Ecological Enhancement Plan (EEP) & Rehabilitation Plan Report

Dufferin Aggregates Milton Quarry East Extension (MQEE)

December 2021

Prepared for:

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Table of Contents

List of Appended Figures

List of Tables

List of Attachments

PART 1: LEVEL 1 REPORT

1.0 INTRODUCTION

Goodban Ecological Consulting Inc. (GEC) was retained by Dufferin Aggregates, a division of CRH Canada Group Inc. (Dufferin), to prepare an Ecological Enhancement Plan (EEP) & Rehabilitation Plan Report 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 1**). The maximum potential dolostone reserve (including both the Amabel and underlying Reynales Formations) in the proposed MQEE is approximately 15 million tonnes.

The Provincial, Regional and Local Natural Heritage Systems are shown on **Figures 2** to **4**. The Town of Halton Hills Official Plan shows the proposed extraction area as Escarpment Rural Area (**Figure 3**), consistent with the Niagara Escarpment Plan (NEP). As shown on **Figure 4**, the extraction area is not part of the Provincial Natural Heritage System. The Region of Halton Official Plan does show a small area near Townline and the existing East Cell as part of the Regional Natural Heritage System (**Figure 2**), but it was determined that this area does not meet the technical criteria to be identified as a Significant Woodland as discussed in Section 8.0 of the Natural Environment Technical Report & EIA (GEC 2021).

The MQEE natural environment study area is shown on **Figure 5**. 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 North ANSI provides habitat for a number of species at risk, including the 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.

This Ecological Enhancement Plan (EEP) & Rehabilitation Plan Report is a companion document to the Natural Environment Technical Report and Environmental Impact Assessment (EIA) (GEC 2021) and the Site Plans prepared by MHBC Planning. The details from this report have been incorporated into the Site Plans.

The implementation of the MQEE Ecological Enhancement Plan (EEP) and the MQEE Rehabilitation Plan will address the Region of Halton Official Plan (ROP) policy direction for new or expanded mineral aggregate operations 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…

This Ecological Enhancement Plan (EEP) & Rehabilitation Plan Report is organized under the following headings:

- 2.0 Goals and Principles for the MQEE Ecological Enhancement Plan (EEP) and Rehabilitation Plan
- 3.0 Ecological Enhancement Plan (EEP) for lands that will not be extracted
- 4.0 Rehabilitation Plan (Natural Environment)
- 5.0 Combined Ecological Enhancement Plan (EEP) and Rehabilitation Plan Summary
- 6.0 Net Environmental Gain

2.0 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

3.0 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 6**. Summary descriptions for the EEP Unit are provided in **Table 1**. As shown on **Figure 6**, 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 4.0**.

The Planning Summary Report (MHBC 2021) provides 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 MQEE Ecological Enhancement Plan (EEP) is discussed below under the following headings:

- 3.1 Tree-planting – Reforestation
- 3.2 Vegetation Management
- 3.3 Habitat Features
- 3.4 Wetland U1 Habitat Enhancements
- 3.5 Enhancement of Wetland Hydrology (Wetlands U1 and W36)
- 3.6 Disturbed Area Restoration
- 3.7 Ecological Enhancement Plan (EEP) Summary

The various EEP Units are mapped on **Figure 6**. Summary descriptions for the EEP Unit are provided in **Table 1**.

3.1 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
- Maintenance and monitoring

3.1.1 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 1**.

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 (*Betula papyrifera*), White Cedar (*Thuja occidentalis*), White Pine (*Pinus strobus*) and Trembling Aspen (*Populus tremuloides*). 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 (*Quercus macrocarpa*), Red Oak (*Quercus rubra*), Bitternut Hickory (*Carya cordiformis*) and Sugar Maple (*Acer saccharum*) 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 (*Ostrya virginiana*) 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 (*Acer* X *freemanii*), Silver Maple (*Acer saccharinum*), White Cedar, Trembling Aspen, Balsam Poplar (*Populus balsamifera*) and Basswood (*Tilia americana*).

Some tall shrub species such as Alternate-leaved Dogwood (*Cornus alternifolia*) and Chokecherry (*Prunus virginiana*) 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)

3.1.2 Planting Approach

Prior to planting, any non-native woody species such as Common Buckthorn (*Rhamnus cathartica* +) 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. 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*).

3.1.3 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 3.2**. 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.

3.1.4 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.

3.2 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 (*Ulmus americana*), White Ash (*Fraxinus americana*), Black Cherry (*Prunus serotina*), Common Buckthorn (+) and hawthorns (*Crataegus* spp.). 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 (*Rhus typhina*) and Roundleaf Dogwood (*Cornus rugosa*), 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).
- 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, Red Oak, Sugar Maple, Basswood, Bitternut Hickory and White Pine.

3.3 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 2 m 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.

3.4 Wetland U1 Habitat Enhancements

At present, Wetland U1 is not a viable salamander 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 [*Cornus sericea*] and shrub willows [*Salix* spp.]); 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.

3.5 Enhancement of Wetland Hydrology (Wetlands U1 and W36)

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.

3.6 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.

3.7 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 6** and described on a unit-by-unit basis in **Table 1**.

Key elements of the MQEE EEP include the following:

- Tree-planting – Reforestation: Approximately 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 1**.
- 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.

4.0 REHABILITATION PLAN (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 2.0**. The MQEE Rehabilitation Plan is shown on **Figure 7a**, with rehabilitation details provided on **Figures 7b** and **7c**, as well as on the Site Plans (MHBC 2021).

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.

4.1 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.

4.2 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 4.3** 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.

4.3 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).

4.4 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 3.1**. 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.

4.4.1 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 (*Populus grandidentata*), 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 (*Viburnum lentago*), Highbush Cranberry (*Viburnum trilobum*), etc. will also be planted in some areas, to provide varied habitats for wildlife.

4.4.2 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. 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 collected 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.

4.4.3 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.

4.5 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. 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.

4.6 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)

5.0 COMBINED ECOLOGICAL ENHANCEMENT PLAN (EEP) AND REHABILITATION PLAN SUMMARY

The following are combined summary statistics for the Ecological Enhancement Plan (EEP) and Rehabilitation Plan:

- EEP - Reforestation: 10.3 ha.
- Rehabilitation - Reforestation: 5.1 ha
- Rehabilitation - Wetlands: 2.7 ha (1.5 ha Shallow, 1.2 ha Deep)
- Rehabilitation - Deep Lake: 7.7 ha
- Rehabilitation – Islands: 0.4 ha (with 9 turtle nesting sites; 30 logs/stumps).
- Rehabilitation – Cliffs: 673 m
- EEP - Habitat Features: 215 rock piles, 215 woody debris piles/features.
- Rehabilitation – Habitat Features: 121 rock piles, 121 woody debris piles/features.
- EEP - Wetland U1 Habitat Enhancements: Vegetation management, strategic woody plantings, installation of various habitat features, addition of egg attachment sites in the wetland.
- EEP - Disturbed Area Restoration: 0.062 ha restoration, with creation of several potential snake hibernacula.
- 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.

6.0 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 2.0** 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 7a**, **8** and **9**.

- *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 3.7** and **4.6**, 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.

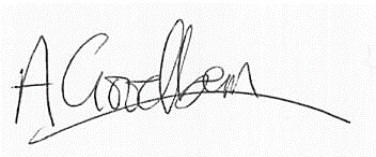
The Rehabilitation Plan will result in the creation of 2.7 ha of new wetlands.

- *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.

In conclusion, the combined implementation of the EEP and Rehabilitation Plan is anticipated to greatly enhance the Natural Heritage System, as described above and as shown on **Figures 8** and **9**.

Respectfully submitted,



Anthony G. Goodban, B.Sc., M.E.S.(Pl.), MCIP, RPP
Consulting Ecologist and Natural Heritage Planner

GOODBAN ECOLOGICAL CONSULTING INC. (GEC)

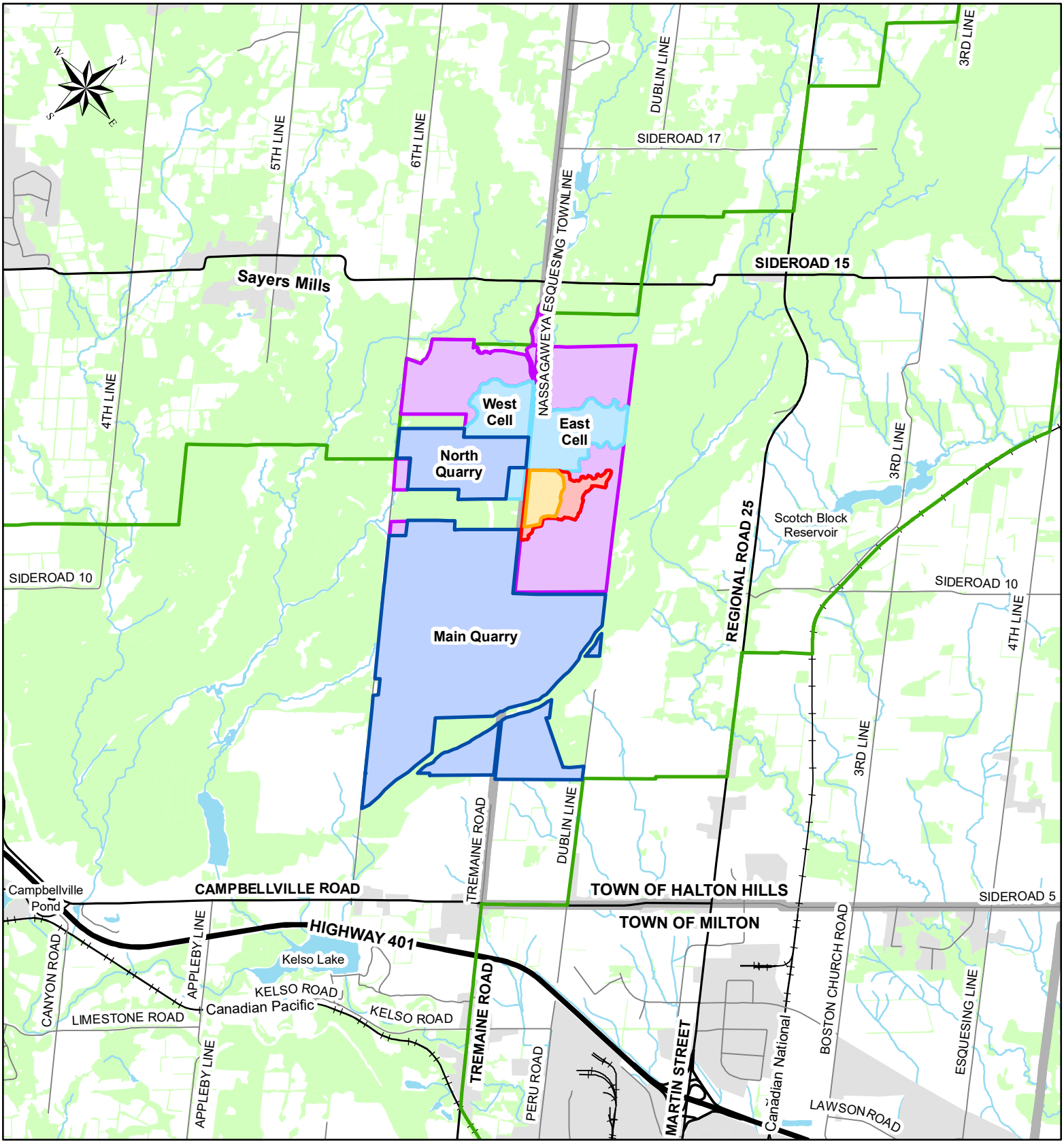


Figure # 1

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
Contains information licensed under the Open Government Licence - Ontario

0 250 500 1,000 1,500 2,000
Meters (1:50,000)

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Goodban Ecological Consulting Inc.

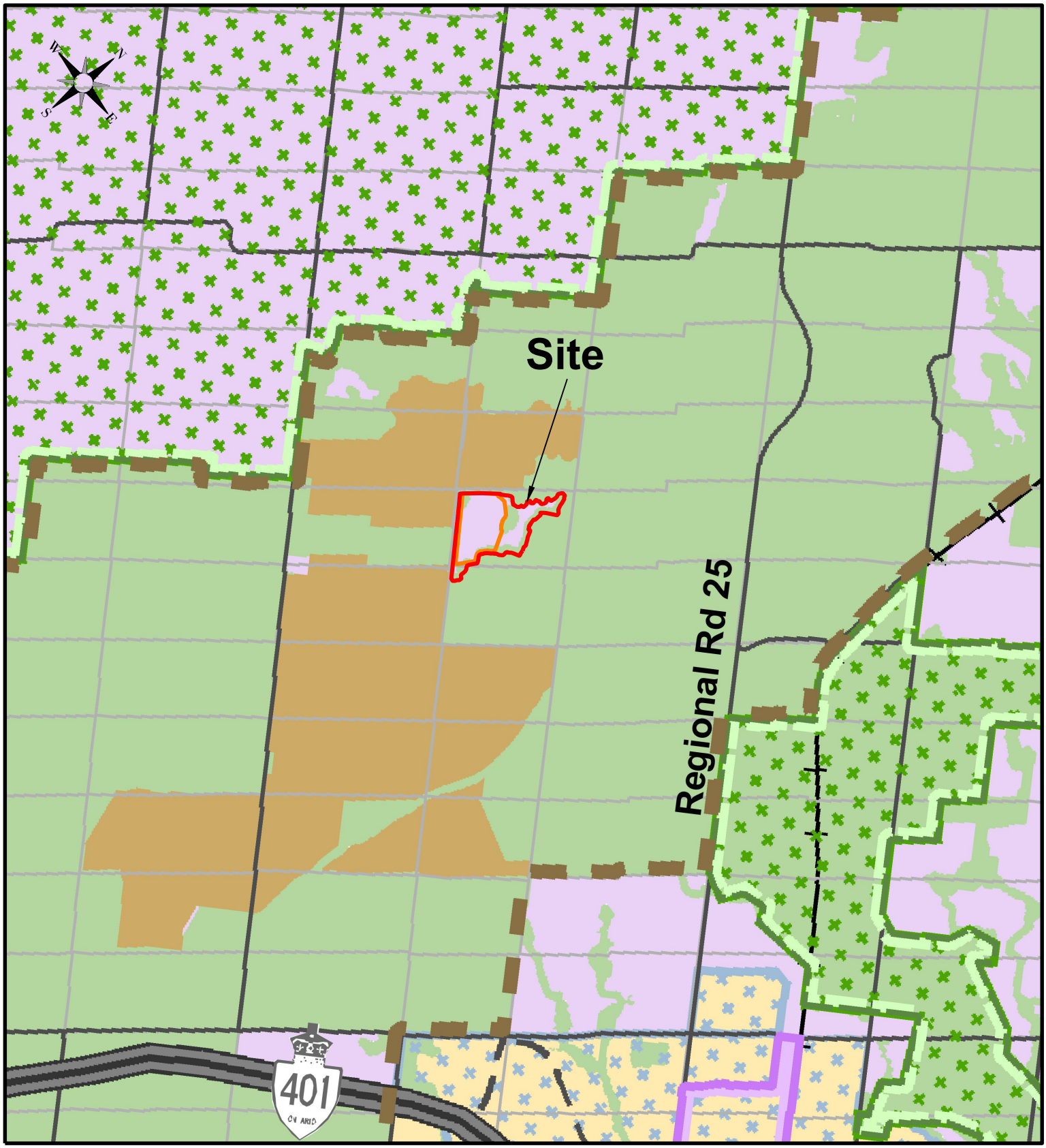

Figure # 2

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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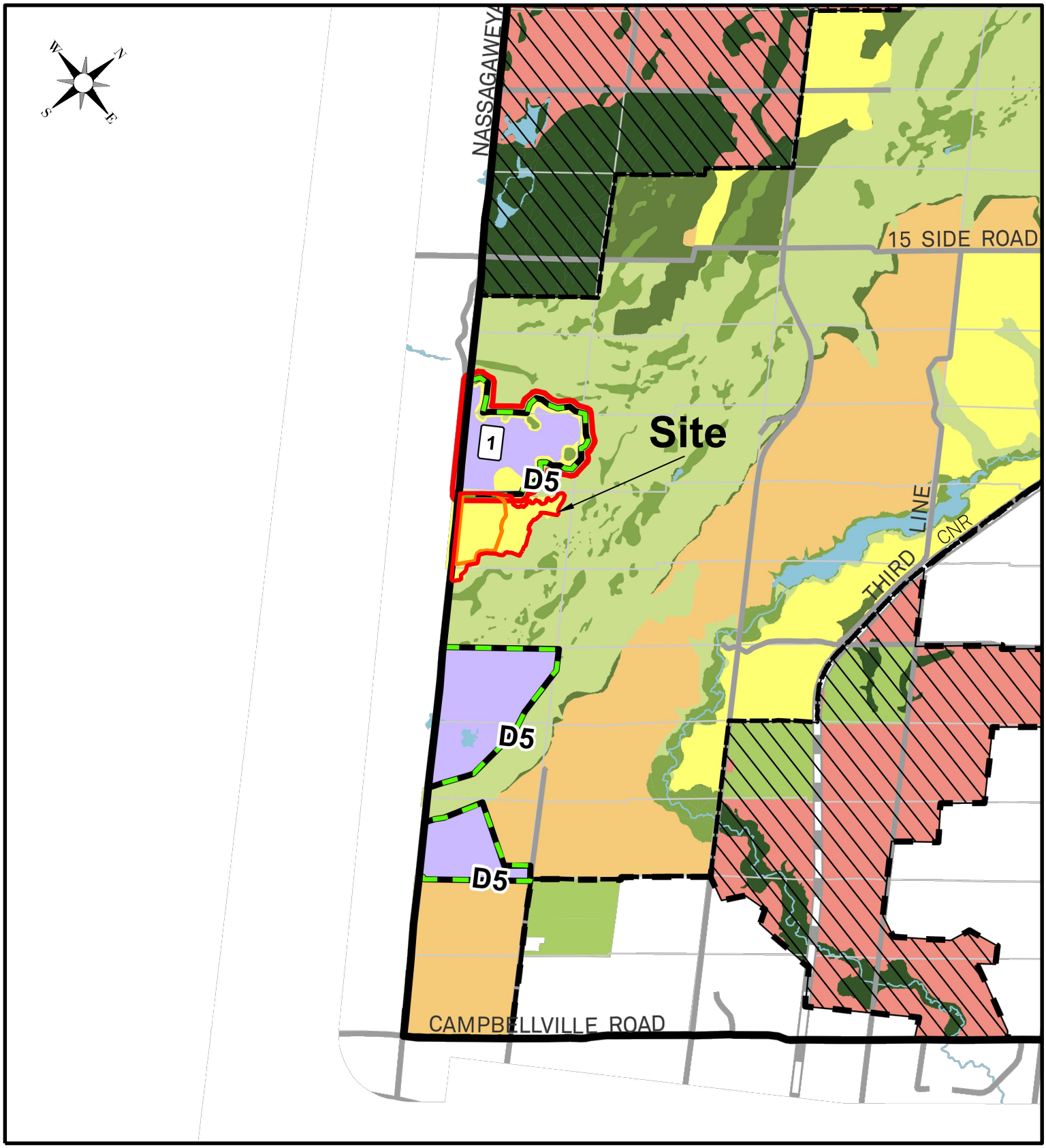

Figure # 3

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

0 600 1200 Meters

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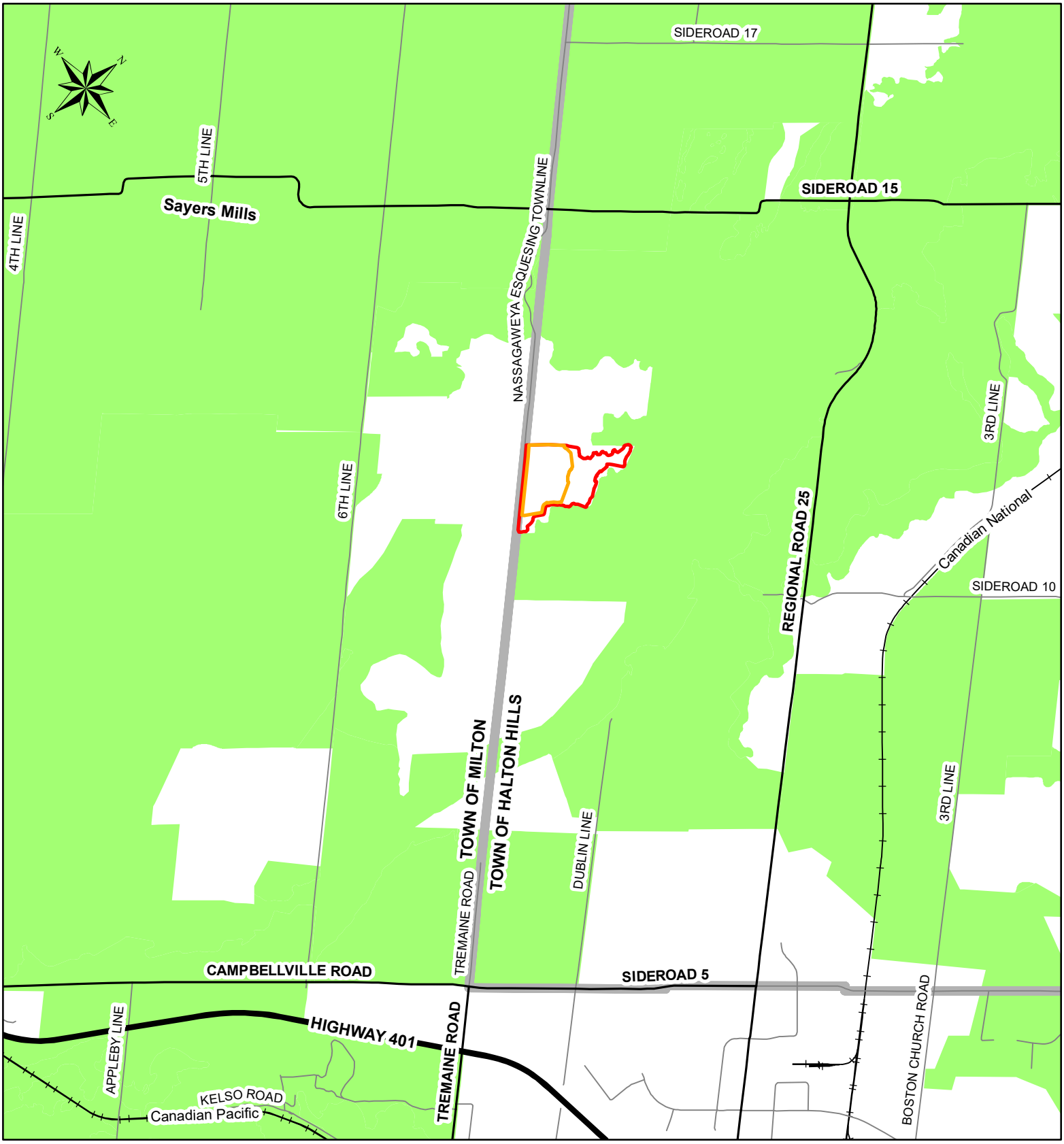

Figure # 4

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)

N:\Brian\9061DJ Dufferin - Milton Quarry East Extension\Drawings - Must be in NAD 27\Figures for Other Consultants\Figures for Goodban\Natural Environment Report\GIS\9061DJ - Figure 5a - Provincial Natural

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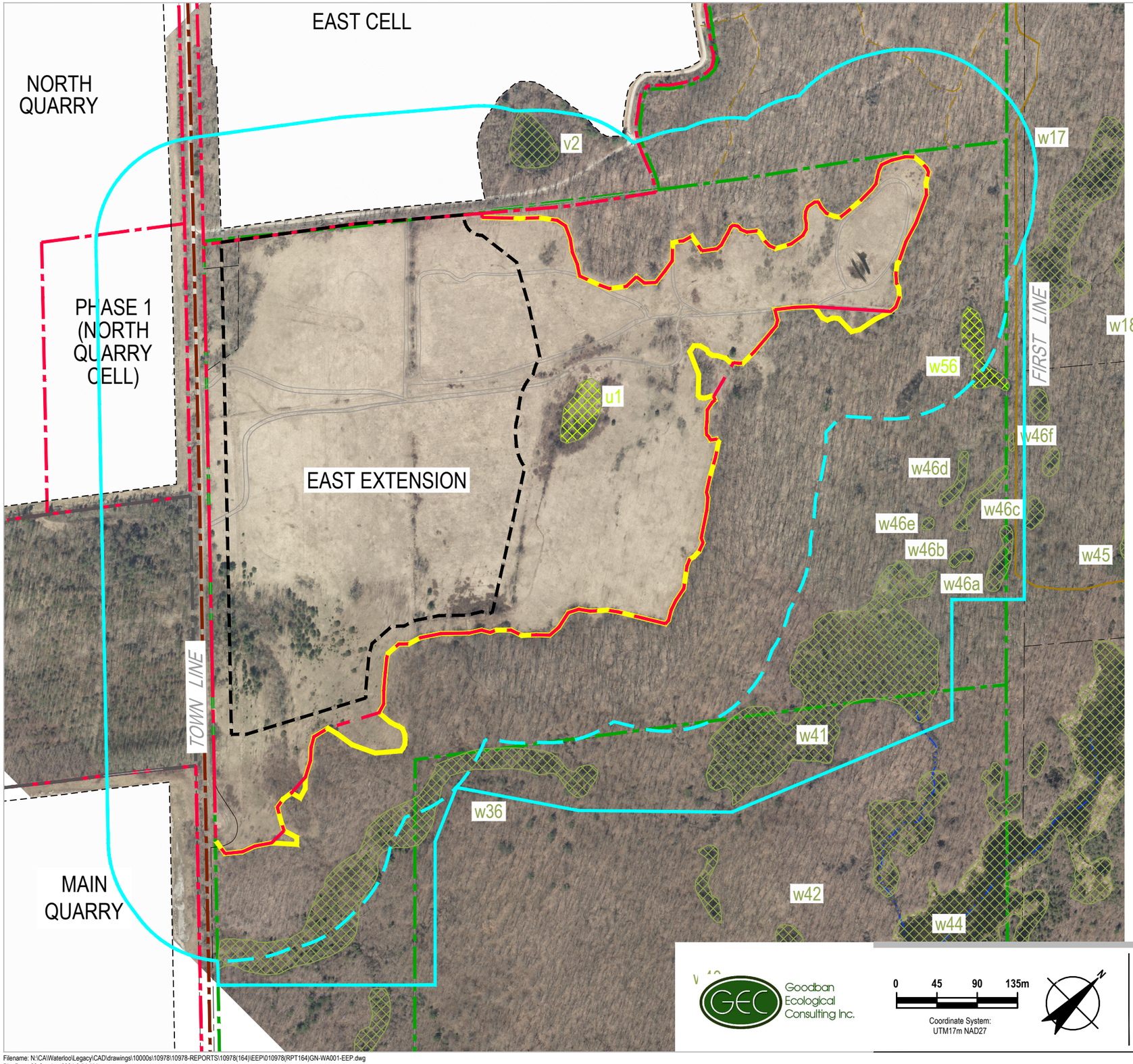

LEGEND

- 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.

0 45 90 135m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

NATURAL ENVIRONMENT STUDY AREA

Project No. **10978-200**
Date **October 2021**

FIGURE 5

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\EEP\010978(RPT164)GN-WA001-EEP.dwg
Plot Date: 28 October 2021 8:54 AM

Image: 2019 Halton Region Orthoimagery from First Base Solutions.

EAST CELL

EAST EXTENSION

TOWN LINE

FIRST LINE

v2
w17
w56
w46f
w46d
w46c
w46e
w46b
w46a
w41
w36
WE1

TP-RA1
TP-B1
TP-RB3
TP-M1
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

LEGEND

- 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)

Goodban Ecological Consulting Inc.

0 35 70 105m

Coordinate System: UTM17m NAD27

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

ECOLOGICAL ENHANCEMENT PLAN (EEP)

Project No. **10978-200**
Date **October 2021**

FIGURE 6

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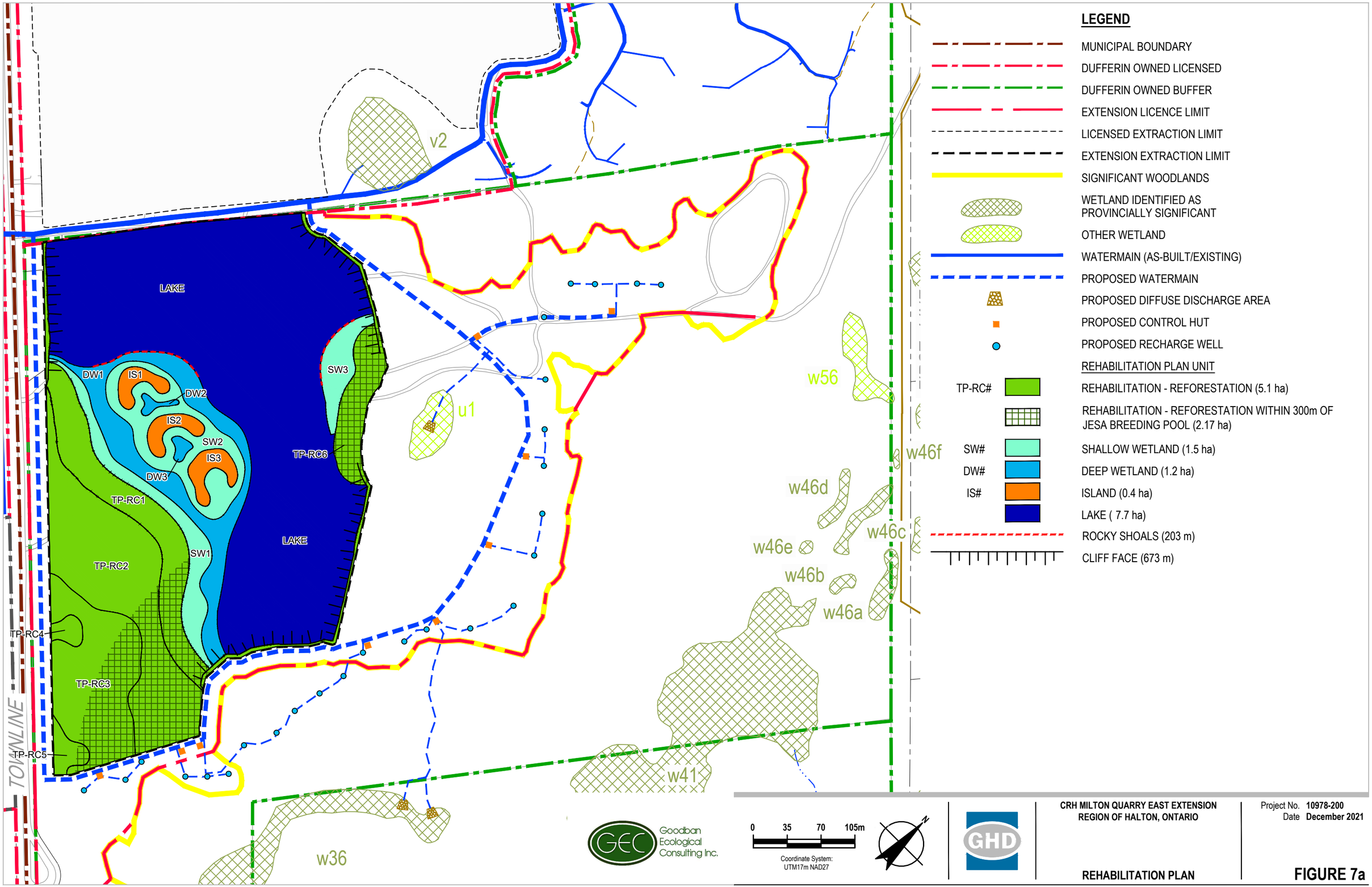
Plot Date: 28 October 2021 8:56 AM

Image: 2019 Halton Region Orthoimagery from First Base Solutions.



CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. **10978-200**
Date **December 2021**

REHABILITATION PLAN

FIGURE 7a

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\EEP\10978(RPT164)GN-WA003-EEP.dwg
Plot Date: 09 December 2021 8:30 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.

Figure # 7b
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

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.

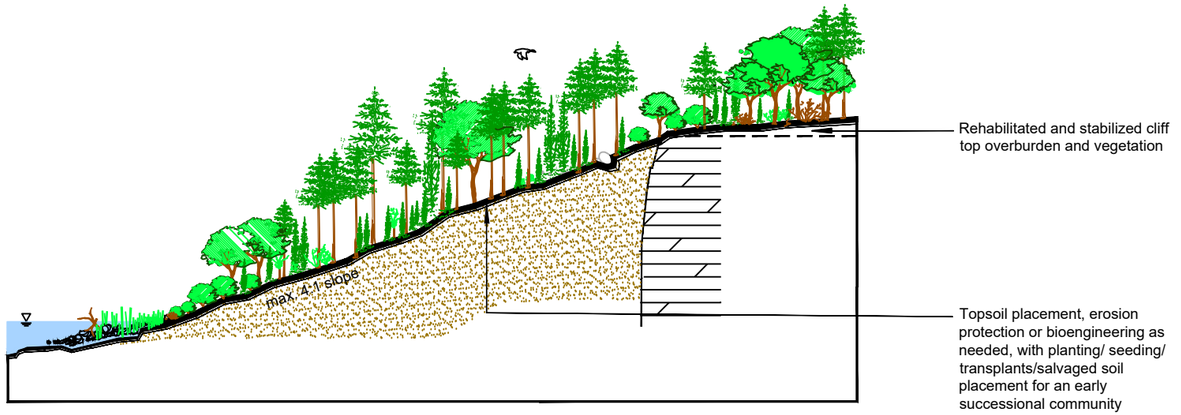


Figure 1.0 - Vegetated Slope to Cliff Top

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.

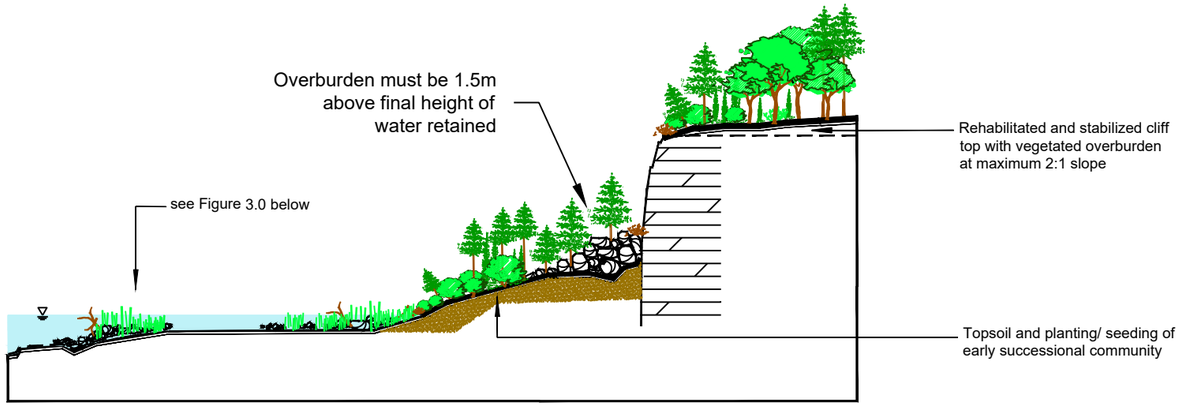


Figure 2.0 - Vegetated Slope to Exposed Bedrock Face

Date	December 2021
Sources	Figures from Milton Quarry East Extension Site Plan Prepared by MHBC dated December 2021
Scale	Not to Scale

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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.

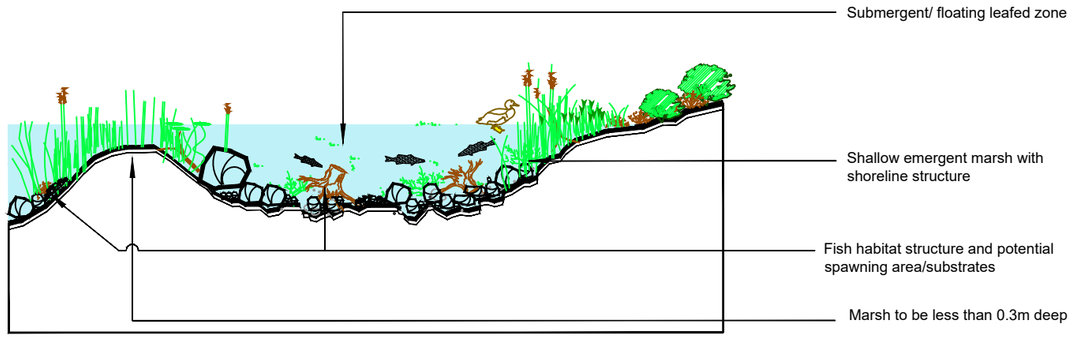


Figure 3.0 - Shoreline Wetland

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).

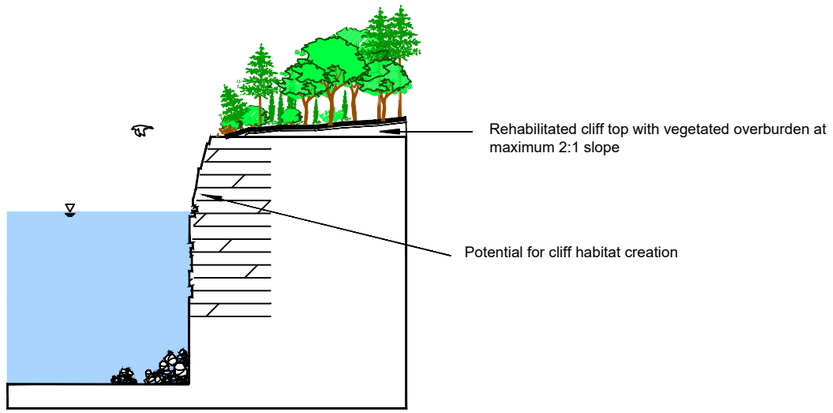


Figure 4.0 - Vertical Face

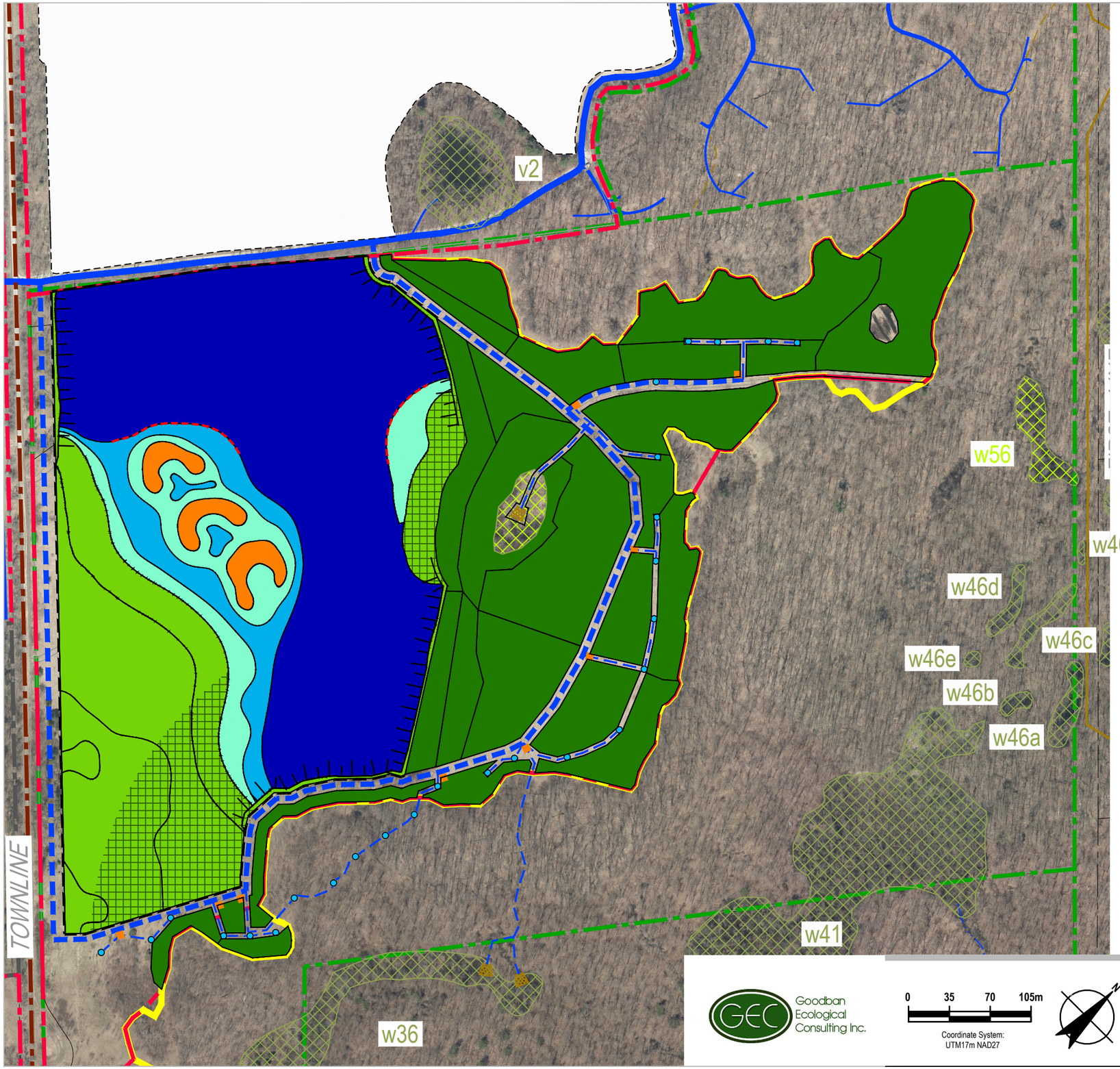
Figure # 7c
Rehabilitation Details

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.



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
- REHABILITATION - REFORESTATION (5.1 ha)
- REHABILITATION - REFORESTATION WITHIN 300m OF JESA BREEDING POOL (2.17 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

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

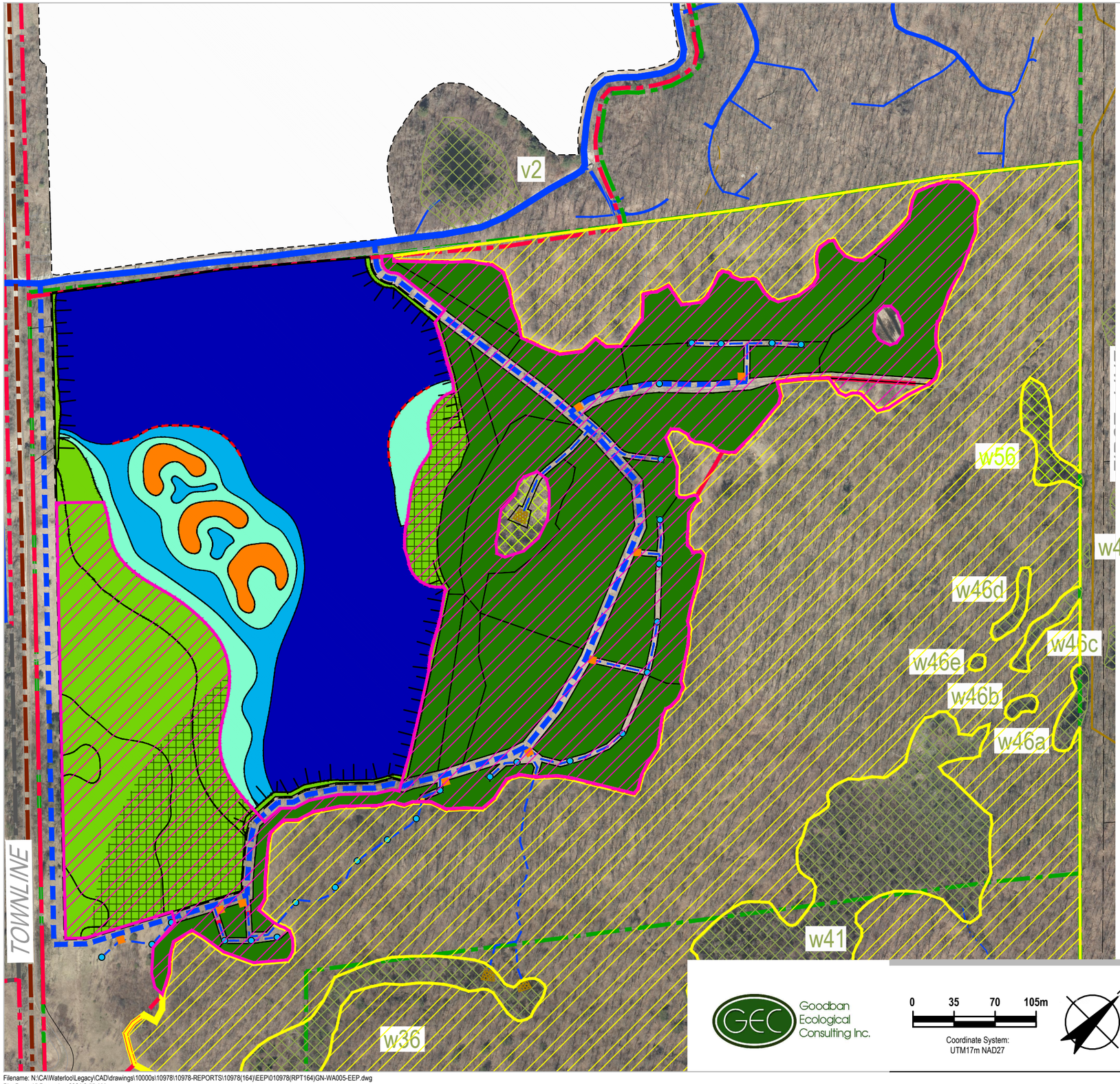
COMBINED ECOLOGICAL ENHANCEMENT PLAN (EEP) AND MQEE REHABILITATION PLAN

Project No. **10978-200**
Date **December 2021**

FIGURE 8

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\EEP\10978(RPT164)GN-WA004-EEP.dwg
Plot Date: 09 December 2021 8:34 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.



LEGEND

- DUFFERIN OWNED LICENSED
- DUFFERIN OWNED BUFFER
- EXTENSION LICENCE LIMIT
- LICENSED EXTRACTION LIMIT
- EXTENSION EXTRACTION LIMIT
- EXISTING SIGNIFICANT WOODLANDS
- FUTURE SIGNIFICANT WOODLANDS (15.2 ha)
- WETLAND IDENTIFIED AS PROVINCIALLY SIGNIFICANT
- OTHER WETLAND
- WATERMAIN (AS-BUILT/EXISTING)
- PROPOSED WATERMAIN
- PROPOSED DIFFUSE DISCHARGE AREA
- 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

GHD

CRH MILTON QUARRY EAST EXTENSION
REGION OF HALTON, ONTARIO

Project No. **10978-200**
Date **December 2021**

SIGNIFICANT WOODLANDS: PRESENT AND FUTURE

FIGURE 9

Filename: N:\CA\Waterloo\Legacy\CAD\drawings\10000s\10978\10978-REPORTS\10978(164)\EEP\010978(RPT164)GN-WA005-EEP.dwg
Plot Date: 15 December 2021 8:55 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: 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. • Raise grade to avoid attracting mole salamanders during breeding season. • 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). • Cap the new feature with weathered rocks.	Restoring Unit DA1 by filling the old excavation and creating several snake hibernacula will serve to: • Discourage trespassers on ATVs; • Prevent mole salamanders 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. 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. • Expand and enhance Significant Woodlands. • 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. • Expand and enhance Significant Woodlands. • 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. • 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. • 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 1: 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. • Expand and enhance Significant Woodlands. • Expand and enhance habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • 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. • Expand and enhance Significant Woodlands. • Expand and enhance habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • 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. • 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.	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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • 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. • 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 (16) and woody debris (16). • 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 1: 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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 1: 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • Install habitat features: rock piles (8) and woody debris (8). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • Install habitat features: rock piles (4) and woody debris (4). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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 1: 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • Install habitat features: rock piles (8) and woody debris (8). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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 1: 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals.	• Remove undesirable woody vegetation (e.g., Common Buckthorn); thin out any White Ash regeneration. • Retain desirable woody vegetation (e.g., hawthorns, hardwood regeneration). • 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. • Enhance potential migration and dispersal habitat for Jefferson Salamander and Unisexuals. • Create summer and hibernation habitat for Jefferson Salamander and Unisexuals. • Enhance breeding habitat for Jefferson Salamander and Unisexuals. • Control invasive woody species.	• 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). • 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). • 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 2: 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. • Create wildlife habitat. • Enhance Cox Tract linkage. • Expand and enhance habitat for Jefferson Salamander and Unisexuals.	• Install habitat features: rock piles (26) and woody debris (26). • Seed with suitable groundcover seed mix. • 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. • Create wildlife habitat. • Enhance Cox Tract linkage. • Expand and enhance habitat for Jefferson Salamander and Unisexuals.	• Install habitat features: rock piles (49) and woody debris (49). • Seed with suitable groundcover seed mix. • 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. • Create wildlife habitat. • Enhance Cox Tract linkage. • Expand and enhance habitat for Jefferson Salamander and Unisexuals.	• Create pit and mound microtopography. • Install habitat features: rock piles (32) and woody debris (32). • Seed with suitable groundcover seed mix. • 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. • Create wildlife habitat. • Enhance Cox Tract linkage.	• Create pit and mound microtopography. • Install habitat features: rock piles (2) and woody debris (2). • Seed with suitable groundcover seed mix. • Control weedy competition and invasive woody species during establishment stage. •	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. • Create wildlife habitat. • Enhance Cox Tract linkage. • Expand and enhance habitat for Jefferson Salamander and Unisexuals.	• Install habitat features: rock piles (3) and woody debris (3). • Seed with suitable groundcover seed mix. • 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. • Create wildlife habitat. • Enhance Cox Tract linkage. • Expand and enhance habitat for Jefferson Salamander and Unisexuals.	• Install habitat features: rock piles (11) and woody debris (11). • Seed with suitable groundcover seed mix. • 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. Contiguous with EEP Unit TP-B2.

Table 2: 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. • 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. • Gravel or sand beaches will be created along the shorelines. • 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. • 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. • Gravel or sand beaches will be created along the shorelines. • 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. • 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. • Gravel or sand beaches will be created along the shorelines. • Install submerged and partially submerged rocks/boulders, root masses and logs. • 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. • Create habitat for fish, amphibians, turtles, waterfowl and other wildlife.	• Grading will produce a variety of slopes and deeper pockets. • At the interface with deeper water, create rocky shoals to within 1.0 m of the water surface, with some areas just above water. • 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. • Create habitat for fish, amphibians, turtles, waterfowl and other wildlife.	• Grading will produce a variety of slopes and deeper pockets. • 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 2: 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. • Create habitat for fish, amphibians, turtles, waterfowl and other wildlife.	• Grading will produce a variety of slopes and deeper pockets. • 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. • 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. • Placement of at least 10 logs and/or stumps/root wads. • 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. • 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. • Placement of at least 10 logs and/or stumps/root wads. • 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. • 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. • Placement of at least 10 logs and/or stumps/root wads. • 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

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)

Goodban Ecological Consulting Inc.

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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.

Goodban, A.G. 2014. The Vegetation Communities of Hamilton, Ontario. pp. 92 to 111, In: Schwetz, N. (ed.), Hamilton Natural Areas Inventory Project 3rd Edition, Nature Counts 2, Species Checklist Document. Hamilton Conservation Authority, Ancaster, Ontario.

Goodban, A.G. and A.C. Garofalo. 2010. Rare Vegetation Types of the Niagara Region, Ontario: A Preliminary Checklist. Chapter 7 In: Natural Areas Inventory 2006-2009 – Niagara Peninsula Conservation Authority Watershed, Volume 1. Niagara Peninsula Conservation Authority, Welland, Ontario.

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.

Goodban, A.G. 2003. The Vegetation Communities of Hamilton, Ontario. pp. 2-1 to 2-22, In: Dwyer, J.K., Nature Counts Project, Hamilton Natural Areas Inventory 2003, Volume 1 – Species Checklists. Hamilton Naturalists' Club, Hamilton, Ontario.

Goodban, A.G. *In prep.* Bronte Creek Provincial Park (North Section): Grasslands Study. Bronte Creek Provincial Park, Burlington, Ontario Parks.

Goodban, A.G. *In prep.* A life science inventory and assessment of Bronte Creek Provincial Park (North Section). Bronte Creek Provincial Park, Burlington, Ontario Parks.

SELECTED PUBLICATIONS AND REPORTS (continued)

Goodban, A.G. 1999. An Overview and Assessment of Prairie and Oak Woodland Vegetation at Bronte Creek Provincial Park. pp. 263-274. In: M. Pollock-Ellwand et al., Parks and Protected Areas Research in Ontario, Proceedings of the Parks Research Forum of Ontario (PRFO) Annual General Meeting. Faculty of Environmental Studies, University of Waterloo, Waterloo, Ontario.

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