia vulgaris*) and Stonewort (*Chara* sp.) will become established. The deeper wetlands will cover approximately 1.2 ha. Wetland plant plugs and seeds from local wetlands and other appropriate sources can be used to introduce the desired native emergent and floating-leaved species, however many wetland species will typically colonize naturally if the suitable physical conditions are correctly established.

Grading (coarse and fine) will be undertaken to sculpt an irregular shoreline and produce a variety of slopes, both in shallow water and above water, and transitioning to nearshore/upland areas and deep-water areas. Island and cove environments will also be incorporated into the shoreline grading plan (see **Section 15.3.2.3** Islands). If suitable organic material is available, it will be added to provide a medium for plant germination and growth. It is critical that any organic materials are not contaminated by seeds, roots or other propagules of invasive plant species such as European Common Reed (*Phragmites australis* ssp. *australis* +), Purple Loosestrife (*Lythrum salicaria* +), etc. Gravel or sand beaches will be created along the shorelines. Granular (gravel, sand, cobble) areas in the shallow water and on shoals will reduce the density of vegetation growth but provide habitat for other aquatic organisms (benthic invertebrates) and foraging fish, as well as spawning habitat for other fish species.

The addition of submerged and partially submerged rocks/boulders, root masses and logs will provide basking opportunities for turtles, refuge and attachment sites for invertebrates and fish, and foraging/perching sites for birds.

#### 15.3.2.3 Islands

At least three islands covering approximately 0.4 ha will be created as part of the MQEE Rehabilitation Plan. The islands will be capped with various granular substrates (gravels and coarse sands), as well as patches of boulders and cobbles. The islands will be planted with suitable shoreline and tallgrass prairie species such as Little Bluestem

(*Schizachyrium scoparium*), Switchgrass (*Panicum virgatum*), Big Bluestem (*Andropogon gerardii*), etc. At least 10 logs and/or stumps/root wads will also be placed on the islands.

The following community types are expected to develop on the islands:

- Mineral Open Beach/Bar (BBO1)
- Willow Gravel Shrub Beach Type (BBS1-2)
- Dry Tallgrass Prairie Ecosite (TPO1)

Approximately nine turtle nesting sites will be constructed on the islands (at least three per island). Dimensions will be approximately 8-10 m by 4-5 m and the nesting areas will be oriented to provide south and/or southwest exposures. Any topsoil will be stripped and heavy-duty landscape fabric will be installed to discourage woody plant growth. Suitable granular material will be piled on top of the landscape fabric (up to 1.5 m deep).

#### 15.3.2.4 Reforestation

The woody species selected for planting and the forest types targeted are complementary to and reflective of the surrounding landscape. The reforestation approach will generally be similar to that described for the Ecological Enhancement Plan (EEP) as in **Section 14.2**. Since the reforestation will occur on newly created uplands located above the final East Cell Lake elevation, the emphasis will be on planting faster-growing, pioneering species. Approximately 5.1 ha of rehabilitated area will be reforested and 2.1 ha is within 300 m of Wetland U1 and the upper portion of Wetland W36.

*Woody Species Selections*

The following are the reforestation target community types for the MQEE Rehabilitation Plan:

- Cultural Woodland Ecosite (CUW1)
- Dry-Fresh Cedar Coniferous Forest Ecosite (FOC2)
- Fresh-Moist White Cedar Coniferous Forest Ecosite (FOC4)
- Dry-Fresh White Cedar Mixed Forest Ecosite (FOM4)
- Fresh-Moist White Cedar - Hardwood Mixed Forest Ecosite (FOM7)
- Dry-Fresh Oak – Maple – Hickory Ecosite (FOD2)
- Dry Fresh Poplar – White Birch Deciduous Forest Ecosite (FOD3)

The main successional species to be planted are White Birch, Trembling Aspen, Bigtooth Aspen, Balsam Poplar, Pin Cherry (*Prunus pensylvanica*), White Cedar, White Pine and Red Cedar (*Juniperus virginiana*), as well as other suitable native woody species.

In some areas with exposure to the south and southwest, longer-lived species such as Bur Oak, Red Oak, Bitternut Hickory, etc. will be planted with some White Pine.

Some conifer patches will be established to provide some winter cover for wildlife, primarily using White Cedar and White Pine.

Some patches of tall shrub species such as Alternate-leaved Dogwood, Chokecherry, Nannyberry, Highbush Cranberry (*Viburnum trilobum*), etc. will also be planted in some areas, to provide varied habitats for wildlife.

*Planting Approach*

Prior to planting, any non-native woody species such as Common Buckthorn (+) and other non-desirable species, e.g., Manitoba Maple (*Acer negundo*), ash regeneration, etc., will be removed and stumps treated with herbicide to prevent re-sprouting. In some areas, control of herbaceous vegetation (e.g., field goldenrods) may be necessary to create suitable conditions for tree planting. Planting will occur during early spring or late fall, to minimize transplant shock, with spring planting being preferred. Nursery stock will be derived from local seed sources, i.e., from Seed Zone 34, or adjacent seed zones if necessary. Where possible, seed will be collected from the adjacent natural areas on Dufferin land will be used to produce suitable material for planting. The nursery stock to be planted will generally be a mix of plugs and container-grown stock.

Areas proposed for tree-planting/reforestation will be planted at a density of 2000 trees/ha (2.0 x 2.5 m spacing) in order to maximize the probability that planted areas will meet woodland density targets in the short and long term. Natural tree regeneration may also contribute to the woodland density targets.

*Maintenance and Monitoring*

Competing herbaceous vegetation will be controlled by placing mulch or installing Cocodisc weed control mats around each planted tree or shrub (up to 50 cm radius of mulch around each planting, depending on conditions). Where access permits, plantings will be watered during dry periods (defined as a 14-day period between May and September with less than 25 mm of precipitation) until establishment has occurred (i.e., in Year 1 and 2 following planting).

Plantings shall be monitored at least annually until “free-to-grow” conditions have been achieved. At the free-to-grow condition, the survival (stocking standard) of planted trees shall be a minimum of 50%. If survival is less than 50%, replacements will be planted in order to achieve a density of 1000 trees/ha. For any replacement plantings, the species mix may be changed in order to utilize woody species with the highest survival rates for a particular area.

#### 15.3.2.5 Cliffs

Approximately 673 m of cliffs will be created as part of the MQEE Rehabilitation Plan. While the former quarry faces will not be planted with trees or shrubs, it is anticipated that some woody vegetation will become established along the cliff rims and on the cliffs themselves, as is the case elsewhere at the Milton and Acton Quarries. The most frequently occurring species on the existing cliffs are White Birch, Trembling Aspen, White Cedar and White Pine.

It is anticipated that the following cliff community types will develop naturally over time:

- Carbonate Open Cliff Ecosite (CLO1)
- White Cedar Treed Carbonate Cliff Type (CLT1-1)
- White Birch – Aspen Treed Carbonate Cliff Type (CLT1-3)

Under the rehabilitation condition when the East Cell Lake water level is around 333 mASL and the height of the cliffs will range from 5 to 10 m. Ontario Peregrine Falcon nests have been found on cliffs as low as 9 m above ground, but most nests are 11 m or higher (Peck and James 1983). It is possible that the Peregrine Falcon will use the MQEE cliffs because they will be above water rather than land, so this will offer better protection from predators. In addition, suitable cliff sites are scarce, so they may use those that would otherwise be suboptimal. Common Ravens may also use the cliffs, similar to the Peregrine.

### 15.3.3 MQEE Rehabilitation Summary

The MQEE Rehabilitation Plan will cover the 15.9 ha extraction area and include the following main rehabilitation themes:

- Deep Lake = 7.7 ha
- Shallow Wetland = 1.5 ha
- Deep Wetland = 1.2 ha
- Islands = 0.4 ha
- Reforestation = 5.1 ha
- Cliffs = 673 m

The landforms and habitats that will be created are complementary to the Escarpment landscape and well connected with the adjacent EEP areas, existing Halton Forest

North ANSI and the Cox Tract, as well as with the East Cell Rehabilitation Plan features.

It is anticipated that the following community types will develop as a result of the MQEE Rehabilitation Plan:

- Mineral Open Beach/Bar (BBO1)
- Willow Gravel Shrub Beach Type (BBS1-2)
- Carbonate Open Cliff Ecosite (CLO1)
- White Cedar Treed Carbonate Cliff Type (CLT1-1)
- White Birch – Aspen Treed Carbonate Cliff Type (CLT1-3)
- Dry-Fresh Cedar Coniferous Forest Ecosite (FOC2)
- Fresh-Moist White Cedar Coniferous Forest Ecosite (FOC4)
- Dry-Fresh White Cedar Mixed Forest Ecosite (FOM4)
- Fresh-Moist White Cedar - Hardwood Mixed Forest Ecosite (FOM7)
- Dry-Fresh Oak – Maple – Hickory Ecosite (FOD2)
- Dry Fresh Poplar – White Birch Deciduous Forest Ecosite (FOD3)
- Cultural Woodland Ecosite (CUW1)
- Cultural Thicket Ecosite (CUT1)
- Dry Tallgrass Prairie Ecosite (TPO1)
- Mineral Thicket Swamp Ecosite (SWT2)
- Mineral Shallow Marsh Ecosite (MAS2)
- Mixed Shallow Aquatic Ecosite (SAM1)

## 16.0 POTENTIAL EFFECTS ON SIGNIFICANT NATURAL HERITAGE FEATURES

This section provides discussion on the potential effects of the MQEE on the following significant natural heritage features:

- 16.1 Habitat of Endangered and Threatened Species
- 16.2 Significant Wetlands
- 16.3 Significant Woodlands
- 16.4 Significant Wildlife Habitat
- 16.5 Significant Areas of Natural and Scientific Interest (ANSIs)
- 16.6 Fish Habitat
- 16.7 Peregrine Falcon

## 16.1 Potential Effects on Habitat of Endangered and Threatened Species

This section provides discussion on the potential effects on habitat of the following Endangered and Threatened Species:

- 16.1.1 Butternut
- 16.1.2 Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population)
- 16.1.3 Birds
- 16.1.4 Bats

### 16.1.1 Potential Effects on Butternut

Five live Butternuts were observed at the locations shown on **Figure 24**: one tree (BN02) and four seedlings (BN01, BN03-BN05). One seedling (BN01) is located within the East Cell licence limit and it would be removed as part of the MQEE.

Dufferin Aggregates had previously registered the Milton Quarry Extension under the Section 23.14 (Pits and Quarries) of Ontario Regulation 242/08. Dufferin follows the requirements of a Mitigation Plan for Butternut that is in place. A Butternut Health Assessment (BHA) will be completed for seedling BN01 by a qualified Butternut Health Assessor prior to its removal. If the seedling is assessed to be a Category 2 (Retainable) individual, then at least two Butternut seedlings from Seed Zone 34 will be planted elsewhere on Dufferin land. The plantings will be tended and maintained for at least two years.

### 16.1.2 Potential Effects on Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population)

The potential effects of the MQEE on Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) are discussed below under the following headings:

- 16.1.2.1 Extraction Footprint
- 16.1.2.2 WMS Footprint
- 16.1.2.3 Mitigation for WMS Installation and the Extraction Footprint
- 16.1.2.4 Breeding Pools for Salamanders
- 16.1.2.5 Ecological Enhancement Plan (EEP)
- 16.1.2.6 Endangered Species Act

#### 16.1.2.1 Extraction Footprint

Based on an analysis of the Jefferson Salamander Habitat Regulation as shown on **Figure 26**, the proposed MQEE extraction footprint overlaps with approximately 3.99 ha of what is conservatively mapped as potential migration and dispersal habitat. This habitat is almost entirely comprised of old field vegetation, which is not the preferred habitat of the Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population). Salamanders may be susceptible to desiccation and predation when they move across open fields between forested areas and breeding pools. The habitat that will be removed by extraction is likely not actually used for migration or dispersal. The direct routes between Wetland U1 and the nearby forest do not overlap with the extraction footprint. Wetland U1 is approximately 115 m away from forest to the northwest, 115 away from forest to the northeast, and approximately 220 m from forest to the southeast. It is more likely that salamanders would select the more direct routes from the forest to Wetland U1, rather than wandering further out into the open fields and taking a more circuitous route.

#### 16.1.2.2 WMS Footprint

The WMS footprint is shown on **Figures 38a** and **39**. The WMS footprint within habitat for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) is partially located within migration habitat (shown in in light green on **Figure 26)**, and small segments of feeder lines with recharge wells and two diffuse discharges are located within foraging and hibernation habitat (shown in light orange on **Figure 26**). A summary of the WMS footprint within the habitat of Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) is provided in **Table 22**.

*WMS within Migration Habitat*

Within migration habitat, the 10 m wide disturbance zone for the buried watermain, and for the feeder lines and access leading to a CV Hut near EEP Units TP-RB1 and TP-RB2, covers approximately 0.926 ha (926 m length). There are six CV Huts that are required, each with a footprint of 36 m$^2$, for a total area of 216 m$^2$ or 0.0216 ha. Following restoration of the disturbed area only the access road (approximately 4 m wide) and the CV Huts are considered continuing removal of habitat. The rest of the 10 m wide watermain disturbance zones will ultimately be re-vegetated, as is the case at the existing Milton Quarry Extension. To be conservative, it is assumed that 5 m of the 10 m wide disturbance zone will be restored. This means 0.926 ha will be initially disturbed, and half (0.463 ha) will remain as the access road. In addition, the six CV Huts will permanently cover 0.0216 ha. The total area of continuing disturbance is approximately 0.485 ha, with a small amount of double counting. The total area temporarily disturbed and then restored is 0.463 ha. It should be noted that while the access road is considered a continuing disturbance and not counted as Jefferson

Salamander Habitat, it will not function as a barrier to salamander movement. Salamanders were regularly observed to cross the access road at the East Cell and they regularly cross much larger, busier roads elsewhere in Halton Region (and beyond) during the spring migration season. The watermain and access road primarily traverse land that was ploughed in late 2020 to facilitate the archaeological investigations.

Within migration habitat, the 5 m wide zones temporarily disturbed to install the feeder lines cover approximately 0.521 ha. These areas will be quickly restored by seeding and some of the feeder line routes may be used as grassed driving trails to access the various EEP Units for watering, replacement planting activities, monitoring, etc. Eighteen (18) recharge wells will be installed within migration habitat. Recharge wells will be established to have a minimal practical area, usually disturbing approximately 25 $m^2$ or less during installation. In the long-term, the disturbed area at each recharge well will typically be less than 2 $m^2$. For the 18 recharge wells, the temporarily disturbed area is 450 $m^2$ and approximately 36 $m^2$ represents the area of continuing disturbance. Outside of the features and buffers, a wider disturbance zone may be used to improve the efficiency of feeder line installation, and these areas will be promptly restored. This additional area is assumed not to exceed 0.2 ha. The diffuse discharge to be installed in Wetland U1 will cover 5 $m^2$ to 10 $m^2$ or less, where existing grades will be maintained and weathered stone and woody debris will be used for cover. If necessary, additional diffuse discharges may be installed. Following restoration, the U1 diffuse discharge will function as habitat for salamanders.

In summary, the WMS installation in migration habitat, which is mostly in open fields that were ploughed in late 2020, will initially disturb approximately 1.7146 ha. The area of continuing disturbance covers approximately 0.4882 ha. The other 1.2264 ha will be promptly restored (e.g., non-used portion of 10 m watermain zone, feeder lines, areas disturbed for recharge well installation).

*WMS within Foraging and Hibernation Habitat*

Within foraging and hibernation habitat the WMS footprint was kept as small as possible. The feeder line routes were selected with care by GEC, as described in **Section 13.2.4**, to avoid better quality trees, areas of dolostone outcropping, rich woodland ground flora, etc. Feeder lines are required to supply water to up to 10 recharge wells, as shown on **Figures 38a** and **39**. A separate feeder line is required to supply water to 2 diffuse discharges located in the upper portion of Wetland W36.

The area that will be temporarily disturbed to install the feeder lines covers 0.194 ha. The disturbed areas will be promptly restored by applying a minimum 15 cm deep layer of fresh wood chips. The installation of up to 10 recharge wells will temporarily disturb 250 $m^2$ or less (0.025 ha), of which 230 $m^2$ (0.023 ha) will be restored. The up to 10 recharge wells will permanently disturb 20 $m^2$. The two diffuse discharges in the upper portion of Wetland W36 will temporarily disturb up to 20 $m^2$, but the existing grades will be maintained and weathered stone and woody debris will be used for cover. Following restoration, the W36 diffuse discharges will function as habitat for salamanders.

In summary, within foraging and hibernation habitat the total area that will temporarily be disturbed is approximately 0.221 ha, of which 0.002 ha will permanently accommodate the up to 10 recharge wells. The remaining 0.219 ha of disturbed area will be promptly restored.

*Summary – WMS Disturbance Footprint within Habitat of Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population)*

A summary of the WMS footprint within the habitat of Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) is provided in **Table 22**.

The WMS installation in migration habitat will initially disturb approximately 1.7146 ha. The area considered to be permanently disturbed for the Control Valve Huts and the access road overtop the watermain covers approximately 0.4882 ha. The other 1.2264 ha will be promptly restored (e.g., non-used portion of 10 m watermain zone, feeder lines, areas disturbed for recharge well installation, staging area, etc.).

Within foraging and hibernation habitat the total area that will temporarily be disturbed is approximately 0.221 ha, of which 0.0012 ha will permanently accommodate up to 10 recharge wells. The other 0.219 ha will be promptly restored.

The installation of the WMS layout as shown on **Figures 38a** and **39** will initially disturb approximately 1.9356 ha within habitat of Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population). Approximately 1.4454 ha of disturbed area will be restored and continue to function as habitat. Approximately 0.4902 ha covers the footprint of the access road and watermain, Control Valve Huts and recharge wells and is considered permanently disturbed.

As noted earlier, **Section 13.2.2** provides details on the installation of the WMS for the Milton Quarry Extension. It provides discussion on how disturbed areas are restored and how they develop over time. **Attachment B2** provides a series of photographs that clearly illustrate how areas that are disturbed during WMS installation can, with appropriate restoration, gradually become naturalized. In many cases, after restoration it is difficult to determine where the feeder lines have been installed and finding the recharge wells out in the field can be a challenge.

#### 16.1.2.3 Mitigation for WMS Installation and the Extraction Footprint

**Section 13.2.5** outlined the various restrictions and design considerations that are recommended by GEC with respect to the establishment of the MQEE WMS, with the aim of minimizing negative effects on natural features and Species at Risk. These recommendations are incorporated into the AMP Addendum. **Section 15.2.3** described the silt/exclusion fence layout and Salamander Excluders, with the layout being shown on **Figure 38a** and **39**.

Key elements of the proposed mitigation for the WMS installation and the extraction footprint, with respect to Jefferson Salamander and Unisexual Ambystoma, include:

- Use of silt/exclusion fencing and Salamander Excluders to prevent salamanders from encroaching into the extraction area;
- Use of silt/exclusion fencing in sensitive areas to prevent salamanders from encroaching into WMS installation work areas;
- Timing restrictions for WMS installation;
- Minimizing the disturbance footprint to the extent feasible; and,
- Ensuring the prompt restoration of disturbed areas.

#### 16.1.2.4 Breeding Pools for Salamanders

Confirmed breeding ponds for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) are shown on **Figure 25**. The wetland hydrology of the various breeding pools will be protected from quarry dewatering effects through the use of the interim WMS mitigation measures during the extraction and lake filling periods. Under the rehabilitated condition (i.e., post lake-filling), mitigation will be achieved through a combination of passive groundwater support from the extended East Cell Lake and the seasonal use of recharge wells and/or diffuse discharges, as necessary. This is discussed at length in **Section 16.2** below.

It is noted that Wetland U1 and Wetland W36 typically do not have springtime high water levels or hydroperiods suitable to support salamander reproduction. It is proposed that ecological conditions in these two wetlands be enhanced through the use of diffuse discharges to maintain water levels at seasonal targets. This should ensure that an optimal hydroperiod is provided to support the successful reproduction of salamanders and other amphibians. This is also discussed at length in **Section 16.2** below.

Linton et al. (2018) prepared the *Recovery Strategy for the Jefferson Salamander (*Ambystoma jeffersonianum*) and Unisexual Ambystoma (Jefferson Salamander dependent population) (*Ambystoma laterale *- (2)* jeffersonianum*) in Ontario*. Recovery Objective 5 in the Recovery Strategy is to “develop and evaluate mitigation and restoration techniques employed to address threats”.

One item mentioned is “Managing Hydroperiod in Breeding Ponds” and the following commentary is provided on pages 33 and 34:

> "Dufferin Aggregates (a division of CRH Canada Group Inc.) has implemented a method to protect and enhance the hydroperiod in Jefferson Salamander breeding pools located near their Milton Quarry Extension. A Water Management System (WMS) was established around the perimeter of the quarry cells, in order to protect offsite water- dependent features (e.g., creeks, wetlands, Jefferson Salamander breeding pools, etc.) from the dewatering effects of quarrying dolostone from below the water table. The system includes a reservoir that holds groundwater and a system of pump stations, watermains and recharge wells that maintain offsite groundwater levels at seasonal targets and discharges water to nearby wetlands."
>
> "This method has proven to be very effective. One pond that was monitored annually from 2003 to 2008 had a suitable hydroperiod for salamander recruitment in only 1 of the 6 years. Since the commencement of WMS in 2009, this pond now has a suitable hydroperiod every year regardless of local climatic conditions and successful salamander breeding has occurred every year which has been confirmed through juvenile recruitment. Artificially maintaining the hydroperiod of salamander breeding ponds with similar WMS may be an important recovery strategy as climate change progressively renders the hydroperiod of more ponds unsuitable for salamander recruitment."

#### 16.1.2.5 Ecological Enhancement Plan (EEP) and Rehabilitation Plan

As described in **Section 14.0**, the proposed MQEE Ecological Enhancement Plan (EEP) covers 10.553 ha of Dufferin land that will not be extracted, as shown on **Figure 39** and described on a unit-by-unit basis in **Table 20**.

Key elements of the EEP include the reforestation of 10.3 ha of land, vegetation management in select EEP units, installation of 215 rock piles and 215 woody debris piles/features, enhancement of Wetland U1 and the restoration of a disturbed area. The reforestation and placement of habitat features will improve the migration habitat between Wetland U1 and the adjacent forests to the northwest, northeast and southeast. As the trees mature, the reforested areas will begin to function as new foraging and hibernation habitat and much improved migration habitat for salamanders. The quality of the habitat will continue to improve over time.

As described in **Section 15.3**, the proposed MQEE Rehabilitation Plan covers 15.9 ha of Dufferin land that will be extracted, as shown on **Figure 41a** and described on a unit-by-unit basis in **Table 21**. The Rehabilitation Plan provides for the reforestation of 2.1 ha of rehabilitated land that is located within 300 m of breeding pools used by Jefferson Salamander and Unisexual Ambystoma.

#### 16.1.2.6 Endangered Species Act

An Endangered Species Act (ESA) 17(2)(c) “Overall Benefit” Permit will likely be required for a portion of the MQEE extraction area and a portion of the WMS footprint, which overlaps with habitat for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population).

The extent of habitat removals and disturbances with salamander habitat are summarized below and in **Table 21**:

- Habitat within the extraction footprint to be removed = 3.99 ha
- Habitat removed to accommodate Control Valve Huts = 0.0216 ha
- Habitat permanently disturbed to accommodate the watermain and access road = 0.463 ha
- Habitat permanently disturbed to accommodate recharge wells required for mitigation = 0.0056 ha
- Habitat temporarily disturbed during WMS installation that will be promptly restored = 1.4454 ha
- Total habitat removed for extraction and permanently disturbed by WMS footprint = 4.4802 ha

A series of mitigation measures are proposed that will minimize or completely eliminate the potential for negative effects on Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population). The mitigation measures are described in detail in **Sections 13.2.5** and **15.2.3**, as summarized above in **Section 16.1.2.3**. Key elements include education/awareness training, the use of silt/exclusion fencing and Salamander Excluders, timing restrictions and limits to the size of work zones for WMS installation, and the prompt restoration of disturbed areas.

The proposed MQEE Ecological Enhancement Plan (EEP) covers 10.553 ha of Dufferin land that will not be extracted, that falls within the area mapped on **Figure 26** as habitat for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population). The EEP includes the reforestation of 10.3 ha of land, vegetation management in select EEP units, installation of 215 rock piles and 215 woody debris piles/features, enhancement of Wetland U1 and the restoration of a disturbed area.

The proposed MQEE Rehabilitation Plan includes the reforestation of 2.1 ha of rehabilitated land within 300 m of breeding pools used by Jefferson Salamander and Unisexual Ambystoma, as mapped on **Figures 41a** and **43**. Over time, these rehabilitation reforestation areas will gradually begin to function as new foraging, hibernation and migration habitat for salamanders.

The reforestation and placement of habitat features will improve the migration habitat between Wetland U1 and the adjacent forests to the northwest, northeast and southeast. The reforested areas will gradually begin to function as new foraging and hibernation habitat and much improved migration habitat for salamanders, in the vicinity of Wetlands U1, V2, W36 and W41.

The wetland hydrology of Wetland U1 and the upper portion of Wetland W36 will be enhanced over existing conditions, providing optimal springtime high water levels and a hydroperiod of sufficient duration to support the reproduction of salamanders and other amphibians.

In GEC's opinion the proposed Ecological Enhancement Plan (EEP) and enhancements to the wetland hydrology of Wetlands U1 and the upper part of Wetland W36, where both are breeding habitat for Jefferson Salamander and Unisexual Ambystoma, will provide an overall benefit to both taxa. Breeding habitat will be enhanced, migration habitat will be greatly enhanced, and over time 12.4 ha of new foraging and hibernation habitat will be created.

### 16.1.3 Potential Effects on Birds

- Barn Swallow

Since there is no nesting habitat in the general vicinity of the proposed MQEE, there is no habitat for Barn Swallow under the general habitat description. The proposed MQEE will not result in any negative effects on the Barn Swallow.

- Bobolink and Eastern Meadowlark

Combined Bobolink and Eastern Meadowlark habitat mapping is provided on **Figure 27**. Approximately 18.7 ha is considered habitat for Bobolink and Eastern Meadowlark, based on the 2019-2020 survey results and the general habitat descriptions for both species, as described above in **Section 6.1.3**.

GEC sent an email to MECP's Species at Risk Branch (SARB) on June 10, 2020, to advise that Dufferin Aggregates was planning to plough some fields as preparation for archaeological investigations and that the fields were habitat for Bobolink and Eastern Meadowlark. GEC indicated that no ploughing would occur until after August 10 and that following the archaeological investigations the fields would be disked and seeded with a hay seed mix that is suitable for Bobolink and Eastern Meadowlark. GEC also noted that this approach had been acceptable to MECP in the past.

On January 18, 2021, MECP replied to GEC's June 10, 2020, email. MECP indicated that since the area is confirmed habitat of Bobolink and Eastern Meadowlark, Dufferin should consider registering the activity under Section 23.6 (Bobolink, Eastern Meadowlark) of Ontario Regulation 242/08. Dufferin registered the activity on March 1, 2021. During March 2021, Dufferin began work on enhancing a larger area of habitat for Bobolink and Eastern Meadowlark elsewhere on one of their nearby properties.

Enhancement activities initially focused on removing woody vegetation from a grassland area, prior to the start of the 2021 bird breeding season. Dufferin will follow the rules in regulation with respect to Bobolink and Eastern Meadowlark. This addresses Section 10 (Habitat Protection) of the Endangered Species Act (ESA).

Since the ploughed fields were seeded with a suitable hay seed mix after the 2020 archaeological investigations were completed, there is a possibility that Bobolink and/or Eastern Meadowlark may return to portions of the extraction area or to areas where the WMS will be installed. To avoid potential contraventions of the Section 9 (Species Protection) of the ESA, stripping of topsoil and ground vegetation will not occur during the bird breeding season, i.e., no topsoil and ground vegetation stripping between April 1 and August 26, as described above in **Section 15.2.4**.

- Chimney Swift

There is at least some potential that Chimney Swift uses large diameter (>50 cm DBH) cavity trees (living or dead) as nest/roost sites. There are no such trees within the proposed MQEE extraction area but some exist within the adjacent forest area, where they will not be affected by the proposed extraction. There will be no negative effects on Chimney Swift as a result of the proposed MQEE.

### 16.1.4 Potential Effects on Bats

Of the four endangered bat species documented during the study, potential maternal roosting habitat exists only for the Little Brown Myotis. This conclusion is very conservative and it is quite possible that the area does not support any maternal roosts. There are definitely no maternal roosts within the hedgerows or in the small copse of trees loosely connected to the southeast corner of Woodland B.

Within Woodland B, exclusive of the small copse of trees, there are a total of 10 potential roost trees. Only two of these are likely to have any potential to actually function as a maternity roost. Most of them are either in trees that are too small in diameter, do not have actual cavities, or the cavities are too close to the ground compared with preferred conditions. Cavity trees 101 and 104 have the highest potential to provide maternal roosting habitat.

There will be a 20 m setback from the Townline Road where no extraction will occur. The two best potential cavity trees are within this setback. Although it cannot be guaranteed that these trees will not be affected because the watermain for the Water Management System will require a 10 m wide disturbance zone within the 20 m setback, Cavity trees 101 and 104 will be retained if feasible at the time of watermain installation.

In the worst-case scenario, ten potential roost trees will be removed, but only two of these may potentially be used by the Little Brown Myotis.

A note will be added to the Site Plan stipulating that vegetation removal will not occur during the active bat period of April 1 to October 31. This will ensure that no bats are harmed as a result of tree removal. Consequently, activities associated with the proposed quarry extension will be in compliance with Section 9 (Species Protection) of the *Endangered Species Act, 2007* (ESA).

The main question associated with removal of trees that have some potential to provide maternal roosting habitat for bats is whether this activity is in compliance with Section 10 (Habitat Protection) of the ESA. As stated by Martin (2021) of the Ministry of Environment, Conservation and Parks (MECP), it is the responsibility of the proponent to determine potential impacts on bats and their habitat and to take appropriate steps to ensure compliance with the ESA. Martin (2021) also stated that the damage and destruction assessment (impact upon bat habitat) may vary depending upon local availability of other maternity and day roost trees.

The subject lands are on the Niagara Escarpment and the landscape is predominantly forested in the immediate vicinity. The main forest block within the MQEE study area is part of the Halton Forest North ANSI, which covers approximately 706 ha. The ANSI is part of the more extensive Halton Forest which is approximately 35 $km^2$ in size.

The extensive forest immediately adjacent to the MQEE provides ideal roosting habitat for bats. The small (0.68 ha) Woodland B is poor bat roosting habitat when compared with the adjacent extensive woodlands. The loss of a maximum of 10 roost trees, only two of which are moderately suitable, will not affect the overall roosting habitat for the Little Brown Myotis in the general area. On the local landscape, trees are not a limiting factor for bats.

It is concluded that removal of the cavity trees within the proposed extraction area will not affect the overall habitat for the Little Brown Myotis. The proposed extension is compliant with both Sections 9 and 10 of the ESA provided that trees are removed during the stipulated time of the year.

The acoustical study suggested that two changes should be made to the sampling protocol for bats. The most important is that the detectors should start recording at least 10 to 15 minutes before sunset as opposed to at dusk. By waiting until dusk to initiate the study, the calls of many bats leaving a roost will be missed. In addition, dusk is a nebulous term. There is no clear definition as to when this actually is. When considering if weather is suitable for the surveys, the requirement that the temperature be at least 10°C should be eliminated. Other studies have demonstrated that bat activity is unaffected by low temperatures.

### 16.2 Potential Effects on Significant Wetlands

The potential effects of the MQEE on Significant Wetlands are discussed below under the following headings:

- 16.2.1 Water Resources Impact Assessment; and,
- 16.2.2 Wetland Ecology Impact Assessment.

#### 16.2.1 Water Resources Impact Assessment

GHD (2021) provide their water resources impact assessment in Section 10 of the Geology & Water Resources Assessment Report and the key aspects are provided below.

The mining plan and mitigation plan for the MQEE aggregate extraction is designed to prevent unacceptable negative effects on water resources and to maximize the short-term and long-term benefits to water resources and water-dependent natural features (GHD 2021). An overview of the proposed water resources mitigation, based on the Water Management System (WMS) operating under the requirements of the AMP and AMP Addendum, is provided above in **Section 13.0**.

A comprehensive performance monitoring program will be implemented to monitor the mitigation measures which will protect the water resources and water-dependent natural features in the vicinity of the proposed MQEE as well as demonstrate the performance of these measures. Prior to the commencement of extraction in the MQEE, the existing Milton Quarry WMS will be proactively extended around the MQEE area to ensure that the necessary mitigation is in place and it is verified to be effective (GHD 2021).

Under rehabilitated quarry conditions, the extension of the East Cell Lake into the MQEE area will minimize the need for ongoing management while protecting and enhancing water-dependent natural features (GHD 2021).

GHD’s impact assessment is summarized below under the following headings:

- 16.2.1.1 Surface Water Assessment
- 16.2.1.2 Groundwater Assessment
- 16.2.1.3 Water Quality
- 16.2.1.4 Cumulative Effects

#### 16.2.1.1 Surface Water Assessment

This section provides a discussion of the potential changes to surface water conditions, and their significance, as a result of the operation and rehabilitation of the proposed MQEE.

As described earlier, there is little to no runoff in the proposed MQEE extraction area. Since the proposed MQEE extraction is in a topographically high area, the proposed extraction will not intercept runoff from any area beyond the extraction limits as drainage along the perimeter of the extraction limit is naturally away from the proposed MQEE extraction area. Therefore, any appreciable effect on surface water flow from the proposed MQEE is not anticipated (GHD 2021).

The proposed MQEE extraction area is 15.9 ha and any runoff that may presently occur from this area to the surrounding landscape will be intercepted by the quarry, infiltrate to groundwater, or evapotranspirate. Presently 2.4 ha of the area that will be intercepted by the proposed MQEE drains to the southwest and south, and any present runoff would be captured by the existing quarry excavations or evapotranspirate. The balance of the proposed MQEE extraction area (13.6 ha) presently drains to the Wetland W36 drainage system that comprises a total of 43.1 ha. The sub-area drainage to Wetland U1 is 15.5 ha, of which 4.3 ha will be removed by the proposed MQEE extraction (GHD 2021). GEC did not observe any surface water flow towards or into Wetland U1 during the ecological field surveys from 2019 to 2021.

There is no potential for effects downstream of the Wetland W36 catchment as the Wetland W36 drainage was intercepted downstream by the Main Quarry. Therefore, any surface water flow that is intercepted by the proposed MQEE represents water that presently either evapotranspirates or is captured by the Milton Quarry as groundwater or surface water inflow (GHD 2021). No surface water was observed flowing from Wetland W36 to the Main Quarry by GEC during the ecological field surveys from 2019 to 2021.

As described earlier, there is little to no runoff evident in the MQEE area and any such runoff that occurs would be on an extremely infrequent basis during extreme precipitation and snow-melt events. As previously identified, no runoff from these areas was observed in 2020 or 2021 (to date) by GHD or by GEC from 2019 to 2021. It is possible that there is some very local drainage or interflow to Wetland U1 and Wetland W36; however, based upon the shallow, generally permeable overburden soils, it is anticipated that the vast majority of precipitation in the proposed MQEE area infiltrates to groundwater or evapotranspirates with limited potential for appreciable runoff flow (GHD 2021).

Considering the very limited potential for runoff from the proposed MQEE area, it is not anticipated that there will be any negative or appreciable water quantity or water quality influence from the proposed MQEE extraction. Any runoff that presently occurs is an occasional event and not a consistent or normal part of the present functioning of the water resources in the catchment area. The water resources within the catchment area that includes the proposed MQEE will be protected and enhanced by the mitigation measures described in **Section 13.0** and as discussed below (GHD 2021).

#### 16.2.1.2 Groundwater Assessment

Groundwater and surface water regimes will be appropriately maintained as part of the proposed implementation of the MQEE. There are no anticipated negative effects on water resources. The water-dependent natural features of concern are the wetlands to the southeast, east and northeast of the proposed MQEE extraction area. These wetlands will be maintained or enhanced by the proposed mitigation, rehabilitation, and monitoring measures described in **Section 13.0**, the AMP and AMP Addendum.

The assessment includes the comparison of conditions under the proposed interim extraction and long-term rehabilitation conditions with the proposed MQEE to the approved interim and rehabilitation conditions for the existing quarry. The compared conditions were evaluated using consistent input data (including long-term average climatic conditions) so that the comparison of results is indicative of the quarry development conditions, not other transient factors. The current approved existing quarry extraction and rehabilitation conditions are used as the basis for comparison of proposed future conditions with the MQEE (GHD 2021).

It is important to note that the mitigation measures planned for the extraction period will also be necessary during the lake-filling period. The mitigation demand will gradually decrease as the lake fills and the drawdown caused by the quarry extraction decreases. All analyses presented in the Geology & Water Resources Assessment Report are based on mitigation being provided as necessary to protect the water resources beyond the cessation of aggregate extraction operations (GHD 2021). The combined active extraction and lake-filling period is referred to as the interim conditions period. This basis is reflected in the requirements of the AMP/AMP Addendum.

***Interim Conditions: Proposed MQEE plus Existing Quarry Fully Extracted vs. Existing Quarry Fully Extracted***

The proposed MQEE under interim conditions with the quarry operating were evaluated by GHD to ensure that appropriate quarry operations and mitigation measures could be implemented throughout all stages of quarry development, including post-extraction lake filling until the final long-term rehabilitation state is achieved. From the perspective of potential impacts to water resources, the worst-case scenario is the simultaneous full extraction of all quarry areas as this scenario represents the maximum potential dewatering influence relative to the surrounding water resources, and is therefore the basis of this discussion (GHD 2021).

The quarry cells are dewatered under extraction conditions, resulting in a potential dewatering influence to the surrounding water resources. The existing quarry has approved mitigation measures to mitigate the drawdown to protect water resources from its potential effects. It is proposed to extend the existing mitigation measures, as described in **Section 13.0** and the AMP Addendum, to provide the appropriate protection of water resources and these conditions were evaluated by GHD (2021) in their assessment.

The simulated hydrogeologic conditions shown on **Figure 42a** demonstrate that the proposed mitigation of water resources during the interim period will generally maintain or raise groundwater levels in the vicinity of the proposed MQEE area. This is consistent with expected results based on the characteristics of the site, the successful operation of the existing mitigation system, and the proposed mitigation for the MQEE. As described in **Section 13.0**, the interim mitigation uses a combination of diffuse discharges for Wetland U1 and Wetland W36 (in combination with some recharge wells for the latter), and groundwater recharge wells for the other nearby wetlands (GHD 2021).

The diffuse discharges proposed for Wetland U1 and the upper portion of Wetland W36 will provide an optimum seasonal hydroperiod and allow suitable water depths to be maintained, similar to Wetlands V2, W7 and W8 associated with the East Cell. This mitigation approach has been demonstrated to be highly effective, maintaining and enhancing wetland features and functions (GEC 2019).

The groundwater recharge system will support groundwater levels to the northeast, east and southeast of the proposed MQEE extraction area in the same manner that the existing recharge well system supports groundwater levels near the existing quarry. **Figure 42a** demonstrates the proposed layout and effectiveness of the recharge system for the proposed MQEE. The positive (green) contour lines reflect the increase in simulated groundwater levels resulting from the proposed MQEE extraction and mitigation. The combined use of the diffuse discharge and groundwater recharge in the area southeast of the proposed MQEE extraction area can be used to increase the existing water level and hydroperiod in Wetland W36, particularly the upper portion, to suit ecological objectives. There are no areas influencing water resources where the groundwater level is not maintained (decreases are shown with negative (purple) contour lines) or raised under these representative simulation conditions (GHD 2021).

***Rehabilitation Conditions: Proposed Extension plus Proposed Existing Quarry Rehabilitation vs. Approved Existing Quarry Rehabilitation***

The proposed MQEE Rehabilitation is based on the extension of the East Cell Lake, as well as creation of islands, shoreline wetlands and a variety of terrestrial landforms, as described in **Section 15.3**.

Under rehabilitation conditions, the integrated East Cell Lake system, including the East Cell and MQEE areas, will help passively support the surrounding groundwater flow system. As with the existing quarry rehabilitation plan, some limited active management will likely be required, in the form of water transfers to store and discharge water for optimal use, the seasonal top-up of lake levels and the continued seasonal diffuse discharge to a limited number of wetlands in proximity to the extraction limit. In large part, seasonal variations in lake levels and surface water features are expected to occur based on climatic variations; however, some transfers of water will be necessary to ensure seasonally appropriate lake levels are maintained and to compensate for seepage of water between phases (GHD 2021).

Wetland U1 and Wetland W36 are anticipated to require seasonal diffuse discharge operation in the long-term, similar to the existing approved condition for the three wetlands adjacent to the East Cell. The addition of Wetland U1 and Wetland W36 to this group is straight-forward and will not significantly affect the required water resource management efforts or complexity (GHD 2021).

The proposed MQEE may require extension or modification of the potential seasonal recharge system operation approved for the East Cell and this has been allowed for in the proposed MQEE rehabilitation plans. The groundwater support provided by the rehabilitation lake level may not be sufficient to fully support the wetlands to the east in their current state as discussed in **Section 13.0**. The East Cell Lake will also tend to dampen the seasonal water level fluctuations; however, the seasonal fluctuations in the bedrock away from the lake may still be great enough to allow adequate seasonal groundwater discharge to the nearby wetlands once the lakes are full, possibly including at Wetland W36. If monitoring indicates the final lake level is high enough to support the wetlands and sufficient seasonal fluctuations in water levels occur, the groundwater recharge system operation will be discontinued. Due to the variability and uncertainty inherent in the hydrogeologic system, this cannot be definitively established at the time of writing. Therefore, consistent with existing approvals for the East Cell, it is recognized that seasonal (spring-time) post-quarrying recharge system operation may be required along a portion of the rehabilitated quarry perimeter to maintain or enhance the functions of the wetlands to the northeast, east and southeast (GHD 2021).

The simulation results presented on **Figure 42b** include the operation of groundwater recharge wells along the northeast and east sides of the East Cell (as currently approved) and extended southeast to provide recharge along the perimeter of the proposed MQEE. The operation of the wells will assure that the water level and seasonal variations of the wetlands can be maintained.

### *Summary*

In summary, the proposed interim mitigation and rehabilitation measures will protect or enhance the surrounding water resources and water-dependent natural features. This conclusion has been illustrated through the use of the groundwater modelling and water budget tools but is ultimately based on the understanding of the site characteristics, implementation of appropriate mitigation and rehabilitation measures, and assured through the performance-based monitoring, analysis, and response actions required by the AMP and AMP Addendum (GHD 2021).

#### 16.2.1.3 Water Quality

The proposed MQEE is not expected to result in any unacceptable changes in water quality. The water quality receptors of potential concern are the nearby wetlands and general groundwater flow system that will receive recharge water from the mitigation system. There are no potable water supplies in the area of the proposed MQEE. The extensive monitoring of water quality conditions for the existing quarry operations and WMS demonstrate that the water quality remains suitable for the intended use and consistently satisfies the MECP effluent criteria in place for the existing quarry (GHD 2021).

The effects of aggregate operations on water quality are generally limited, because the existing quarry and proposed MQEE represent areas of groundwater inflow and extraction, any changes in water quality will generally be exposed to the surrounding environment only through the discharge of water from the WMS. The addition of the proposed MQEE to the Milton WMS will not appreciably change the water quality (GHD 2021).

As identified above, the effects of aggregate operations on water quality are generally limited. This conclusion is supported by experience at operating quarries and is consistent with the findings of the MOE's Municipal Industrial Strategy for Abatement Study (MISA 1993) that concluded quarries (and pits) *"…do not appear to have a significant environmental impact…. [and] have been exempted from the [MISA] regulation."* The water generally becomes somewhat more mineralized during the active life of the quarry due to the increased contact with un-weathered bedrock surfaces (i.e., blasted rock); however, no unacceptable changes typically occur (GHD 2021).

The principal effects on water quality that may potentially occur within the quarry environment include increases in suspended solids/turbidity, increases in ammonia levels (particularly the unionized ammonia fraction which is of importance to aquatic organisms) and bacteria arising from natural sources to the water accumulated in storage. These influences are already present in the Milton Quarry and the resultant water quality is suitable for intended uses. Changes in relation to these aspects with the proposed MQEE are expected to be negligible. In fact, much of the groundwater in the proposed MQEE area is already originating from the present WMS operations as a result of the groundwater recharge occurring to the east of the East Cell that flows through the proposed MQEE area (GHD 2021).

Water that is collected from the proposed MQEE dewatering operations will be handled in the same manner as existing quarry dewatering flows. The water will be pumped to the Main Quarry Reservoir or other operation area that provide the vast attenuation capacity and the opportunity for testing of water quality (GHD 2021).

The ecological monitoring of wetlands by GEC that receive recharge to the surface water directly from the WMS (i.e., Wetlands W7, W8, and V2 around the East Cell) as well as wetlands that are supported by the groundwater recharge system (e.g., Wetlands W5 west of the West Cell, Wetlands W9, W10 and W21 in proximity to the East Cell) demonstrate that the recharge water quality is suitable to maintain and in some cases enhance wetland features and functions as described in the *Milton Quarry Extension AMP: Wetland Ecology 5-Year Review Report (2013-2018)* (GEC 2019).

In summary, the proposed MQEE will not result in any negative or unacceptable effects on water quality in the Milton Quarry WMS or affect its suitability for use for mitigation of wetlands and groundwater flow by the WMS. All water discharged off site (to surface water or groundwater) will be required to meet appropriate effluent criteria as is typically regulated by MECP through Ontario Water Resources Act Environmental Compliance Approval (ECA) conditions and presently occurs for the existing quarry (GHD 2021)

#### 16.2.1.4 Cumulative Effects (Water Resources)

The water resources characterization and impact assessments presented in GHD's *Geology & Water Resources Assessment Report* have considered the potential for cumulative effects that may arise from the development of the proposed MQEE. The proposed MQEE has been designed and evaluated in manner that is fully integrated with the existing quarry. The AMP/AMP Addendum and its mitigation, monitoring, and response actions directly ensure the protection or enhancement of features and functions related to water resources in the vicinity of Milton Quarry and the proposed MQEE. There are no known other forms of development identified in the immediate area that would contribute to a significant cumulative effect on water resources in the area of Milton Quarry (GHD 2021).

The assessments presented by GHD (2021) demonstrate that the proposed MQEE is acceptable from a water resources perspective in combination with the Milton Quarry, including surface water, groundwater, water budget, and water quality considerations. Furthermore, the proposed MQEE provides the potential to enhance some of the existing water-dependent natural features such as Wetland U1 and Wetland W36. Therefore, the proposed MQEE will not have any negative cumulative effects (GHD 2021).

### 16.2.2 Wetland Ecology Impact Assessment

As described in **Section 7.0**, Wetlands V2, W36, W41 and W46a-f are Provincially Significant Wetlands. Wetlands U1 and W56 are Unevaluated Wetlands. Wetland W56 was not mapped by LIO.

The seasonal water levels targets and hydroperiod in Wetland V2 are maintained by diffuse discharge from the existing East Cell WMS, as per the approvals for the Milton Quarry Extension. This wetland will not be affected by the proposed MQEE. All of the existing forested area around Wetland V2 will be retained and reforestation will occur on some nearby old field areas as part of the MQEE Ecological Enhancement Plan (EEP) described in **Section 14.0** and mapped on **Figure 39**.

As described above in **Section 16.2.1**, there will be no reduction in surface catchment to Wetland W41 and any dewatering influence from the MQEE will be mitigated through the use of recharge wells to maintain groundwater levels and gradients. **Figure 42b** shows the groundwater contours in the rehabilitated condition. The +0.2 m contour intersects with Wetland W41, suggesting a slight increase in groundwater on an annualized basis. Any surplus water in Wetland W41 would outlet to Wetland W42 and, ultimately, Wetland W44. It is concluded that there will be no negative impact on Wetland W41.

Similarly, there will be no loss of surface catchment for Wetlands W46a-f and any dewatering influence from the MQEE will be mitigated through the use of recharge wells to maintain groundwater levels and gradients. **Figure 42b** shows the groundwater contours in the rehabilitated condition. The +0.2 m contour intersects with Wetlands W46a-f, suggesting a slight increase in groundwater on an annualized basis. It is concluded that there will be no negative impact on Wetlands W46a-f.

There will be no loss of surface catchment for Wetland W56 and any dewatering influence from the MQEE will be mitigated through the use of recharge wells to maintain groundwater levels and gradients. As described above in **Section 5.5.5.2** the observed groundwater and surface water levels indicate that Wetland W56 may receive very limited groundwater discharge from the north and west during high groundwater level periods. W56 may be more influenced by snowmelt and precipitation events. Water that does accumulate in Wetland W56 infiltrates to groundwater to the east and southeast, or is lost through evapotranspiration during the growing season. **Figure 42b** shows the groundwater contours in the rehabilitated condition. Wetland W56 is located beyond the +0.2 m contour, suggesting little to no change in groundwater elevations on an annualized basis. It is concluded that there will be no negative impact on Wetland W56.

As described above in **Sections 5.5.1** and **5.5.2**, typically the hydroperiod of Wetland U1 is too short to support successful reproduction of amphibians, i.e., frogs, toads and salamanders. The hydroperiod of the upper portion of Wetland W36 may only support the successful reproduction of early breeders such as Wood Frog and Spring Peeper in wetter years, and the hydroperiod is too short to support the reproduction of mole salamanders. There is an opportunity to enhance the wetland hydrology of Wetlands U1 and W36, relative to current conditions. It is proposed to enhance the wetland hydrology of both features through the use of diffuse discharges to maintain target surface water levels in both Wetland U1 and the upper portion of W36 and provide a hydroperiod that will support the successful reproduction of frogs, toads and salamanders.

Great care will be taken in installing the diffuse discharges in Wetlands U1 and W36, and the feeder lines that will supply water to them, as described in detail in **Section 13.3.5**. Mitigation measures include seasonal timing constraints, restriction to a 5 m wide disturbance zone, use of silt fencing and the restoration of all disturbed areas. As described in **Section 13.2.2**, the areas temporarily disturbed during installation of feeder lines and diffuse discharges are restored and they are quickly naturalized, as illustrated in the series of photographs provided in **Attachment B2**.

As described in **Section 14.5**, a series of habitat enhancements are proposed in and adjacent to Wetland U1, as part of the Ecological Enhancement Plan (EEP). Implementation of the enhancement measures will serve to increase the productivity of U1 for amphibian breeding, once the hydroperiod is restored. Enhancement measures include vegetation management, planting of wetland and facultative tree species, installation of habitat features such as rock piles and woody debris, and the addition of egg mass attachment sites within the deepest portion of U1.

**Figure 42a** shows that the use of recharge wells will increase groundwater levels in the upper portion of Wetland W36 by less than 0.2 m on an annualized basis. **Figure 42b** shows the predicted changes to groundwater levels under the rehabilitated condition, i.e., the East Cell Lake is filled. Groundwater levels are predicted to increase by approximately 0.5 m in the vicinity of the upper portion of Wetland W36. The combined use of the diffuse discharge and groundwater recharge will increase the water level and hydroperiod in Wetland W36.

It is concluded that there will be no negative impacts on Wetlands U1 and W36. It is also concluded that the wetland hydrology and habitat conditions in Wetlands U1 and W36 will be enhanced relative to existing conditions, as a result of the MQEE.

### 16.2.3 Summary of Potential Effects on Significant Wetlands

In consideration of all aspects of the proposed MQEE relating to groundwater and surface water resources and water-dependent natural features, the proposed MQEE protects all water resources and water-dependent natural features in the vicinity. There will be no negative impacts on Significant Wetlands or on Wetlands U1 and W56. The MQEE also provides a unique opportunity to enhance the ecological conditions in Wetlands U1 and the upper portion of W36, which are breeding habitats for the

Endangered Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population).

### 16.3 Potential Effects on Significant Woodlands

The Significant Woodland boundary is shown on **Figure 30**. Woodlands A and B are not considered to be Significant Woodlands according to the Region of Halton and Provincial criteria for woodland significance, as discussed in detail in **Sections 8.1** and **8.2** respectively.

The Significant Woodland boundary is shown on **Figure 30**; it is generally similar to the Halton Forest North ANSI boundary shown on **Figure 36b**. The predominantly forested ANSI is 706.4 ha in size and it forms part of the much larger 35 $km^2$ Halton Forest.

There will be no direct removal of Significant Woodlands as a result of the proposed MQEE. Minor encroachment into the Significant Woodland is proposed, in order to install feeder lines to supply up to 10 recharge wells and 2 diffuse discharges to be installed at the upper end of Wetland W36. This is necessary in order for the mitigation system to protect Wetland W36 most effectively. The WMS footprint is shown on **Figures 38a** and **39**.

The WMS footprint within foraging and hibernation habitat for Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population) was discussed in detail in **Section 16.1.2.2**. The Significant Woodland is essentially coincident with the salamander foraging and over-wintering habitat.

The WMS footprint was kept as small as possible within the Significant Woodland. The feeder line routes were selected with care by GEC, as described in **Section 13.2.4**, to avoid better quality trees, areas of dolostone outcropping, rich woodland ground flora, etc. The area that will be temporarily disturbed to install the feeder lines covers 0.194 ha. The disturbed areas will be promptly restored by applying a minimum 15 cm deep layer of fresh wood chips. The installation of up to 10 recharge wells will temporarily disturb 250 $m^2$ or less (0.025 ha), of which 230 $m^2$ (0.023 ha) will be restored. Ten (10) recharge wells will permanently disturb 20 $m^2$. The two diffuse discharges in the upper portion of Wetland W36 will temporarily disturb up to 20 $m^2$, but the existing grades will be maintained and weathered stone and woody debris will be used for cover. Following restoration, the W36 diffuse discharges will function as habitat for salamanders. In summary, within the Significant Woodland the total area that will be disturbed is approximately 0.221 ha, of which 0.219 ha will be promptly restored.

As noted earlier, **Section 13.2.2** provides details on the installation of the WMS for the Milton Quarry Extension. It provides discussion on how disturbed areas are restored and how they develop over time. **Attachment B2** provides a series of photographs that clearly illustrate how areas that are disturbed during WMS installation can, with appropriate restoration, gradually become naturalized. Several years after restoration, it is often difficult to determine where the feeder lines have been installed and finding the recharge wells out in the field can be challenging.

The minor WMS encroachment into the Significant Woodland will not result in a negative impact. A high level of mitigation will be applied during WMS installation and there will be a strong emphasis on prompt restoration of the disturbed area. The 10 recharge wells within the Significant Woodland will have an effective area of no more than 20 $m^2$.

A minimum 10 m buffer is recommended where the Significant Woodland boundary is relatively close to the proposed MQEE extraction area. An additional 10 m wide area is required in order to accommodate the WMS, e.g., watermain and access road, CV Huts, etc., resulting in a 20 m extraction setback to the Significant Woodland boundary.

The Ecological Enhancement Plan (EEP) described above in **Section 14.0** and **Table 20**, and mapped on **Figure 39**, includes a series of Significant Woodland buffer treatments. Units TP-B1 to TP-B6 are buffer planting areas that will be planted in the first two years after licence issuance. The buffer planting areas are in proximity to the proposed MQEE extraction area and they provide a buffer for the Significant Woodland and/or other EEP planting areas. The species selected for this purpose are White Birch, White Cedar, White Pine and Trembling Aspen. These pioneering species have all colonized newly created cliff rim habitats at the Milton Quarry and Acton Quarry, along the edges of former extraction areas, and they are well suited as buffer plantings. Existing suitable woody vegetation within the 10 m buffers will be retained.

The 10 m Significant Woodland is the *minimum* buffer that will be applied. The Significant Woodland boundary on the MQEE property is approximately 2340 m in length. The 10 m buffer applies to only 215 m of the Significant Woodland boundary. Everywhere else the Significant Woodland buffers are larger, often considerably larger. As much as possible the routing of the watermain and feeder lines, and the placement of recharge wells, was located away from the Significant Woodland boundary.

Minimum 10 m buffers for Significant Woodlands were accepted by the agencies for the Acton Quarry Extension. Considering that the 10 m minimum buffer, plus an additional 10 m setback to accommodate the WMS beside the extraction limit, is only applicable to relatively short lengths of the Significant Woodland boundary (215 m out of a total length of 2340 m), and that the 10 m buffers will be planted with suitable fast-growing woody species, the buffers in these cases are appropriate. This allows access to the dolostone bedrock resource while protecting the adjacent Significant Woodland. GEC has not observed any negative effects as a result of the woodland buffers applied to the Milton Quarry Extension and Acton Quarry Extension. Elsewhere on the MQEE lands, the buffers are much larger and they form part of the EEP Units that will be planted.

As described above in **Section 14.0**, the EEP will result in the reforestation of 10.3 ha. The planting will be completed within 5 years of licence issuance. Habitat features will be installed prior to planting, including at least 215 rock piles and 215 woody debris piles/features, to improve the quality of the future forest habitat for wildlife, including the Jefferson Salamander and Unisexual Ambystoma. Since the EEP Units will form a new forest that is contiguous with the existing Significant Woodland, the EEP tree-planting will expand the Significant Woodland by 10.3 ha.

As described in **Section 15.3.2.4**, the MQEE Rehabilitation Plan also includes the reforestation of 5.1 ha of rehabilitated land, as shown on **Figures 41**, **43** and **44**. The reforestation completed as part of the Rehabilitation Plan will provide an improved connection between the Cox Tract and the existing Significant Woodland.

There will be no negative impacts on Significant Woodlands as a result of the proposed MQEE. Appropriate buffering is provided and the buffers will be planted within 2 years of licence issuance. Approximately 10.3 of EEP reforestation and 5.1 ha of Rehabilitation Plan reforestation will ultimately expand the Significant Woodland by 15.2 ha.

### 16.4 Potential Effects on Significant Wildlife Habitat

The potential effects of the proposed MQEE on Significant Wildlife Habitat are discussed below under the following headings:

- 16.4.1 Potential Effects on Area-sensitive Bird Breeding Habitat
- 16.4.2 Potential Effects on Significant Amphibian Breeding Ponds
- 16.4.3 Potential Effects on Seeps and Springs
- 16.4.4 Potential Effects on Habitats of Special Concern Bird Species

#### 16.4.1 Potential Effects on Area-sensitive Bird Breeding Habitat

Woodland Area-sensitive Bird Breeding Habitat is discussed above in **Section 9.2.2**. The area mapped on **Figure 31** as candidate Significant Wildlife Habitat for Woodland Area-sensitive Bird Breeding Habitat is habitat for the following six area-sensitive bird species listed in the Ecoregion Criteria Schedules (OMNRF 2015):

- Black-throated Blue Warbler
- Ovenbird
- Scarlet Tanager
- Veery

- Winter Wren
- Yellow-bellied Sapsucker

**Figure 31** shows the locations where the above-listed area-sensitive bird species were recorded in the MQEE study area. Scarlet Tanager, Ovenbird, Yellow-bellied Sapsucker were all recorded in proximity to the Main Quarry, North Quarry and East Cell. The area mapped as Significant Wildlife Habitat falls within the Significant Woodland boundary. As discussed above, no negative impacts on the Significant Woodland are anticipated as a result of the proposed MQEE.

The feeder lines to the Wetland W36 diffuse discharges overlap with the area identified as Significant Wildlife Habitat for Area-sensitive Bird Breeding Habitat. As described above in **Section 13.2.5**, the timing of the installation of feeder lines, recharge wells and diffuse discharges within the Significant Woodland will be scheduled to avoid critical ecological periods, i.e., breeding periods for amphibians and birds, between March 10 to August 26. Installation of diffuse discharges will occur when water levels are low or features are dry, i.e., between August 26 to February 28.

It is concluded that there will be no negative impact on Area-sensitive Bird Breeding Habitat as a result of the proposed MQEE. Following the implementation of the Ecological Enhancement Plan (EEP) as described in **Section 14.0**, the Significant Woodland will increase in size by 10.3 ha. As the new forest gradually matures, the area available for use by area-sensitive bird species is anticipated to increase. Over the longer-term, the reforestation of 5.1 ha of rehabilitated land, contiguous with the Significant Woodland and the northeast end of the Cox Tract is also anticipated to contribute to the amount of habitat available for area-sensitive woodland breeding bird species.

### 16.4.2 Potential Effects on Significant Amphibian Breeding Ponds

Wetlands W41 and W46a are mapped on **Figure 32** as Significant Wildlife Habitat for Amphibian Breeding Habitat (Woodland). This is academic, because the selected wetlands are Jefferson Salamander breeding pools and Significant Wetlands.

Wetland W46a is located more than 300 m into the Significant Woodland and no WMS installation work will occur in the vicinity. The wetland hydrology of W46a will be protected during the interim operating period by the WMS recharge system, as described above in **Section 16.2.2**. Under the rehabilitation condition, a combination of the filled East Cell Lake and the seasonal operation of the recharge system will protect the wetland hydrology of W46a, as described in **Section 16.2.2**.

Wetland W41 is located more than 150 m inside the Significant Woodland. As described above in **Section 13.2.5**, the timing of the installation of feeder lines, recharge wells and diffuse discharges within the Significant Woodland will be scheduled to avoid critical ecological periods, i.e., breeding periods for amphibians and birds, between March 10 to August 26. Installation of diffuse discharges will occur when water levels are low or features are dry, i.e., between August 26 to February 28.

The wetland hydrology of W41 will be protected during the interim operating period by the WMS recharge system, as described above in **Section 16.2.2**. Under the rehabilitation condition, a combination of the filled East Cell Lake and the seasonal operation of the recharge system will protect the wetland hydrology of W41, as described in **Section 16.2.2**.

It is concluded that there will be no negative impacts on Significant Amphibian Breeding Ponds (Woodland) as a result of the proposed MQEE. Proposed enhancements to the existing wetland hydrology of Wetland U1 and Wetland W36 will also increase the availability of suitable breeding habitat for amphibians in the area.

### 16.4.3 Potential Effects on Seeps and Springs

The areas considered to be Significant Wildlife Habitat for Seeps and Springs are shown on **Figure 33**. The spring and seeps that flow into Wetland W41 and the seeps that discharge water from Wetland 41, are identified as Significant Wildlife Habitat.

As described above in **Sections 16.2.1** and **16.2.2**, there will be no reduction in surface catchment to Wetland W41 and any dewatering influence from the MQEE will be mitigated through the use of recharge wells to maintain groundwater levels and gradients. **Figure 42b** shows the groundwater contours in the rehabilitated condition. The +0.2 m contour intersects with Wetland W41, suggesting a slight increase in groundwater on an annualized basis. Any surplus water in Wetland W41 would outlet to Wetland W42 and, ultimately, Wetland W44. Therefore, it is concluded that there will be no negative impact on Wetland W41 or the related seeps and springs.

### 16.4.4 Potential Effects on Habitats of Special Concern Bird Species

The habitat of Special Concern bird species is discussed above in **Section 9.2.2**. The area mapped on **Figure 34** as candidate Significant Wildlife Habitat for Special Concern Bird Species is habitat for the Eastern Wood-Pewee and Wood Thrush.

**Figure 34** also shows the locations where Eastern Wood Peewee and Wood Thrush occur within the MQEE study area. There is considerable overlap with the area mapped as Significant Wildlife Habitat for Area-sensitive Bird Breeding Habitat (Woodland), as described in **Sections 9.2.2** and **16.4.1**. and mapped on **Figure 31**. The larger area mapped as Significant Wildlife Habitat for Special Concern Bird Species falls within the Significant Woodland boundary. As discussed above, no negative impacts on the Significant Woodland are anticipated as a result of the proposed MQEE. The northeast end of the Cox Tract was also mapped as Significant Wildlife Habitat for Special Concern Bird Species.

The feeder lines to the Wetland W36 diffuse discharges overlap with the area identified as Significant Wildlife Habitat for Special Concern Bird Species. As described above in **Section 13.2.5**, the timing of the installation of feeder lines, recharge wells and diffuse discharges within the Significant Woodland will be scheduled to avoid critical ecological periods, i.e., breeding periods for amphibians and birds, between March 10 to August 26. Installation of diffuse discharges will occur when water levels are low or features are dry, i.e., between August 26 to February 28.

It is concluded that there will be no negative impact on habitat for Special Concern bird species as a result of the proposed MQEE. Following the implementation of the Ecological Enhancement Plan (EEP) as described in **Section 14.0**, the Significant Woodland will increase in size by 10.3 ha. As the new forest gradually matures, the area available for use by area-sensitive bird species is anticipated to increase. Over the longer-term, the reforestation of 5.1 ha of rehabilitated land, contiguous with the Significant Woodland and the northeast end of the Cox Tract is also anticipated to contribute to the amount of habitat available for Special Concern bird species.

### 16.5 Potential Effects on Significant Areas of Natural and Scientific Interest

The 35 $km^2$ Halton Forest and the associated Halton Forest North, Halton Forest South and Speyside Forest ANSIs are mapped at a regional scale on **Figure 36a**. The boundary of the Halton Forest North ANSI within the MQEE study area is mapped on **Figure 36b**, using GIS data from Land Information Ontario (LIO). The ANSI boundary is more or less coincident with the Significant Woodland boundary interpreted by GEC and mapped on **Figure 30**. The ANSI also includes the numerous wetlands that occur on the local landscape.

Potential effects on Significant Wetlands, Significant Woodlands and Significant Wildlife Habitat were discussed above in **Sections 16.2**, **16.3** and **16.4**, respectively. It was concluded above that there will be no negative impacts on Significant Woodlands, Significant Wetlands and Significant Wildlife Habitat as a result of the proposed MQEE. Therefore, it is concluded that, similarly, there will be no negative impacts on the Halton Forest North ANSI as a result of the proposed MQEE.

### 16.6 Potential Effects on Fish Habitat

As described above in **Section 11.0**, taking a cautious and conservative approach, the outlet from Wetland W41 is considered to be potential indirect fish habitat because the water and organic material coming out of Wetland W41 ends up, at least in part, in Wetland W44 (see **Figure 33**). The HF-1 Tributary is blocked by several large Beaver dams downstream and only intermittent flows reach the Main Quarry where the tributary is truncated, so there is no direct connection to any fish habitat downstream towards the Hilton Falls Reservoir.

The potential effects on Wetland W41 were considered in detail in **Section 16.2**. It was concluded that there will be no negative impacts on Significant Wetlands, including Wetland W41, as a result of the proposed MQEE. Since the function of the springs and seeps associated with Wetland W41 will be maintained, it is concluded that there will be no negative impact on the potential indirect fish habitat associated with the outlet from Wetland W41.

### 16.7 Potential Effects on the Peregrine Falcon

As described above in **Sections 5.4.4.2** and **9.3.1**, Peregrine Falcons nested in the East Cell on the cliff beside Townline in 2020 and 2021. Considering that the Peregrine Falcon is nesting within the approved Milton Quarry Extension in the active East Cell, which is not subject to a Planning Act application and the PPS, and that the nest location will most likely be under water once final rehabilitation conditions are achieved, the cliff is not identified as Significant Wildlife Habitat for a Species of Conservation Concern by GEC. The Peregrine Falcon is protected under the Ontario *Fish and Wildlife Conservation Act (1994)* and recommendations aimed at minimizing disturbance during the nesting season were provided above in **Section 15.2.4**. Further discussion on the Peregrine Falcon is provided below under the following headings:

- 16.7.1 General Biology of the Peregrine Falcon
- 16.7.2 Peregrine Falcon Response to Disturbance
- 16.7.3 Mitigation Measures for the Peregrine Falcon

#### 16.7.1 General Biology of the Peregrine Falcon

Historically, the Peregrine Falcon nested on isolated cliffs near water and forests. It has adapted to nesting on human-made structures such as tall buildings in cities, smoke stacks, and artificial cliffs created by road-cuts and quarries (Peck and James 1983, 1999; Ratcliffe and Armstrong 2002). In the southern portion of its range, nests tend to face east or north so that they are shaded from the afternoon sun (Sandilands 2005). Nests have been reported 9 to 52 m from the ground in Ontario, with most 11-23 m up (Peck and James 1983, 1999).

Eggs have been reported in Ontario nests from the third week of April until mid-June, with most present from early May to mid-June. Eggs are laid at 2- to 3-day intervals and incubation begins with the laying of the second or third egg. The incubation period is 33 to 35 days and the young leave the nest when they are 35 to 49 days old (Peck and James 1987, 1993; Sandilands 2005). Based on this chronology, young may be in the nest as late as the third week of July until the first week of August.

### 16.7.2 Peregrine Falcon Response to Disturbance

It is difficult to determine any wildlife species' response to human disturbance because individuals may react differently. There are two generally accepted principles: that those in isolated areas with little human contact are more likely to be disturbed than those in areas with higher amounts of human activity; and species are more disturbed by pedestrians than they are by vehicles and machinery. As an example, Bald Eagles routinely perch in winter within 10 m of Highway 401 at the Grand River and ignore the high volume of traffic but may flush at distances of 50 to 100 m if a human is walking in the area.

In the case of the Peregrine Falcon, it nests both on cliffs in isolated locations and in disturbed areas such as on high-rise buildings in cities, on road-cuts, and in quarries. At least three studies have been done on nesting Peregrine Falcons in disturbed areas. In Alaska, two pairs successfully fledged young from nests on road-cuts adjacent to the Alaska Highway where approximately 600 vehicles per day passed the nests. Falcons also nested successfully within an active quarry where blasting occurred and the crusher was within 200 m of the nest (Ritchie et al. 1998).

In Ireland, 50% of quarries with suitable cliffs were occupied by nesting Peregrine Falcons, with an estimated 65 pairs nesting in quarries. Cliff height was the most important factor in determining whether falcons would nest within a given quarry, and larger quarries were more likely to support falcons. There were no differences in the occupancy rates of idle and active quarries; 48.9% of active quarries supported nests compared with 46.9% of inactive quarries. Some nested on recently blasted faces and most birds in active quarries appeared to be quite unaffected by the intense noise and activity occurring below them (Moore et al. 1977).

Olsen and Allen (1997) completed a detailed study of the effects of an active quarry on a pair of nesting Peregrine Falcons in Australia. The quarry was originally inactive. When it was reactivated, the falcons moved their nest to a location that was approximately 500 m from the active face. Blasting occurred regularly within the quarry and large pieces of unprocessed rock were collected regularly from a muck pile about 10 m below and 20 m to the side of the nest ledge. After the muck pile was depleted, it was necessary to blast again. Forty-five holes 26 m deep were laid in two rows, with the one end of the rows within 100 m of the nest. The total tonnage of explosive was 1,800 kg with the maximum instantaneous charge of 40 kg. The intensity of the blast was measured 5 m above the nest. At this location, the ground vibration was 34.8 mm per second and the air overpressure reached a peak of 139 dB. When the blast occurred, the female flew from the nest, did a circuit of the quarry, disappeared for a few minutes, and then returned to the nest. A quick visual inspection revealed no damage to the eggs. The female successfully fledged all three young.

Ratcliffe (1993) stated that Peregrine Falcons are tolerant of humans in vehicles, such as front-end loaders and trucks, but that a human visitor on foot, especially above the nest site, usually elicits a vigorous response, with the birds cackling and swooping at the intruder. Early in the nesting season, direct human disturbance can cause desertion of the site. Later in the season, prolonged disturbance may result in nest failure caused by chilling or overheating of eggs or small chicks while they are unattended by the adults.

### 16.7.3 Mitigation Measures for the Peregrine Falcon

In 2021 the nest was located in proximity to the southeast quarry face which is near the common boundary with the MQEE property. There is a small ledge adjacent to and just below the 2021 nest site on the cliff, just in the corner of the face along Townline and the face parallel to the common boundary with the MQEE.

A series of recommendations aimed at mitigating potential effects on nesting Peregrine Falcons were provided above in **Section 15.2.8**. The recommendations included provisions for annual monitoring at appropriate times of year, restricting pedestrian traffic in proximity to an active nest during the breeding season, restricting quarry equipment from operating within 25 m during the breeding season, restricting blasting within 125 m of the active nest site (with target thresholds for vibration and overpressure), and follow-up monitoring to confirm the nest is no longer active towards the end of the breeding season.

If the recommendations described in **Section 15.2.8** and summarized above are implemented, there should be no contravention of the Ontario *Fish and Wildlife Conservation Act (1994)*.

## 17.0 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

**Section 16.0** considered the potential effects on key natural heritage features, including the following:

- Habitat of Endangered and Threatened Species
- Significant Wetlands
- Significant Woodlands
- Significant Wildlife Habitat
- Significant Areas of Natural and Scientific Interest (ANSIs)
- Fish Habitat

The Region of Halton's Official Plan Policy s.277 with respect to Significant Woodlands has been addressed in **Section 8.0**. Later, in **Section 16.3** it was concluded that there will be no negative impacts on Significant Woodlands and that, over time, Significant Woodlands would increase by approximately 10.3 ha as a result of the implementation of the Ecological Enhancement Plan (EEP) and be further increased by 4.9 ha as a result of the Rehabilitation Plan. This 15.2 ha increase is Significant Woodlands is shown on **Figure 44**. There will be no negative impacts on the Provincial, Regional and Local Natural Heritage Systems.

The remainder of this section provides discussion on the following topics:

- 17.1 Cox Tract;
- 17.2 Landscape Connectivity and Wildlife Corridors;
- 17.3 Net Environmental Gain; and,
- 17.4 Cumulative Effects.

### 17.1 Cox Tract

A portion of the northeast end of the Cox Tract is located within the MQEE study area. Surveys of vegetation, flora and wildlife were completed as part of the ecological surveys completed between 2019 and 2021. The section of the Cox Tract located to the northeast of the haul road crossing between the Main Quarry and North Quarry is under lease to Dufferin Aggregates by the Region of Halton.

The ecological field surveys identified several species of conservation concern in the northeast end of the Cox Tract, including Eastern Wood-Pewee (Special Concern) and Wood Thrush (Special Concern). As discussed in **Sections 9.3.1** and **16.4.4**, this portion of the Cox Tract was identified as Significant Wildlife Habitat for Special Concern Bird Species. A few area-sensitive forest bird species were also identified, including Scarlet Tanager and Ovenbird. The existing quarry haul road wraps around the northwest and southwest sides of the northeast end of the Cox Tract, yet this area supports a number of significant bird species.

The northeast end of the Cox Tract is mainly a conifer plantation that was planted in 1951, as described in **Section 8.0**. A combination of forest management and natural succession is slowly resulting in the development of a more natural forest community.

The Cox Tract haul road crossing is between 29 and 31 m wide, which means the northeast end of the Cox Tract is considered a separate woodland, as discussed in **Section 8.1**. On both sides of the haul road crossing, heavy-duty silt fencing has been installed at the request of the Region of Halton. On the southwest side of the Cox Tract, large dolostone boulders have been placed along the top of the steep road shoulder for safety, and a heavy-duty silt fence and heavy-duty chain-link supporting fence have been installed, as well as a secondary silt fence. The crossing and associated silt fencing and other obstacles form a barrier to the movement of many species. Some of the more mobile mammals, such as Coyote, White-tailed Deer, Red Fox, Raccoon, etc. can still move across the haul road by crossing at either end. Nevertheless, any ecological linkage function is limited at present. In the longer-term, the haul road will be rehabilitated and only a small access road or driving trail will remain.

The Cox Tract will be separated from the MQEE extraction area by approximately 40 m. There will be a 20 m extraction setback along the northeast side of Townline and the Townline road allowance provides an additional 20 m setback. No negative impacts on the Cox Tract are anticipated. The fact that the area supports Special Concern bird species and some area-sensitive forest bird species, highlights that the northeast end of the Cox Tract is a resilient feature in proximity to the active Main Quarry and North Quarry.

### 17.2 Landscape Connectivity and Wildlife Corridors

Animal movement corridors were considered as potential Significant Wildlife Habitat in **Section 9.4**. It was concluded that there are no significant *Animal Movement Corridors* within the MQEE study area, as defined by the SWHTG and SWHECS. Movement through the local area undoubtedly occurs by common species such as White-tailed Deer, Coyote, and a number of other common mammal species. These species were regularly observed within the MQEE study area and they also occur within rehabilitated areas within the Milton Quarry, where there are terrestrial linkages with the surrounding Escarpment landscape.

As shown on **Figure 36a**, at a larger landscape scale the main corridors occur to the northwest and west of the North Quarry, West Cell and East Cell. Another corridor follows the edge of the Escarpment and the slopes below, in the vicinity of the Main Quarry. Although the quarry haul road for highway trucks to Dublin Line occurs in this area, there are areas where wildlife can cross relatively easily, especially when there is no truck traffic.

As discussed in **Section 17.1**, the linkage function of the Cox Tract is limited at present due to the haul road crossing and the extensive road shoulders, heavy-duty silt fencing and chain-link supporting fence.

The Cox Tract will become more important in terms of landscape connectivity following the implementation of the Ecological Enhancement Plan (EEP) described in **Section 14.0** and the completion of the MQEE Rehabilitation Plan as described in **Section 15.3**, as well as the ultimate restoration of the Cox Tract haul road crossing. **Figures 43** and **44** show the landscape as it will appear when the EEP and Rehabilitation Plan are both implemented.

## 17.3 Net Environmental Gain

With respect to new or expanded mineral aggregate operations, the Region of Halton Official Plan (ROP) policy direction is for proponents to pursue a "net environmental gain" approach. The Town of Halton Hills Official Plan has a similar policy direction. Section 110(7.2)d) of the Region of Halton Official Plan reads as follows:

> Where the proponent has satisfied the requirements of Sections 110(7.2)a) through 110(7.2)c) as applicable, require any application for a new or expanded *mineral aggregate operation* to consider a "net environmental gain" approach to the preservation and enhancement of the Greenbelt and/or Regional Natural Heritage System…

Goals and principles for the MQEE EEP and Rehabilitation Plan were outlined in **Section 14.1** and they are similar to those listed in Halton Region's ROP Section 110(7.2)d)B) that are relevant to this particular set of circumstances. Each of the goals and principles are discussed below:

- *Increase in the spatial extent of the Local and Regional Natural Heritage System;*

The implementation of the MQEE Ecological Enhancement Plan will increase the size of the Significant Woodland in the vicinity by 10.3 ha and an additional 0.28 ha will also be enhanced. The MQEE Rehabilitation Plan will result in an additional 5.1 ha of new woodland that is contiguous with the Significant Woodland. Combined, the spatial extent of the Provincial, Regional and Local Natural Heritage Systems will increase by a total of 15.4 ha of new forests. In addition, a 7.7 ha lake, 0.4 ha of islands, 2.7 ha of wetlands and 673 m of cliffs will also be created as part of the MQEE Rehabilitation Plan. Refer to **Figures 39**, **41**, **43** and **44**.

- *Increase in biological and habitat diversity;*

At present, the proposed MQEE extraction area is primarily old field vegetation that was formerly in agricultural use and most of the fields were ploughed in late 2020 to facilitate the archaeological investigations. The extraction area and watermain footprint also includes portions of two remnant woodland features that cover approximately 1.86 ha, as well as minor hedgerow features. Biological diversity and habitat diversity is low at present, both within the proposed extraction area and the other non-forested areas that will be improved through the EEP.

As described above in **Sections 14.0** and **15.3**, a variety of new vegetation community types (ELC community types) will develop following the implementation of the EEP and Rehabilitation Plan. New habitats including a lake, wetlands, islands, forested uplands and cliffs will be created, that are complementary to the surrounding natural landscape.

- *Enhancement of ecological system function;*

Ecological system function will be enhanced through a variety of avenues. Forest cover will be increased which will, over time, increase the amount of habitat available for area-sensitive forest species and improve the quality and function of habitat for amphibians.

The enhancement of wetland hydrology in Wetland U1 and the upper portion of Wetland W36 will improve the ecological function of these features. Wetlands U1 and W36 will no longer function as ecological traps following the implementation of enhancement measures via the WMS. Instead, these wetlands will have optimal spring high water levels and hydroperiods that will support the successful reproduction of a variety of frog, toad and salamander species.

- *Enhancement of wildlife habitat;*

The creation of a lake, wetlands, islands and cliffs will provide a variety of new habitats that are more diverse than the existing features within the extraction footprint. The provision of habitat features such as rock piles and woody debris will improve the habitat value of the new forested habitats to be created through the EEP and Rehabilitation Plan.

Again, the enhancement of wetland hydrology in Wetland U1 and the upper portion of Wetland W36 will improve the wildlife habitat value of these features, especially for breeding amphibians.

- *Enhancement of natural succession;*

Natural succession will be accelerated in the EEP Units through reforestation with suitable native species and the provision of habitat features such as rock piles and woody debris piles/features.

EEP Units TP-M1 and TP-M2 cover approximately 1.63 ha and they contain some existing woody vegetation. Management activities will include:

- Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration; remove defective stems.
- Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).
- Interplant shade-tolerant species such as Sugar Maple in thinned out poplar-ash patches.
- Install habitat features: rock piles (25) and woody debris (25).
- Clean up old farm junk piles.

Most of these activities will enhance natural succession.

- *Creation of new wetlands and woodlands; and,*

As noted above, the implementation of the MQEE Ecological Enhancement Plan will increase the size of the Significant Woodland in the vicinity by 10.3 ha. The MQEE Rehabilitation Plan will result in an additional 5.1 ha of new forest that is contiguous with the Significant Woodland.

The Rehabilitation Plan will result in the creation of 2.7 ha of new wetlands.

- *Establishment or enhancement of linkages between significant natural heritage features and areas.*

The implementation of the EEP and the Rehabilitation Plan will replace what is mostly open fields formerly in agricultural use with a variety of new habitat types and features that will be well linked with the surrounding key natural heritage features. When combined with the ultimate rehabilitation of the Cox Tract haul road crossing, the features created by the EEP and Rehabilitation Plan will enhance the Cox Tract as a southwest – northeast ecological linkage.

### 17.4 Cumulative Effects

GHD's discussion of cumulative effects from a water resources perspective was provided in **Section 16.2.1.4** of this report.

GHD noted that the proposed MQEE has been designed and evaluated in manner that is fully integrated with the existing quarry. The AMP/AMP Addendum and its mitigation, monitoring, and response actions directly ensure the protection or enhancement of features and functions related to water resources in the vicinity of Milton Quarry and the proposed MQEE. There are no known other forms of development identified in the immediate area that would contribute to a significant cumulative effect on water resources in the area of Milton Quarry (GHD 2021). They noted that there were some opportunities to enhance some existing wetlands (U1 and W36). GHD (2021) concluded that the proposed MQEE will not have any negative cumulative effects from a water resources perspective.

From an ecological perspective, similarly, there are no known other forms of development identified in the immediate area that would contribute to a significant negative cumulative effect on the Natural Heritage System in the vicinity of the Milton Quarry. The implementation of the EEP and Rehabilitation Plan is anticipated to greatly enhance the Natural Heritage System, as described above in **Section 17.3** and as shown on **Figures 39**, **41**, **43** and **44**.

## 18.0 SUMMARY AND CONCLUSIONS

Goodban Ecological Consulting Inc. (GEC) was retained by Dufferin Aggregates, a division of CRH Canada Group Inc. (Dufferin), to prepare a Natural Environment Level 1 and 2 Technical Report and Environmental Impact Statement (EIS) for an ARA licence application for their proposed Milton Quarry East Extension (MQEE).

The proposed extension of the Milton Quarry, referred to as the Milton Quarry East Extension (MQEE), represents a proposed extraction area of approximately 15.9 hectares. The MQEE is contiguous with the existing East Cell and separated from the existing North Quarry by the Nassagaweya-Esquesing Townline (Townline). The proposed MQEE would be extracted as an extension to the existing East Cell. The maximum potential dolostone reserve (including both the Amabel and underlying Reynales Formations) in the proposed MQEE is approximately 15 million tonnes.

The subject property contains some large open fields that were formerly in agricultural use. The surrounding lands include forested areas, most of which form part of the 706.4 ha Halton Forest North ANSI. There are a number of wetlands located within the forest that form part of the provincially significant Halton Escarpment Wetland Complex and there is a small unevaluated wetland within the open field area. The Halton Forest, which covers around 35 $km^2$, consists of the Halton Forest South, Halton Forest North and Speyside Forest ANSIs.

The proposed MQEE mining plan involves removing the common setback and expanding the East Cell into the MQEE extraction area. Dewatering of the combined extraction cell will continue in order for quarry operations to occur under typical dry quarry floor conditions. Water-dependent natural features in the vicinity of the proposed MQEE will be protected and, in some cases enhanced over existing conditions, by the recharge of water to the groundwater flow system and diffuse discharge to two wetlands (Wetlands U1 and W36). Dufferin has already committed to integrate the MQEE into the state-of-the-art Water Management System (WMS) and Adaptive Environmental Management and Protection Plan (AMP) that are already in place and have been operating at the Milton Quarry and Milton Quarry Extension since 2007. The Water Management System has effectively maintained groundwater levels around the perimeter of the Milton Quarry Extension, thereby protecting surrounding water resources including water-dependent natural features.

An Ecological Enhancement Plan (EEP) will cover approximately 10.55 ha of Dufferin land that will not be extracted. Ecological enhancements will include reforestation using native species well suited to the local landscape, management of existing woody vegetation in some areas and the placement of habitat features such as rock piles, stumps/root wads and other woody debris. The implementation of the EEP will expand the Significant Woodland onsite, which will provide an overall benefit to the Jefferson

Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population), as well as many other forest-dwelling wildlife species.

The rehabilitation of the proposed 15.9 ha MQEE extraction area will be integrated with the existing rehabilitation plan for the East Cell and the EEP described above. The MQEE rehabilitation plan includes a large sheltered wetland, an open lake, exposed cliff faces, reforestation areas and terrestrial linkages will be created within the area proposed to be extracted. The expanded East Cell will be filled with water to allow for more passive maintenance of the groundwater flow regime and associated water resources in the long-term.

GEC completed a detailed set of ecological field surveys from 2019 to 2021, including surveys of vegetation communities, flora, wetlands, amphibians, reptiles, breeding birds, bats and other wildlife groups. The review of available background information and the ecological survey data resulted in the identification of the following significant natural heritage features within the MQEE study area:

- Habitat of Endangered and Threatened Species
- Significant Wetlands
- Significant Woodlands
- Significant Wildlife Habitat
- Significant Areas of Natural and Scientific Interest (ANSIs)
- Fish Habitat

These significant natural heritage features were considered in detail in **Sections 6.0** to **11.0**.

A detailed overview of the proposed mitigation to protect water-dependent natural features was provided in **Section 13.0**, including discussion on the Adaptive Management Plan (AMP) and the Water Management System (WMS). GEC recommended a detailed set of restrictions and design considerations for the installation of the MQEE WMS in **Section 13.2.5**.

**Section 14.0** provided the details on the Ecological Enhancement Plan (EEP) for lands that will not be extracted. The EEP will result in the enhancement of approximately 10.55 ha of land that is mostly open fields formerly in agricultural use. Key components of the EEP include tree-planting/reforestation, vegetation management, creation of habitat features, enhancements to Wetland U1 and the surrounding area, enhancements to the wetland hydrology of Wetlands U1 and W36, and the restoration of a disturbed area.

**Section 15.0** provided a description of the proposed extraction, Operational Plan and Rehabilitation Plan. **Section 15.1** described the proposed extraction and the

Operational Plan in some detail. GEC recommended a series of natural environment notes and details for the Operational Plan in **Section 15.2**. The Rehabilitation Plan was described in detail in **Section 15.3**.

**Section 16.0** provided the main impact assessment component of this report, assessing the potential effects of the proposed MQEE on significant natural heritage features.

**Section 17.0** provided some additional discussion related to environmental impact assessment, considering the Cox Tract, landscape connectivity and wildlife corridors, net environmental gain and cumulative effects.

It is GEC's opinion that:

- If the water resources mitigation is implemented as described in **Section 13.0**, per the WMS and AMP;
- If the restrictions and design consideration presented in **Section 13.2.5** are followed during the WMS installation;
- If the EEP is implemented as described in **Section 14.0**;
- If the natural environment notes and details for the Operational Plan are incorporated into the MQEE Site Plans, as provided in **Section 15.2**; and,
- If the MQEE Rehabilitation Plan is implemented as described in **Section 15.3**;

Then there will be no negative impacts on the features and functions associated with the significant natural heritage features described in this Level 1 and 2 Natural Environment Technical Report and EIA, as discussed in detail in **Sections 16.0** and **17.0**.

Furthermore, there will be a considerable net environmental gain to the Provincial, Regional and Local Natural Heritage Systems and there will be an overall benefit provided to the Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population).

Respectfully submitted,

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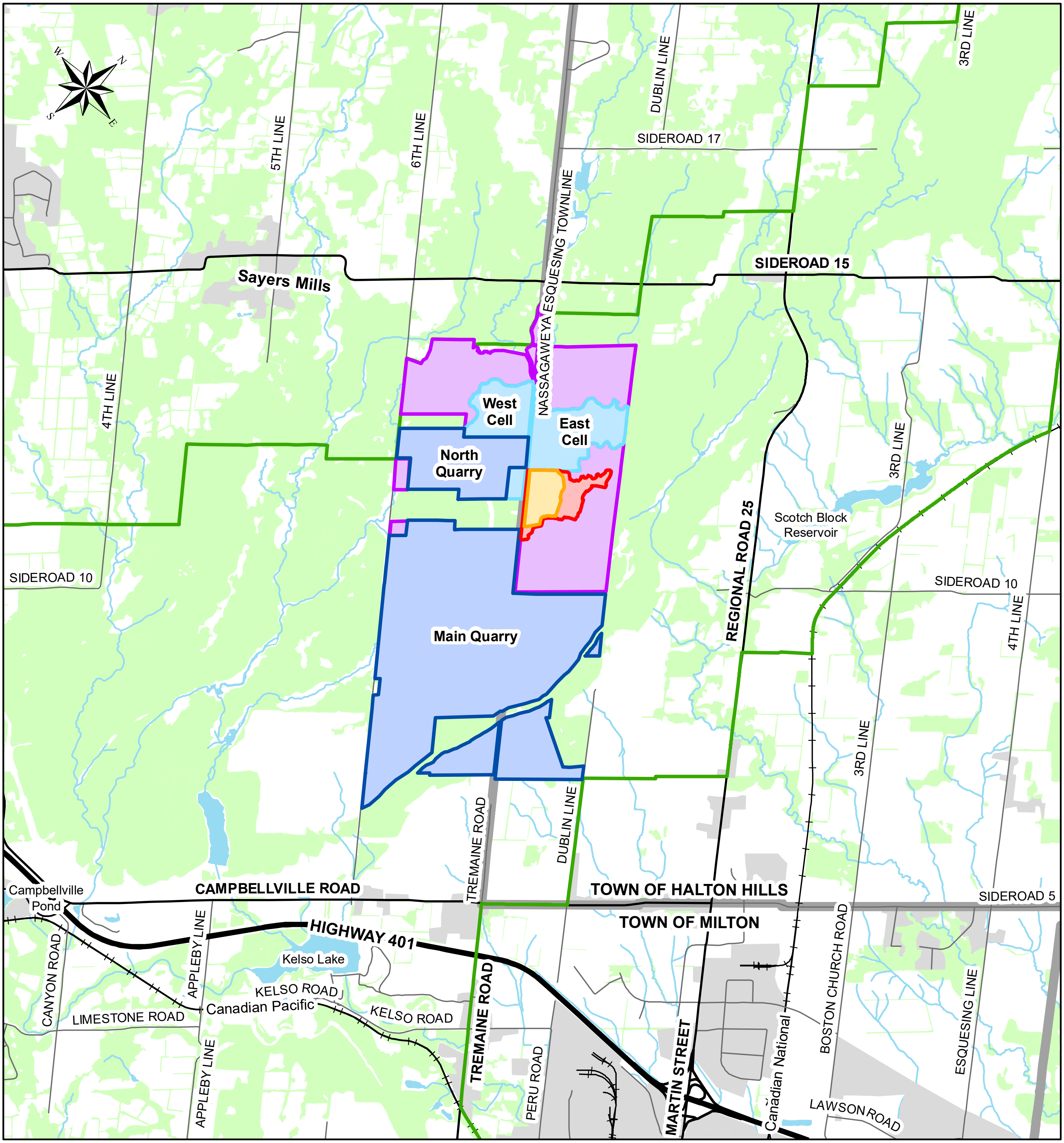


Figure # 1

## Location

**Milton Quarry East Extension**
Part of Lots 11 and 12, Concession 1
(Geographic Township of Esquesing)
Town of Halton Hills
Regional Municipality of Halton

Legend

- Proposed Milton Quarry East Extension - Licence Boundary
- Proposed Milton Quarry East Extension - Limit of Extraction
- Milton Quarry (1962)
- Milton Quarry Extension (2007)
- Other Lands Owned by Dufferin
- Niagara Escarpment Plan Boundary
- Built up Area

DATE December 2021

SOURCES Land Information Ontario
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0 250 500 1,000 1,500 2,000
Meters (1:50,000)

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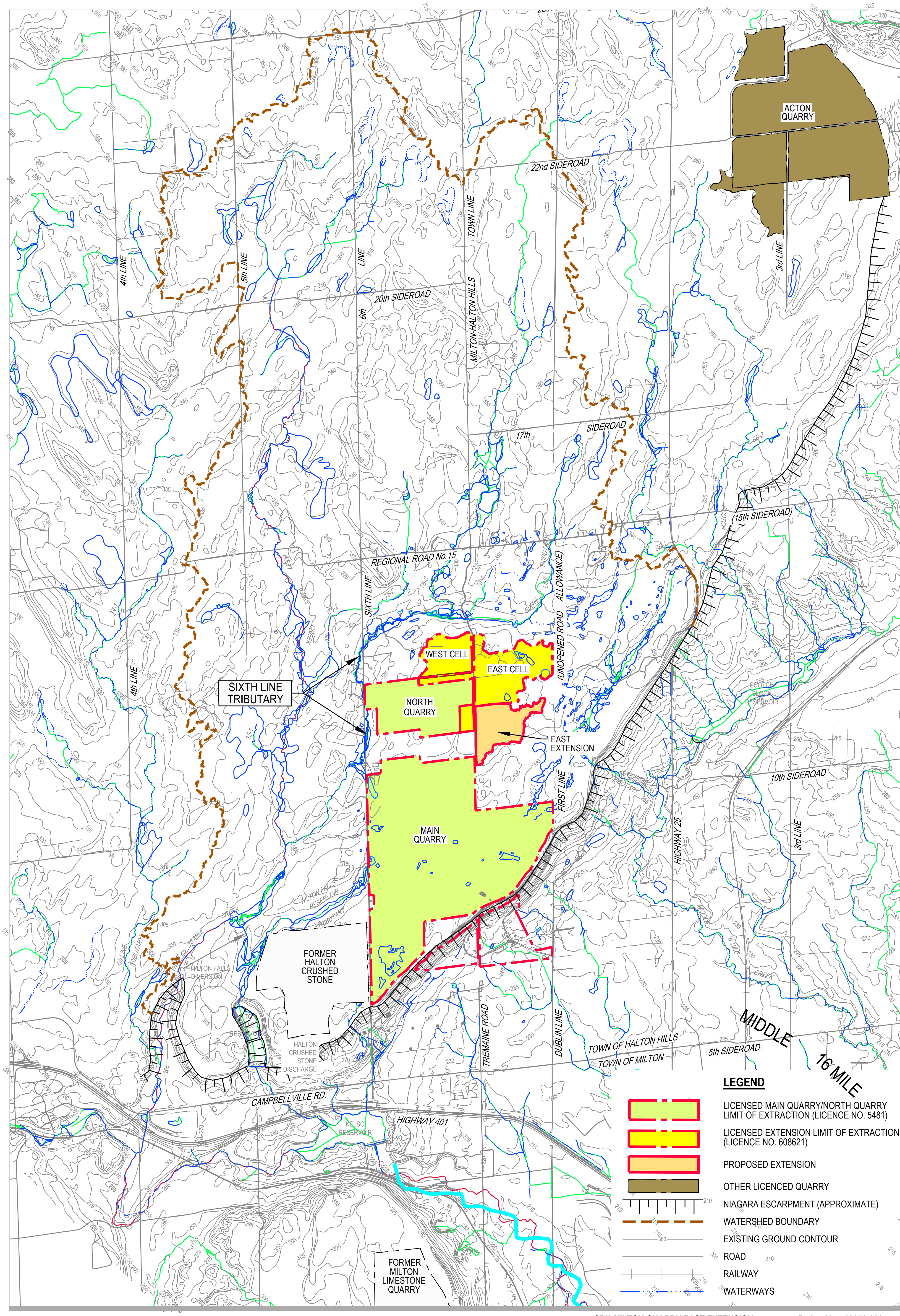
GEC Goodban Ecological Consulting Inc.




SOURCE:
MAP REPRODUCED USING DATA DERIVED FROM MINISTRY OF NATURAL RESOURCES, QUEEN'S PRINTER OF ONTARIO, 2007, AMENDED WITH DATA FROM CONSERVATION HALTON, 2006.

WATERSHED BOUNDARY BASED ON SURFACE WATER CATCHMENTS PROVIDED BY CONSERVATION HALTON, OCTOBER 2010.

0 400 800 1200m

Coordinate System: UTM17m NAD27

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

REGIONAL MAP

Project No. 10978-200
Date December 2021

FIGURE 2

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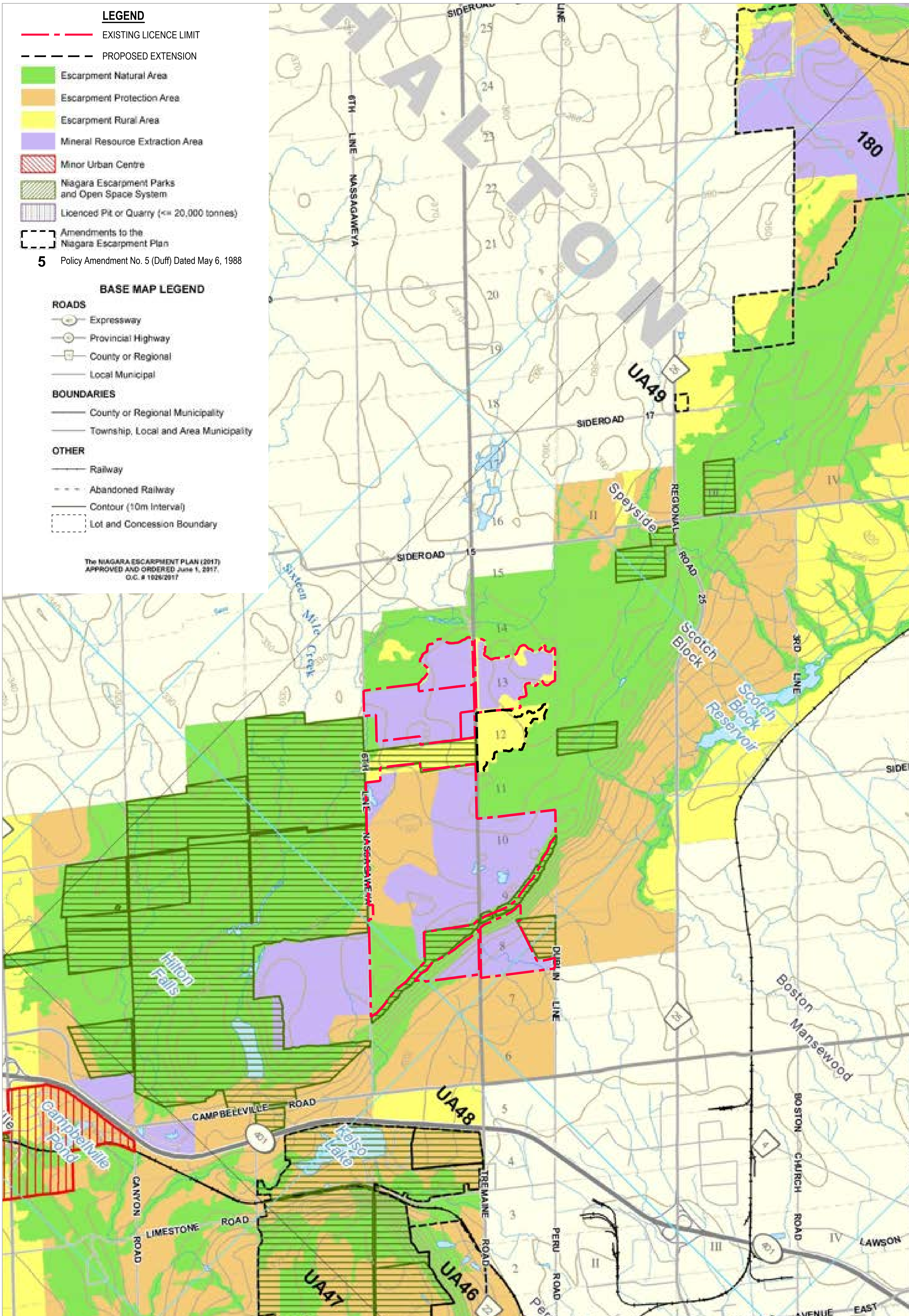


SOURCE:
NIAGARA ESCARPMENT PLAN 3, JUNE 2017.

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Coordinate System:
UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

NIAGARA ESCARPMENT PLAN

Project No. 10978-200
Date December 2021

FIGURE 3

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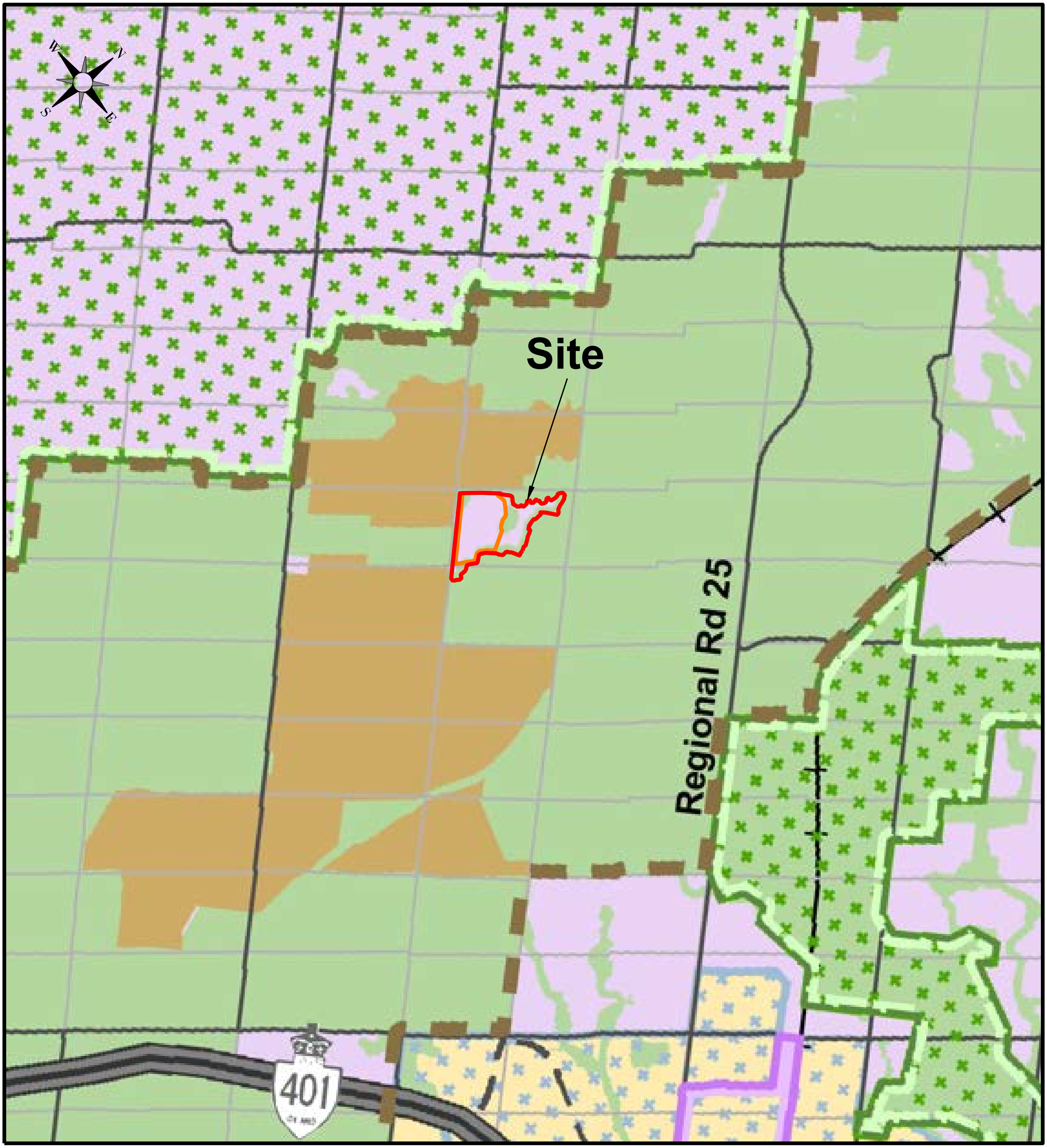


Figure # 4a

**Regional Structure**

Region of Halton Official Plan

**Milton Quarry East Extension**

Part of Lots 11 and 12, Concession 1
(Geographic Township of Esquesing)
Town of Halton Hills
Regional Municipality of Halton

Legend

- Proposed Milton Quarry East Extension - Licence Boundary
- Proposed Milton Quarry East Extension - Limit of Extraction
- Niagara Escarpment Plan
- Built Boundary
- Protected Countryside Boundary
- Employment Area
- Greenbelt Natural Heritage System
- Regional Natural Heritage System
- Agricultural Area
- Mineral Resource Extraction Area
- Urban Area

Date: December 2021

Sources: Halton Region Official Plan - Map 1 - Regional Structure, dated June 19, 2018

Scale 1:40,000

0 600 1200 Meters

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Goodban Ecological Consulting Inc.

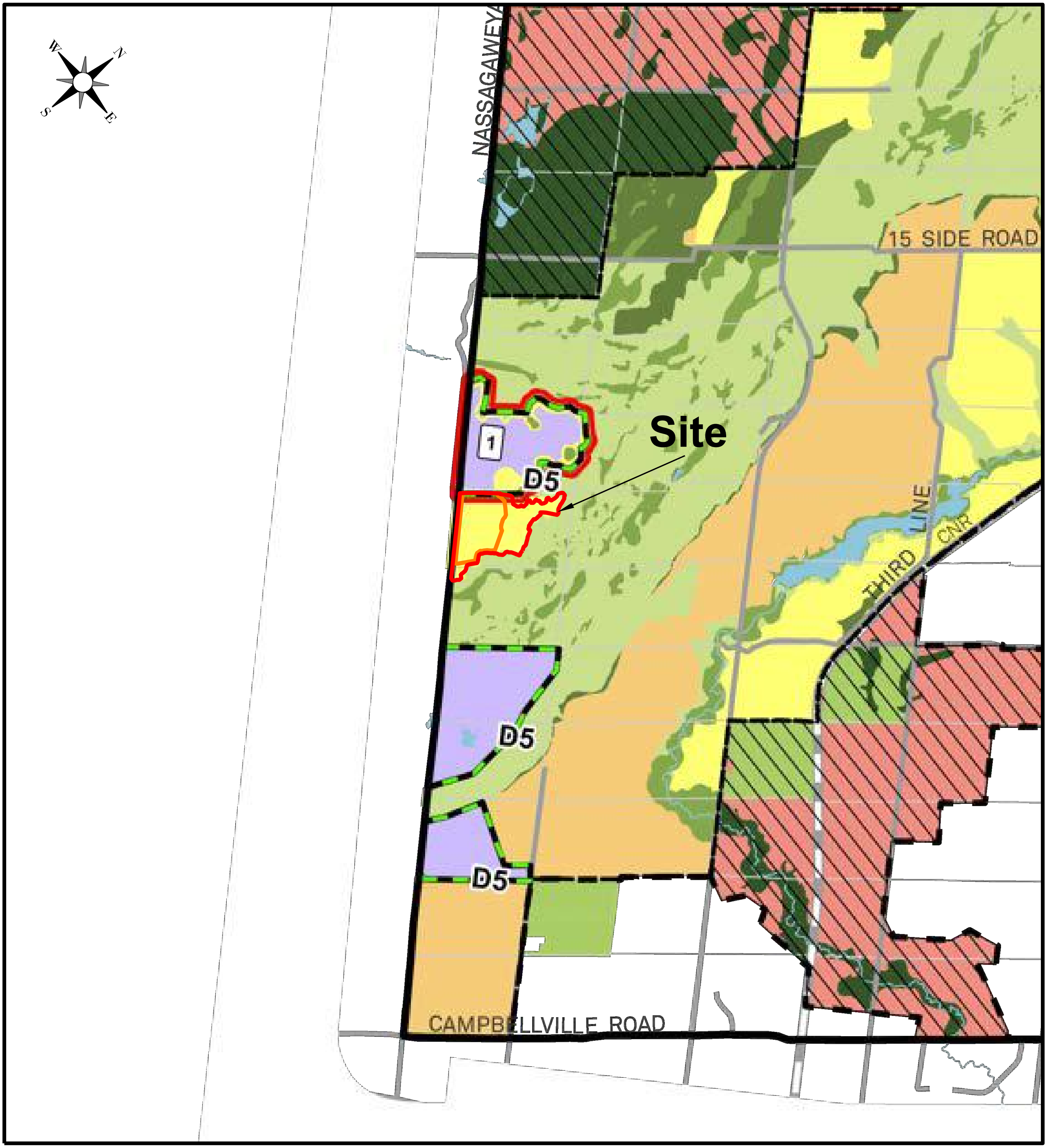


Figure # 4b

**Greenbelt Plan**

Town of Halton Hills Official Plan

**Milton Quarry East Extension**

Part of Lots 11 and 12, Concession 1
(Geographic Township of Esquesing)
Town of Halton Hills
Regional Municipality of Halton

Legend

- Proposed Milton Quarry East Extension - Licence Boundary
- Proposed Milton Quarry East Extension - Limit of Extraction
- Natural Heritage System Overlay
- Special Policy Area/Defferal
- Greenbelt Greenlands Area
- Greenlands A & Greenlands B
- Escarpment Natural/Protection Area
- Protected Countryside Area
- Escarpment Rural Area
- Mineral Resource Area
- Private Open Space Area

Date December 2021

Sources
Town of Halton Hills Official Plan - Schedule A2
Greenbelt Plan, consolidated May 1, 2019

Scale 1:40,000

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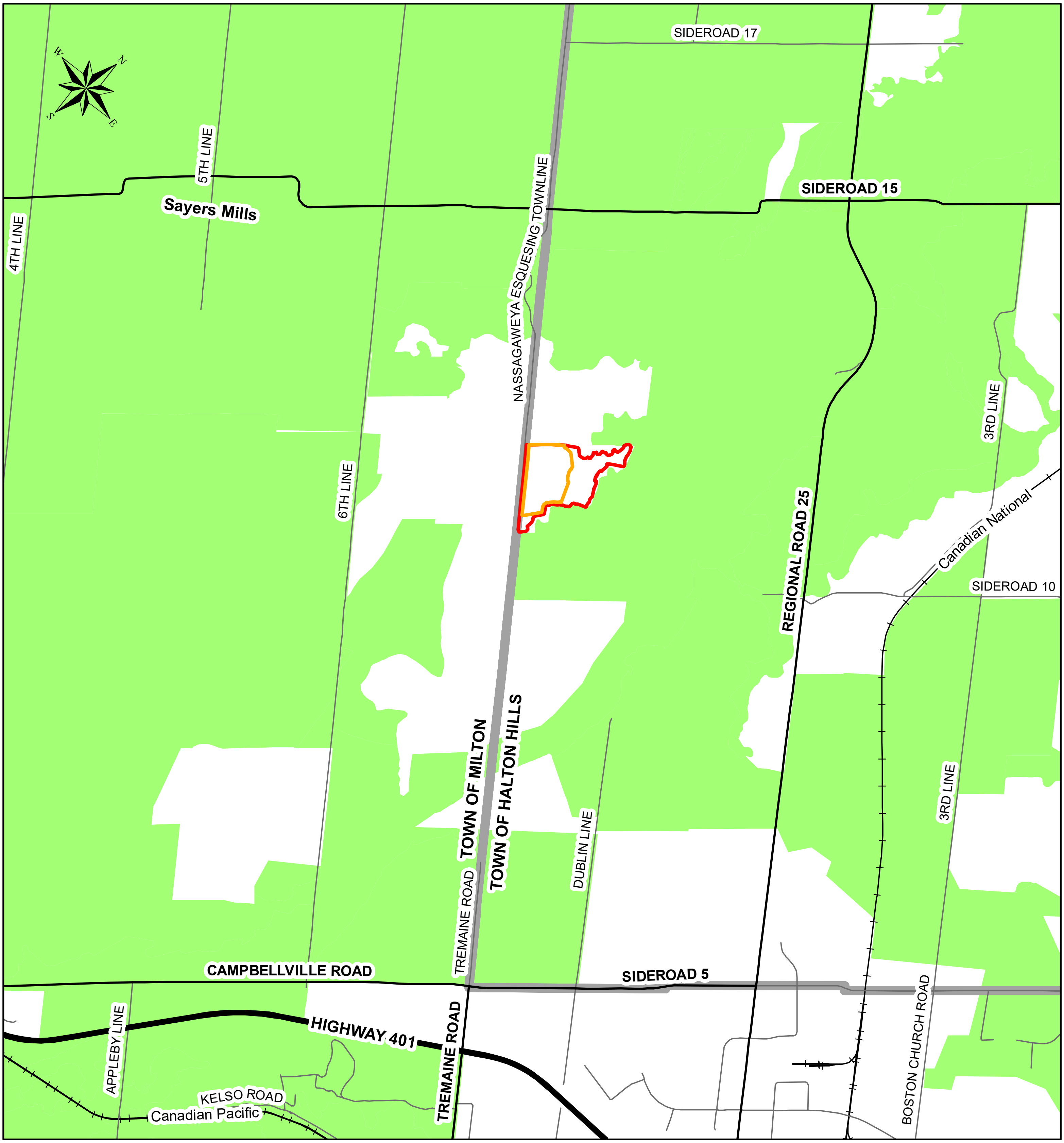


Figure # 5a

## Provincial Natural Heritage System

**Milton Quarry East Extension**
Part of Lots 11 and 12, Concession 1
(Geographic Township of Esquesing)
Town of Halton Hills
Regional Municipality of Halton

Legend

- Proposed Milton Quarry East Extension - Licence Boundary
- Proposed Milton Quarry East Extension - Limit of Extraction
- Provincial Natural Heritage System

DATE December 2021

SOURCES
Land Information Ontario
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0 200 400 800 1,200 1,600
Meters (1:40,000)

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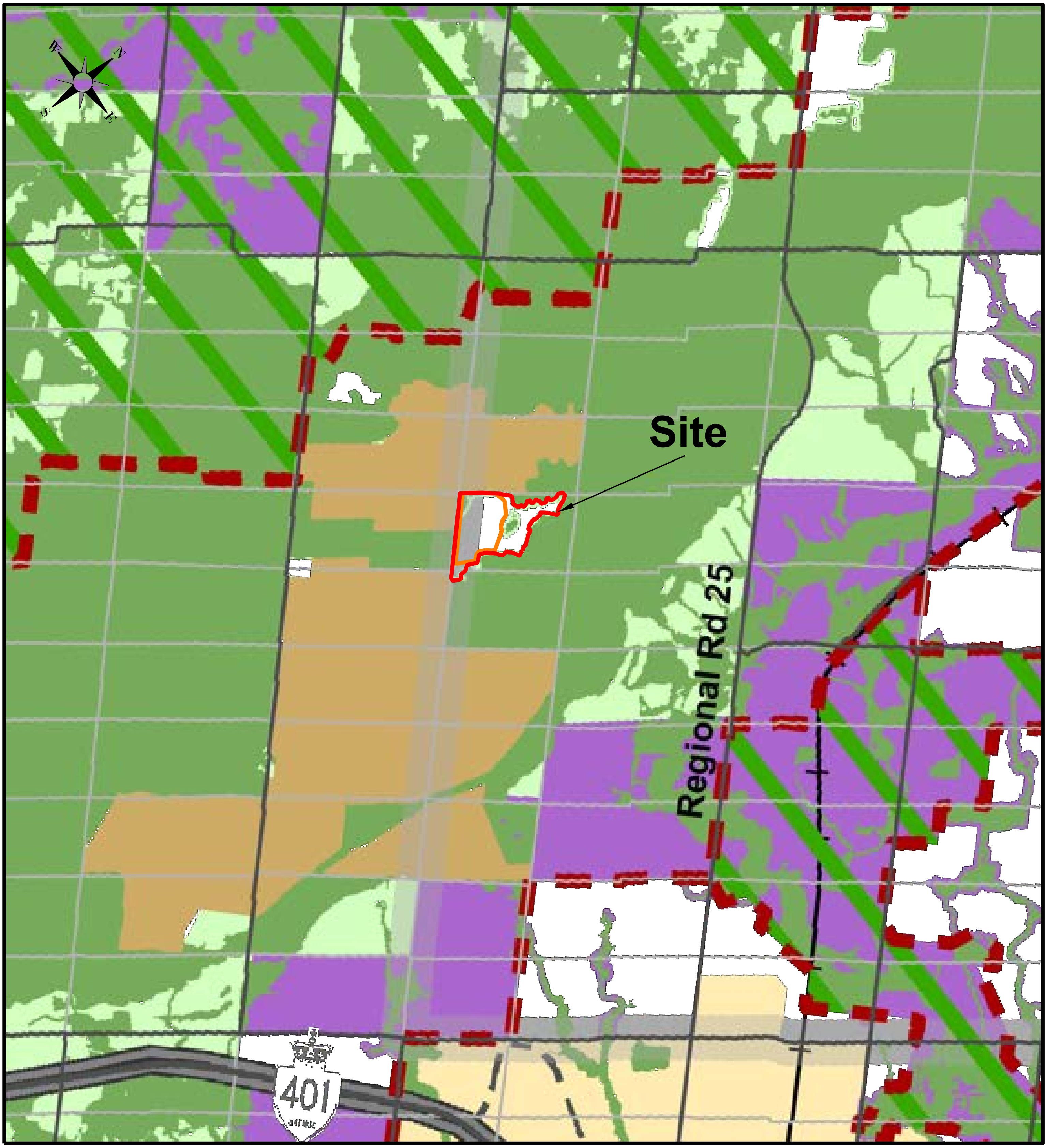


Figure # 5b

**Key Features within the Greenbelt & Regional Natural Heritage Systems**

Town of Halton Hills Official Plan

**Milton Quarry East Extension**

Part of Lots 11 and 12, Concession 1
Town of Halton Hills
Regional Municipality of Halton

Legend

- Proposed Milton Quarry East Extension - Licence Boundary
- Proposed Milton Quarry East Extension - Limit of Extraction
- Greenbelt Plan Boundary
- Natural Heritage System (Greenbelt)
- Key Features
- Enhancement Areas, Linkages & Buffers
- Mineral Resource Extraction Area
- Urban Area
- Prime Agricultural Areas in Natural Heritage System Enhancements / Linkages / Buffers

Date December 2021

Sources Halton Region Official Plan - Map 1G
Key Features within the Greenbelt &
Regional Natural Heritage Systems, dated June 19, 2018

Scale 1:40,000

0 600 1200 Meters

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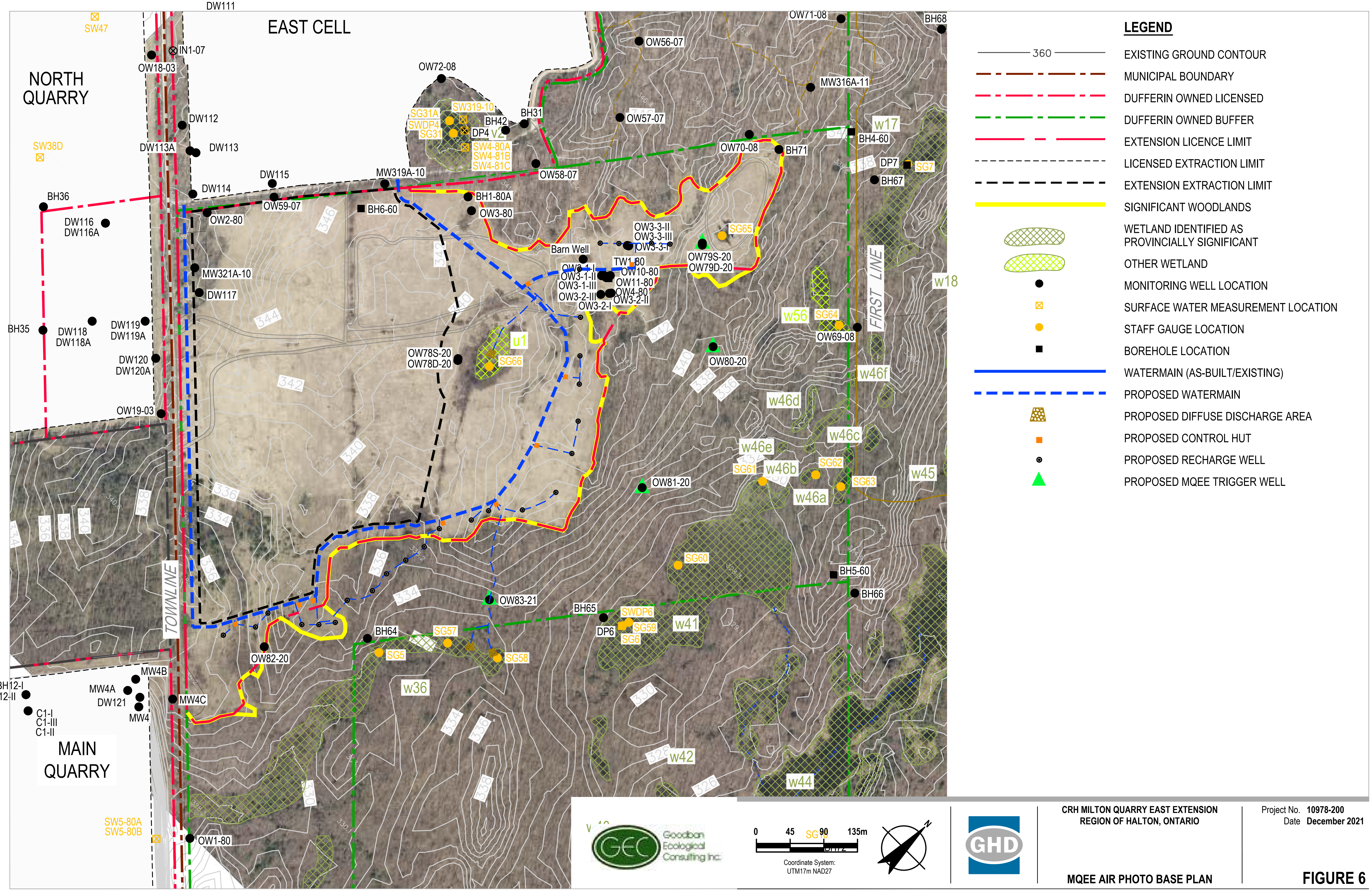
Goodban Ecological Consulting Inc.

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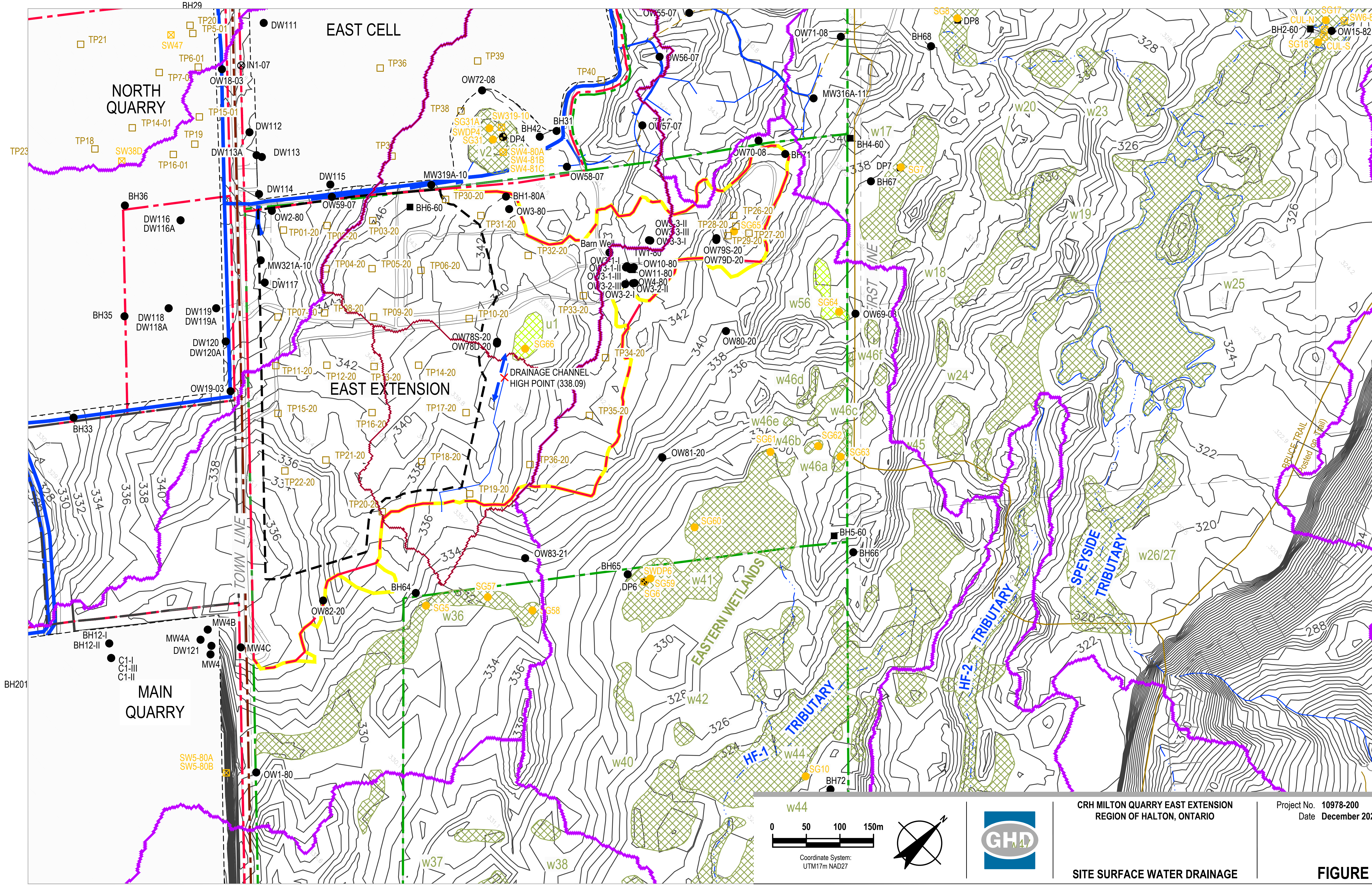


CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

SITE SURFACE WATER DRAINAGE

FIGURE 7

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA026-GEC.dwg
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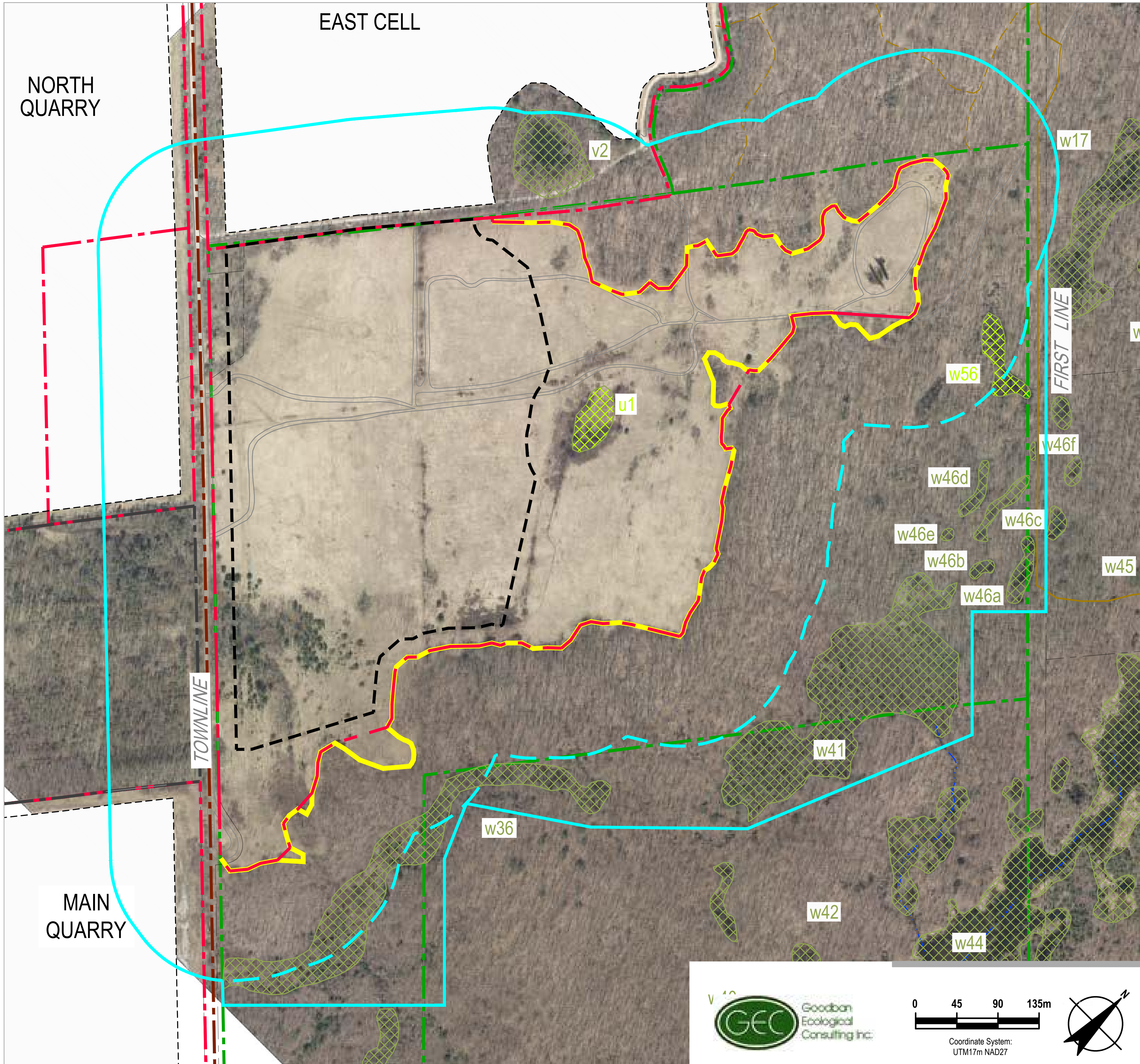


**LEGEND**

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- 120 m OFFSET FROM EXTENSION LICENCE LIMIT

Goodban Ecological Consulting Inc.

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

MQEE NATURAL ENVIRONMENT
STUDY AREA

Project No. 10978-200
Date December 2021

**FIGURE 8**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA016-GEC.dwg
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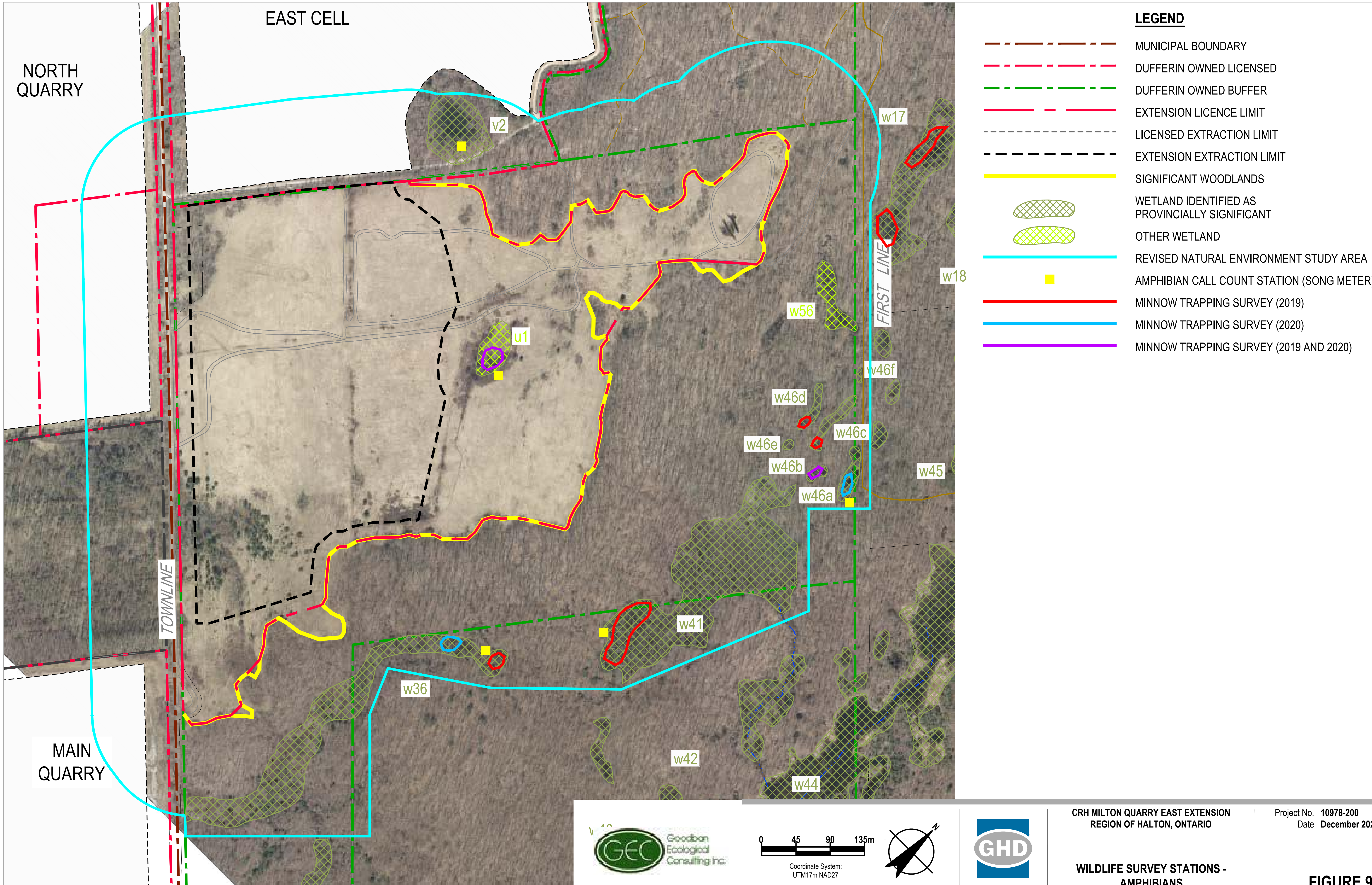


CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

WILDLIFE SURVEY STATIONS - AMPHIBIANS

FIGURE 9a

Image: 2019 Halton Region Orthoimagery from First Base Solutions.

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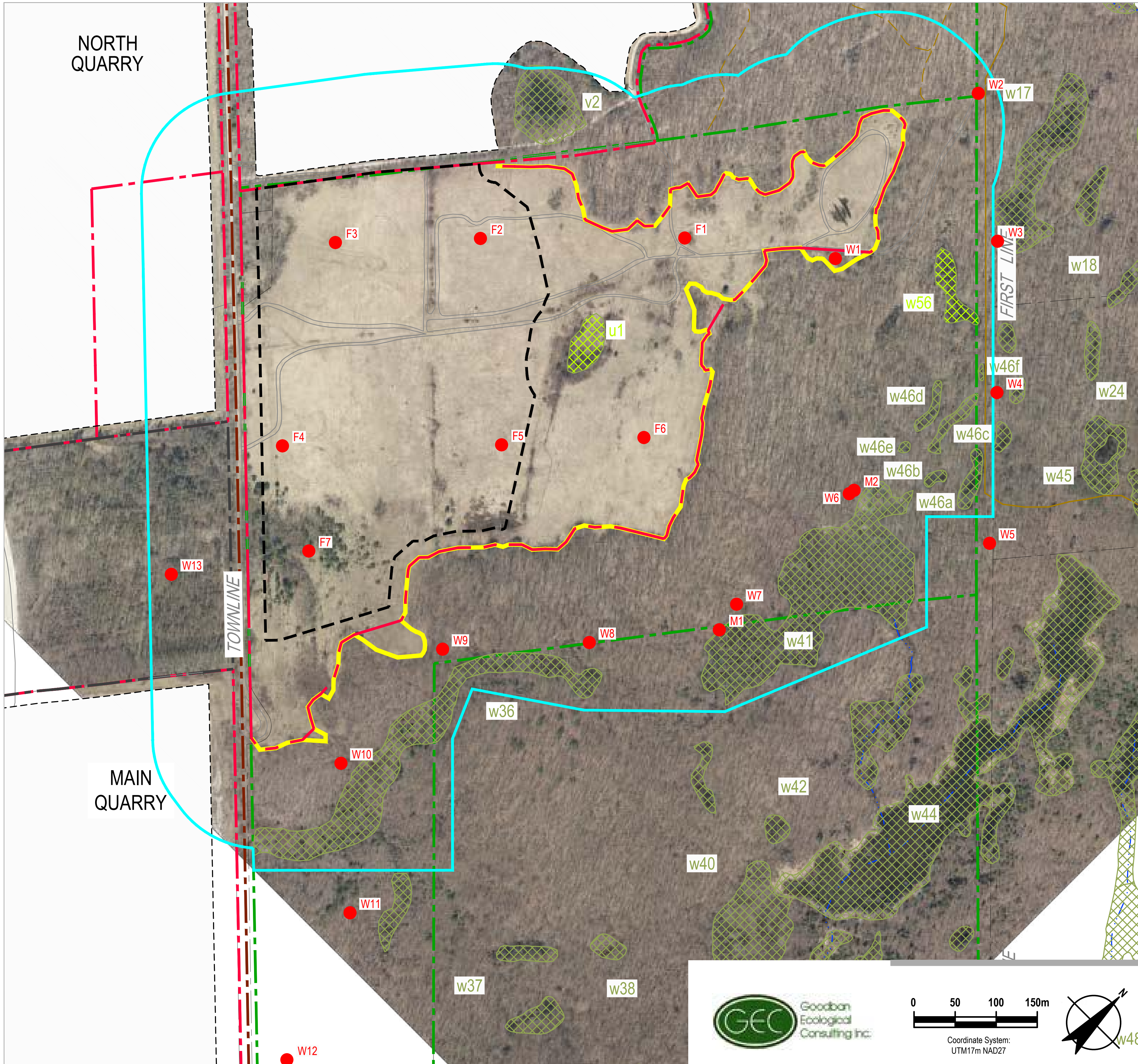


**LEGEND**

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- F1 FIELD - POINT COUNT STATION (2019 AND 2020)
- W1 WOODLAND - POINT COUNT STATION (2020)
- M1 MARSH - MARSH MONITORING PROTOCOL SURVEY STATION (2021)

GEC Goodban Ecological Consulting Inc.

0 50 100 150m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

**WILDLIFE SURVEY STATIONS - BREEDING BIRDS**

**FIGURE 9b**

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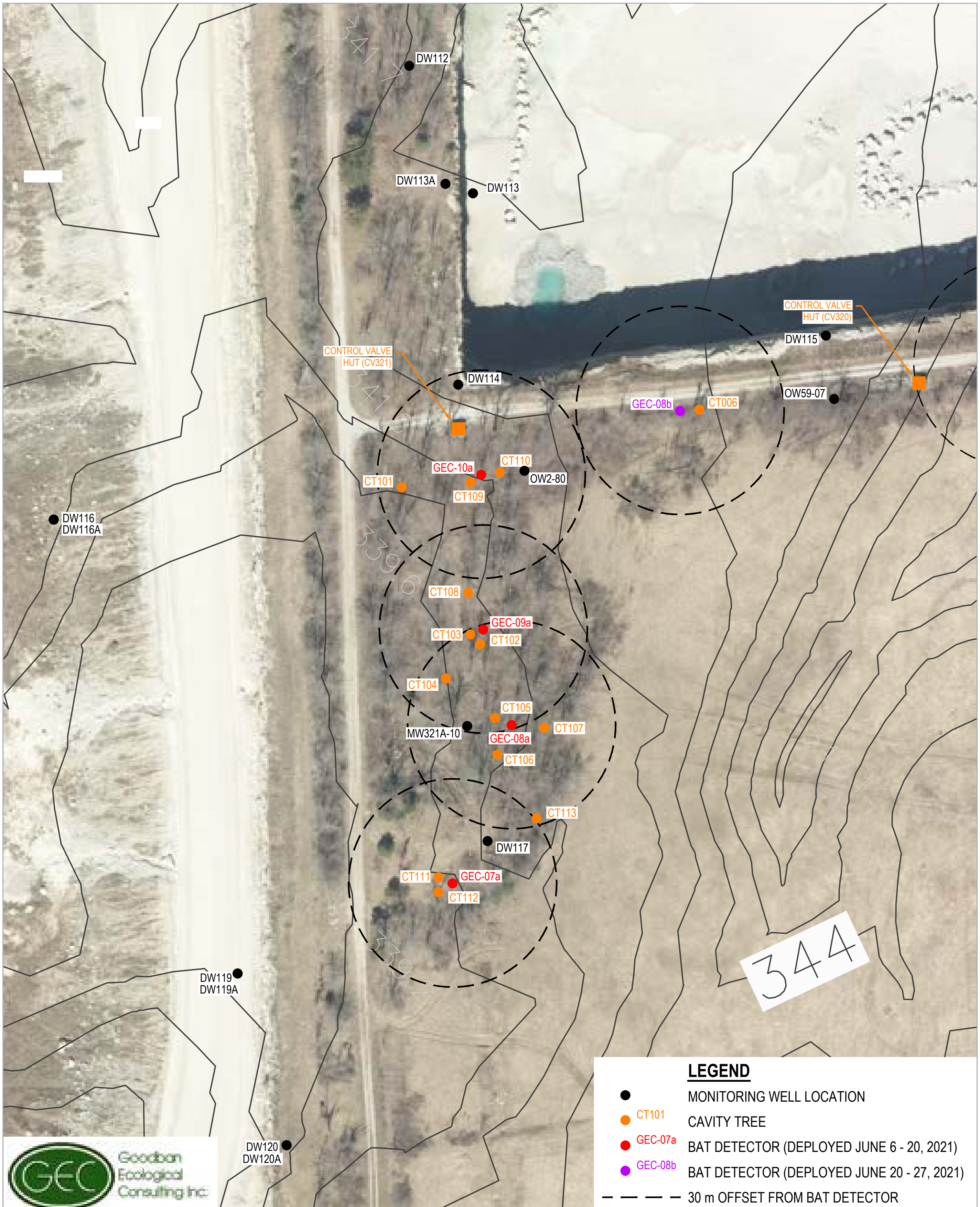


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Coordinate System:
UTM17m NAD27

GHD

**CRH MILTON QUARRY EAST EXTENSION**
**REGION OF HALTON, ONTARIO**

**CAVITY TREE LOCATIONS AND BAT DETECTOR STATIONS - WOODLOT**

Project No. **10978-200**
Date **December 2021**

**FIGURE 10a**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA005-GEC.dwg
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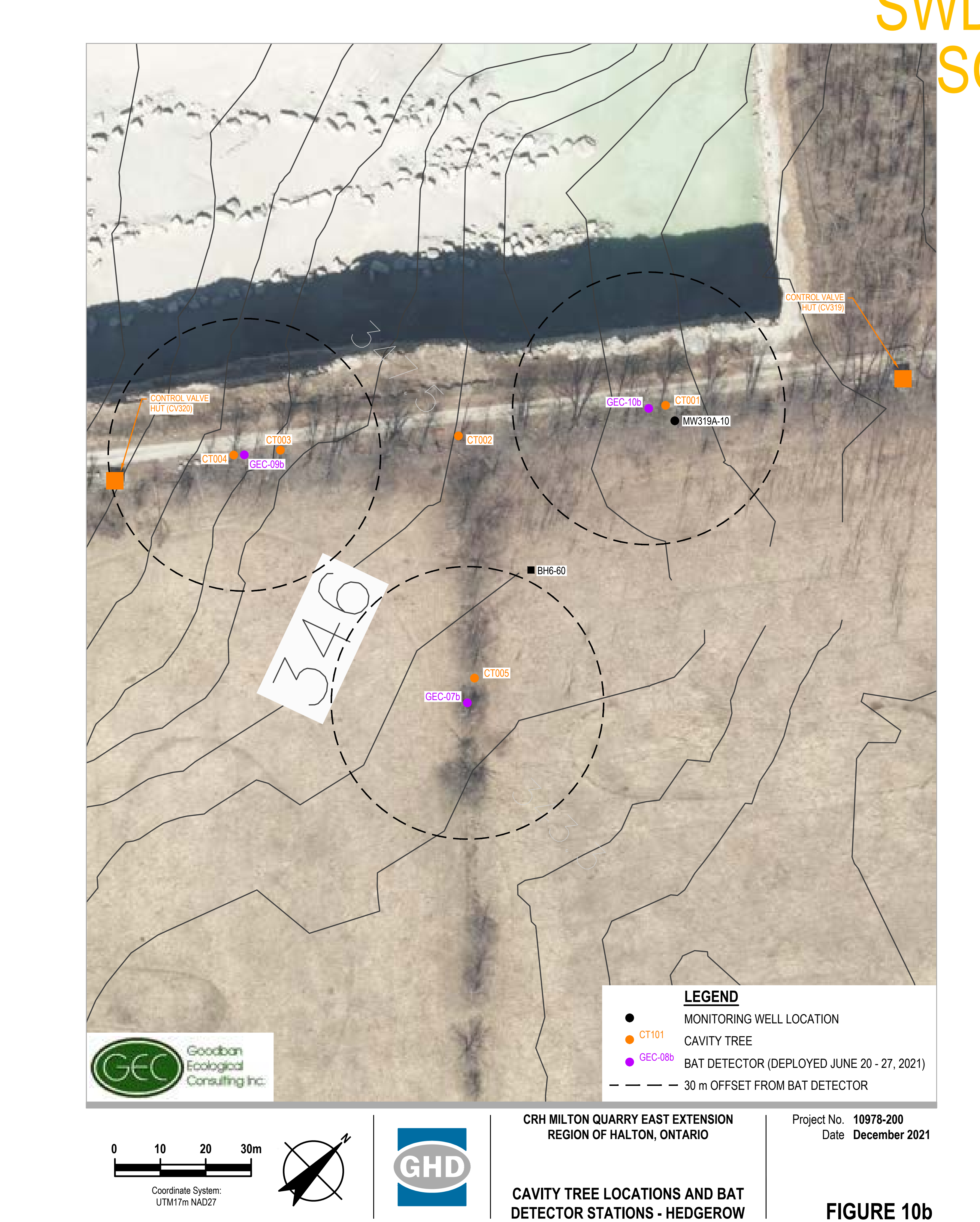


CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. **10978-200**
Date **December 2021**

**CAVITY TREE LOCATIONS AND BAT DETECTOR STATIONS - HEDGEROW**

**FIGURE 10b**

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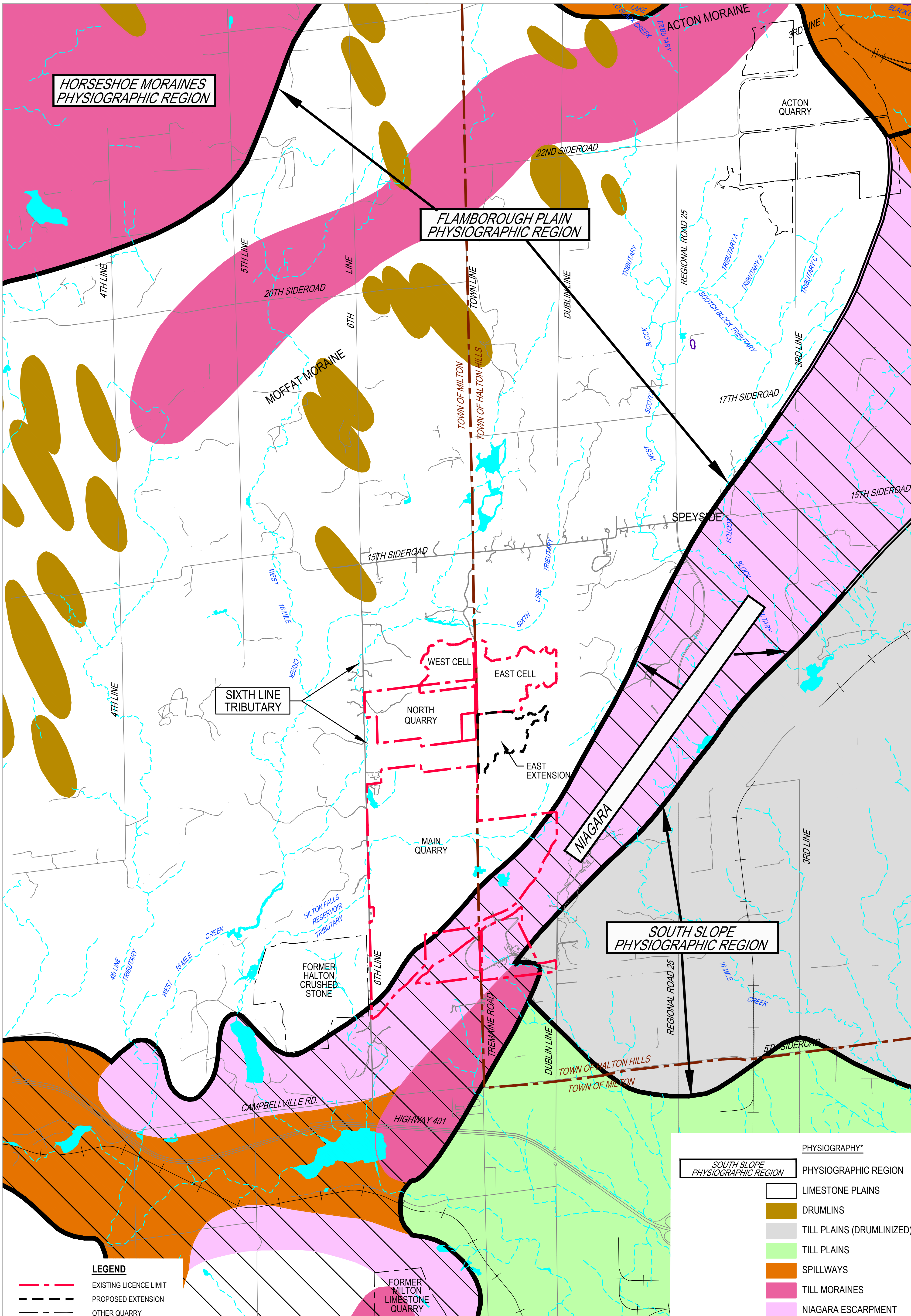


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Coordinate System: UTM17m NAD27

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

REGIONAL PHYSIOGRAPHY

FIGURE 11

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA019-GEC.dwg
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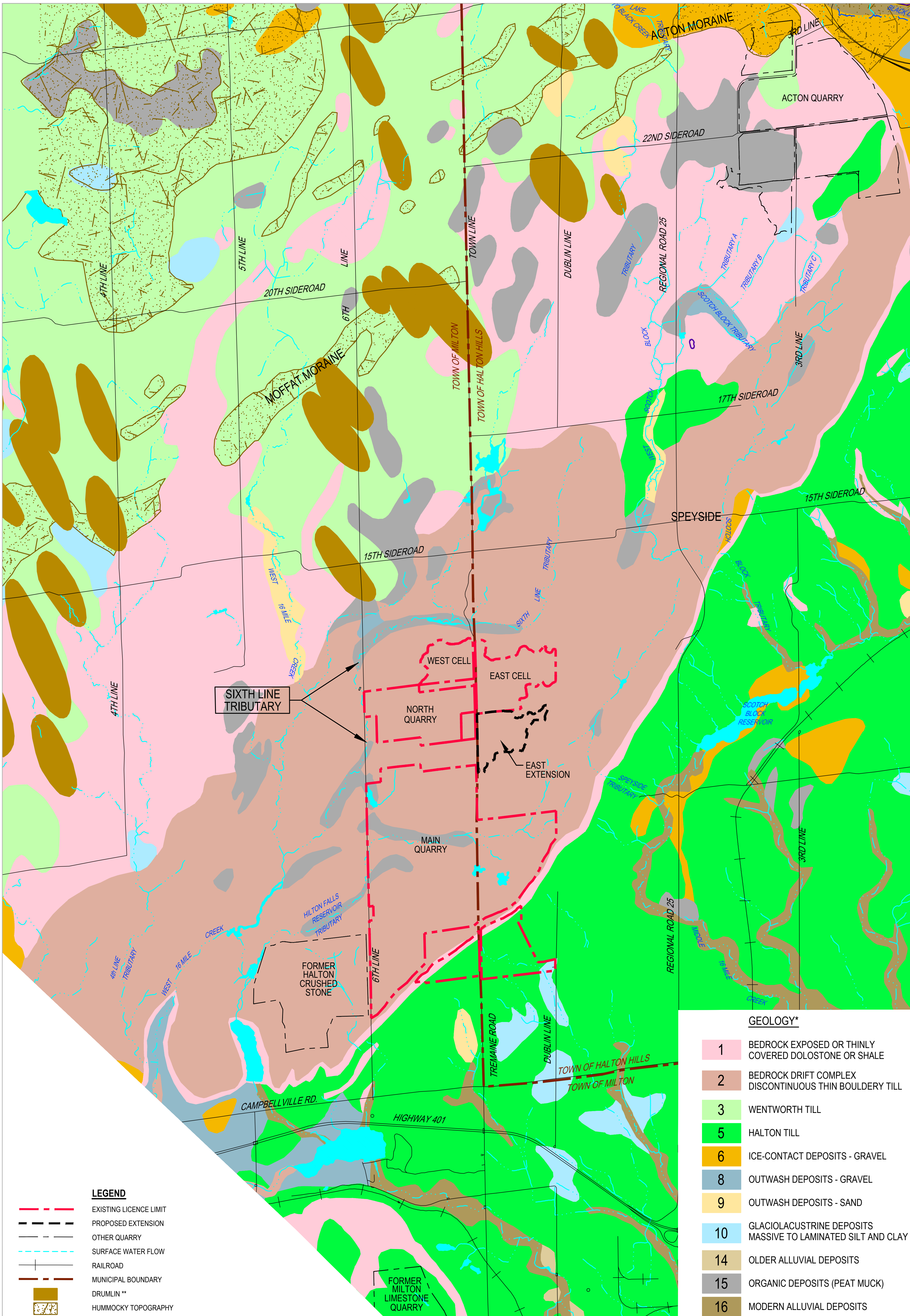


*SOURCE:
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**SOURCE: ONTARIO GEOLOGICAL SURVEY, 2007. PHYSIOGRAPHY OF SOUTHERN ONTARIO. MISCELLANEOUS RELEASE - DATA 228.

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

REGIONAL SURFICIAL GEOLOGY

FIGURE 12

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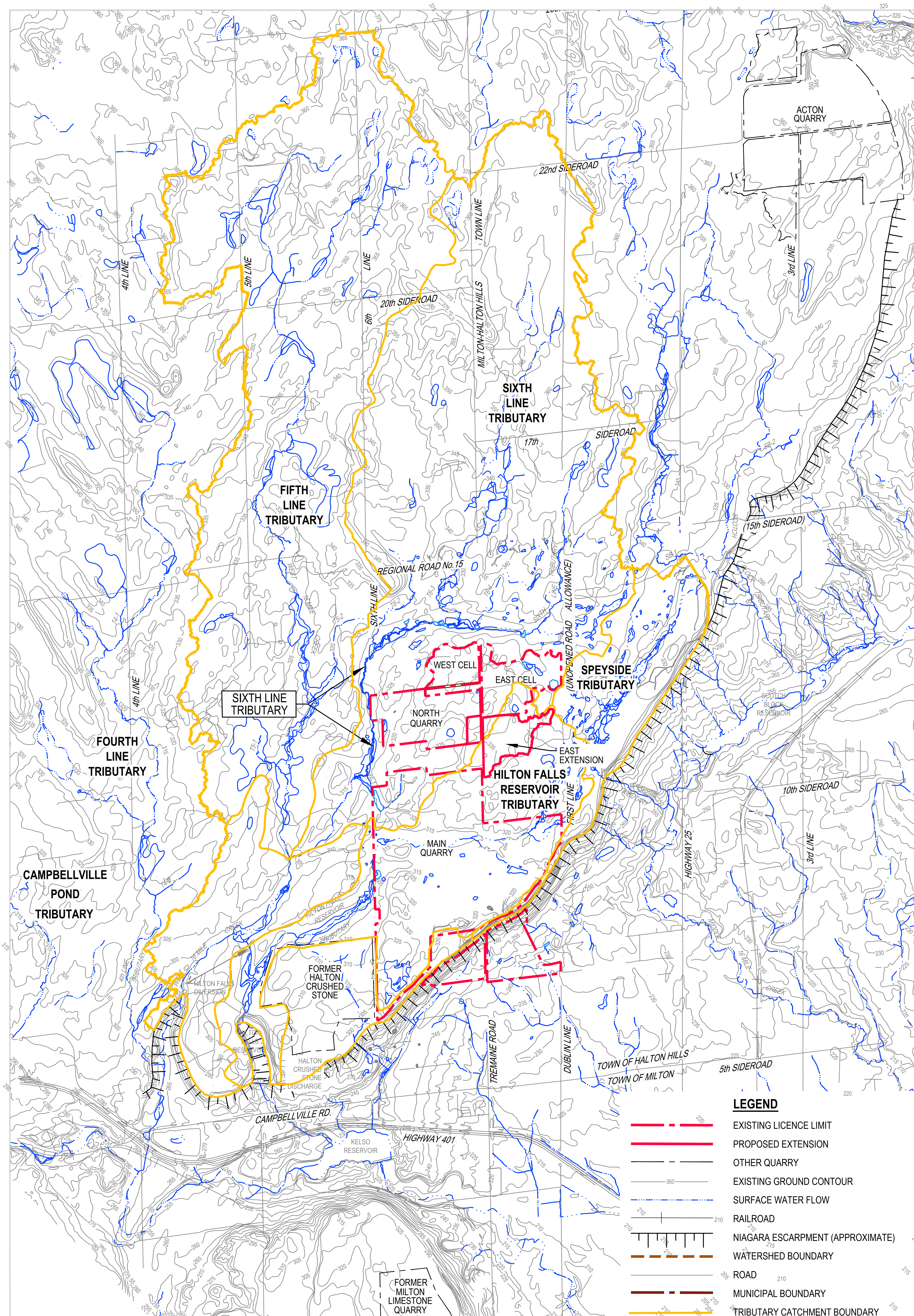


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Coordinate System:
UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

REGIONAL SURFACE WATER SYSTEM AND WATERSHED BOUNDARIES

Project No. 10978-200
Date December 2021

FIGURE 13

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA022-GEC.dwg
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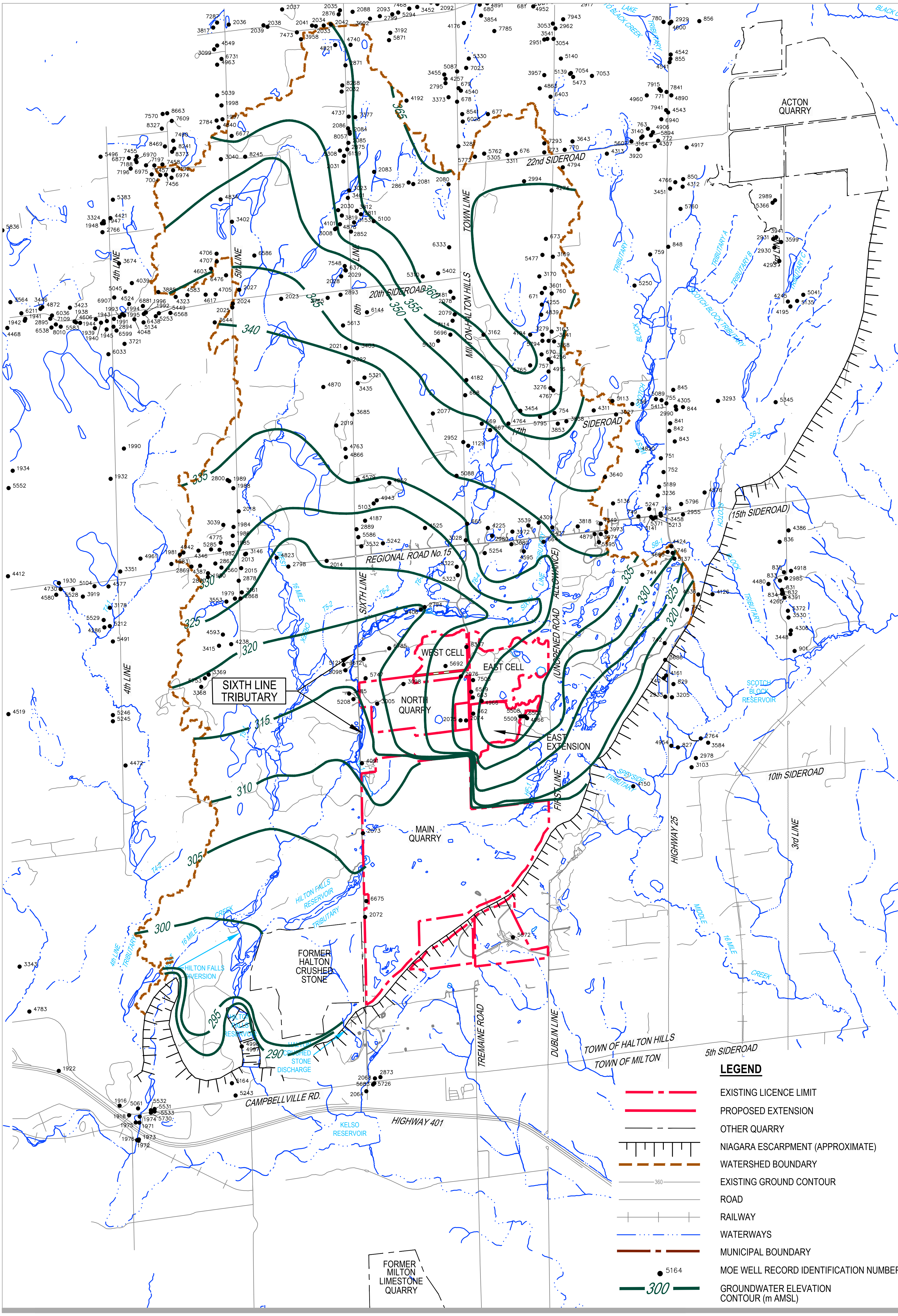


SOURCE:
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NOTE:
APPROXIMATE WELL LOCATIONS AND GROUNDWATER ELEVATIONS ARE FROM MOE DRILLING RECORDS EXTRACTED FOR 2000 GWRA.

0 400 800 1200m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

REGIONAL GROUNDWATER FLOW

FIGURE 14

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA021-GEC.dwg
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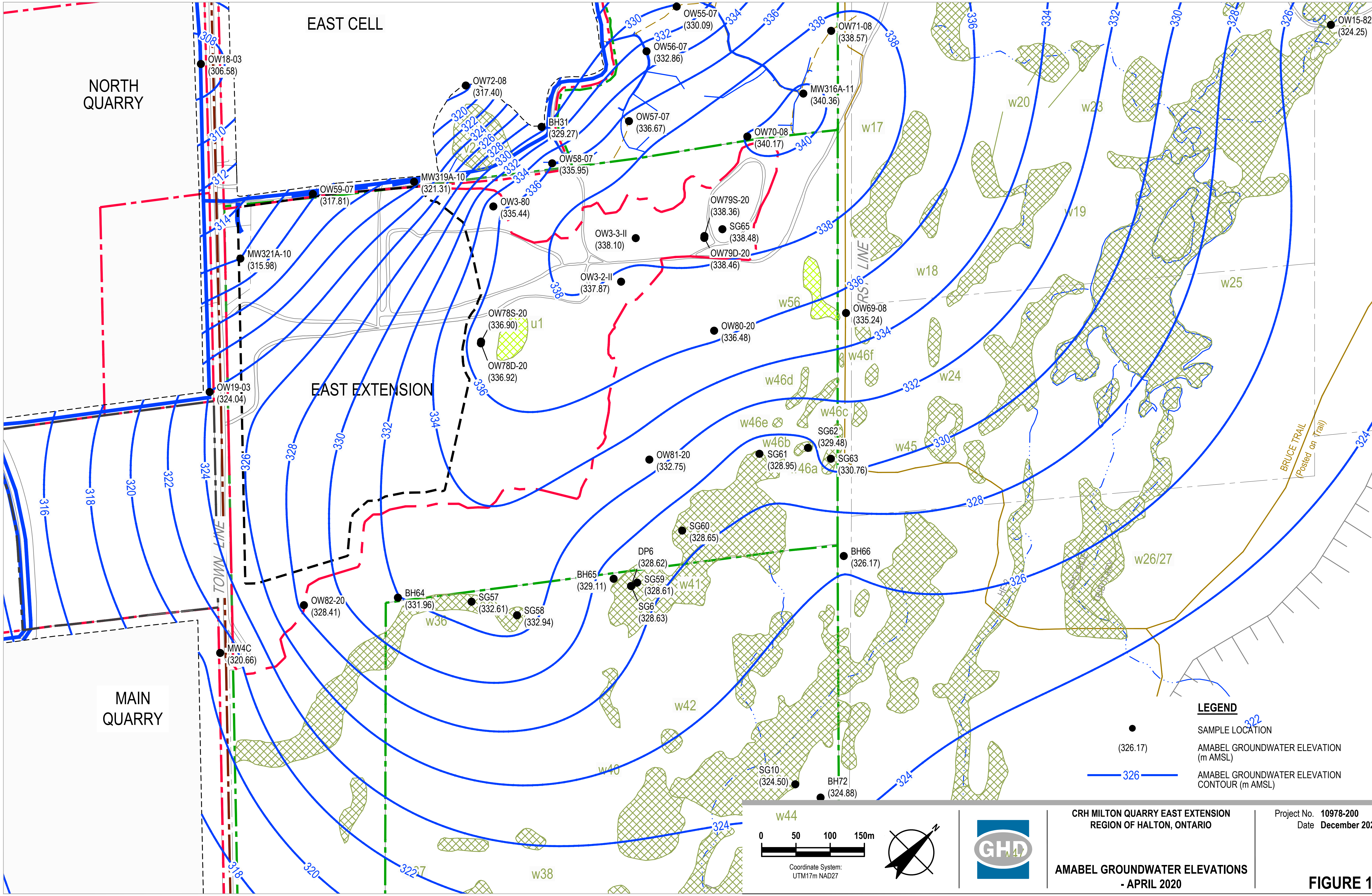


CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

AMABEL GROUNDWATER ELEVATIONS - APRIL 2020

FIGURE 15

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA024-GEC.dwg
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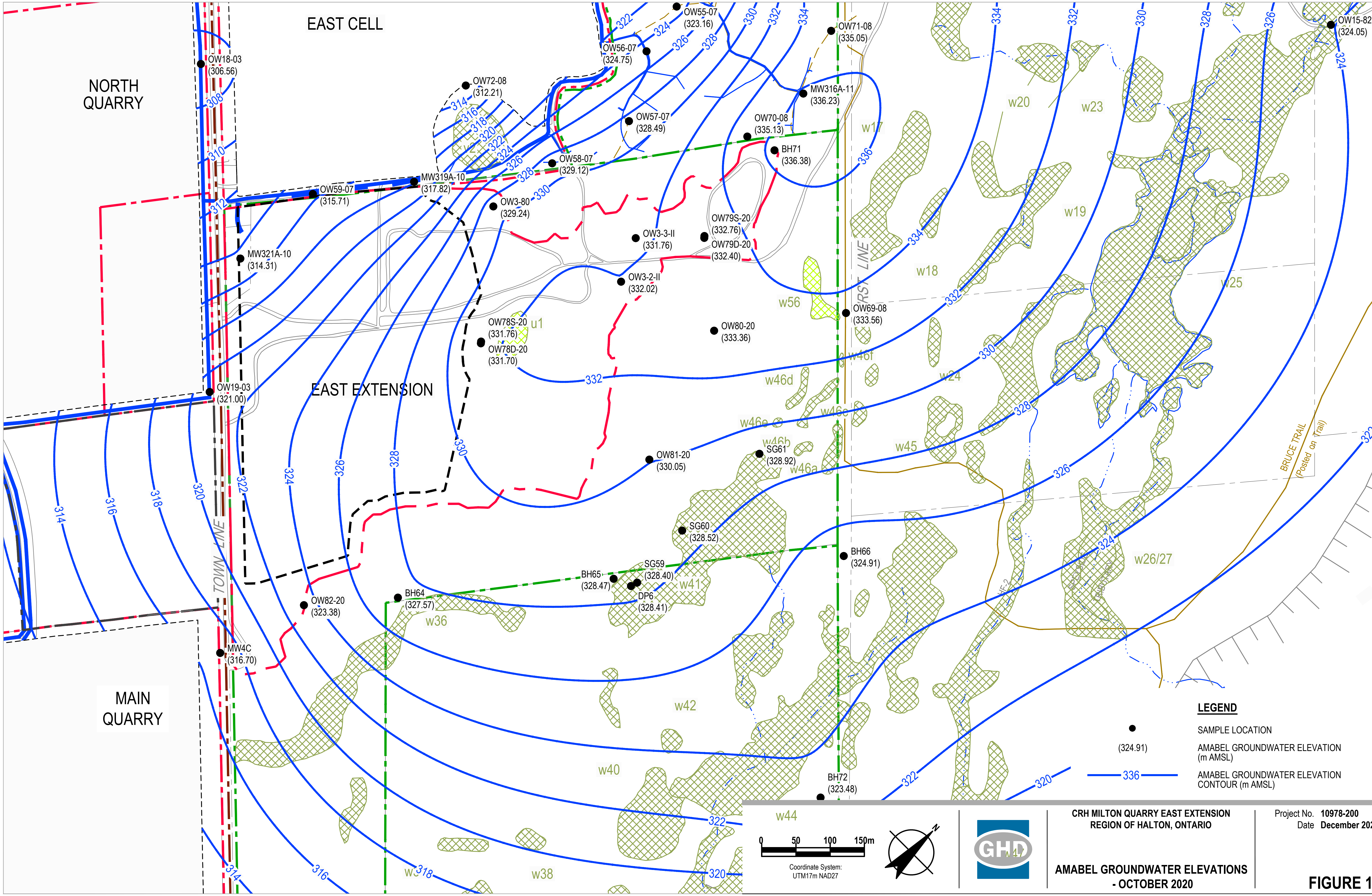


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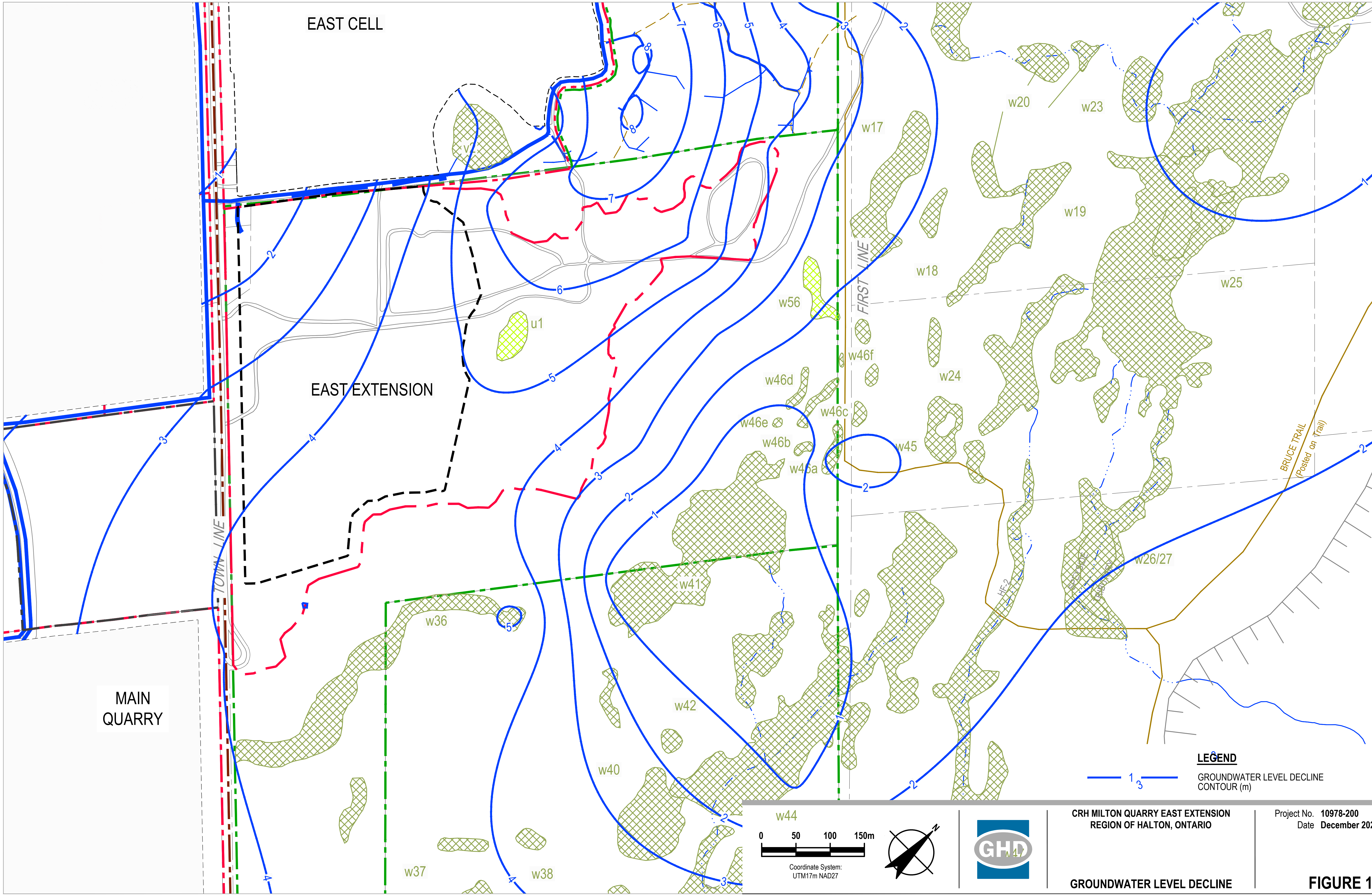


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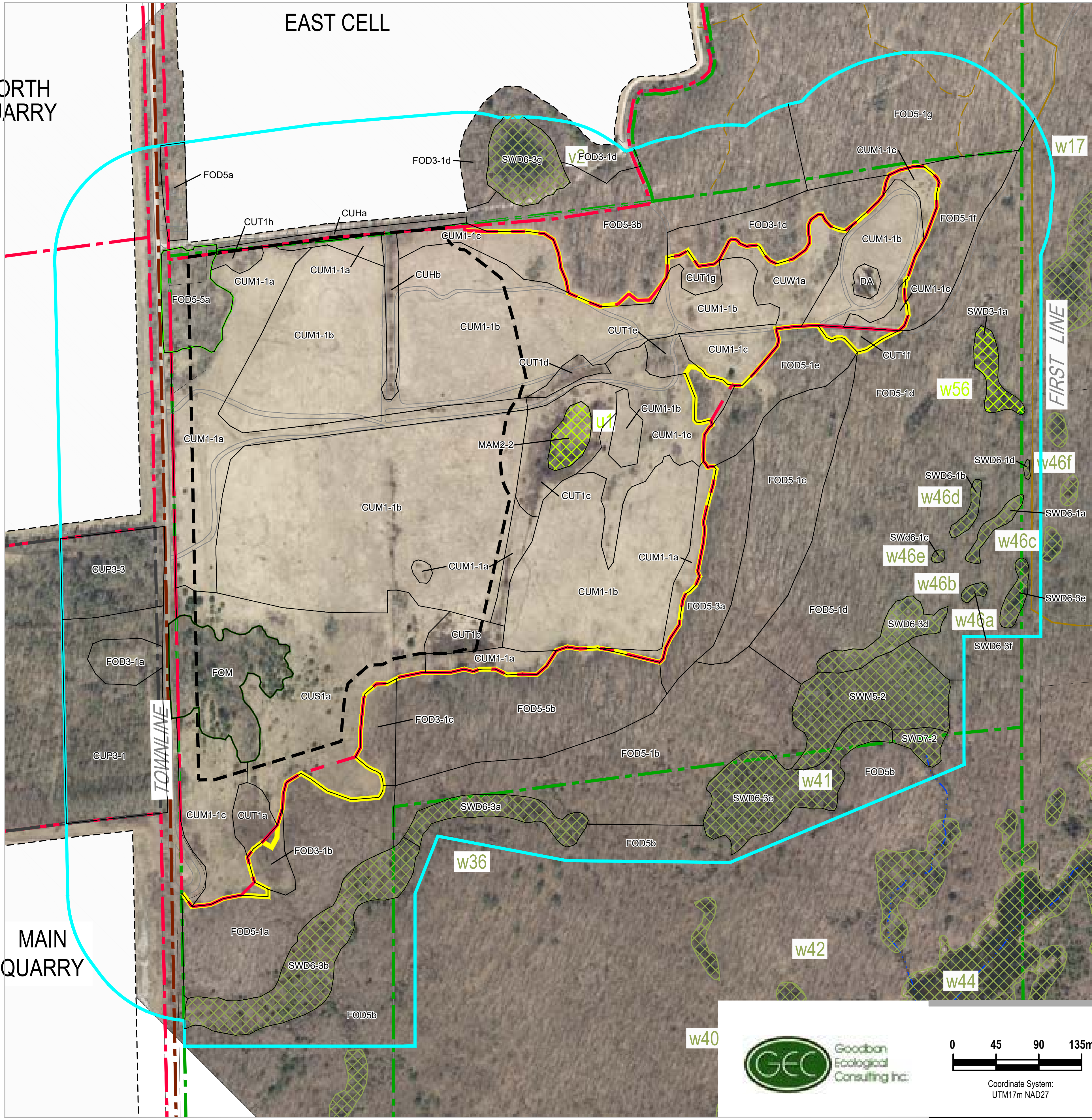


## LEGEND

MUNICIPAL BOUNDARY
DUFFERIN OWNED LICENSED
DUFFERIN OWNED BUFFER
EXTENSION LICENCE LIMIT
LICENSED EXTRACTION LIMIT
EXTENSION EXTRACTION LIMIT
SIGNIFICANT WOODLANDS
WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
OTHER WETLAND
REVISED NATURAL ENVIRONMENT STUDY AREA
WOODLAND A BOUNDARY
WOODLAND B BOUNDARY

VEGETATION COMMUNITIES (ELC UNITS)

TERRESTRIAL

| | |
|---|---|
| FOM | MIXED FOREST |
| FOD3-1 | DRY-FRESH POPLAR DECIDUOUS FOREST TYPE |
| FOD5 | DRY-FRESH SUGAR MAPLE DECIDUOUS FOREST ECOSITE |
| FOD5-1 | DRY-FRESH SUGAR MAPLE DECIDUOUS FOREST TYPE |
| FOD5-3 | DRY-FRESH SUGAR MAPLE - OAK DECIDUOUS FOREST TYPE |
| FOD5-5 | DRY-FRESH SUGAR MAPLE - HICKORY DECIDUOUS FOREST TYPE |

TERRESTRIAL - CULTURAL

| | |
|---|---|
| CUP3-1 | RED PINE CONIFEROUS PLANTATION TYPE |
| CUP3-3 | SCOTS PINE CONIFEROUS PLANTATION TYPE |
| CUW1 | MINERAL CULTURAL WOODLAND TYPE |
| CUS1 | MINERAL CULTURAL SAVANNAH TYPE |
| CUT1 | MINERAL CULTURAL THICKET TYPE |
| CUM1-1a | DRY-MOIST OLD FIELD MEADOW TYPE |
| CUM1-1b | DRY-MOIST OLD FIELD MEADOW TYPE (PLOUGHED AND RESEEDED LATE 2020) |
| CUM1-1c | DRY-MOIST OLD FIELD MEADOW TYPE (WITH SOME WOODY REGENERATION) |
| CUH* | TREED HEDGEROW |

WETLAND

| | |
|---|---|
| SWM5-2 | SWAMP MAPLE - CONIFER ORGANIC MIXED SWAMP TYPE |
| SWD3-1 | RED MAPLE MINERAL DECIDUOUS SWAMP TYPE |
| SWD6-1 | RED MAPLE ORGANIC DECIDUOUS SWAMP TYPE |
| SWD6-3 | SWAMP MAPLE ORGANIC DECIDUOUS SWAMP TYPE |
| SWD7-2 | YELLOW BIRCH ORGANIC DECIDUOUS SWAMP TYPE |
| MAM2-2 | REED CANARY GRASS MEADOW MARSH |

* NOT IN ELC (LEE ET AL. 1998)

GEC Goodban Ecological Consulting Inc.

0 45 90 135m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

VEGETATION COMMUNITIES - ELC UNITS

FIGURE 18

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA002-GEC.dwg
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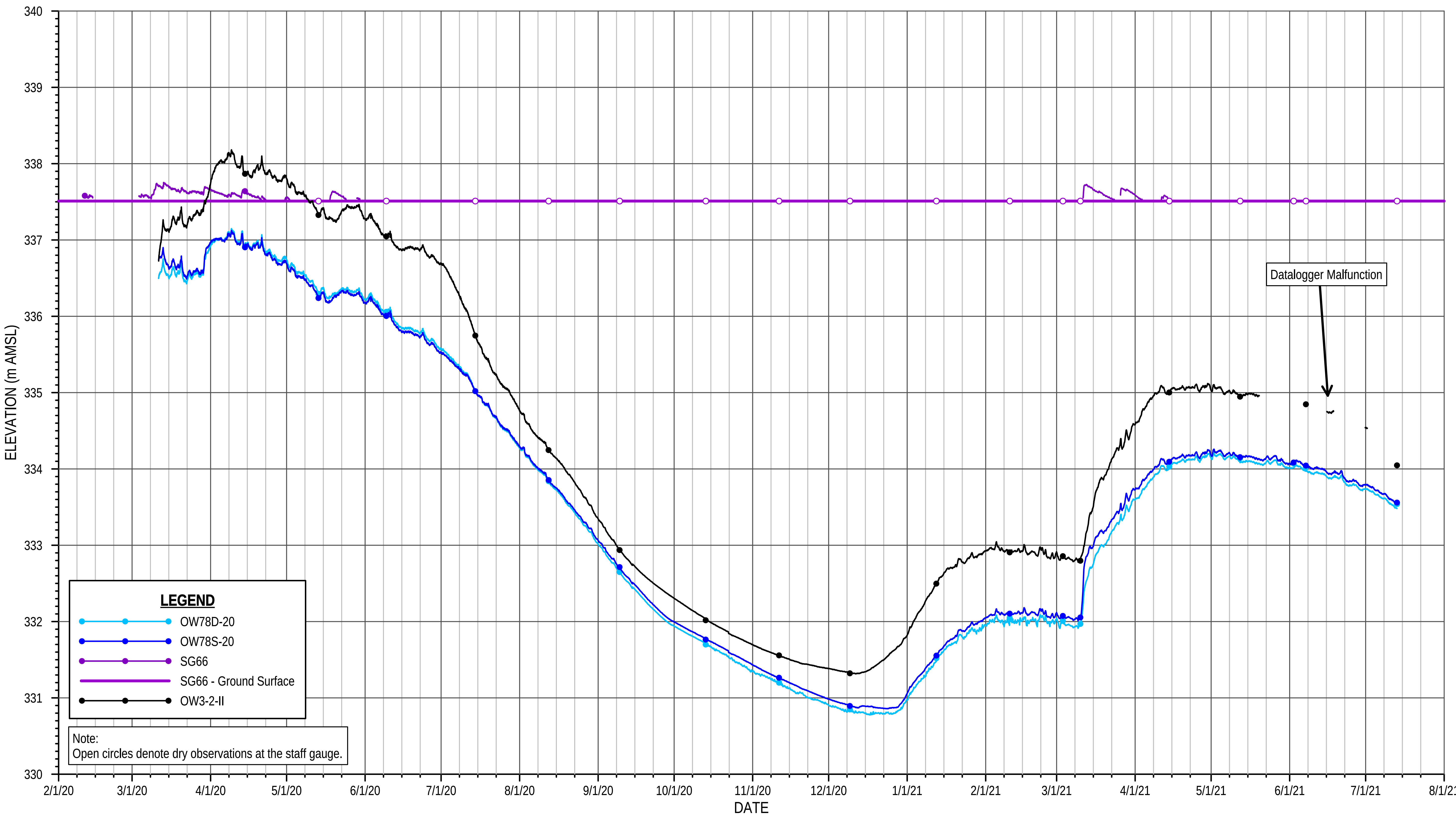
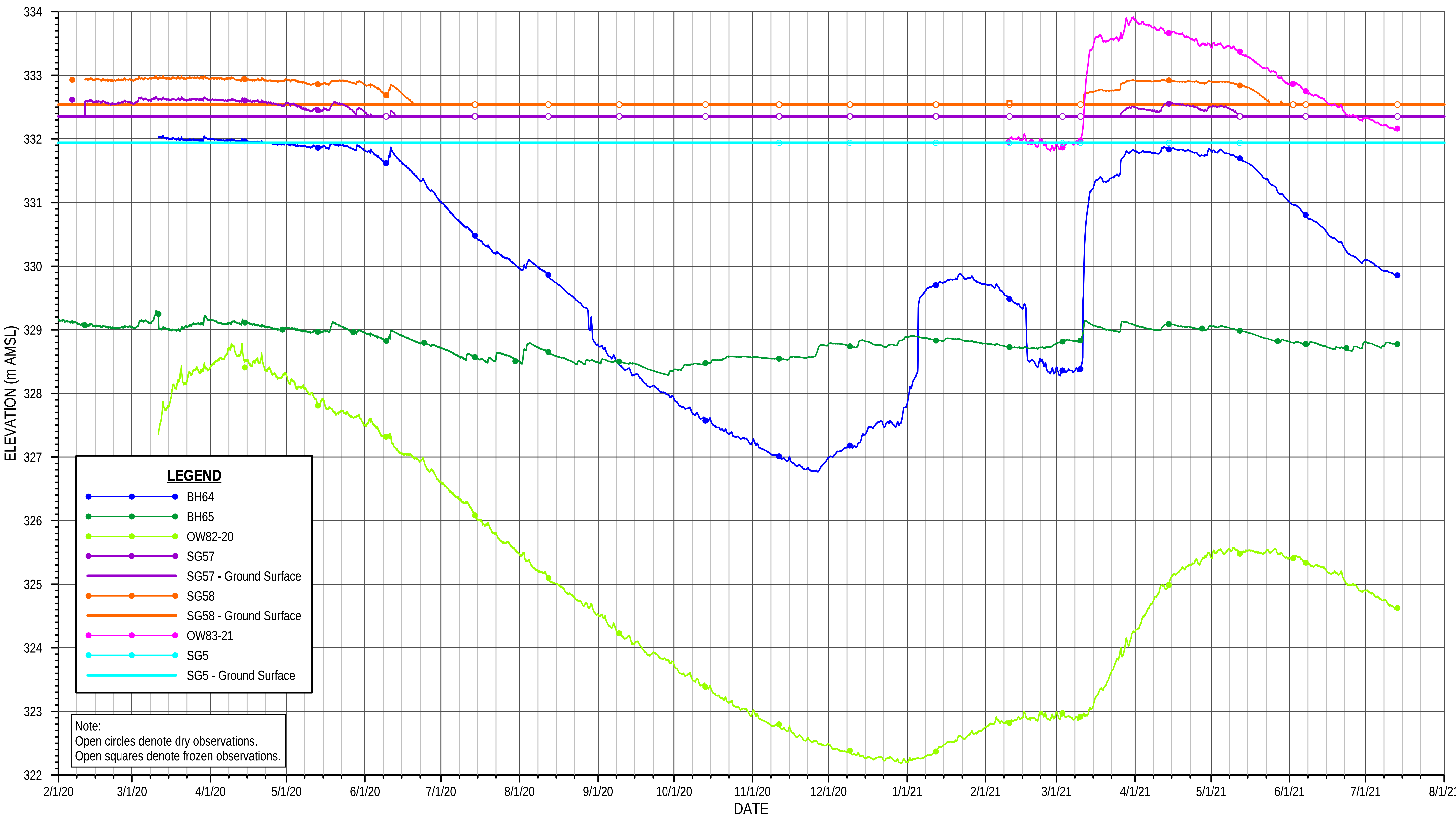



MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

HYDROGRAPH - WETLAND U1

Project No. **10978**
Date **November 2021**

**FIGURE 19**




GHD

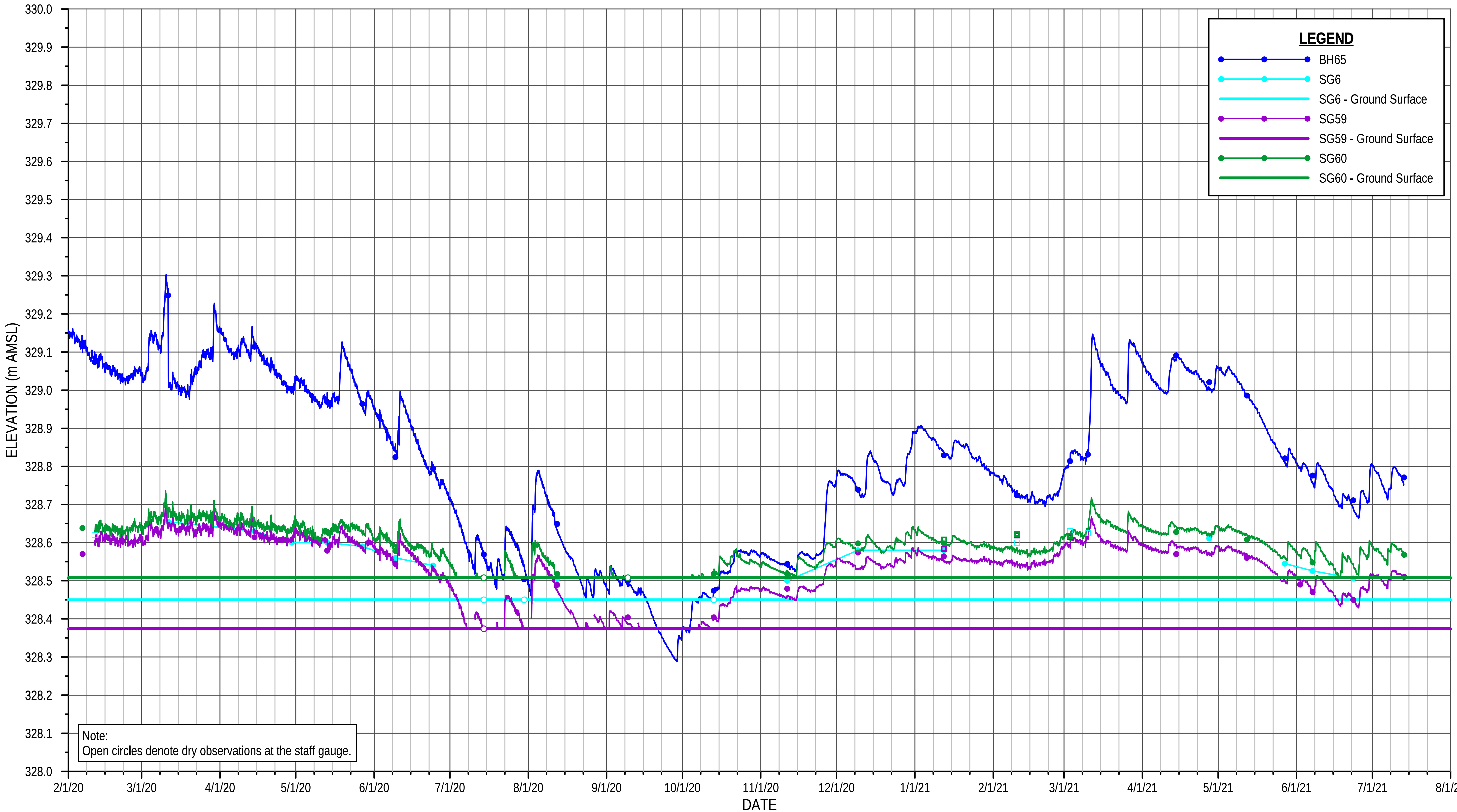
MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978
Date September 2021

HYDROGRAPH - WETLAND W36

FIGURE 20

HEG file: N:\CA\Waterloo\Projects\662\010978\Grapher\Report 164\Figure 6.11 - W36.grf
Plot Date: September 17 2021 11:09 AM




MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. **10978**
Date **September 2021**

**HYDROGRAPH - WETLAND W41 WEST**

**FIGURE 21**

HEG file: N:\CA\Waterloo\Projects\662\010978\Grapher\Report 164\Figure 6.12 - W41 West.grf
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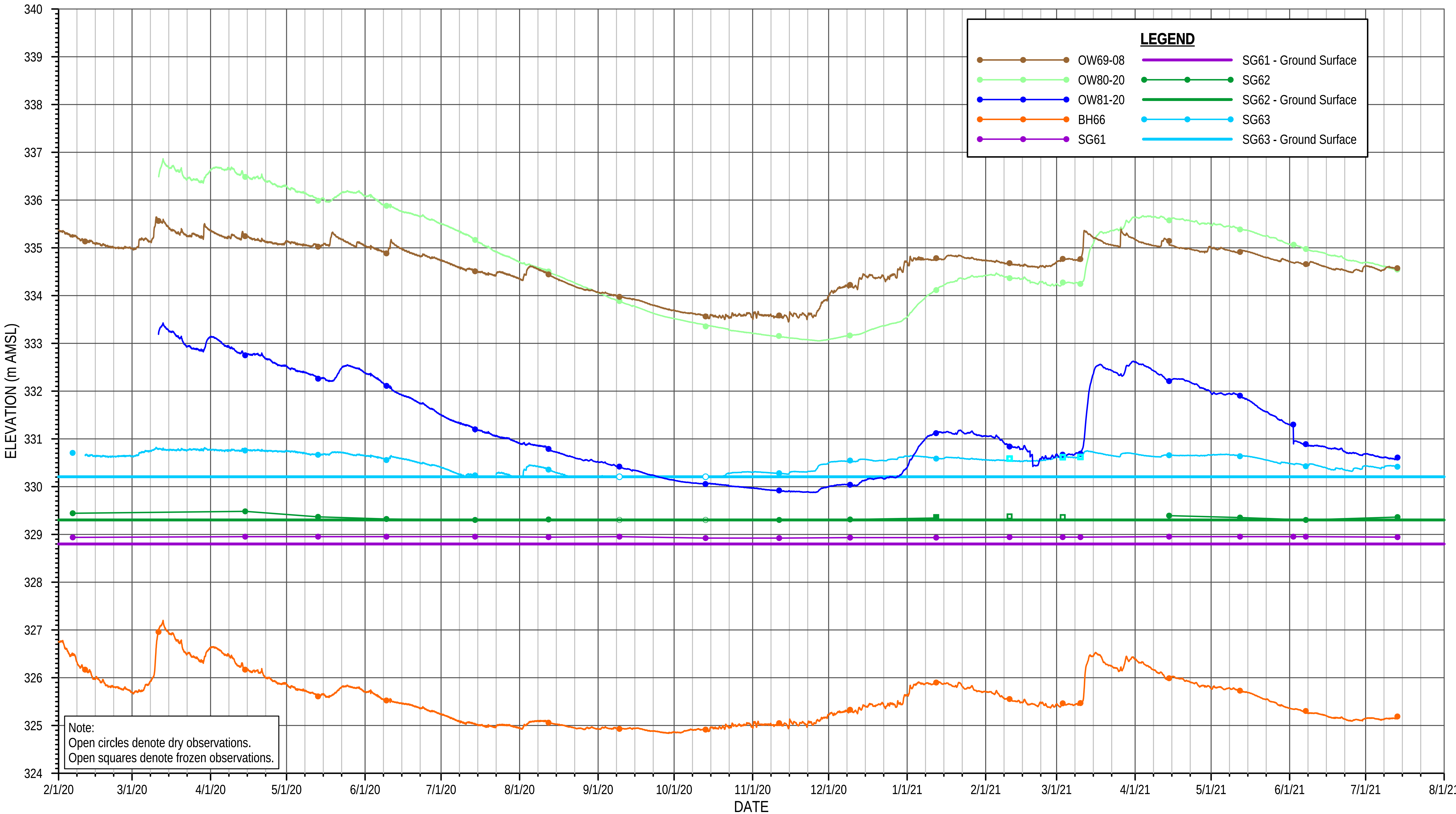


MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978
Date September 2021

HYDROGRAPH
WETLAND W41 EAST - W46

FIGURE 22

HEG file: N:\CA\Waterloo\Projects\662\010978\Grapher\Report 164\Figure 6.13 - W41 East - W46.grf
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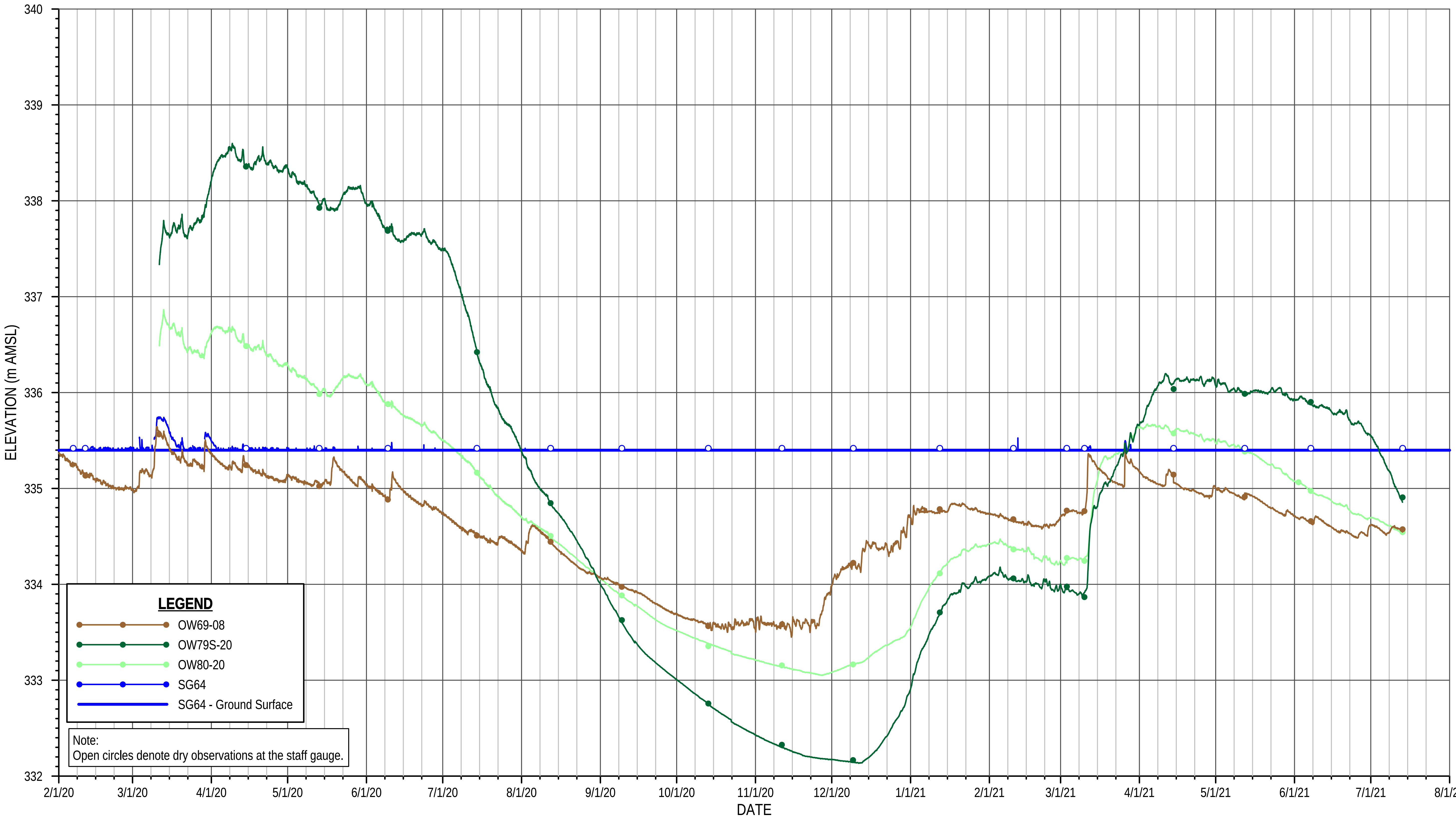


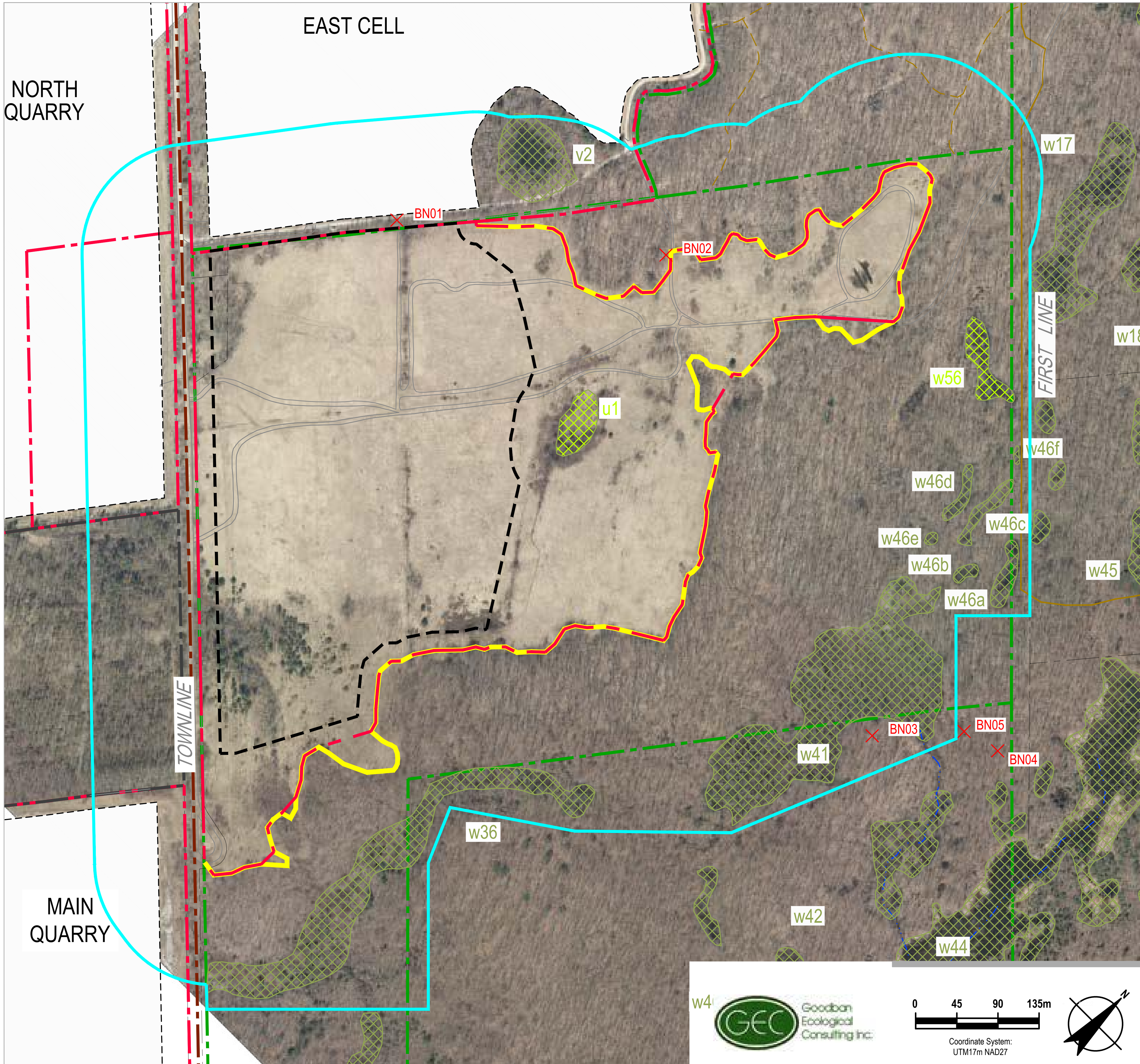

MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

HYDROGRAPH - WETLAND W56

Project No. **10978**
Date **September 2021**

**FIGURE 23**

HEG file: N:\CA\Waterloo\Projects\662\010978\Grapher\Report 164\Figure 6.14 - W56.grf
Plot Date: September 17 2021 11:09 AM




## LEGEND

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- BN01 BUTTERNUT

0 45 90 135m

Coordinate System: UTM17m NAD27

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

BUTTERNUT LOCATIONS

**FIGURE 24**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA008-GEC.dwg
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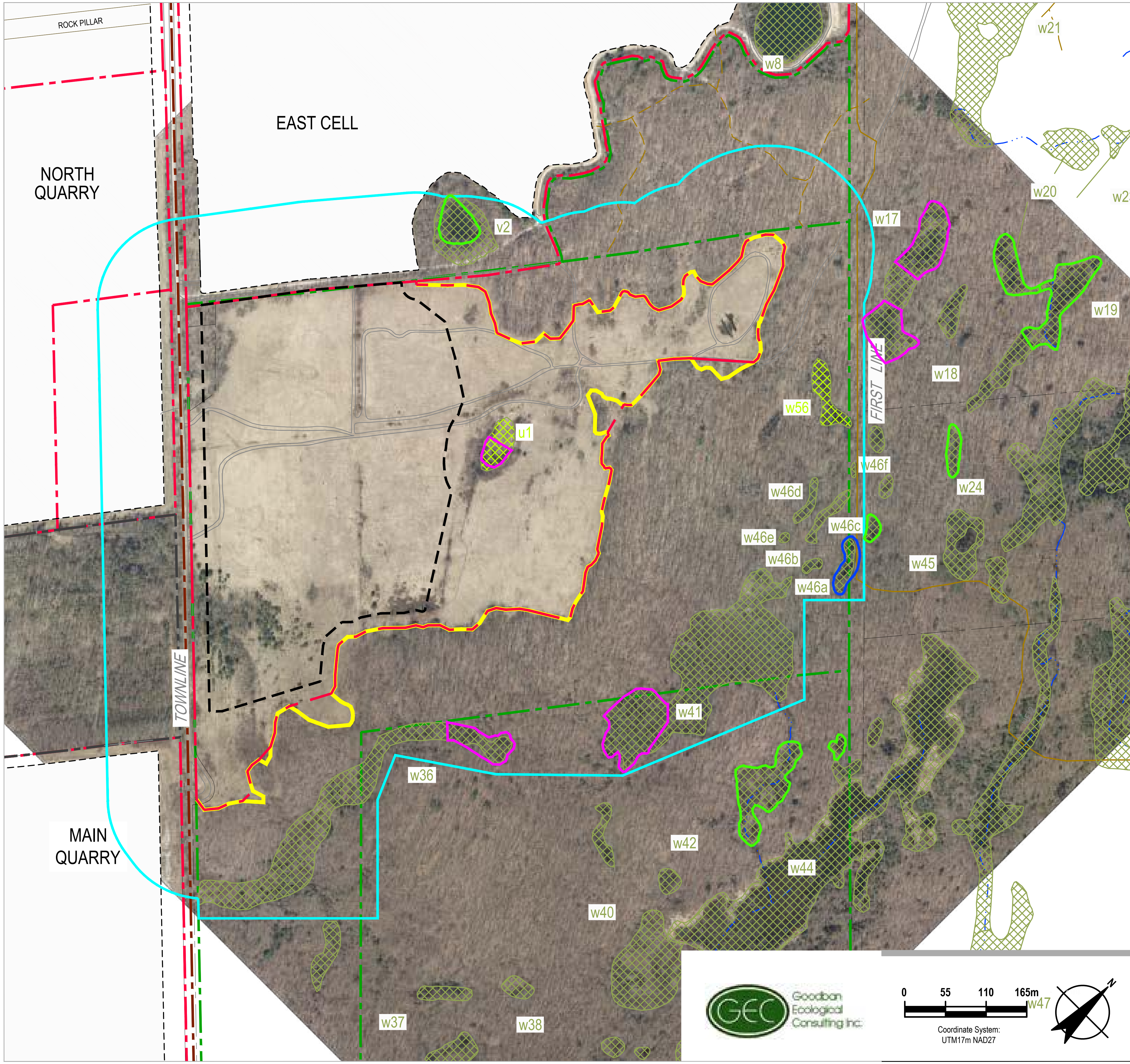


## LEGEND

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- CONFIRMED JESA BREEDING POOL (PRE - 2019)
- CONFIRMED JESA BREEDING POOL (2019)
- CONFIRMED JESA BREEDING POOL (2020)

Goodban Ecological Consulting Inc.

0 55 110 165m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

JEFFERSON SALAMANDER AND UNISEXUAL - BREEDING POOLS

Project No. 10978-200
Date December 2021

**FIGURE 25**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA006-GEC.dwg
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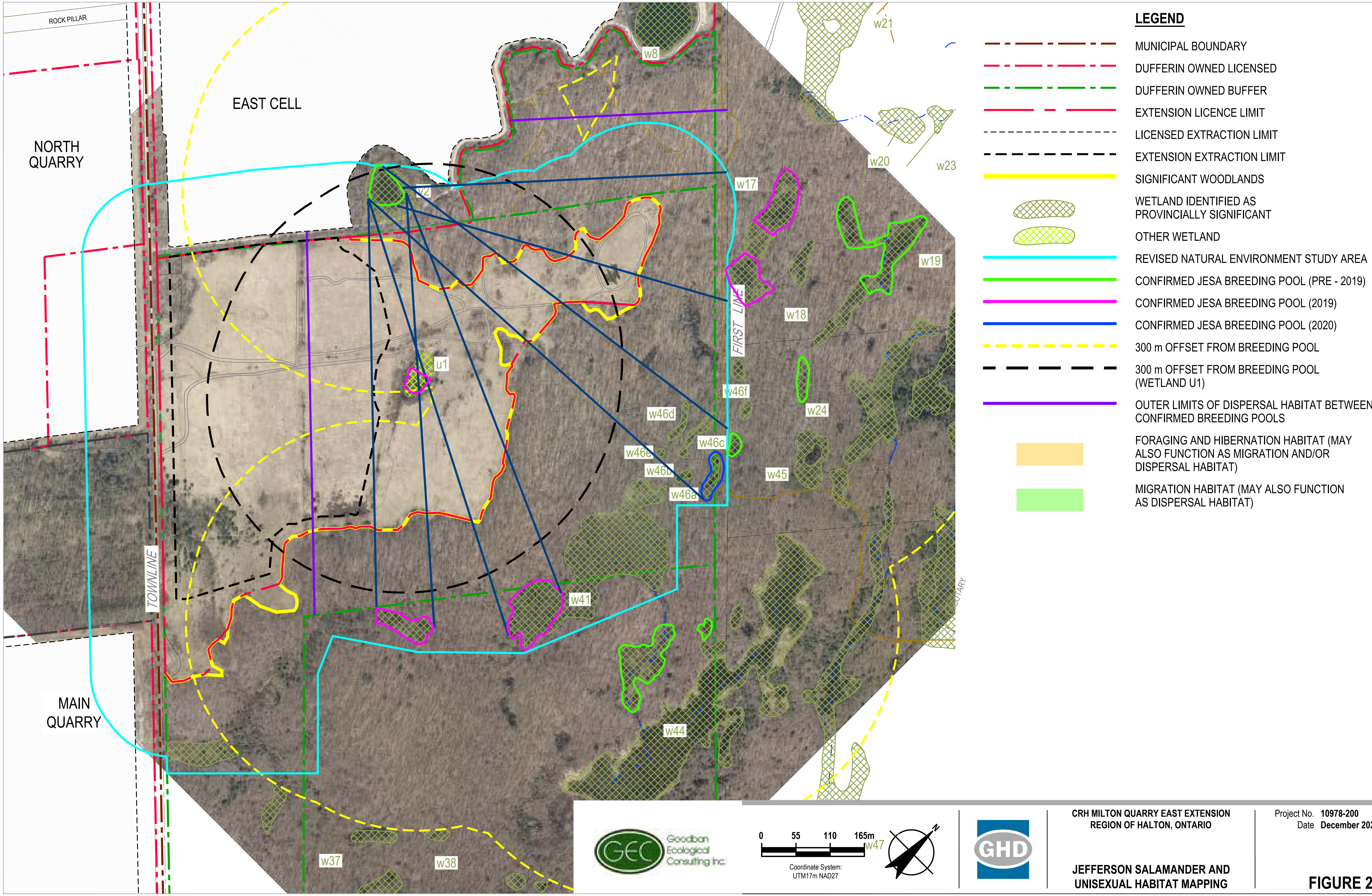


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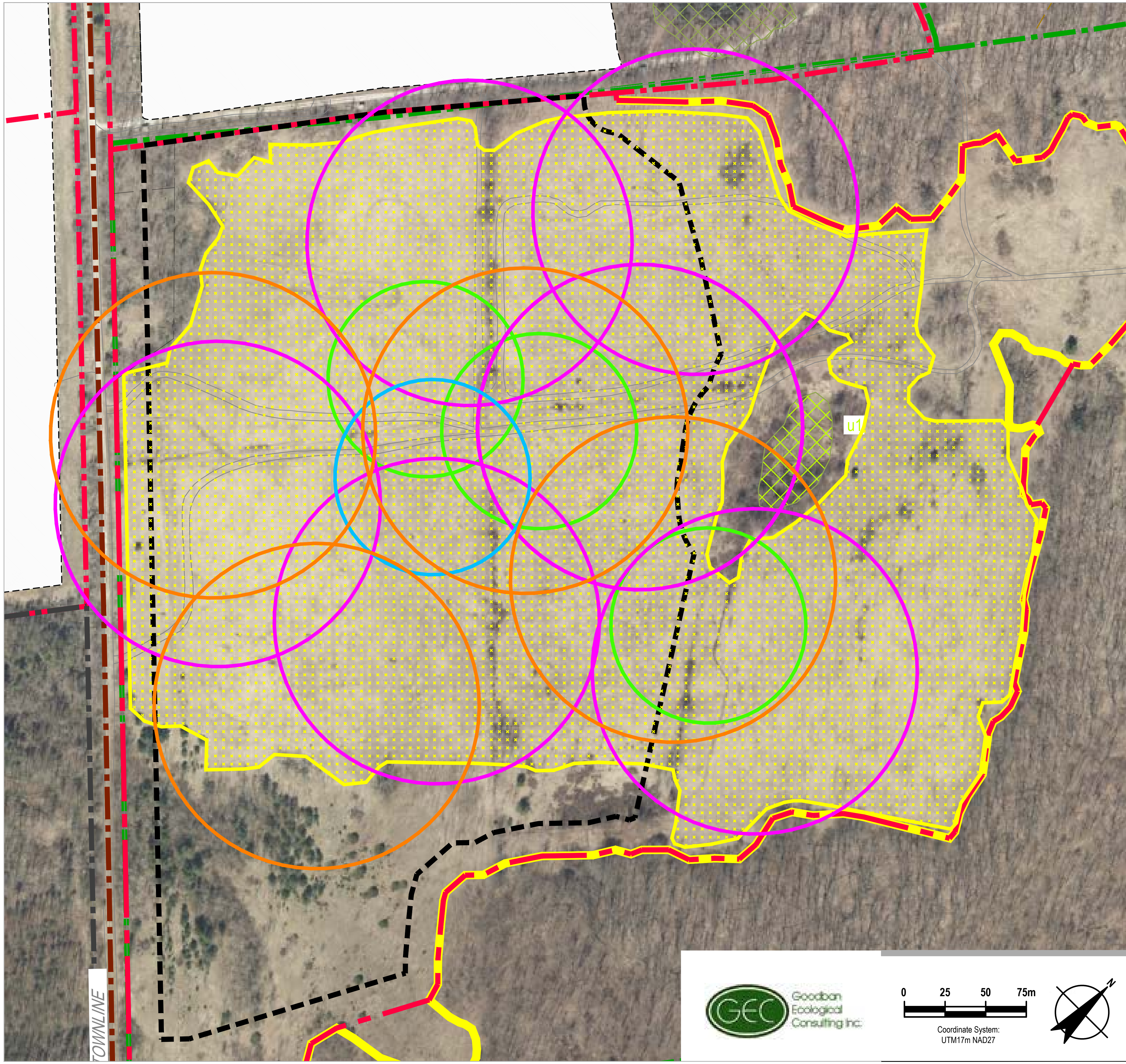


**LEGEND**

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- 2019 EASTERN MEADOWLARK CATEGORY 2 HABITAT
- 2019 BOBOLINK CATEGORY 2 HABITAT
- 2020 EASTERN MEADOWLARK CATEGORY 2 HABITAT
- 2020 BOBOLINK CATEGORY 2 HABITAT
- SUITABLE HABITAT FOR BOBOLINK AND EASTERN MEADOWLARK (18.7 ha)

Goodban Ecological Consulting Inc.

0 25 50 75m

Coordinate System: UTM17m NAD27

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

BOBOLINK AND EASTERN MEADOWLARK HABITAT (2019 - 2020)

Project No. 10978-200
Date December 2021

**FIGURE 27**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA009-GEC.dwg
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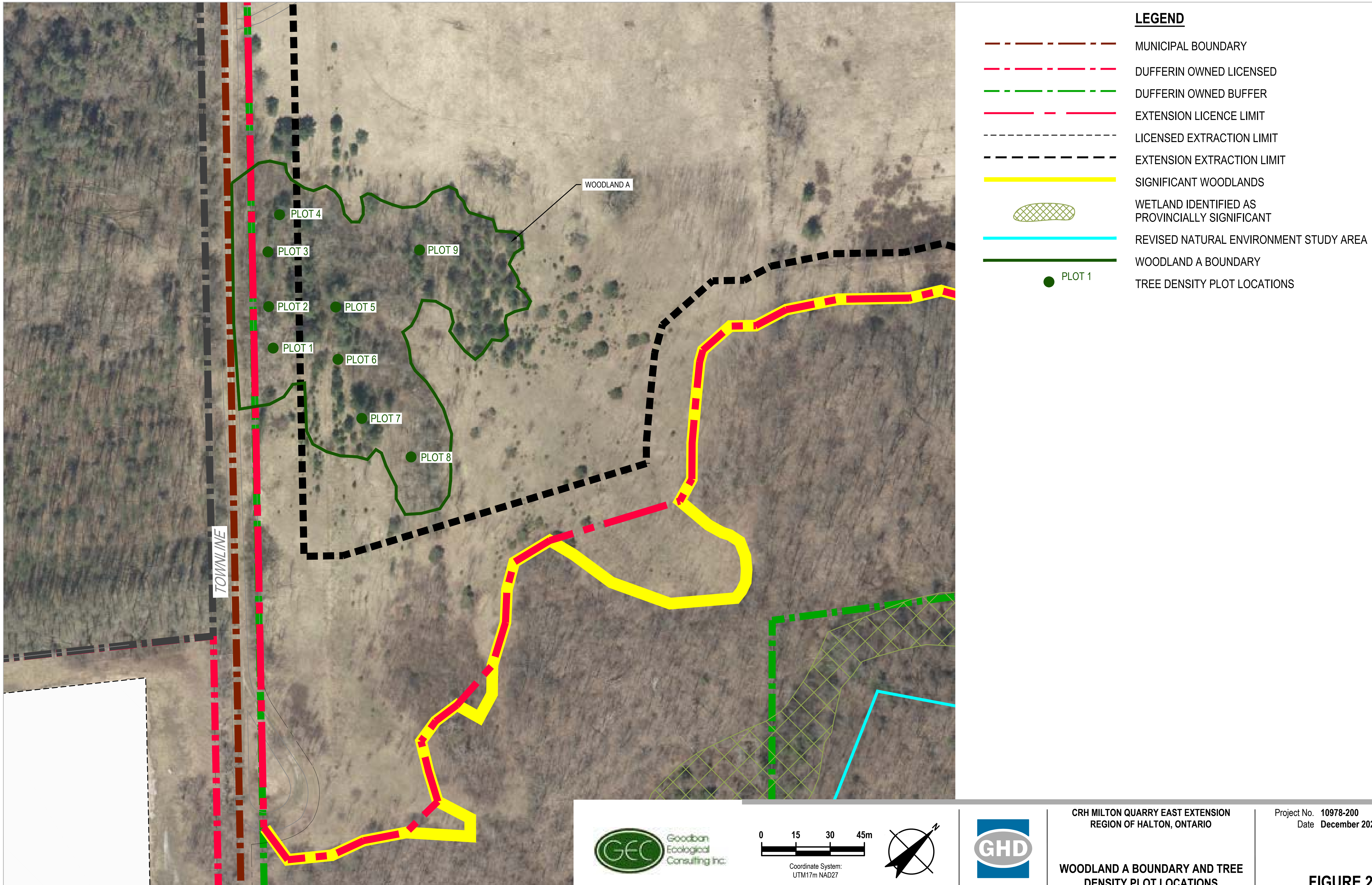


GEC Goodban Ecological Consulting Inc.

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

WOODLAND A BOUNDARY AND TREE DENSITY PLOT LOCATIONS

Project No. 10978-200
Date December 2021

FIGURE 28

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA011-GEC.dwg
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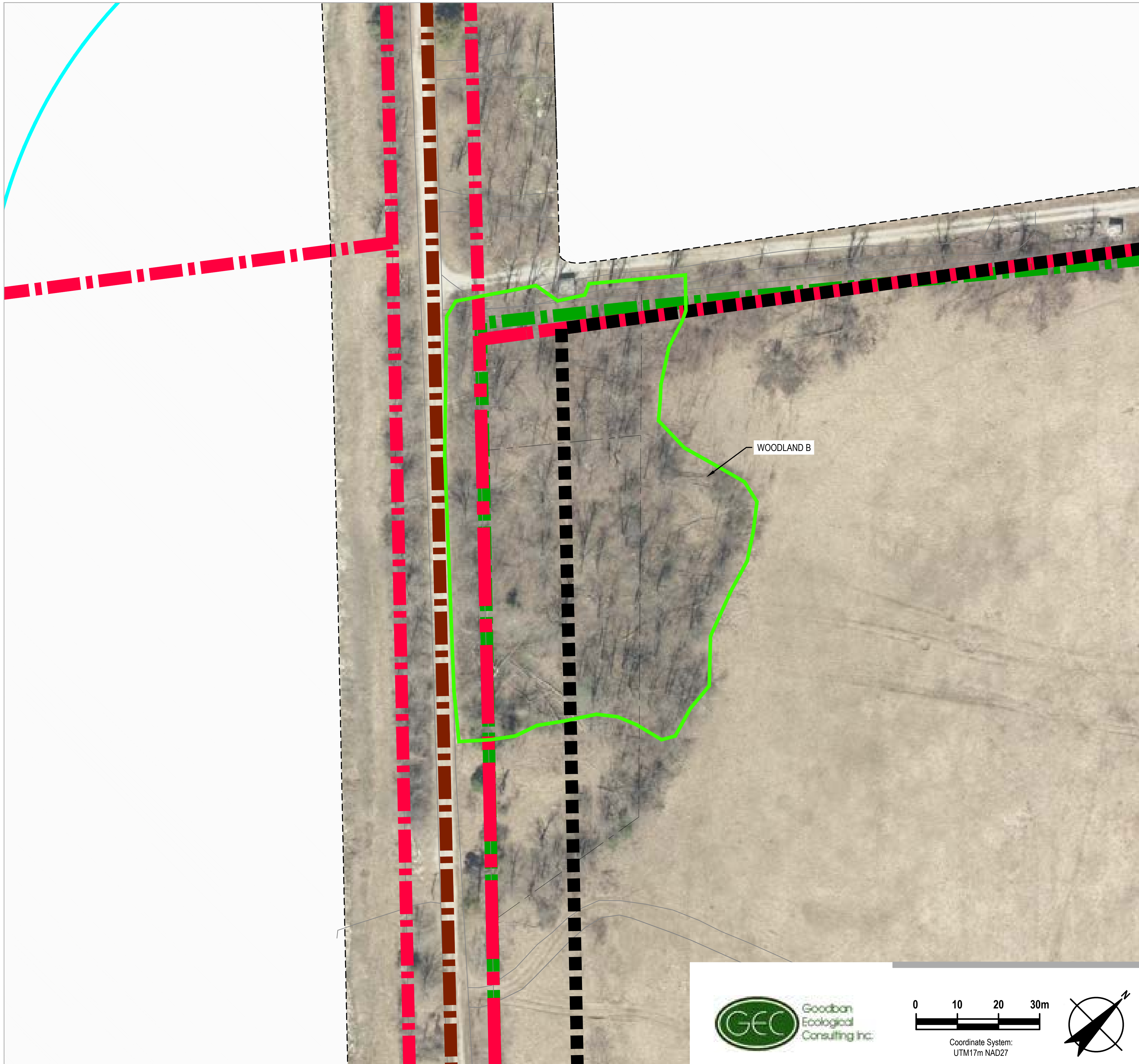


**LEGEND**

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- REVISED NATURAL ENVIRONMENT STUDY AREA
- WOODLAND B BOUNDARY

Goodban Ecological Consulting Inc.

0 10 20 30m

Coordinate System:
UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

WOODLAND B BOUNDARY

**FIGURE 29**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA010-GEC.dwg
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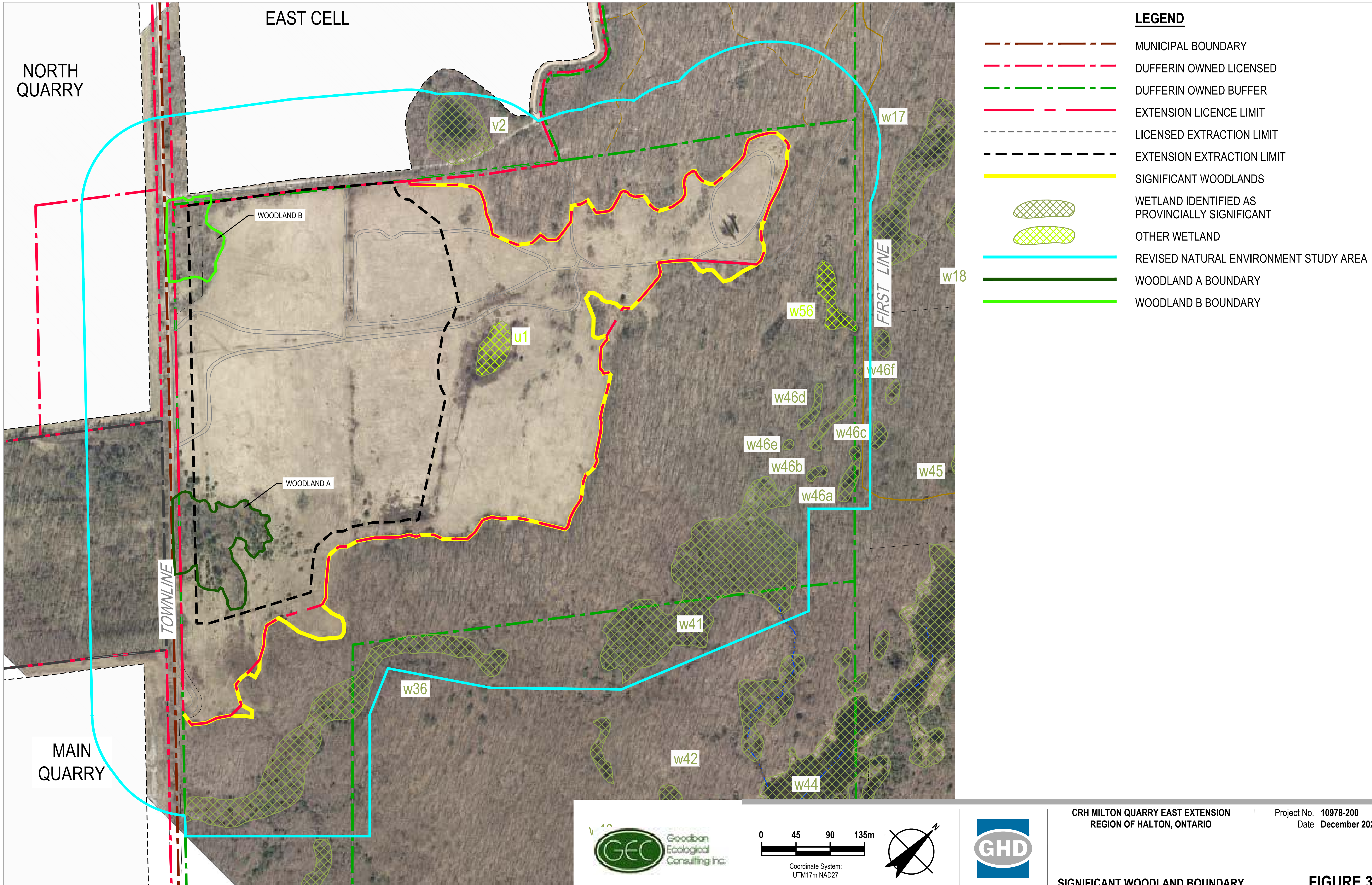


Goodban Ecological Consulting Inc.

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

SIGNIFICANT WOODLAND BOUNDARY

FIGURE 30

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA029-GEC.dwg
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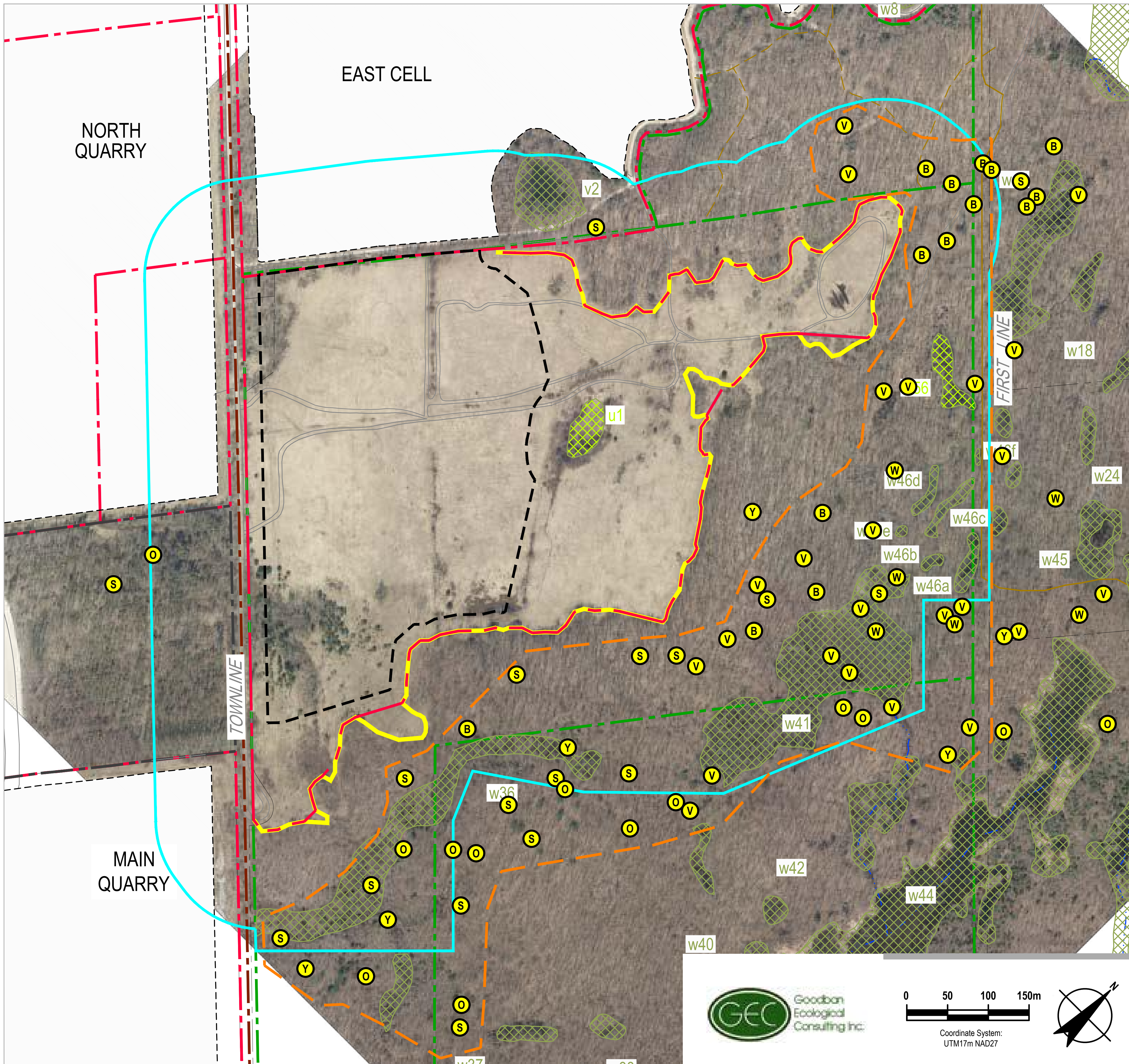


## LEGEND

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- SIGNIFICANT WILDLIFE HABITAT FOR AREA-SENSITIVE FOREST BIRD SPECIES
- B BLACK-THROATED BLUE WARBLER
- O OVENBIRD
- S SCARLET TANAGER
- V VEERY
- W WINTER WREN
- Y YELLOW-BELLIED SAPSUCKER

Goodban Ecological Consulting Inc.

0 50 100 150m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

**AREA-SENSITIVE BIRD BREEDING HABITAT (WOODLAND) - SIGNIFICANT WILDLIFE HABITAT**

Project No. 10978-200
Date December 2021

**FIGURE 31**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA012-GEC.dwg
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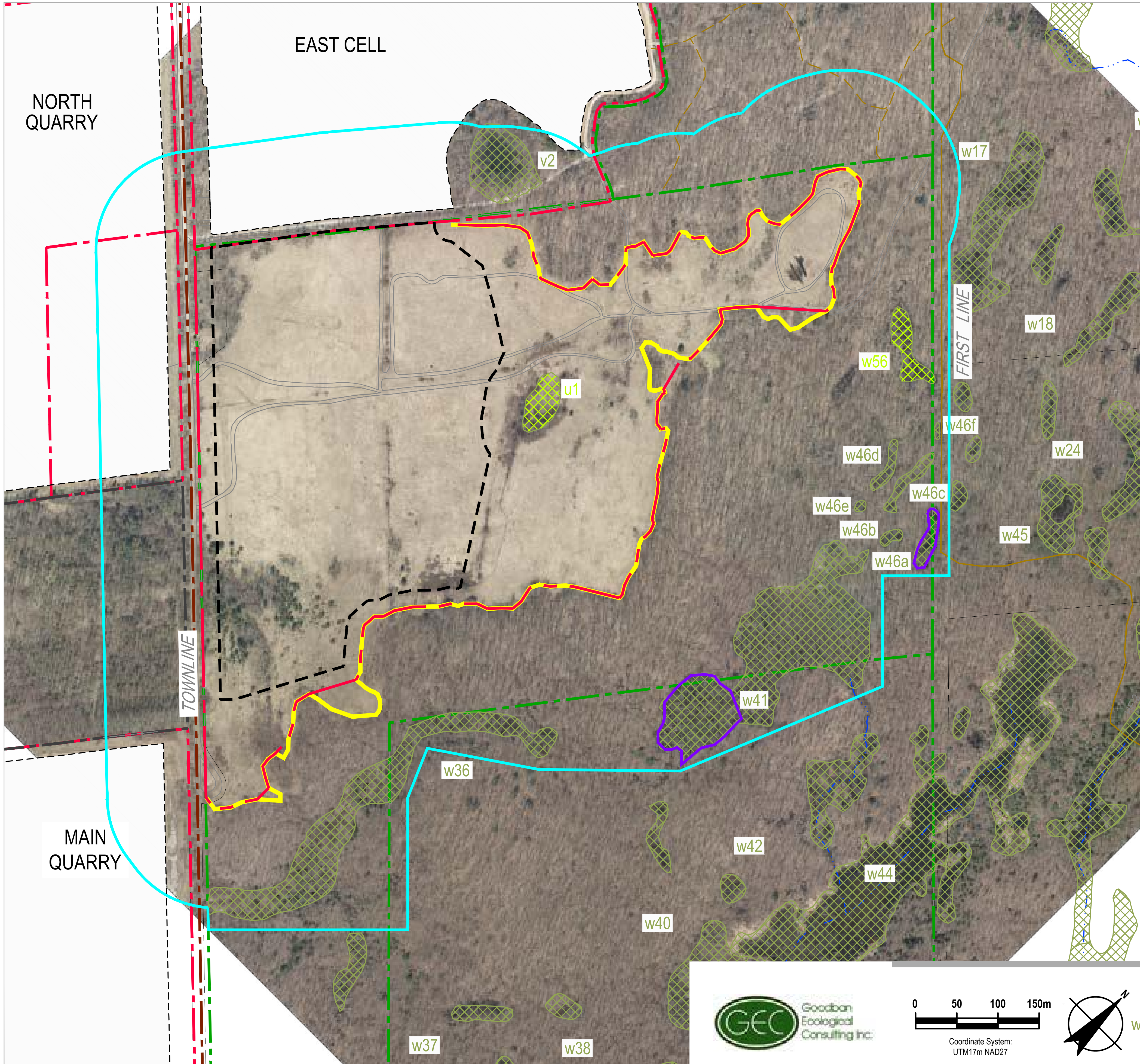


**LEGEND**

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- AMPHIBIAN BREEDING HABITAT

Goodban Ecological Consulting Inc.

0 50 100 150m

Coordinate System: UTM17m NAD27

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

**AMPHIBIAN BREEDING HABITAT (WOODLAND) - SIGNIFICANT WILDLIFE HABITAT**

Project No. 10978-200
Date December 2021

**FIGURE 32**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA015-GEC.dwg
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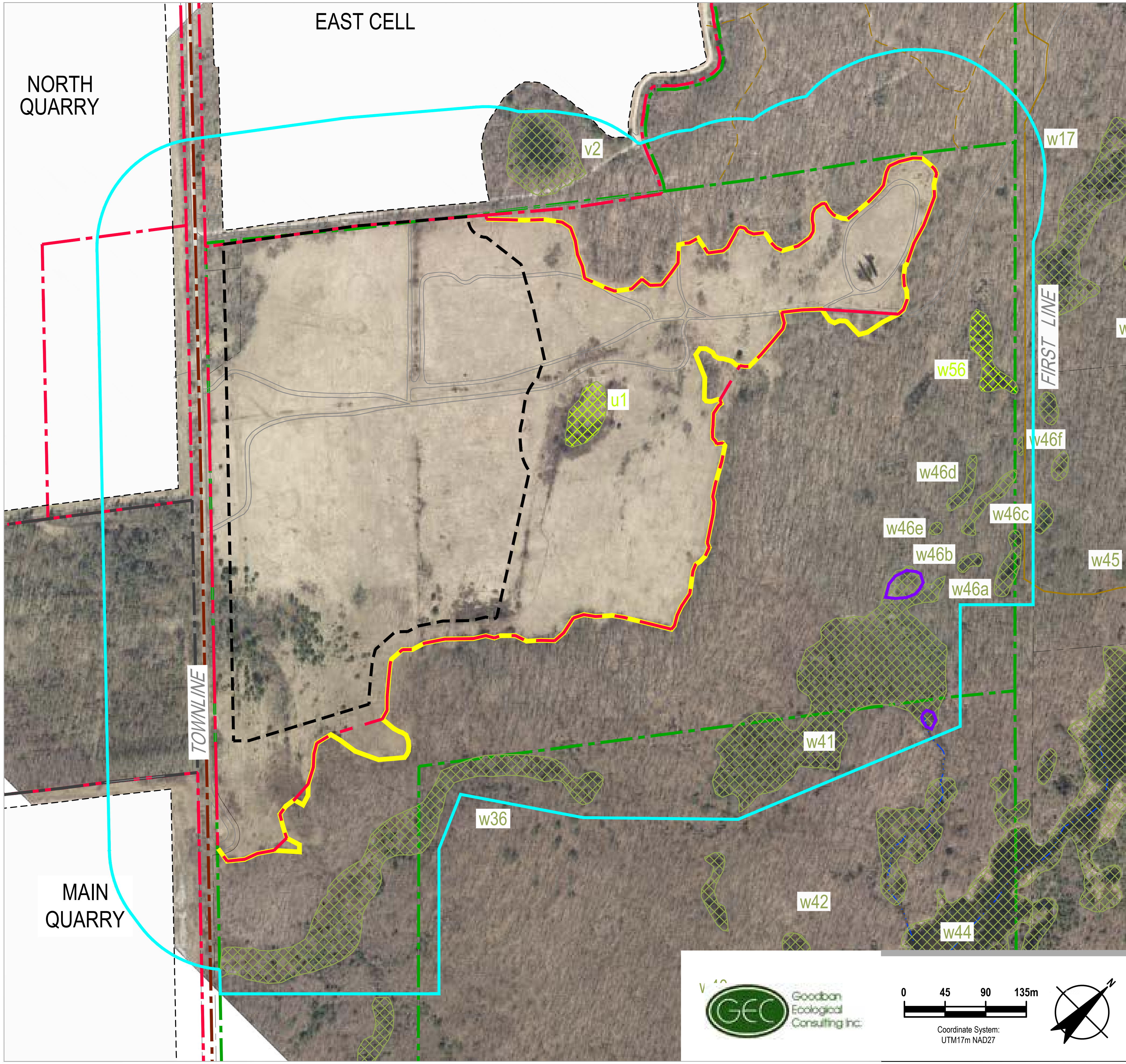


**LEGEND**

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- SEEPS AND SPRINGS

Goodban Ecological Consulting Inc.

0 45 90 135m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

SEEPS AND SPRINGS - SIGNIFICANT WILDLIFE HABITAT

Project No. 10978-200
Date December 2021

**FIGURE 33**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA014-GEC.dwg
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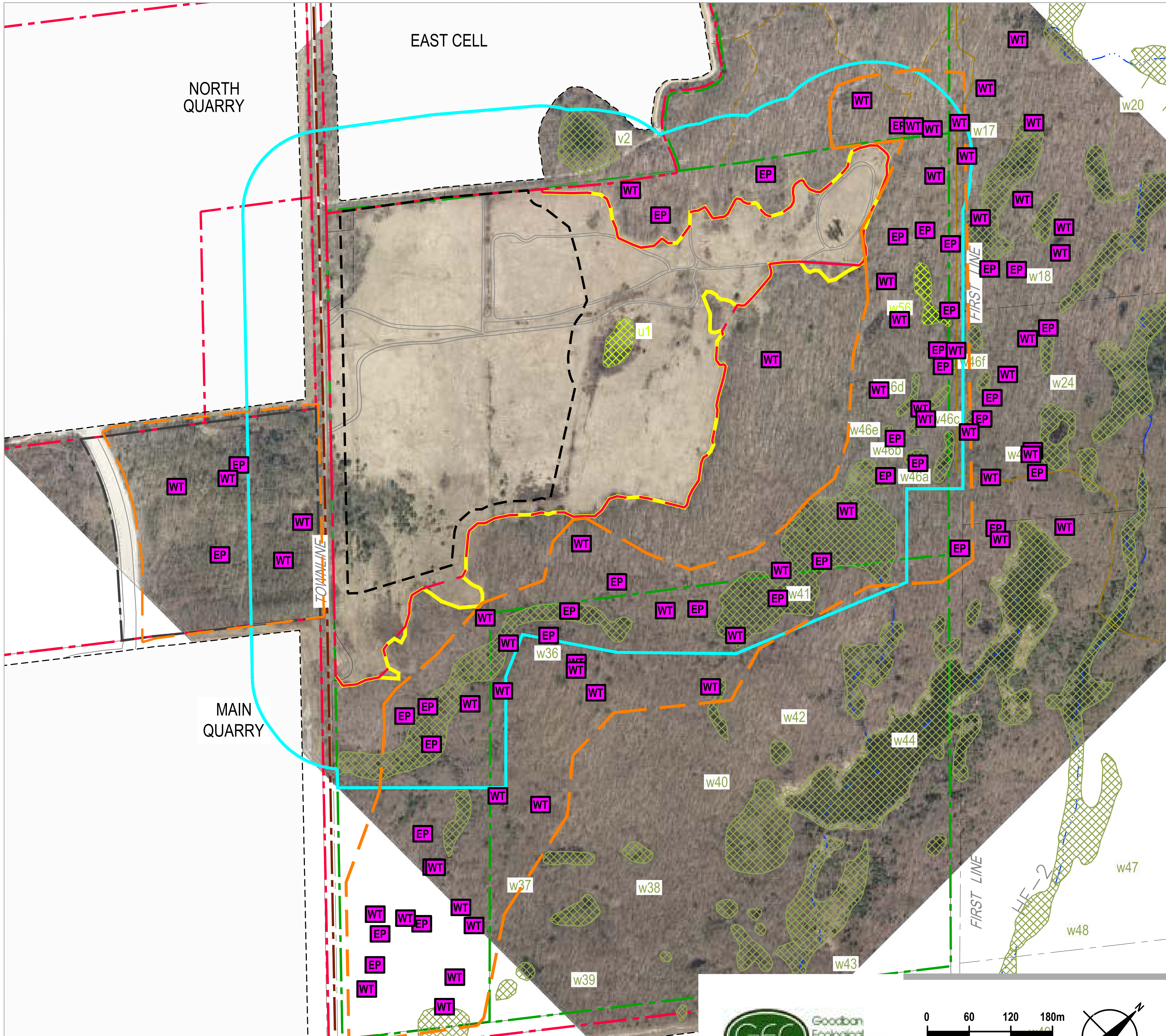


**LEGEND**

MUNICIPAL BOUNDARY

DUFFERIN OWNED LICENSED

DUFFERIN OWNED BUFFER

EXTENSION LICENCE LIMIT

LICENSED EXTRACTION LIMIT

EXTENSION EXTRACTION LIMIT

SIGNIFICANT WOODLANDS

WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT

OTHER WETLAND

REVISED NATURAL ENVIRONMENT STUDY AREA

SIGNIFICANT WILDLIFE HABITAT FOR SPECIAL CONCERN BIRD SPECIES

EP EASTERN WOOD PEWEE

WT WOOD THRUSH

Goodban Ecological Consulting Inc.

0 60 120 180m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

**HABITATS OF SPECIAL CONCERN BIRD SPECIES - SIGNIFICANT WILDLIFE HABITAT**

Project No. 10978-200
Date December 2021

**FIGURE 34**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA013-GEC.dwg
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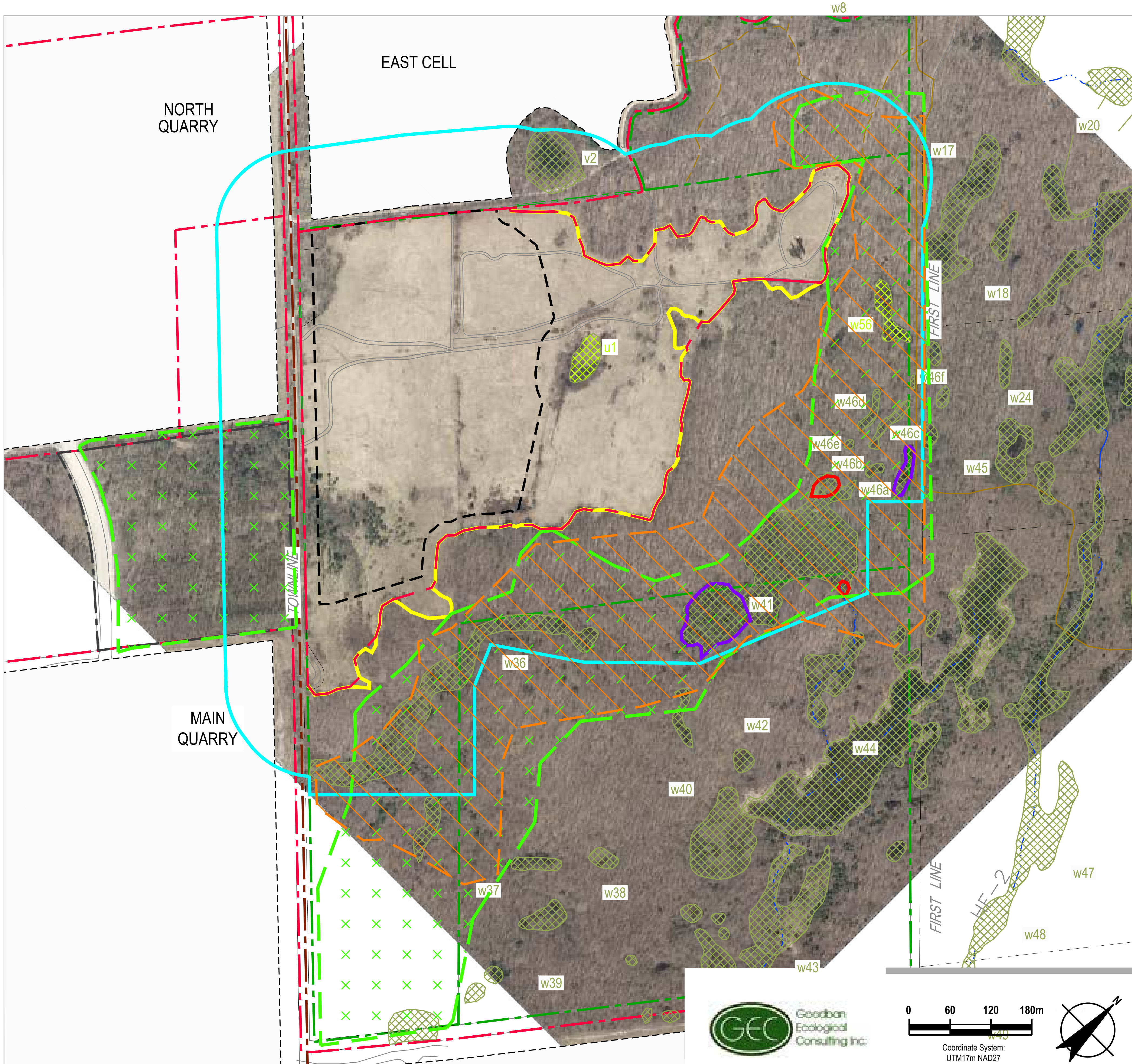


LEGEND

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- SEEPS AND SPRINGS
- AMPHIBIAN BREEDING HABITAT
- SIGNIFICANT WILDLIFE HABITAT FOR AREA-SENSITIVE FOREST BIRD SPECIES
- SIGNIFICANT WILDLIFE HABITAT FOR SPECIAL CONCERN BIRD SPECIES

Goodban Ecological Consulting Inc.

0 60 120 180m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

SIGNIFICANT WILDLIFE HABITAT

FIGURE 35

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA030-GEC.dwg
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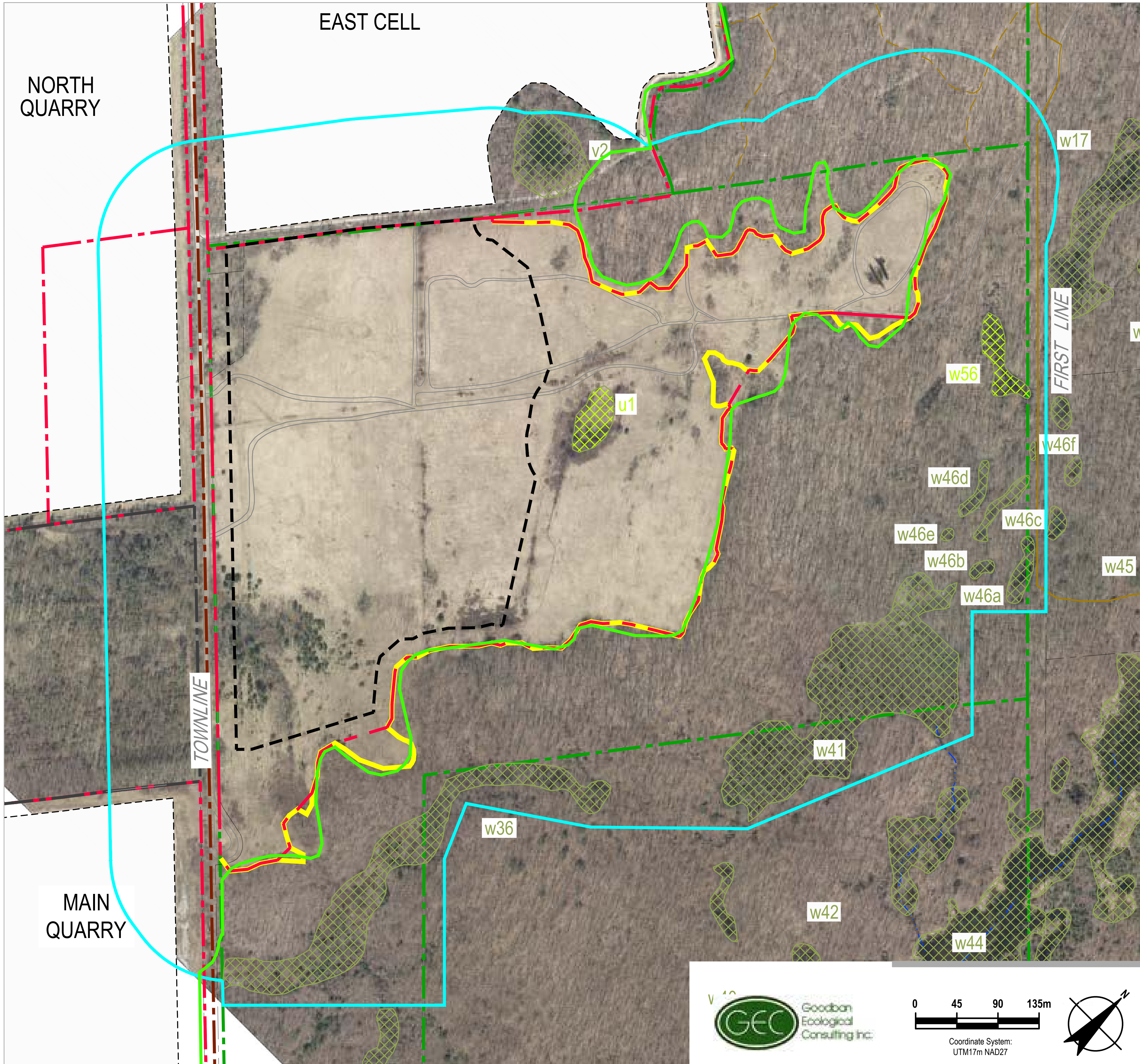


**LEGEND**

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- REVISED NATURAL ENVIRONMENT STUDY AREA
- LANDS INFORMATION ONATRIO (LIO) AREA OF NATURAL SCIENTIFIC INTEREST (ANSI)

Goodban Ecological Consulting Inc.

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

HALTON FOREST NORTH ANSI

**FIGURE 36**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA031-GEC.dwg
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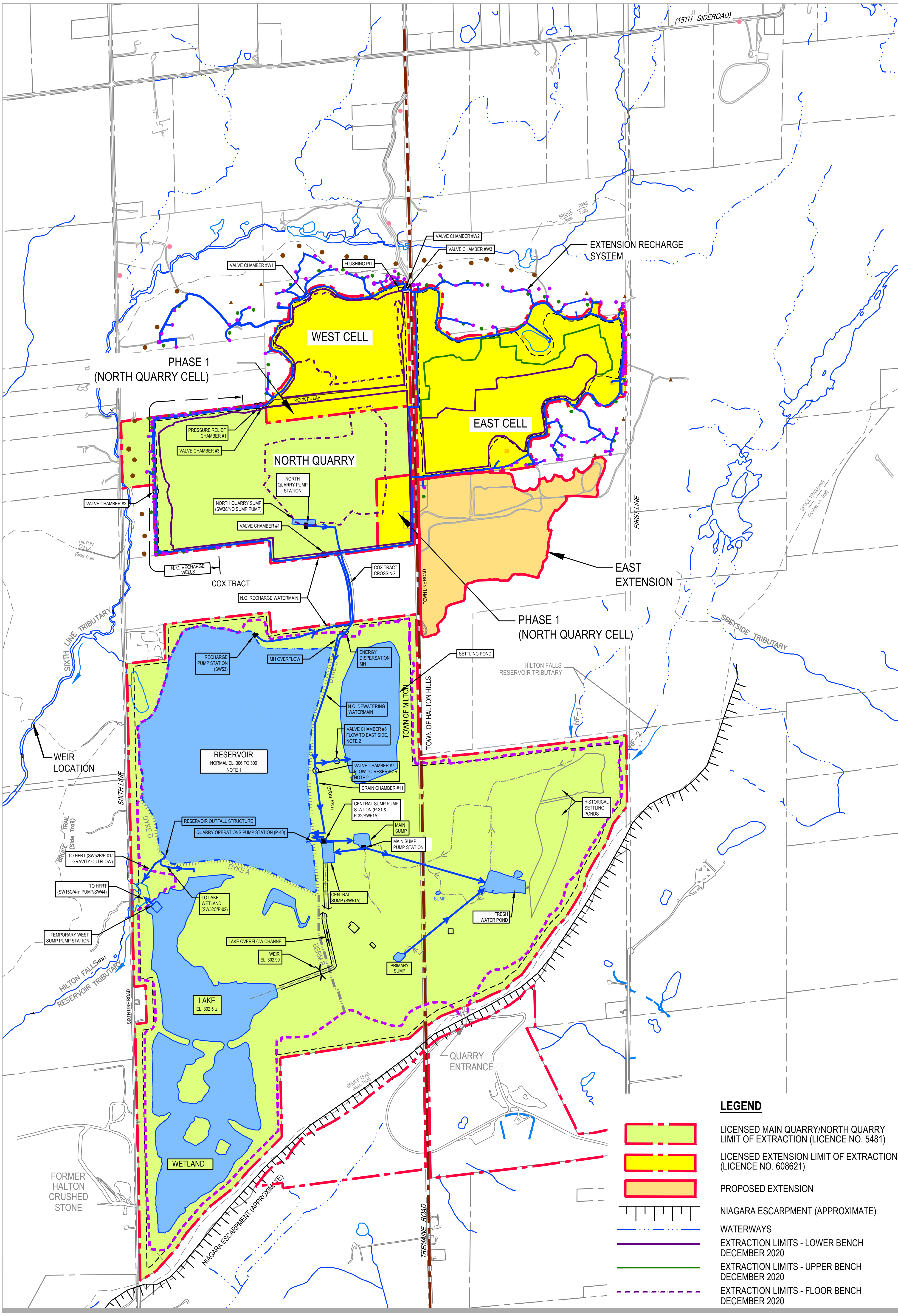



SOURCE:
BASE MAPPING PRODUCED BY MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED AND CONESTOGA-ROVERS & ASSOCIATES UNDER LICENCE WITH THE ONTARIO MINISTRY OF NATURAL RESOURCES
© QUEEN'S PRINTER 1997

0 150 300 450m

Coordinate System: UTM17m NAD27

N

GHD

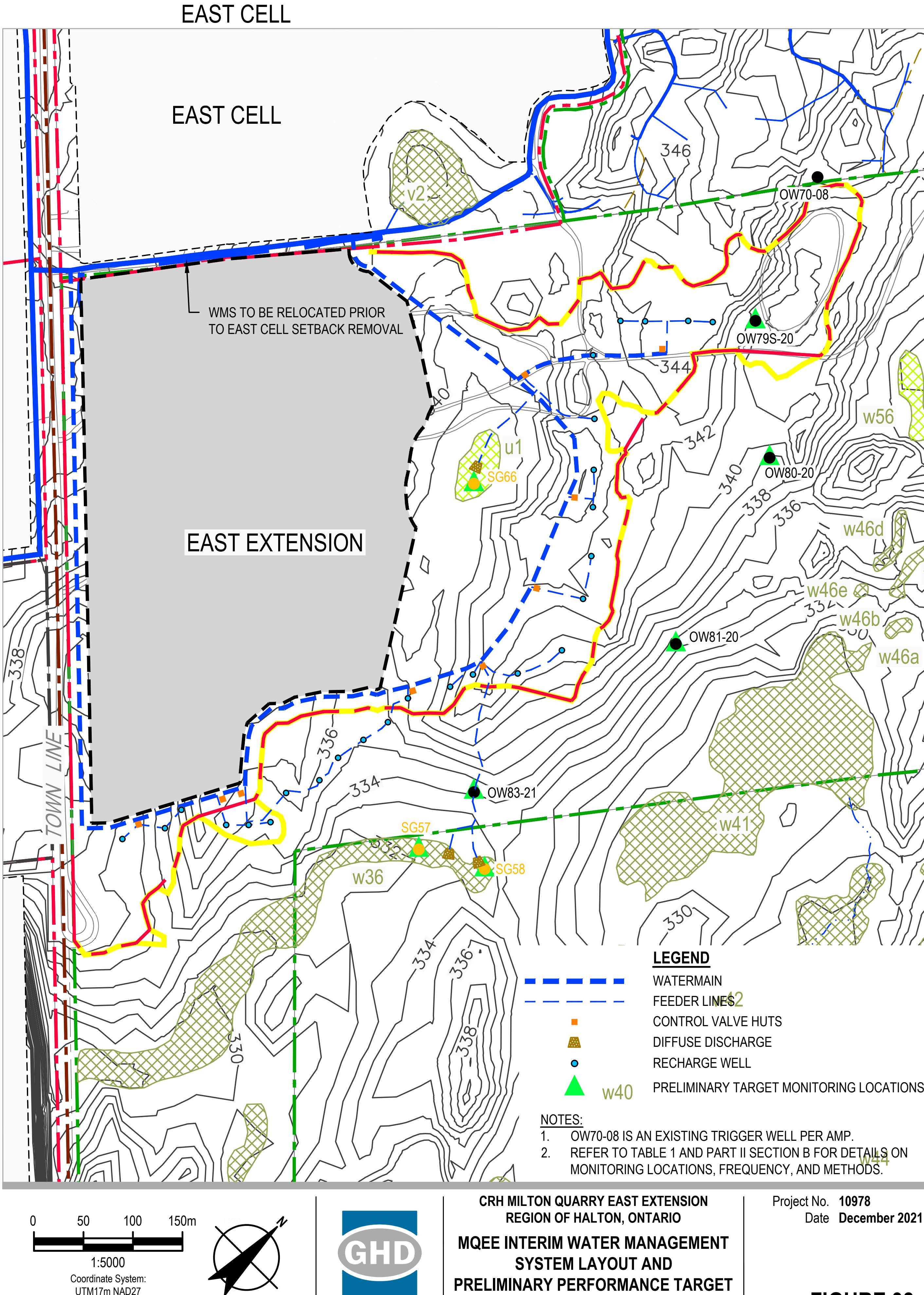
CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

EXISTING CONDITIONS AND WATER MANAGEMENT SYSTEM OVERVIEW

Project No. 10978-200
Date December 2021

FIGURE 37

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA028-GEC.dwg
Plot Date: 07 December 2021 3:48 PM




CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

**MQEE INTERIM WATER MANAGEMENT SYSTEM LAYOUT AND PRELIMINARY PERFORMANCE TARGET MONITORING LOCATIONS**

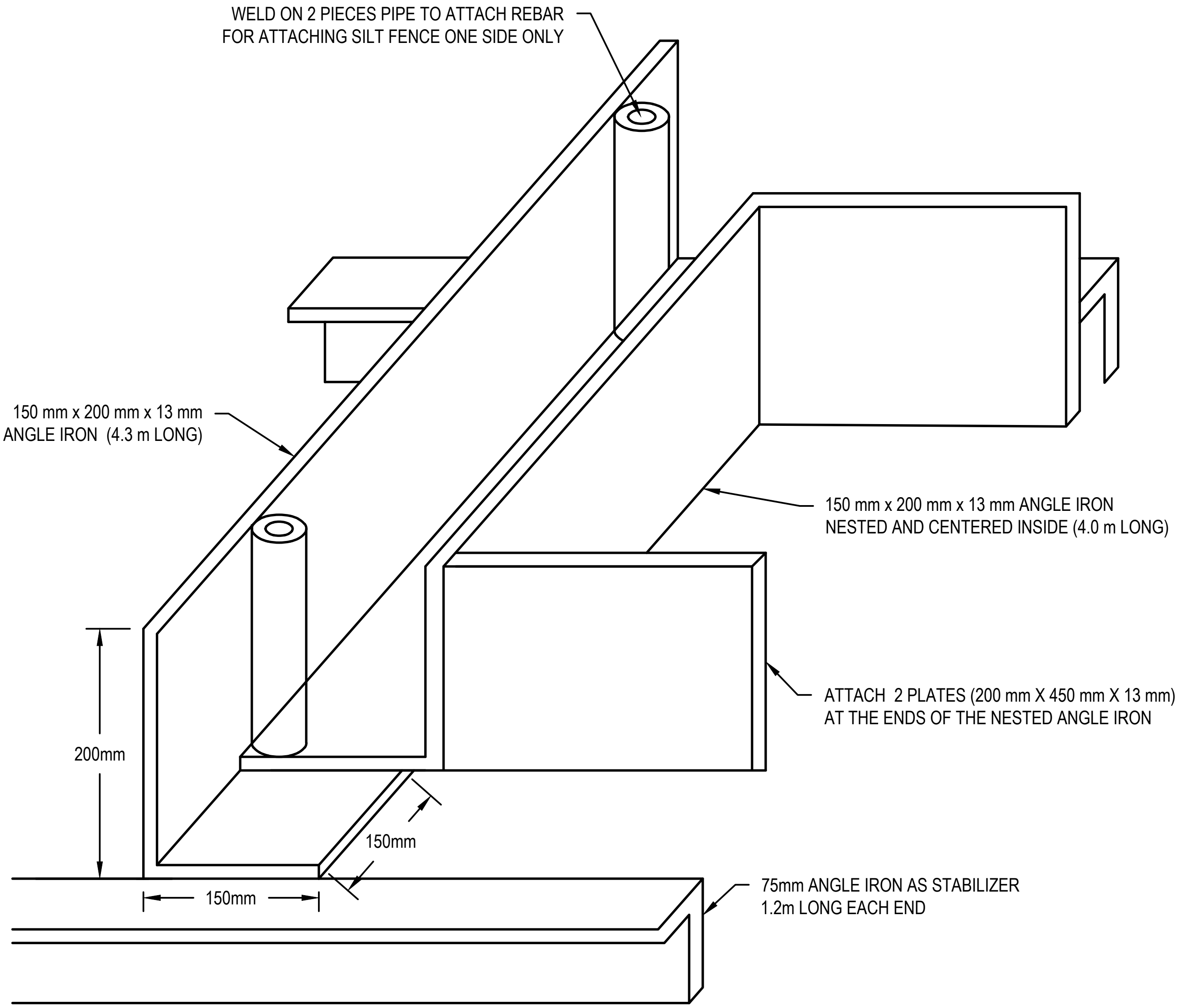
Project No. 10978
Date December 2021

**FIGURE 38a**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA032-GEC.dwg
Plot Date: 07 December 2021 4:29 PM

GENERAL NOTES:

- ALL METAL TO BE DEBURRED AND FREE OF SHARP EDGES
- STRUCTURE IS TO BE PRIMED FOLLOWING ASSEMBLY
- WELDED CONNECTIONS ARE INTERCHANGEABLE WITH FASTENERS




NOTE: ORIGINAL DESIGN BY RUSS CURRY

Goodban Ecological Consulting Inc.

Dufferin Aggregates

A division of CRH Canada Group Inc.

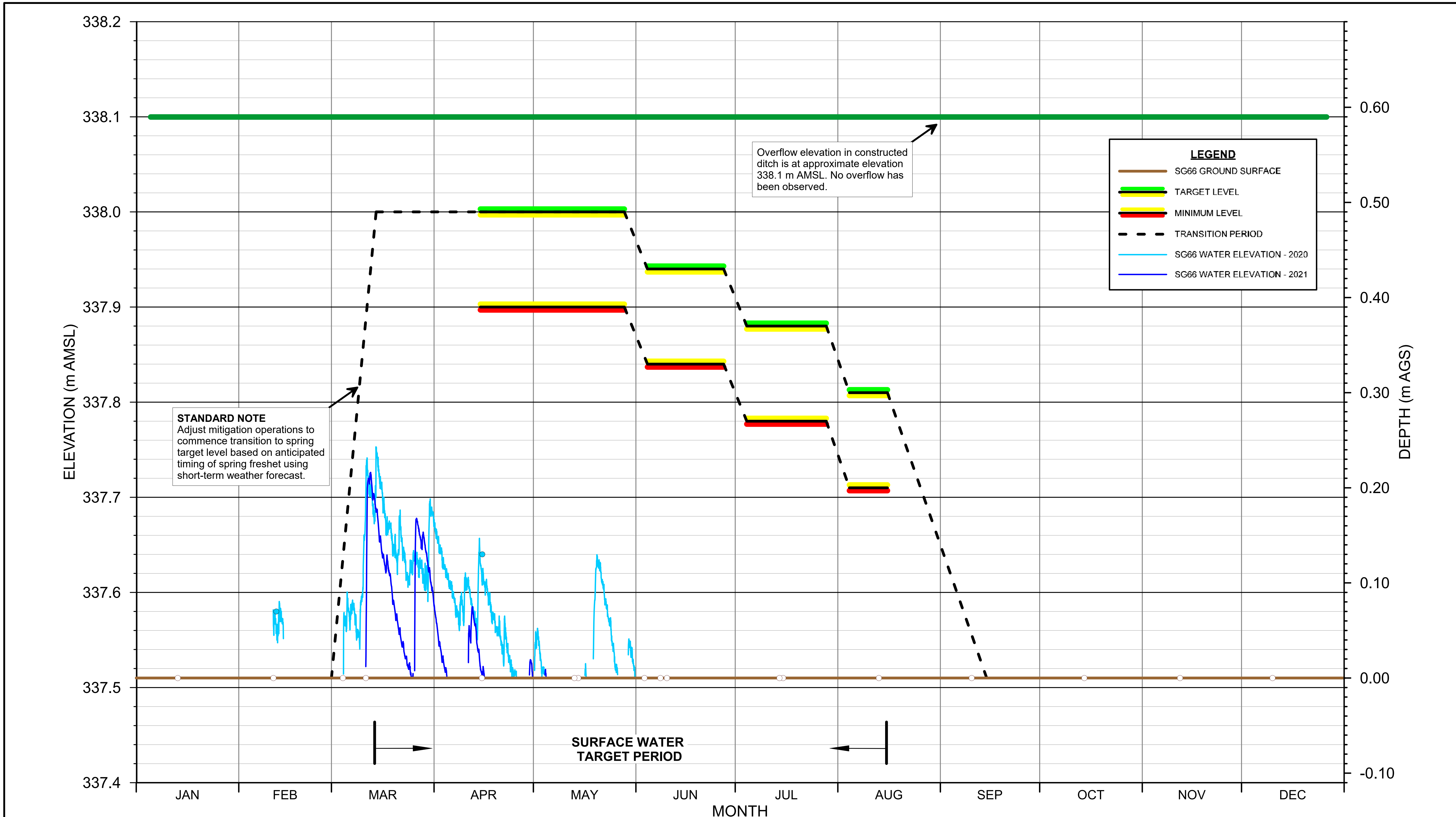
GHD

**CRH MILTON QUARRY EAST EXTENSION**
**REGION OF HALTON, ONTARIO**

Project No. **10978**
Date **December 2021**

**SALAMANDER EXCLUDER DETAIL**

**FIGURE 38b**




Note: - The target is the water elevation that is intended to be maintained as a normal minimum wetland level. Precipitation would further raise the water levels. Water Management System to be operated to ensure target is met or exceeded.
- Open circles represent a dry condition and a boxed symbol represent a frozen condition.
- Wetland U1 is currently instrumented by SG66; however, performance monitoring may be accomplished by alternate instrumentation, including the anticipated use of a stilling well.

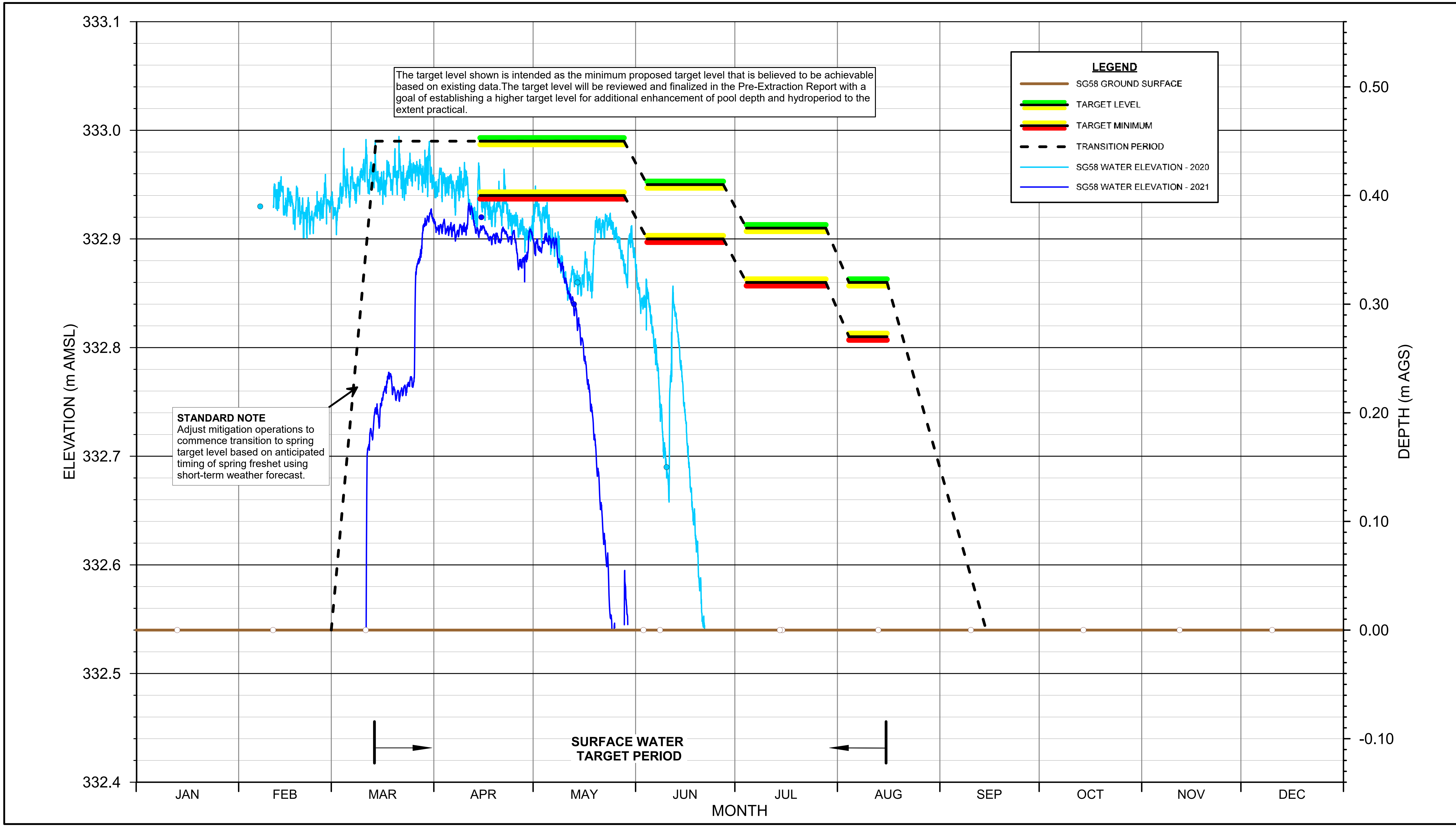
MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

PROPOSED PRELIMINARY SURFACE WATER TARGET
WETLAND U1

010978-200
Nov 18, 2021

FIGURE 38c

WAT File: \\ghdnet\ghd\CA\Waterloo\Projects\662\010978\Workshare\010978-REPORTS\010978-RPT-165 - AMP Addendum\010978-165-Part II\010978-165-Part II-Section B\Figure B.2 - U1 Target.grf




Note: - The target is the water elevation that is intended to be maintained as a normal minimum wetland level. Precipitation would further raise the water levels. Water Management System to be operated to ensure target is met or exceeded.
- Open circles represent a dry condition and a boxed symbol represent a frozen condition.
- The Wetland W36 upper pool is currently instrumented by SG58; however, performance monitoring may be accomplished by alternate instrumentation, including the anticipated use of a stilling well.

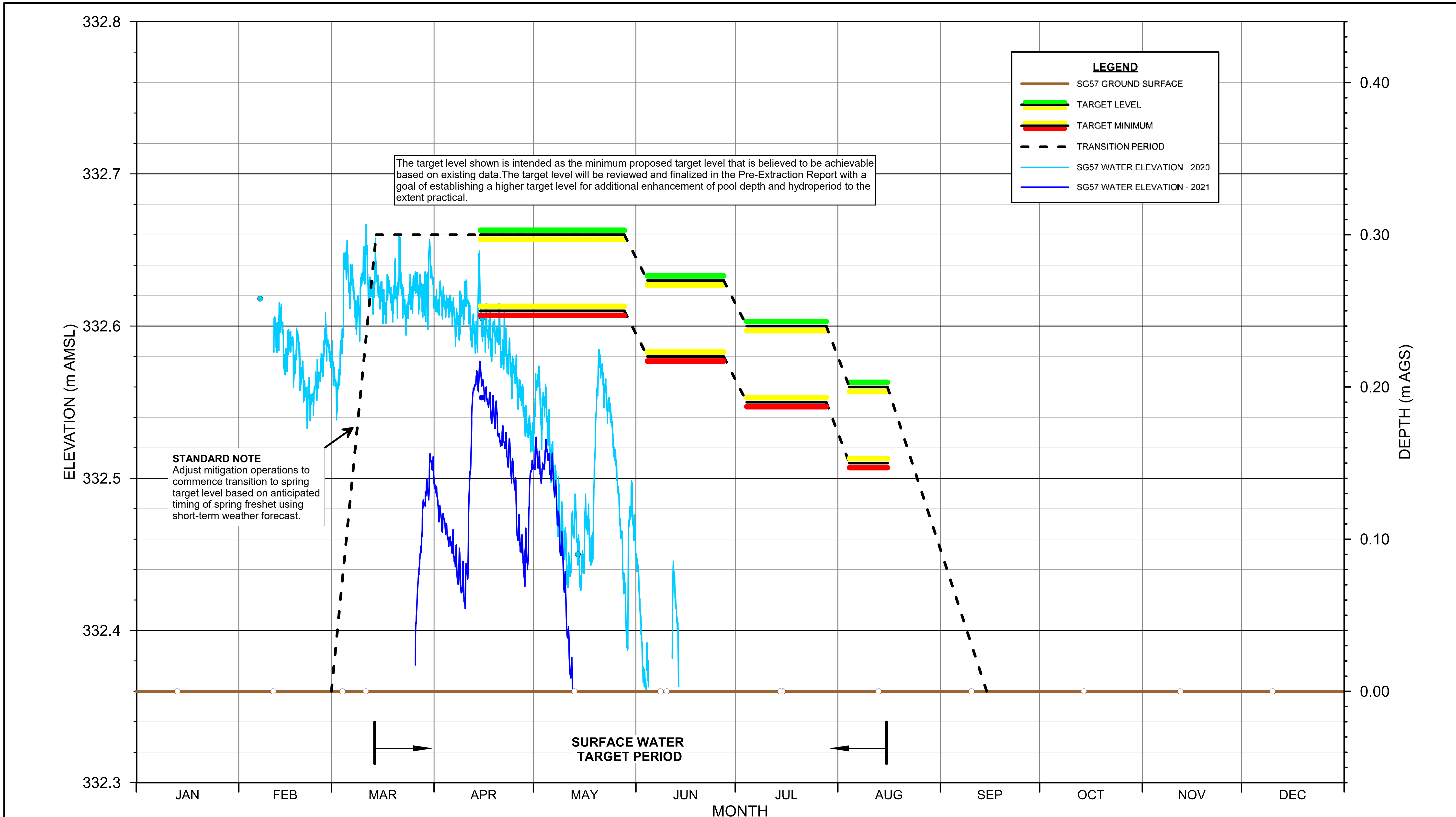
MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

PROPOSED PRELIMINARY SURFACE WATER TARGET
WETLAND W36 - UPPER POOL

010978-200
Nov 18, 2021

FIGURE 38d

WAT File: \\ghdnet\ghd\CA\Waterloo\Projects\662\010978\Workshare\010978-REPORTS\010978-RPT-165 - AMP Addendum\010978-165-Part II\010978-165-Part II-Section B\Figure B.4 - W36 Target - SG58.grf




Note: - The target is the water elevation that is intended to be maintained as a normal minimum wetland level. Precipitation would further raise the water levels. Water Management System to be operated to ensure target is met or exceeded.
- Open circles represent a dry condition and a boxed symbol represent a frozen condition.
- The Wetland W36 lower pool is currently instrumented by SG57; however, performance monitoring may be accomplished by alternate instrumentation, including the anticipated use of a stilling well.

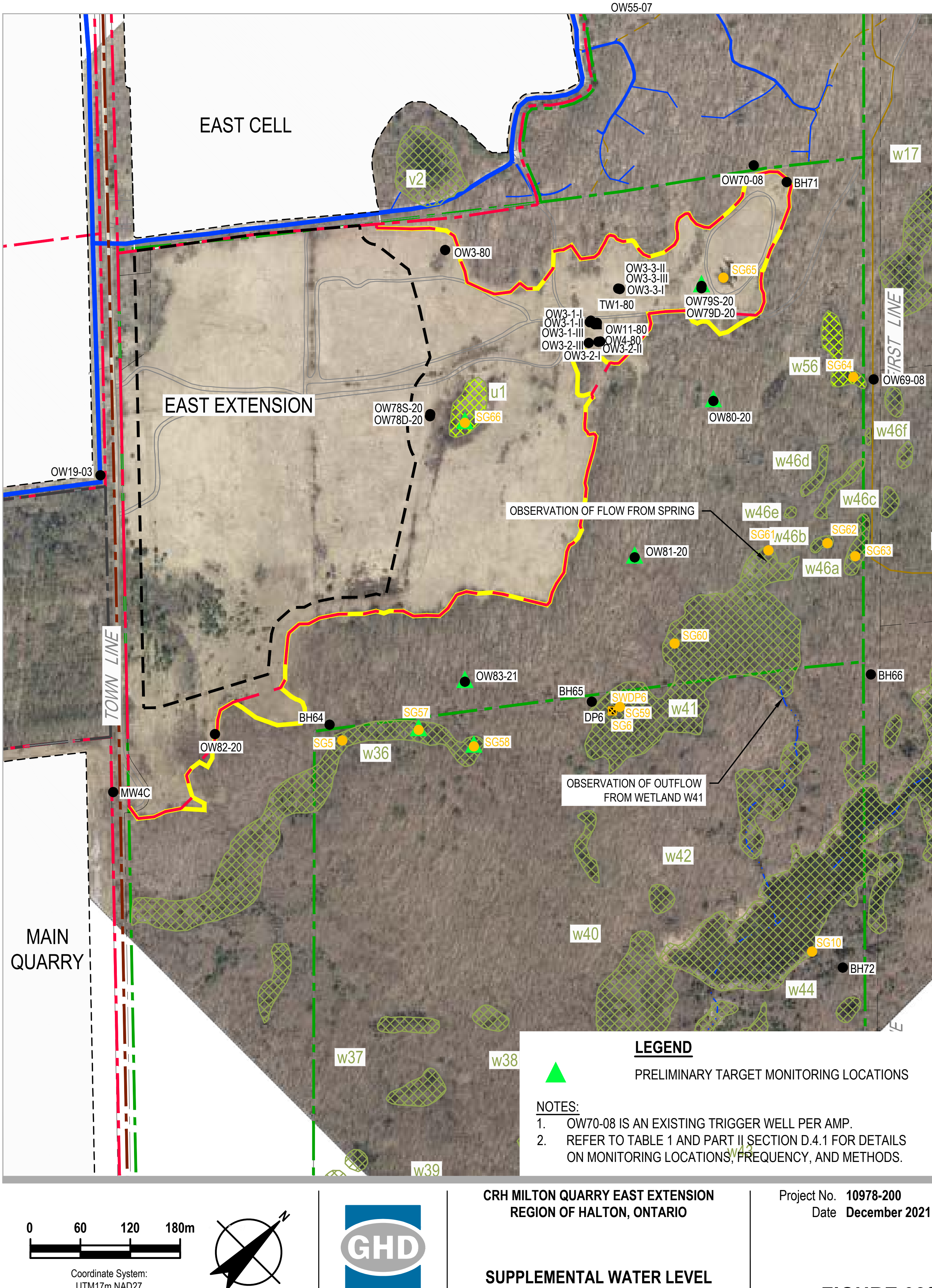
MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

PROPOSED PRELIMINARY SURFACE WATER TARGET
WETLAND W36 - LOWER POOL

010978-200
Dec 8, 2021

FIGURE 38e

WAT File: \\ghdnet\ghd\CA\Waterloo\Projects\662\010978\Workshare\010978-REPORTS\010978-RPT-165 - AMP Addendum\010978-165-Part II\010978-165-Part II-Section B\Figure B.3 - W36 Target - SG57.grf




GHD

**CRH MILTON QUARRY EAST EXTENSION**
**REGION OF HALTON, ONTARIO**

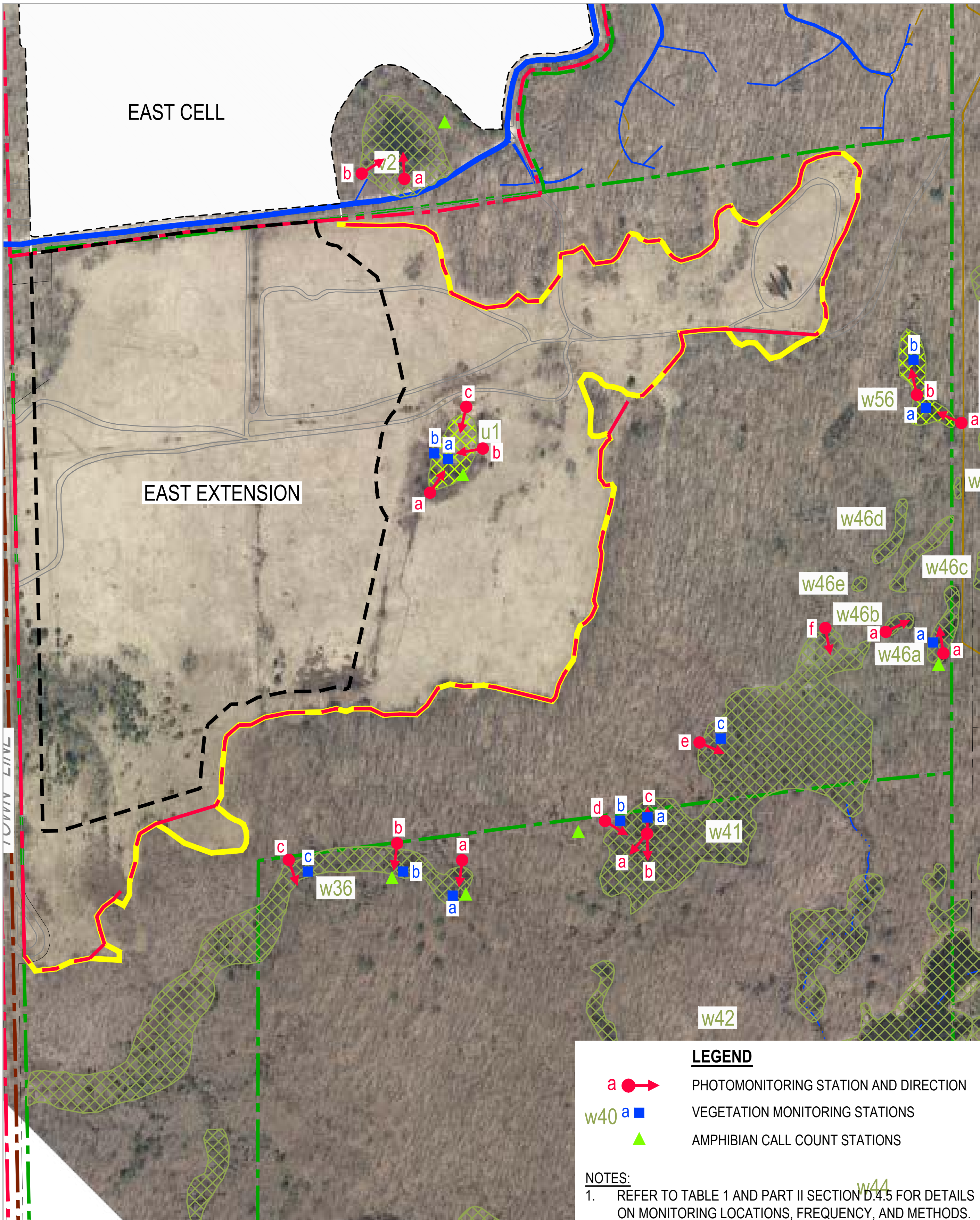
**SUPPLEMENTAL WATER LEVEL MONITORING LOCATIONS**

Project No. **10978-200**
Date **December 2021**

**FIGURE 38f**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA040-GEC.dwg
Plot Date: 07 December 2021 4:19 PM

Image: 2019 Halton Region Orthoimagery from First Base Solutions.




0 50 100 150m

Coordinate System:
UTM17m NAD27

GHD

**CRH MILTON QUARRY EAST EXTENSION**
**REGION OF HALTON, ONTARIO**

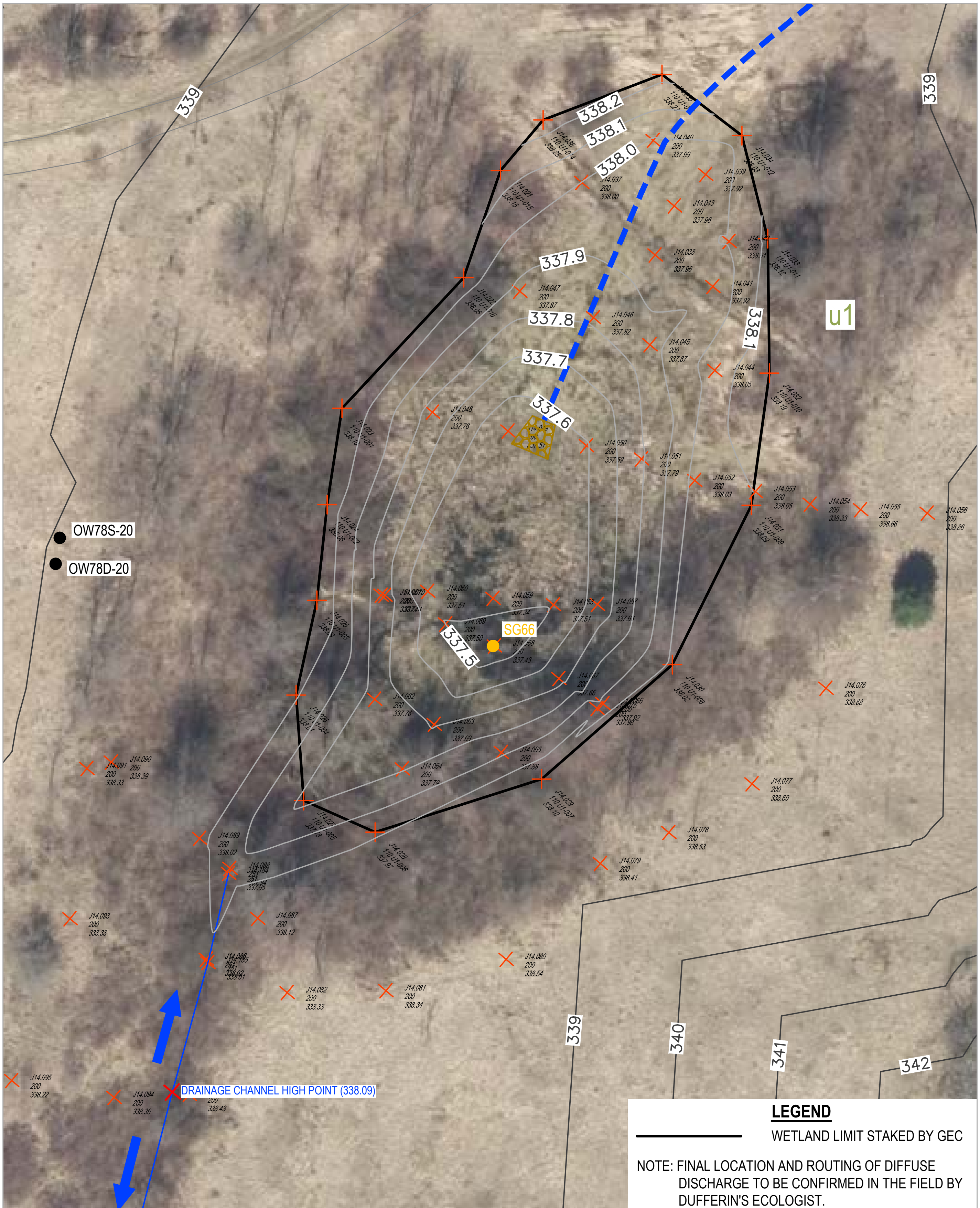
**WETLAND ECOLOGY MONITORING NETWORK**

Project No. **10978-200**
Date **December 2021**

**FIGURE 38g**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA041-GEC.dwg
Plot Date: 07 December 2021 4:21 PM

Image: 2019 Halton Region Orthoimagery from First Base Solutions.




0 5 10 15m

1:500

Coordinate System:
UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

WETLAND U1 DETAILS

Project No. 10978
Date December 2021

**FIGURE 38h**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA038-GEC.dwg
Plot Date: 07 December 2021 4:15 PM


0 10 20 30m

Coordinate System:
UTM17m NAD27

N

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

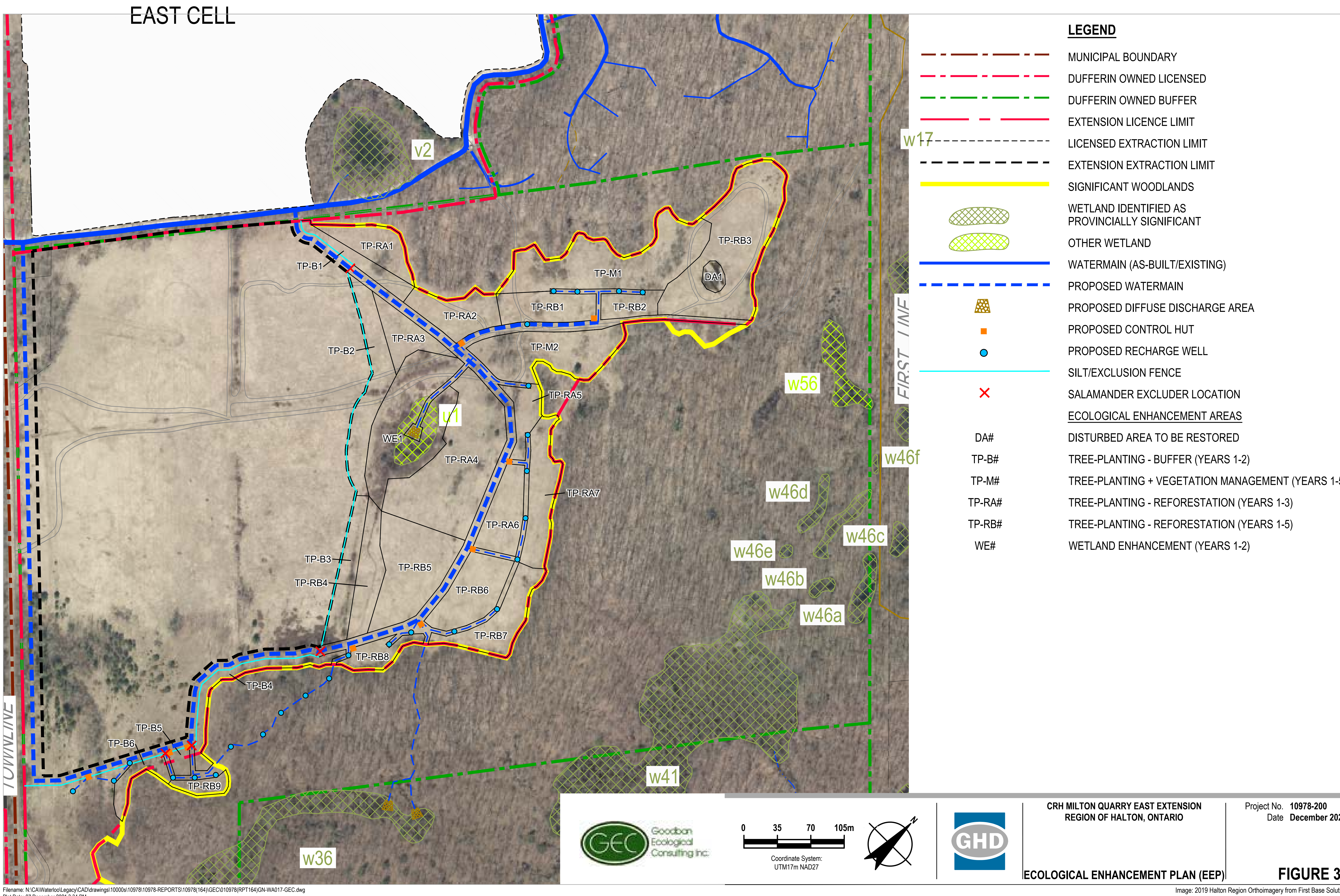
WETLAND W36 DETAILS

Project No. 10978-200
Date December 2021

FIGURE 38i

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA039-GEC.dwg
Plot Date: 07 December 2021 4:17 PM

Image: 2019 Halton Region Orthoimagery from First Base Solutions.



EAST CELL
v2
w17
w56
u1
WE1
w46f
w46d
w46c
w46e
w46b
w46a
w41
w36
TP-RA1
TP-B1
TP-M1
TP-RB3
DA1
TP-RB1
TP-RB2
TP-RA2
TP-RA3
TP-B2
TP-M2
TP-RA5
TP-RA4
TP-RA7
TP-RA6
TP-B3
TP-RB5
TP-RB4
TP-RB6
TP-RB7
TP-RB8
TP-B4
TP-B5
TP-B6
TP-RB9
TOWNLINE
FIRST LINE
LEGEND
MUNICIPAL BOUNDARY
DUFFERIN OWNED LICENSED
DUFFERIN OWNED BUFFER
EXTENSION LICENCE LIMIT
LICENSED EXTRACTION LIMIT
EXTENSION EXTRACTION LIMIT
SIGNIFICANT WOODLANDS
WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
OTHER WETLAND
WATERMAIN (AS-BUILT/EXISTING)
PROPOSED WATERMAIN
PROPOSED DIFFUSE DISCHARGE AREA
PROPOSED CONTROL HUT
PROPOSED RECHARGE WELL
SILT/EXCLUSION FENCE
SALAMANDER EXCLUDER LOCATION
ECOLOGICAL ENHANCEMENT AREAS
DA# DISTURBED AREA TO BE RESTORED
TP-B# TREE-PLANTING - BUFFER (YEARS 1-2)
TP-M# TREE-PLANTING + VEGETATION MANAGEMENT (YEARS 1-5)
TP-RA# TREE-PLANTING - REFORESTATION (YEARS 1-3)
TP-RB# TREE-PLANTING - REFORESTATION (YEARS 1-5)
WE# WETLAND ENHANCEMENT (YEARS 1-2)
GEC Goodban Ecological Consulting Inc.
0 35 70 105m
Coordinate System: UTM17m NAD27
N
GHD
CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO
ECOLOGICAL ENHANCEMENT PLAN (EEP)
Project No. 10978-200
Date December 2021
FIGURE 39
Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA017-GEC.dwg
Plot Date: 07 December 2021 3:34 PM
Image: 2019 Halton Region Orthoimagery from First Base Solutions.

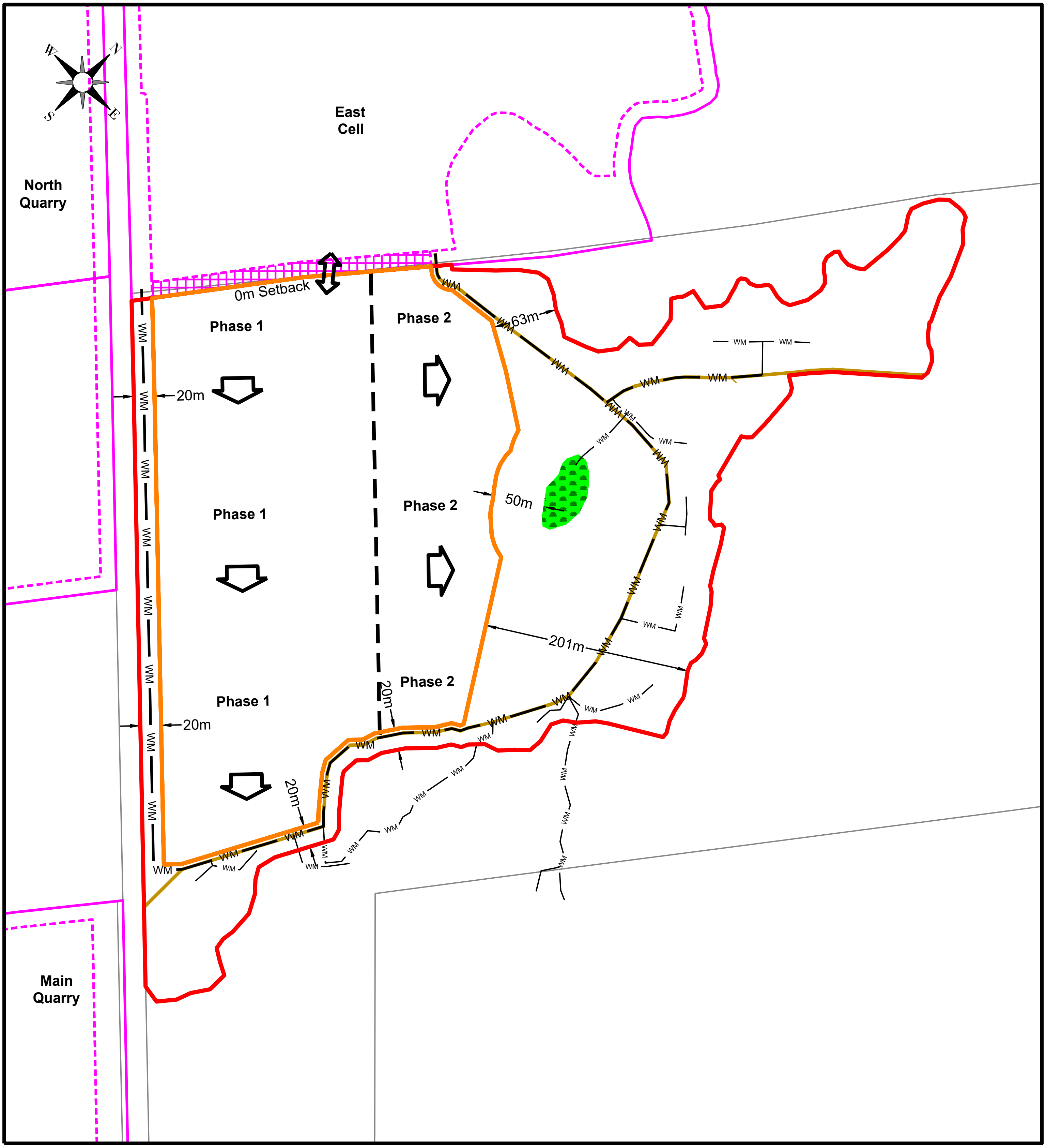



Figure # 40

## Operations Schematic

**Milton Quarry East Extension**

Part of Lots 11 and 12, Concession 1
(Geographic Township of Esquesing)
Town of Halton Hills
Regional Municipality of Halton

Legend

- Proposed Milton Quarry East Extension - Licence Boundary
- Proposed Milton Quarry East Extension - Limit of Extraction
- Existing Licence Boundaries
- Existing Limits of Extraction
- East Cell Setback Removal
- WM Main Watermain / Service Access
- WM Feeder Line
- Site Entrance
- Phase Direction
- Phase Boundary
- Existing Wetland U1

Date December 2021

Sources

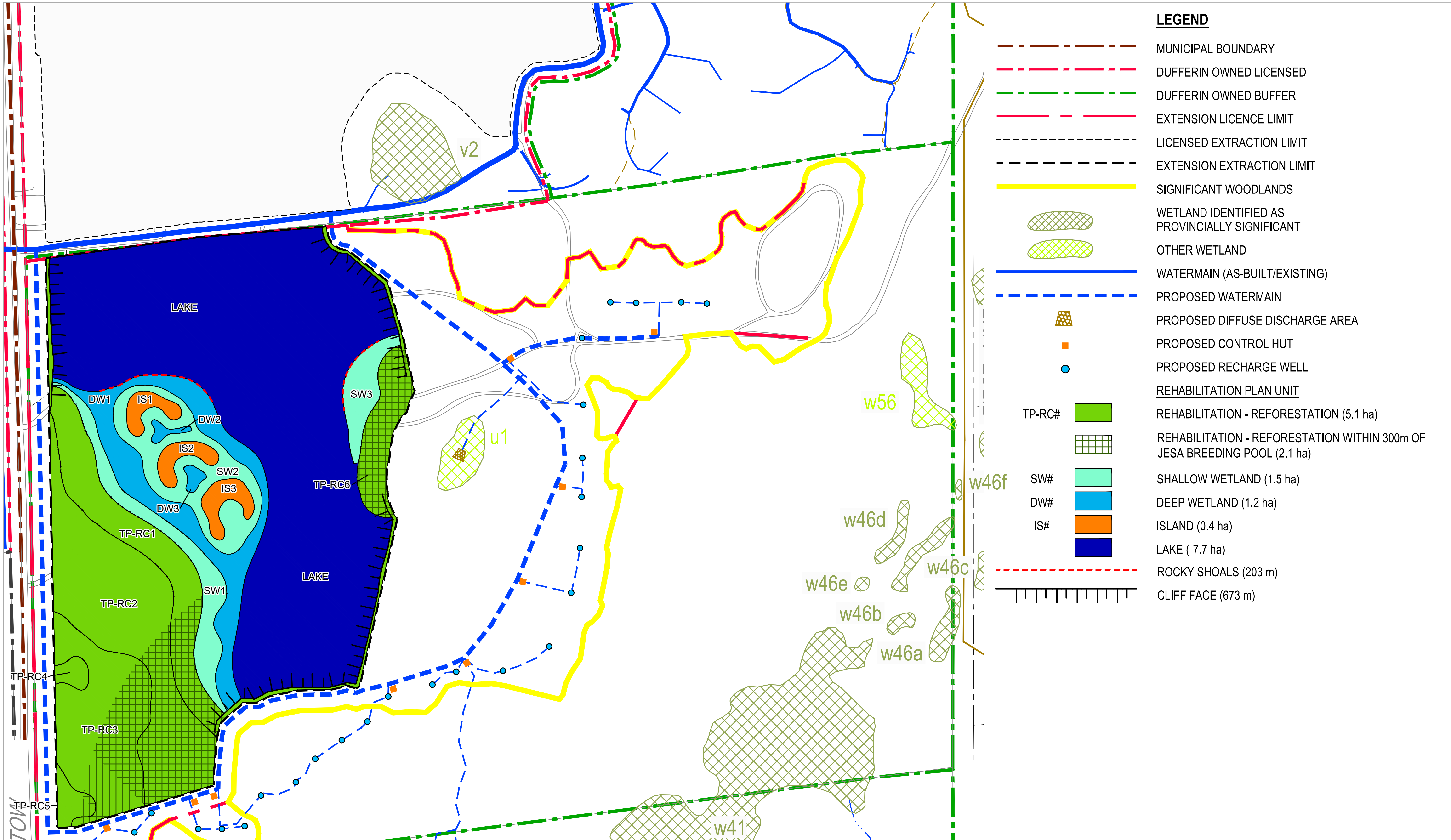
Milton Quarry East Extension Operational Plan prepared by MHBC dated November 2021

Scale - 1:5000

0 75 150 Meters

N:\Brian\9061DJ Dufferin - Milton Quarry East Extension\Drawings - Must be in NAD 27\Figures for Other Consultants\Figures for Goodban\Natural Environment Report\CAD\9061DJ - Figure 40 - Operational Schematic.dwg

Goodban Ecological Consulting Inc.




CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. 10978-200
Date December 2021

REHABILITATION PLAN

FIGURE 41a

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA035-GEC.dwg
Plot Date: 09 December 2021 3:52 PM

Source: MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE, Milton Quarry East Extension, Rehabilitation Plan, Dated November 2021.
Image: 2019 Halton Region Orthoimagery from First Base Solutions.

1. Fill slope to be extended from quarry floor to the wetlands and from the wetlands to match grade with stabilized overburden on cliff top.
2. The objective for this treatment is to provide linkages between the quarry lake system and the surrounding natural areas.
3. Slope no steeper than 4:1 with a layer of topsoil suitable for planting with native seed or transplanted material.
4. Habitat diversity will be increased by leaving a small scarp or cliff face between the quarry face and the fill slope (i.e. 1-2 m) in places. These forested micro-cliff faces often provide habitat for rare and specialized plant species as well as hibernacula.
5. Planting will vary according to slope aspect and moisture regime. Fast-growing, successional species will be used in some areas while longer-lived species will be used in other areas. Species selections are provided in Table 2: Rehabilitation Plant Unit Summary.
6. Shoreline vegetation to be chosen to maximize the habitat diversity and provide aquatic/terrestrial connections.

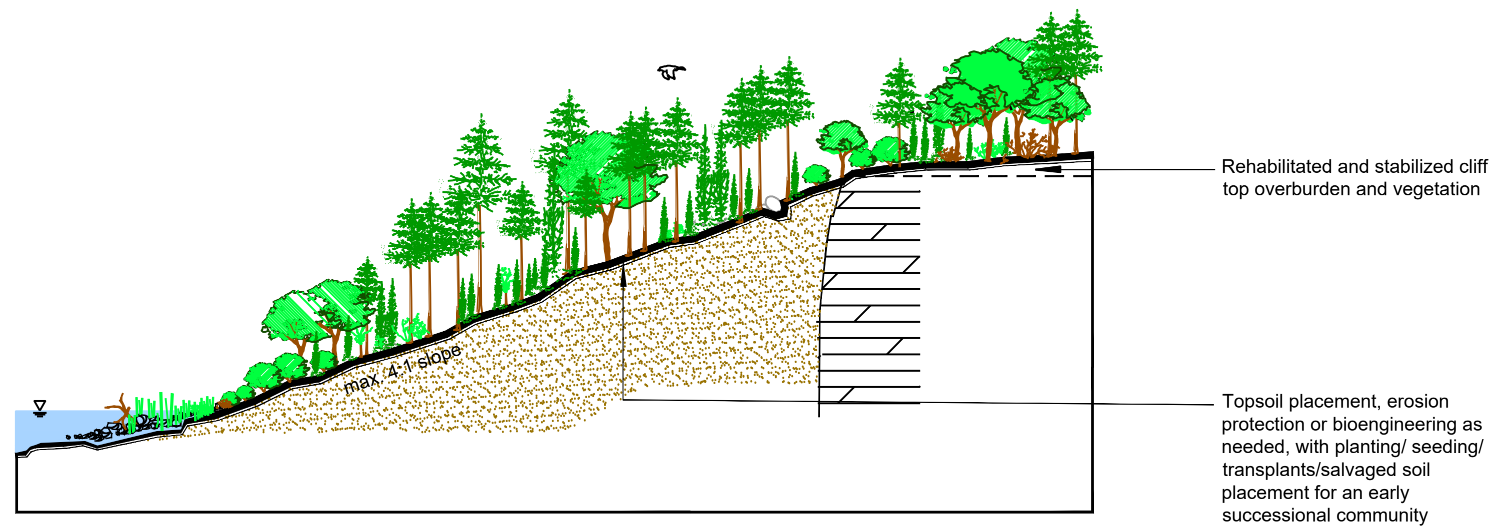



**Figure 1.0 - Vegetated Slope to Cliff Top**

1. Fill slope to be extended from quarry floor to the wetlands and from the wetlands to the exposed quarry face.
2. The objective for this treatment is to create habitats that are complementary to the Escarpment landscape, with cliffs and vegetated slopes above the shoreline wetlands.
3. Slopes no more than 4:1 and should be at a gradient that maximizes connectivity with shoreline habitats. Height of quarry face will vary.
5. Planting will vary according to slope aspect and moisture regime. Fast-growing, successional species will be used in some areas while longer-lived species will be used in other areas. Species selections are provided in Table 2: Rehabilitation Plant Unit Summary.
6. Shoreline vegetation to be chosen to maximize the habitat diversity and provide aquatic/terrestrial connections.

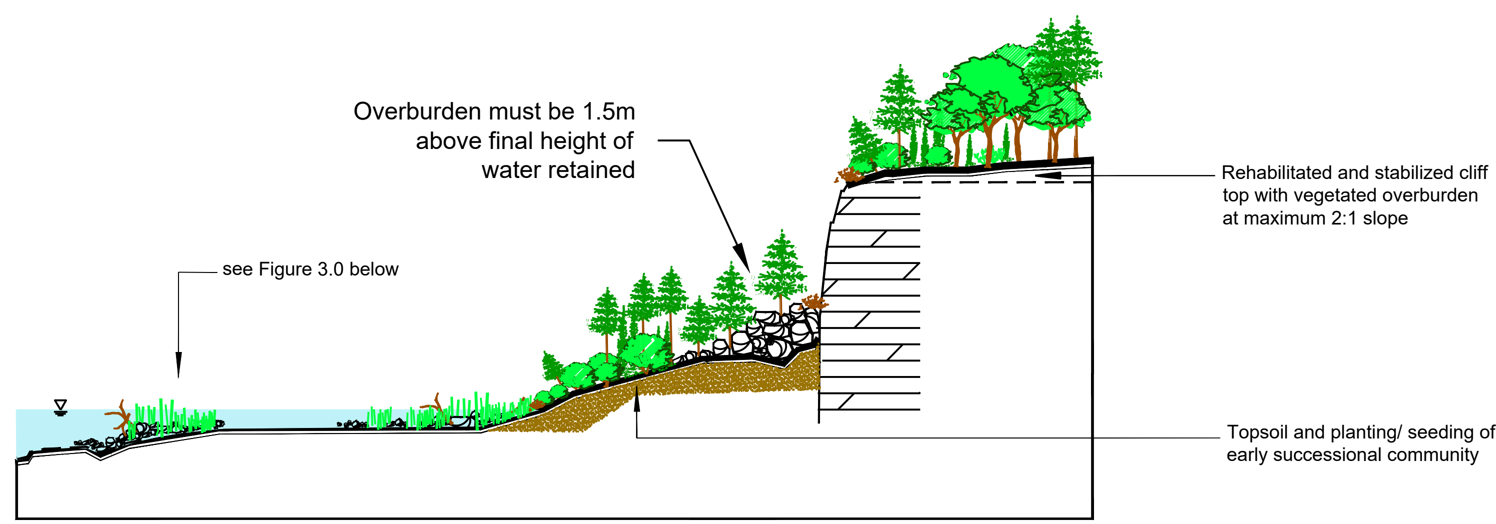



**Figure 2.0 - Vegetated Slope to Exposed Bedrock Face**

Figure # 41b
**Rehabilitation Details**

**Milton Quarry East Extension**
Part of Lots 11 and 12, Concession 1
(Geographic Township of Esquesing)
Town of Halton Hills
Regional Municipality of Halton

| | |
|---|---|
| Date | December 2021 |
| Sources | Figures from Milton Quarry East Extension Site Plan Prepared by MHBC dated December 2021 |
| Scale | Not to Scale |

N:\Brian\9061DJ Dufferin - Milton Quarry East Extension\Drawings - Must be in NAD 27\Figures for Other Consultants\Figures for Goodban\Natural Environment Report\CAD\9061DJ - Various Report Figures - Town and Region Official Plan Schedules.dwg

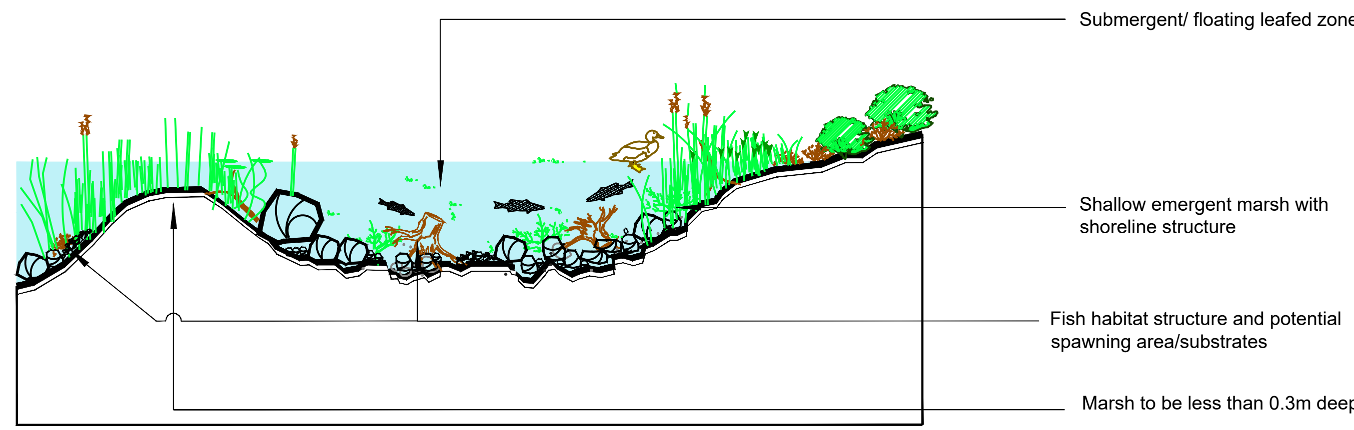
Goodban Ecological Consulting Inc.

1. Fill slope to be extended from quarry floor to the wetlands.
2. The objective is to create vegetated wetland, shoreline marsh and submergent aquatic communities, as well as nursery and forage fish habitat with seasonal access to large predatory fish, (for spawning) and habitat connections for terrestrial species.
3. The outer edge of the wetlands will have a submerged shoal no more than ±0.3m deep, with a range of depths emphasizing the 0.5m to 1.0m and 0m to 0.5m zones for submergent and emergent vegetation respectively, and selected areas with sand and gravel substrates for potential spawning, and a nearshore emergent marsh community with associated structures and shoreline cover.
4. Shallow emergent marsh vegetation extending to ±0.15 m deep ±5 m from shore (e.g. water plantain, arrowhead, sedges, spikerushes and bulrushes); interspersed with cover structures (e.g. boulders, root wads). Species selections are provided in Table 2: Rehabilitation Plant Unit Summary.

4.1. Organic material and topsoil should be added to most shoreline areas to promote shoreline vegetation. Organic material in deeper littoral areas will provide the required substrate for wintering amphibians and turtles and support emergent and submergent growth. Organic material shall only be used if it is confirmed to be free of invasive species such as European Common Reed and Purple Loosestrife.

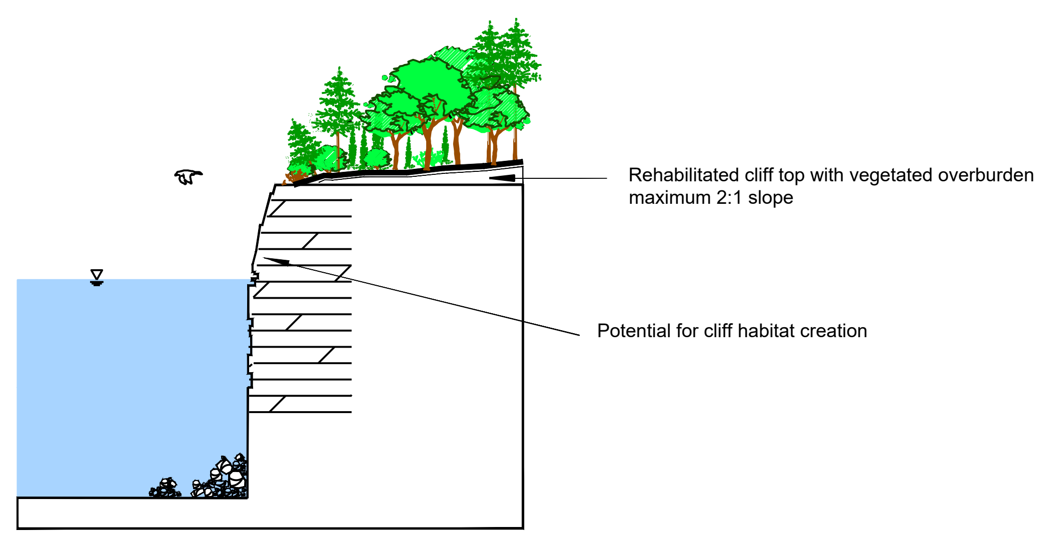
4.2. Supplement with basking logs to create turtle habitat, nesting platforms and boxes for waterfowl and sandy slopes on south facing exposure for potential turtle nesting.

5. A marsh zone from ±0.15 to ±0.65 m deep dominated by species such as cattails and rushes, with scattered submerged fish habitat structures and open areas with sand and fine gravel substrates for certain inverebrate and forage species.
6. Deeper areas to provide floating leafed/submergent wetland component with plants such as species of water lily, pondweed, duckweed, coontail, bladder-wort.
7. On outer exposed face of shoal, gravels (3 to 6 cm diam.) will be placed to provide potential spawning habitat for fish (ie: smallmouth bass); "placement" of sand & gravel in some shallow areas and on reef will provide potential spawning habitat for sunfish and some forage species.




## Figure 3.0 - Shoreline Wetland

1. Quarry face to extend from cliff top to filled quarry floor. Selective blasting will create irregular cliff face, shelves and niches on exposed vertical faces above and below water level. Blast rock piles will remain on quarry floor below water level to provide submerged aquatic habitat structure.
2. Exposed faces are required for the passive groundwater mitigation of streams and wetlands to the east. These faces will provide cliff and open deep water habitat. No backfilling of overburden shall occur (see Variations from Control and Operation Standards on drawing 2 of 4).




## Figure 4.0 - Vertical Face

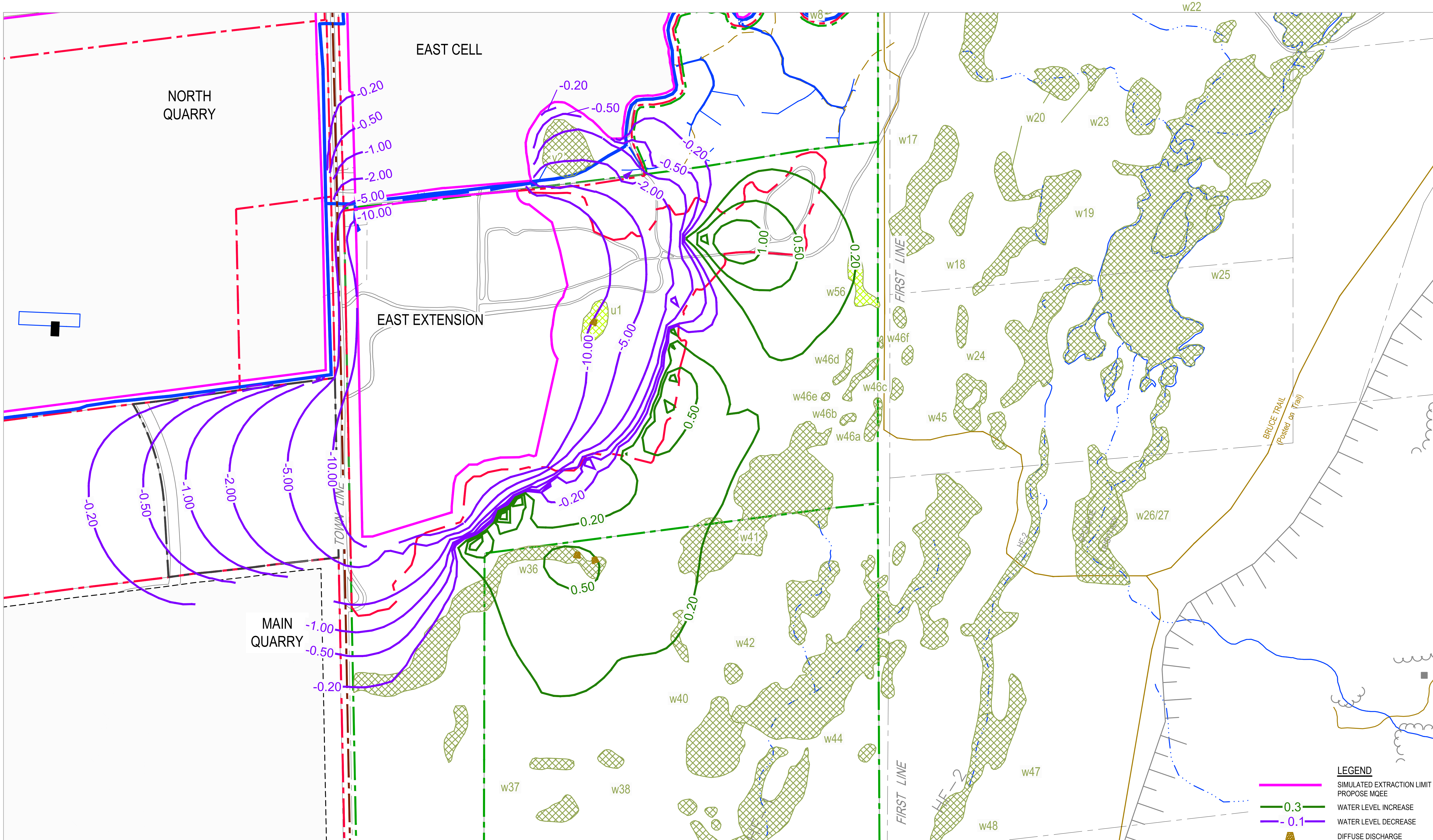
Figure # 41c
**Rehabilitation Details**

**Milton Quarry East Extension**
Part of Lots 11 and 12, Concession 1
(Geographic Township of Esquesing)
Town of Halton Hills
Regional Municipality of Halton

| | |
|---|---|
| Date | December 2021 |
| Sources | Figures from Milton Quarry East Extension Site Plan Prepared by MHBC dated December 2021 |
| Scale | Not to Scale |

N:\Brian\9061DJ Dufferin - Milton Quarry East Extension\Drawings - Must be in NAD 27\Figures for Other Consultants\Figures for Goodban\Natural Environment Report\CAD\9061DJ - Various Report Figures - Town and Region Official Plan Schedules.dwg

Goodban Ecological Consulting Inc.




0 60 120 180m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

SIMULATED WATER LEVEL CHANGE - INTERIM CONDITION

Project No. 10978-200
Date December 2021

**FIGURE 42a**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA042-GEC.dwg
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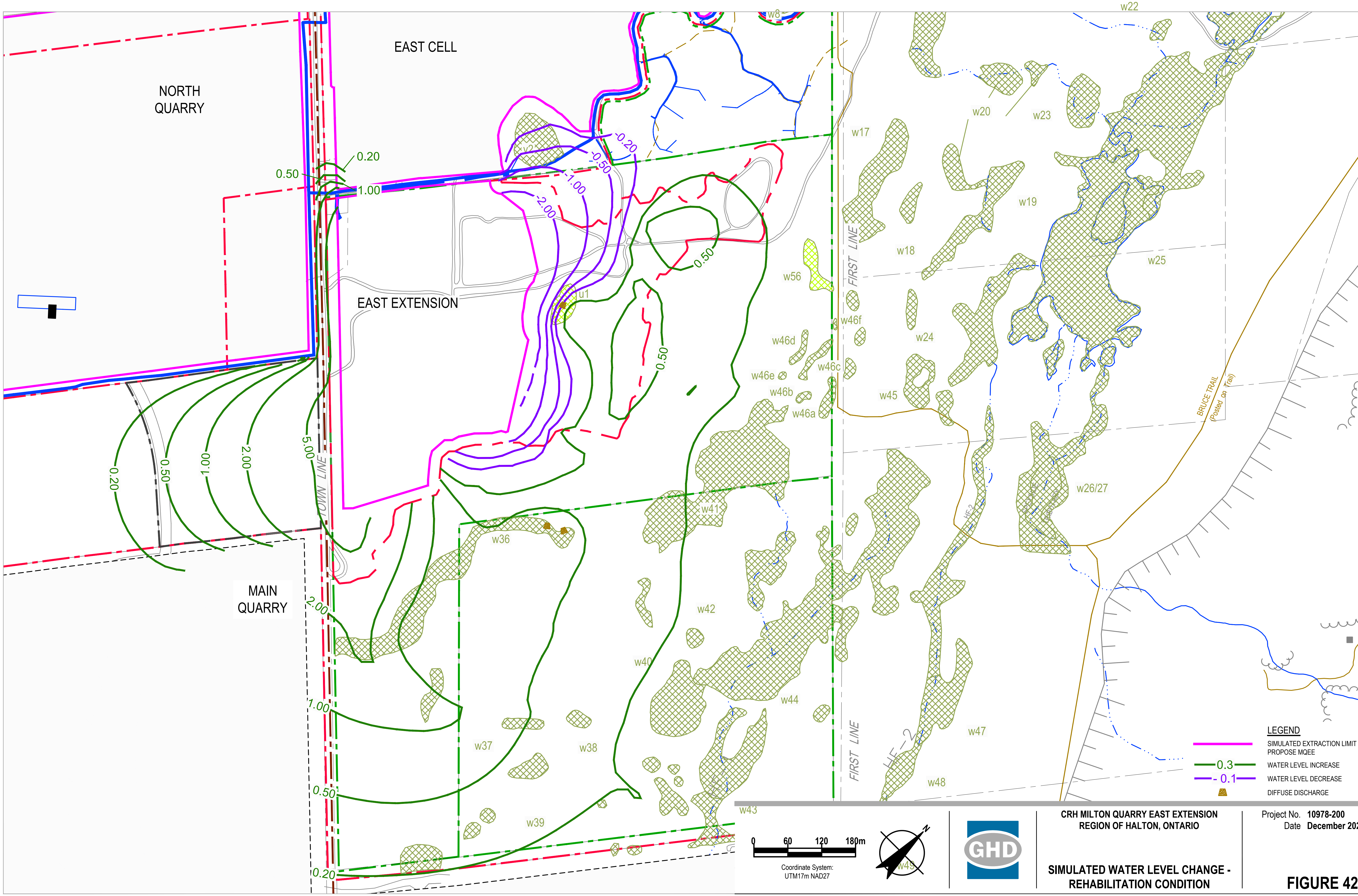


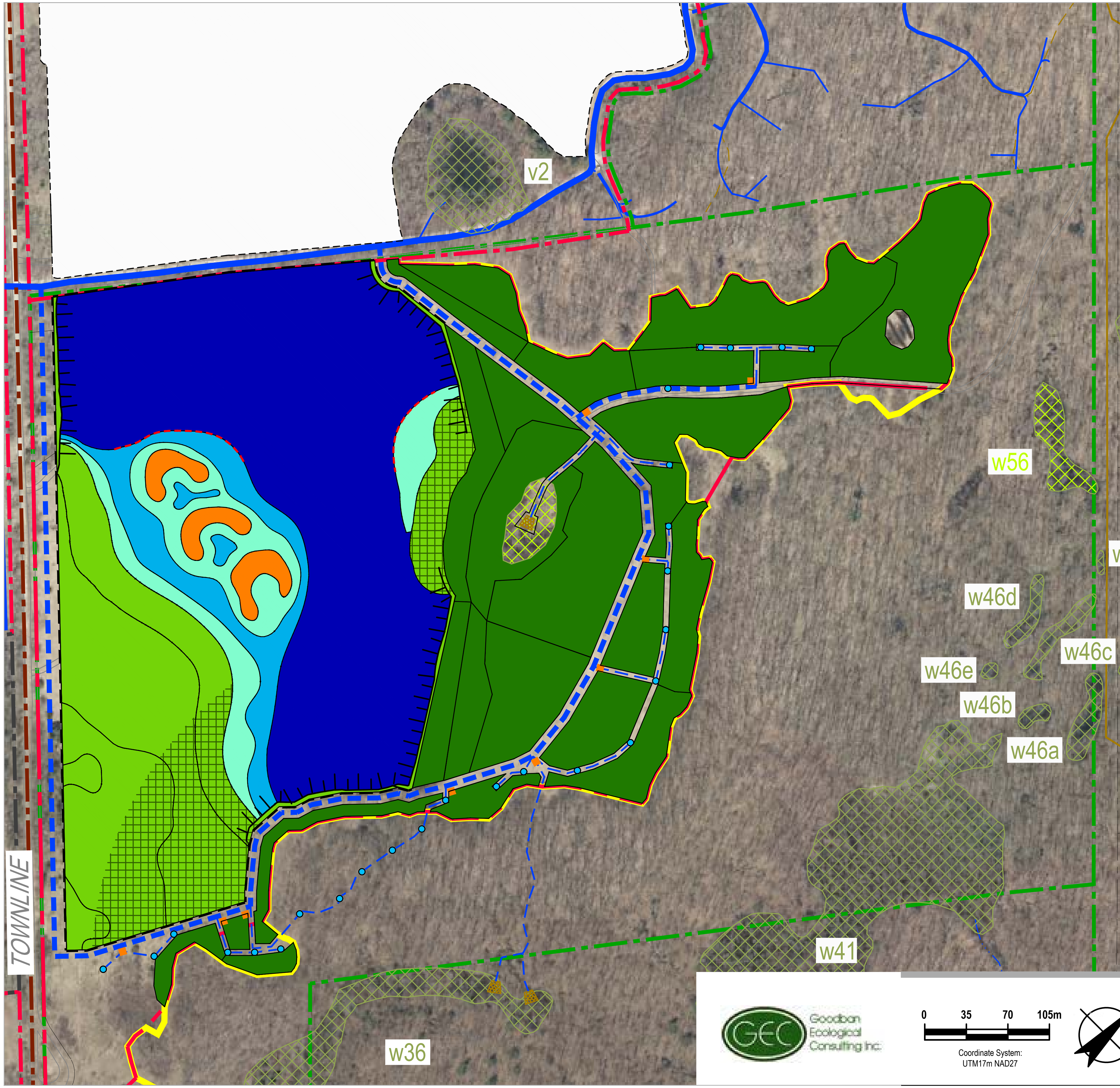

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

SIMULATED WATER LEVEL CHANGE - REHABILITATION CONDITION

Project No. 10978-200
Date December 2021

FIGURE 42b

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA043-GEC.dwg
Plot Date: 14 December 2021 2:11 PM




**LEGEND**

- MUNICIPAL BOUNDARY
- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- SIGNIFICANT WOODLANDS
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- WATERMAIN (AS-BUILT/EXISTING)
- PROPOSED WATERMAIN
- PROPOSED DIFFUSE DISCHARGE AREA (NTS)
- PROPOSED CONTROL HUT
- PROPOSED RECHARGE WELL
- REHABILITATION - REFORESTATION (5.1 ha)
- REHABILITATION - REFORESTATION WITHIN 300m OF JESA BREEDING POOL (2.1 ha)
- SHALLOW WETLAND (1.5 ha)
- DEEP WETLAND (1.2 ha)
- ISLAND (0.4 ha)
- LAKE (7.7 ha)
- EEP - REFORESTATION (10.3 ha)
- ROCKY SHOALS (203 m)
- CLIFF FACE (673 m)

Goodban Ecological Consulting Inc.

0 35 70 105m

Coordinate System: UTM17m NAD27

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

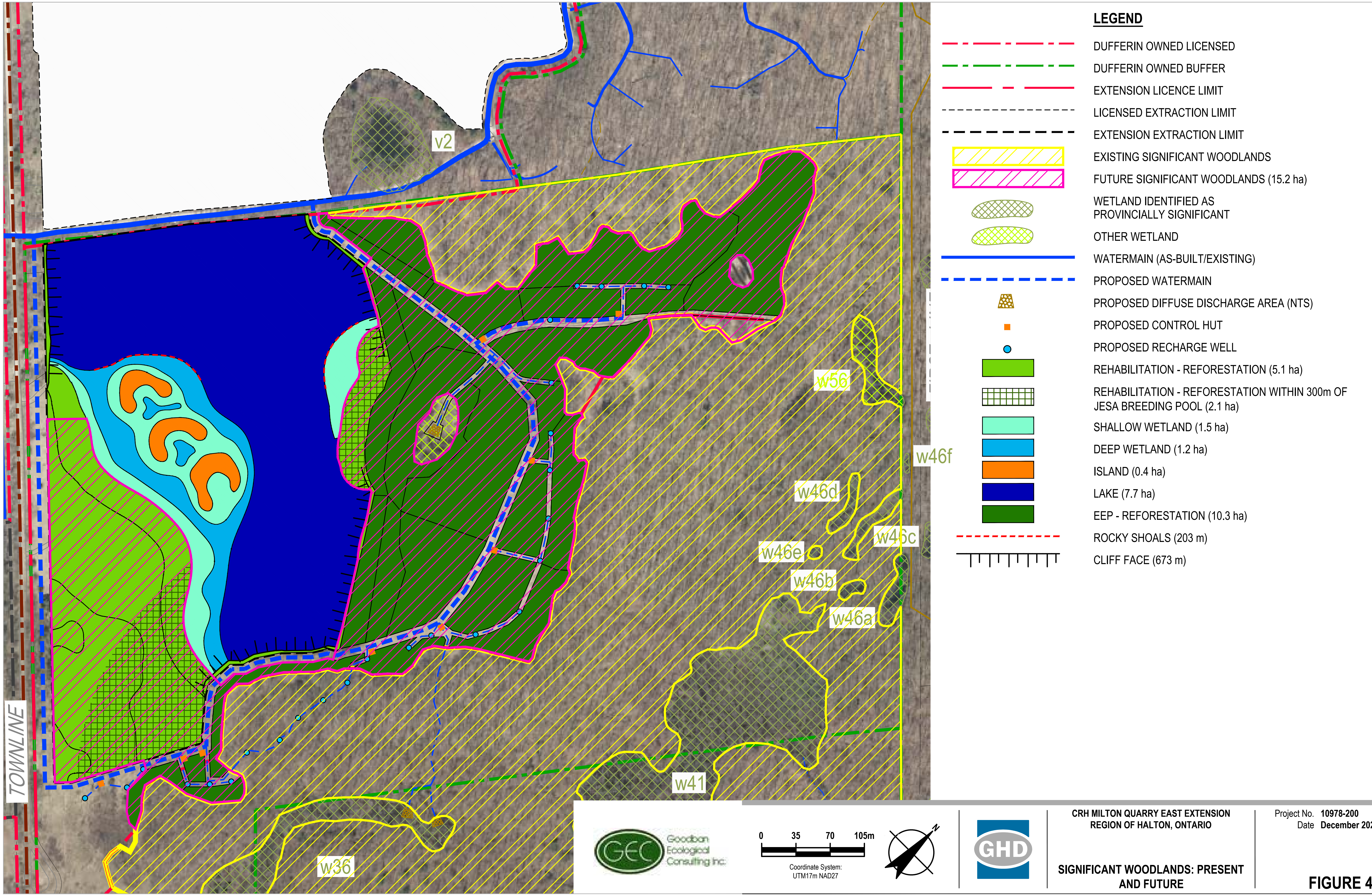
**COMBINED ECOLOGICAL ENHANCEMENT PLAN (EEP) AND MQEE REHABILITATION PLAN**

Project No. 10978-200
Date December 2021

**FIGURE 43**

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA036-GEC.dwg
Plot Date: 14 December 2021 2:12 PM

Source: MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE, Milton Quarry East Extension, Rehabilitation Plan, Dated November 2021.
Image: 2019 Halton Region Orthoimagery from First Base Solutions.




Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\GEC\010978(RPT164)GN-WA037-GEC.dwg
Plot Date: 15 December 2021 8:54 AM

Source: MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE, Milton Quarry East Extension, Rehabilitation Plan, Dated November 2021.
Image: 2019 Halton Region Orthoimagery from First Base Solutions.

**Table 1: MQEE Ecological Survey Details – 2018 to 2021**
**Goodban Ecological Consulting Inc. (GEC)**

| Date | Surveyors[1] | Time | Purpose | Weather Conditions[2] | Notes |
|---|---|---|---|---|---|
| 2018/08/10 | AG, AS | 1015 - 1520 | General reconnaissance. | Sunny, warm. | Initial site visit to scope potential issues and formulate the approach to the ecological survey program. |
| 2019/03/21 | AG | 1120 - 1605 | Wetland survey. Deploy Song Meters in selected wetlands. | Cloudy, cold. 2°C. | Check on ice conditions in woodland pools. |
| 2019/03/24 | AG | 0910 - 1320 | Wetland survey. | Cloudy, cold. 4°C. | Check on ice conditions in woodland pools. Partial snow cover present. |
| 2019/03/30 | AG | 1230 – 1545 | Deploy minnow traps. Wetland survey. | Cloudy, cold. 2°C. | 6 traps set in Wetland U1. |
| 2019/03/31 | AG | | Check/remove minnow traps. | Cloudy, cold. 0°C. | Snow cover was present. |
| 2019/04/06 | AG | 1315 – 1650 | Deploy minnow traps. Wetland survey. | Mix of sun and cloud. 11°C. | 6 traps set in Wetland U1; 2 traps set in Wetland W36; 6 traps set in Wetland W41. |
| 2019/04/07 | AG | 0920 – 1310 | Check minnow traps. Wetland survey. Vegetation/flora survey. | Cloudy. 8°C. | 6 traps set in Wetland W17a; 8 traps set in W46. |
| 2019/04/08 | AG | 0840 – 1240 | Check/remove minnow traps. | Cloudy. 8°C. | All minnow traps removed from wetlands. |
| 2019/04/09 | AG | 0900 - 1215 | Wetland survey. | Mix of sun and cloud. 6°C. | Wetland reconnaissance. |
| 2019/04/18 | AG | 1350 - 1655 | Snake survey. Vegetation/flora survey. | Mix of sun and cloud. 18°C. | Snake survey was focused on rocky fencelines, outcrops and woodland/wetland edges. |
| 2019/05/05 | AG | 1200 - 1645 | Snake survey. Vegetation/flora survey. | Mix of sun and cloud. 16°C. | Snake survey was focused on rocky fencelines, outcrops and woodland/wetland edges. |

**Table 1: MQEE Ecological Survey Details – 2018 to 2021**
**Goodban Ecological Consulting Inc. (GEC)**

| Date | Surveyors[1] | Time | Purpose | Weather Conditions[2] | Notes |
|---|---|---|---|---|---|
| 2019/05/06 | AG | 1405 - 1720 | Snake survey. Vegetation/flora survey. | Mix of sun and cloud. 20°C. | Snake survey was focused on rocky fencelines, outcrops and woodland/wetland edges. |
| 2019/06/08 | TH | 0630 - 0900 | Grassland bird survey. Incidental wildlife survey. | 18-21°C, BWS 2, CC 0% | First 2019 grassland bird survey. |
| 2019/06/08 | AG | 0630 - 1430 | Vegetation/flora survey. Incidental wildlife survey. | 18-23°C, BWS 2, CC 0% | |
| 2019/06/16 | TH | 0700 - 1000 | Grassland bird survey. Incidental wildlife survey. | 14-16°C, BWS 2-3, CC 20-40% | Second 2019 grassland bird survey. |
| 2019/06/16 | AG | 0700 - 1620 | Wetland survey. Vegetation/flora survey. Incidental wildlife survey. | 14-18°C, BWS 2-3, CC 20-40% | |
| 2019/06/20 | AG | 0830 - 1215 | Wetland survey. Vegetation/flora survey. Incidental wildlife survey. | Mix of sun and cloud. 14-18°C. | |
| 2019/06/30 | TH | 0730 - 1000 | Grassland bird survey. Incidental wildlife survey. | 19-21°C, BWS 3, CC 10-30% | Third 2019 grassland bird survey. |
| 2019/06/30 | AG | 0730 - 1520 | Wetland survey. Vegetation/flora survey. Incidental wildlife survey. | 19-23°C, BWS 3, CC 10-30% | |

**Table 1: MQEE Ecological Survey Details – 2018 to 2021**
**Goodban Ecological Consulting Inc. (GEC)**

| Date | Surveyors[1] | Time | Purpose | Weather Conditions[2] | Notes |
|---|---|---|---|---|---|
| 2019/09/28 | AG | 1040 - 1645 | Wetland survey. Vegetation/flora survey. Incidental wildlife survey. | Sun and cloud. 18°C. | |
| 2019/10/05 | AG | 0815 - 1520 | Wetland survey. Vegetation/flora survey. Incidental wildlife survey. | Sun and cloud. 10°C. | |
| 2020/01/16 | AG | 1040 - 1450 | Winter wildlife survey. | Mostly cloudy. -1°C. | In/around Wetlands W36, W41, W46a/b and W56. |
| 2020/02/21 | AG | 1310 - 1500 | Winter wildlife survey. | Sunny. -1°C. | In/around Wetlands U1, W36 and W41. |
| 2020/03/19 | AG | 1500 – 1630 | Deploy Song Meters. Deploy minnow traps for salamander survey. Wetland survey. | Mostly cloudy. 6°C. | |
| 2020/03/20 | AG | 0900 – 1030 | Check/retrieve minnow traps. | Mostly cloudy. 13°C. | |
| 2020/03/29 | AG | 1500 – 1630 | Deploy minnow traps for salamander survey. | Mix of sun and cloud. 14°C. | |
| 2020/03/30 | AG | 0900 - 1045 | Check/retrieve minnow traps. | Mostly cloudy. 5°C. | |
| 2020/05/03 | AG | 0930 - 1615 | Snake survey. Incidental wildlife. | Sun and cloud. 15-18°C. | Snake survey was focused on rocky fencelines, outcrops and woodland/wetland edges. |
| 2020/05/10 | AG | 0945 - 1530 | Vegetation/flora. Incidental wildlife. | Mostly cloudy. 6-10°C. | |

**Table 1: MQEE Ecological Survey Details – 2018 to 2021**
**Goodban Ecological Consulting Inc. (GEC)**

| Date | Surveyors[1] | Time | Purpose | Weather Conditions[2] | Notes |
|---|---|---|---|---|---|
| | | | | | |
| 2020/05/30 | TH | 0554 – 0940 | Forest bird survey. | 13-17°C, BWS 1-2, CC 80% | First 2020 forest bird survey. |
| 2020/05/30 | AG | 0554 – 1330 | Vegetation/flora. Incidental wildlife. | Mostly cloudy. 13-20°C. | |
| 2020/05/31 | TH | 0700 – 0925 | Grassland bird survey. | 9-12°C, BWS 3, CC 20% | First 2020 grassland bird survey. |
| 2020/05/31 | AG | 0700 - 1415 | Vegetation/flora. Incidental wildlife. | Mostly sunny. 9-13°C. | |
| 2020/06/06 | TH | 0600 - 0945 | Forest bird survey. | 16-22°C, BWS 0-2, CC 0% | Second 2020 forest bird survey. |
| 2020/06/06 | AG | 0600 - 1330 | Vegetation/flora. Incidental wildlife. | Sun and cloud. 16-23°C. | |
| 2020/06/07 | TH | 0700 - 1000 | Grassland bird survey. | 13-18°C, BWS 2-3, CC 30-50% | Second 2020 grassland bird survey. |
| 2020/06/07 | AG | 0700 - 1415 | Vegetation/flora. Incidental wildlife. Peregrine Falcon. | Sun and cloud. 13-20°C | |
| 2020/06/28 | TH | 0720 - 1000 | Grassland bird survey. | 20-24°C, BWS 2, CC 100% | Third 2020 grassland bird survey. |
| 2020/06/28 | AG | 0720 - 1315 | Vegetation/flora. Incidental wildlife. Peregrine Falcon. | Cloudy. 20-26°C. | |
| 2020/07/04 | TH | 0600 - 0955 | Forest bird survey. | 21-25°C, BWS 1-3, CC 20% | Third 2020 forest bird survey. |
| 2020/07/04 | AG | 0600 – 1000 | Stake Wetland U1 boundary. Vegetation/flora. | Mostly sunny. 21-25°C. | |

**Table 1: MQEE Ecological Survey Details – 2018 to 2021**
**Goodban Ecological Consulting Inc. (GEC)**

| Date | Surveyors[1] | Time | Purpose | Weather Conditions[2] | Notes |
|---|---|---|---|---|---|
| | | | | | |
| 2020/07/04 | AG, TH | 1010 - 1240 | Snake survey.<br>Incidental wildlife. | Mostly sunny.<br>25°C. | |
| 2020/08/30 | AG | 0900 - 1545 | Vegetation/flora.<br>Incidental wildlife. | Sun and cloud.<br>17-21°C. | |
| 2020/10/03 | AG | 1000 - 1610 | Vegetation/flora.<br>Incidental wildlife. | Sun and cloud.<br>8-11°C. | |
| 2020/10/31 | AG, JJ | | Tree density plots | | Woodland A |
| 2020/11/08 | AG, JJ | | Tree density plots | | Woodland A |
| 2020/11/29 | AG, JJ | | Stake woodland boundary. | | The Significant Woodland boundary was staked in those areas where the extraction limit and watermain alignment is relatively close to the Significant Woodland. |
| 2020/12/06 | AG, JJ | | Stake woodland boundary. | | The Significant Woodland boundary was staked in those areas where the extraction limit and watermain alignment is relatively close to the Significant Woodland. |
| 2020/12/19 | AG | 0945 - 1430 | Winter wildlife survey | Cloudy.<br>0°C. | |
| 2021/03/25 | AG | 1015 - 1545 | Deploy Song Meters.<br>Vegetation/Wetlands.<br>Snake survey. | Mostly sunny.<br>13-19°C. | |
| 2021/04/10 | AG | 0915 - 1650 | Vegetation/flora.<br>Wetlands.<br>Snake survey. | Sun and cloud.<br>15-20°C. | Snake survey was focused on rocky fencelines, outcrops and woodland/wetland edges. |
| 2021/05/02 | AG, AS | 0900 - 1200 | Bat habitat assessment.<br>Peregrine Falcon. | Mostly cloudy.<br>13-16°C. | |

**Table 1: MQEE Ecological Survey Details – 2018 to 2021**
**Goodban Ecological Consulting Inc. (GEC)**

| Date | Surveyors[1] | Time | Purpose | Weather Conditions[2] | Notes |
|---|---|---|---|---|---|
| | | | | | |
| 2021/05/09 | AG | 1045 - 1600 | Cavity Tree Survey.<br>Peregrine Falcon. | Cloudy.<br>9-10°C. | Cavity tree survey of Woodland B and hedgerows CUHa and CUHb. |
| 2021/05/16 | AG | 0915 - 1515 | Vegetation/flora.<br>Incidental wildlife. | Sunny.<br>18-21°C. | |
| 2021/05/24 | AG | 0845 - 1315 | Peregrine Falcon.<br>Cox Tract. | Sunny.<br>15-21°C. | |
| 2021/06/06 | TH, AG | 0720 - 0830 | Marsh bird survey. | 18°C, BWS 1, CC 0% | First 2021 marsh bird survey. |
| 2021/06/06 | AG | 0900 - 1145 | Deploy bat detectors.<br>Vegetation/flora. | Sunny.<br>26-29°C. | Deploy 4 bat detectors in Woodland B. |
| 2021/06/20 | TH | 0720 - 0830 | Marsh bird survey. | 17°C, BWS 0, CC 0% | Second 2021 marsh bird survey. |
| 2021/06/20 | AG | 0720 - 1415 | Vegetation/flora.<br>Incidental wildlife.<br>Peregrine Falcon. | Sunny.<br>22-26°C. | |
| 2021/07/24 | AG | 0900 - 1345 | Wetland W41. | Mostly sunny.<br>20-21°C. | |
| 2021/08/02 | AG, KF | 0945 - 1430 | Wetland W41. | Sunny.<br>20-23°C. | |
| 2021/08/08 | AG | 0830 - 1215 | Wetland W36.<br>Vegetation/flora.<br>Incidental wildlife. | Sun and cloud.<br>21-25°C. | |
| 2021/10/10 | AG | 0930 - 1415 | Vegetation/flora.<br>Incidental wildlife. | Sun and cloud.<br>17-19°C. | |
| 2021/11/07 | AG | 1015 - 1430 | Vegetation.<br>Incidental wildlife. | Sunny.<br>11-15°C. | |
| 2021/11/13 | AG | 1100 - 1515 | Vegetation.<br>Incidental wildlife. | Sunny.<br>3-6°C. | |

## Table 1: MQEE Ecological Survey Details – 2018 to 2021
## Goodban Ecological Consulting Inc. (GEC)

[1]**Surveyors:**

GEC:

AG – Anthony Goodban (Goodban Ecological Consulting Inc.)
AS – Al Sandilands (Gray Owl Environmental Inc.)
JJ – Jeremy Jackson (Jackson Arboriculture Inc.)
TH – Tyler Hoar (Ornithologist)

GHD:

KF – Kyle Fritz (GHD)

[2]**Weather Conditions** (Information provided for weather-dependent wildlife surveys)

Temperature ($^{o}C$)
BWS Beaufort Wind Scale (0 to 12)
CC Cloud Cover (%)

**Table 2: June 2021 Sunset Times for Acton, Ontario**

| Date | Sunset Time |
|---|---|
| 2021/06/06 | 21:34 |
| 2021/06/07 | 21:35 |
| 2021/06/08 | 21:36 |
| 2021/06/09 | 21:36 |
| 2021/06/10 | 21:37 |
| 2021/06/11 | 21:38 |
| 2021/06/12 | 21:38 |
| 2021/06/13 | 21:39 |
| 2021/06/14 | 21:39 |
| 2021/06/15 | 21:40 |
| 2021/06/16 | 21:40 |
| 2021/06/17 | 21:40 |
| 2021/06/18 | 21:41 |
| 2021/06/19 | 21:41 |
| 2021/06/20 | 21:41 |
| 2021/06/21 | 21:41 |
| 2021/06/22 | 21:42 |
| 2021/06/23 | 21:42 |
| 2021/06/24 | 21:42 |
| 2021/06/25 | 21:42 |
| 2021/06/26 | 21:42 |
| 2021/06/27 | 21:42 |

**Data Source:**

https://www.timeanddate.com/sun/@5882133?month=6&year=2021

**Table 3**
**Vegetation Communities (ELC Units) – Milton Quarry East Extension (MQEE) Natural Environment Study Area**

| ELC Code | Community Type | Dominant Species | Size Class (cm DBH) | Canopy Closure | Soils / Moisture Regime | Photo Ref.** | Notes |
|---|---|---|---|---|---|---|---|
| *Terrestrial* | | | | | | | |
| FOM | Mixed Forest | Scots Pine (*Pinus sylvestris* +), Red Pine (*Pinus resinosa*), Trembling Aspen (*Populus tremuloides*), Green Ash (*Fraxinus pennsylvanica*) and Common Buckthorn (*Rhamnus cathartica* +), with a few scattered Black Walnut (*Juglans nigra*) and White Birch (*Betula papyrifera*). | <10<br>10-20 | >60% | Well drained to imperfectly drained. Dumfries loam. | 1-4 | Woodland A is a small, relatively young (30 years old) 1.18 ha feature located on the northeast side of Townline, opposite the northeast end of the Cox Tract. It was classified by GEC as Mixed Forest (FOM), although some parts appear to be Coniferous Plantation (CUP3). Some of the Scots Pine (+) and Red Pine, and almost all of the Black Walnut are growing in rows, but others appear to be natural regeneration. Woodland A is discussed in detail in Section 8.1. |
| FOD3-1a | Dry-Fresh Poplar Deciduous Forest Type | Trembling Aspen, with scattered declining White Ash (*Fraxinus americana*), White Birch and Scots Pine (+). | 10-24 | >60% | Well drained. Dumfries loam. | 5 | This small unit is located at the northeast end of the Cox Tract. This general area was planted with conifers in 1951. Former landing area has grown in with Trembling Aspen. |
| FOD3-1b | Dry-Fresh Poplar Deciduous Forest Type | Trembling Aspen, with declining White Ash, White Birch and Common Buckthorn (+). | <10<br>10-24 | >60% | Well drained to imperfectly drained. Dumfries loam. | 6 | Small disturbed unit dominated by pioneering species. Old ditch line cuts through this unit; no water observed 2018-2021. |
| FOD3-1c | Dry-Fresh Poplar Deciduous Forest Type | Trembling Aspen, with Sugar Maple (*Acer saccharum*), declining White Ash and Common Buckthorn (+). | 10-24 | >60% | Well drained. Dumfries loam. | 7 | This small unit has regenerated on former agricultural land, expanding the Significant Woodland. |
| FOD3-1d | Dry-Fresh Poplar Deciduous Forest Type | Trembling Aspen and Bigtooth Aspen (*Populus grandidentata*), with White Birch, Sugar Maple, declining White Ash, White Pine (*Pinus strobus*) and Common Buckthorn (+). | 10-24<br>25-50 | >60% | Well drained to imperfectly drained. Dumfries loam. | 8 | This unit has regenerated on former agricultural land, adjacent to Wetland V2. Fairly extensive damage from the December 2013 ice storm. |
| FOD5a | Dry-Fresh Sugar Maple Deciduous Forest Ecosite | Sugar Maple, with Black Cherry (*Prunus serotina*), Ironwood (*Ostrya virginiana*), Bitternut Hickory (*Carya cordiformis*), Red Oak (*Quercus rubra*), White Birch, White Pine and White Cedar (*Thuja occidentalis*). | 25-50 | 60% | Well drained. Dumfries loam. | n/a | This unit is a narrow strip of trees mostly within the East Cell licence limit, beside Townline. There were several residences fronting onto Townline and there are now gaps within this unit, along with some remnant ornamental trees. |
| FOD5b | Dry-Fresh Sugar Maple | Sugar Maple dominant, with varying mixes of Basswood (*Tilia americana*), declining White Ash, Bitternut Hickory, | 25-50 | 75-90% | Well drained to | 9, 10 | Varied Sugar Maple dominated deciduous forest located on the far side of Wetlands W36 and W41. Numerous bedrock outcrops through most of this unit. Some areas with rich native ground flora. Dense layer of ash-maple |

**Table 3**
**Vegetation Communities (ELC Units) – Milton Quarry East Extension (MQEE) Natural Environment Study Area**

| ELC Code | Community Type | Dominant Species | Size Class (cm DBH) | Canopy Closure | Soils / Moisture Regime | Photo Ref.** | Notes |
|---|---|---|---|---|---|---|---|
| | Deciduous Forest Ecosite | Red Oak, Black Cherry, Ironwood, White Birch, Beech (*Fagus grandifolia*), White Pine, White Cedar and Eastern Hemlock (*Tsuga canadensis*). | | | imperfectly drained. Farmington loam. | | regeneration, with Alternate-leaved Dogwood (*Cornus alternifolia*) in areas where selective cutting has occurred in the past. |
| FOD5-1a | Dry-Fresh Sugar Maple Deciduous Forest Type | Sugar Maple dominant, with a mix of Basswood, declining White Ash, Black Cherry, Ironwood, White Birch, White Pine and White Cedar. | 10-24 | 90% | Well drained. Dumfries loam. Farmington loam. | 11, 12 | This unit is a younger Sugar Maple dominated stand that has formed in an area that was formerly much more open and likely pastured. Patches of White Ash regeneration. Groundcover species diversity is relatively low. Several trails and informal cycling paths cross this unit. |
| FOD5-1b | Dry-Fresh Sugar Maple Deciduous Forest Type | Sugar Maple dominant with occasional Basswood, declining White Ash, Bitternut Hickory, Red Oak, Black Cherry, Ironwood and White Birch, with scattered Beech, White Pine, White Cedar and Eastern Hemlock. | 10-24<br>25-50 | >60% | Well drained. Dumfries loam. Farmington loam. | 13 | Mixed-age stand with some larger trees interspersed amongst younger ones. Patches of ash-maple regeneration in areas with canopy gaps due primarily to past selective logging. Some dolostone outcrops. Fair amount of coarse woody debris on the forest floor. Several trails and informal cycling paths cross this unit. |
| FOD5-1c | Dry-Fresh Sugar Maple Deciduous Forest Type | Sugar Maple dominant, with declining/dead White Ash, Basswood, Ironwood and Black Cherry, with scattered White Pine and Beech. | 10-24<br>25-50 | >60% | Well drained. Dumfries loam. Farmington loam. | 14 | Mixed-age stand with some larger trees interspersed amongst younger ones. Patches of ash-maple regeneration in areas with canopy gaps due primarily to past selective logging. Some dolostone outcrops, boulders and rocks. Several trails and informal cycling paths cross this unit. |
| FOD5-1d | Dry-Fresh Sugar Maple Deciduous Forest Type | Sugar Maple dominant, with declining/dead White Ash, Basswood, Bitternut Hickory, Ironwood, Black Cherry, Beech, Red Maple (*Acer rubrum*) and scattered White Pine, White Cedar and Eastern Hemlock. | 10-24<br>25-50 | >60% | Well drained. Farmington loam. | 15, 16 | Relatively open canopy in places, due to past selective logging. Dense patches of ash-maple regeneration and Alternate-leaved Dogwood have formed beneath the canopy gaps. Extensive dolostone outcrops, boulders and rocks. Rich native groundcovers in more rocky areas. Old barbed wire fencelines suggest some grazing occurred historically. Several trails occur in this unit. |
| FOD5-1e | Dry-Fresh Sugar Maple Deciduous Forest Type | Sugar Maple with Trembling Aspen, declining/dead White Ash, Black Cherry, Common Buckthorn (+) and Basswood. | 10-24 | >60% | Well drained. Dumfries loam. | 17 | Younger disturbed stand with a higher proportion of pioneering woody species. Formerly a more open area. Groundcovers are weedy. Garlic Mustard (*Alliaria petiolata* +) is widespread. Some openings occur in this unit and there are some piles of farm junk/debris. |
| FOD5-1f | Dry-Fresh Sugar Maple Deciduous Forest Type | Sugar Maple dominant, with declining/dead White Ash, Black Cherry, Trembling Aspen and White Cedar. | 10-24 | >60% | Well drained. Dumfries loam. | 18 | Younger stand in an area disturbed by construction of a farm access pre-1947, with evidence of cut slopes and fill placement. The old road bed is now an informal trail. Some dense patches of younger trees. Groundcovers are weedy. Garlic Mustard (+) is widespread. |

**Table 3**
**Vegetation Communities (ELC Units) – Milton Quarry East Extension (MQEE) Natural Environment Study Area**

| ELC Code | Community Type | Dominant Species | Size Class (cm DBH) | Canopy Closure | Soils / Moisture Regime | Photo Ref.** | Notes |
|---|---|---|---|---|---|---|---|
| FOD5-1g | Dry-Fresh Sugar Maple Deciduous Forest Type | Sugar Maple dominant with varying mix of declining White Ash, Bitternut Hickory, Black Cherry, Basswood, Ironwood and Red Oak. | 25-50 | >60% | Well drained. Farmington loam. | 19 | Mature stand. Some dolostone outcrops, boulders and rocks. Fair amount of coarse woody debris on the forest floor. Likely grazed until the 1980's. Garlic Mustard (+) is localized but forms dense patches. |
| FOD5-3a | Dry-Fresh Sugar Maple - Oak Deciduous Forest Type | Sugar Maple dominant, with Red Oak, declining/dead White Ash, Bitternut Hickory, Ironwood, Black Cherry and Basswood. | 25-50 | >60% | Well drained. Dumfries loam. Farmington loam. | n/a | Red Oak is more abundant towards the forest edge. Some canopy gaps due to selective cutting in the late 1990's. Dense patches of ash-maple regeneration and Alternate-leaved Dogwood have formed beneath the canopy gaps. Some outcrops, boulders and rocks. Garlic Mustard (+) is patchy. |
| FOD5-3b | Dry-Fresh Sugar Maple - Oak Deciduous Forest Type | Sugar Maple dominant, with Red Oak, Red Maple, Bitternut Hickory, declining/dead White Ash, Black Cherry, Basswood and Bigtooth Aspen. | 10-24<br>25-50 | >60% | Well drained to imperfectly drained. Dumfries loam. | 20 | Mixed-age stand, with larger maples and oaks, and younger Sugar Maple and White Ash. Garlic Mustard (+) is established in some areas. Coarse woody debris on the forest floor. |
| FOD5-5a | Dry-Fresh Sugar Maple - Hickory Deciduous Forest Type | Sugar Maple, with Bitternut Hickory, declining/dead White Ash, Black Cherry and Red Oak. | 10-24<br>25-50 | 60% | Well drained. Dumfries loam. | 21-23 | Woodland B is a small 0.68 ha feature located immediately northeast of Townline, just south of the East Cell licence limit. A rural residence was formerly located just beyond the southeast end of the woodlot. The groundcover is quite weedy in places, with invasive species such as Goutweed (*Aegopodium podagraria* +), Periwinkle (*Vinca minor* +) and Garlic Mustard (+) being common, especially at the southeast end. Many of the Bitternut Hickory are damaged, presumably from the 2013 ice storm. The hickories that are forest-grown are tall with few lower branches and a small crown, with the ice storm resulting in crown dieback/damage. The canopy closure is variable and there are some large gaps. Woodland B is discussed in more detail in Section 8.2. |
| FOD5-5b | Dry-Fresh Sugar Maple - Hickory Deciduous Forest Type | Sugar Maple, with Bitternut Hickory, declining/dead White Ash, Black Cherry, Ironwood, Red Oak, Basswood and Bigtooth Aspen. | 10-24<br>25-50 | >60% | Well drained. Dumfries loam. Farmington loam. | 24 | Mix-aged stand with a thinned-out canopy due to past logging (ca. late 1990's). Many of the Bitternut Hickory are damaged, presumably from the 2013 ice storm. The hickories that are forest-grown are tall with few lower branches and a small crown, with the ice storm resulting in crown dieback/damage. Some dolostone outcrops, boulders and rocks. Fair amount of coarse woody debris on the forest floor. |
| *Terrestrial – Cultural* | | | | | | | |
| CUP3-1 | Red Pine Coniferous | Red Pine dominant, with Sugar Maple, Black Cherry and Red Oak as frequent associates. Other trees include | 10-36 | >60% | Well drained. Dumfries loam. | 25 | Red Pine plantation at the northeast end of the Cox Tract. Planted in 1951 and natural regeneration has occurred over the years. Common Buckthorn (+) and Alternate-leaved Dogwood are common in the regeneration layer. |

**Table 3**
**Vegetation Communities (ELC Units) – Milton Quarry East Extension (MQEE) Natural Environment Study Area**

| ELC Code | Community Type | Dominant Species | Size Class (cm DBH) | Canopy Closure | Soils / Moisture Regime | Photo Ref.** | Notes |
|---|---|---|---|---|---|---|---|
| | Plantation Type | declining/dead White Ash, Basswood, European Larch (*Larix decidua* +), Trembling Aspen, White Pine and Black Walnut. | | | | | |
| CUP3-3 | Scots Pine Coniferous Plantation Type | Scots Pine (+) dominant, with Black Cherry, Red Pine, Sugar Maple and Basswood. | 10-36 | >60% | Well drained. Dumfries loam. | n/a | Scots Pine plantation at the northeast end of the Cox Tract. Planted in 1951 and natural regeneration has occurred over the years. Common Buckthorn (+) is common in the regeneration layer. |
| CUW1a | Mineral Cultural Woodland Type | Trembling Aspen, with some White Ash and Sugar Maple regeneration, scattered White Elm (*Ulmus americana*), White Pine and Basswood.<br><br>Patches of Staghorn Sumac (*Rhus typhina*), Common Buckthorn (+) and hawthorns (*Crataegus* spp.), as well as more open patches of old field vegetation. | <10<br>10-24 | 30-50% | Well drained. Farmington loam. | 26 | Variable unit with clusters of Trembling Aspen, declining White Ash and other trees, as well as patches of shrub thicket and old field. Some farm debris/junk is present. |
| CUS1a | Mineral Cultural Savannah Type | Red Pine, Scots Pine, White Ash, Green Ash, Trembling Aspen and White Elm. Common Buckthorn (+), Dotted Hawthorn (*Crataegus punctata*), Staghorn Sumac, Gray Dogwood (*Cornus racemosa*), Red-osier Dogwood (*Cornus sericea*) and Common Blackberry (*Rubus alleghaniensis*). | <10 | 20-30% | Well drained. Dumfries loam. | 27, 28 | Former agricultural area gradually being invaded by woody vegetation. The trees are generally quite young. Shrub cover is around 10%. Typical old field groundcovers. |
| CUT1a | Mineral Cultural Thicket Type | Red-osier Dogwood, Common Buckthorn (+), Riverbank Grape (*Vitis riparia*) and Wild Red Raspberry. Scattered declining Green Ash and Trembling Aspen. | n/a | >60% shrub cover | Imperfectly drained. Dumfries loam. | 29 | This unit is associated with a ditch that formerly conveyed some water during the spring period. No water was observed in the ditch during the 2018-2021 ecological surveys and these areas are now dry. The groundcovers are mainly weedy upland species. |

**Table 3**
**Vegetation Communities (ELC Units) – Milton Quarry East Extension (MQEE) Natural Environment Study Area**

| ELC Code | Community Type | Dominant Species | Size Class (cm DBH) | Canopy Closure | Soils / Moisture Regime | Photo Ref.** | Notes |
|---|---|---|---|---|---|---|---|
| CUT1b | Mineral Cultural Thicket Type | Red-osier Dogwood, Common Buckthorn (+) and Wild Red Raspberry. | n/a | 50% shrub cover | Well drained to imperfectly drained. Dumfries loam. | 30, 31 | This unit is associated with a ditch that formerly conveyed some water during the spring period. No water was observed in the ditch during the 2018-2021 ecological surveys and these areas are now dry. The groundcovers are mainly weedy upland species. |
| CUT1c | Mineral Cultural Thicket Type | Red-osier Dogwood, Common Buckthorn (+), Nannyberry (*Viburnum lentago*), Heart-leaved Willow (*Salix eriocephala*) and Staghorn Sumac. | n/a | 10% tree cover 50% shrub cover | Well drained to imperfectly drained. Dumfries loam. | 32 | This unit is associated with the upland fringe surrounding Wetland U1 and an old ditch that formerly conveyed water from U1 during the spring period. No water was observed in the ditch during the 2018-2021 ecological surveys and these areas are now dry. The groundcovers are mainly weedy upland species. |
| CUT1d | Mineral Cultural Thicket Type | A single Crack Willow (*Salix* X *fragilis* +) and a few Trembling Aspen, along with small tangles of Red-osier Dogwood, Common Buckthorn (+) and Staghorn Sumac. | n/a | 5% tree cover 40% shrub cover | Well drained to imperfectly drained. Dumfries loam. | 33, 34 | This small feature is separated from Wetland U1 by an old driveway leading to a former farmstead on higher ground. The driveway was constructed with dolostone rubble and overburden; it is becoming overgrown. This feature is very small, covering around 0.045 ha and it was not observed to contain any standing water between 2018 and 2021. |
| CUT1e | Mineral Cultural Thicket Type | Staghorn Sumac dominant, with Common Buckthorn (+), hawthorns and Round-leaved Dogwood (*Cornus rugosa*). | n/a | 5% tree cover 60% shrub cover | Well drained. Farmington loam. | 35 | Small shrub thicket feature on dolostone outcropping, with a few old snags. |
| CUT1f | Mineral Cultural Thicket Type | Round-leaved Dogwood dominant, with Alternate-leaved Dogwood, Common Buckthorn (+) and Staghorn Sumac. | n/a | 70% shrub cover | Well drained. Farmington loam. | 36 | Small shrub thicket unit at the forest edge. Strongly dominated by Round-leaved Dogwood. |
| CUT1g | Mineral Cultural Thicket Type | Common Buckthorn (+), hawthorns, Staghorn Sumac, White Ash, Trembling Aspen and Sugar Maple. | n/a | 15% tree cover 60% shrub cover | Well drained. Farmington loam. | 37 | Former open area near farmstead that is gradually transitioning from shrub thicket to woodland. |

**Table 3**
**Vegetation Communities (ELC Units) – Milton Quarry East Extension (MQEE) Natural Environment Study Area**

| ELC Code | Community Type | Dominant Species | Size Class (cm DBH) | Canopy Closure | Soils / Moisture Regime | Photo Ref.** | Notes |
|---|---|---|---|---|---|---|---|
| CUM1-1A | Dry-Moist Old Field Meadow Type | Smooth Brome (*Bromus inermis* +), Kentucky Bluegrass (*Poa pratensis* +), Timothy (*Phleum pratense* +), Orchard Grass (*Dactylis glomerata* +), New England Aster (*Symphyotrichum novae-angliae*), White Heath Aster (*Symphyotrichum ericoides*), Bird Vetch (*Vicia cracca* +) and Tall Goldenrod (*Solidago altissima*). | n/a | n/a | Well drained. Dumfries loam. Farmington loam. | 38 | The open portions of the MQEE study area are primarily Dry-Moist Old Field Meadow Type (CUM1-1) that were formerly in agricultural use for row crops and hay, and for pasture. |
| CUM1-1B | Dry-Moist Old Field Meadow Type (ploughed & reseeded late 2020) | Timothy (+), Orchard Grass (+), Kentucky Bluegrass (+), Smooth Brome (+), Canada Bluegrass (*Poa compressa* +), White Clover (*Trifolium repens*), Red Clover (*Trifolium repens*), New England Aster, White Heath Aster, Bird Vetch (+) and Tall Goldenrod. | n/a | n/a | Well drained. Dumfries loam. | 39-44 | Old fields with deeper soils were ploughed in early September 2020 to prepare for the required archaeological investigations for the proposed MQEE licence area. Following completion of the archaeological work, the ploughed fields were then disked and seeded a suitable hay seed mix.<br><br>Reestablishment of old field groundcovers was slow early in the 2021 growing season due to the drier than normal conditions. As the season progressed, the grasses gradually became established. |
| CUM1-1C | Dry-Moist Old Field Meadow Type (with some woody regeneration) | Smooth Brome (+), Kentucky Bluegrass (+), Timothy (+), Orchard Grass (+), New England Aster, White Heath Aster, Bird Vetch (+) and Tall Goldenrod. White Ash, Trembling Aspen, White Pine, Common Buckthorn (+), hawthorns, Staghorn Sumac and Gray Dogwood. | n/a | n/a | Well drained. Dumfries loam. Farmington loam. | 45 | Some old fields contain some woody regeneration, but contain less than 25% shrub cover and 25% tree cover. The trees are generally quite young. |
| CUHa* | Treed Hedgerow | Red Oak and Sugar Maple, with occasional Black Cherry, White Birch, Bigtooth Aspen, dead/dying White Ash, Basswood and Bitternut Hickory. Tall shrubs are mainly Chokecherry (*Prunus virginiana*) and Common Buckthorn (+). | 20-60 | n/a | Well drained. Dumfries loam. | 46 | Unit CUHa is the hedgerow feature along the common boundary between the East Cell and the MQEE. |
| CUHb* | Treed Hedgerow | Trembling Aspen, Bigtooth Aspen, Black Cherry, White Birch, dead/dying White Ash, Basswood, White Elm and Red Oak. | 20-35 | n/a | Well drained. Dumfries loam. | 47 | Unit CUHb is a discontinuous hedgerow that is perpendicular to Unit CUHa. |

**Table 3**
**Vegetation Communities (ELC Units) – Milton Quarry East Extension (MQEE) Natural Environment Study Area**

| ELC Code | Community Type | Dominant Species | Size Class (cm DBH) | Canopy Closure | Soils / Moisture Regime | Photo Ref.** | Notes |
|---|---|---|---|---|---|---|---|
| *Wetland* | | | | | | | |
| SWM5-2 | Swamp Maple – Conifer Organic Mixed Swamp Type | Swamp Maple (*Acer* X *freemanii*), White Cedar, Black Ash (*Fraxinus nigra*), Green Ash, Red Maple, Yellow Birch (*Betula alleghaniensis*), Eastern Hemlock, Balsam Fir (*Abies balsamea*) and White Elm. | 10-24 | >60% | Poorly drained. Organic. | 48, 49 | This fairly large unit is located in the central portion of Wetland W41. Typical groundcovers include Sensitive Fern (*Onoclea sensibilis*), Bulblet Fern (*Cystopteris bulbifera*), Marsh Fern (*Thelypteris palustris*), Cinnamon Fern (*Osmunda cinnamomea*), sedges (e.g., *Carex lupulina, C. interior, C. pseudo-cyperus, C. scabrata*), Field Horsetail (*Equisetum arvense*), Fowl Manna Grass (*Glyceria striata*), Orange Touch-me-not (*Impatiens capensis*), Dwarf Raspberry (*Rubus pubescens*), Rough Goldenrod (*Solidago rugosa*) and Wild Sarsaparilla (*Aralia nudicaulis*). |
| SWD3-1 | Red Maple Mineral Deciduous Swamp Type | Red Maple, with Swamp Maple, Yellow Birch, dead/declining Green Ash, White Elm and Basswood. | 10-24<br>25-50 | >60% | Poorly drained. Mineral. | 50, 51 | Wetland W56 comprises Unit SWD3-1. Shallow, ephemeral vernal pooling is evident. Typical groundcovers include Fowl Manna Grass, Sensitive Fern, Ostrich Fern (*Matteuccia struthiopteris*), Small-spike False Nettle (*Boehmeria cylindrica*), sedges (e.g., *Carex bebbii, C. intumescens, C. lupulina*), Canada Clearweed (*Pilea pumila*), Orange Touch-me-not and Rough Goldenrod. |
| SWD6-1a-d | Red Maple Organic Deciduous Swamp Type | Red Maple, with Swamp Maple, White Cedar, Yellow Birch and declining/dead Green Ash. | 10-24<br>25-50 | >25% | Poorly drained. Organic. | n/a | This community type occurs in small wetland pockets identified as Wetlands W46c to W46f. Limited vernal pooling is present. Typical groundcovers include Sensitive Fern, Ostrich Fern, Small-spike False Nettle, (*Bidens frondosa, B. tripartita*), Fowl Manna Grass, sedges (e.g., *Carex lupulina, C. hystericina*), Climbing Nightshade (*Solanum dulcamara* +) and Orange Touch-me-not. |
| SWD6-3a | Swamp Maple Organic Deciduous Swamp Type | Swamp Maple, Silver Maple, declining/dead Green Ash, White Cedar, Yellow Birch, White Elm and Mountain Maple (*Acer spicatum*). | 10-24<br>25-50 | >25% | Poorly drained. Organic. | 52-57 | This unit is located in the upper (north) portion of Wetland W36. Shallow vernal pooling is evident. Wild Red Raspberry grows around the margins. Groundcovers include Small-spike False Nettle, Canada Clearweed, Reed Canary Grass (*Phalaris arundinacea*), Water-parsnip (*Sium suave*) and Climbing Nightshade (*Solanum dulcamara* +). |
| SWD6-3b | Swamp Maple Organic Deciduous Swamp Type | Swamp Maple, Silver Maple, declining/dead Green Ash, White Cedar, Yellow Birch and White Elm. Red-osier Dogwood, Nannyberry, Common Buckthorn (+), Wild Red Raspberry and Riverbank Grape (*Vitis riparia*). | 10-24<br>25-50 | >25% | Poorly drained. Organic. | 58, 59 | This unit is located in the lower (south) portion of Wetland W36. dense tangles of brambles (*Rubus idaeus* ssp. *melanolasius, R. occidentalis*) and Riverbank Grape have formed. Groundcovers include nettles, Canada Wood Nettle (*Laportea canadensis*), Small-spike False Nettle, Slender Stinging Nettle (*Urtica gracilis*) and Canada Clearweed, with other species such as Garlic Mustard (+), Orange Touch-me-not, and Fowl Manna Grass. |

**Table 3**
**Vegetation Communities (ELC Units) – Milton Quarry East Extension (MQEE) Natural Environment Study Area**

| ELC Code | Community Type | Dominant Species | Size Class (cm DBH) | Canopy Closure | Soils / Moisture Regime | Photo Ref.** | Notes |
|---|---|---|---|---|---|---|---|
| SWD6-3c | Swamp Maple Organic Deciduous Swamp Type | Swamp Maple dominant, with Silver Maple, White Cedar, dead/declining Black Ash and Green Ash, Yellow Birch, Eastern Hemlock, Balsam Fir and White Elm. | 10-24<br>25-50 | >25% | Poorly drained. Organic. | 60, 61 | This unit is located in the south and central portions of Wetland W41, where there is extensive vernal pooling. The rich wetland groundcovers include Cyperus-like Sedge (*Carex pseudo-cyperus*), beggar's-ticks (*Bidens cernua, B. frondosa, B. tripartita*), Green-fruited Bur-reed (*Sparganium emersum*), Climbing Nightshade (+), Marsh Fern, Bulbous Water-hemlock (*Cicuta bulbifera*), Rice Cut Grass (*Leersia oryzoides*), Inland Sedge (*Carex interior*), Spotted Water-hemlock (*Cicuta maculata*), Dwarf Raspberry, Purple-stemmed Aster (*Symphyotrichum puniceum*), Water-parsnip, Panicled Aster (*Symphyotrichum lanceolatum*), Sensitive Fern, Cinnamon Fern, Common Cattail (*Typha latifolia*), Orange Touch-me-not, Water-horehound (Lycopus uniflorus), Small-spike False Nettle, Rough Goldenrod, Star Duckweed (*Lemna trisulca*) and Common Duckweed (*Lemna minor*). |
| SWD6-3d | Swamp Maple Organic Deciduous Swamp Type | Swamp Maple dominant, with Red Maple, White Cedar, dead/declining Green Ash, Yellow Birch, Eastern Hemlock and White Elm. | 10-24 | >25% | Poorly drained. Organic. | 62-64 | This unit is located at the north end of Wetland W41. There is a perennial spring and seepage zone discharging water into the edge of the wetland, supporting a patch of Small-leaved Watercress (*Nasturtium microphyllum*). There are some very small patches of open cattail marsh within this unit, where the main groundcovers are Narrow-leaved Cattail (*Typha angustifolia*) and Reed Canary Grass (*Phalaris arundinacea*). Elsewhere in this unit the groundcovers include Sensitive Fern, Marsh Fern, Cinnamon Fern, Dwarf Raspberry, sedges (e.g., *Carex pseudo-cyperus, C. hystericina, C. interior, C. lupulina*), beggar's-ticks (*Bidens cernua, B. frondosa, B. tripartita*), Rough Goldenrod, Climbing Nightshade (+), Rice Cut Grass, Spotted Water-hemlock, Purple-stemmed Aster, Water-parsnip, Orange Touch-me-not and Water-horehound. |
| SWD6-3e | Swamp Maple Organic Deciduous Swamp Type | Swamp Maple dominant, with Red Maple, dead/declining Green Ash, Yellow Birch and White Elm. | | >25% | Poorly drained. Organic. | 65, 66 | Unit SWD6-3e is located in Wetland W46a. This is a cigar-shaped vernal pool with a treed fringe of mainly Swamp Maple and there are a few maples growing on hummocks. Groundcovers around the fringes are Fowl Manna Grass, Sensitive Fern, Marsh Fern, sedges (e.g., *Carex hystericina, C. lupulina*), beggar's-ticks (*Bidens frondosa, B. tripartita*), Dwarf Raspberry, Climbing Nightshade (+), Water-parsnip and Orange Touch-me-not. |
| SWD6-3f | Swamp Maple Organic Deciduous Swamp Type | Swamp Maple with dead/declining Green Ash and White Elm. | | >25% | Poorly drained. Organic. | 67-69 | Unit SWD6-3f is located in Wetland W46b. This is a small cigar-shaped vernal pool with a treed fringe of mainly Swamp Maple and declining/dead Green Ash. The dense groundcovers include Reed Canary Grass, Panicled Aster, Purple-stemmed Aster, Marsh Fern, Common Boneset (*Eupatorium perfoliatum*), Devil's Beggar's-ticks (*Bidens frondosa*), Climbing Nightshade (+) and Porcupine Sedge. |

**Table 3**
**Vegetation Communities (ELC Units) – Milton Quarry East Extension (MQEE) Natural Environment Study Area**

| ELC Code | Community Type | Dominant Species | Size Class (cm DBH) | Canopy Closure | Soils / Moisture Regime | Photo Ref.** | Notes |
|---|---|---|---|---|---|---|---|
| SWD6-3g | Swamp Maple Organic Deciduous Swamp Type | Swamp Maple with dead/declining Green Ash and White Elm. | | >25% | Poorly drained. Organic. | 70-73 | Unit SWD6-3g is located in Wetland V2. The groundcovers around the margins include sedges (e.g., *Carex hystericina, C. lupulina, C. tuckermanii*), Fowl Manna Grass, Reed Canary Grass, Water-parsnip, Devil's Beggar's-ticks (*Bidens frondosa*) and Climbing Nightshade (+). Cover in the main pool by floating-leaved aquatic plants such as Common Duckweed (*Lemna minor*), Star Duckweed (*Lemna trisulca*) and the liverwort Slender Riccia (*Riccia fluitans*) varies considerably from year to year. |
| SWD7-2 | Yellow Birch Organic Deciduous Swamp Type | Yellow Birch, White Cedar, Red Maple, Swamp Maple, White Elm, Eastern Hemlock and declining/dead Black Ash. | | >60% | Poorly drained. Organic. | 74-76 | This unit is located at the north end of Wetland W41, at the outlet. Groundcovers include Sensitive Fern, Fowl Manna Grass, Wild Sarsaparilla, Bulblet Fern, Dwarf Raspberry, Orange Touch-me-not and Fringed Brome (*Bromus ciliatus*). |
| MAM2-2 | Reed Canary Grass Mineral Meadow Marsh | Reed Canary Grass (*Phalaris arundinacea*) dominant, with Narrow-leaved Cattail (*Typha angustifolia*). Small patch of Green Ash at the southeast end. | | <25% | Poorly drained. Mineral. | 77-80 | Unit MAM2-2 is located in Wetland U1, which is a small wetland pocket dominated by Reed Canary Grass. Surrounded by a fringe of Red-osier Dogwood, Common Buckthorn (+) and Heart-leaved Willow. Small inclusion of Green Ash Mineral Deciduous Swamp (SWD2-2), with Narrow-leaved Cattail. Purple Loosestrife (*Lythrum salicaria* +) is well established. Several Silver Maple and Crack Willow (+) occur at the southeast end, on the upland fringe. |

**Notes:**

* Not in ELC (Lee et al. 1998).

** Photo Ref. = Photo Reference. See **Attachment B1** for representative vegetation community photographs.

**Table 4: MQEE Wildlife Checklists**

**Odonates, Butterflies, Amphibians, Reptiles & Mammals**

| **Common Name** | ***Scientific Name*** | **S-rank[1]** | **COSSARO[2]** | **Halton Status[3]** |
|---|---|---|---|---|
| **ODONATES** | **ODONATA** | | | |
| **DAMSELFLIES** | **ZYGOPTERA** | | | |
| Eastern Forktail | *Ischnura verticalis* | S5 | | Common |
| **DRAGONFLIES** | **ANISOPTERA** | | | |
| Common Green Darner | *Anax junius* | S5 | | Common |
| Lancet Clubtail | *Gomphus exilis* | S5 | | Uncommon |
| Calico Pennant | *Celithemis elisa* | S5 | | Common |
| Eastern Pondhawk | *Erythemis simplicicollis* | S5 | | Common |
| Chalk-fronted Corporal | *Ladona julia* | S5 | | Common |
| Dot-tailed Whiteface | *Leucorrhinia intacta* | S5 | | Common |
| Widow Skimmer | *Libellula luctuosa* | S5 | | Common |
| Twelve-spotted Skimmer | *Libellula pulchella* | S5 | | Common |
| Common Whitetail | *Plathemis lydia* | S5 | | Common |
| Black Saddlebags | *Tramea lacerta* | S4 | | Common |
| **BUTTERFLIES** | **PHOPALOCERA** | | | |
| Silver-spotted Skipper | *Epargyreus clarus* | S4 | | Common |
| Wild Indigo Dusky Wing | *Erynnis baptisiae* | S4 | | Rare |
| European Skipper | *Thymelicus lineola* | SNA | | Common |
| Black Swallowtail | *Papilio polyxenes* | S5 | | Common |
| Eastern Tiger Swallowtail | *Papilio glaucus* | S5 | | Common |
| Cabbage White | *Pieris rapae* | SNA | | Common |
| Common Sulphur | *Colias philodice* | S5 | | Common |
| Northern Azure | *Celastrina lucius* | S5 | | Common |
| Northern Crescent | *Phyciodes pascoensis* | S5 | | Common |
| Mourning Cloak | *Nymphalis antiopa* | S5 | | Common |
| Red Admiral | *Vanessa atalanta* | S5 | | Common |
| Red-spotted Purple | *Limenitis arthemis astanax* | S5 | | Common |
| Common Ringlet | *Coenonympha tullia* | S5 | | Common |
| Common Wood-Nymph | *Cercyonis pegala* | S5 | | Common |
| Monarch | *Danaus plexippus* | S4B, S2N | SC | Common |
| **AMPHIBIANS** | **AMPHIBIA** | | | |
| Red-spotted Newt | *Notophthalmus viridescens* | S5 | | Common |
| Jefferson Salamander | *Ambystoma jeffersonianum* | S2 | END | Uncommon |
| Unisexual Ambystoma – Jefferson Salamander dependent population | *Ambystoma laterale - (2) jeffersonianum* | S2 | END | n/a |
| Spotted Salamander | *Ambystoma maculatum* | S4 | | Uncommon |
| Eastern Redback Salamander | *Plethodon cinereus* | S5 | | Common |
| American Toad | *Anaxyrus americanus* | S5 | | Abundant |
| Gray Treefrog | *Hyla versicolor* | S5 | | Abundant |
| Spring Peeper | *Pseudacris crucifer* | S5 | | Abundant |
| Green Frog | *Lithobates clamitans* | S5 | | Abundant |

## Table 4: MQEE Wildlife Checklists
## Odonates, Butterflies, Amphibians, Reptiles & Mammals

| **Common Name** | ***Scientific Name*** | **S-rank[1]** | **COSSARO[2]** | **Halton Status[3]** |
|---|---|---|---|---|
| Wood Frog | *Lithobates sylvatica* | S5 | | Common |
| Northern Leopard Frog | *Lithobates pipiens* | S5 | | Abundant |
| **REPTILES** | **REPTILIA** | | | |
| Snapping Turtle | *Chelydra serpentina* | S3 | SC | Common |
| Eastern Gartersnake | *Thamnophis sirtalis* | S5 | | Abundant |
| Northern Watersnake | *Nerodia sipedon sipedon* | S5 | | Uncommon |
| Dekay's Brown Snake | *Storeria dekayi* | S5 | | Common |
| Eastern Milksnake | *Lampropeltis triangulum* | S4 | | Common |
| **MAMMALS** | **MAMMALIA** | | | |
| Virginia Opossum | *Didelphis virginiana* | S4 | | Common |
| Northern Short-tailed Shrew | *Blarina brevicauda* | S5 | | Common |
| Small-footed Myotis | *Myotis leibii* | S2S3 | END | Not listed |
| Little Brown Myotis | *Myotis lucifugus* | S4 | END | Common |
| Northern Myotis | *Myotis septentrionalis* | S3 | END | Common |
| Silver-haired Bat | *Lasionycteris noctivagans* | S4 | | Migrant |
| Tri-colored Bat | *Pipistrellus subflavus* | S3? | END | Not listed |
| Red Bat | *Lasiurus borealis* | S4 | | Common |
| Big Brown Bat | *Eptesicus fuscus* | S5 | | Common |
| Hoary Bat | *Lasiurus cinereus* | S4 | | Common |
| Eastern Cottontail | *Sylvilagus floridanus* | S5 | | Common |
| Eastern Chipmunk | *Tamias striatus* | S5 | | Common |
| Gray Squirrel | *Sciurus carolinensis* | S5 | | Common |
| Red Squirrel | *Tamiasciurus hudsonicus* | S5 | | Common |
| Meadow Vole | *Microtus pennsylvanicus* | S5 | | Common |
| Woodland Jumping Mouse | *Napaeozapus insignis* | S5 | | Uncommon |
| Porcupine | *Erethizon dorsatum* | S5 | | Common |
| Coyote | *Canis latrans* | S5 | | Common |
| Red Fox | *Vulpes vulpes* | S5 | | Common |
| Raccoon | *Procyon lotor* | S5 | | Common |
| Striped Skunk | *Mephitis mephitis* | S5 | | Common |
| White-tailed Deer | *Odocoileus virginianus* | S5 | | Common |

**Table 4: Explanation of Species Status and Acronyms**

**[1]S-rank – Subnational Rank (Provincial – Ontario)**

S1: Critically imperiled in Ontario
S2: Imperiled in Ontario
S3: Vulnerable in Ontario
S4: Apparently secure in Ontario
S5: Secure in Ontario
SB: Status during the breeding season
SN: Status during the nonbreeding season
S#S#: Range rank used to indicate any range of uncertainty about status
SNA: Not Applicable, not a suitable target for conservation activities
SH: Possibly extirpated (historical), with some possibility that it may be rediscovered
?: Not yet ranked; or, following a ranking, rank inexact or uncertain

**[2]G-rank – Global Rank**

G1: Critically imperiled
G2: Imperiled
G3: Vulnerable
G4: Apparently secure
G5: Secure
GNR: Rank unavailable
GU: Status uncertain
T#: Intra-specific taxon - ranked
TNR: Intra-specific taxon – not ranked

**[3]COSSARO – Committee on the Status of Species at Risk in Ontario (ESA 2007 Listings)**

END: Endangered
THR: Threatened
SC: Special Concern
NAR: Not at Risk
DD: Data Deficient
HYB: Hybrid

**[4]Halton Status – Species Status in the Region of Halton, Ontario**

Dwyer, J.K. (ed.), Halton Natural Areas Inventory 2006: Volume 2 – Species Checklists. Halton/North Peel Naturalists' Club, South Peel Naturalists' Club, Hamilton Naturalists' Club, Conservation Halton and the Regional Municipality of Halton.

Odonates – Rothfels (2006)
Butterflies – Wormington (2006)
Amphibians & Reptiles – Curry (2006)
Mammals - Dwyer et al. (2006)

**Table 5 - Summary of 2019 MQEE Salamander Minnow Trapping Survey Results**

| Date | Wetland I.D. | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | U1 | W17a (North Section) | W17a (South Section) | W36 | W41 | W46b | W46c | W46d |
| March 30 | Set 6 traps | - | - | - | - | - | - | - |
| March 31 | No captures | - | - | - | - | - | - | - |
| April 6 | Set 6 traps | - | - | Set 2 traps | Set 6 traps | - | - | - |
| April 7 | 3 JESA (3 TT) | Set 3 traps | Set 3 traps | 1 JESA (1 TT)<br>6 SPSA | 1 JESA (1 TT)<br>69 SPSA | Set 4 traps | Set 2 traps | Set 2 traps |
| April 8 | 5 JESA (5 TT) | 22 JESA (2 TT)<br>4 SPSA | 15 JESA (2 TT)<br>4 SPSA | 4 JESA (1 TT)<br>1 SPSA | 2 JESA (1 TT)<br>99 SPSA | No captures | 15 SPSA | 14 SPSA |
| **Totals** | 8 JESA (8 TT) | 22 JESA (2 TT)<br>4 SPSA | 15 JESA (2 TT)<br>4 SPSA | 5 JESA (2 TT)<br>7 SPSA | 3 JESA (2 TT)<br>168 SPSA | No captures | 15 SPSA | 14 SPSA |

**Notes:**

JESA = Jefferson Salamander Complex
SPSA = Spotted Salamander
TT = Tail tip collected

**Table 6 – Summary of 2020 MQEE Salamander Minnow Trapping Survey Results**

| Date | Wetland I.D. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Wetland U1** | | **Wetland W36** | | **W46a** | | | | **W46b** | |
| | **Trap 1** | **Trap 2** | **Trap 1** | **Trap 2** | **Trap 1** | **Trap 2** | **Trap 3** | **Trap 4** | **Trap 1** | **Trap 2** |
| March 19/20 | 16 JESA (8 TT) | 4 JESA (2 TT) 1 SPSA | 1 JESA (1 TT) | No captures | n/a | n/a | n/a | n/a | n/a | n/a |
| March 29/30 | n/a | n/a | n/a | n/a | No Captures | No Captures | 1 JESA (1 TT) 7 SPSA | No Captures | 7 SPSA | 5 SPSA |

**Notes:**

JESA = Jefferson Salamander
SPSA = Spotted Salamander
TT = Tail Tip Collected

**Table 7: 2019-2020 Jefferson Salamander and Unisexual Tail-tip Collection Summary**
**Milton Quarry East Extension, Town of Halton Hills, Region of Halton**

| Wetland | Sample I.D. | Collection Date | Genetics | Notes |
|---|---|---|---|---|
| **2019** | | | | |
| U1 | U1-01 | 2019-04-07 | LJJ | Female. |
| U1 | U1-02 | 2019-04-07 | LJJ | Female. |
| U1 | U1-03 | 2019-04-07 | JJ | Male. |
| U1 | U1-04 | 2019-04-08 | LJJ | Female. |
| U1 | U1-05 | 2019-04-08 | LJJ | Female. |
| U1 | U1-06 | 2019-04-08 | LJJ | Female. |
| U1 | U1-07 | 2019-04-08 | LJJ | Female. |
| U1 | U1-08 | 2019-04-08 | LJJ | Female. |
| W17a (north) | W17a-01 | 2019-04-08 | LJJ | Female. |
| W17a (north) | W17a-02 | 2019-04-08 | LJJ | Female. |
| W17a (south) | W17a-03 | 2019-04-08 | JJ | Male. |
| W17a (south) | W17a-04 | 2019-04-08 | JJ | Male. |
| W36 | W36-01 | 2019-04-07 | JJ | Male. |
| W36 | W36-02 | 2019-04-08 | JJ | Female. |
| | | | | |
| W41 | W41-01 | 2019-04-07 | LJJ | Female. |
| W41 | W41-02 | 2019-04-08 | LJJ | Female. |
| **2020** | | | | |
| U1 | U1-01 | 2020-03-20 | JJ | Male. |
| U1 | U1-02 | 2020-03-20 | JJ | Male. |
| U1 | U1-03 | 2020-03-20 | JJ | Male. |
| U1 | U1-04 | 2020-03-20 | JJ | Male. |
| U1 | U1-05 | 2020-03-20 | LJJ | Female. |
| U1 | U1-06 | 2020-03-20 | LJJ | Female. |
| U1 | U1-07 | 2020-03-20 | LJJ | Female. |
| U1 | U1-08 | 2020-03-20 | LJJ | Female. |
| U1 | U1-09 | 2020-03-20 | LJJ | Female. |
| U1 | U1-10 | 2020-03-20 | LJJ | Female. |
| W36 | W36-01 | 2020-03-20 | LJJ | Female. |
| W46a | W46-4-01 | 2020-03-30 | LJJ | Female. |

**Genetics:**

JJ = Jefferson Salamander (*Ambystoma jeffersonianum*)
LJJ = Unisexual Ambystoma – Jefferson Salamander dependent population (*Ambystoma laterale - (2) jeffersonianum*)

**Table 8a: Amphibian Call Count Data for Wetlands U1, W36 and W46a (2019-2021)**

| **Wetland** | **Wetland U1** | | | | | **Wetland W36** | | | | | | | | **Wetland W46a** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2019** | | | **2020** | **2021** | **2019** | | | **2020** | | | **2021** | | **2021** | | |
| **Species** | 04/18 | 05/06 | 05/27 | | | 04/18 | 05/06 | 05/27 | 04/13 | 05/18 | 06/10 | 03/30 | 04/11 | 03/30 | 04/28 | 06/03 |
| American Toad | L1(3) | - | - | Not surveyed in 2020 due to low spring water levels. | Not surveyed in 2021 due to lack of standing water. | - | - | - | - | - | - | - | - | - | - | - |
| Gray Treefrog | - | - | L1(4) | | | - | - | - | - | - | - | - | - | - | - | - |
| Green Frog | - | - | - | | | - | - | - | - | - | - | - | - | - | - | - |
| Northern Leopard Frog | - | - | - | | | - | - | - | - | - | - | - | - | - | - | - |
| Spring Peeper | L3 | L2 | L1(4) | | | L2 | L1(3) | - | L2 | - | - | - | L1(2) | L2 | L2 | - |
| Wood Frog | L1(2) | - | - | | | L2 | - | - | L1(3) | - | - | L1(2) | - | L3 | - | - |

**Table 8b: Amphibian Call Count Data for Wetlands V2 and W41 (2019-2021)**

| **Wetland** | **V2** | | | | | | | | | **W41** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **2019** | | | **2020** | | | **2021** | | | **2019** | | | **2020** | | | **2021** | | |
| **Species** | 04/18 | 05/06 | 06/06 | 04/13 | 05/18 | 06/10 | 03/30 | 04/28 | 06/03 | 04/18 | 05/06 | 06/06 | 04/13 | 05/18 | 06/10 | 03/30 | 04/28 | 06/03 |
| American Toad | - | - | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Gray Treefrog | - | - | L2 | - | - | L3 | - | - | L2 | - | - | L2 | - | - | L3 | - | - | L2 |
| Green Frog | - | - | L1(2) | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Northern Leopard Frog | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Spring Peeper | L3 | L2 | - | L3 | L2 | L1(2) | L3 | L2 | - | L3 | L2 | - | L3 | L2 | - | L3 | L2 | - |
| Wood Frog | L2 | - | - | L2 | | | L3 | - | - | L2 | | - | L3 | - | - | L3 | | - |

**Table 9: MQEE Breeding Bird Checklist (2019-2021)**

| Common Name | Scientific Name | Breeding Evidence (OBBA) | S-rank | COSSARO | Area Sensitive[1] (Forest) | Halton Status[2] |
|---|---|---|---|---|---|---|
| **ANSERIFORMES: Anatidae** | | | | | | |
| Canada Goose | *Branta canadensis* | possible | S5 | | | Abundant |
| Wood Duck | *Aix sponsa* | probable | S5B | | | Common |
| Mallard | *Anas platyrhynchos* | possible | S5 | | | Abundant |
| **GALLIFORMES: Phasianidae** | | | | | | |
| Ruffed Grouse | *Bonasa umbellus* | probable | S5 | | | Common |
| Wild Turkey | *Meleagris gallopavo* | possible | S5 | | | Uncommon |
| **COLUMBIFORMES: Columbidae** | | | | | | |
| Rock Pigeon | *Columba livia* | possible | SNA | | | Abundant, Introduced |
| Mourning Dove | *Zenaida macroura* | probable | S5 | | | Abundant |
| **CUCULIFORMES: Cuculidae** | | | | | | |
| Yellow-billed Cuckoo | *Coccyzus americanus* | probable | S4B | | | Rare |
| Black-billed Cuckoo | *Coccyzus erythropthalmus* | probable | S5B | | | Uncommon |
| **CAPRIMULGIFORMES: Apodidae** | | | | | | |
| Chimney Swift | *Chaetura pelagica* | non observed | S4B, S4N | Threatened | | Uncommon |
| **CAPRIMULGIFORMES: Trochilidae** | | | | | | |
| Ruby-throated Hummingbird | *Archilochus colubris* | possible | S5B | | | Common |
| **GRUIFORMES: Gruidae** | | | | | | |
| Sandhill Crane | *Antigone canadensis* | non observed | S5B | | | Casual migrant |
| **CHARADRIIFORMES: Charadriidae** | | | | | | |
| Killdeer | *Charadrius vociferus* | possible | S5B, S5N | | | Common |
| **CHARADRIIFORMES: Scolopacidae** | | | | | | |
| American Woodcock | *Scolopax minor* | possible | S4B | | | Common |
| Wilson's Snipe | *Gallinago delicata* | possible | S5B | | | Uncommon |
| Spotted Sandpiper | *Actitis macularius* | possible | S5 | | | Common |

**Table 9: MQEE Breeding Bird Checklist (2019-2021)**

| Common Name | Scientific Name | Breeding Evidence (OBBA) | S-rank | COSSARO | Area Sensitive[1] (Forest) | Halton Status[2] |
|---|---|---|---|---|---|---|
| **CHARADRIIFORMES: Laridae** | | | | | | |
| Ring-billed Gull | *Larus delawarensis* | non observed | S5B, S4N | | | Abundant |
| **GAVIIFORMES: Gaviidae** | | | | | | |
| Common Loon | *Gavia immer* | non observed | S5B, S5N | | | Uncommon migrant, casual summer resident |
| **PELECANIFORMES: Ardeidae** | | | | | | |
| Great Blue Heron | *Ardea herodias* | non observed | S5 | | | Common |
| **CATHARTIFORMES: Cathartidae** | | | | | | |
| Turkey Vulture | *Cathartes aura* | non observed | S5B | | | Common |
| **ACCIPITRIFORMES: Pandionidae** | | | | | | |
| Osprey | *Pandion haliaetus* | non observed | S5B | | | Rare |
| **ACCIPITRIFORMES: Accipitridae** | | | | | | |
| Sharp-shinned Hawk | *Accipiter striatus* | possible | S5 | | | Uncommon |
| Red-tailed Hawk | *Buteo jamaicensis* | possible | S5 | | | Common |
| **STRIGIFORMES: Strigidae** | | | | | | |
| Great Horned Owl | *Bubo virginianus* | possible | S5 | | | Common |
| **CORACIIFORMES: Alcedinidae** | | | | | | |
| Belted Kingfisher | *Megaceryle alcyon* | non observed | S4B | | | Common |
| **PICIFORMES: Picidae** | | | | | | |
| Yellow-bellied Sapsucker | *Sphyrapicus varius* | probable | S5B | | YES | Uncommon |
| Red-bellied Woodpecker | *Melanerpes carolinus* | confirmed | S4 | | | Uncommon |
| Downy Woodpecker | *Dryobates pubescens* | confirmed | S5 | | | Common |
| Hairy Woodpecker | *Dryobates villosus* | probable | S5 | | | Common |
| Pileated Woodpecker | *Dryocopus pileatus* | probable | S5 | | | Uncommon |
| Northern Flicker | *Colaptes auratus* | confirmed | S4B | | | Common |

**Table 9: MQEE Breeding Bird Checklist (2019-2021)**

| Common Name | Scientific Name | Breeding Evidence (OBBA) | S-rank | COSSARO | Area Sensitive[1] (Forest) | Halton Status[2] |
|---|---|---|---|---|---|---|
| **FALCONIFORMES: Falconidae** | | | | | | |
| American Kestrel | *Falco sparverius* | possible | S4B | | | Common |
| Merlin | *Falco columbarius* | possible | S5B | | | Uncommon |
| Peregrine Falcon | *Falco peregrinus* | confirmed | S3B | Special Concern | | Casual |
| **PASSERIFORMES: Tyrannidae** | | | | | | |
| Eastern Wood-Pewee | *Contopus virens* | probable | S4B | Special Concern | | Common |
| Alder Flycatcher | *Empidonax alnorum* | possible | S5B | | | Common |
| Willow Flycatcher | *Empidonax traillii* | possible | S5B | | | Uncommon |
| Least Flycatcher | *Empidonax minimus* | probable | S4B | | | Uncommon |
| Eastern Phoebe | *Sayornis phoebe* | possible | S5B | | | Common |
| Great Crested Flycatcher | *Myiarchus crinitus* | confirmed | S4B | | | Common |
| Eastern Kingbird | *Tyrannus tyrannus* | confirmed | S4B | | | Common |
| **PASSERIFORMES: Vireonidae** | | | | | | |
| Yellow-throated Vireo | *Vireo flavifrons* | probable | S4B | | | Rare |
| Warbling Vireo | *Vireo gilvus* | probable | S5B | | | Common |
| Red-eyed Vireo | *Vireo olivaceus* | confirmed | S5B | | | Abundant |
| **PASSERIFORMES: Corvidae** | | | | | | |
| Blue Jay | *Cyanocitta cristata* | probable | S5 | | | Abundant |
| American Crow | *Corvus brachyrhynchos* | probable | S5B | | | Abundant |
| Common Raven | *Corvus corax* | confirmed | S5 | | | Rare |
| **PASSERIFORMES: Paridae** | | | | | | |
| Black-capped Chickadee | *Poecile atricapillus* | confirmed | S5 | | | Abundant |
| **PASSERIFORMES: Hirundinidae** | | | | | | |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | possible | S4B | | | Uncommon |

**Table 9: MQEE Breeding Bird Checklist (2019-2021)**

| Common Name | Scientific Name | Breeding Evidence (OBBA) | S-rank | COSSARO | Area Sensitive[1] (Forest) | Halton Status[2] |
|---|---|---|---|---|---|---|
| Tree Swallow | *Tachycineta bicolor* | possible | S4B | | | Abundant |
| Barn Swallow | *Hirundo rustica* | non observed | S5B | Threatened | | Common |
| **PASSERIFORMES: Sittidae** | | | | | | |
| White-breasted Nuthatch | *Sitta carolinensis* | probable | S5 | | | Common |
| **PASSERIFORMES: Polioptilidae** | | | | | | |
| Blue-gray Gnatcatcher | *Polioptila caerulea* | possible | S4B | | | Uncommon |
| **PASSERIFORMES: Troglodytidae** | | | | | | |
| House Wren | *Troglodytes aedon* | confirmed | S5B | | | Common |
| Winter Wren | *Troglodytes hiemalis* | probable | S5B | | YES | Uncommon |
| **PASSERIFORMES: Sturnidae** | | | | | | |
| European Starling | *Sturnus vulgaris* | possible | SNA | | | Abundant, Introduced |
| **PASSERIFORMES: Mimidae** | | | | | | |
| Gray Catbird | *Dumetella carolinensis* | probable | S4B | | | Common |
| Brown Thrasher | *Toxostoma rufum* | possible | S4B | | | Common |
| **PASSERIFORMES: Turdidae** | | | | | | |
| Veery | *Catharus fuscescens* | probable | S4B | | YES | Common |
| Wood Thrush | *Hylocichla mustelina* | probable | S4B | Special Concern | | Common |
| American Robin | *Turdus migratorius* | confirmed | S5B | | | Abundant |
| **PASSERIFORMES: Bombycillidae** | | | | | | |
| Cedar Waxwing | *Bombycilla cedrorum* | probable | S5B | | | Common |
| **PASSERIFORMES: Fringillidae** | | | | | | |
| American Goldfinch | *Spinus tristis* | probable | S5B | | | Abundant |

**Table 9: MQEE Breeding Bird Checklist (2019-2021)**

| Common Name | Scientific Name | Breeding Evidence (OBBA) | S-rank | COSSARO | Area Sensitive[1] (Forest) | Halton Status[2] |
|---|---|---|---|---|---|---|
| **PASSERIFORMES: Passerellidae** | | | | | | |
| Grasshopper Sparrow | *Ammodramus savannarum* | probable | S4B | Special Concern | | Uncommon |
| Chipping Sparrow | *Spizella passerina* | probable | S5B | | | Common |
| Field Sparrow | *Spizella pusilla* | confirmed | S4B | | | Common |
| Vesper Sparrow | *Pooecetes gramineus* | possible | S4B | | | Uncommon |
| Savannah Sparrow | *Passerculus sandwichensis* | confirmed | S4B | | | Abundant |
| Song Sparrow | *Melospiza melodia* | confirmed | S5B | | | Abundant |
| Eastern Towhee | *Pipilo erythrophthalmus* | probable | S4B | | | Uncommon |
| **PASSERIFORMES: Icteridae** | | | | | | |
| Bobolink | *Dolichonyx oryzivorus* | probable | S4B | Threatened | | Common |
| Eastern Meadowlark | *Sturnella magna* | probable | S4B | Threatened | | Common |
| Baltimore Oriole | *Icterus galbula* | probable | S4B | | | Common |
| Red-winged Blackbird | *Agelaius phoeniceus* | confirmed | S5 | | | Abundant |
| Brown-headed Cowbird | *Molothrus ater* | possible | S4B | | | Abundant |
| Common Grackle | *Quiscalus quiscula* | confirmed | S5B | | | Abundant |
| **PASSERIFORMES: Parulidae** | | | | | | |
| Ovenbird | *Seiurus aurocapilla* | probable | S4B | | YES | Abundant |
| Northern Waterthrush | *Parkesia noveboracensis* | probable | S5B | | | Uncommon |
| Blue-winged Warbler | *Vermivora cyanoptera* | confirmed | S4B | | | Uncommon |
| Mourning Warbler | *Geothlypis philadelphia* | probable | S4B | | | Uncommon |
| Common Yellowthroat | *Geothlypis trichas* | confirmed | S5B | | | Common |
| Hooded Warbler | *Setophaga citrina* | confirmed | S4B | | | Rare |
| American Redstart | *Setophaga ruticilla* | confirmed | S5B | | | Common |
| Yellow Warbler | *Setophaga petechia* | probable | S5B | | | Common |
| Chestnut-sided Warbler | *Setophaga pensylvanica* | confirmed | S5B | | | Uncommon |
| Black-throated Blue Warbler | *Setophaga caerulescens* | probable | S5B | | YES | Rare |

**Table 9: MQEE Breeding Bird Checklist (2019-2021)**

| Common Name | Scientific Name | Breeding Evidence (OBBA) | S-rank | COSSARO | Area Sensitive[1] (Forest) | Halton Status[2] |
|---|---|---|---|---|---|---|
| **PASSERIFORMES: Cardinalidae** | | | | | | |
| Scarlet Tanager | *Piranga olivacea* | probable | S4B | | YES | Common |
| Northern Cardinal | *Cardinalis cardinalis* | probable | S5 | | | Common |
| Rose-breasted Grosbeak | *Pheucticus ludovicianus* | probable | S4B | | | Common |
| Indigo Bunting | *Passerina cyanea* | probable | S4B | | | Common |

**Notes:**

Nomenclature follows Clements et al. (2019).

[1]Based on listing of area sensitive forest bird species in OMNRF (2015).

[2]Halton Status – Reference:

McIlveen, W.D. 2006. Birds of Halton Region, Ontario. pp 79-96 In: Dwyer, J.K. (ed.), Halton Natural Areas Inventory 2006: Volume 2 – Species Checklists. Halton/North Peel Naturalists' Club, South Peel Naturalists' Club, Hamilton Naturalists' Club, Conservation Halton and the Regional Municipality of Halton.

## Table 10: Potential Roost Trees in Woodland B

| Tree No. | Species | Notes | DBH (cm) (>25cm only) | Tree height (m) | Cavity Height (m) | UTM (Zone: 17) | One of tallest trees in community | Exhibits cavities /crevices/scars/woodpecker holes | Largest DBH in community | Cavity or crevice is high up in tree (>10 m) | Within highest density or cluster of cavity trees | Large amount of loose, peeling bark | Open canopy | Early stages of decay (class 1-3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Trees Within the Woodlot | | | | | | | | | | | | | | |
| 101 | Sugar Maple | 2 cavities | 52 | 18 | 7+, 14 | 582702 4822568 | | x | | x | | | | 1 |
| 102 | Bitternut Hickory | | 34 | 9 | | 582750 4822552 | | | | | | x | | 5 |
| 103 | Sugar Maple | | 31 | 12 | 3-4 | 582746 4822552 | | x | | | | | | 5 |
| 104 | Bitternut Hickory | | 48 | 12 | 10 | 582750 4822538 | | x | | | | x | | 4 |
| 105 | Bitternut Hickory | | 36 | 12 | | 582768 4822540 | | | | | | x | | 5 |
| 106 | Bitternut Hickory | | 27 | 10 | 9 | 582776 4822533 | | x | | | | | | 4 |
| 107 | Bitternut Hickory | | 27 | 8 | | 582780 4822548 | | | | | | x | | 5 |
| 108 | Basswood | | 34 | 15 | 6 | 582737 4822560 | | x | | | | | | 1 |
| 109 | Black Cherry | 2 stems | 38 | 14 | 8 | 582715 4822583 | | x | | | | x | | 4 |
| 110 | Black Cherry | | 32 | 16 | | 582715 4822583 | | x | | | | x | | 4 |
| Trees Adjacent to the Woodlot | | | | | | | | | | | | | | |
| 111 | Sugar Maple | | 48 | 14 | 4 | 582789 4822496 | | x | | | | x | | 2 |
| 112 | White Ash | | 36 | 8 | 3 | 582792 4822494 | | x | | | | | | 4 |
| 113 | White Ash | | 26 | 13 | | 582797 4822528 | | | | | | x | | 4 |

## Table 11: Potential Roost Trees in Hedgerows CUHa and CUHb

| Tree No. | Species | Notes | DBH (cm) (>25cm only) | Tree height (m) | Cavity Height (m) | UTM (Zone: 17) | One of tallest trees in community | Exhibits cavities /crevices/scars/woodpecker holes | Largest DBH in community | Cavity or crevice is high up in tree (>10 m) | Within highest density or cluster of cavity trees | Large amount of loose, peeling bark | Open canopy | Early stages of decay (class 1-3) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 001 | Sugar Maple | one apparent cavity | 30 | 10 | 3 | 582659 4822796 | | x | | | | | | 1-2 |
| 002 | White Ash | dead, loose bark, few cavities | 36 | 12 | 5 | 582830 4822758 | | x | | | | x | | 3 |
| 003 | Black Cherry | 1 limb with several small cavities, loose bark | 52 | 15 | 8 | 582803 4822731 | | x | | | | | | 1 |
| 004 | Sugar Maple | | 58 | 14 | 8-12 (peeling bark) | 582796 4822722 | | | | | | x | | 2 |
| 005 | White Ash | north-south hedgerow beside White Birch | 26 | | | 582873 4822720 | | | | | | x | | 4 |

## Table 12: Summary of Documented Bat Calls

| Species | Woodlot | | | Hedgerows | | | Totals | | |
|---|---|---|---|---|---|---|---|---|---|
| | Number | Percent of Total | Mean No. per Night | Number | Percent of Total | Mean No. per Night | Number | Percent of Total | Mean No. per Night |
| Endangered Species | | | | | | | | | |
| LBMY[1] | 1396 | 47.9 | 99.7 | 219 | 27.8 | 36.5 | 1615 | 43.6 | 80.8 |
| NOMY[2] | 1024 | 35.1 | 73.1 | 7 | 0.9 | 1.2 | 1031 | 27.8 | 51.5 |
| SFMY[3] | 129 | 4.4 | 9.2 | 14 | 1.8 | 2.3 | 143 | 3.9 | 7.2 |
| TCBA[4] | 2 | 0.1 | 0.1 | 0 | 0.0 | 0.0 | 2 | 0.1 | 0.1 |
| Not-at-Risk Species | | | | | | | | | |
| BBBA[5] | 267 | 9.2 | 19.1 | 419 | 53.2 | 69.8 | 686 | 18.5 | 34.3 |
| SHBA[6] | 30 | 1.0 | 2.1 | 59 | 7.5 | 9.8 | 89 | 2.4 | 4.5 |
| HOBA[7] | 54 | 1.9 | 3.9 | 61 | 7.7 | 10.2 | 115 | 3.1 | 5.8 |
| REBA[8] | 12 | 0.4 | 0.9 | 9 | 1.1 | 1.5 | 21 | 0.6 | 1.1 |
| **TOTALS** | **2914** | **100.0** | **208.1** | **788** | **100.0** | **131.3** | **3702** | **100.0** | **185.3** |

Legend:

[1] – Little Brown Myotis
[2] – Northern Myotis
[3] – Eastern Small-footed Myotis
[4] – Tri-colored Bat
[5] – Big Brown Bat
[6] – Silver-haired Bat
[7] – Hoary Bat
[8] – Red Bat

## Table 13: Summary of Bat Calls in the Woodlot by Detector

| Species | Detector 07 | | | Detector 08 | | | Detector 09 | | | Detector 10 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number | % of Total | Mean per Night | Number | % of Total | Mean per Night | Number | % of Total | Mean per Night | Number | % of Total | Mean per Night |
| Endangered Species | | | | | | | | | | | | |
| LBMY[1] | 9 | 8.6 | 0.6 | 213 | 55.6 | 15.2 | 738 | 55.2 | 52.7 | 436 | 40.1 | 31.1 |
| NOMY[2] | 1 | 1.0 | 0.1 | 73 | 19.1 | 5.2 | 439 | 32.8 | 31.4 | 511 | 47.0 | 36.5 |
| SFMY[3] | 1 | 1.0 | 0.1 | 36 | 9.4 | 2.6 | 42 | 3.1 | 3.0 | 50 | 4.6 | 3.6 |
| TCBA[4] | 0 | 0.0 | 0.0 | 2 | 0.5 | 0.1 | 0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 |
| Not-at-Risk Species | | | | | | | | | | | | |
| BBBA[5] | 90 | 85.7 | 6.1 | 37 | 9.7 | 2.6 | 73 | 5.5 | 5.2 | 67 | 6.2 | 4.8 |
| SHBA[6] | 1 | 1.0 | 0.1 | 3 | 0.8 | 0.2 | 19 | 1.4 | 1.4 | 7 | 0.6 | 0.5 |
| HOBA[7] | 3 | 2.9 | 0.2 | 18 | 4.7 | 1.3 | 19 | 1.4 | 1.4 | 14 | 1.3 | 1.0 |
| REBA[8] | 0 | 0.0 | 0.0 | 1 | 0.3 | 0.1 | 8 | 0.6 | 0.6 | 3 | 0.3 | 0.2 |
| **TOTALS** | **105** | **100.2** | **7.5** | **383** | **100.1** | **27.4** | **1338** | **100.0** | **95.6** | **1088** | **100.1** | **77.7** |

Legend:

[1] – Little Brown Myotis
[2] – Northern Myotis
[3] – Eastern Small-footed Myotis
[4] – Tri-colored Bat
[5] – Big Brown Bat
[6] – Silver-haired Bat
[7] – Hoary Bat
[8] – Red Bat

**Table 14: Summary of Bat Calls in the Hedgerows CUHa and CUHb by Detector**

| Species | Detector 07 | | | Detector 08 | | | Detector 09 | | | Detector 10 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number | % of Total | Mean per Night | Number | % of Total | Mean per Night | Number | % of Total | Mean per Night | Number | % of Total | Mean per Night |
| Endangered Species | | | | | | | | | | | | |
| LBMY[1] | 7 | 21.2 | 1.2 | 97 | 18.7 | 16.2 | 56 | 47.5 | 9.3 | 59 | 49.6 | 9.8 |
| NOMY[2] | 0 | 0.0 | 0.0 | 3 | 0.6 | 0.5 | 0 | 0.0 | 0.0 | 4 | 3.4 | 0.7 |
| SFMY[3] | 0 | 0.0 | 0.0 | 8 | 1.5 | 1.3 | 4 | 3.4 | 0.7 | 2 | 1.7 | 0.3 |
| Not-at-Risk Species | | | | | | | | | | | | |
| BBBA[4] | 21 | 63.6 | 3.5 | 310 | 59.8 | 51.7 | 44 | 37.3 | 7.3 | 44 | 37.0 | 7.3 |
| SHBA[5] | 3 | 9.1 | 0.6 | 43 | 8.3 | 7.2 | 13 | 11.0 | 2.2 | 0 | 0.0 | 0.0 |
| HOBA[6] | 2 | 6.1 | 0.3 | 52 | 10.0 | 8.7 | 1 | 0.8 | 0.2 | 6 | 5.0 | 1.0 |
| REBA[7] | 0 | 0.0 | 0.0 | 5 | 1.0 | 0.8 | 0 | 0.0 | 0.0 | 4 | 3.4 | 0.7 |
| **TOTALS** | **33** | **100.0** | **5.5** | **518** | **99.9** | **86.3** | **118** | **100.0** | **19.7** | **119** | **100.1** | **19.8** |

Legend:

[1] – Little Brown Myotis
[2] – Northern Myotis
[3] – Eastern Small-footed Myotis
[4] – Big Brown Bat
[5] – Silver-haired Bat
[6] – Hoary Bat
[7] – Red Bat

## Table 15: 2013-2018 Frog Call Survey Data Summary for Wetlands V2 and W41
## Milton Quarry Extension - AMP Wetland Ecology Monitoring

| Wetland | Species | 2013 | | | 2014 | | | 2015 | | | 2016 | | | 2017 | | | 2018 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** |
| W41 | American Toad | | L2 | | | L2 | | | L2 | | | L1 | | | L1 | | | L1 | |
| | Gray Treefrog | | L2 | L1 | | L3 | L2 | | L2 | L2 | | L3 | L2 | | L3 | L2 | | L2 | L3 |
| | Green Frog | | | | | | | | | | | | | | | L1 | | | |
| | Northern Leopard Frog | L1 | L1 | | L1 | L1 | | L2 | L1 | | L2 | | | L1 | | | L1 | | |
| | Spring Peeper | L3 | L2 | L1 | L3 | L3 | L1 | L3 | L3 | L2 | L3 | L3 | | L3 | L2 | | L3 | L2 | |
| | Wood Frog | L1 | | | L3 | | | L3 | | | L2 | | | L3 | | | L3 | | |
| V2 | American Toad | | L1 | | L1 | L2 | | | L2 | | | L1 | | | L1 | | | L1 | |
| | Gray Treefrog | | L2 | L1 | | L1 | L2 | | L3 | L2 | | L2 | L3 | | L2 | L3 | | L2 | L3 |
| | Green Frog | | | L1 | | | L1 | | | L1 | | | L1 | | | L1 | | | L1 |
| | Northern Leopard Frog | | L2 | | L2 | L1 | | L2 | L1 | | L2 | | | L1 | | | L1 | | |
| | Spring Peeper | L3 | L2 | | L3 | L3 | L1 | L3 | L3 | L1 | L3 | L2 | | L3 | L2 | | L3 | L2 | |
| | Wood Frog | L2 | | | L3 | | | L3 | | | L3 | | | L3 | | | L2 | | |

**Notes:**

Survey Dates

2013 Survey Dates: 1 = 2013-04-15, 2 = 2013-05-05, 3 = 2013-05-21
2014 Survey Dates: 1 = 2014-04-17, 2 = 2014-05-10, 3 = 2014-05-26
2015 Survey Dates: 1 = 2015-04-18, 2 = 2015-05-04, 3 = 2015-05-19
2016 Survey Dates: 1 = 2016-04-21, 2 = 2016-05-20, 3 = 2016-06-05
2017 Survey Dates: 1 = 2017-04-10, 2 = 2017-05-17, 3 = 2017-06-03
2018 Survey Dates: 1 = 2018-04-26, 2 = 2018-05-15, 3 = 2018-06-13

Calling Levels

Level 1 (L1) - Individual can be counted, not overlapping (number in parentheses indicates estimate of individuals calling).
Level 2 (L2) - Indicates calls overlapping.
Level 3 (L3) - Indicates full chorus.

# Table 18: Woodland A – Plot Tally Sheet

| Plot # | Species | Diameter Classes (cm) | | | | | | Plot Radius | Notes |
|---|---|---|---|---|---|---|---|---|---|
| | | 0-5 | 6-9 | 10-12 | 13-20 | 21-24 | 25+ | | |
| 1 | Trembling Aspen | 3 | 2 | 1 | 2 | | | 4 | |
| | Green Ash | 6 | | | | | | | |
| 2 | Trembling Aspen | 16 | 1 | | 1 | | | 4 | |
| | Scots Pine | | | | 2 | | | | |
| | Green Ash | 13 | 2 | 1 | | | | | |
| 3 | Trembling Aspen | 2 | 4 | | | | | 4 | |
| | Scots Pine | | | | 1 | | | | |
| | Green Ash | 8 | 2 | 2 | | | | | |
| 4 | Scots Pine | | | | 1 | | 2 | 4 | Increasing plot size would not yield more trees within the plot up to an 8 m radius. |
| | Green Ash | 25 | 1 | | | | | | |
| 5 | Trembling Aspen | 1 | | | 1 | | | 5 | |
| | Scots Pine | | | | | 1 | | | |
| | Green Ash | 4 | | | | | | | |
| | Red Pine | 1 | 1 | | 1 | | | | |
| 6 | Trembling Aspen | 4 | | | | | | 4 | |
| | Scots Pine | 4 | 1 | | | | | | |
| | Green Ash | 11 | | | 1 | | | | |
| 7 | Scots Pine | 6 | | | | | 1 | 4 | |
| | Green Ash | 2 | 1 | | 1 | | | | |
| 8 | Trembling Aspen | 39 | 3 | 3 | 3 | | | 4 | Deer rubs spreading hypoxylon canker. |
| 9 | Trembling Aspen | 1 | | 1 | | | | 4 | |
| | Black Walnut | | 1 | | | | | | |
| | White Birch | | | | 1 | | | | |
| | Red Pine | | | | 1 | | | | |
| | Scots Pine | 2 | | 1 | 1 | | 1 | | |
| | Green Ash | 1 | | | | | | | |

**Note:** Plot sampling completed by J. Jackson and A. Goodban on October 30 and November 8, 2020.

**Table 19a: Woodland A – Tree Density Analysis**

| Plot # | Plot Area ($m^2$) | Size Class | Number of Trees | Density (Trees/ha) | Woodland (Yes/No) |
|---|---|---|---|---|---|
| **Plot 1** | 50.24 | Any Size | 14 | 2787 | Y |
| | | 6 cm+ | 5 | 995 | Y |
| | | 13 cm+ | 2 | 398 | N |
| | | 21 cm+ | 0 | 0 | N |
| **Plot 2** | 50.24 | Any Size | 36 | 7166 | Y |
| | | 6 cm+ | 7 | 1393 | Y |
| | | 13 cm+ | 3 | 597 | Y |
| | | 21 cm+ | 0 | 0 | N |
| **Plot 3** | 50.24 | Any Size | 19 | 3782 | Y |
| | | 6 cm+ | 9 | 1791 | Y |
| | | 13 cm+ | 1 | 199 | N |
| | | 21 cm+ | 0 | 0 | N |
| **Plot 4** | 50.24 | Any Size | 29 | 5772 | Y |
| | | 6 cm+ | 4 | 796 | Y |
| | | 13 cm+ | 3 | 597 | Y |
| | | 21 cm+ | 2 | 398 | Y |
| **Plot 5** | 78.85 | Any Size | 10 | 1268 | Y |
| | | 6 cm+ | 4 | 507 | N |
| | | 13 cm+ | 3 | 380 | N |
| | | 21 cm+ | 1 | 127 | N |
| **Plot 6** | 50.24 | Any Size | 21 | 4180 | Y |
| | | 6 cm+ | 2 | 398 | N |
| | | 13 cm+ | 1 | 199 | N |
| | | 21 cm+ | 0 | 0 | N |
| **Plot 7** | 50.24 | Any Size | 11 | 2189 | Y |
| | | 6 cm+ | 3 | 597 | N |
| | | 13 cm+ | 2 | 398 | N |
| | | 21 cm+ | 1 | 199 | N |
| **Plot 8** | 50.24 | Any Size | 48 | 9554 | Y |
| | | 6 cm+ | 9 | 1791 | Y |
| | | 13 cm+ | 3 | 597 | Y |
| | | 21 cm+ | 0 | 0 | N |
| **Plot 9** | 50.24 | Any Size | 11 | 2189 | Y |
| | | 6 cm+ | 7 | 1393 | Y |
| | | 13 cm+ | 4 | 796 | Y |
| | | 21 cm+ | 1 | 199 | N |

**Table 19b: Woodland A – Tree Density Summary**

| Size Class | Number of Trees | Density (trees/ha) | Woodland (Yes/No) |
|---|---|---|---|
| **Any Size** | 199 | 4139 | Y |
| **6 cm+** | 50 | 1049 | Y |
| **13 cm+** | 22 | 458 | N |
| **21 cm+** | 5 | 104 | N |

**Table 20: Milton Quarry East Extension**
**Ecological Enhancement Plan (EEP) Unit Summary**

| Unit[1] | Area (ha) | Site Conditions | Woody Species Planting List | Year(s) | Purpose | Other Management Activities | Notes |
|---|---|---|---|---|---|---|---|
| DA1 | 0.062 | Disturbed area. Small excavation that contains water briefly in the spring. Formerly used as a “mud run” for off-road trucks and ATVs. | Not applicable. | 1-3 | • Restore previously disturbed area.<br>• Raise grade to avoid attracting mole salamanders during breeding season.<br>• Create potential snake hibernacula. | • Use fill materials that will serve to create several potential snake hibernacula (e.g., mix of earth, rock rubble and woody debris).<br>• Cap the new feature with weathered rocks. | Restoring Unit DA1 by filling the old excavation and creating several snake hibernacula will serve to:<br>• Discourage trespassers on ATVs;<br>• Prevent mole salamanders from being attracted to water that is only present for a short period in the springtime; and,<br>• Provide potential hibernation habitat for snakes and other wildlife.<br>Complete this work in conjunction with nearby WMS installation work. |
| TP-B1 | 0.178 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). Some portions not ploughed (CUM1-1a), with some rock piles, shrub thicket and White Ash regeneration. | White Birch (30%) – White Cedar (30%) – White Pine (20%) – Trembling Aspen (10%) – Other suitable native species (10%) | 1-2 | • Buffer to Unit TP-RA1 and Significant Woodland.<br>• Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. | Narrow buffer strip beside the watermain alignment. This outer edge of this unit comes within 10 m of the extraction limit. |
| TP-B2 | 0.488 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). | White Birch (30%) – White Cedar (30%) – White Pine (20%) – Trembling Aspen (10%) – Other suitable native species (10%) | 1-2 | • Buffer to Units TP-RA3, WE1 and Wetland U1.<br>• Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn). | Narrow buffer strip beside the extraction limit. |
| TP-B3 | 0.302 | Old Field Meadow, with old fenceline with rock piles. Mostly not ploughed in late 2020 (CUM1-1a). | White Birch (30%) – White Cedar (30%) – White Pine (20%) – Trembling Aspen (10%) – Other suitable native species (10%) | 1-2 | • Buffer to Units TP-RB4, TP-RB5 and WE1. Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn). | Narrow buffer strip beside the extraction limit. |
| TP-B4 | 0.244 | Old Field Meadow (Unit CUM1-1a) and Cultural Savannah (CUS1). | White Birch (30%) – White Cedar (30%) – White Pine (20%) – Trembling Aspen (10%) – Other suitable native species (10%) | 1-2 | • Buffer to Significant Woodland.<br>• Expand and enhance Significant Woodlands. | • Remove undesirable woody vegetation (e.g., Common Buckthorn). | Narrow buffer strip beside the watermain alignment. The outer edge of this unit comes within 10 m of the extraction limit. |

**Table 20: Milton Quarry East Extension**
**Ecological Enhancement Plan (EEP) Unit Summary**

| Unit[1] | Area (ha) | Site Conditions | Woody Species Planting List | Year(s) | Purpose | Other Management Activities | Notes |
|---|---|---|---|---|---|---|---|
| TP-B5 | 0.055 | Old Field Meadow (Unit CUM1-1a) and Cultural Savannah (CUS1). | White Birch (30%) – White Cedar (30%) – White Pine (20%) – Trembling Aspen (10%) – Other suitable native species (10%) | 1-2 | • Buffer to Significant Woodland.<br>• Expand and enhance Significant Woodlands.<br>• Expand and enhance habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). | Buffer patch beside watermain and feeder lines. Outer edge of this unit comes within 10 m of the extraction limit. If feasible, this area should be planted following the installation of WMS feeder lines in this vicinity. |
| TP-B6 | 0.131 | Old Field Meadow (Unit CUM1-1a) and Cultural Savannah (CUS1). | White Birch (30%) – White Cedar (30%) – White Pine (20%) – Trembling Aspen (10%) – Other suitable native species (10%) | 1-2 | • Buffer to Significant Woodland.<br>• Expand and enhance Significant Woodlands.<br>• Expand and enhance habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). | Buffer patch beside watermain and feeder lines. Outer edge of this unit comes within 10 m of the extraction limit. If feasible, this area should be planted following the installation of WMS feeder lines in this vicinity. |
| TP-M1 | 0.981 | Old Field Meadow: Mostly ploughed in late 2020 (CUM1-1b). Poplar woods (FOD3-1). Shrub thicket (CUT1). Some dolostone outcrops. | Sugar Maple (30%) – White Birch (30%) – Basswood (10%) – White Cedar (10%) – White Pine (10%) – Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration; remove defective stems.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Interplant shade-tolerant species such as Sugar Maple in thinned out poplar-ash patches.<br>• Install habitat features: rock piles (25) and woody debris (25).<br>• Clean up old farm junk piles. | Fairly large patch of old field with early successional patches of shrubs, Trembling Aspen and White Ash. Tree-planting in Unit TP-M1 will contribute to reforesting an open gap between two areas of mature forest, along with Units TP-M2, TP-RB1, TP-RB2 and TP-RB3. |
| TP-M2 | 0.646 | Old Field Meadow (Unit CUM1-1a), Staghorn Sumac Shrub Thicket (CUT1-1) with cluster of mature trees. | Bur Oak (20%) – Red Oak (20%) – Sugar Maple (20%) – Bitternut Hickory (10%) – Basswood (10%) – White Pine (10%) - Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration; remove defective stems.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Interplant shade-tolerant species such as Sugar Maple in thinned out poplar-ash patches.<br>• Install habitat features: rock piles (16) and woody debris (16).<br>• Clean up old farm junk piles. | Varied patch with old field, shrub thickets, clusters of open-grown trees, dolostone outcrops, etc. Strategic location near Wetland U1 and fairly close to Significant Woodland and Wetlands V2 and W41 (both are Jefferson Salamander breeding habitat). Tree-planting in Unit TP-M2 will contribute to reforesting an open gap between two areas of mature forest, along with Units TP-M1, TP-RB1, TP-RB2 and TP-RB3. |

**Table 20: Milton Quarry East Extension**
**Ecological Enhancement Plan (EEP) Unit Summary**

| Unit[1] | Area (ha) | Site Conditions | Woody Species Planting List | Year(s) | Purpose | Other Management Activities | Notes |
|---|---|---|---|---|---|---|---|
| TP-RA1 | 0.286 | Old Field Meadow (Unit CUM1-1a) with small cluster of Common Buckthorn and hawthorns. | Red Oak (30%) – Bur Oak (15%) – Sugar Maple (15%) – White Pine (20%) - Basswood (10%) –- Other suitable native species (10%) | 1-3 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (7) and woody debris (7). | Unit TP-RA1 is approximately 50 m away from Wetland V2, which is Jefferson Salamander breeding habitat. Strategically located between Wetlands V2 and U1. Tree-planting in Units TP-RA1, TP-RA2 and TP-RA3 will establish a wooded connection between Wetland U1 and the Significant Woodland adjacent to Wetland V2. |
| TP-RA2 | 0.336 | Old Field Meadow: Mostly ploughed in late 2020 (CUM1-1b). | Red Oak (30%) – Bur Oak (15%) – Sugar Maple (15%) – White Pine (20%) - Basswood (10%) –- Other suitable native species (10%) | 1-3 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (8) and woody debris (8). | Unit TP-RA2 is approximately 120 m away from Wetland V2 and 70 m away from 70 m. Strategically located between Wetlands V2 and U1. Tree-planting in Units TP-RA1, TP-RA2 and TP-RA3 will establish a wooded connection between Wetland U1 and the Significant Woodland adjacent to Wetland V2. |
| TP-RA3 | 0.244 | Old Field Meadow: Mostly ploughed in late 2020 (CUM1-1b). | Red Oak (30%) – Bur Oak (15%) – Sugar Maple (15%) – White Pine (20%) - Basswood (10%) –- Other suitable native species (10%) | 1-3 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (6) and woody debris (6). | Unit TP-RA3 is strategically located between Wetlands V2 and U1. Tree-planting in Units TP-RA1, TP-RA2 and TP-RA3 will establish a wooded connection between Wetland U1 and the Significant Woodland adjacent to Wetland V2. |
| TP-RA4 | 1.138 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). Some portions not ploughed (CUM1-1a), with some rock outcrops and rock piles, scattered shrub patches and trees. | Red Oak (30%) – Bur Oak (15%) – Sugar Maple (15%) – White Pine (20%) - Basswood (10%) –- Other suitable native species (10%) | 1-3 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (28) and woody debris (28). | This larger unit is located between Wetland U1 and the Significant Woodland. The distance between Wetland U1 and Significant Woodland is approximately 140 m. Tree-planting in Units TP-RA4, TP-RA5, TP-RA6 and TP-RA7 will establish a wooded connection between Wetland U1 and the Significant Woodland. |
| TP-RA5 | 0.174 | Old Field Meadow: Mostly ploughed in late 2020 (CUM1-1b). | Red Oak (30%) – Bur Oak (15%) – Sugar Maple (15%) – White Pine (20%) - Basswood (10%) –- Other suitable native species (10%) | 1-3 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (4) and woody debris (4). | This unit is located between Wetland U1 and the Significant Woodland. Tree-planting in Units TP-RA4, TP-RA5, TP-RA6 and TP-RA7 will establish a wooded connection between Wetland U1 and the Significant Woodland. |

**Table 20: Milton Quarry East Extension**
**Ecological Enhancement Plan (EEP) Unit Summary**

| Unit[1] | Area (ha) | Site Conditions | Woody Species Planting List | Year(s) | Purpose | Other Management Activities | Notes |
|---|---|---|---|---|---|---|---|
| | | | | | • | | |
| TP-RA6 | 0.321 | Old Field Meadow: Mostly ploughed in late 2020 (CUM1-1b). | White Birch (30%) – Sugar Maple (20%) – Basswood (10%) – Bitternut Hickory (10%) – White Cedar (10%) - White Pine (10%) – Other suitable native species (10%) | 1-3 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (8) and woody debris (8). | This unit is located between Wetland U1 and the Significant Woodland. Tree-planting in Units TP-RA4, TP-RA5, TP-RA6 and TP-RA7 will establish a wooded connection between Wetland U1 and the Significant Woodland. |
| TP-RA7 | 0.406 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). Some portions not ploughed (CUM1-1a), with some rock outcrops and rock piles, scattered shrub patches and trees. | White Birch (30%) – Sugar Maple (20%) – Basswood (10%) – Bitternut Hickory (10%) – White Cedar (10%) - White Pine (10%) – Other suitable native species (10%) | 1-3 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (10) and woody debris (10). | This unit is immediately adjacent to the Significant Woodland and located in between the woodland and Wetland U1. Tree-planting in Units TP-RA4, TP-RA5, TP-RA6 and TP-RA7 will establish a wooded connection between Wetland U1 and the Significant Woodland. |
| TP-RB1 | 0.311 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). Some portions not ploughed (CUM1-1a), with some rock outcrops and rock piles, scattered shrub patches and trees. | Bur Oak (20%) – Red Oak (20%) – Sugar Maple (20%) – Bitternut Hickory (10%) – Basswood (10%) – White Pine (10%) - Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (8) and woody debris (8).<br>• Clean up old farm junk. | Tree-planting in Unit TP-RB1 will contribute to reforesting an open gap between two areas of mature forest, along with Units TP-M1, TP-M2, TP-RB2 and TP-RB3. |
| TP-RB2 | 0.155 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). Some portions not ploughed (CUM1-1a), with some rock outcrops and rock piles, scattered shrub patches and trees. | Bur Oak (20%) – Red Oak (20%) – Sugar Maple (20%) – Bitternut Hickory (10%) – Basswood (10%) – White Pine (10%) - Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (4) and woody debris (4).<br>• Clean up old farm junk. | Tree-planting in Unit TP-RB2 will contribute to reforesting an open gap between two areas of mature forest, along with Units TP-M1, TP-M2, TP-RB1 and TP-RB3. |
| TP-RB3 | 1.109 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). Some portions not ploughed (CUM1-1a), with some rock outcrops and rock piles, scattered shrub patches and trees. | Sugar Maple (30%) - White Birch (20%) - Basswood (10%) - Bitternut Hickory (10%) – White Cedar (10%) - White Pine (10%) – Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (28) and woody debris (28). | Tree-planting in Unit TP-RB3 will contribute to reforesting an open gap between two areas of mature forest, along with Units TP-M1, TP-M2, TP-RB1 and TP-RB2. |

**Table 20: Milton Quarry East Extension**
**Ecological Enhancement Plan (EEP) Unit Summary**

| Unit[1] | Area (ha) | Site Conditions | Woody Species Planting List | Year(s) | Purpose | Other Management Activities | Notes |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| TP-RB4 | 0.312 | Old Field Meadow. A portion was ploughed in late 2020 (CUM1-1b) but the rest was not (CUM1-1a). A small dry ditch runs through this unit. | Silver Maple (25%) – White Cedar (25%) – Trembling Aspen (15%) - Balsam Poplar (15%) – Basswood (10%) – Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (8) and woody debris (8).<br>• Install erosion control features (e.g., rip-rap) along ditch line, as necessary. | This unit contains an old ditch line that no longer conveys flows. Following implementation of hydroperiod enhancement measures via the WMS, there may be some flow in the ditch. The woody species selected are facultative species that can tolerate some inundation (except Basswood). |
| TP-RB5 | 0.700 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). A small portion was not ploughed (CUM1-1a), with some rock outcrops and rock piles, scattered shrub patches and trees. | Red Oak (30%) – Bur Oak (15%) – Sugar Maple (15%) – White Pine (20%) - Basswood (10%) –- Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (18) and woody debris (18). | This unit is located between Wetland U1 and the Significant Woodland. Tree-planting in Units TP-RB5, TP-RB6, TP-RB7 and TP-RB8 will establish a wooded connection between Wetland U1 and the Significant Woodland. |
| TP-RB6 | 0.420 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). A small portion was not ploughed (CUM1-1a), with some rock outcrops and rock piles, scattered shrub patches and trees. | Red Oak (30%) – Bur Oak (15%) – Sugar Maple (15%) – White Pine (20%) - Basswood (10%) –- Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (11) and woody debris (11). | This unit is located between Wetland U1 and the Significant Woodland. Tree-planting in Units TP-RB5, TP-RB6, TP-RB7 and TP-RB8 will establish a wooded connection between Wetland U1 and the Significant Woodland. |
| TP-RB7 | 0.377 | Old Field Meadow. Mostly ploughed in late 2020 (CUM1-1b). Some portions not ploughed (CUM1-1a), with some rock outcrops and rock piles, scattered shrub patches and trees. | White Birch (30%) – Sugar Maple (20%) – Basswood (10%) – Bitternut Hickory (10%) – White Cedar (10%) - White Pine (10%) – Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (9) and woody debris (9). | This unit is immediately adjacent to the Significant Woodland and located in between the woodland and Wetland U1. Tree-planting in Units TP-RB5, TP-RB6, TP-RB7 and TP-RB8 will establish a wooded connection between Wetland U1 and the Significant Woodland. |

**Table 20: Milton Quarry East Extension**
**Ecological Enhancement Plan (EEP) Unit Summary**

| Unit[1] | Area (ha) | Site Conditions | Woody Species Planting List | Year(s) | Purpose | Other Management Activities | Notes |
|---|---|---|---|---|---|---|---|
| TP-RB8 | 0.168 | Old Field Meadow, mostly not ploughed (CUM1-1a), with some rock outcrops and scattered trees. | White Birch (30%) – Sugar Maple (20%) – Basswood (10%) – Bitternut Hickory (10%) – White Cedar (10%) - White Pine (10%) – Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (4) and woody debris (4). | This unit is immediately adjacent to the Significant Woodland and located in between the woodland and Wetland U1. Tree-planting in Units TP-RB5, TP-RB6, TP-RB7 and TP-RB8 will establish a wooded connection between Wetland U1 and the Significant Woodland. |
| TP-RB9 | 0.092 | Old Field Meadow (CUM1-1a) with White Ash regeneration. | Sugar Maple (40%) – Basswood (10%) – Bitternut Hickory (10%) – Ironwood (10%) – White Pine (10%) – White Cedar (10%) – Other suitable native species (10%) | 1-5 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. | • Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (3) and woody debris (3). | This unit is immediately adjacent to the Significant Woodland boundary and tree-planting will help to fill in a gap in the forest. |
| WE1 | 0.917 | Wetland U1 and surrounding thickets and tree clusters. | Swamp Maple – Silver Maple – White Cedar | 1-3 | • Expand and enhance Significant Woodlands.<br>• Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals.<br>• Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.<br>• Enhance breeding habitat for Jefferson Salamander and Unisexuals.<br>• Control invasive woody species. | • Remove undesirable woody vegetation (e.g., declining Red-osier Dogwood and shrub willows); thin out any White Ash regeneration.<br>• Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration).<br>• Install habitat features: rock piles (10) and woody debris (10).<br>• Install egg mass attachment sites within Wetland U1 (e.g., small branches with fine twigs).<br>• Install some small clusters of rocks and woody debris within Wetland U1 to provide potential refuges for salamander larvae and juveniles. | At present, Wetland U1 is not a viable salamander breeding pool because it lacks sufficient hydroperiod. The hydroperiod will be enhanced via mitigation through the WMS. The proposed habitat improvements will increase the productivity of U1 for amphibian breeding, once the hydroperiod is restored. |
| **Total** | **10.553** | | | | | | |

**Notes:**

[1]**EEP Unit Codes:**

DA - Disturbed Area
TP-B – Tree-planting – Buffer (Years 1-2)
TP-M – Tree-planting – Reforestation & Vegetation Management (Years 1-5)
TP-RA – Tree-planting – Reforestation (Years 1-3)
TP-RB – Tree-planting – Reforestation (Years 1-5)

**Table 21: Milton Quarry East Extension (MQEE)**
**Rehabilitation Plan Unit Summary**

| Unit[1] | Area (ha) | Feature | Plant List | Purpose | Other Management Activities | Notes |
|---|---|---|---|---|---|---|
| TP-RC1 | 1.035 | Reforestation Area | White Birch (30%) – White Cedar (30%) – White Pine (20%) – Trembling Aspen (10%) – Other suitable native species (10%) | • Expand and enhance Significant Woodlands.<br>• Create wildlife habitat.<br>• Enhance Cox Tract linkage.<br>• Expand and enhance habitat for Jefferson Salamander and Unisexuals. | • Install habitat features: rock piles (26) and woody debris (26).<br>• Seed with suitable groundcover seed mix.<br>• Control weedy competition and invasive woody species during establishment stage. | This will be a generally north-facing slope that has 7 m of relief (340 mASL – 333 mASL), leading down to the shoreline wetlands. |
| TP-RC2 | 1.978 | Reforestation Area | Bur Oak (20%) – Red Oak (20%) – Sugar Maple (20%) – Bitternut Hickory (10%) – Basswood (10%) – White Pine (10%) - Other suitable native species (10%) | • Expand and enhance Significant Woodlands.<br>• Create wildlife habitat.<br>• Enhance Cox Tract linkage.<br>• Expand and enhance habitat for Jefferson Salamander and Unisexuals. | • Install habitat features: rock piles (49) and woody debris (49).<br>• Seed with suitable groundcover seed mix.<br>• Control weedy competition and invasive woody species during establishment stage. | This will be a ridge at elevations of 340 mASL to 336 mASL. |
| TP-RC3 | 1.279 | Reforestation Area | Red Maple (20%) – White Cedar (20%) – Sugar Maple (10%) – Basswood (10%) - Trembling Aspen (10%) – Balsam Poplar (10%) - White Birch (10%) – Other suitable native species (10%) | • Expand and enhance Significant Woodlands.<br>• Create wildlife habitat.<br>• Enhance Cox Tract linkage.<br>• Expand and enhance habitat for Jefferson Salamander and Unisexuals. | • Create pit and mound microtopography.<br>• Install habitat features: rock piles (32) and woody debris (32).<br>• Seed with suitable groundcover seed mix.<br>• Control weedy competition and invasive woody species during establishment stage. | This will be a lower-lying area between the 334 and 336 mASL contours. Ground surface will be approximately 1.0 m to 3.0 m above the lake level. |
| TP-RC4 | 0.078 | Reforestation Area | Silver Maple (20%) – Red Maple (20%) – White Cedar (20%) – Trembling Aspen (10%) – Balsam Poplar (10%) - Yellow Birch (10%) – Other suitable native species (10%) | • Expand and enhance Significant Woodlands.<br>• Create wildlife habitat.<br>• Enhance Cox Tract linkage. | • Create pit and mound microtopography.<br>• Install habitat features: rock piles (2) and woody debris (2).<br>• Seed with suitable groundcover seed mix.<br>• Control weedy competition and invasive woody species during establishment stage.<br>• | This will be a lower-lying area at or below the 334 mASL contour, near Townline. Ground surface will be approximately 1.0 m above the lake level. |
| TP-RC5 | 0.122 | Reforestation Area | Bur Oak (20%) – Red Oak (20%) – Sugar Maple (20%) – Bitternut Hickory (10%) – Basswood (10%) – White Pine (10%) - Other suitable native species (10%) | • Expand and enhance Significant Woodlands.<br>• Create wildlife habitat.<br>• Enhance Cox Tract linkage.<br>• Expand and enhance habitat for Jefferson Salamander and Unisexuals. | • Install habitat features: rock piles (3) and woody debris (3).<br>• Seed with suitable groundcover seed mix.<br>• Control weedy competition and invasive woody species during establishment stage. | This is a small unit near Townline at or above the 336 mASL contour. |
| TP-RC6 | 0.441 | Reforestation Area | Bur Oak (20%) – Red Oak (20%) – Sugar Maple (20%) – Bitternut Hickory (10%) – Basswood (10%) – White Pine (10%) - Other suitable native species (10%) | • Expand and enhance Significant Woodlands.<br>• Create wildlife habitat.<br>• Enhance Cox Tract linkage.<br>• Expand and enhance habitat for Jefferson Salamander and Unisexuals. | • Install habitat features: rock piles (11) and woody debris (11).<br>• Seed with suitable groundcover seed mix.<br>• Control weedy competition and invasive woody species during establishment stage. | Southwest-facing slope. Located as close as 50 m from Wetland U1, which is a Jefferson Salamander breeding pool.<br>Contiguous with EEP Unit TP-B2. |

**Table 21: Milton Quarry East Extension (MQEE)**
**Rehabilitation Plan Unit Summary**

| Unit[1] | Area (ha) | Feature | Plant List | Purpose | Other Management Activities | Notes |
|---|---|---|---|---|---|---|
| SW1 | 0.530 | Shallow Wetland | Common Cattail (*Typha latifolia*) - Sedges (e.g., *Carex* spp., *Eleocharis* spp., *Scirpus* spp. and *Schoenoplectus* spp.) – Water-plantain (*Alisma plantago-aquatica*) – Common Arrowhead (*Sagittaria latifolia*) - Scattered shrubs (mainly *Salix* spp.) – Other suitable native wetland species | • Create new lacustrine wetland area.<br>• Create habitat for fish, amphibians, turtles, snakes, waterfowl and other wildlife. | • Grading (coarse and fine) will sculpt an irregular shoreline and produce a variety of slopes, both in shallow water and above water, and transitioning to nearshore/upland areas and deep-water areas.<br>• Gravel or sand beaches will be created along the shorelines.<br>• Install submerged and partially submerged rocks/boulders, root masses and logs. | Unit SW1 is the main shoreline wetland unit located at the base of the north-facing slope that contains Unit TP-RC1. |
| SW2 | 0.727 | Shallow Wetland | Common Cattail (*Typha latifolia*) - Sedges (e.g., *Carex* spp., *Eleocharis* spp., *Scirpus* spp. and *Schoenoplectus* spp.) – Water-plantain (*Alisma plantago-aquatica*) – Common Arrowhead (*Sagittaria latifolia*) - Scattered shrubs (mainly *Salix* spp.) – Other suitable native wetland species | • Create new lacustrine wetland area.<br>• Create habitat for fish, amphibians, turtles, snakes, waterfowl and other wildlife. | • Grading (coarse and fine) will sculpt an irregular shoreline and produce a variety of slopes, both in shallow water and above water, and transitioning to nearshore/upland areas and deep-water areas.<br>• Gravel or sand beaches will be created along the shorelines.<br>• Install submerged and partially submerged rocks/boulders, root masses and logs. | Unit SW2 is the shallow water area around Islands IS1, IS2 and IS3. |
| SW3 | 0.280 | Shallow Wetland | Common Cattail (*Typha latifolia*) - Sedges (e.g., *Carex* spp., *Eleocharis* spp., *Scirpus* spp. and *Schoenoplectus* spp.) – Water-plantain (*Alisma plantago-aquatica*) – Common Arrowhead (*Sagittaria latifolia*) - Scattered shrubs (mainly *Salix* spp.) – Other suitable native wetland species | • Create new lacustrine wetland area.<br>• Create habitat for fish, amphibians, turtles, snakes, waterfowl and other wildlife. | • Grading (coarse and fine) will sculpt an irregular shoreline and produce a variety of slopes, both in shallow water and above water, and transitioning to nearshore/upland areas and deep-water areas.<br>• Gravel or sand beaches will be created along the shorelines.<br>• Install submerged and partially submerged rocks/boulders, root masses and logs.<br>• At the interface with deeper water, create rocky shoals to within 1.0 m of the water surface, with some areas just above water. | Unit SW3 is the shallow water area adjacent to the created wooded slope (Unit TP-RC6). |
| DW1 | 1.088 | Deep Wetland | Pondweeds (*Potamogeton* spp.) - Common Bladderwort (*Utricularia vulgaris*) – Coontail (*Ceratophyllum demersum*) – Fragrant Water-lily (*Nymphaea odorata*) – Common Duckweed (*Lemna minor*) - Stonewort (*Chara* sp.) – Other suitable native aquatic species | • Create new lacustrine wetland area.<br>• Create habitat for fish, amphibians, turtles, waterfowl and other wildlife. | • Grading will produce a variety of slopes and deeper pockets.<br>• At the interface with deeper water, create rocky shoals to within 1.0 m of the water surface, with some areas just above water.<br>• Install submerged rocks/boulders, root masses and logs. | Unit DW1 is the main Deep Wetland area that surrounds Islands IS1, IS2 and IS3. |
| DW2 | 0.035 | Deep Wetland | Pondweeds (*Potamogeton* spp.) - Common Bladderwort (*Utricularia vulgaris*) – Coontail (*Ceratophyllum demersum*) – Fragrant Water-lily (*Nymphaea odorata*) – Common Duckweed (*Lemna minor*) - Stonewort (*Chara* sp.) – Other suitable native aquatic species | • Create new lacustrine wetland area.<br>• Create habitat for fish, amphibians, turtles, waterfowl and other wildlife. | • Grading will produce a variety of slopes and deeper pockets.<br>• Install submerged rocks/boulders, root masses and logs. | Unit DW2 is a small area of Deep Wetland located in between Islands IS1 and IS2. |

**Table 21: Milton Quarry East Extension (MQEE)**
**Rehabilitation Plan Unit Summary**

| Unit[1] | Area (ha) | Feature | Plant List | Purpose | Other Management Activities | Notes |
|---|---|---|---|---|---|---|
| DW3 | 0.035 | Deep Wetland | Pondweeds (*Potamogeton* spp.) - Common Bladderwort (*Utricularia vulgaris*) – Coontail (*Ceratophyllum demersum*) – Fragrant Water-lily (*Nymphaea odorata*) – Common Duckweed (*Lemna minor*) - Stonewort (*Chara* sp.) – Other suitable native aquatic species | • Create new lacustrine wetland area.<br>• Create habitat for fish, amphibians, turtles, waterfowl and other wildlife. | • Grading will produce a variety of slopes and deeper pockets.<br>• Install submerged rocks/boulders, root masses and logs. | Unit DW3 is a small area of Deep Wetland located in between Islands IS2 and IS3. |
| IS1 | 0.114 | Island | Little Bluestem (*Schizachyrium scoparium*) (40%) - Switchgrass (*Panicum virgatum*) (20%) - Big Bluestem (*Andropogon gerardii*) (20%) – Suitable native wildflower species (20%) | • Create island habitat that will provide habitat for nesting waterfowl, shorebirds and turtles.<br>• Shallow water between and around islands will provide sheltered nursery habitat for fish. | • The island will be capped with various granular substrates (gravels and coarse sands), as well as patches of boulders and cobbles.<br>• Placement of at least 10 logs and/or stumps/root wads.<br>• At least 3 turtle nesting sites will be constructed on the island well above the high-water line, using suitable granular material. Dimensions of turtle nesting areas will be approximately 8-10 m by 4-5 m and the nesting areas will be oriented to provide south and/or southwest exposures. | The islands are oriented towards the prevailing wind from the west and northwest, with sheltered coves on the leeward side. Shallow Wetland and Deep Wetland areas are associated with the islands. |
| IS2 | 0.123 | Island | Little Bluestem (*Schizachyrium scoparium*) (40%) - Switchgrass (*Panicum virgatum*) (20%) - Big Bluestem (*Andropogon gerardii*) (20%) – Suitable native wildflower species (20%) | • Create island habitat that will provide habitat for nesting waterfowl, shorebirds and turtles.<br>• Shallow water between and around islands will provide sheltered nursery habitat for fish. | • The island will be capped with various granular substrates (gravels and coarse sands), as well as patches of boulders and cobbles.<br>• Placement of at least 10 logs and/or stumps/root wads.<br>• At least 3 turtle nesting sites will be constructed on the island well above the high-water line, using suitable granular material. Dimensions of turtle nesting areas will be approximately 8-10 m by 4-5 m and the nesting areas will be oriented to provide south and/or southwest exposures. | The islands are oriented towards the prevailing wind from the west and northwest, with sheltered coves on the leeward side. Shallow Wetland and Deep Wetland areas are associated with the islands. |
| IS3 | 0.150 | Island | Little Bluestem (*Schizachyrium scoparium*) (40%) - Switchgrass (*Panicum virgatum*) (20%) - Big Bluestem (*Andropogon gerardii*) (20%) – Suitable native wildflower species (20%) | • Create island habitat that will provide habitat for nesting waterfowl, shorebirds and turtles.<br>• Shallow water between and around islands will provide sheltered nursery habitat for fish. | • The island will be capped with various granular substrates (gravels and coarse sands), as well as patches of boulders and cobbles.<br>• Placement of at least 10 logs and/or stumps/root wads.<br>• At least 3 turtle nesting sites will be constructed on the island well above the high-water line, using suitable granular material. Dimensions of turtle nesting areas will be approximately 8-10 m by 4-5 m and the nesting areas will be oriented to provide south and/or southwest exposures. | The islands are oriented towards the prevailing wind from the west and northwest, with sheltered coves on the leeward side. Shallow Wetland and Deep Wetland areas are associated with the islands. |
| **Total:** | 8.015 ha | | | | | |

**Notes:**

[1] **Rehabilitation Plan Unit Codes:**

TP-RC – Tree-planting/Reforestation
SW – Shallow Wetland
DW – Deep Wetland
IS - Island

**Table 22: WMS Footprint within Habitat of Jefferson Salamander and Unisexual Ambystoma (Jefferson Salamander dependent population)**

| WMS Component | Total Disturbed Area (ha) | Permanently Disturbed / Removed Area (ha) | Restored Area (ha) | Notes |
|---|---|---|---|---|
| *Within Migration Habitat* | | | | |
| Access Road & Watermain | 0.926 ha | 0.463 ha | 0.463 ha | 10 m wide disturbance zone during installation. 5 m used for the access road and watermain. 5 m to be restored. |
| CV Huts | 0.0216 ha | 0.0216 ha | 0.0 ha | 6 CV Huts are required, each with a footprint of 36 $m^2$. |
| Feeder Lines | 0.521 ha | 0.0 ha | 0.521 ha | 5 m wide disturbance zone during installation; to be promptly restored. |
| Recharge Wells | 0.045 ha | 0.0036 ha | 0.0414 ha | Recharge well installation will disturb approximately 25 $m^2$ or less. Following restoration, the disturbed area per recharge well will typically be less than 2 $m^2$. |
| Diffuse Discharges | 0.001 ha | 0.0 ha | 0.001 ha | Diffuse discharges will typically cover 5 to 10 $m^2$ or less, where existing grades will be maintained and weathered stone and woody debris will be used for cover. Post-restoration, the diffuse discharge will function as habitat for salamanders. |
| WMS Installation Staging Areas | 0.2 ha | 0.0 ha | 0.2 ha | Small areas of open field to be used for staging equipment and supplies during WMS installation. |
| Total | 1.7146 ha | 0.4882 ha | 1.2264 ha | 0.4882 ha of habitat is permanently removed or disturbed. |
| *Within Foraging & Hibernation Habitat (Within Significant Woodland)* | | | | |
| Feeder Lines | 0.194 | 0.0 | 0.194 | 5 m wide disturbance zone during installation; to be promptly restored. |
| Recharge Wells | 0.025 | 0.002 | 0.023 | Recharge well installation will disturb approximately 25 $m^2$ or less. Following restoration, the disturbed area per recharge well will typically be less than 2 $m^2$. |
| Diffuse Discharges | 0.002 | 0.0 | 0.002 | Diffuse discharges will typically cover 5 $m^2$ to 10 $m^2$ or less, where existing grades will be maintained and weathered stone and woody debris will be used for cover. Post-restoration, the diffuse discharge will function as habitat for salamanders. |
| Total | 0.221 | 0.002 | 0.219 | 0.002 ha of habitat is permanently removed or disturbed. |
| *Overall Totals* | | | | |
| Total | 1.9356 | 0.4902 | 1.4454 | 0.4902 ha of habitat is permanently removed or disturbed. |

# ATTACHMENT A

## Curriculum vitae

## of

## Anthony G. Goodban, B.Sc., M.E.S.(Pl.), RPP, MCIP
## Consulting Ecologist and Natural Heritage Planner

## Goodban Ecological Consulting Inc. (GEC)

**ANTHONY G. GOODBAN,** **B.Sc., M.E.S.(Pl.), MCIP, RPP**
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Phone: (905) 693-9064

***Consulting Services in Field Botany, Ecology and Natural Heritage Planning***

## EDUCATION

1995 M.E.S.(Planning), Environmental Planning, York University, North York, Ontario

1992 Honours B.Sc., Ecology, University of Guelph, Guelph, Ontario

## PROFESSIONAL ASSOCIATIONS

Ontario Professional Planners Institute - Full Member
Canadian Institute of Planners - Full Member

## PROFESSIONAL TRAINING

2017 Completed the 3-day *Ontario Reptile & Amphibian Field Survey Course* presented by Blazing Star Environmental, NRSI, Ontario Ministry of Natural Resources and Forestry (MNRF). The course was held on Beausoleil Island in Georgian Bay.

2014 Completed the 2-day RX-100 *Low Complexity Prescribed Burn (LCPB) Worker Course* provided by Tallgrass Ontario in Bloomingdale, Ontario.

2013 Completed the Trees Ontario 2-day *Ontario Tree Seed Collector Training Course* in Angus, Ontario.

2013 Completed the Ministry of Natural Resources and Forestry (MNRF) Butternut Health Assessment "Refresher" Training at the Royal Botanical Gardens (RBG), Burlington, Ontario.

2009 Completed the MNRF *Butternut Health Assessment Workshop* at the Royal Botanical Gardens, Burlington, Ontario.

2008 Completed the MNRF 5-day training course in the use of the *Ecological Land Classification System for Southern Ontario* (ELC) at Ball's Falls Conservation Area, Jordan, Ontario.

1994 Completed the MNRF 5-day training course in the use of the *Ontario Wetlands Evaluation System: Southern Manual* (Third Edition) in Tweed, Ontario.

## PROFESSIONAL EXPERIENCE

| | |
|---|---|
| 1999-Present | Consulting Ecologist and Natural Heritage Planner, Goodban Ecological Consulting Inc. |
| 1992-1998 | Ecologist and Natural Heritage Planner, Ecoplans Limited |
| 1991-1992 | Botanist and Ecologist, Hamilton-Wentworth Natural Areas Inventory Project |
| 1990 | Field Botanist, Hamilton Region Conservation Authority and Hamilton Naturalists' Club |

## PROFILE

Mr. Anthony Goodban's academic background is in botany, ecology and environmental planning at the undergraduate and graduate level and he has over 30 years of field and professional experience. He has expert knowledge of the vegetation and flora of southern Ontario, being especially familiar with the flora of the Hamilton and Halton Region. Mr. Goodban has been the principal of Goodban Ecological Consulting Inc. since 1999 and he works either as an independent consultant or as a subconsultant to other firms. Past and present clients include other consulting firms, aggregate companies, developers, municipalities, conservation authorities, provincial ministries, naturalist clubs and private citizens. Mr. Goodban has worked on a broad variety of projects involving species at risk, including many different plant and wildlife species. He often undertakes detailed field ecological field surveys for a wide range of projects, including Official Plan updates, aggregate applications, land development projects, park planning exercises, natural areas inventories, restoration and monitoring projects. Mr. Goodban has worked on many wetland projects, including wetland evaluations, boundary delineations, impact assessments and monitoring programs. He provides project input relating to planning matters such as the natural heritage components of the Provincial Policy Statement, Greenbelt Plan and the Endangered Species Act, and has prepared numerous environmental impact statements for a wide variety of development proposals. Mr. Goodban prepared and updated the Flora of Hamilton, in association with the Hamilton Conservation Authority. He has expertise dealing with rare vegetation communities, including alvars and prairies, and has written several papers and reports on prairie and savanna vegetation in the Hamilton and Halton areas. He is certified to complete wetland evaluations under the *Ontario Wetland Evaluation System: Southern Manual (3rd Edition)* and to use the *Ecological Land Classification System for Southern Ontario* (ELC). Mr. Goodban has appeared as an expert witness before the Ontario Municipal Board and the Joint Board.

## PROJECT EXPERIENCE

### Species at Risk

- Mr. Goodban has worked on many projects involving Threatened and Endangered Species in recent years. Projects dealing with wildlife species include Jefferson Salamander, Butler's Garter Snake, Eastern Fox Snake, Gray Rat Snake, Bank Swallow, Barn Swallow, Bobolink, Chimney Swift and Eastern Meadowlark. Projects dealing with plant species include American Chestnut, American Columbo, American Ginseng, Butternut, Flowering Dogwood and Kentucky Coffee-tree.

- Mr. Goodban has completed a series of detailed studies of the Endangered Jefferson Salamander and its habitats. Work has included detailed monitoring of six breeding pools from 2004 to the present (including frog call surveys, egg mass surveys, fixed-point photography, water temperature, vegetation, etc), egg mass surveys of 30+ breeding pools in Halton, Hamilton, Peel, Waterloo and Wellington, spring migration studies with drift fencing and pitfall traps, larval surveys in breeding pools, etc. In 2014, Mr. Goodban began monitoring almost 1 km of drift fence and 60+ pitfall traps set up to capture salamanders migrating to breeding pools in the early spring.

- Mr. Goodban is a certified Ontario Butternut Health Assessor (BHA) who has completed many Butternut Health Assessments in recent years. In 2014 he assessed 27 Butternut trees on the Oro Moraine, of which 6 were retainable (Category 2) trees, and 6 Butternut trees on the Niagara Escarpment in Halton Hills which were all non-retainable (Category 1). Mr. Goodban has also overseen compensatory Butternut planting programs required by *Endangered Species Act* Stewardship Agreements and through the registry process allowed under O.Reg 242/08.

**Resource Management - Watersheds and Natural Heritage System Planning**

- Responsible for the development of Natural Heritage Systems for the Sixteen Mile Creek watershed, Township of Oro-Medonte and North Oakville.

**Resource Management – Wetlands, ANSI's and ESA's**

- Responsible for numerous wetland evaluations and impact assessments for a range of development proposals across Ontario, including such wetlands as: Dorchester Swamp, Strasburg Creek Wetland Complex, Forks of the Credit Wetland Complex, Creditview Swamp, Victoria Point Wetland Complex and Halton Escarpment Wetland Complex. Many of these projects required the preparation of environmental impact studies/assessments, often including the detailed review and integration of water resources (hydrogeology, hydrology, stormwater engineering) and ecological (wetlands, fisheries) data.

**Resource Management – Wetlands, ANSI's and ESA's (continued)**

- Main environmental consultant to the City of Orillia during an OMB hearing that focused on the issue of large-scale development within a Provincially Significant Wetland (Victoria Point Bog).

- Main environmental consultant to local residents in the Town of Essex during a 2002 OMB hearing that examined an 18-hole golf course proposal within a Provincially Significant Wetland (Marshfield Woods).

- Participant in evaluations and impact assessments for development proposals adjacent to Environmentally Sensitive Areas (ESAs) across southern Ontario, including: Sixteen Mile Creek Valley (ESA 16) and Hilton Falls Complex (ESA 25) in Halton Region, Doon Pinnacle Hill (ESPA 35) in Waterloo Region, Major Spink Area (ESA No. 97) in Durham Region and Hayesland Complex (ESA No. 28) in Hamilton.

**Transportation Projects**

- Participated in the preparation of a number of highway Environmental Assessments, including: the Bradford Bypass, the Leslie Street Extension in Toronto, the Parry Sound and Mactier sections of Highway 69 and Highway 7 from Kitchener to Guelph.

- Participant in Class Environmental Assessments for sensitive river, wetland and valley crossings, including: the northerly and southerly crossings of Twelve Mile Creek in Oakville, the Mountainview Road crossing of Silver Creek in Georgetown and Sixth Line crossing of Sixteen Mile Creek in Milton.

**Aggregates**

- Participant in multi-disciplinary studies in support of sand and gravel pit license applications, including the Lockyer Brothers pit in Mono Township, Armbro Pinchin Pit in Caledon. Responsible for several MTO wayside permit applications (one quarry and three pits) in eastern Ontario.

- Participant in multi-disciplinary studies in support of limestone/dolostone quarry license applications, including the Tomlinson Brothers quarry in Stittsville, Holmenin quarry near Buckhorn, Dufferin Aggregates' Milton Quarry and Acton Quarry Extensions and James Dick Construction Limited's proposed Rockfort Quarry in Caledon.

- Responsible for the development and implementation of wetland vegetation monitoring programs adjacent to aggregate operations, as components of adaptive management plans (AMP).

- Consulting Botanist/Ecologist to aggregate companies for biodiversity plans, enhancement plans and rehabilitation plans at a number of pits and quarries in southern Ontario.

**Vegetation and Flora - Inventory, Management and Monitoring**

- Responsible for completing detailed botanical inventories of numerous sites in southern Ontario, including Bronte Creek Provincial Park (Halton), the Red Hill Valley (Hamilton-Wentworth) and the Dundas Valley (Hamilton-Wentworth).

- Consulting botanist and ecologist to Natural Areas Inventory Projects in southern Ontario, including Hamilton (2001-2002; 2010-2014), Halton (2003-2004) and Niagara (2006-2008).

- Developed vegetation management plans and strategies for a number of significant natural areas and communities, including:
    - Ontario Hydro's right-of-way at Bronte Creek Provincial Park (Oakville)
    - prairie and other vegetation at Bronte Creek Provincial Park (Oakville)

- prairie and oak woodland vegetation at Spencer Gorge Wilderness Area (Dundas/Flamborough)
- prairie vegetation at the Ancaster Prairie (Ancaster)
- rare species and significant communities in the Albion Falls - Buttermilk Falls portion of the Red Hill Valley (Hamilton)

**RELATED EXPERIENCE AND COMMUNITY INVOLVEMENT**

*1995 to present*

Mr. Goodban is the first author of a research paper on the historical and present extent and floristic composition of prairie and savanna vegetation in the vicinity of Hamilton, Ontario, prepared with the assistance of two other authors (W.D. Bakowsky and B.D. Bricker). This paper was presented at the 23rd Natural Areas, 15th North American Prairie, and Indiana Dunes Ecosystems Conferences held at St. Charles, Illinois, on October 26, 1996. It was published in the Proceedings of the 15th North American Prairie Conference (1999). Mr. Goodban is currently undertaking further research on prairie, savanna and oak woodland vegetation in the western Lake Ontario region of Ontario. He has authored several papers and studies on the prairie and oak woodland vegetation at Bronte Creek Provincial Park.

*1995 to 1999*

Mr. Goodban was a participant in the **International Alvar Conservation Initiative** or **'Alvar Working Group'**. This was a collaborative project aimed at documenting and protecting alvar sites in the Great Lakes basin. Participants from across eastern North America examined sites in Michigan, New York, Ohio and Ontario. Mr. Goodban's masters level research on alvar vegetation on the Flamborough Plain was integrated into this broader study. He prepared the text for a 24-page full color brochure and poster for the Federation of Ontario Naturalists, as one of the products generated by the Alvar Working Group, entitled *Great Lakes Alvars*. Mr. Goodban has studied alvar vegetation in all of the main alvar regions in Ontario. He has also visited alvar sites in New York and Ohio.

*1991 to present*

Mr. Goodban has led numerous naturalist and field botanist field trips in southern Ontario on behalf of the Field Botanists of Ontario. He has given presentations on rare vegetation communities (e.g., prairies, alvars) at conferences, meetings and naturalist club events.

*1991 to present*

Mr. Goodban has worked in collaboration with the Hamilton Region Conservation Authority to document the flora of the City of Hamilton. The first edition of *The Vascular Plant Flora of the Regional Municipality of Hamilton-Wentworth, Ontario,* was produced in 1995. Mr. Goodban prepared a Second Edition of the Flora in 2003 and a Third Edition in 2014, documenting more than 1400 vascular plant taxa in the City of Hamilton.

*1995 to 2000*

Member of the Regional Municipality of Hamilton-Wentworth's **ENVIRONMENTALLY SIGNIFICANT AREA IMPACT EVALUATION GROUP** (ESAIEG). ESAIEG considers development proposals located within or adjacent to Environmentally Significant Areas (ESAs) and provides advice to planning staff.

*1991 to 1995*

Member of the Regional Municipality of Halton's **ECOLOGICAL AND ENVIRONMENTAL ADVISORY COMMITTEE** (EEAC). The basic function of EEAC is to provide technical advice, through the Planning and Development Department, to staff and Council on all environmental matters affecting Halton.

## SELECTED PUBLICATIONS AND REPORTS

Goodban, A.G. 2014. The Vascular Plants of Hamilton, Ontario. pp. 1 to 91, In: Schwetz, N. (ed.), Hamilton Natural Areas Inventory Project 3rd Edition, Nature Counts 2, Species Checklist Document. Hamilton Conservation Authority, Ancaster, Ontario.

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Crins, W.J., W.D. McIlveen, A.G. Goodban and P.G. O'Hara. 2006. The Vascular Plants of Halton Region, Ontario. pp. 1-79 In: Dwyer, J.K. (ed.), Halton Natural Areas Inventory 2006: Volume 2 – Species Checklists. Halton/North Peel Naturalists' Club, South Peel Naturalists' Club, Hamilton Naturalists' Club, Conservation Halton and the Regional Municipality of Halton.

Goodban, A.G. 2003. The Vascular Plants of Hamilton, Ontario. pp. 1-1 to 1-99, In: Dwyer, J.K., Nature Counts Project, Hamilton Natural Areas Inventory 2003, Volume 1 – Species Checklists. Hamilton Naturalists' Club, Hamilton, Ontario.

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Goodban, A.G. *In prep.* Bronte Creek Provincial Park (North Section): Grasslands Study. Bronte Creek Provincial Park, Burlington, Ontario Parks.

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Goodban, A.G., W.D. Bakowsky and B.D. Bricker. 1999. The historical and present extent and floristic composition of prairie and savanna vegetation in the vicinity of Hamilton, Ontario. pp. 87-103. In: Proceedings of the 15th North American Prairie Conference. *Edited by* C. Warwick. Natural Areas Association, Bend, Oregon.

Goodban, A.G. 1998. Significant Flora Survey: Ontario Hydro Right-of-Way, Bronte Creek Provincial Park Nature Reserve Zone Area of Natural and Scientific Interest. Prepared for Ontario Hydro. 11 pp + map.

Goodban, A.G. 1997. A survey of the rare vascular plant flora of the Albion Falls - Buttermilk Falls area in the City of Hamilton, Ontario. Hamilton Region Conservation Authority, Ancaster, Ontario. 14 pp. + appendix + map.

Goodban, A.G. 1996. The vegetation and flora of the Red Hill Valley and environs. pp. 17-66. In: Biological Inventory of the Red Hill Valley, Hamilton Naturalists' Club (eds.), Hamilton, Ontario.

Goodban, A.G. 1995. Alvar Vegetation on the Flamborough Plain: Ecological Features, Planning Considerations and Conservation Recommendations. Major Paper. Faculty of Environmental Studies, York University, North York, Ontario. 88 pp. + appendices.

Goodban, A.G. 1994. *Carex virescens* (Cyperaceae) new to the Regional Municipality of Hamilton-Wentworth. Field Botanists of Ontario Newsletter 7(1): 11-12.

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# ATTACHMENT B1

## MQEE Natural Environment Study Area Photo Album

# Attachment B1:

# Dufferin Aggregates
# Milton Quarry East Extension (MQEE)

# Vegetation Community Photographs
# taken by GEC from 2018 to 2021

Goodban Ecological Consulting Inc. (GEC)

December 2021


Photo 1 - Woodland A - GEC 2020-11-08


Photo 2 - Woodland A - GEC 2020-11-08

Photo 3 - Woodland A - GEC 2020-11-08

Photo 4 - Woodland A - GEC 2020-10-31

Photo 5 - FOD3-1a - GEC 2021-11-07

Photo 6 - FOD3-1b - GEC 2020-10-31


Photo 7 - FOD3-1b - GEC 2021-05-16


Photo 8 - FOD3-1d - GEC 2021-11-13

Photo 9 - FODb - GEC 2021-08-02

Photo 10 - FODb - GEC 2021-08-02

Photo 11 - FOD5-1a - GEC 2021-08-08

Photo 12 - FOD5-1a - GEC 2021-08-08


Photo 13 - FOD5-1b - GEC 2021-11-07


Photo 14 - FOD5-1c - GEC 2021-04-10

Photo 15 - FOD5-1d GEC 2021-07-24

Photo 16 - FOD5-1d - GEC 2021-07-24


Photo 17 - FOD5-1e - GEC 2020-12-19


Photo 18 - FOD5-1f - GEC 2020-10-03

Photo 19 - FOD5-1g - GEC 2021-11-13

Photo 20 - FOD5-3b - GEC 2021-11-13

Photo 21 - Woodland B - FOD5-5a - GEC 2021-05-09

Photo 22 - Woodland B - FOD5-5a - GEC 2021-05-09

Photo 23 - Woodland B - Goutweed - GEC 2021-05-09

Photo 24 - FOD5-5b - GEC 2021-05-16

Photo 25 - CUP3-1 - GEC 2021-11-07

Photo 26 - CUW1a - GEC 2020-12-19


Photo 27 - CUS1a - GEC 2021-11-07


Photo 28 - CUS1a - GEC 2021-11-07

Photo 29 - CUT1a - GEC 2020-11-29

Photo 30 - CUT1b - GEC 2021-05-16

Photo 31 - CUT1b - GEC 2021-05-16

Photo 32 - CUT1c and MAM2-2 - GEC 2020-12-19

Photo 33 - CUT1d - GEC 2021-03-25

Photo 34 - CUT1d - GEC 2021-03-25

Photo 35 - CUT1e - GEC 2020-12-19

Photo 36 - CUT1f GEC 2020-12-19

Photo 37 - CUT1g - GEC 2020-12-19

Photo 38 - CUM1-1A - GEC 2021-05-16

Photo 39 - CUM1-1B - GEC 2020-10-03

Photo 40 - CUM1-1B - 2021-06-20

Photo 41 - CUM1-1B - GEC 2020-10-03

Photo 42 - CUM1-1B - GEC 2020-10-03

Photo 43 - CUM1-1B - GEC 2021-07-24

Photo 44 - CUM1-1B - GEC 2021-07-24

Photo 45 - CUM1-1C - GEC 2020-12-19

Photo 46 - CUHa - GEC 2021-05-09

Photo 47 - CUHb - GEC 2021-05-16

Photo 48 - W41 SWM5-2 GEC 2019-04-06

Photo 49 - W41 SWM5-2 GEC 2020-02-21

Photo 50 - W56 SWD3-1 - GEC 2020-03-29

Photo 51 - W56 SWD3-1 - GEC 2020-03-29

Photo 52 - W36-Upper SWD6-3a - GEC 2019-04-06

Photo 53 - W36-Upper SWD6-3a - GEC 2019-06-08

Photo 54 - W36-Upper SWD6-3a - GEC 2019-06-20


Photo 55 - W36-Upper SWD6-3a SG58 - GEC 2021-05-16


Photo 56 - W36-Upper SWD6-3a SG58 - GEC 2021-07-24


Photo 57 - W36-Upper SWD6-3a - GEC 2021-11-07


Photo 58 - W36-Lower SWD6-3b - GEC 2021-08-08

Photo 59 - W36-Lower SWD6-3b - GEC 2021-08-08

Photo 60 - W41 SWD6-3c - GEC 2021-07-24

Photo 61 - W41 SWD6-3c - GEC 2021-07-24

Photo 62 - W41 SWD6-3d GEC 2021-06-06

Photo 63 - W41 SWD6-3d Spring - GEC 2021-04-10

Photo 64 - W41 SWD6-3d Spring - GEC 2021-04-10

Photo 65 - W46a SWD6-3e - GEC 2021-04-10

Photo 66- W46a SWD6-3e - GEC 2021-08-02

Photo 67 - W46b SWD6-3f - GEC 2020-01-16

Photo 68 - W46b SWD6-3f - GEC 2021-04-10


Photo 69 - W46b SWD6-3f - GEC 2021-08-02


Photo 70 - V2 SWD6-3g - GEC 2020-05-30-L

Photo 71 - V2 SWD6-3g - GEC 2020-05-30-ML

Photo 72 - V2 SWD6-3g - GEC 2020-05-30-MR

Photo 73 - V2 SWD6-3 - GEC 2020-05-30-R

Photo 74 - W41 SWD7-2 - GEC 2021-07-24

Photo 75 - W41 SWD7-2 - GEC 2021-07-24

Photo 76 - W41 SWD7-2 Outlet - GEC 2021-07-24


Photo 77 - U1 MAM2-2 (with SWD2-2 Inclusion)
GEC 2018-08-10


Photo 78 - U1 MAM2-2 - GEC 2019-04-06

Photo 79 - U1 MAM2-2 - GEC 2019-06-08

Photo 80 - U1 MAM2-2 (SWD2-2 Inclusion)
GEC 2021-03-25

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# ATTACHMENT B2

## Milton Quarry Extension – Water Management System (WMS) Photographs Taken by GEC and GHD

# Attachment B2:

# Dufferin Aggregates - Milton Quarry Extension

# Water Management System (WMS) Photographs taken by GEC and GHD

Goodban Ecological Consulting Inc. (GEC)

September 2021

Photo 1 – A view of the East Cell driving access and watermain near Wetland V2, immediately after construction in late 2010. Disturbance is generally contained within a 10 m wide zone, but in this area it was restricted to less than 8 m because it is not adjacent to the extraction area and the alignment was through a treed area. The driving accessis generally between 4.0 and 4.5 m wide. The shoulders were treated with 15+ cm of fresh wood chips to curtail the spread of invasive plant species such as Garlic Mustard *(Alliaria petiolata*).
GEC 2010-11-22

Photo 2 – This is a second view of the East Cell driving access and watermain near Wetland V2, taken from the same vantage point as for Photo 1. Note how woody and herbaceous plants have become established within the previously disturbed area. The lightly travelled access is essentially a *driving trail* that is 3.0 to 4.0 m wide in this area.
GEC 2018-07-29

Photo 3 – A view of the East Cell watermain and driving access. In areas where the alignment crossed through old field areas, the shoulder and safety berm (on the right side of the access in this photo) were seeded with a standard MTO seed mix. The extraction area is off to the right.
GEC 2018-08-26

Photo 4 – Traffic on the driving access is very light, typically limited to monitoring access, WMS operation and upgrades. Post-extraction and after lake-filling, traffic will be even lighter.
GEC 2018-08-26

Photo 5 – View of a typical Control Valve (CV) Hut. Vegetation becomes re-established around the huts relatively quickly.
GEC 2018-08-26

Photo 6 – Side view of typical Control Valve (CV) Hut.
GEC 2017-08-25

Photo 7 – View showing recently buried feeder lines leading to Recharge Wells RW203C, RW203D, RW204C and RW204D, closer to Sixth Line. GEC 2012-10-09

Photo 8 – Second view showing recently buried feeder lines leading to Recharge Wells RW203C, RW203D, RW204C and RW204D, closer to Sixth Line. GEC 2012-10-09

Photo 9 - View showing recently buried feeder lines leading to Recharge Wells RW203C, RW203D, RW204C and RW204D, with a 15-20 cm deep layer of fresh wood chips.
GEC - 2013-05-04

Photo 10 – View showing the same area, almost 6 years after the feeder lines were buried. GEC 2018-08-26

Photo 11 – View showing area where feeder lines were buried 6 years earlier. GEC 2018-08-26

Photo 12 – View showing area where feeder lines were buried 5 years earlier. GHD 2017-09-07

Photo 13 – View showing the buried feeder line to Recharge Well RW317D, after backfilling.  Extra feeder lines are typically buried at the same time; if additional recharge wells are subsequently required then less trenching will be necessary. GHD 2012-11-14

Photo 14 – This is the same view of buried feeder lines to Recharge Well RW317D, after restoration.  The 15 to 20 cm deep layer of wood chips helps to prevent the establishment and spread of invasive groundcover species such as Garlic Mustard (*Alliaria petiolata*).  GHD 2012-11-30

Photo 15 – View of buried feeder lines leading to the RW317 series of recharge wells.  GEC 2012-05-31

Photo 16 – View showing the feeder line leading to Recharge Well RW207A.  This well was connected in 2009, which is 5 years prior to this photo being taken.  GHD 2014-05-21

Photo 17 – View of buried feeder line leading to Recharge Well RW206C. GEC 2012-10-13

Photo 18 – View of buried feeder line leading to Recharge Well RW206C. This photo was taken 5 years after the feeder line was installed. Note the woody debris and native ground flora along the feeder line alignment. GHD 2014-05-21

Photo 19 – View of the feeder line leading to Recharge Well RW201B, taken 5 years after the feeder line was buried in 2009. GHD 2014-05-21

Photo 20 – View of the feeder line leading to Recharge Well RW316B, taken 3 years after the feeder line was buried. Note the woody debris and numerous Sugar Maple seedlings. GHD 2014-05-21

Photo 21 – View of the feeder line leading to Recharge Well RW316C, taken 3 years after the feeder line was buried in 2011. Note the woody debris. GHD 2014-05-21

Photo 22 – View of the feeder line leading to Recharge Well RW316D, taken 3 years after the feeder line was buried in 2011. GHD 2014-05-21

Photo 23 – View of Wetland W7 Diffuse Discharge Inflow, shortly after installation in 2010. GEC 2010-09-30

Photo 24 – View of Wetland W7 Diffuse Discharge Inflow, approximately 4 years after it was installed. Note the patch of Sensitive Fern and other wetland plants that have colonized the feeder line alignment. GEC 2014-09-22

Photo 25 – Close-up view of Sensitive Fern and other wetland plant species that have colonized the feeder line alignment leading to the Wetland W7 Diffuse Discharge Inflow.
GEC 2014-09-22

Photo 26 – View of the feeder line alignment leading to Wetland W7 Diffuse Discharge Inflow, taken 4 years after it was installed in 2010. In the foreground, the feeder line alignment is completely covered with native plant species.
GEC 2014-09-22

Photo 27 – View showing the naturalized condition of Wetland W7 Diffuse Discharge Inflow. GEC 2016-09-25

Photo 28 – View showing Wetland W7 Diffuse Discharge Inflow. Note that the gabion stone used to armour the diffuse discharge is now well-weathered, 7 years after it was installed. GEC 2017-10-01

Photo 29 – View showing Recharge Well RW316C shortly after installation in late 2012. Note the 15-20 cm deep layer of fresh wood chips that were placed on the disturbed area.
GHD 2012-12-21

Photo 30 – View showing Recharge Well RW201A, taken 5 years after installation. Note the regeneration of Sugar Maple, Chokecherry and forest groundcovers. GHD 2014-05-21

Photo 31 – View of Recharge Well 201C, 5 years after installation in 2009. Note the woody debris and regeneration of forest plants. GHD 2014-05-21

Photo 32 – View of Recharge Well RW206B, 5 years after installation in 2009. Note the woody debris and regeneration of Chokecherry, Zig-Zag Goldenrod, sedges, violets and other groundcover species. GHD 2014-05-21

Photo 33 – View of Recharge Well RW207C, taken 5 years after installation in 2009. Note the regeneration of Alternate-leaved Dogwood, Bracken and sedges. GHD 2014-05-21

Photo 34 – View of Recharge Well RW302C, taken 3 years after installation in 2011. GHD 2014-05-21

Photo 35 – View of Recharge Well RW302D, taken 3 years after installation in 2011. GHD 2014-05-21

Photo 36 – View of Recharge Well RW308A, taken 3 years after installation in 2011. Note the woody debris and regeneration of forest plants. GHD 2014-05-21

Photo 37 – View of Recharge Well RW309B, taken 3 years after installation in 2011. Note the woody debris and regeneration of forest plants, especially Chokecherry. GHD 2014-05-21

Photo 38 – View of Recharge Well RW316A, taken 3 years after installation in 2011. Note the extensive regeneration of Sugar Maple. GHD 2014-05-21

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# ATTACHMENT C

## Vascular Plant Checklist

**ATTACHMENT C: VASCULAR PLANT LIST (2018-2021) – MILTON QUARRY EAST EXTENSION (MQEE) – GOODBAN ECOLOGICAL CONSULTING INC.**

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Abies balsamea | Balsam Fir | S5 | | 5 | -3 | | | | | | X | X | | |
| Acer negundo | Manitoba Maple | S5 | | 0 | 0 | X | X | X | X | X | | | X | X |
| Acer rubrum | Red Maple | S5 | | 4 | 0 | | | X | | X | X | X | | |
| Acer saccharinum | Silver Maple | S5 | | 5 | -3 | | | X | | | X | | X | |
| Acer saccharum | Sugar Maple | S5 | | 4 | 3 | X | X | X | | X | | | | X |
| Acer spicatum | Mountain Maple | S5 | | 6 | 3 | | | X | | | X | X | | |
| Acer x freemanii | Swamp Maple (Acer rubrum X Acer saccharinum) | SNA | | 6 | -5 | | X | X | | | X | X | X | |
| Achillea borealis | Woolly Yarrow | S5 | | 0 | 3 | X | X | | | | | | | X |
| Actaea pachypoda | White Baneberry | S5 | | 6 | 5 | | | X | | X | | | | |
| Actaea rubra | Red Baneberry | S5 | | 6 | 3 | | | X | | X | | | | |
| Adiantum pedatum | Northern Maidenhair Fern | S5 | | 7 | 3 | | | X | | X | | | | |
| Aegopodium podagraria | Goutweed | SNA | SE5 | | 0 | X | X | | | X | | | | |
| Agrimonia gryposepala | Hooked Agrimony | S5 | | 2 | 3 | | X | X | | X | | | | |
| Agrostis gigantea | Redtop | SNA | SE5 | | -3 | X | X | | | | | | | X |
| Agrostis stolonifera | Creeping Bentgrass | SNA | SE5 | | -3 | | | X | | | X | | | |
| Alisma triviale | Northern Water-plantain | S5 | | 1 | -5 | | | X | | | X | | | |
| Alliaria petiolata | Garlic Mustard | SNA | SE5 | | 0 | X | X | X | X | X | | | | X |
| Allium tricoccum | Wild Leek | S4 | | 7 | 3 | | | X | | X | | | | |
| Alopecurus pratensis | Meadow Foxtail | SNA | SE5 | | -3 | X | X | | | | | | | X |
| Amaranthus hybridus | Smooth Amaranth | SNA | SE5? | | 5 | X | X | | | | | | | X |
| Amaranthus retroflexus | Redroot Amaranth | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Ambrosia artemisiifolia | Common Ragweed | S5 | | 0 | 3 | X | X | | | | | | | X |
| Amelanchier arborea | Downy Serviceberry | S5 | | 5 | 3 | | | X | | X | | | | |
| Amelanchier laevis | Smooth Serviceberry | S5 | | 5 | 5 | | | X | | X | | | | |
| Amphicarpaea bracteata | American Hog-peanut | S5 | | 4 | 0 | | | X | | X | | | | |
| Anemone quinquefolia | Wood Anemone | S5 | | 7 | 0 | | | X | | X | | | | |
| Anemone virginiana | Tall Anemone | S5 | | 4 | 3 | | | X | | X | | | | |
| Apocynum androsaemifolium | Spreading Dogbane | S5 | | 3 | 5 | | X | | | | | | | X |

**ATTACHMENT C: VASCULAR PLANT LIST (2018-2021) – MILTON QUARRY EAST EXTENSION (MQEE) – GOODBAN ECOLOGICAL CONSULTING INC.**

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Apocynum cannabinum | Hemp Dogbane | S5 | | 3 | 0 | | | X | X | | | | | |
| Aquilegia canadensis | Red Columbine | S5 | | 5 | 3 | | | X | | X | | | | |
| Arctium lappa | Great Burdock | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Arctium minus | Common Burdock | SNA | SE5 | | 3 | X | X | | X | | | | | X |
| Arisaema triphyllum | Jack-in-the-pulpit | S5 | | 5 | -3 | | | X | | X | | | | |
| Asarum canadense | Canada Wild-ginger | S5 | | 6 | 5 | | | X | | X | | | | |
| Asclepias exaltata | Poke Milkweed | S4 | | 8 | 5 | | | X | | X | | | | |
| Asclepias incarnata | Swamp Milkweed | S5 | | 6 | -5 | | | X | | | X | X | | |
| Asclepias syriaca | Common Milkweed | S5 | | 0 | 5 | X | X | | X | | | | | X |
| Asparagus officinalis | Garden Asparagus | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Asplenium rhizophyllum | Walking Fern | S4 | | 9 | 5 | | | X | | X | | | | |
| Asplenium trichomanes ssp. quadrivalens | Limestone Maidenhair Spleenwort | S4 | | 8 | 5 | | | X | | X | | | | |
| Athyrium filix-femina var. angustum | Northeastern Lady Fern | S5 | | 4 | 0 | | | X | | X | X | | | |
| Barbarea vulgaris | Bitter Wintercress | SNA | SE5 | | 0 | X | X | | | | | | | X |
| Berberis vulgaris | Common Barberry | SNA | SE5 | | 3 | | X | | | | | | | X |
| Betula alleghaniensis | Yellow Birch | S5 | | 6 | 0 | | | X | | X | X | X | | |
| Betula papyrifera | Paper Birch | S5 | | 2 | 3 | X | X | X | X | X | X | X | | X |
| Bidens cernua | Nodding Beggarticks | S5 | | 2 | -5 | | X | X | | | X | X | X | |
| Bidens frondosa | Devil's Beggarticks | S5 | | 3 | -3 | | X | X | | | X | X | X | |
| Bidens tripartita | Three-parted Beggarticks | S5 | | 5 | -3 | | | X | | | X | X | | |
| Boehmeria cylindrica | Small-spike False Nettle | S5 | | 4 | -5 | | | X | | | X | X | | |
| Botrypus virginianus | Rattlesnake Fern | S5 | | 5 | 3 | | | X | | X | | | | |
| Brassica nigra | Black Mustard | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Bromus ciliatus | Fringed Brome | S5 | | 6 | -3 | | | X | | | X | X | | |
| Bromus inermis | Smooth Brome | SNA | SE5 | | 5 | X | X | | X | | | | | X |
| Bromus tectorum | Downy Brome | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Calamagrostis canadensis | Bluejoint Reedgrass | S5 | | 4 | -5 | | | | X | | X | X | | |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Caltha palustris | Yellow Marsh Marigold | S5 | | 5 | -5 | | | X | | | X | X | | |
| Campanula rapunculoides | Creeping Bellflower | SNA | SE5 | | 5 | X | X | | | X | | | | X |
| Capsella bursa-pastoris | Common Shepherd's Purse | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Cardamine concatenata | Cut-leaved Toothwort | S5 | | 6 | 3 | | | X | | X | | | | |
| Cardamine diphylla | Two-leaved Toothwort | S5 | | 7 | 3 | | | X | | X | | | | |
| Cardamine pensylvanica | Pennsylvania Bittercress | S5 | | 6 | -3 | | | X | | | | X | | |
| Carex albursina | White Bear Sedge | S5 | | 7 | 5 | | | X | | X | | | | |
| Carex arctata | Drooping Woodland Sedge | S5 | | 5 | 5 | | | X | | X | | | | |
| Carex bebbii | Bebb's Sedge | S5 | | 3 | -5 | | | X | | | X | X | X | |
| Carex blanda | Woodland Sedge | S5 | | 3 | 0 | | | X | | X | | | | |
| Carex bromoides | Brome-like Sedge | S5 | | 7 | -3 | | | X | | | X | | | |
| Carex communis | Fibrous-root Sedge | S5 | | 6 | 5 | | | X | | X | | | | |
| Carex comosa | Bearded Sedge | S5 | | 5 | -5 | | | X | | | X | X | | |
| Carex crinita | Fringed Sedge | S5 | | 6 | -5 | | | X | | | X | X | | |
| Carex cristatella | Crested Sedge | S5 | | 3 | -3 | | | X | | | X | | | |
| Carex deweyana | Dewey's Sedge | S5 | | 6 | 3 | | | X | | X | | | | |
| Carex digitalis | Slender Woodland Sedge | S4S5 | | 7 | 5 | | | X | | X | | | | |
| Carex disperma | Two-seeded Sedge | S5 | | 8 | -5 | | | X | | | X | X | | |
| Carex eburnea | Bristle-leaved Sedge | S5 | | 6 | 3 | | | X | | X | | | | |
| Carex flava | Yellow Sedge | S5 | | 5 | -5 | | | X | | | | X | | |
| Carex gracillima | Graceful Sedge | S5 | | 4 | 3 | | | X | X | X | | | | |
| Carex granularis | Limestone Meadow Sedge | S5 | | 3 | -3 | | X | | | | | | | X |
| Carex hitchcockiana | Hitchcock's Sedge | S4S5 | | 6 | 5 | | | X | | X | | | | |
| Carex hystericina | Porcupine Sedge | S5 | | 5 | -5 | | | X | | | X | X | X | |
| Carex interior | Inland Sedge | S5 | | 6 | -5 | | | X | | | X | X | | |
| Carex intumescens | Bladder Sedge | S5 | | 6 | -3 | | | X | | | X | X | | |
| Carex lacustris | Lake Sedge | S5 | | 5 | -5 | | | X | | | X | X | | |
| Carex laxiculmis | Spreading Sedge | S4 | | 7 | 3 | | | X | | X | | | | |
| Carex laxiflora | Loose-flowered Sedge | S5 | | 5 | 0 | | | X | | X | | | | |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carex leptalea | Bristle-stalked Sedge | S5 | | 8 | -5 | | | X | | | X | X | | |
| Carex lupulina | Hop Sedge | S5 | | 6 | -5 | | | X | | | X | X | | |
| Carex peckii | Peck's Sedge | S5 | | 6 | 5 | | | | | X | | | | |
| Carex pedunculata | Long-stalked Sedge | S5 | | 5 | 3 | | | X | | X | | | | |
| Carex pensylvanica | Pennsylvania Sedge | S5 | | 5 | 5 | | X | X | | X | | | | X |
| Carex plantaginea | Plantain-leaved Sedge | S5 | | 7 | 5 | | | X | | X | | | | |
| Carex platyphylla | Broad-leaved Sedge | S4S5 | | 7 | 5 | | | X | | X | | | | |
| Carex pseudocyperus | Cyperus-like Sedge | S5 | | 6 | -5 | | | X | | | X | X | | |
| Carex radiata | Eastern Star Sedge | S5 | | 4 | 0 | | | X | | X | | | | |
| Carex retrorsa | Retrorse Sedge | S5 | | 5 | -5 | | X | X | | | X | | | X |
| Carex rosea | Rosy Sedge | S5 | | 2 | 5 | | | X | | X | | | | |
| Carex scabrata | Eastern Rough Sedge | S5 | | 8 | -5 | | | X | | | X | X | | |
| Carex sparganioides | Burreed Sedge | S4S5 | | 5 | 3 | | | X | | X | | | | |
| Carex spicata | Spiked Sedge | SNA | SE5 | | 3 | | X | | | | | | | X |
| Carex stipata | Awl-fruited Sedge | S5 | | 3 | -5 | | | X | | | X | | | |
| Carex stricta | Tussock Sedge | S5 | | 4 | -5 | | | X | | | X | X | | |
| Carex tribuloides | Blunt Broom Sedge | S4 | | 5 | -3 | | | X | | | X | | | |
| Carex utriculata | Northern Beaked Sedge | S5 | | 7 | -5 | | | X | | | X | X | | |
| Carex vulpinoidea | Fox Sedge | S5 | | 3 | -5 | | X | X | | | X | | X | |
| Carex woodii | Wood's Sedge | S4 | | 6 | 3 | | | X | | X | | | | |
| Carpinus caroliniana | Blue-beech | S5 | | 6 | 0 | | | X | | X | X | | | |
| Carya cordiformis | Bitternut Hickory | S5 | | 6 | 0 | | X | X | | X | | | | X |
| Carya ovata | Shagbark Hickory | S5 | | 6 | 3 | | | X | | X | | | | |
| Caulophyllum giganteum | Giant Blue Cohosh | S5 | | 5 | 5 | | | X | | X | | | | |
| Centaurea jacea | Brown Knapweed | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Centaurea stoebe | Spotted Knapweed | SNA | SE5 | | 5 | | X | | | | | | | X |
| Cerastium fontanum ssp. vulgare | Common Mouse-ear Chickweed | SNA | SE5 | | 3 | | X | X | | X | | | | X |
| Chelidonium majus | Greater Celandine | SNA | SE5 | | 5 | X | X | X | | X | | | | X |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chelone glabra | White Turtlehead | S5 | | 7 | -5 | | | X | | | X | X | | |
| Chenopodium album | Common Lamb's-quarters | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Chrysosplenium americanum | American Golden-saxifrage | S4 | | 8 | -5 | | | X | | | X | | | |
| Cichorium intybus | Wild Chicory | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Cicuta bulbifera | Bulbous Water-hemlock | S5 | | 5 | -5 | | | X | | | X | X | | |
| Cicuta maculata | Spotted Water-hemlock | S5 | | 6 | -5 | | | X | | | X | X | | |
| Cinna arundinacea | Stout Woodreed | S4 | | 7 | -3 | | | X | | | X | | | |
| Circaea alpina | Small Enchanter's Nightshade | S5 | | 6 | -3 | | | | | | | X | | |
| Circaea canadensis ssp. canadensis | Canada Enchanter's Nightshade | S5 | | 2 | 3 | X | X | X | X | X | | | | X |
| Cirsium arvense | Canada Thistle | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Cirsium vulgare | Bull Thistle | SNA | SE5 | | 3 | | X | | | | | | | X |
| Claytonia virginica | Eastern Spring Beauty | S5 | | 5 | 3 | | | X | | X | | | | |
| Clematis virginiana | Virginia Clematis | S5 | | 3 | 0 | X | X | | X | | | | | X |
| Clinopodium vulgare | Wild Basil | S5 | | 4 | 5 | | X | | | | | | | X |
| Convallaria majalis | European Lily-of-the-valley | SNA | SE5 | | 5 | X | X | | | X | | | | X |
| Convolvulus arvensis | Field Bindweed | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Coptis trifolia | Goldthread | S5 | | 7 | -3 | | | X | | | X | X | | |
| Cornus alternifolia | Alternate-leaved Dogwood | S5 | | 6 | 3 | X | X | X | X | X | | | | X |
| Cornus obliqua | Silky Dogwood | S5 | | 2 | -3 | | | X | | | X | X | | |
| Cornus racemosa | Grey Dogwood | S5 | | 2 | 0 | X | X | | | | | | | X |
| Cornus rugosa | Round-leaved Dogwood | S5 | | 6 | 5 | | X | X | | X | | | | X |
| Cornus sericea | Red-osier Dogwood | S5 | | 2 | -3 | X | X | X | X | | X | X | X | X |
| Crataegus coccinea | Scarlet Hawthorn | S5 | | 4 | 5 | | X | | | | | | | X |
| Crataegus monogyna | English Hawthorn | SNA | SE4 | | 3 | X | X | | | | | | | X |
| Crataegus pruinosa | Frosted Hawthorn | S5 | | 4 | 5 | | X | | | | | | | X |
| Crataegus punctata | Dotted Hawthorn | S5 | | 4 | 5 | X | X | | | | | | | X |
| Crepis tectorum | Narrow-leaved Hawksbeard | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Cryptogramma stelleri | Steller’s Rockbrake | S4 | | 10 | 3 | | | X | | X | | | | |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cypripedium parviflorum | Yellow Lady's-slipper | S5 | | 5 | 0 | | | X | | | X | X | | |
| Cystopteris bulbifera | Bulblet Bladder Fern | S5 | | 5 | -3 | | | X | | X | X | X | | |
| Cystopteris tenuis | Mackay's Brittle Fern | S4 | | 6 | 5 | | | X | | X | | | | |
| Dactylis glomerata | Orchard Grass | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Danthonia spicata | Poverty Oatgrass | S5 | | 5 | 5 | | X | | | | | | | X |
| Daucus carota | Wild Carrot | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Dianthus armeria | Deptford Pink | SNA | SE5 | | 5 | X | X | X | X | X | | | | X |
| Dicentra canadensis | Squirrel-corn | S5 | | 7 | 5 | | | X | | X | | | | |
| Dichanthelium implicatum | Slender-stemmed Panicgrass | S5 | | 3 | 0 | | X | | | | | | | X |
| Diervilla lonicera | Northern Bush-honeysuckle | S5 | | 5 | 5 | | | X | | X | | | | |
| Digitaria sanguinalis | Hairy Crabgrass | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Dipsacus fullonum | Common Teasel | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Dirca palustris | Eastern Leatherwood | S4 | | 7 | 0 | | | X | | X | | | | |
| Dryopteris carthusiana | Spinulose Wood Fern | S5 | | 5 | -3 | | | X | | X | | | | |
| Dryopteris clintoniana | Clinton's Wood Fern | S4 | | 7 | -3 | | | X | | | X | X | | |
| Dryopteris cristata | Crested Wood Fern | S5 | | 7 | -5 | | | X | | | X | X | | |
| Dryopteris intermedia | Evergreen Wood Fern | S5 | | 5 | 0 | | | X | | X | | | | |
| Dryopteris marginalis | Marginal Wood Fern | S5 | | 5 | 3 | | | X | | X | | | | |
| Echinochloa crus-galli | Large Barnyard Grass | SNA | SE5 | | -3 | X | X | | | | | | | X |
| Echinocystis lobata | Wild Cucumber | S5 | | 3 | -3 | X | X | | X | | | | | X |
| Echium vulgare | Common Viper's Bugloss | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Elaeagnus angustifolia | Russian Olive | SNA | SE3 | | 3 | | X | | | | | | | X |
| Eleocharis erythropoda | Red-stemmed Spikerush | S5 | | 4 | -5 | | | X | | | X | X | | |
| Eleocharis obtusa | Blunt Spikerush | S5 | | 5 | -5 | | | | | | | X | | |
| Elymus hystrix | Bottlebrush Grass | S5 | | 5 | 5 | | | X | | X | | | | |
| Elymus repens | Quackgrass | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Elymus virginicus | Virginia Wildrye | S5 | | 5 | -3 | | | X | | X | X | | | |
| Endotropis alnifolia | Alder-leaved Buckthorn | S5 | | 7 | -5 | | | X | | | X | X | | |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Epilobium ciliatum ssp. ciliatum var. ciliatum | Northern Willowherb | S5 | | 3 | -3 | | | X | | | X | | | |
| Epilobium coloratum | Purple-veined Willowherb | S5 | | 3 | -5 | | | X | | | X | | | |
| Epipactis helleborine | Broad-leaved Helleborine | SNA | SE5 | | 3 | X | X | X | X | X | | | | X |
| Equisetum arvense | Field Horsetail | S5 | | 0 | 0 | X | X | X | X | X | X | X | X | X |
| Equisetum pratense | Meadow Horsetail | S5 | | 8 | -3 | | | X | | | X | | | |
| Equisetum scirpoides | Dwarf Scouring-rush | S5 | | 7 | 0 | | | X | | | X | X | | |
| Equisetum sylvaticum | Woodland Horsetail | S5 | | 7 | -3 | | | X | | | X | X | | |
| Eragrostis cilianensis | Stinkgrass | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Erigeron annuus | Annual Fleabane | S5 | | 0 | 3 | X | X | | | | | | | X |
| Erigeron canadensis | Canada Horseweed | S5 | | 0 | 3 | X | X | | | | | | | X |
| Erigeron philadelphicus var. philadelphicus | Philadelphia Fleabane | S5 | | 1 | -3 | X | X | | | | | | | X |
| Erysimum cheiranthoides | Wormseed Wallflower | S5? | | | 3 | X | X | | | | | | | X |
| Erythronium americanum ssp. americanum | Yellow Trout-lily | S5 | | 5 | 5 | | | X | | X | | | | |
| Euonymus obovatus | Running Strawberry-bush | S4 | | 6 | 5 | | | X | | X | | | | |
| Eupatorium perfoliatum | Common Boneset | S5 | | 2 | -3 | | | X | | | X | X | | |
| Euphorbia cyparissias | Cypress Spurge | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Eurybia macrophylla | Large-leaved Aster | S5 | | 5 | 5 | | | X | | X | | | | |
| Euthamia graminifolia | Grass-leaved Goldenrod | S5 | | 2 | 0 | | X | X | | | X | | | X |
| Eutrochium maculatum | Spotted Joe Pye Weed | S5 | | 3 | -5 | | | X | | | X | X | | |
| Fagus grandifolia | American Beech | S4 | | 6 | 3 | | | X | | X | | | | |
| Fallopia convolvulus | Eurasian Black Bindweed | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Festuca rubra | Red Fescue | S5 | | | 3 | X | X | | | | | | | X |
| Fragaria vesca | Woodland Strawberry | S5 | | 4 | 3 | X | X | X | X | X | | | | X |
| Fragaria virginiana | Wild Strawberry | S5 | | 2 | 3 | | X | X | | | | | | X |
| Fraxinus americana | White Ash | S4 | | 4 | 3 | X | X | X | X | X | | | | X |
| Fraxinus nigra | Black Ash | S4 | | 7 | -3 | | | X | | | X | X | | |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fraxinus pennsylvanica | Red Ash | S4 | | 3 | -3 | X | X | X | X | | X | X | X | X |
| Galeopsis tetrahit | Common Hemp-nettle | SNA | SE | | 3 | X | X | | | | | | | X |
| Galium aparine | Common Bedstraw | S5 | | 4 | 3 | | | X | | X | | | | |
| Galium asprellum | Rough Bedstraw | S5 | | 6 | -5 | | | X | | | X | X | | |
| Galium mollugo | Smooth Bedstraw | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Galium palustre | Common Marsh Bedstraw | S5 | | 5 | -5 | | | X | | | X | X | | |
| Galium triflorum | Three-flowered Bedstraw | S5 | | 4 | 3 | | | X | | X | | | | |
| Geranium maculatum | Spotted Geranium | S5 | | 6 | 3 | | | X | | X | | | | |
| Geranium robertianum | Herb-Robert | S5 | | 2 | 3 | X | X | X | X | X | | | | X |
| Geum aleppicum | Yellow Avens | S5 | | 2 | 0 | | | X | | | X | | | |
| Geum canadense | Canada Avens | S5 | | 3 | 0 | | | X | | X | X | | | |
| Geum fragarioides | Barren Strawberry | S5 | | 5 | 5 | | | X | | X | | | | |
| Geum urbanum | Wood Avens | SNA | SE3 | | 5 | X | X | X | X | X | | | | X |
| Glyceria grandis | Tall Mannagrass | S5 | | 5 | -5 | | | X | | | X | | | |
| Glyceria septentrionalis var. septentrionalis | Eastern Mannagrass | S4 | | 7 | -5 | | | X | | | X | | | |
| Glyceria striata | Fowl Mannagrass | S5 | | 3 | -5 | | | X | | | X | X | | |
| Gymnocarpium dryopteris | Common Oak Fern | S5 | | 7 | 3 | | | X | | X | | | | |
| Hackelia virginiana | Virginia Stickseed | S5 | | 5 | 3 | | | X | | X | | | | |
| Hemerocallis fulva | Orange Daylily | SNA | SE5 | | 5 | X | X | | | X | | | | |
| Hepatica acutiloba | Sharp-lobed Hepatica | S5 | | 8 | 5 | | | X | | X | | | | |
| Hesperis matronalis | Dame's Rocket | SNA | SE5 | | 3 | X | X | X | X | X | | | | X |
| Hordeum jubatum | Foxtail Barley | S5? | | 0 | 0 | X | X | | | | | | | X |
| Hydrocotyle americana | American Water Pennywort | S4S5 | | 7 | -5 | | | X | | | X | | | |
| Hydrophyllum canadense | Bluntleaf Waterleaf | S4 | | 8 | 0 | | | X | | X | | | | |
| Hydrophyllum virginianum | Virginia Waterleaf | S5 | | 6 | 0 | X | X | X | | X | | | | X |
| Hypericum perforatum | Common St. John's-wort | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Hypericum punctatum | Spotted St. John's-wort | S5 | | 5 | 0 | | | X | | | X | | | |
| Ilex verticillata | Common Winterberry | S5 | | 5 | -3 | | | X | | | X | | | |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Impatiens capensis | Spotted Jewelweed | S5 | | 4 | -3 | X | | X | | X | X | X | X | |
| Impatiens pallida | Pale Jewelweed | S4 | | 7 | -3 | | | X | | X | X | | | |
| Inula helenium | Elecampane | SNA | SE5 | | 3 | | X | | | | | | | X |
| Iris versicolor | Harlequin Blue Flag | S5 | | 5 | -5 | | | X | | | X | X | | |
| Juglans cinerea | Butternut | S2? | | 6 | 3 | | | X | | X | | | | X |
| Juglans nigra | Black Walnut | S4? | | 5 | 3 | X | X | | | | | | | X |
| Juncus bufonius | Toad Rush | S5 | | 1 | -3 | | | X | | X | | | | |
| Juncus dudleyi | Dudley's Rush | S5 | | 1 | -3 | | | X | | | X | | | X |
| Juncus effusus | Soft Rush | S5 | | 4 | -5 | | | X | | | X | X | | |
| Juncus tenuis | Path Rush | S5 | | 0 | 0 | | | X | | X | | | | |
| Juniperus virginiana | Eastern Red Cedar | S5 | | 4 | 3 | | X | | | | | | | X |
| Lactuca serriola | Prickly Lettuce | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Laportea canadensis | Canada Wood Nettle | S5 | | 6 | -3 | | | X | | | X | X | | |
| Lapsana communis | Common Nipplewort | SNA | SE5 | | 3 | | X | X | | X | | | | X |
| Larix decidua | European Larch | SNA | SE2 | | 5 | | | X | | | | | | X |
| Leersia oryzoides | Rice Cutgrass | S5 | | 3 | -5 | | | X | | | X | X | | |
| Lemna minor | Small Duckweed | S5 | | 5 | -5 | | | X | | | X | X | | |
| Lemna trisulca | Star Duckweed | S5 | | 6 | -5 | | | X | | | X | | | |
| Leonurus cardiaca ssp. cardiaca | Common Motherwort | SNA | SE5 | | 5 | X | X | X | X | X | | | | X |
| Lepidium campestre | Field Peppergrass | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Lepidium densiflorum | Common Peppergrass | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Leucanthemum vulgare | Oxeye Daisy | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Ligustrum vulgare | European Privet | SNA | SE5 | | 3 | X | X | | | X | | | | |
| Lilium michiganense | Michigan Lily | S4 | | 7 | -3 | | | X | | | X | | | |
| Linaria vulgaris | Butter-and-eggs | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Lindera benzoin | Northern Spicebush | S4 | | 6 | -3 | | | X | | X | | | | |
| Liparis loeselii | Loesel's Twayblade | S4S5 | | 5 | -3 | | | X | | | | X | | |
| Lithospermum officinale | European Gromwell | SNA | SE5 | | 5 | | X | | | | | | | X |

ATTACHMENT C: VASCULAR PLANT LIST (2018-2021) – MILTON QUARRY EAST EXTENSION (MQEE) – GOODBAN ECOLOGICAL CONSULTING INC.

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lobelia cardinalis | Cardinal Flower | S5 | | 7 | -5 | | | X | | | X | X | | |
| Lobelia inflata | Indian-tobacco | S5 | | 3 | 3 | | | X | | X | | | | |
| Lobelia siphilitica | Great Blue Lobelia | S5 | | 6 | -3 | | | X | | | X | X | | |
| Lolium arundinaceum | Tall Ryegrass | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Lolium perenne | Perennial Ryegrass | SNA | SE4 | | 3 | X | X | | | | | | | X |
| Lonicera canadensis | Canada Fly Honeysuckle | S5 | | 6 | 3 | | | X | | X | | X | | |
| Lonicera dioica | Limber Honeysuckle | S5 | | 5 | 3 | | | X | | X | | | | |
| Lonicera tatarica | Tatarian Honeysuckle | SNA | SE5 | | 3 | | X | X | X | X | | | | X |
| Lotus corniculatus | Garden Bird's-foot Trefoil | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Luzula acuminata | Hairy Woodrush | S5 | | 6 | 3 | | | X | | X | | | | |
| Luzula multiflora | Many-flowered Woodrush | S5 | | 6 | 3 | | | X | | X | | | | |
| Lycopus americanus | American Water-horehound | S5 | | 4 | -5 | | | X | | | X | X | | |
| Lycopus uniflorus | Northern Water-horehound | S5 | | 5 | -5 | | | X | | | X | X | | |
| Lysimachia ciliata | Fringed Yellow Loosestrife | S5 | | 4 | -3 | | | X | | | X | X | | |
| Lysimachia thyrsiflora | Tufted Yellow Loosestrife | S5 | | 7 | -5 | | | X | | | | X | | |
| Lythrum salicaria | Purple Loosestrife | SNA | SE5 | | -5 | | X | X | | | X | | | X |
| Maianthemum canadense | Wild Lily-of-the-valley | S5 | | 5 | 3 | | | X | | X | | | | |
| Maianthemum racemosum | Large False Solomon's Seal | S5 | | 4 | 3 | X | X | X | | X | | | | |
| Maianthemum stellatum | Star-flowered False Solomon's Seal | S5 | | 6 | 0 | | | X | | X | | | | |
| Malus pumila | Common Apple | SNA | SE4 | | 5 | | X | X | X | X | | | | X |
| Matteuccia struthiopteris | Ostrich Fern | S5 | | 5 | 0 | | | X | | X | X | X | | |
| Medeola virginiana | Indian Cucumber-root | S5 | | 8 | 3 | | | X | | X | | | | |
| Medicago lupulina | Black Medick | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Medicago sativa | Alfalfa | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Melilotus albus | White Sweet-clover | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Melilotus officinalis | Yellow Sweet-clover | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Menispermum canadense | Canada Moonseed | S4 | | 7 | 0 | | | X | | X | X | | | |
| Mentha canadensis | Canada Mint | S5 | | 3 | -3 | | | X | | | X | X | | |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mimulus ringens | Square-stemmed Monkeyflower | S5 | | 6 | -5 | | | X | | | X | | | |
| Mitchella repens | Partridgeberry | S5 | | 6 | 3 | | | X | | X | | | | |
| Mitella diphylla | Two-leaved Mitrewort | S5 | | 5 | 3 | | | X | | X | | X | | |
| Mitella nuda | Naked Mitrewort | S5 | | 6 | -3 | | | X | | | | X | | |
| Monarda fistulosa | Wild Bergamot | S5 | | 6 | 3 | | X | | | | | | | X |
| Monotropa uniflora | Indian-pipe | S5 | | 6 | 3 | | | X | | X | | | | |
| Muhlenbergia mexicana var. mexicana | Mexican Muhly | S5 | | 1 | -3 | | | X | | | X | X | | |
| Myosotis laxa | Small Forget-me-not | S5 | | 6 | -5 | | | X | | | X | X | | |
| Nasturtium microphyllum | Small-leaved Watercress | SNA | SE5 | | -5 | | | X | | | X | X | | |
| Nepeta cataria | Catnip | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Oenothera parviflora | Small-flowered Evening-primrose | S5 | | 1 | 3 | | X | | | | | | | X |
| Onoclea sensibilis | Sensitive Fern | S5 | | 4 | -3 | | X | X | | X | X | X | X | |
| Osmorhiza claytonii | Hairy Sweet Cicely | S5 | | 5 | 0 | | | X | | X | | | | |
| Osmundastrum cinnamomeum | Cinnamon Fern | S5 | | 7 | -3 | | | X | | | X | X | | |
| Ostrya virginiana | Eastern Hop-hornbeam | S5 | | 4 | 3 | X | X | X | | X | | | | X |
| Oxalis stricta | Upright Yellow Wood-sorrel | SNA | SE5 | | 3 | X | X | X | X | X | | | | X |
| Panicum capillare | Common Panicgrass | S5 | | 0 | 0 | X | X | | | | | | | X |
| Parthenocissus vitacea | Thicket Creeper | S5 | | 4 | 3 | X | X | X | X | X | X | X | X | X |
| Persicaria amphibia | Water Smartweed | S5 | | 5 | -5 | | | X | | | X | X | | |
| Persicaria hydropiperoides | False Waterpepper | S5 | | 4 | -5 | | | X | | | X | X | | |
| Persicaria lapathifolia | Pale Smartweed | S5 | | 2 | -3 | | | X | | | X | | | |
| Persicaria maculosa | Spotted Lady's-thumb | SNA | SE5 | | -3 | X | X | X | X | X | | | | X |
| Persicaria pensylvanica | Pennsylvania Smartweed | S5 | | 3 | -3 | | | X | | | X | X | | |
| Phalaris arundinacea | Reed Canary Grass | S5 | | 0 | -3 | | X | X | | | X | X | X | X |
| Phleum pratense | Common Timothy | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Phlox divaricata | Wild Blue Phlox | S4 | | 7 | 3 | | | X | | X | | | | |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phragmites australis ssp. australis | European Reed | SNA | SE5 | | -3 | | | X | | | | | | X |
| Phryma leptostachya | Lopseed | S4S5 | | 6 | 3 | | | X | | X | | | | |
| Picea abies | Norway Spruce | SNA | SE3 | | 5 | | X | | | X | | | | X |
| Picea glauca | White Spruce | S5 | | 6 | 3 | | | X | | | | | | X |
| Pilea pumila | Dwarf Clearweed | S5 | | 5 | -3 | | | X | | | X | X | | |
| Pilosella aurantiaca | Orange Hawkweed | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Pilosella officinarum | Mouse-ear Hawkweed | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Pilosella piloselloides | Tall Hawkweed | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Pinus resinosa | Red Pine | S5 | | 8 | 3 | X | X | X | X | | | | | X |
| Pinus strobus | Eastern White Pine | S5 | | 4 | 3 | X | X | X | | X | | X | | X |
| Pinus sylvestris | Scots Pine | SNA | SE5 | | 3 | X | X | X | X | | | | | X |
| Plantago lanceolata | English Plantain | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Plantago major | Common Plantain | SNA | SE5 | | 3 | X | X | X | X | X | | | | X |
| Plantago rugelii | Rugel's Plantain | S5 | | 1 | 0 | | | X | | X | | | | |
| Platanthera hyperborea | Leafy Northern Green Orchid | S4S5 | | | -3 | | | X | | | | X | | |
| Poa annua | Annual Bluegrass | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Poa compressa | Canada Bluegrass | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Poa nemoralis | Eurasian Woodland Bluegrass | SNA | SE4 | | 3 | | X | X | | X | | | | X |
| Poa palustris | Fowl Bluegrass | S5 | | 5 | -3 | | | X | | | X | X | | |
| Poa pratensis | Kentucky Bluegrass | S5 | | 0 | 3 | X | X | | | | | | | X |
| Podophyllum peltatum | May-apple | S5 | | 5 | 3 | X | X | X | X | X | | | | X |
| Polygonatum pubescens | Hairy Solomon's Seal | S5 | | 5 | 5 | | | X | | X | | | | |
| Polygonum aviculare | Prostrate Knotweed | S4? | | 0 | 3 | X | X | | | | | | | X |
| Polypodium virginianum | Rock Polypody | S5 | | 7 | 5 | | | X | | X | | | | |
| Polystichum acrostichoides | Christmas Fern | S5 | | 5 | 3 | | | X | | X | | | | |
| Populus balsamifera | Balsam Poplar | S5 | | 4 | -3 | | | X | | X | | | | |
| Populus grandidentata | Large-toothed Aspen | S5 | | 5 | 5 | | X | X | | X | | | | X |
| Populus tremuloides | Trembling Aspen | S5 | | 2 | 0 | X | X | X | X | X | X | | | X |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Populus x canadensis | (Populus deltoides X Populus nigra) | SNA | | | | X | X | | X | | | | | X |
| Potentilla norvegica | Rough Cinquefoil | S5 | | 0 | 0 | | X | | | | | | | X |
| Potentilla recta | Sulphur Cinquefoil | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Prunella vulgaris ssp. lanceolata | Lance-leaved Self-heal | S5 | | 0 | 0 | X | X | X | X | X | X | X | X | |
| Prunus pensylvanica | Pin Cherry | S5 | | 3 | 3 | | X | | | | | | | X |
| Prunus serotina | Black Cherry | S5 | | 3 | 3 | X | X | X | | X | | | | X |
| Prunus virginiana | Chokecherry | S5 | | 2 | 3 | X | X | X | X | X | | | | X |
| Pteridium aquilinum | Bracken Fern | S5 | | 2 | 3 | | X | X | | X | | | | X |
| Quercus macrocarpa | Bur Oak | S5 | | 5 | 3 | | X | X | | X | | | | X |
| Quercus rubra | Northern Red Oak | S5 | | 6 | 3 | X | X | X | | X | | | | X |
| Ranunculus abortivus | Kidney-leaved Buttercup | S5 | | 2 | 0 | | | X | | X | X | X | | |
| Ranunculus acris | Common Buttercup | SNA | SE5 | | 0 | X | X | X | | X | | | | X |
| Ranunculus caricetorum | Northern Swamp Buttercup | S5 | | 5 | -5 | | | X | | | X | X | | |
| Ranunculus recurvatus | Hooked Buttercup | S5 | | 4 | -3 | | | X | | | X | X | | |
| Ranunculus sceleratus | Cursed Buttercup | S5 | | 2 | -5 | | X | | | | | | X | |
| Rhus typhina | Staghorn Sumac | S5 | | 1 | 3 | X | X | X | X | X | | | | X |
| Ribes americanum | American Black Currant | S5 | | 4 | -3 | | | X | | | X | | | |
| Ribes cynosbati | Eastern Prickly Gooseberry | S5 | | 4 | 3 | | | X | | X | | | | |
| Ribes rubrum | European Red Currant | SNA | SE5 | | 5 | X | X | X | | X | | | | X |
| Ribes triste | Swamp Red Currant | S5 | | 6 | -5 | | | X | | | X | X | | |
| Rosa blanda | Smooth Rose | S5 | | 3 | 3 | | X | | | | | | | X |
| Rosa multiflora | Multiflora Rose | SNA | SE5 | | 3 | X | X | X | X | X | | | | X |
| Rubus allegheniensis | Allegheny Blackberry | S5 | | 2 | 3 | X | X | X | X | X | | | | X |
| Rubus idaeus ssp. strigosus | North American Red Raspberry | S5 | | 2 | 3 | X | X | X | X | X | X | | X | X |
| Rubus occidentalis | Black Raspberry | S5 | | 2 | 5 | X | X | X | X | X | X | | | |
| Rubus odoratus | Purple-flowering Raspberry | S5 | | 3 | 5 | | | X | | X | | | | |
| Rudbeckia hirta | Black-eyed Susan | S5 | | 0 | 3 | X | X | | | | | | | X |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rumex acetosella | Sheep Sorrel | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Rumex crispus | Curled Dock | SNA | SE5 | | 0 | X | X | X | | | X | | X | X |
| Rumex triangulivalvis | Triangular-valve Dock | S5 | | 0 | 0 | | | X | | | X | X | | |
| Salix amygdaloides | Peach-leaved Willow | S5 | | 6 | -3 | X | X | X | X | | X | | X | X |
| Salix bebbiana | Bebb's Willow | S5 | | 4 | -3 | | X | X | | | X | | X | X |
| Salix discolor | Pussy Willow | S5 | | 3 | -3 | | X | X | | | X | | X | |
| Salix eriocephala | Cottony Willow | S5 | | 4 | -3 | | X | X | | | X | X | X | |
| Salix interior | Sandbar Willow | S5 | | 1 | -3 | | X | | | | | | X | |
| Salix lucida | Shining Willow | S5 | | 5 | -3 | | | X | | | X | | | |
| Salix x fragilis | (Salix alba X Salix euxina) | SNA | SE5? | | -4 | | X | | | | | | X | X |
| Sambucus canadensis | Common Elderberry | S5 | | 5 | -3 | | | X | | | X | X | | |
| Sambucus racemosa | Red Elderberry | S5 | | 5 | 3 | | | X | | X | | | | |
| Sanguinaria canadensis | Bloodroot | S5 | | 5 | 3 | | | X | | X | | | | |
| Sanicula marilandica | Maryland Sanicle | S5 | | 5 | 3 | | | X | | X | | | | |
| Saponaria officinalis | Bouncing-bet | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Schizachne purpurascens | Purple False Melic | S5 | | 6 | 3 | | | X | | X | | | | |
| Schoenoplectus tabernaemontani | Soft-stemmed Bulrush | S5 | | 5 | -5 | | | X | | | X | | | |
| Scirpus atrovirens | Dark-green Bulrush | S5 | | 3 | -5 | | X | X | | | X | X | X | |
| Scirpus cyperinus | Common Woolly Bulrush | S5 | | 4 | -5 | | | X | | | X | X | | |
| Scutellaria galericulata | Marsh Skullcap | S5 | | 6 | -5 | | | X | | | X | X | | |
| Scutellaria lateriflora | Mad-dog Skullcap | S5 | | 5 | -5 | | | X | | | X | X | | |
| Senecio vulgaris | Common Ragwort | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Setaria pumila | Yellow Foxtail | SNA | SE5 | | 0 | X | X | | | | | | | X |
| Setaria viridis | Green Foxtail | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Silene latifolia | White Campion | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Silene vulgaris | Bladder Campion | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Sisymbrium altissimum | Tall Tumble Mustard | SNA | SE5 | | 3 | | X | | | | | | | X |
| Sisymbrium officinale | Common Tumble Mustard | SNA | SE5 | | 5 | X | X | | | | | | | X |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sisyrinchium montanum | Strict Blue-eyed-grass | S5 | | 4 | 0 | | X | | | | | | | X |
| Sium suave | Common Water-parsnip | S5 | | 4 | -5 | | | X | | | X | | | |
| Smilax herbacea | Herbaceous Carrionflower | S4? | | 5 | 0 | | | X | | X | X | | | |
| Smilax tamnoides | Bristly Greenbriar | S5 | | 6 | 0 | | | X | | X | | | | |
| Solanum dulcamara | Climbing Nightshade | SNA | SE5 | | 0 | X | X | X | X | X | X | X | X | X |
| Solidago altissima | Tall Goldenrod | S5 | | 1 | 3 | X | X | X | X | | | | | X |
| Solidago caesia | Blue-stemmed Goldenrod | S5 | | 5 | 3 | | | X | | X | | | | |
| Solidago canadensis | Canada Goldenrod | S5 | | 1 | 3 | X | X | X | | | | | | X |
| Solidago flexicaulis | Zigzag Goldenrod | S5 | | 6 | 3 | X | X | X | | X | | | | |
| Solidago juncea | Early Goldenrod | S5 | | 3 | 5 | | X | | | | | | | X |
| Solidago nemoralis | Grey-stemmed Goldenrod | S5 | | 2 | 5 | X | X | | | | | | | X |
| Solidago patula | Spreading Goldenrod | S4 | | 8 | -5 | | | X | | | | X | | |
| Solidago rugosa | Rough-stemmed Goldenrod | S5 | | 4 | 0 | | | X | | X | X | X | | |
| Sonchus arvensis | Field Sow-thistle | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Sonchus asper | Prickly Sow-thistle | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Sonchus oleraceus | Common Sow-thistle | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Sorbus aucuparia | European Mountain-ash | SNA | SE4 | | 5 | | | X | | X | | | | X |
| Sparganium emersum | Green-fruited Burreed | SU | | 6 | -5 | | | X | | | | X | | |
| Sphenopholis intermedia | Slender Wedgegrass | S4S5 | | 6 | 0 | | | X | | | | X | X | |
| Spiraea alba | White Meadowsweet | S5 | | 3 | -3 | | | X | | | | X | | |
| Streptopus lanceolatus var. lanceolatus | Eastern Rose Twisted-stalk | S5? | | 7 | 3 | | | X | | X | | | | |
| Symphoricarpos albus | Thin-leaved Snowberry | S5 | | 7 | 3 | | | X | | X | | | | |
| Symphyotrichum cordifolium | Heart-leaved Aster | S5 | | 5 | 5 | X | X | X | | X | | | | X |
| Symphyotrichum ericoides | White Heath Aster | S5 | | 4 | 3 | X | X | X | | | | | | X |
| Symphyotrichum lanceolatum | Panicled Aster | S5 | | 3 | -3 | X | X | X | | | X | X | X | |
| Symphyotrichum lateriflorum | Calico Aster | S5 | | 3 | 0 | | | X | | X | | | | |
| Symphyotrichum novae-angliae | New England Aster | S5 | | 2 | -3 | X | X | X | | | | | | X |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Symphyotrichum pilosum | Old Field Aster | S5 | | | 3 | | X | | | | | | | X |
| Symphyotrichum puniceum | Purple-stemmed Aster | S5 | | 6 | -5 | | | X | | | X | X | | |
| Symphyotrichum urophyllum | Arrow-leaved Aster | S4 | | 6 | 5 | | | X | | X | | | | X |
| Symplocarpus foetidus | Eastern Skunk Cabbage | S5 | | 7 | -5 | | | X | | | X | | | |
| Syringa vulgaris | Common Lilac | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Tanacetum vulgare | Common Tansy | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Taraxacum officinale | Common Dandelion | SNA | SE5 | | 3 | X | X | X | | X | | | | X |
| Thalictrum dioicum | Early Meadow-rue | S5 | | 6 | 3 | | | X | | X | | | | |
| Thalictrum pubescens | Tall Meadow-rue | S5 | | 5 | -3 | | | X | | | X | X | | |
| Thelypteris palustris | Marsh Fern | S5 | | 5 | -3 | | | X | | | X | X | X | |
| Thlaspi arvense | Field Pennycress | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Tiarella cordifolia | Heart-leaved Foamflower | S5 | | 6 | 3 | | | X | | X | X | X | | |
| Tilia americana | Basswood | S5 | | 4 | 3 | X | X | X | | X | X | | | X |
| Toxicodendron radicans var. radicans | Eastern Poison Ivy | S5 | | 2 | 0 | | | X | | X | | | | |
| Toxicodendron radicans var. rydbergii | Western Poison Ivy | S5 | | 2 | 0 | X | X | X | | X | X | X | | X |
| Tragopogon dubius | Yellow Goatsbeard | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Tragopogon pratensis | Meadow Goatsbeard | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Trifolium hybridum | Alsike Clover | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Trifolium pratense | Red Clover | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Trifolium repens | White Clover | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Trillium erectum | Red Trillium | S5 | | 6 | 3 | | | X | | X | | | | |
| Trillium grandiflorum | White Trillium | S5 | | 5 | 3 | X | X | X | | X | | | | |
| Triosteum aurantiacum | Orange-fruit Horse-gentian | S4S5 | | 7 | 5 | | | X | | X | | | | |
| Tsuga canadensis | Eastern Hemlock | S5 | | 7 | 3 | | | X | | X | X | X | | |
| Tussilago farfara | Coltsfoot | SNA | SE5 | | 3 | X | X | X | X | X | X | X | X | X |
| Typha angustifolia | Narrow-leaved Cattail | SNA | SE5 | | -5 | | X | X | | X | X | | X | |
| Typha latifolia | Broad-leaved Cattail | S5 | | 1 | -5 | | X | X | | X | X | | X | |

| Scientific Name | Common Name | S-Rank | Exotic Status | CC | CW | Ext. Area | Lic. Area | Adj. Land | FOM | FOD | SWD | SWM | MAM | CU |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ulmus americana | White Elm | S5 | | 3 | -3 | X | X | X | X | X | X | X | X | X |
| Ulmus rubra | Slippery Elm | S5 | | 6 | 0 | | | X | | X | | | | |
| Urtica gracilis | Slender Stinging Nettle | S5 | | | | | | X | | | X | | | |
| Verbascum blattaria | Moth Mullein | SNA | SE5 | | 3 | X | X | | | | | | | X |
| Verbascum thapsus | Common Mullein | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Verbena hastata | Blue Vervain | S5 | | 4 | -3 | | X | | | | X | | X | |
| Verbena urticifolia | White Vervain | S5 | | 4 | 0 | X | X | | | | | | | X |
| Veronica arvensis | Corn Speedwell | SNA | SE5 | | 5 | | X | | | | | | | X |
| Veronica officinalis | Common Speedwell | SNA | SE5 | | 5 | | X | X | | X | | | | |
| Veronica serpyllifolia | Thyme-leaved Speedwell | SU | | | 0 | | X | | | | | | | X |
| Viburnum acerifolium | Maple-leaved Viburnum | S5 | | 6 | 5 | | | X | | X | | | | |
| Viburnum lentago | Nannyberry | S5 | | 4 | 0 | | | X | | | X | | | X |
| Viburnum opulus var. americanum | Highbush Cranberry | S5 | | 5 | -3 | | X | | | | | | | X |
| Vicia cracca | Tufted Vetch | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Vicia tetrasperma | Four-seed Vetch | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Vinca minor | Lesser Periwinkle | SNA | SE5 | | 5 | X | X | | | | | | | X |
| Vincetoxicum rossicum | European Swallowwort | SNA | SE5 | | 5 | | X | X | | | | | | |
| Viola blanda | Sweet White Violet | S5 | | 6 | -3 | | | | | | | X | | |
| Viola canadensis | Canada Violet | S5 | | 6 | 3 | | | X | | X | | | | |
| Viola cucullata | Marsh Blue Violet | S5 | | 5 | -5 | | | X | | | X | X | | |
| Viola pubescens | Yellow Violet | S5 | | 5 | 3 | | | X | | X | | | | |
| Viola rostrata | Long-spurred Violet | S5 | | 6 | 3 | | | X | | X | | | | |
| Viola sororia | Woolly Blue Violet | S5 | | 4 | 0 | X | X | X | | X | | | | |
| Vitis riparia | Riverbank Grape | S5 | | 0 | 0 | X | X | X | | X | X | | | X |

## PLANT LIST NOTES:

### Taxonomy and Nomenclature

The taxonomy and nomenclature used in this list generally follows that used by the Ontario Natural Heritage Information Centre (NHIC).

### Table Column Information

| | |
|---|---|
| S-Rank | Provincial (subnational) conservation status rank assigned by NHIC; S1 to S5 based on decreasing level of conservation concern. |
| Exotic Status | Provincial (provincial) exotic status rank assigned by NHIC, SE1 to SE5 based on increasing abundance. |
| SNA | S-Rank not available/applicable. |
| CC | Coefficient of Conservatism (Oldham et al. 1995). |
| CW | Coefficient of Wetness (Oldham et al. 1995). |
| Ext. Area | Extraction Area |
| Lic. Area | Licence Area |
| Adj. Land | Adjacent Land |
| Habitat Type: | FOM Mixed Forest |
| | FOD Deciduous Forest |
| | SWD Deciduous Swamp |
| | SWM Mixed Swamp |
| | MAM Meadow Marsh |
| | CU Cultural (Woodland, Thicket, Meadow, Conifer Plantation, Hedgerow) |

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# ATTACHMENT D

## Point Count Data – 2019 and 2020 Breeding Bird Surveys

**ATTACHMENT D: POINT COUNT DATA – 2019 AND 2020 BREEDING BIRD SURVEYS**

**POINT COUNT STATION F1 2019**

June 8 2019

| Species | <100m | >100m |
|---|---|---|
| AMERICAN REDSTART | 0 | 2 |
| BALTIMORE ORIOLE | 1 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLUE-WINGED WARBLER | 1 | 0 |
| EASTERN WOOD PEWEE | 0 | 1 |
| RED-EYED VIREO | 1 | 1 |
| SAVANNAH SPARROW | 1 | 0 |
| SONG SPARROW | 0 | 1 |
| WARBLING VIREO | 1 | 0 |

June 16 2019

| Species | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 1 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLACK-THROATED BLUE WARBLER | 0 | 1 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN WOOD PEWEE | 1 | 1 |
| FIELD SPARROW | 0 | 1 |
| NORTHERN FLICKER | 1 | 0 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| WARBLING VIREO | 1 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

June 30 2019

| Species | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN REDSTART | 1 | 0 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLUE-WINGED WARBLER | 1 | 0 |
| CHESTNUT-SIDED WARBLER | 0 | 1 |
| COMMON GRACKLE | 0 | 1 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN KINGBIRD | 2 | 0 |
| FIELD SPARROW | 0 | 1 |
| GRAY CATBIRD | 0 | 1 |
| GREAT BLUE HERON | 0 | 1 |
| INDIGO BUNTING | 0 | 2 |
| MOURNING DOVE | 2 | 0 |
| RED-EYED VIREO | 1 | 0 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| SONG SPARROW | 1 | 1 |
| TURKEY VULTURE | 0 | 2 |

**POINT COUNT STATION F1 2020**

May 31 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN REDSTART | 1 | 0 |
| AMERICAN ROBIN | 1 | 2 |
| COMMON YELLOWTHROAT | 0 | 2 |
| FIELD SPARROW | 0 | 1 |
| GRAY CATBIRD | 1 | 1 |
| GREAT-CRESTED FLYCATCHER | 1 | 0 |
| INDIGO BUNTING | 0 | 1 |
| NORTHERN CARDINAL | 0 | 1 |
| RED-BELLIED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 1 | 2 |
| RED-WINGED BLACKBIRD | 0 | 2 |
| WARBLING VIREO | 1 | 1 |
| WOOD THRUSH | 0 | 1 |
| YELLOW WARBLER | 0 | 2 |

June 7 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 3 | 0 |
| AMERICAN ROBIN | 0 | 2 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLUE JAY | 0 | 1 |
| BLUE-WINGED WARBLER | 1 | 1 |
| CEDAR WAXWING | 0 | 2 |
| COMMON RAVEN | 0 | 1 |
| COMMON YELLOWTHROAT | 1 | 1 |
| EASTERN MEADOWLARK | 0 | 1 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| FIELD SPARROW | 2 | 0 |
| GRAY CATBIRD | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| MALLARD | 0 | 1 |
| MOURNING WARBLER | 1 | 0 |
| NORTHERN FLICKER | 0 | 1 |
| RED-EYED VIREO | 1 | 0 |
| SONG SPARROW | 0 | 1 |
| WARBLING VIREO | 1 | 1 |

June 28 2020

| Species | <100m | >100m |
|---|---|---|
| BARN SWALLOW | 0 | 0 |
| BLUE JAY | 0 | 1 |
| CEDAR WAXWING | 2 | 0 |
| EASTERN WOOD-PEWEE | 0 | 1 |
| FIELD SPARROW | 1 | 1 |
| INDIGO BUNTING | 1 | 0 |
| NORTHERN CARDINAL | 0 | 1 |
| RED-EYED VIREO | 1 | 3 |
| RED-WINGED BLACKBIRD | 2 | 1 |
| SONG SPARROW | 1 | 1 |
| WARBLING VIREO | 1 | 1 |
| WOOD THRUSH | 0 | 1 |
| YELLOW WARBLER | 1 | 0 |

**POINT COUNT STATION F2 2019**

June 8 2019

| Species | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN GOLDFINCH | 1 | 2 |
| BALTIMORE ORIOLE | 1 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BOBOLINK | 1 | 1 |
| COMMON GRACKLE | 1 | 0 |
| EASTERN KINGBIRD | 1 | 1 |
| EASTERN WOOD PEWEE | 0 | 1 |
| EUROPEAN STARLING | 2 | 0 |
| FIELD SPARROW | 0 | 1 |
| GREAT CRESTED FLYCATCHER | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| RED-WINGED BLACKBIRD | 0 | 3 |
| SONG SPARROW | 1 | 2 |
| TREE SWALLOW | 0 | 1 |
| WILLOW FLYCATCHER | 0 | 1 |
| YELLOW WARBLER | 0 | 1 |

June 16 2019

| Species | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN GOLDFINCH | 1 | 1 |
| AMERICAN ROBIN | 0 | 2 |
| BALTIMORE ORIOLE | 0 | 1 |
| BOBOLINK | 2 | 1 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN KINGBIRD | 0 | 1 |
| EASTERN MEADOWLARK | 1 | 1 |
| FIELD SPARROW | 0 | 2 |
| INDIGO BUNTING | 0 | 2 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SONG SPARROW | 0 | 1 |
| TURKEY VULTURE | 0 | 1 |

June 30 2019

| Species | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 1 | 0 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| CEDAR WAXWING | 2 | 0 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN MEADOWLARK | 1 | 1 |
| EASTERN WOOD PEWEE | 0 | 1 |
| EUROPEAN STARLING | 0 | 2 |
| FIELD SPARROW | 0 | 3 |
| INDIGO BUNTING | 1 | 1 |
| MOURNING DOVE | 0 | 2 |
| NORTHERN FLICKER | 0 | 2 |
| RED-WINGED BLACKBIRD | 0 | 2 |
| SONG SPARROW | 1 | 1 |
| TURKEY VULTURE | 0 | 4 |

**POINT COUNT STATION F2 2020**

May 31 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BLUE JAY | 0 | 1 |
| BLUE-WINGED WARBLER | 0 | 1 |
| COMMON GRACKLE | 0 | 1 |
| COMMON YELLOWTHROAT | 1 | 1 |
| EASTERN KINGBIRD | 1 | 0 |
| EASTERN MEADOWLARK | 0 | 1 |
| FIELD SPARROW | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| RED-EYED VIREO | 0 | 2 |
| RED-WINGED BLACKBIRD | 1 | 1 |
| SAVANNAH SPARROW | 3 | 0 |
| SONG SPARROW | 0 | 2 |
| WILLOW FLYCATCHER | 0 | 1 |
| WOOD THRUSH | 0 | 1 |
| YELLOW WARBLER | 1 | 1 |

June 28 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| CEDAR WAXWING | 1 | 0 |
| COMMON RAVEN | 0 | 1 |
| EASTERN KINGBIRD | 0 | 1 |
| EASTERN MEADOWLARK | 0 | 1 |
| EUROPEAN STARLING | 7 | 0 |
| FIELD SPARROW | 0 | 2 |
| GRAY CATBIRD | 0 | 1 |
| INDIGO BUNTING | 1 | 0 |
| NORTHERN FLICKER | 0 | 2 |
| RED-EYED VIREO | 0 | 3 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| SAVANNAH SPARROW | 3 | 1 |
| SONG SPARROW | 2 | 0 |
| YELLOW WARBLER | 1 | 1 |

June 7 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 2 |
| AMERICAN ROBIN | 0 | 2 |
| BALTIMORE ORIOLE | 0 | 1 |
| BLUE JAY | 0 | 1 |
| COMMON YELLOWTHROAT | 1 | 0 |
| EASTERN MEADOWLARK | 1 | 1 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| PILEATED WOODPECKER | 0 | 1 |
| RED-BELLIED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 0 | 2 |
| RED-WINGED BLACKBIRD | 0 | 3 |
| SAVANNAH SPARROW | 2 | 0 |
| SCARLET TANAGER | 0 | 1 |
| SONG SPARROW | 1 | 0 |
| YELLOW-BILLED CUCKOO | 1 | 0 |

**POINT COUNT STATION F3 2019**

June 8 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 1 | 0 |
| BALTIMORE ORIOLE | 0 | 1 |
| BOBOLINK | 0 | 1 |
| EASTERN KINGBIRD | 0 | 1 |
| EUROPEAN STARLING | 2 | 0 |
| FIELD SPARROW | 1 | 2 |
| GREAT CRESTED FLYCATCHER | 1 | 0 |
| MOURNING WARBLER | 1 | 1 |
| RED-EYED VIREO | 0 | 1 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| SAVANNAH SPARROW | 1 | 1 |
| SONG SPARROW | 1 | 1 |

June 16 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN ROBIN | 0 | 2 |
| BARN SWALLOW | 1 | 0 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BOBOLINK | 0 | 3 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN KINGBIRD | 0 | 1 |
| EASTERN MEADOWLARK | 1 | 2 |
| EUROPEAN STARLING | 1 | 0 |
| FIELD SPARROW | 1 | 2 |
| GRAY CATBIRD | 0 | 1 |
| GREAT CRESTED FLYCATCHER | 0 | 1 |
| HOUSE WREN | 0 | 1 |
| MOURNING DOVE | 0 | 3 |
| RED-WINGED BLACKBIRD | 0 | 3 |
| SAVANNAH SPARROW | 2 | 2 |
| SONG SPARROW | 2 | 1 |
| TURKEY VULTURE | 0 | 1 |

June 30 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 1 | 2 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| CEDAR WAXWING | 2 | 0 |
| EASTERN MEADOWLARK | 0 | 2 |
| EUROPEAN STARLING | 2 | 0 |
| GREAT CRESTED FLYCATCHER | 1 | 0 |
| NORTHERN FLICKER | 0 | 1 |
| SAVANNAH SPARROW | 1 | 0 |
| SONG SPARROW | 0 | 1 |
| TURKEY VULTURE | 0 | 3 |

## POINT COUNT STATION F3 2020

May 31 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 1 | 1 |
| BALTIMORE ORIOLE | 0 | 1 |
| BLUE-WINGED WARBLER | 1 | 0 |
| BOBOLINK | 0 | 1 |
| BROWN THRASHER | 1 | 0 |
| CANADA GOOSE | 0 | 1 |
| COMMON GRACKLE | 2 | 0 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN KINGBIRD | 0 | 1 |
| EASTERN MEADOWLARK | 1 | 1 |
| FIELD SPARROW | 0 | 3 |
| GRASSHOPPER SPARROW | 1 | 0 |
| GRAY CATBIRD | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| HOUSE WREN | 0 | 1 |
| KILLDEER | 0 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| RED-EYED VIREO | 1 | 1 |
| SONG SPARROW | 1 | 0 |
| TURKEY VULTURE | 1 | 0 |
| YELLOW WARBLER | 1 | 1 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

June 7 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BLUE JAY | 0 | 1 |
| CHESTNUT-SIDED WARBLER | 1 | 0 |
| COMMON RAVEN | 0 | 2 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN MEADOWLARK | 1 | 1 |
| EASTERN WOOD-PEWEE | 0 | 1 |
| FIELD SPARROW | 1 | 3 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| MOURNING DOVE | 0 | 1 |
| NORTHERN FLICKER | 0 | 2 |
| PEREGRINE FALCON | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| SONG SPARROW | 0 | 1 |
| YELLOW WARBLER | 1 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

June 28 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN ROBIN | 0 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BROWN THRASHER | 0 | 1 |
| CHESTNUT-SIDED WARBLER | 1 | 0 |
| EASTERN KINGBIRD | 0 | 3 |
| EASTERN MEADOWLARK | 1 | 1 |
| GRAY CATBIRD | 0 | 2 |
| HOUSE WREN | 2 | 1 |
| KILLDEER | 0 | 2 |
| NORTHEN FLICKER | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| SAVANNAH SPARROW | 2 | 0 |
| SONG SPARROW | 1 | 2 |
| WARBLING VIREO | 0 | 1 |

**POINT COUNT STATION F4 2019**

June 8 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 1 | 0 |
| BALTIMORE ORIOLE | 0 | 1 |
| BLUE JAY | 0 | 1 |
| BOBOLINK | 0 | 2 |
| CEDAR WAXWING | 2 | 0 |
| CHESTNUT-SIDED WARBLER | 1 | 1 |
| COMMON GRACKLE | 1 | 0 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN MEADOWLARK | 1 | 1 |
| EUROPEAN STARLING | 0 | 6 |
| HOUSE WREN | 0 | 1 |
| MOURNING DOVE | 0 | 1 |
| RED-WINGED BLACKBIRD | 4 | 1 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SAVANNAH SPARROW | 2 | 0 |
| SCARLET TANAGER | 0 | 1 |
| TURKEY VULTURE | 1 | 4 |

June 16 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 0 | 1 |
| BLUE-WINGED WARBLER | 0 | 2 |
| BOBOLINK | 0 | 1 |
| CEDAR WAXWING | 0 | 3 |
| CHESTNUT-SIDED WARBLER | 0 | 1 |
| EASTERN MEADOWLARK | 1 | 1 |
| EASTERN TOWHEE | 0 | 1 |
| FIELD SPARROW | 0 | 1 |
| GRAY CATBIRD | 0 | 1 |
| MOURNING DOVE | 0 | 1 |
| RED-EYED VIREO | 1 | 1 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SAVANNAH SPARROW | 3 | 1 |
| SONG SPARROW | 1 | 1 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

June 30 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN REDSTART | 0 | 1 |
| CEDAR WAXWING | 1 | 0 |
| EASTERN MEADOWLARK | 2 | 1 |
| FIELD SPARROW | 0 | 2 |
| GRAY CATBIRD | 1 | 0 |
| SAVANNAH SPARROW | 1 | 2 |
| SONG SPARROW | 0 | 1 |

**POINT COUNT STATION F4 2020**

May 31 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN ROBIN | 3 | 1 |
| BALTIMORE ORIOLE | 0 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLUE JAY | 0 | 2 |
| BOBOLINK | 0 | 1 |
| BROWN THRASHER | 0 | 1 |
| COMMON GRACKLE | 1 | 0 |
| COMMON RAVEN | 0 | 1 |
| EASTERN KINGBIRD | 0 | 1 |
| EASTERN MEADOWLARK | 1 | 2 |
| FIELD SPARROW | 0 | 2 |
| MOURNING DOVE | 0 | 1 |
| SAVANNAH SPARROW | 1 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

June 7 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 2 | 3 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLUE JAY | 0 | 1 |
| CEDAR WAXWING | 1 | 0 |
| EASTERN MEADOWLARK | 1 | 1 |
| FIELD SPARROW | 0 | 1 |
| GRASSHOPPER SPARROW | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| NORTHERN FLICKER | 1 | 0 |
| SAVANNAH SPARROW | 1 | 0 |
| WARBLING VIREO | 0 | 1 |
| YELLOW WARBLER | 0 | 1 |

June 28 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN KESTREL | 1 | 0 |
| AMERICAN REDSTART | 0 | 1 |
| AMERICAN ROBIN | 0 | 2 |
| BROWN THRASHER | 1 | 0 |
| EASTERN MEADOWLARK | 2 | 2 |
| FIELD SPARROW | 0 | 1 |
| GRASSHOPPER SPARROW | 1 | 0 |
| GRAY CATBIRD | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| NORTHERN CARDINAL | 0 | 2 |
| NORTHERN FLICKER | 0 | 1 |
| RED-EYED VIREO | 0 | 2 |
| RED-WINGED BLACKBIRD | 0 | 2 |
| ROCK PIGEON | 1 | 0 |
| ROSE-BREASTED GROSBEAK | 0 | 2 |
| SAVANNAH SPARROW | 1 | 0 |
| SONG SPARROW | 1 | 1 |
| TURKEY VULTURE | 0 | 3 |
| WOOD THRUSH | 0 | 1 |
| YELLOW WARBLER | 0 | 2 |
| YELLOW-BILLED CUCKOO | 0 | 1 |
| YELLOW-THROATED VIREO | 0 | 1 |

POINT COUNT STATION F5 2019

June 8 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 1 | 0 |
| BALTIMORE ORIOLE | 1 | 2 |
| BLUE-WINGED WARBLER | 0 | 1 |
| BOBOLINK | 0 | 2 |
| EASTERN KINGBIRD | 2 | 1 |
| EASTERN MEADOWLARK | 0 | 1 |
| GRAY CATBIRD | 0 | 1 |
| RED-EYED VIREO | 1 | 2 |
| RED-WINGED BLACKBIRD | 0 | 3 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SONG SPARROW | 2 | 2 |
| WILLOW FLYCATCHER | 0 | 1 |
| YELLOW WARBLER | 2 | 0 |

June 16 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 0 | 1 |
| BLUE JAY | 0 | 2 |
| BOBOLINK | 1 | 1 |
| EASTERN MEADOWLARK | 0 | 2 |
| FIELD SPARROW | 0 | 1 |
| GREAT CRESTED FLYCATCHER | 0 | 1 |
| MOURNING DOVE | 0 | 1 |
| PILEATED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| RED-WINGED BLACKBIRD | 1 | 2 |
| SONG SPARROW | 2 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

June 30 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 2 | 2 |
| AMERICAN ROBIN | 1 | 2 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BOBOLINK | 1 | 0 |
| CHESTNUT-SIDED WARBLER | 0 | 1 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN MEADOWLARK | 0 | 2 |
| FIELD SPARROW | 0 | 1 |
| MOURNING DOVE | 0 | 2 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SONG SPARROW | 1 | 2 |
| WARBLING VIREO | 0 | 1 |
| YELLOW WARBLER | 3 | 0 |

**POINT COUNT STATION F5 2020**

May 31 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 3 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BALTIMORE ORIOLE | 0 | 1 |
| BLACK-BILLED CUCKOO | 0 | 2 |
| BLUE JAY | 0 | 1 |
| BOBOLINK | 0 | 1 |
| BROWN THRASHER | 1 | 1 |
| BROWN-HEADED COWBIRD | 1 | 0 |
| CANADA GOOSE | 0 | 1 |
| COMMON RAVEN | 0 | 1 |
| COMMON YELLOWTHROAT | 2 | 1 |
| FIELD SPARROW | 0 | 2 |
| GRAY CATBIRD | 0 | 1 |
| PILEATED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| SAVANNAH SPARROW | 0 | 1 |
| SONG SPARROW | 1 | 0 |
| WILD TURKEY | 0 | 1 |
| WILLOW FLYCATCHER | 0 | 1 |
| YELLOW WARBLER | 1 | 1 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

June 7 2020

| Species | <100m | >100m |
|---|---|---|
| ALDER FLYCATCHER | 1 | 2 |
| AMERICAN CROW | 0 | 3 |
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN REDSTART | 0 | 1 |
| AMERICAN ROBIN | 0 | 4 |
| BLUE-WINGED WARBLER | 0 | 1 |
| COMMON YELLOWTHROAT | 1 | 1 |
| EASTERN MEADOWLARK | 0 | 2 |
| FIELD SPARROW | 0 | 1 |
| NORTHERN FLICKER | 1 | 0 |
| RED-BELLIED WOODPECKER | 0 | 1 |
| RED-WINGED BLACKBIRD | 1 | 1 |
| SAVANNAH SPARROW | 1 | 1 |
| SONG SPARROW | 3 | 1 |
| TREE SWALLOW | 1 | 0 |
| WARBLING VIREO | 0 | 1 |
| YELLOW WARBLER | 1 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 2 |

June 28 2020

| Species | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 6 | 0 |
| AMERICAN REDSTART | 0 | 1 |
| AMERICAN ROBIN | 0 | 3 |
| BALTIMORE ORIOLE | 1 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| CEDAR WAXWING | 3 | 0 |
| EASTERN KINGBIRD | 2 | 0 |
| EASTERN MEADOWLARK | 3 | 1 |
| EUROPEAN STARLING | 0 | 1 |
| FIELD SPARROW | 1 | 1 |
| GRAY CATBIRD | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| NORTHERN ROUGH-WINGED SWALLOW | 1 | 0 |
| RED-EYED VIREO | 0 | 1 |
| RED-WINGED BLACKBIRD | 1 | 1 |
| SAVANNAH SPARROW | 2 | 0 |
| SONG SPARROW | 3 | 2 |
| WARBLING VIREO | 0 | 1 |
| WOOD THRUSH | 0 | 1 |
| YELLOW WARBLER | 3 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

**POINT COUNT STATION F6 2019**

June 8 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 2 | 1 |
| AMERICAN REDSTART | 1 | 0 |
| BLACK-BILLED CUCKOO | 0 | 2 |
| BLUE JAY | 1 | 0 |
| BOBOLINK | 0 | 1 |
| EASTERN KINGBIRD | 0 | 1 |
| EASTERN MEADOWLARK | 1 | 0 |
| FIELD SPARROW | 0 | 1 |
| MOURNING DOVE | 0 | 2 |
| RED-EYED VIREO | 0 | 3 |
| RED-WINGED BLACKBIRD | 0 | 4 |
| SCARLET TANAGER | 0 | 1 |
| SONG SPARROW | 1 | 1 |
| WILLOW FLYCATCHER | 0 | 1 |
| WOOD THRUSH | 0 | 1 |

June 16 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 4 | 0 |
| AMERICAN REDSTART | 0 | 1 |
| BALTIMORE ORIOLE | 0 | 1 |
| BLUE-WINGED WARBLER | 0 | 2 |
| BOBOLINK | 1 | 0 |
| CEDAR WAXWING | 2 | 0 |
| CHESTNUT-SIDED WARBLER | 0 | 1 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN MEADOWLARK | 0 | 1 |
| EASTERN WOOD PEWEE | 0 | 2 |
| EUROPEAN STARLING | 1 | 1 |
| RED-EYED VIREO | 0 | 6 |
| RED-WINGED BLACKBIRD | 1 | 1 |
| ROSE-BREASTED GROSBEAK | 0 | 3 |
| SONG SPARROW | 0 | 2 |
| WOOD THRUSH | 0 | 1 |
| YELLOW WARBLER | 0 | 2 |
| YELLOW-BILLED CUCKOO | 0 | 2 |

June 30 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 3 | 1 |
| AMERICAN ROBIN | 0 | 1 |
| BALTIMORE ORIOLE | 1 | 0 |
| BOBOLINK | 0 | 1 |
| CHIPPING SPARROW | 0 | 1 |
| FIELD SPARROW | 1 | 1 |
| MOURNING DOVE | 0 | 1 |
| MOURNING WARBLER | 1 | 0 |
| RED-BELLIED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| RED-WINGED BLACKBIRD | 0 | 3 |
| SONG SPARROW | 1 | 0 |
| WILLOW FLYCATCHER | 0 | 1 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

**POINT COUNT STATION F6 2020**

May 31 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 2 |
| AMERICAN GOLDFINCH | 2 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLACK-CAPPED CHICKADEE | 0 | 1 |
| BROWN THRASHER | 0 | 1 |
| BROWN-HEADED COWBIRD | 1 | 0 |
| COMMON GRACKLE | 1 | 0 |
| COMMON LOON | 0 | 1 |
| FIELD SPARROW | 1 | 1 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| PILEATED WOODPECKER | 0 | 2 |
| RED-EYED VIREO | 0 | 2 |
| RED-WINGED BLACKBIRD | 1 | 1 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SAVANNAH SPARROW | 4 | 0 |
| SONG SPARROW | 1 | 4 |

June 7 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN REDSTART | 0 | 1 |
| AMERICAN ROBIN | 1 | 3 |
| BALTIMORE ORIOLE | 1 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLACK-CAPPED CHICKADEE | 0 | 1 |
| BOBOLINK | 0 | 1 |
| CEDAR WAXWING | 1 | 0 |
| COMMON GRACKLE | 1 | 0 |
| COMMON YELLOWTHROAT | 1 | 0 |
| FIELD SPARROW | 0 | 2 |
| GRAY CATBIRD | 0 | 1 |
| MOURNING DOVE | 0 | 1 |
| MOURNING WARBLER | 0 | 1 |
| RED-EYED VIREO | 0 | 3 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| SONG SPARROW | 1 | 1 |
| TREE SWALLOW | 1 | 0 |
| WARBLING VIREO | 0 | 1 |
| YELLOW-BILLED CUCKOO | 1 | 0 |

June 28 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 3 | 0 |
| AMERICAN ROBIN | 0 | 2 |
| BLUE JAY | 0 | 2 |
| BROWN THRASHER | 0 | 1 |
| COMMON GRACKLE | 0 | 1 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN KINGBIRD | 1 | 0 |
| EASTERN MEADOWLARK | 0 | 2 |
| FIELD SPARROW | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 1 | 1 |
| NORTHERN FLICKER | 0 | 2 |
| RED-EYED VIREO | 0 | 3 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| SAVANNAH SPARROW | 1 | 0 |
| SONG SPARROW | 2 | 2 |
| WARBLING VIREO | 0 | 2 |
| YELLOW WARBLER | 0 | 2 |
| YELLOW-BELLIED SAPSUCKER | 0 | 1 |
| YELLOW-BILLED CUCKOO | 0 | 2 |

## POINT COUNT STATION F7 2019

June 8 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN ROBIN | 0 | 1 |
| BALTIMORE ORIOLE | 2 | 0 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLUE JAY | 1 | 0 |
| BLUE-WINGED WARBLER | 1 | 0 |
| CANADA GOOSE | 0 | 12 |
| FIELD SPARROW | 1 | 0 |
| HOUSE WREN | 1 | 0 |
| MOURNING DOVE | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| SONG SPARROW | 1 | 0 |

June 16 2019

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN REDSTART | 1 | 0 |
| BLACK-BILLED CUCKOO | 1 | 0 |
| BLUE-WINGED WARBLER | 1 | 0 |
| CHESTNUT-SIDED WARBLER | 0 | 1 |
| EUROPEAN STARLING | 1 | 0 |
| GREAT CRESTED FLYCATCHER | 0 | 1 |
| RED-EYED VIREO | 1 | 1 |
| SONG SPARROW | 0 | 1 |
| YELLOW-BILLED CUCKOO | 1 | 0 |

June 30 2019

| SPECIES | <100m | >100m |
|---|---|---|
| BARN SWALLOW | 0 | 1 |
| BLUE-WINGED WARBLER | 1 | 3 |
| CEDAR WAXWING | 1 | 0 |
| COMMON YELLOWTHROAT | 1 | 0 |
| EASTERN TOWHEE | 1 | 0 |
| FIELD SPARROW | 1 | 1 |
| GRASSHOPPER SPARROW | 0 | 1 |
| MOURNING DOVE | 0 | 1 |
| NORTHERN ROUGH-WINGED SWALLOW | 0 | 1 |
| RED-EYED VIREO | 0 | 2 |
| RUFFED GROUSE | 6 | 0 |

## POINT COUNT STATION F7 2020

May 31 2020

| SPECIES | <100m | >100m |
|---|---|---|
| BALTIMORE ORIOLE | 3 | 0 |
| BLACK-CAPPED CHICKADEE | 1 | 0 |
| BLUE JAY | 0 | 2 |
| BLUE-WINGED WARBLER | 2 | 1 |
| BROWN THRASHER | 0 | 1 |
| CANADA GOOSE | 1 | 1 |
| CEDAR WAXWING | 1 | 0 |
| COMMON YELLOWTHROAT | 1 | 1 |
| EASTERN KINGBIRD | 1 | 0 |
| EASTERN TOWHEE | 1 | 1 |
| LEAST FLYCATCHER | 1 | 0 |
| MOURNING DOVE | 0 | 2 |
| MOURNING WARBLER | 1 | 1 |
| RED-EYED VIREO | 0 | 1 |
| SONG SPARROW | 0 | 1 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

June 7 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 0 | 3 |
| BALTIMORE ORIOLE | 1 | 0 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLUE JAY | 0 | 1 |
| BLUE-WINGED WARBLER | 2 | 1 |
| CHESTNUT-SIDED WARBLER | 0 | 1 |
| COMMON YELLOWTHROAT | 1 | 0 |
| EASTERN TOWHEE | 1 | 0 |
| FIELD SPARROW | 3 | 0 |
| HOUSE WREN | 1 | 0 |
| RED-BELLIED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 0 | 3 |
| SONG SPARROW | 2 | 1 |
| WOOD THRUSH | 0 | 1 |

June 28 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN REDSTART | 1 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BALTIMORE ORIOLE | 1 | 0 |
| BLACK-CAPPED CHICKADEE | 3 | 0 |
| BLUE JAY | 0 | 1 |
| BLUE-WINGED WARBLER | 3 | 0 |
| BROWN THRASHER | 1 | 0 |
| COMMON YELLOWTHROAT | 2 | 0 |
| DOWNY WOODPECKER | 1 | 0 |
| EASTERN MEADOWLARK | 0 | 1 |
| FIELD SPARROW | 3 | 1 |
| MOURNING DOVE | 1 | 0 |
| MOURNING WARBLER | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| SONG SPARROW | 1 | 0 |
| WILSON'S SNIPE | 1 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

## POINT COUNT STATION W1 2020

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 2 |
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BLUE-GRAY GNATCATCHER | 1 | 0 |
| COMMON YELLOWTHROAT | 1 | 0 |
| FIELD SPARROW | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| INDIGO BUNTING | 0 | 1 |
| MOURNING DOVE | 0 | 1 |
| NORTHERN CARDINAL | 1 | 0 |
| RED-EYED VIREO | 0 | 3 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| SONG SPARROW | 2 | 0 |
| TREE SWALLOW | 0 | 1 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 1 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BLACK-CAPPED CHICKADEE | 0 | 2 |
| CEDAR WAXWING | 2 | 0 |
| EASTERN WOOD-PEWEE | 0 | 1 |
| FIELD SPARROW | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 1 | 0 |
| INDIGO BUNTING | 1 | 0 |
| MOURNING WARBLER | 0 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| SONG SPARROW | 1 | 1 |
| WOOD THRUSH | 0 | 1 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 1 | 1 |
| BLACK-CAPPED CHICKADEE | 1 | 0 |
| COMMON YELLOWTHROAT | 2 | 2 |
| EASTERN TOWHEE | 1 | 1 |
| FIELD SPARROW | 1 | 0 |
| HAIRY WOODPECKER | 0 | 1 |
| INDIGO BUNTING | 1 | 0 |
| RED-EYED VIREO | 0 | 1 |
| SANDHILL CRANE | 0 | 1 |
| SONG SPARROW | 1 | 1 |

**POINT COUNT STATION W2 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| BLACK-THROATED BLUE WARBER | 3 | 0 |
| CEDAR WAXWING | 1 | 0 |
| CHESTNUT-SIDED WARBLER | 0 | 1 |
| DOWNY WOODPECKER | 1 | 0 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| HOODED WARBLER | 1 | 0 |
| NORTHERN FLICKER | 0 | 1 |
| PILEATED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 1 | 6 |
| ROSE-BREASTED GROSBEAK | 1 | 0 |
| SCARLET TANAGER | 1 | 0 |
| WOOD THRUSH | 4 | 1 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| BLACK-THROATED BLUE WARBER | 3 | 0 |
| CEDAR WAXWING | 2 | 0 |
| EASTERN WOOD-PEWEE | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 2 | 1 |
| HOODED WARBLER | 1 | 0 |
| RED-EYED VIREO | 2 | 2 |
| ROSE-BREASTED GROSBEAK | 0 | 3 |
| VEERY | 0 | 1 |
| WOOD THRUSH | 1 | 1 |
| YELLOW-BILLED CUCKOO | 1 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 1 | 2 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLACK-CAPPED CHICKADEE | 1 | 0 |
| BLACK-THROATED BLUE WARBER | 2 | 1 |
| DOWNY WOODPECKER | 0 | 1 |
| HOODED WARBLER | 0 | 1 |
| RED-EYED VIREO | 1 | 4 |
| RUFFED GROUSE | 1 | 0 |
| VEERY | 0 | 2 |
| WOOD THRUSH | 1 | 1 |
| YELLOW-BILLED CUCKOO | 1 | 1 |

**POINT COUNT STATION W3 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 3 | 0 |
| BLUE JAY | 0 | 1 |
| CEDAR WAXWING | 0 | 1 |
| EASTERN WOOD-PEWEE | 3 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| RED-EYED VIREO | 6 | 2 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| WOOD THRUSH | 0 | 4 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 2 |
| AMERICAN REDSTART | 0 | 1 |
| EASTERN WOOD-PEWEE | 2 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| RED-EYED VIREO | 1 | 1 |
| RING-BILLED GULL | 1 | 0 |
| ROSE-BREASTED GROSBEAK | 1 | 0 |
| VEERY | 0 | 1 |
| WOOD THRUSH | 0 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN REDSTART | 0 | 1 |
| AMERICAN ROBIN | 0 | 2 |
| BLACK-THROATED BLUE WARBER | 0 | 1 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| RED-EYED VIREO | 3 | 2 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| VEERY | 1 | 1 |
| WOOD THRUSH | 1 | 1 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

**POINT COUNT STATION W4 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN REDSTART | 4 | 1 |
| AMERICAN ROBIN | 2 | 0 |
| BLACK-CAPPED CHICKADEE | 0 | 1 |
| BLUE JAY | 1 | 0 |
| EASTERN WOOD-PEWEE | 1 | 4 |
| NORTHERN CARDINAL | 1 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| PILEATED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 1 | 5 |
| RUFFED GROUSE | 1 | 1 |
| VEERY | 0 | 1 |
| WINTER WREN | 0 | 1 |
| WOOD THRUSH | 2 | 1 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN REDSTART | 1 | 0 |
| AMERICAN ROBIN | 2 | 1 |
| BLUE JAY | 1 | 1 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| RED-EYED VIREO | 1 | 1 |
| SONG SPARROW | 0 | 1 |
| WOOD THRUSH | 2 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN REDSTART | 1 | 1 |
| AMERICAN ROBIN | 2 | 0 |
| BROWN-HEADED COWBIRD | 1 | 0 |
| CHESTNUT-SIDED WARBLER | 0 | 2 |
| EASTERN WOOD-PEWEE | 1 | 1 |
| NORTHERN WATERTHRUSH | 1 | 0 |
| RED-EYED VIREO | 1 | 3 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| VEERY | 1 | 0 |
| WHITE-BREASTED NUTHATCH | 0 | 1 |
| WINTER WREN | 1 | 1 |
| WOOD THRUSH | 1 | 2 |

**POINT COUNT STATION W5 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN REDSTART | 3 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BLUE JAY | 0 | 2 |
| COMMON GRACKLE | 0 | 1 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 2 |
| HOUSE WREN | 1 | 0 |
| LEAST FLYCATCHER | 1 | 0 |
| NORTHERN CARDINAL | 1 | 1 |
| NORTHERN WATERTHRUSH | 1 | 1 |
| RED-EYED VIREO | 2 | 1 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| ROSE-BREASTED GROSBEAK | 1 | 1 |
| WINTER WREN | 0 | 1 |
| WOOD THRUSH | 0 | 2 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 1 | 1 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| HOUSE WREN | 1 | 0 |
| LEAST FLYCATCHER | 2 | 0 |
| NORTHERN WATERTHRUSH | 0 | 1 |
| OVENBIRD | 0 | 1 |
| RED-EYED VIREO | 5 | 2 |
| RED-WINGED BLACKBIRD | 0 | 2 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SCARLET TANAGER | 0 | 1 |
| VEERY | 1 | 1 |
| WOOD THRUSH | 0 | 1 |
| YELLOW-BELLIED SAPSUCKER | 0 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 1 | 1 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN WOOD-PEWEE | 1 | 1 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| HAIRY WOODPECKER | 0 | 1 |
| HOUSE WREN | 1 | 0 |
| MOURNING WARBLER | 0 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| OVENBIRD | 0 | 1 |
| RED-EYED VIREO | 1 | 3 |
| ROSE-BREASTED GROSBEAK | 0 | 2 |
| VEERY | 1 | 4 |
| WINTER WREN | 1 | 1 |
| WOOD THRUSH | 1 | 0 |
| YELLOW-BELLIED SAPSUCKER | 1 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

**POINT COUNT STATION W6 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN REDSTART | 3 | 0 |
| AMERICAN ROBIN | 0 | 1 |
| BALTIMORE ORIOLE | 1 | 0 |
| BLUE JAY | 1 | 2 |
| CEDAR WAXWING | 1 | 0 |
| COMMON YELLOWTHROAT | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 2 | 0 |
| NORTHERN CARDINAL | 0 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| NORTHERN WATERTHRUSH | 1 | 1 |
| RED-EYED VIREO | 1 | 3 |
| ROSE-BREASTED GROSBEAK | 2 | 0 |
| WHITE-BREASTED NUTHATCH | 1 | 0 |
| WOOD THRUSH | 1 | 2 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN GOLDFINCH | 0 | 1 |
| AMERICAN REDSTART | 2 | 1 |
| AMERICAN ROBIN | 1 | 1 |
| BALTIMORE ORIOLE | 1 | 0 |
| BLACK-CAPPED CHICKADEE | 1 | 0 |
| BLACK-THROATED BLUE WARBER | 2 | 0 |
| COMMON RAVEN | 0 | 1 |
| COMMON YELLOWTHROAT | 1 | 0 |
| EASTERN WOOD-PEWEE | 1 | 1 |
| GREAT-CRESTED FLYCATCHER | 1 | 1 |
| HAIRY WOODPECKER | 1 | 0 |
| HOUSE WREN | 1 | 0 |
| OVENBIRD | 0 | 1 |
| RED-BELLIED WOODPECKER | 1 | 1 |
| RED-EYED VIREO | 1 | 3 |
| SONG SPARROW | 1 | 0 |
| VEERY | 1 | 1 |
| WHITE-BREASTED NUTHATCH | 1 | 0 |
| WOOD THRUSH | 0 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN REDSTART | 2 | 1 |
| AMERICAN ROBIN | 2 | 0 |
| BALTIMORE ORIOLE | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 1 | 2 |
| RED-EYED VIREO | 1 | 2 |
| ROSE-BREASTED GROSBEAK | 2 | 0 |
| SONG SPARROW | 1 | 0 |
| VEERY | 1 | 0 |
| WINTER WREN | 0 | 1 |
| WOOD THRUSH | 0 | 1 |
| YELLOW-THROATED VIREO | 2 | 1 |

**POINT COUNT STATION W7 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 2 |
| AMERICAN REDSTART | 2 | 0 |
| AMERICAN ROBIN | 1 | 0 |
| BLUE JAY | 0 | 1 |
| COMMON YELLOWTHROAT | 0 | 1 |
| DOWNY WOODPECKER | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 2 |
| OVENBIRD | 0 | 1 |
| RED-EYED VIREO | 3 | 4 |
| ROSE-BREASTED GROSBEAK | 1 | 1 |
| SONG SPARROW | 2 | 0 |
| VEERY | 1 | 3 |
| WOOD THRUSH | 1 | 0 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 2 |
| AMERICAN REDSTART | 0 | 1 |
| BLACK-THROATED BLUE WARBER | 1 | 0 |
| BLUE JAY | 0 | 1 |
| COMMON RAVEN | 0 | 1 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| HAIRY WOODPECKER | 1 | 0 |
| OVENBIRD | 0 | 1 |
| RED-EYED VIREO | 2 | 2 |
| SONG SPARROW | 1 | 0 |
| WHITE-BREASTED NUTHATCH | 1 | 0 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| BLACK-CAPPED CHICKADEE | 1 | 1 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| HAIRY WOODPECKER | 1 | 0 |
| HOUSE WREN | 1 | 0 |
| RED-BELLIED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 1 | 3 |
| RED-WINGED BLACKBIRD | 0 | 1 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SCARLET TANAGER | 0 | 2 |
| SONG SPARROW | 0 | 1 |
| VEERY | 1 | 1 |
| WOOD THRUSH | 0 | 1 |
| YELLOW-THROATED VIREO | 0 | 1 |

## POINT COUNT STATION W8 2020

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN ROBIN | 2 | 3 |
| COMMON YELLOWTHROAT | 0 | 1 |
| EASTERN WOOD-PEWEE | 1 | 1 |
| HAIRY WOODPECKER | 1 | 1 |
| OVENBIRD | 1 | 2 |
| RED-BELLIED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 2 | 3 |
| SCARLET TANAGER | 1 | 1 |
| VEERY | 0 | 1 |
| WOOD THRUSH | 1 | 2 |
| YELLOW-BELLIED SAPSUCKER | 2 | 0 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| BROWN-HEADED COWBIRD | 1 | 0 |
| CEDAR WAXWING | 3 | 0 |
| DOWNY WOODPECKER | 1 | 0 |
| EASTERN WOOD-PEWEE | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 1 | 1 |
| HAIRY WOODPECKER | 1 | 0 |
| LEAST FLYCATCHER | 0 | 1 |
| NORTHERN FLICKER | 0 | 1 |
| OVENBIRD | 0 | 1 |
| RED-BELLIED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 3 | 3 |
| ROSE-BREASTED GROSBEAK | 1 | 0 |
| SCARLET TANAGER | 1 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 1 | 0 |
| COMMON GRACKLE | 1 | 0 |
| EASTERN TOWHEE | 0 | 1 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| HAIRY WOODPECKER | 1 | 0 |
| MOURNING WARBLER | 0 | 1 |
| RED-BELLIED WOODPECKER | 0 | 1 |
| RED-EYED VIREO | 1 | 4 |
| SCARLET TANAGER | 1 | 0 |
| WHITE-BREASTED NUTHATCH | 2 | 0 |
| WOOD THRUSH | 0 | 2 |
| YELLOW-THROATED VIREO | 1 | 0 |

## POINT COUNT STATION W9 2020

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 3 |
| AMERICAN REDSTART | 1 | 0 |
| AMERICAN ROBIN | 2 | 1 |
| BLACK-BILLED CUCKOO | 0 | 2 |
| BROWN THRASHER | 0 | 1 |
| COMMON RAVEN | 1 | 0 |
| COMMON YELLOWTHROAT | 1 | 0 |
| EASTERN TOWHEE | 0 | 1 |
| OVENBIRD | 0 | 1 |
| RED-EYED VIREO | 3 | 0 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| WOOD THRUSH | 1 | 2 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 1 | 0 |
| BLACK-BILLED CUCKOO | 0 | 2 |
| BLACK-THROATED BLUE WARBER | 1 | 0 |
| BLUE JAY | 0 | 1 |
| BROWN-HEADED COWBIRD | 1 | 0 |
| CEDAR WAXWING | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 0 | 1 |
| MOURNING DOVE | 0 | 1 |
| MOURNING WARBLER | 1 | 0 |
| RED-EYED VIREO | 3 | 2 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SCARLET TANAGER | 1 | 0 |
| SONG SPARROW | 0 | 1 |
| WOOD THRUSH | 0 | 2 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 1 | 1 |
| BLUE JAY | 0 | 1 |
| EASTERN WOOD-PEWEE | 0 | 1 |
| FIELD SPARROW | 0 | 1 |
| MOURNING WARBLER | 0 | 2 |
| OVENBIRD | 0 | 1 |
| RED-EYED VIREO | 0 | 4 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| SCARLET TANAGER | 0 | 1 |

**POINT COUNT STATION W10 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| BALTIMORE ORIOLE | 1 | 0 |
| BLUE JAY | 0 | 1 |
| CHESTNUT-SIDED WARBLER | 2 | 0 |
| COMMON RAVEN | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 1 | 0 |
| MOURNING WARBLER | 0 | 1 |
| OVENBIRD | 1 | 1 |
| RED-BELLIED WOODPECKER | 0 | 2 |
| RED-EYED VIREO | 3 | 0 |
| ROSE-BREASTED GROSBEAK | 0 | 2 |
| SCARLET TANAGER | 0 | 1 |
| SONG SPARROW | 1 | 0 |
| WOOD THRUSH | 0 | 1 |
| YELLOW-BELLIED SAPSUCKER | 0 | 1 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| BALTIMORE ORIOLE | 1 | 0 |
| BLUE JAY | 0 | 2 |
| CHESTNUT-SIDED WARBLER | 1 | 0 |
| COMMON YELLOWTHROAT | 1 | 0 |
| EASTERN WOOD-PEWEE | 2 | 0 |
| GRAY CATBIRD | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 1 | 0 |
| HOUSE WREN | 1 | 0 |
| MOURNING WARBLER | 1 | 0 |
| NORTHERN WATERTHRUSH | 1 | 0 |
| RED-EYED VIREO | 3 | 1 |
| ROSE-BREASTED GROSBEAK | 2 | 0 |
| RUFFED GROUSE | 1 | 0 |
| SCARLET TANAGER | 1 | 0 |
| WOOD THRUSH | 1 | 2 |
| YELLOW-BILLED CUCKOO | 1 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN REDSTART | 0 | 1 |
| AMERICAN ROBIN | 1 | 1 |
| BLACK-CAPPED CHICKADEE | 1 | 0 |
| BLUE JAY | 0 | 2 |
| EASTERN TOWHEE | 1 | 0 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| RED-EYED VIREO | 1 | 1 |
| ROSE-BREASTED GROSBEAK | 2 | 1 |
| SONG SPARROW | 0 | 1 |

**POINT COUNT STATION W11 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 2 | 0 |
| BLUE JAY | 1 | 1 |
| CANADA GOOSE | 1 | 2 |
| CEDAR WAXWING | 3 | 0 |
| DOWNY WOODPECKER | 2 | 0 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| GREAT-CRESTED FLYCATCHER | 2 | 1 |
| OVENBIRD | 1 | 0 |
| RED-BELLIED WOODPECKER | 1 | 1 |
| RED-EYED VIREO | 1 | 0 |
| SCARLET TANAGER | 1 | 1 |
| WHITE-BREASTED NUTHATCH | 2 | 0 |
| WOOD THRUSH | 1 | 2 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 0 | 1 |
| BALTIMORE ORIOLE | 1 | 0 |
| BLACK-CAPPED CHICKADEE | 1 | 0 |
| EASTERN TOWHEE | 1 | 0 |
| EASTERN WOOD-PEWEE | 1 | 1 |
| GREAT-CRESTED FLYCATCHER | 2 | 0 |
| NORTHERN CARDINAL | 0 | 1 |
| RED-EYED VIREO | 4 | 1 |
| ROSE-BREASTED GROSBEAK | 0 | 1 |
| WOOD THRUSH | 0 | 2 |
| YELLOW-BELLIED SAPSUCKER | 1 | 0 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| BLUE JAY | 0 | 2 |
| CHESTNUT-SIDED WARBLER | 1 | 1 |
| HOODED WARBLER | 1 | 1 |
| OVENBIRD | 0 | 1 |
| RED-EYED VIREO | 1 | 4 |
| SCARLET TANAGER | 0 | 1 |

**POINT COUNT STATION W12 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN REDSTART | 0 | 1 |
| AMERICAN ROBIN | 0 | 1 |
| BLUE JAY | 0 | 1 |
| CANADA GOOSE | 0 | 1 |
| EASTERN WOOD-PEWEE | 2 | 0 |
| GRAY CATBIRD | 0 | 1 |
| GREAT-CRESTED FLYCATCHER | 0 | 2 |
| RED-EYED VIREO | 3 | 0 |
| SCARLET TANAGER | 1 | 1 |
| WOOD THRUSH | 1 | 1 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN ROBIN | 1 | 0 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| MOURNING WARBLER | 0 | 1 |
| RED-EYED VIREO | 4 | 2 |
| SCARLET TANAGER | 0 | 1 |
| WOOD THRUSH | 2 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN ROBIN | 2 | 1 |
| BLACK-BILLED CUCKOO | 1 | 0 |
| BLACK-CAPPED CHICKADEE | 1 | 0 |
| MOURNING WARBLER | 0 | 1 |
| NORTHERN FLICKER | 1 | 0 |
| RED-EYED VIREO | 3 | 2 |
| WOOD THRUSH | 0 | 2 |

**POINT COUNT STATION W13 2020**

May 30 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN CROW | 0 | 1 |
| AMERICAN REDSTART | 2 | 1 |
| AMERICAN ROBIN | 1 | 0 |
| BALTIMORE ORIOLE | 0 | 1 |
| BLUE-WINGED WARBLER | 1 | 0 |
| CHESTNUT-SIDED WARBLER | 3 | 1 |
| EASTERN TOWHEE | 0 | 1 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| MOURNING DOVE | 0 | 2 |
| MOURNING WARBLER | 2 | 1 |
| NORTHERN CARDINAL | 2 | 1 |
| RED-EYED VIREO | 1 | 1 |
| ROSE-BREASTED GROSBEAK | 4 | 0 |
| RUFFED GROUSE | 1 | 1 |
| SCARLET TANAGER | 2 | 1 |
| WOOD THRUSH | 1 | 0 |

June 6 2020

| SPECIES | <100m | >100m |
|---|---|---|
| AMERICAN REDSTART | 0 | 1 |
| BALTIMORE ORIOLE | 0 | 1 |
| BLACK-BILLED CUCKOO | 0 | 1 |
| BLACK-CAPPED CHICKADEE | 1 | 0 |
| BLUE JAY | 2 | 0 |
| BLUE-WINGED WARBLER | 1 | 0 |
| CEDAR WAXWING | 1 | 0 |
| CHESTNUT-SIDED WARBLER | 3 | 0 |
| EASTERN WOOD-PEWEE | 1 | 0 |
| MOURNING DOVE | 1 | 0 |
| MOURNING WARBLER | 2 | 0 |
| OVENBIRD | 1 | 0 |
| RED-EYED VIREO | 1 | 2 |
| ROSE-BREASTED GROSBEAK | 1 | 0 |
| WOOD THRUSH | 1 | 0 |
| YELLOW-BILLED CUCKOO | 0 | 1 |

July 4 2020

| SPECIES | <100m | >100m |
|---|---|---|
| BLUE-WINGED WARBLER | 1 | 0 |
| CHESTNUT-SIDED WARBLER | 1 | 0 |
| COMMON YELLOWTHROAT | 1 | 1 |
| EASTERN TOWHEE | 0 | 1 |
| FIELD SPARROW | 0 | 1 |
| HOUSE WREN | 1 | 0 |
| INDIGO BUNTING | 0 | 1 |
| MOURNING DOVE | 0 | 1 |
| RED-EYED VIREO | 0 | 1 |
| SONG SPARROW | 0 | 1 |
| WOOD THRUSH | 0 | 1 |
| YELLOW-THROATED VIREO | 1 | 0 |