



ENVIRONMENTAL IMPACT STUDY

**Reconstruction of Regional Road 45 (Creek Road)
Between Regional Road 27 (River Road) and Regional
Road 63 (Canborough Road) in the Township of Wainfleet
Municipal Class Environmental Assessment, Schedule 'C'
October 2021**

Prepared for: Regional Municipality of Niagara

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INTRODUCTION

1.0 Introduction

1.1 Project Overview

The Regional Municipality of Niagara retained Parsons Inc. to conduct a Class Environmental Assessment (EA) Study to identify improvements along the Regional Road 45 (referred to as Creek Road) corridor between Regional Road 27 (River Road) and Regional Road 63 (Canborough Road) in the Township of Wainfleet (**Figure 1**). The study was conducted in accordance with the planning and design process for a Schedule 'C' Municipal Class Environmental Assessment (EA; Municipal Engineers' Association, 2015), which is an approved process under the Ontario *Environmental Assessment Act, 1990*. The Class EA Study was undertaken to investigate the need for improvements along Creek Road, including addressing existing road conditions, intersection safety, and two single-lane bridge rehabilitation or replacement options along Creek Road (i.e., the Project). The study is also considering improvements for active transportation (i.e., walking and cycling).

This Environmental Impact Study (EIS) was completed to support the Class EA Study and inform the Environmental Study Report.

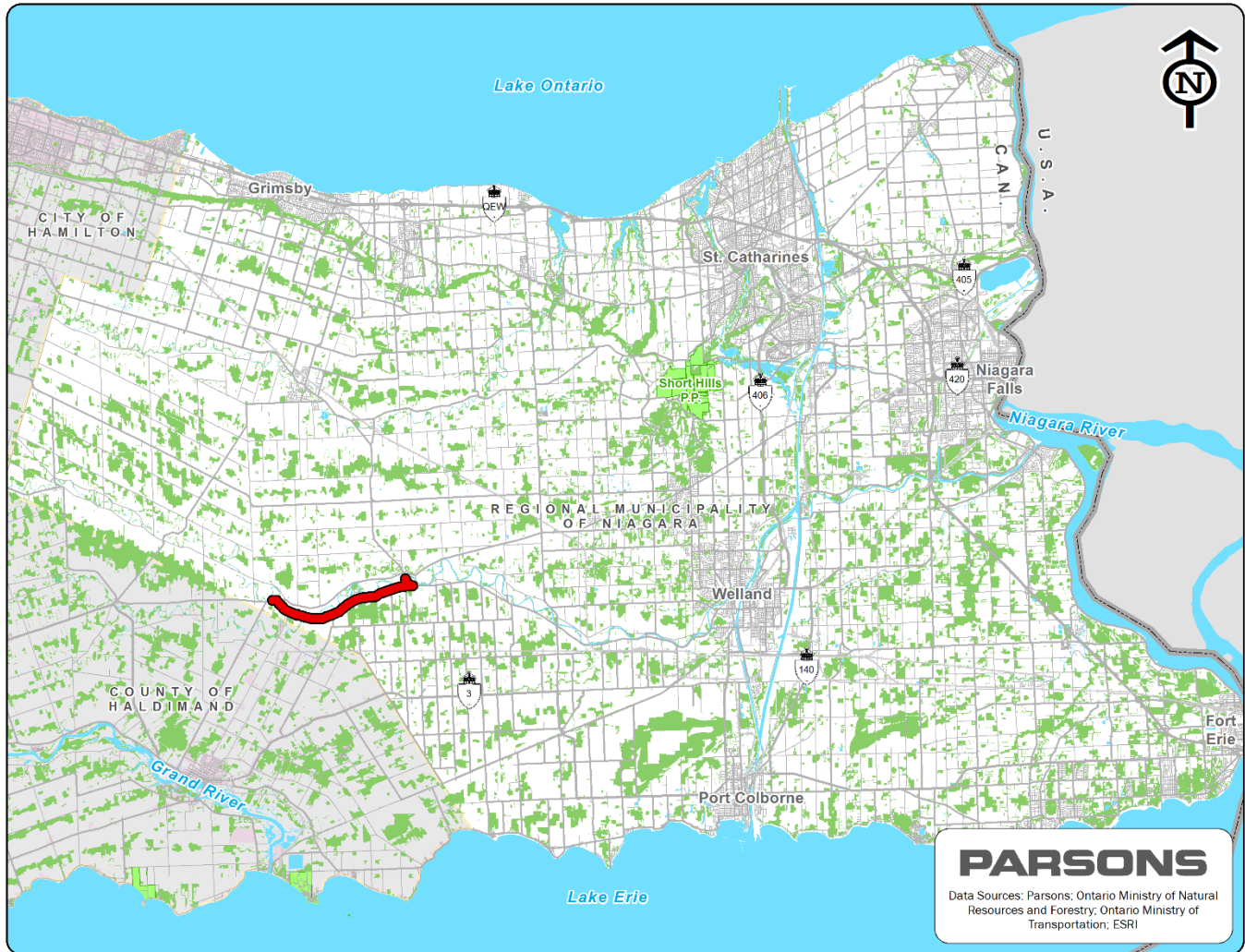


FIGURE 1 - LOCATION OF THE PROJECT IN NIAGARA REGION

The Recommended Alternatives and Alternative Design Concepts for Creek Road includes:

- Road reconstruction and/or resurfacing;
- Road realignment and/or geometric improvements;
- Intersection improvements including geometric design and traffic control;
 - Minor realignment of Creek Road to the east to create a “T” intersection at Canborough Road;
 - Realignment of Wellandport Road to the south to create a “T” intersection at River Road;
 - Close Creek Road at River Road in a cul-de-sac;
- Adding facilities that support and encourage active pedestrian and cyclist transportation; and
- Replacement for both Oswego Creek Bridge and Creek Road Bridge along its existing alignment.

To facilitate the Recommended Alternatives, the following construction activities are anticipated that have potential environmental constraints:

- Removal of trees, shrubs, and herbaceous vegetation;
- Clearing, grubbing, excavating, ditching, grading, dewatering, landscaping, and seeding or sodding;
- Creation of temporary construction laydown area(s);
- In-water work to isolate work sites and place fill below the high-water level; and,
- Removal of existing bridges and construction of new bridges.

1.2 Objectives

The overall goal of this EIS is to describe the effects of the Recommended Alternatives on the ecological features and functions within the study area. The objectives of this EIS are to identify natural features and constraints within the study area, inform the design and configuration of the work, determine the potential impacts associated with the Recommended Alternatives, and identify mitigation and/or compensation measures for any unavoidable negative impacts that will need to be incorporated into the design and construction plan(s). This EIS was completed in compliance with the Niagara Region (2018) *Environmental Impact Study Guidelines*, which state that:

“An EIS is to be submitted where development or site alteration is proposed wholly or partially within, or adjacent to, a natural heritage feature as defined in Provincial, Regional, local policies and regulations. It also is required where development or site alteration is proposed:

1. In the Greenbelt Natural Heritage System; and
2. On lands adjacent to key hydrologic features in the Greenbelt.” (p. 3)

The Niagara Region (2018) *Environmental Impact Study Guidelines* also state that the key components of an EIS include:

- “A biophysical and/or hydrologic inventory and analysis, including a description and analysis of the aquatic and terrestrial settings, as well as hydrological conditions such as surface and groundwater features and functions;
- A description of the ecological and hydrological functions served and required by the natural heritage features and/or hydrologic features;
- A description of the linkages between and among natural features and areas, surface water features and ground water features both on the site and in the surrounding area;
- A description of the proposed undertaking;
- Identification of constraints and opportunities;
- Mapping;
- Identification and analysis of potential direct, indirect and cumulative impacts from the proposed activities on the ecological and/or hydrological functions identified;
- The development of appropriate development modifications, recommendations, mitigation measures and enhancement opportunities;
- An assessment of the significance of the cumulative net environmental impacts expected over the long term after these measures have been implemented;
- The recommendation and description of monitoring needs and programs; and
- Recommendations regarding possible residual impacts, including recommendations for proceeding with the development as proposed or modified.” (p. 7)

1.3 Study Area

The study area for the Project is illustrated in **Figure 2** and includes lands within 120 m of the existing Creek Road alignment between Canborough Road and Wellandport Road; areas within 120 m of the Recommended Alternatives for the realignment of Creek Road; and areas within 120 m of Oswego Creek Bridge and Creek Road Bridge. The study area also includes crossings of the Welland River, Oswego Creek, and several unnamed tributaries.

Most of this land is currently and has historically been used for agriculture. As such, natural areas within the road corridor are minimal and exhibit a legacy of anthropogenic disturbance. The largest areas of natural habitat are within Chippawa Creek Conservation Area (CA). Other natural areas (e.g., Provincially Significant Wetlands [PSW]) can be found along the Welland River and Oswego Creek. There are also numerous hedgerows and other small vegetation patches throughout the study area.

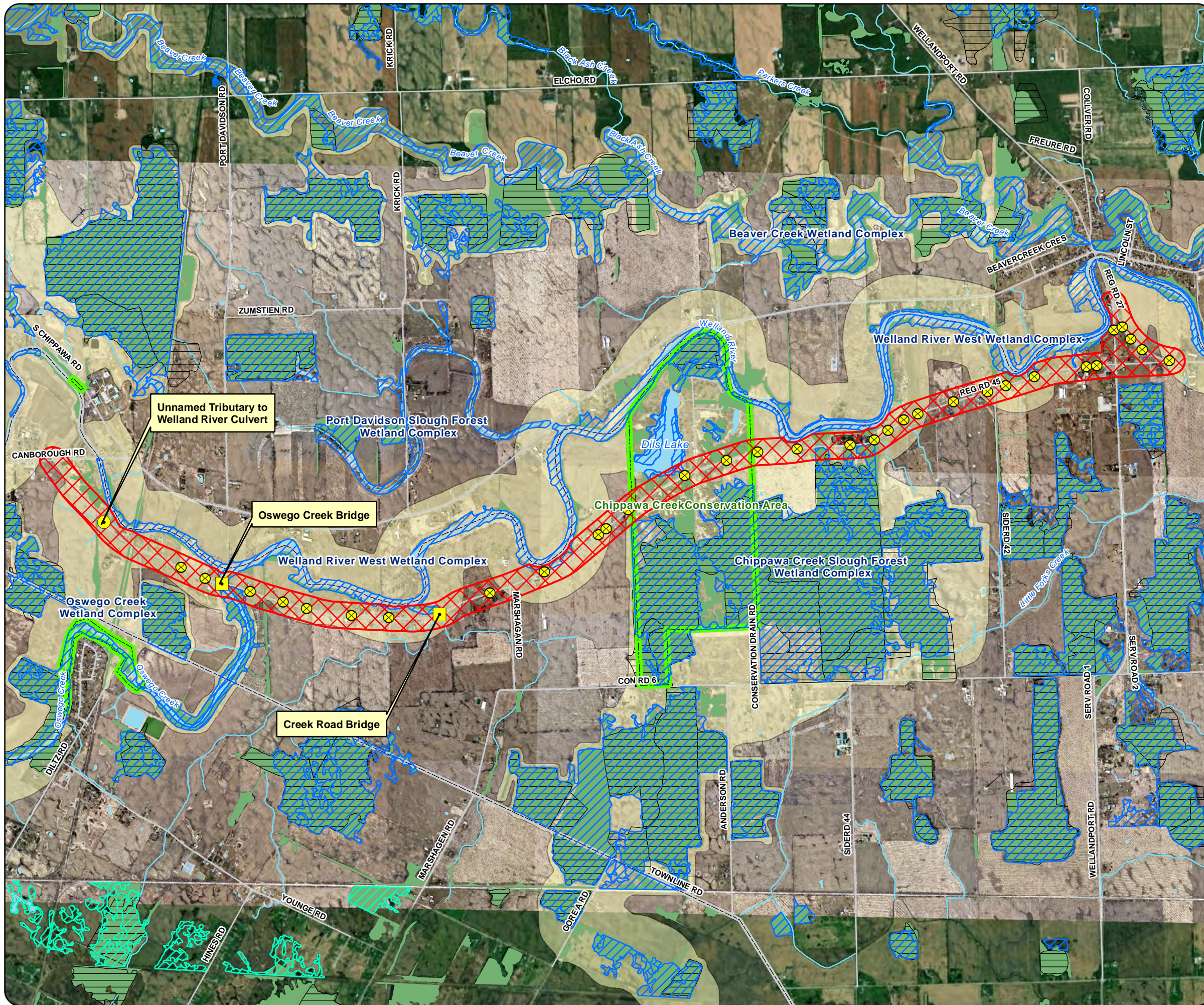
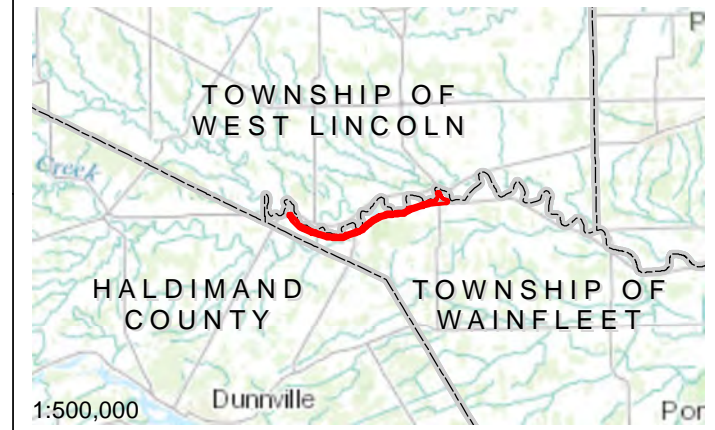


FIGURE 2
Study Area Overview

LOCATION MAP



LEGEND

- Bridge Crossing, Fish Habitat
- Culvert Crossing, Fish Habitat
- Culvert Crossing, Drainage
- Road
- Watercourse
- Study Area (120 m)
- Municipality
- NPCA Conservation Area
- Deer Wintering Area (LIO)
- Evaluated Wetland - Other (LIO)
- Provincially Significant Wetland (LIO)
- Waterbody (LIO)
- Woodland (LIO)
- Growth Plan for the Greater Golden Horseshoe

1:35,000 Kilometers

DATA SOURCES: Parsons; Ontario Ministry of Natural Resources and Forestry; Niagara Peninsula Conservation Authority (NPCA); Ontario Ministry of Transportation; ESRI; Land Information Ontario (LIO)

Creek Road Municipal Class Environmental Assessment, Schedule 'C'
Environmental Impact Study: Reconstruction of Regional Road 45 (Creek Road) Between Regional Road 27 (River Road) and Regional Road 63 (Canborough Road) in the Township of Wainfleet

PARSONS PN: 603118

DATE: 7/15/2021

DRAFT BY: A.V.



2.0 Policy and Legislative Framework

2.1 Federal

2.1.1 FISHERIES ACT (1985)

The *Fisheries Act* sets out provisions to protect fish and fish habitat. In 2018, Fisheries and Oceans Canada (DFO) introduced proposed amendments to the *Fisheries Act* with the aim to provide for the sustainability, proper management and control of fisheries, restoration of lost protections, and to ensure the conservation, protection, and rehabilitation of fish and fish habitat, including the prevention of pollution. In 2019, the new, modernized Fisheries Act received royal assent and became law, including new protections in the form of standard codes of practice and guidelines for projects near water.

The *Fisheries Act*, in part, requires that projects avoid causing the death of fish by means other than fishing and the harmful alteration, disruption or destruction (HADD) of fish habitat, which are prohibited under subsections 34.4(1) and 35(1) respectively, unless first authorized by the DFO or a designated representative. As per amendments made to the Fisheries Act, proponents have the responsibility to follow the measures to protect fish and fish habitat during the implementation of proposed projects in or near water to avoid causing the death of fish or HADD of fish habitat.

2.1.2 SPECIES AT RISK ACT (2002)

Species that are classified as Endangered and Threatened in Schedule 1 of the *Species at Risk Act, 2002* (SARA) are protected under the provisions of the SARA, which includes protection to the species and their residence (e.g., nest, den). While the SARA applies to species on federal land, such as national parks, national wildlife areas, some migratory bird sanctuaries, and First Nations reserve lands, it also applies to Species at Risk (SAR) migratory birds protected under the *Migratory Birds Convention Act, 1994* (MBCA) and fish, anywhere they occur. There are no federal lands within or near the Project, therefore the SARA would only apply to SAR migratory birds and fish for this project.

2.1.3 MIGRATORY BIRDS CONVENTION ACT (1994)

The MBCA and associated regulations have the goal of ensuring the conservation of migratory bird populations by regulating potentially harmful human activities. Environment and Climate Change Canada administers the MBCA through the Migratory Birds Regulations and Migratory Birds Sanctuary Regulations. Section 12 of the MBCA prohibits capturing, killing, injuring, taking, or disturbing of migratory birds, their eggs, and nests. Aquatic and other habitats used by migratory birds is also protected in accordance with Section 5 of the MBCA. This includes prohibitions on depositing (or allowing to be deposited) substances harmful to migratory birds, including in areas frequented by migratory birds, or that has the potential to enter waters where they occur. Any tree removals would need to be completed outside of the breeding bird season (April 1 to August 31) to avoid disturbing active nests of migratory birds protected under the MBCA.

2.2 Provincial

2.2.1 PROVINCIAL POLICY STATEMENT

The *Provincial Policy Statement, 2020* (PPS) was issued under Section 3 of the *Planning Act, 1990*; and came into effect May 1, 2020. The PPS provides the framework for provincial planning documents and regulating land use and development planning policies for specific geographic areas within Ontario. Provincial plans relevant to the Project study area include the Greenbelt Plan (section 2.2.2) and A Place to Grow: Growth Plan for the Greater Golden Horseshoe (section 2.2.3).

There are several natural heritage provisions in Section 2.1 of the PPS. These provisions prohibit development and site alteration in provincially significant natural features (e.g., woodlands, wetlands, Significant Wildlife Habitat [SWH]) unless it can be demonstrated that there will be no negative effects to the features and ecological functions of those natural areas. Technical guidance for implementing the natural heritage policies of the PPS is found within the second edition of

the Natural Heritage Reference Manual (Ministry of Natural Resources [MNR], 2010). This manual recommends the approach and technical criteria for protecting natural heritage features in Ontario.

The PPS applies to projects approved under the *Planning Act, 1990* and thus directly applies to the Project.

2.2.2 ENDANGERED SPECIES ACT (2007)

The *Endangered Species Act, 2007* (ESA) applies to species that are designated as Extirpated, Endangered or Threatened and listed on the Species at Risk in Ontario (SARO) List (O. Reg. 230/08). The ESA includes provisions to ensure protection to the species and their habitat. Species designated as Special Concern are not given species or habitat protection under the ESA. General habitat protection applies to all Endangered and Threatened species. Species-specific habitat protection is also given to those species with regulated habitat, as identified in O. Reg. 242/08.

Key provisions of the ESA include:

- Section 9(1) of the ESA prohibits the killing, harming, harassment, capture, taking, possession, transport, collection, buying, selling, leasing, trading, or offering to buy, sell, lease, or trade species listed as Extirpated, Endangered, or Threatened on the SARO List;
- Section 10(1) prohibits damaging or destroying habitat of Endangered or Threatened species on the SARO List, and may apply to Extirpated species through special regulations; and
- Section 17(2)(c) includes provisions for permits that would otherwise contravene the ESA. Permits related to habitat destruction would require an Overall Benefit Permit.

2.3 Conservation Authority

2.3.1 NIAGARA PENINSULA CONSERVATION AUTHORITY ONTARIO REGULATION 155/06

Niagara Peninsula Conservation Authority's (NPCA) Ontario Regulation (O.Reg.) 155/06: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses authorizes NPCA to regulate development and activities in or near watercourses, wetlands, and waterbodies within their watershed. These activities include temporary or permanent placement of fill, grading, removal of fill, or site alteration, as well as bridges, crossings, roads, pipelines, and municipal drains.

2.4 Regional/Municipal

2.4.1 NIAGARA REGION WOODLAND CONSERVATION BY-LAW NO. 2020-79

The Niagara Region Woodland Conservation By-law No. 2020-79 governs the protection and preservation of the Region's woodlands and ensures that any tree cutting is undertaken using good forestry practices. The by-law prohibits the clearing of woodland except under specific circumstances. Selective cutting or removal of individual trees usually requires permit approval.

2.4.2 NIAGARA REGION OFFICIAL PLAN

The Niagara Region (2014) Official Plan (Section 7.B.2) states that an EIS will be required for development and site alteration within or adjacent to Environmental Protection Areas (including PSW, Areas of Natural or Scientific Interest [ANSI], SAR habitat, and Greenbelt Natural Heritage System natural heritage features), fish habitat within the Greenbelt Natural Heritage System, key hydrologic features within the Unique Agricultural Areas, and any associated vegetation protection zones in the Greenbelt Area. An EIS is also required for lands in Environmental Conservation Areas (including significant woodlands, SWH, Species of Conservation Concern [SoCC] habitat, critical or other fish habitat, significant valleylands, or other evaluated wetlands) or on adjacent lands to Environmental Protection and Environmental Conservation Areas. The study area contains both Environmental Protection Areas and Environmental Conservation Areas.

2.4.3 TOWNSHIP OF WAINFLEET OFFICIAL PLAN

The EIS requirements outlined in the Township of Wainfleet's (2016) Official Plan align with those from the Niagara Region (2014) Official Plan.

METHODOLOGY

3.0 Methodology and Field Investigations

3.1 Methodology

Prior to and throughout field investigations, the study team conducted a thorough search of existing information related to the study area. Primary data sources included:

- Publicly accessible significant species occurrence records (Ministry of Natural Resources and Forestry [MNRF]/Natural Heritage Information Centre [NHIC]; 2020);
- Correspondence with the local Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNR, formerly MNR and MNRF) office;
- DFO Aquatic SAR mapping (DFO, 2019);
- Mapping and data obtained from the NPCA;
- Citizen science and other public databases such as eBird (2021), iNaturalist (2021), and the Ontario Reptile and Amphibian Atlas (Ontario Nature, 2021);
- Geospatial data from Land Information Ontario (LIO; 2021); and
- High-resolution aerial imagery of the study area.

3.1.1 TERRESTRIAL VEGETATION

Lists of flora and fauna observed in the study area were maintained throughout the duration of the Project. Floral surveys were completed over three seasons to account for both early- and late-blooming species (e.g., spring forest ephemeral wildflowers versus fall asters and goldenrods). Conservation status ranks at the provincial level were determined using the NHIC's checklist of vascular plants for Ontario (2020), and at the regional level using the List of the Vascular Plants of Ontario's Carolinian Zone (Oldham, 2017). Vegetation communities were delineated on aerial photographs and were classified using Ecological Land Classification (ELC) for Southern Ontario (Lee *et al.*, 1998) where possible, building upon the existing ELC mapping that was obtained from NPCA. Large oak trees and standing snags near the road, which might provide roosting habitat for bats, were identified during spring vegetation surveys and mapped using hand-held Geographical Positioning Systems units.

3.1.2 WILDLIFE AND WILDLIFE HABITAT

In keeping with accepted protocols, breeding birds were evaluated on two separate occasions at least two weeks apart during the typical nesting season (June - July). Birds were identified by sight and call, and the breeding evidence for each species was recorded. Surveys were conducted from the roadside for the entire length of the study area, using both visual and auditory cues to identify birds in the habitat on either side of the road. Creek Road Bridge was investigated for evidence of nests belonging to Barn Swallow (*Hirundo rustica*), Cliff Swallow (*Petrochelidon pyrrhonota*), or other species that are known to occur on these types of structures. The full underside of the Oswego Creek bridge could not be accessed due to the depth of the water, but a similar nest inspection was conducted over as much of the structure as could be viewed from the banks, and bird activity around the bridge was documented.

Anuran (frog and toad) call surveys were completed at night on three separate occasions as per the Bird Studies Canada (2008) Marsh Monitoring Program Participant's Handbook for amphibian surveys. Each of the three surveys were scheduled to meet the minimum temperature requirements for target species as described in the protocol. Parsons established five survey points throughout the study area based on the presence of or proximity to wetlands and other aquatic features which were potential breeding habitat for frogs.

Candidate SWH features were identified as per the Significant Wildlife Habitat Criteria Schedule for Ecoregion 7e (MNRF, 2015) and the Significant Wildlife Habitat Technical Guide (MNR, 2000). Incidental observations of all wildlife (i.e. sight,

scat, tracks, and/or vocalization) were recorded on each site visit. Riverbanks and other potential basking sites were scanned for sunning reptiles.

3.1.3 FISHERIES AND AQUATIC HABITAT

The fish community and aquatic habitats present were assessed during the fall field investigation. In combination with existing fisheries data and background information, including advice from the NDMNRF, a single season sampling in the fall was adequate to fully assess the aquatic habitat and communities present as visibility and flow conditions were ideal. Fisheries collections were conducted using a Smith-Root backpack electrofishing unit (Model LR-24). Aquatic habitat parameters and riparian features were visually assessed and mapped to document existing conditions and determine habitat sensitivity.

3.2 Schedule of Field Investigations

Field investigations were completed by Parsons in 2016 and 2017 (Table 1).

TABLE 1 - SCHEDULE OF PARSONS' 2016 AND 2017 FIELD INVESTIGATIONS

Date of Survey	Target Species/Data	Site Conditions
June 16, 2016	Site reconnaissance, late spring frogs	22°C, clear
June 17, 2016	Breeding birds	19-22°C, sunny
July 15, 2016	Breeding birds, summer vegetation inventory	24-27°C, sunny
September 12, 2016	ELC, fall vegetation inventory	22°C, sunny
October 13, 2016	Fisheries assessment	17°C, sunny
April 10, 2017	Early spring frogs	18°C, overcast, rain started as survey was completed
May 24, 2017	Mid-season frogs, spring vegetation	16°C, overcast, rain ended just before survey began
Throughout all site visits	Incidental wildlife, wildlife habitat, photographic record	n/a

EXISTING CONDITIONS

4.0 Existing Conditions

4.1 Physiography and Soil

The study area is found in Haldimand Clay Plain Physiographic Region, which is found between the Niagara Escarpment and Lake Erie throughout the Niagara peninsula. This region was historically submerged by a glacial lake and therefore is most often characterized by stratified clay soils and moraine till ridges (Chapman and Putnam, 1984). The dominant natural physiographic features in the study area are the Welland River and Oswego Creek.

4.2 Surface Water

There are several surface water features within the study area for the Project. The Welland River, Oswego Creek, and an unnamed tributary to Welland River at Creek Road Bridge east of Oswego Creek are permanent watercourses (**Figure 2**). Other small tributaries in the study area are ephemeral (i.e., containing flowing water only during spring runoff and large storm events). Dils Lake, located in Chippawa Creek CA north of the roadway, is a permanent anthropogenic reservoir. Ephemeral pools were observed in woodlands in Chippawa Creek CA and several other locations in the study area, generally located away from the road corridor.

Elevated concentrations of total phosphorus are a widespread cause of water quality impairment in the Welland River (NPCA, 2017). Sampling data from the report indicated more than 95% of samples collected in the main Welland River were in exceedance of the Provincial Water Quality Objective. High phosphorus in the Welland River is expected to be the cause of overgrown algae and duckweed throughout the watershed (NPCA, 2017).

4.3 Groundwater

Geotechnical investigations indicated that the static groundwater elevation is estimated at depths of approximately 5 to 6 m below the existing ground surface, near to or slightly above the level of the Welland River (Soil Mat Consultants and Engineers, 2016). During their borehole investigations, 44 out of 46 borehole locations were recorded as dry upon completion of drilling. NPCA indicated that groundwater discharges sustain continuous base flow within the Welland River (NPCA, 2017).

4.4 Designated Areas and Features

The Study Area contains several Designated Areas and Features that have potential to interact with the Project. The Designated Areas and Features are discussed below.

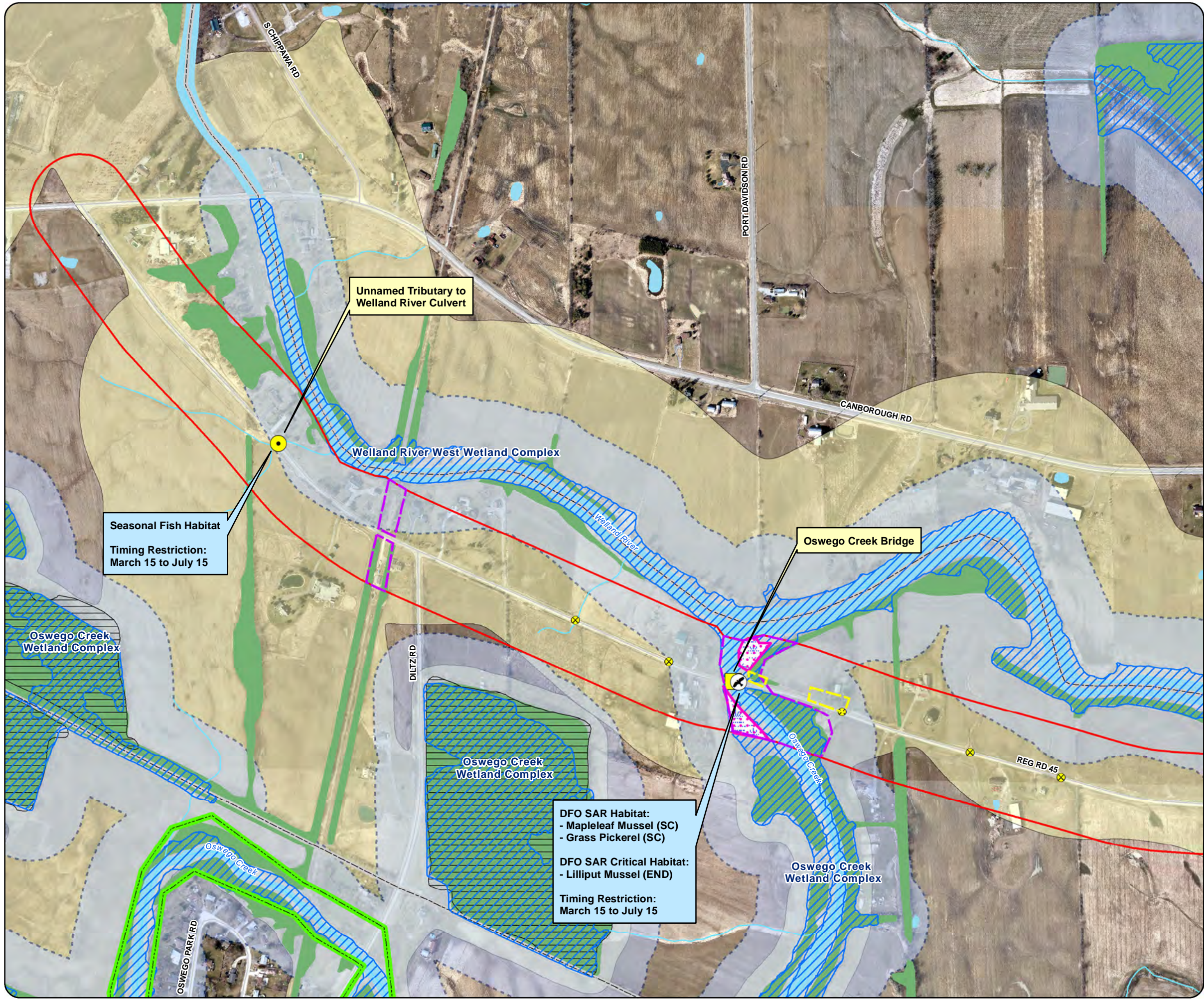
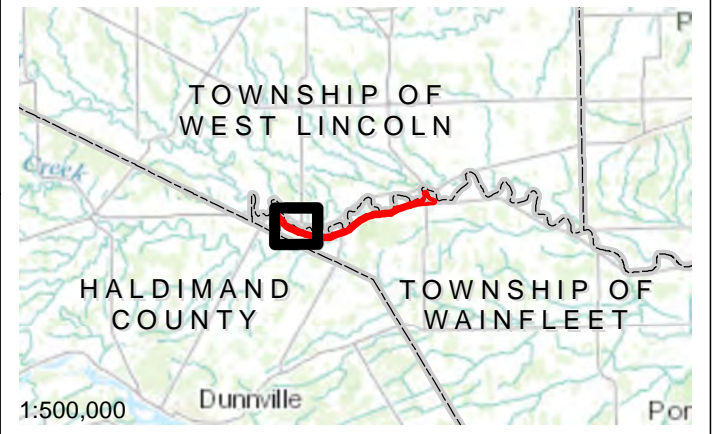


FIGURE 3 (1 of 4)
Constraints and Opportunities

LOCATION MAP

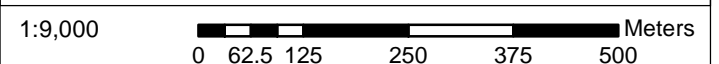


LEGEND

- Bridge Crossing, Fish Habitat
- Culvert Crossing, Fish Habitat
- Culvert Crossing, Drainage
- Road
- Watercourse
- Study Area (120 m)
- Municipality
- Waterbody (LIO)
- Woodland (LIO)

Constraints and Opportunities

- Barn Swallow Nest
- Bat Tree Concentration Area
- Wildlife Movement Corridor
- Amphibian Breeding Habitat
- Wetland Community (Parsons)
- NPCA Conservation Area
- Deer Wintering Area (LIO)
- Provincially Significant Wetland (PSW)
- PSW Buffer (120 m)
- Growth Plan for the Greater Golden Horseshoe



DATA SOURCES: Parsons; Ontario Ministry of Natural Resources and Forestry; Niagara Peninsula Conservation Authority (NPCA); Ontario Ministry of Transportation; ESRI; Land Information Ontario (LIO)

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PARSONS PN: 603118 DATE: 7/15/2021 DRAFT BY: A.V.



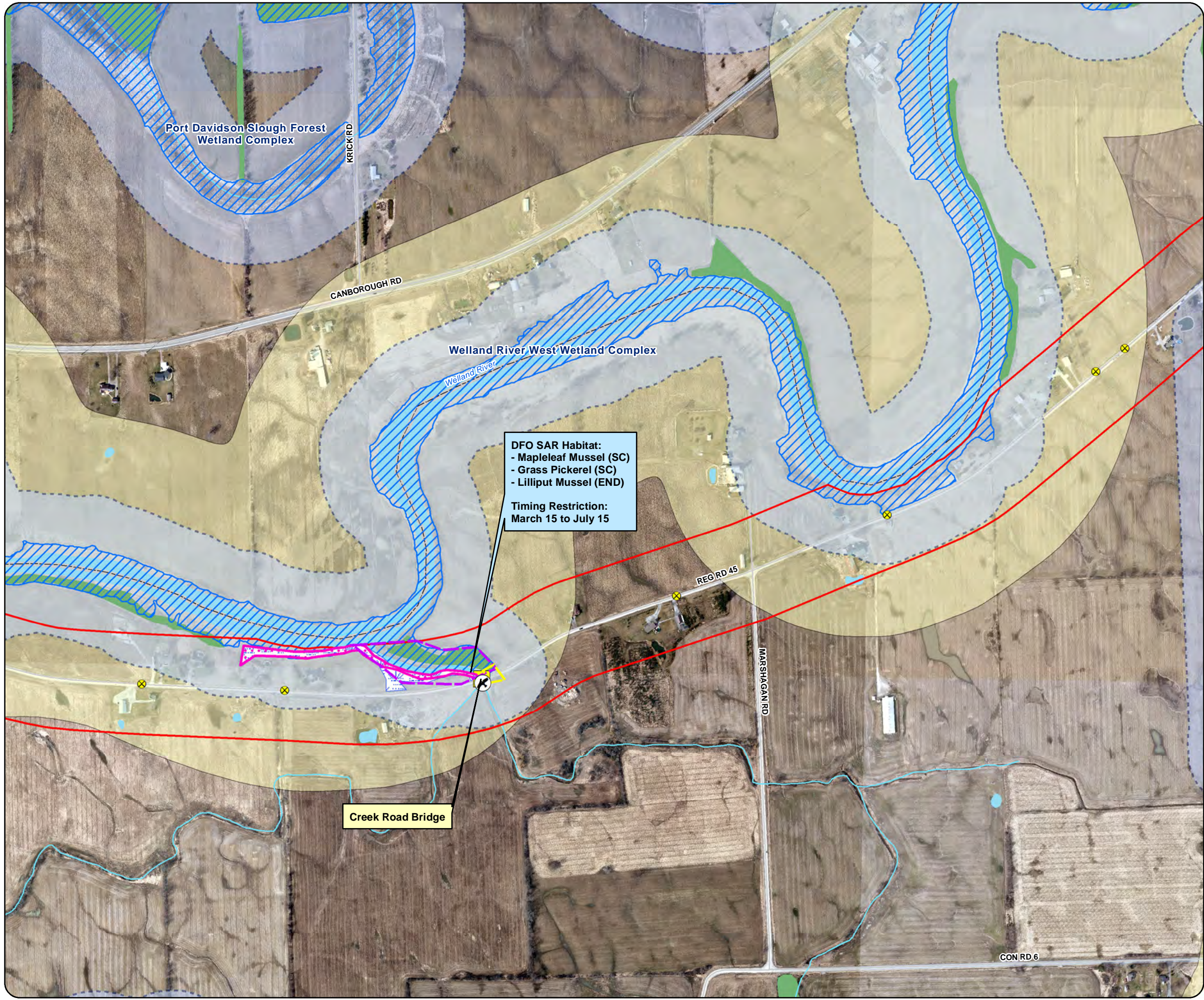
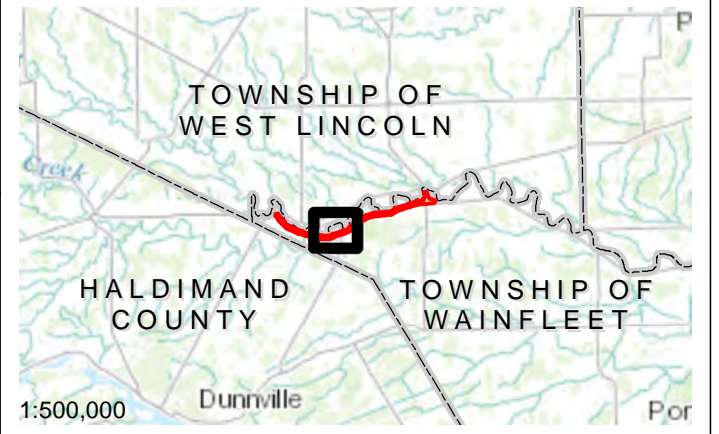


FIGURE 3 (2 of 4)
Constraints and Opportunities

LOCATION MAP



LEGEND

- Bridge Crossing, Fish Habitat
- Culvert Crossing, Fish Habitat
- ⊗ Culvert Crossing, Drainage
- Study Area (120 m)
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- Watercourse

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PARSONS PN: 603118 DATE: 7/15/2021 DRAFT BY: A.V.



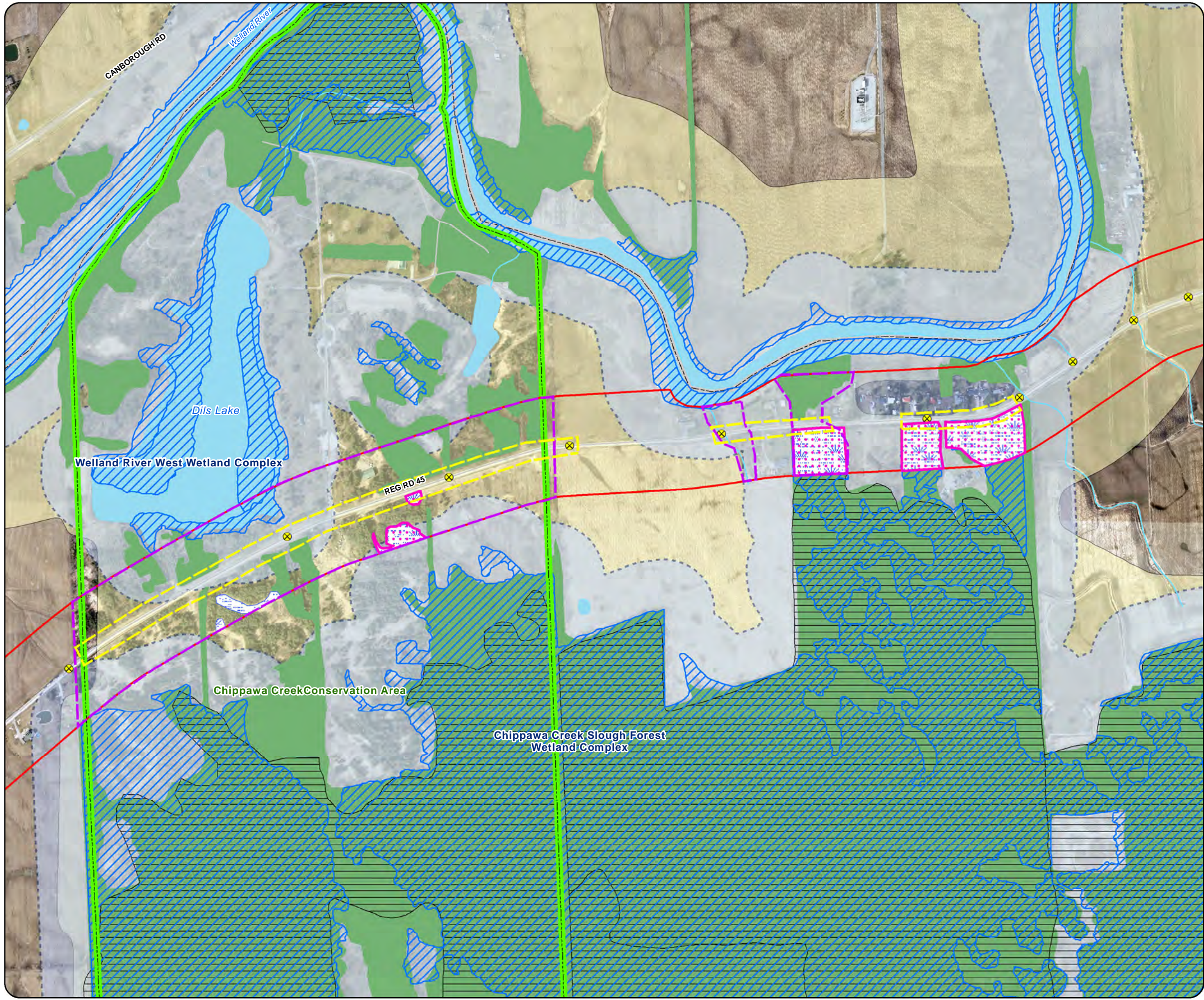
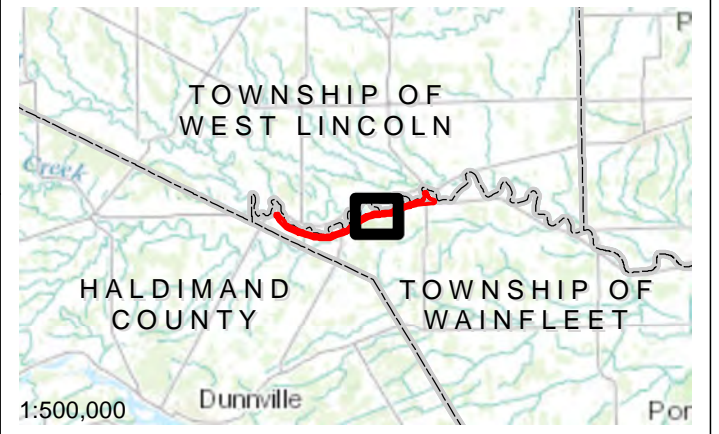


FIGURE 3 (3 of 4)
Constraints and Opportunities

LOCATION MAP



LEGEND

- Bridge Crossing, Fish Habitat
- Culvert Crossing, Fish Habitat
- ⊗ Culvert Crossing, Drainage
- Road
- Watercourse
- Study Area (120 m)
- Municipality
- Waterbody (LIO)
- Woodland (LIO)

Constraints and Opportunities

- 🕒 Barn Swallow Nest
- 🦇 Bat Tree Concentration Area
- 🦊 Wildlife Movement Corridor
- 🐸 Amphibian Breeding Habitat
- 🌿 Wetland Community (Parsons)
- 🌿 NPCA Conservation Area
- 🦌 Deer Wintering Area (LIO)
- 🌊 Provincially Significant Wetland (PSW)
- 🌊 PSW Buffer (120 m)
- 🌟 Growth Plan for the Greater Golden Horseshoe



DATA SOURCES: Parsons; Ontario Ministry of Natural Resources and Forestry; Niagara Peninsula Conservation Authority (NPCA); Ontario Ministry of Transportation; ESRI; Land Information Ontario (LIO)

Creek Road Municipal Class Environmental Assessment, Schedule 'C'

Environmental Impact Study: Reconstruction of Regional Road 45 (Creek Road) Between Regional Road 27 (River Road) and Regional Road 63 (Canborough Road) in the Township of Wainfleet

PARSONS PN: 603118 | DATE: 7/15/2021 | DRAFT BY: A.V.



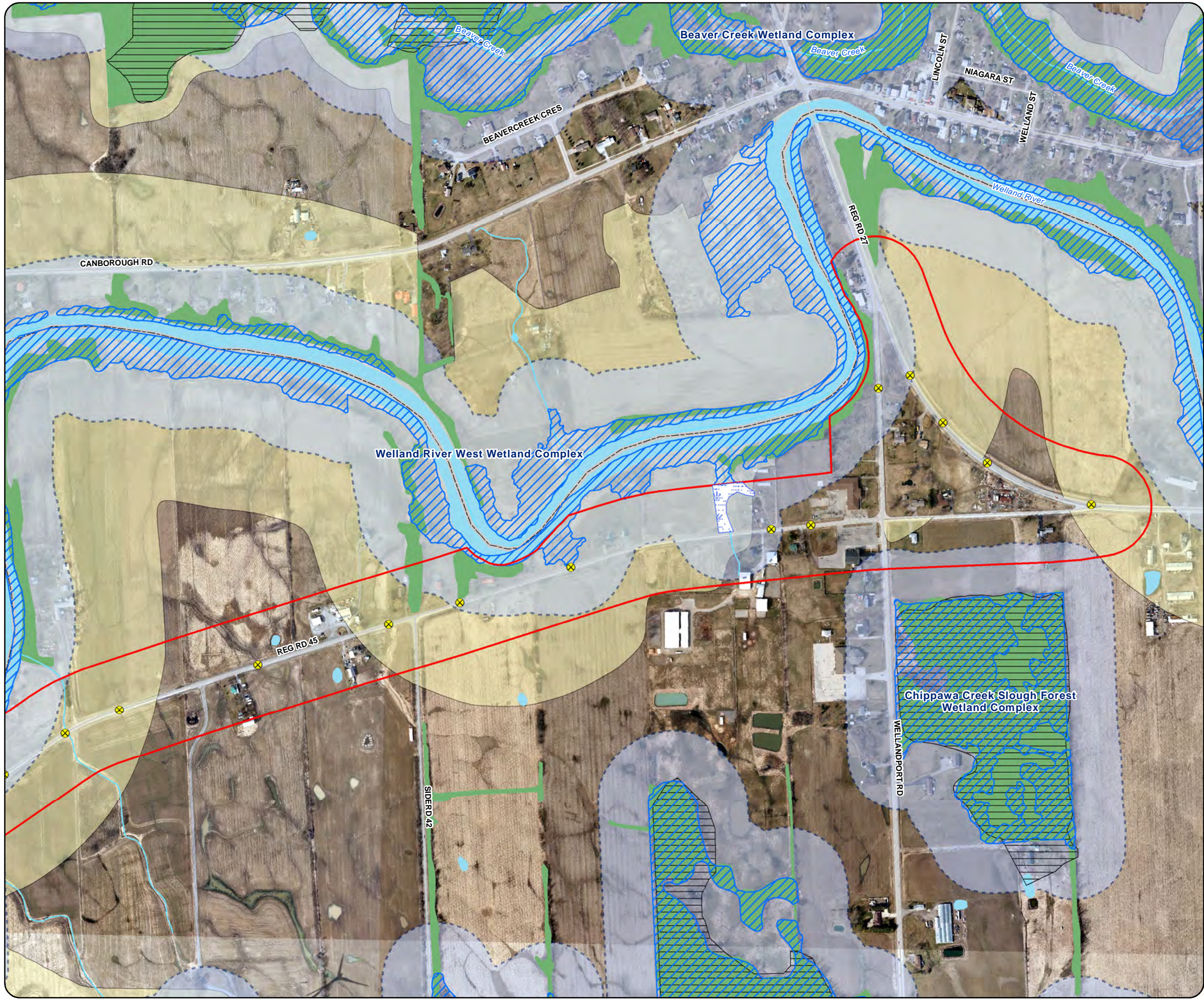
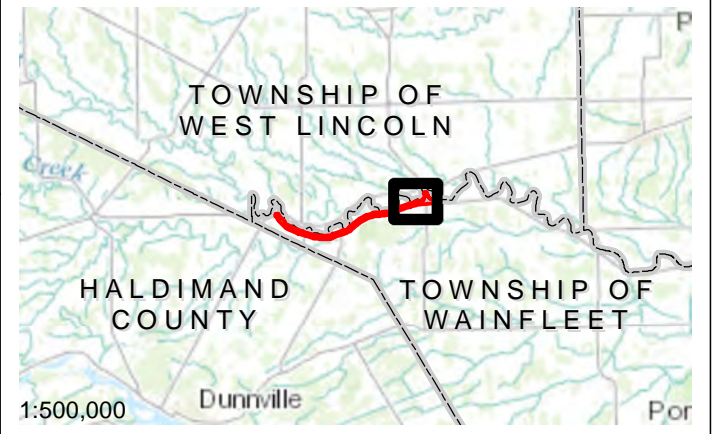


FIGURE 3 (4 of 4)
Constraints and Opportunities

LOCATION MAP



LEGEND

- Bridge Crossing, Fish Habitat
- Culvert Crossing, Fish Habitat
- ⊗ Culvert Crossing, Drainage
- Road
- Watercourse
- Study Area (120 m)
- Municipality
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Constraints and Opportunities

- 🕊 Barn Swallow Nest
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- 🦌 Deer Wintering Area (LIO)
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- 🌱 Growth Plan for the Greater Golden Horseshoe



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PARSONS PN: 603118 DATE: 7/15/2021 DRAFT BY: A.V.



4.4.1 NIAGARA REGION OFFICIAL PLAN

Much of the study area is designated as environmental protection or environmental conservation areas (Niagara Region Official Plan, 2014; Schedule C). This includes Chippawa Creek CA, Chippawa Creek Slough Forest PSW Complex, Welland River West PSW Complex, and riparian areas along the Welland River and Oswego Creek (**Figure 3**). All of these features fall within the study area and are situated adjacent to or overlapping the project limits.

4.4.2 NPCA REGULATED AREAS

The project limits pass through 21 NPCA regulated areas associated with the Welland River and its tributaries, Oswego Creek and its tributaries, Chippawa Creek Slough Forest PSW Complex, Oswego Creek PSW Complex, and Welland River West PSW Complex (**Figure 3**; NPCA, 2017). O. Reg. 155/06, administered by the NPCA, applies to these regulated areas within the study area. Under this regulation, any development, site alteration, construction, or placement of fill within the regulated area requires a permit from NPCA, as does interference with a wetland or any alteration to an existing watercourse channel. Chippawa Creek CA is owned and managed by the NPCA; therefore, conservation authority regulations and management plans apply to the property.

4.4.3 PROVINCIALY SIGNIFICANT WETLANDS

Three separate PSWs (**Figure 3**) are situated within the Creek Road project limits:

- Welland River West PSW Complex - found along the Welland River throughout the study area and includes the confluence with Oswego Creek up to Creek Road;
- Oswego Creek PSW Complex - follows Oswego Creek and connects with the Welland River West PSW at Creek Road; and,
- Chippawa Creek Slough Forest PSW Complex – found mainly south of Creek Road in association with the Chippawa Creek CA property, but directly abuts the road a short distance east of the CA.

All three PSWs overlap or abut the Creek Road right-of-way (ROW) within the project limits (MNR, 2020).

4.4.4 AREAS OF NATURAL AND SCIENTIFIC INTEREST

No ANSIs were identified in the study area.

4.5 Fisheries and Aquatic Habitat

4.5.1 AQUATIC HABITAT

The primary water features of interest within the study area are the Welland River, Oswego Creek, and an unnamed tributary to Welland River located approximately 600 m west of Marshagan Road (Niagara Regional Road 7; **Figure 3**). Although the Welland River does not cross Creek Road, it does flow within close proximity to Creek Road in some areas. It should be noted that 2016 was an exceptionally dry year with record low precipitation amounts in the spring and record high temperatures in the summer; therefore, field investigations were completed in late fall to identify potential seasonal fish habitats that may have been dry in the spring or summer. At the time of investigations, three watercourse crossings along Creek Road were found to provide seasonal or permanent fish habitat. The remaining watercourse crossings do not directly support fish populations; however, given their connectivity to the Welland River, these features provide contributions indirectly to fish habitat along the river shoreline where they outlet.

4.5.1.1 Unnamed Tributary to Welland River

The watercourse at this crossing is a Corrugated Steel Pipe (CSP) located on Creek Road approximately 500 m northwest of Diltz Road. It was observed to have shallow pools at the culvert inlet and outlet within an otherwise dry channel, and very little water was observed to be entering the pools from the CSP culvert during field investigations. Dissolved oxygen (DO) levels were relatively low in the pools and other water quality parameters were consistent with the conditions and

surrounding land use (**Table 2**). The water quality is likely to limit the fish community to warm water species tolerant of low DO.

The watercourse was comprised of a dry overland swale in the agricultural field upstream of the culvert. Downstream, the channel was lined with rip-rap through manicured lawn for approximately 25 m before leading to a deeper, naturalized section, approximately 0.5 m deep that may offer potential nursery/rearing habitat near the river confluence (**Figure 4**). Some erosion was observed downstream of the rip-rap channel, consisting of minor undercut banks.

TABLE 2 - WATER QUALITY CONDITIONS AT UNNAMED TRIBUTARY TO WELLAND RIVER

Parameter	At Culvert
Conductivity (µS/cm)	765
pH	8.16
Water Temperature (°C)	15
Air Temperature (°C)	10
Dissolved Oxygen (mg/L)	4.0

Based on conditions observed, this watercourse may provide seasonal fish habitat up to and including the ROW; however, due to the absence of sufficient flow, refuge habitat, and a low flow channel on both sides of Creek Road, prolonged usage by fish is unlikely in the study area.



FIGURE 4 - REPRESENTATIVE PHOTOS OF UNNAMED TRIBUTARY TO WELLAND RIVER (LEFT: UPSTREAM, RIGHT: DOWNSTREAM)

4.5.1.2 Oswego Creek

The Oswego Creek Bridge is located crossing Creek Road approximately 750 m southeast of Diltz Road. At the bridge, submerged and/or floating vegetation was present along both banks of Oswego Creek (**Figure 5**). The Oswego Creek corridor is identified as a PSW (**Figure 3**). Upstream (southside) of Creek Road, the creek is part of the Oswego Creek PSW Complex and downstream (northside), the creek is part of the Welland River West PSW Complex. Oswego Creek is exposed to multiple potential stressors, such as agricultural and roadway runoff, which are expected to be the source of increased phosphorus resulting in potential nuisance algae and abundant duckweed during summer months (NPCA, 2017). Migration of fish through Oswego Creek from the larger permanent Welland River is likely when conditions permit. The overhanging trees found throughout the watercourse banks shade the watercourse, provide cover for fish, and contribute to coarse woody in-stream cover found along the creek margins (**Figure 5**). Water depths at this section of the river are estimated to be 4 m - 6 m at the centre of the creek with muddy/silty substrate. Water quality parameters for this feature are indicative of slow, depositional warmwater creeks in the area (**Table 3**).

TABLE 3 - WATER QUALITY CONDITIONS IN THE WELLAND RIVER AND OSWEGO CREEK INTERSECTION

Parameter	At Oswego Creek Bridge
Conductivity ($\mu\text{S}/\text{cm}$)	746
pH	8.25
Water Temperature ($^{\circ}\text{C}$)	15.6
Air Temperature ($^{\circ}\text{C}$)	10
Dissolved Oxygen (mg/L)	6.6



FIGURE 5 - REPRESENTATIVE PHOTOS OF OSWEGO CREEK AT THE BRIDGE (LEFT: UPSTREAM, RIGHT: DOWNSTREAM)

Based on field investigations, aquatic habitat in Oswego Creek is abundant along the shorelines and suitable for sustaining a diverse fishery and supporting important spawning, feeding, and nursery functions. Available in-stream habitat consists of floating, submergent, and emergent aquatic macrophytes, overhanging bank vegetation, limited coarse woody debris, and rock protection around the existing bridge wingwalls.

4.5.1.3 Creek Road Bridge

This watercourse is another unnamed tributary of Welland River located on Creek Road approximately 600 m southwest of Regional Road 7 (Marshagan Road) and is a main intersect drainage point from the agricultural fields upstream to the Welland River (**Figure 6**). Upstream of the culvert, the channel was completely overgrown in places with emergent wetland vegetation. Downstream of the culvert, large riparian trees are located along the banks of the creek offering submerged root systems that provide complex structure for fish habitat. Tall grasses and other semi-aquatic vegetation found throughout the watercourse likely provide spawning habitat for many fish species, including Northern Pike (*Esox lucius*) and potentially Grass Pickerel (*Esox americanus vermiculatus*; **Figure 6**). Phosphorus concentrations are high throughout the Welland River (NPCA, 2017), a known limiting nutrient to the nuisance algae *Cladophora*, which was found in dense mats throughout the watercourse. The portion of this watercourse found north of Creek Road is identified as part of the Welland River West PSW complex and provides important habitat for small or young fish. Conductivity in the unnamed tributary was fairly high and DO was in a suitable range to support a diverse fish community (**Table 4**).

TABLE 4 - WATER QUALITY CONDITIONS AT CREEK ROAD BRIDGE

Parameter	At Culvert
Conductivity ($\mu\text{S}/\text{cm}$)	2041
pH	8.15
Water Temperature ($^{\circ}\text{C}$)	15.3

Air Temperature (°C)	10
Dissolved Oxygen (mg/L)	6.8



FIGURE 6 - REPRESENTATIVE PHOTOS AT CREEK ROAD BRIDGE (LEFT: UPSTREAM, RIGHT: DOWNSTREAM)

4.5.2 AQUATIC COMMUNITY INVENTORY

The Welland River, Oswego Creek, and associated tributaries were mapped as suitable habitat to support diverse fish and mussel communities. Due to flow conditions observed in some tributaries, only Welland River, Oswego Creek, and the unnamed tributary at Creek Road Bridge provide suitable habitat for freshwater mussels. The Lilliput mussel (*Toxoplasma parvum*) is potentially present at both watercourses and identified as an Endangered species under the SARA and Threatened under the ESA with known critical habitat at the Oswego Creek bridge. The Mapleleaf mussel (*Quadrula quadrula*) is identified as a Special Concern species under the SARA and ESA and was highlighted on DFO online SAR Mapping (2019) as potentially inhabiting Oswego Creek and the unnamed tributary to Welland River at Creek Road Bridge given their permanent flow conditions and presence of suitable habitat. Multiple Mapleleaf shells were found along the shoreline of the Welland River near Oswego Creek confirming the presence of the SAR species. In addition, Grass Pickerel is a species of Special Concern under the SARA and ESA and may also be present at both watercourses as well.

4.5.2.1 Background Information

NDMNR fish records indicate a diverse fish community in the following sections for the Welland River and Oswego Creek (MNR, pers. comm.). The fish communities in these watercourses are provided in **Table 5**.

TABLE 5 - FISH COMMUNITIES IN THE WELLAND RIVER AND OSWEGO CREEK

Common Name	Taxonomic Name	Welland River	Oswego Creek	Unnamed Tributary of Welland River at Creek Road Bridge (Parsons, 2016)
Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	X		X
Black Crappie	<i>Pomoxis nigromaculatus</i>	X	X	
Bluegill	<i>Lepomis macrochirus</i>	X	X	X
Bluntnose Minnow	<i>Pimephales notatus</i>	X		X
Bowfin	<i>Amia calva</i>	X	X	
Brook Silverside	<i>Labidesthes sicculus</i>	X		
Brown Bullhead	<i>Ameiurus nebulosus</i>	X	X	X

Channel Catfish	<i>Ictalurus punctatus</i>	X	X	
Common Carp	<i>Cyprinus carpio</i>	X	X	
Common Shiner	<i>Luxilus cornutus</i>	X	X	
Emerald Shiner	<i>Notropis atherinoides</i>	X	X	
Freshwater Drum	<i>Aplodinotus grunniens</i>	X	X	
Gizzard Shad	<i>Dorosoma cepedianum</i>	X	X	X
Golden Shiner	<i>Notemigonus crysoleucas</i>	X	X	
Goldfish	<i>Carassius auratus</i>	X	X	X
Greater Redhorse	<i>Moxostoma valenciennesi</i>	X		
Green Sunfish	<i>Lepomis cyanellus</i>	X		
Johnny Darter	<i>Etheostoma nigrum</i>		X	
Largemouth Bass	<i>Micropterus salmoides</i>	X	X	
Sunfish sp.	<i>Lepomis spp.</i>	X		
Logperch	<i>Percina caprodes</i>	X		
Redhorse sp.	<i>Moxostoma spp.</i>	X	X	
Northern Pike	<i>Esox lucius</i>	X	X	
Pumpkinseed	<i>Lepomis gibbosus</i>	X	X	X
Rock Bass	<i>Ambloplites rupestris</i>	X		
Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	X	X	
Walleye	<i>Sander vitreus</i>	X	X	
White Crappie	<i>Pomoxis annularis</i>	X	X	
White Perch	<i>Morone americana</i>	X	X	
White Sucker	<i>Catostomus commersonii</i>	X		
Yellow Bullhead	<i>Ameiurus natalis</i>	X	X	
Yellow Perch	<i>Perca flavescens</i>	X	X	

4.5.2.2 Field Investigations

4.5.2.2.1 Unnamed Tributary to Welland River

This tributary is intermittent or ephemeral and dry for most of the year. Directly at the culvert outlet, small pools of water were present at the time of inspection; however, no fish were observed while electrofishing. The channel downstream of the culvert connects hydrologically to the Welland River, which contains a diverse fish community (**Table 5**); however, seasonal migration between the unnamed tributary and the Welland River when creek flow is elevated. Due to the absence of refuge habitat or a low-flow channel upstream of the culvert, seasonal fish are not likely to move beyond the road crossing.

4.5.2.2.2 Oswego Creek

Oswego Creek is the largest tributary of the Welland River and the Oswego Creek Bridge crossing (approximately 20 m from the Welland River confluence) provides a significant migration route for multiple fish species. The crossing does not have any permanent or seasonal barriers and fish communities between the Welland River and Oswego Creek are contiguous. According to the MNRF, Grass Pickerel historically occurred in tributaries of the Welland River and are rarely found in the main stem of the river today; however, marshy habitat surrounds the bridge increasing the potential for Grass Pickerel to occur at this location.

4.5.2.2.3 Creek Road Bridge

This watercourse was sampled upstream and downstream of the Creek Road culvert during the October 2016 field investigations (Table 5). This species list suggests a warmwater ecosystem with a diverse fishery as documented in background information obtained. No aquatic SAR were observed or captured during field investigations.

Freshwater shrimp (which are likely to be *Gammarus fasciatus* based on size and habitat features) were observed in the watercourse at the Creek Road Bridge. This species of amphipod is likely predated by fish such as the commercially significant Yellow Perch, frogs, birds, and insects. Additionally, *Gammarus fasciatus* has been known to be an effective bioindicator of ecosystem health, indicating the presence and toxicity of pesticides and chemicals in the watershed (Kipp, 2013). *Gammarus fasciatus* has been correlated to increased amounts of *Cladophora*, which was overgrown throughout this portion of the Welland River. Like the Gizzard Shad found in the area, *Gammarus fasciatus* prefers well oxygenated, cool waterbodies and is likely to be negatively impacted by abrupt temperature changes.

4.6 Terrestrial Vegetation

The largest areas of natural vegetation in the study area are in the Chippawa Creek CA and in the extension of the PSW that abuts Creek Road east of the CA. Patches of natural and naturalized vegetation are also present along watercourses, along the abandoned railway corridor which crosses the road corridor, and in hedgerows at the edges of fields.

Natural and naturalized vegetation in the study area includes deciduous forests, swamp, marsh, cultural thickets, and cultural meadows. Vegetation in the study area was divided into overall vegetation units and further refined into vegetation communities within these units (Appendix A).

The vegetation communities within the study area are diverse and varied (Table 6). Much of the study area has experienced historical disturbance through clearing and agriculture, which can make characterization using ELC challenging due to edge effects and altered soil horizons. However, ELC terminology has been applied to the greatest extent possible.

TABLE 6 - VEGETATION COMMUNITIES

ELC Code	Community Type	Description/Comments
CUM1	Mineral Cultural Meadow	Cultural meadow typically includes old fields and open areas in the early stages of succession. It is characterized as well-drained, open habitat dominated by grass and forbs with few or no trees and shrubs. Cultural meadow is widespread in the study area and represents the largest contiguous vegetation communities.
CUP1	Deciduous Plantation	Planted areas of deciduous trees, including Black Walnut (<i>Juglans nigra</i>), Black Locust (<i>Robinia pseudoacacia</i>), and Hickories (<i>Carya</i> spp.), are located in Chippawa Creek CA.
CUS1-1	Hawthorn Cultural Savannah	Cultural savannah typically represents old fields and pastures with scattered trees and groundcover dominated by grasses and forbs. Several patches of cultural savannah are present in the study area, mainly between Creek Road and the Welland River.
CUP3	Coniferous Plantation	Plantations of coniferous trees, namely Pine (<i>Pinus</i> spp.) and Spruce (<i>Picea</i> spp.), represent most vegetation in Chippawa Creek CA.
CUW1	Mineral Cultural Woodland	Typically a vegetation community of human origin but in a more advanced stage of succession than cultural savannah or cultural meadow. Cultural woodlands are present at various locations throughout the study area.
HAc	Common Apple Hedgerow	Narrow hedgerow containing predominantly Common Apple (<i>Malus pumila</i>).
HAg	Green Ash Hedgerow	Narrow hedgerow containing predominantly Green Ash (<i>Fraxinus pennsylvanica</i>).
HOsw	Swamp White Oak Hedgerow	Hedgerow consisting of planted (or possibly remnant) Swamp White Oaks (<i>Quercus bicolor</i>).
FOD6-5	Fresh-Moist Sugar Maple-Hardwood Deciduous Forest	Deciduous forest community with a canopy dominated by Sugar Maple (<i>Acer saccharum</i>) and other hardwood trees. This is a common and widespread community typical of southern Ontario forests.
FOD7-2	Fresh-Moist Ash Lowland Deciduous Forest	Deciduous forest community with a canopy dominated by Ash (<i>Fraxinus</i> spp.) and other hardwood trees. This community is located adjacent to most of the watercourses in the study area.

FOD9	Fresh-Moist Oak-Maple-Hickory Deciduous Forest	Deciduous forest community with a canopy dominated by Oaks (<i>Quercus</i> spp.), Maples (<i>Acer</i> spp.) and Hickories. There is only one small area of this community in the study area, in Chippawa Creek CA.
FOM	Mixed Forest	Forest community consisting of a mix of deciduous and coniferous trees. Much of Chippawa Creek CA can be classified as mixed forest.
FOM2-2	Dry-Fresh White Pine-Sugar Maple Mixed Forest	Forest community with a canopy dominated by Eastern White Pine (<i>Pinus strobus</i>) and Sugar Maple (<i>Acer saccharum</i>). There are two small areas of this vegetation community located in the eastern section of the study area.
MAM2-2	Reed Canary Grass Mineral Meadow Marsh	Seasonally flooded marsh community dominated by Reed Canary Grass (<i>Phalaris arundinacea</i>). This is a common and widespread vegetation community in Ontario.
MAS2	Mineral Shallow Marsh	Typically permanently flooded marsh community with mineral substrate.
MAS2-9	Forb Mineral Shallow Marsh	Typically permanently flooded marsh community with mineral substrate. Forb mineral shallow marshes in the study area are dominated by Arrowhead (<i>Sagittaria</i> spp.).
SAF1-1	Water Lily Floating-leaved Shallow Aquatic	Found along the banks of Oswego Creek.
SWD2-2	Green Ash Mineral Deciduous Swamp	Swamp community with a canopy dominated by Green Ash. This is the predominant component of PSWs in and around the study area. Inclusions of meadow marsh and other wetland communities occur within mineral deciduous swamp communities in the study area.
SWT2-9	Grey Dogwood Mineral Thicket Swamp	Swamp community dominated by Grey Dogwood (<i>Cornus racemosa</i>), or in some cases Silky Dogwood (<i>Cornus amomum</i>).

A full list of plant species observed by Parsons in the study area is included in **Appendix B**. SoCC were also documented in the study area, including one provincially rare species and seven regionally rare species. Species of note include Walter's Barnyard-grass (*Echinochloa walteri*), a provincially rare species which was found growing in riparian marsh habitat along Oswego Creek to the north of the Oswego Creek Bridge.

4.7 Wildlife

4.7.1 BIRDS

A total of 42 bird species were identified by Parsons in the study area, and 32 additional species were documented by others via eBird (2021) and iNaturalist (2021). Noteworthy species include Barn Swallow (*Hirundo rustica*) and Eastern Wood-Pewee (*Contopus virens*), which are SAR. **Appendix D** details the results of Parsons' bird observations in the study area, combining the results of the formal breeding bird surveys with incidental observations. Observation data from other sources, such as eBird, iNaturalist, and the Ontario Breeding Bird Atlas, has been incorporated into **Appendix C** which provides the master wildlife species list for the project.

A single nest was observed on Creek Road Bridge. This nest was a cup-shaped structure attached to a small ledge on the side wall, consistent with the nest characteristics of Barn Swallow. There was a large amount of fine plant material built onto the nest, which suggests that another species took over the nest site. Regardless, this structure has the potential for future nesting of Barn Swallow as well as other species.

The underside of the Oswego Creek bridge has numerous ledges and cavities created by the exposed support beams, and therefore has a high potential to support nesting birds. Although visibility beneath the bridge was limited by steep banks and deep water, bird activity around the bridge was high and Barn Swallows were observed on multiple occasions flying above the water around the bridge. The bridge is therefore considered potential nesting habitat for Barn Swallow.

4.7.2 AMPHIBIANS

Breeding amphibian surveys completed by Parsons identified six species of frog within the study area: American Bullfrog (*Lithobates catesbianus*), American Toad (*Anaxyrus americanus*), Gray Tree Frog (*Hyla versicolor*), Green Frog (*Lithobates clamitans*), Spring Peeper (*Pseudacris crucifer*), and Western Chorus Frog (*Pseudacris triseriata*). Full details of Parsons' amphibian surveys have been provided in **Appendix E**. Amphibian breeding habitat will be discussed further in **Section 4.8.3**, as it relates to SWH.

4.7.3 OTHER WILDLIFE

Parsons' incidental mammal observations within the study area include: Red Fox (*Vulpes vulpes*), White-tailed Deer (*Odocoileus virginianus*), Striped Skunk (*Mephitis mephitis*), Eastern Chipmunk (*Tamias striatus*), Eastern Cottontail (*Sylvilagus floridanus*), and Red Squirrel (*Tamiasciurus hudsonicus*). Many of these observations were made in the vicinity of the Chippawa Creek CA, and some were observed dead on the road surface.

Parsons' only reptile observations in the study area were two Eastern Garter Snakes (*Thamnophis sirtalis sirtalis*) and one Midland Painted Turtle (*Chrysemys picta marginata*), all of which were found dead on the road shoulder. The Ontario Reptile and Amphibian Atlas indicated that numerous other reptile species could occur in the vicinity (**Appendix C**). Of these, Snapping Turtle (*Chelydra serpentina*) and Northern Water Snake (*Nerodia sipedon sipedon*) are likely to occur in the study area in association with suitable habitat in the large watercourses crossed by Creek Road.

Seven species of butterfly were also observed within the study area, in open fields and along roadsides. This includes the provincially and federally listed Special Concern species Monarch (*Danaus plexippus*), which will be discussed further in **Section 4.8.4**.

A full list of all wildlife observations and species documented by other sources is provided in **Appendix C**.

4.8 Terrestrial Wildlife Habitat

SWH features and functions are described in MNR's (2000) Significant Wildlife Habitat Technical Guide and further defined in the MNRF (2015) Significant Wildlife Habitat Criteria Schedule for Ecoregion 7E. Significant habitats include seasonal concentration areas (e.g., deer wintering yards, colonial bird nesting sites), and specialized habitats such as forest interiors and seeps/springs. The following sections include an assessment of SWH in the study area in detail.

4.8.1 SEASONAL CONCENTRATION AREAS

4.8.1.1 Waterfowl Stopover and Staging Areas

This type of habitat includes water-sheeted fields in spring as well as ponds and other watercourses which provide waterfowl with the opportunity to rest and feed during migration. While sewage treatment and stormwater storage ponds do not qualify as SWH, active agricultural fields with sheeted water in spring are eligible if they support enough birds. Within the study area, the large aquatic features (e.g., the Welland River, Oswego Creek, and Dils Lake) likely provide some stopover habitat during migration, although large numbers of waterfowl have not been reported in the area via eBird records, nor were any observed during Parsons' own site investigations. As such, candidate Waterfowl Stopover and Staging Areas are considered present within the study area.

4.8.1.2 Shorebird Migratory Stopover Areas

The study area does not have the extensive mud flats or shallow, weedy areas that would attract significant numbers of shorebirds during the spring or fall migration. Some migrating shorebirds could potentially be found along sections of the river and creek banks; however, despite the very thorough bird species list compiled from both Parsons' own observations and eBird records from local residents (**Appendix C**), no shorebirds other than Killdeer (*Charadrius vociferus*) were documented in the area. Since habitats characteristic of Shorebird Migratory Stopover Areas are not present within the study area, this SWH type will not be considered further.

4.8.1.3 Landbird Migratory Stopover Areas

Significant landbird stopover areas are woodlots greater than 5 ha in size located within 5 km of Lake Erie or Lake Ontario. The study area does not contain any sites within that location boundary; therefore, this SWH type is considered absent from the study area.

4.8.1.4 Raptor Wintering Areas

Open fields that support small mammal populations, in conjunction with woodlands providing roosting sites, are important to the winter survival of many raptors (MNR, 2000). Species such as Red-tailed Hawk (*Buteo jamaicensis*) are frequently seen along open road ROW bordering old fields or agricultural lands, perching on utility poles or snag trees. The open spaces adjacent to Creek Road within the study area could be appealing to raptors and are found near wooded areas which could provide the associated roosting sites. However, as field investigations were not conducted during winter, the presence of this SWH type could not be confirmed. Thus, candidate Raptor Wintering Areas are considered present in the study area.

4.8.1.5 Colonially-nesting Bird Breeding Habitat

Bird nesting colonies can occur on cliffs and structures (e.g., Cliff Swallows under a bridge), in natural vegetation (e.g., Great Blue Herons [*Ardea herodias*] in a swamp), and on open ground (e.g., gulls on a rocky shore or island). Parsons did not observe any evidence of nesting colonies of any type within the study area. The underside of the Oswego Creek Bridge could potentially support a colony of birds such as Cliff Swallows or Barn Swallows; however, anthropogenic structures are not eligible to be SWH. Therefore, Colonially-nesting Bird Breeding Habitat is considered absent from the study area.

4.8.1.6 Bat Hibernacula and Maternity Colonies

Bat overwintering sites (e.g., deep caves and abandoned mines) are absent in the study area.

Maternity colonies typically occur in forests with large-diameter dead or dying trees (called “snags”) and/or with several oak trees, preferably with dead or dying branch tips (habitat usage varies depending on the species of bat). Numerous suitable roost trees with potential to provide bat maternity habitat were observed within the study area, often near the existing road (**Appendix F**). Complete surveys of snag trees throughout the study area were not conducted; however, snag surveys and acoustic monitoring would be required to rule out the possibility of bat maternity colonies in the study area. Therefore, candidate bat maternity habitat is considered present in the study area.

4.8.1.7 Turtle Wintering Areas

Turtle overwintering habitat requires permanent water bodies deep enough to prevent the full water column from freezing through, typically with soft mud substrates. This type of habitat could be present in the Welland River, Oswego Creek, and Dils Lake. Therefore, candidate Turtle Wintering Areas are considered present within the study area.

4.8.1.8 Snake Hibernacula

Communal snake hibernation sites frequently include old animal burrows, rock crevices, or building foundations where animals can get below the frost line and where there is sufficient moisture to prevent them from desiccating. Features such as crumbling culvert footings, rock piles, and old stumps can provide entrances to hibernacula; such features were not documented near the existing road. However, hibernacula can be very difficult to find so a lack of incidental observations cannot be taken as definitive proof that hibernacula are absent. Therefore, candidate snake hibernacula habitat is considered present in the study area.

4.8.1.9 Migratory Butterfly Stopover Areas

In the fall, migrant butterflies typically target old field habitats dominated by abundant nectar sources such as goldenrods and asters. Although the open areas and roadsides within the study area contained a high number and variety of butterflies in the late summer and fall (including Monarch, a Special Concern species), the study area does not meet the requirement for provincially significant stopover sites to be within 5 km of Lake Ontario or Lake Erie. As such, Migratory Butterfly Stopover Areas are considered absent from the study area.

4.8.1.10 Deer Winter Congregation Areas

The importance of sheltered winter deer habitat is greatest in areas with deep snow accumulation since deer do not move well in deep snow. However, even in areas with little snow, deer still often congregate in large numbers in suitable forested

habitat during the winter (MNR, 2000). Although deer are present and were observed both directly and by tracks on multiple occasions, deer management is a NDMNRF responsibility and therefore significant congregation areas are mapped by NDMNRF. Winter deer yards were not identified by NDMNRF in the study area; therefore, Deer Winter Congregation Areas are considered absent from the study area.

4.8.2 RARE VEGETATION COMMUNITIES

None of the vegetation communities identified along the road corridor are considered rare in Ontario.

4.8.3 SPECIALIZED HABITAT FOR WILDLIFE

4.8.3.1 Waterfowl Nesting Areas

This habitat category includes upland areas adjacent to wetlands that provide nesting sites for waterfowl. Wetland habitat is present adjacent to Creek Road along Oswego Creek and the tributary to the Welland River. However, Parsons did not observe any nesting waterfowl in this area while conducting breeding bird surveys. As such, candidate Waterfowl Nesting Areas are considered present in the study area.

4.8.3.2 Bald Eagle and Osprey Nesting, Foraging, and Perching Habitat

Nests are typically located in trees near lakes, rivers, and other water features. The criteria for SWH includes both the nest itself and the area around it which provides foraging and perching functions. Nest sites for these species were not observed directly adjacent to Creek Road; however, the woodlands in the Chippawa Creek CA are adjacent to Dils Lake and the Welland River, providing candidate Bald Eagle (*Haliaeetus leucocephalus*) and Osprey (*Pandion haliaetus*) Nesting, Foraging, and Perching Habitat.

4.8.3.3 Woodland Raptor Nesting Habitat

The requirements for significant raptor nesting habitat include both natural forests and conifer plantations containing one or more active nests of the raptor species indicated in the SWH criteria. The area of SWH varies based on species (50 – 400 m from the nest site). Parsons did not observe raptor nests in trees immediately adjacent to Creek Road. However, the woodland-nesting Cooper's Hawk (*Accipiter cooperii*) was reported via eBird in the study area near suitable nesting habitat. Therefore, candidate Woodland Raptor Nesting Habitat is considered present in the study area.

4.8.3.4 Woodland Area-sensitive Bird Breeding Habitat

Typically, this habitat category includes mature forests and swamps containing interior habitat (i.e., forest >200 m from any edge) with breeding pairs of indicator species present. By default, no forest interior habitat occurs within 200 m of Creek Road, any of the watercourses, or any residential or agricultural development within the study area. There is a very large forest/wetland unit found south of Creek Road in association with the CA property. None of the indicator species listed in the SWH criteria were observed within the study area. Therefore, Woodland Area-sensitive Bird Breeding Habitat is considered absent from the study area.

4.8.3.5 Turtle Nesting Areas

Ideal turtle nesting habitat occurs near water and away from roads; areas usually occur along sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers. Turtle nesting also frequently occurs in loose sandy or gravelly soils on road shoulders, but these are not eligible as SWH. Within the study area, the banks of Oswego Creek, the Welland River, and the unnamed tributary to the Welland River provide suitable habitat for turtle nesting. As such, Turtle Nesting Areas are considered present in the study area.

4.8.3.6 Amphibian Breeding Habitat (Woodland)

This type of amphibian breeding habitat typically consists of wetlands, ponds, or vernal pools within or adjacent to a woodland, and supports species that spend part of their life cycles in upland habitats. This habitat is considered provincially

significant when two or more of the frog species listed in the criteria schedule are observed with call codes of three or with total numbers greater than 20.

Parsons' amphibian surveys within the study area identified three points where woodland habitat with potential wetland components intersected Creek Road. Aerial photographs show these points as part of a much larger vegetation unit to the south of the road, which is visibly riddled with interconnected, low-lying patches and is part of the Chippawa Creek Slough Forest PSW Complex. Parsons' surveys in 2016 and 2017 documented large numbers of Spring Peepers, Eastern Chorus Frogs, Grey Tree Frogs, American Bullfrogs, Green Frogs, American Toads, and Western Chorus Frogs throughout these areas, qualifying it as SWH. Although most of the calls were heard from south of the road, some frogs were recorded on the north side as well, and there was observed movement between these areas. Therefore, Amphibian Breeding Habitat (Woodland) has been confirmed within the study area.

4.8.3.7 Amphibian Breeding Habitat (Wetland)

This category of habitat provides for wetlands that are independent of woodlands. Within the study area, this sort of habitat occurs along the major watercourses in the form of floating emergent, submergent, and shallow water vegetated areas (Appendix A).

Significant amphibian breeding habitat occurs when two or more of the frog species listed in the criteria schedule are observed with call codes of three or with total numbers greater than 20, or, in this case, where a confirmed breeding American Bullfrog population exists. Parsons heard American Bullfrogs calling from multiple locations along the Welland River, Oswego Creek, and the lower portion of the tributary to the Welland River. These features are interconnected and could be considered part of the same habitat unit. The riparian wetlands along these major drainage features should therefore be considered SWH.

4.8.3.8 Seeps and Springs

Seepage areas, springs, and small intermittent streams are considered significant because they frequently provide habitat for unusual species and support a high diversity of plants, as well as providing a water source for wildlife that doesn't freeze during the winter. Adjacent to Creek Road, such areas are very likely to occur in the woodland/wetland associated with the CA property. Therefore, candidate Seeps and Springs are considered present within the study area.

4.8.4 HABITAT FOR SPECIES OF CONSERVATION CONCERN

This category does not include Endangered or Threatened species; see **Section 4.9** for discussion of specific SAR associated with the study area.

4.8.4.1 Marsh Bird Breeding Habitat

Wetlands and shallow open water habitats supporting breeding pairs of the indicator species listed in the NDMNRF's criteria qualify as SWH. Suitable habitat is present in the study area; therefore, candidate Marsh Bird Breeding SWH is considered present in the study area.

4.8.4.2 Open Country Bird Breeding Habitat

Significant open country habitat is indicated by the presence of indicator bird species as identified by the NDMNRF (2015) in certain minimum numbers. In the study area, Savannah Sparrow (*Passerculus sandwichensis*) was the only open country indicator bird species observed during breeding bird surveys, and these were not observed in sufficient density to qualify their habitats as SWH (i.e., only one potential breeding pair was observed per suitable patch of habitat).

4.8.4.3 Shrub/Early Successional Bird Breeding Habitat

Significant successional bird habitat is defined by the presence of certain indicator species. Of the listed species, only Willow Flycatcher (*Empidonax trailii*) was observed during breeding bird surveys. This species was observed in a ~4 ha patch of shrubby, successional habitat on the Chippawa Creek CA lands; this patch, of itself, is not large enough to be considered candidate SWH without further observation of the indicator species.

4.8.4.4 Terrestrial Crayfish

The presence of terrestrial crayfish (*Cambarus spp.*) burrows in meadow marsh, swamp, or other moist natural habitats qualifies those areas as SWH; active agricultural lands are excluded from this category (MNRF, 2015). Crayfish burrows were not observed in the study area; however, suitable habitat is present. Candidate terrestrial crayfish SWH is considered present in the study area.

4.8.4.5 Species of Conservation Concern

Seventeen SoCC, which include species ranked as Special Concern under the ESA or SARA and provincially rare (i.e., with a sub-national rank of S1, S2, or S3) animal and plant species, are confirmed or have the potential to occur in the study area (Table 6).

The species list was based on MNRF’s publicly available SAR occurrence records for the study area, the list of known SAR occurring in Maitland Township (provided by MNRF correspondence), DFO (2019) aquatic SAR mapping, and Parsons’ observations. The species on the list were evaluated based on the availability of suitable habitat for the species in question, and the date of the most recently documented occurrence. The habitat that supports important life stages of these species qualifies as SWH.

TABLE 7 - SPECIES OF CONSERVATION CONCERN ASSOCIATED WITH THE STUDY AREA

Species	Status	Discussion
<i>Fish and Mussels</i>		
Mapleleaf <i>Quadrula quadrula</i>	SARA - SC ESA - SC COSEWIC - SC SRANK - S2	Dead valves belonging to this species were found during field investigations at the confluence of Oswego Creek and the Welland River. Mapleleaf is very likely present at both bridge locations and is also mapped as present by DFO (2019).
Grass Pickerel <i>Esox americanus vermiculatus</i>	SARA - SC ESA - SC COSEWIC - SC SRANK - S3	Wetland and stream habitat in the study area is suitable for Grass Pickerel, though it was not observed during field investigations.
<i>Reptiles</i>		
Eastern Milksnake <i>Lampropeltis triangulum</i>	SARA - SC ESA - NAR COSEWIC - SC SRANK - S4	This is a relatively widespread species in the region and could easily occur in the area, especially given the number of abandoned structures and other potential hibernacula. Milksnakes are often secretive and hard to detect even by dedicated snake surveys.
Eastern Ribbonsnake <i>Thamnophis sauritus</i>	SARA - SC ESA - SC COSEWIC - SC SRANK - S4	Although it was not observed during field investigations, suitable potential habitat is present along the study area watercourses and in adjacent open, grassy areas.
Northern Map Turtle <i>Graptemys geographica</i>	SARA - SC ESA - SC COSEWIC - SC SRANK - S3	Both the Welland River and Oswego Creek are deep, permanent watercourses and provide potential habitat.
Snapping Turtle <i>Chelydra serpentina</i>	SARA - SC ESA - SC COSEWIC - SC SRANK - S4	Very likely to occur in study area watercourses. Could also be found entering the road corridor to bask on warm asphalt surfaces and/or seek out gravelly nesting areas.
<i>Birds</i>		
Eastern Wood-pewee <i>Contopus virens</i>	SARA - SC ESA - SC COSEWIC - SC SRANK - S4B	This species was heard singing from wooded lands associated with the Chippawa Creek CA and is probably breeding in this location.

Species	Status	Discussion
Bald Eagle <i>Haliaeetus leucocephalus</i>	SARA - no status ESA - SC COSEWIC - NAR SRANK - S2N, S4B	Local eBird (2021) records exist for this species in association with the Chippawa Creek CA.
Plants		
Finely-nerved Sedge <i>Carex leptonevia</i>	RRANK - R	Found growing at the edge of woodland habitat to the west of Anderson Sideroad (in Chippawa Creek CA).
Buttonbush Dodder <i>Cuscuta cephalanthi</i>	SRANK - S2	Could be present on emergent aquatic plants in Oswego Creek and other deep watercourses.
Swamp Loosestrife <i>Decodon verticillatus</i>	RRANK - R	Grows extensively in shallow water along Oswego Creek. Occurs in proximity to the Oswego Creek bridge and could be impacted by construction.
Walter's Barmyard-grass <i>Echinochloa walteri</i>	SRANK - S3 RRANK - R	Found during field investigations growing in riparian marsh habitat on the east side of Oswego Creek about 50 m north of Oswego Creek Bridge.
Honey-locust <i>Gleditsia triacanthos</i>	SRANK - S2 RRANK - R	A thicket of Honey-locust, including several large trees, is located to the south of the intersection of Creek Road and Wellandport Road. This is a frequently planted ornamental species. It is not possible to determine whether the individuals at this location are planted or naturally occurring. Notably, these individuals are not cultivars (as would be expected of planted trees).
Pickernelweed <i>Pontederia cordata</i>	RRANK - R	Pickernelweed grows extensively in Oswego Creek in proximity to the bridge and could be impacted by construction.
American Plum <i>Prunus americana</i>	RRANK - R	American Plum was found growing at the edge of the forest to the north of Creek Road within Chippawa Creek CA.
Branching Bur-reed <i>Sparganium angrocladum</i>	SRANK - SH	Could be present in Oswego Creek and other watercourses.
Insects		
Monarch <i>Danaus plexippus</i>	SARA - SC ESA - SC COSEWIC - END SRANK - S2N, S4B	Observed in multiple locations within the study area. Requires milkweed (<i>Asclepias</i> sp.) plants for larval food source and fall wildflowers as nectar source prior to migration - both of which are present in the study area.

4.8.5 WILDLIFE MOVEMENT CORRIDORS

Several potential natural heritage corridors are in the study area as indicated in Schedule C of the Niagara Region Official Plan (2014). Two of these corridors run north-south through the study area and intersect with Creek Road. The first includes terrestrial habitats and riparian areas associated with Oswego Creek and the second includes natural areas within and connected to Chippawa Creek CA. The Welland River and associated terrestrial habitats also constitute a natural heritage corridor as indicated in the Official Plan.

Other potential connections and corridors include the former rail bed, which likely provides passage for terrestrial wildlife through the study area. Mature hedgerows throughout the study area also provide potential movement corridors for wildlife.

Parsons observed multiple mammal, amphibian, and reptile carcasses on Creek Road during field investigations, indicating that the road acts as a barrier to wildlife movement. Frog movement and mortality on the road was observed during early spring night surveys adjacent to the CA lands, which supports the idea that frogs are utilizing breeding habitat on both sides of the road and attempting to migrate between these areas, especially on rainy spring nights. The vicinity of the CA lands is also where the reptile roadkill observations were made.

Currently, terrestrial habitat connectivity along major watercourses via the bridge/culverts is minimal. Bridge and culvert structures extend right to the water's edge with no space for terrestrial species to move along the banks beneath the roadway.

4.9 Species at Risk

The below list of potential SAR within the study area was populated based on NDMNRF's publicly available SAR occurrence records for the study area, the list of known SAR occurring in Maitland township (provided by NDMNRF correspondence), DFO (2019) aquatic SAR mapping, and Parsons' observations. The species on the list were evaluated based on the availability of suitable habitat for the species in question and the date of the most recently documented occurrence.

Eleven species are confirmed to be present or considered to have high potential to occur in the study area (**Table 8**). The full list of potential SAR within the study area, including those that were screened out due to habitat unsuitability, is provided for reference in **Appendix F**.

TABLE 8 – SPECIES AT RISK ASSOCIATED WITH THE STUDY AREA

Species	Status	Discussion
<i>Fish and Mussels</i>		
Lilliput <i>Toxolasma parvum</i>	ESA - THR SARA - END COSEWIC - END SRANK - S2	Although it was not observed during field investigations, suitable habitat is present in the study area at Oswego Creek and Creek Road Bridges and is also mapped as present by DFO (2019). Oswego Creek is known critical habitat for Lilliput.
<i>Birds</i>		
Barn Swallow <i>Hirundo rustica</i>	SARA - THR ESA - THR COSEWIC - THR SRANK - S5B	Numerous Barn Swallows were observed throughout the study area during field investigations. There are barns, sheds, and other structures in and around the study area which likely provide nesting habitat for the species. One nest was also observed in tributary culvert, and Barn Swallows were observed flying around the underside of the Oswego Creek bridge.
Bank Swallow <i>Riparia riparia</i>	SARA - THR ESA - THR COSEWIC - THR SRANK - S4B	Not observed during breeding bird surveys but reported in the study area via eBird along the river corridor near the eastern project limits. Suitable breeding habitat could potentially occur along the Welland River banks.
Wood Thrush <i>Hylocichla mustelina</i>	SARA - THR ESA - SC COSEWIC - THR SRANK - S4B	Not observed during breeding bird surveys but reported via eBird in the Chippawa Creek CA. Suitable breeding habitat is present in forested areas adjacent to the road.
Common Nighthawk <i>Chordeiles minor</i>	SARA - THR ESA - SC COSEWIC - SC SRANK - S4B	Local eBird records exist for this species in association with the Chippawa Creek CA.
Eastern Whip-poor-will <i>Antrostomus vociferus</i>	SARA - THR ESA - THR COSEWIC - THR SRANK - S4B	The habitats that abut Creek Road in the CA and further east could potentially provide habitat for this species, as these areas consist of forests with many clearings and open patches. However, it was not observed by Parsons and was not reported in the area by eBird.
<i>Mammals</i>		
Eastern Small-footed Myotis <i>Myotis leibii</i>	SARA - no status ESA - END COSEWIC - no status SRANK - S2S3	Roosts in rock outcrops, hollow trees, cavities, beneath loose bark, and in similar features. As previously noted, large diameter snags that could provide bat maternity and/or roosting habitat were observed close to the existing road.
Little Brown Myotis <i>Myotis lucifugus</i>	SARA - END ESA - END COSEWIC - END SRANK - S3	Roosts in crevices and cavities in dead or dying trees, or sometimes beneath naturally loose bark on species like Shagbark Hickory (<i>Carya glabra</i> ; MNRF, 2017). These features are present in the study area, in some cases directly adjacent to the existing road (refer to Figure 3).
Northern Myotis <i>Myotis septentrionalis</i>	SARA - END ESA - END	Roosts in crevices and cavities in dead or dying trees, or sometimes beneath naturally loose bark on species like Shagbark Hickory (MNRF, 2017). These features are present in the study area, in some cases directly adjacent to the existing road (refer to Figure 3).

Species	Status	Discussion
	COSEWIC - END SRANK - S3	
Tri-coloured Bat <i>Perimyotis subflavus</i>	SARA - END ESA - END COSEWIC - END SRANK - S3?	Roosts in foliage within or below the canopy, preferably in oak species but also sometimes in maples. Clusters of dead or dying leaves on live branches are preferred (MNRF, 2017). The study area included many large oaks with such features, as noted in Figure 3 .
<i>Plants</i>		
Butternut <i>Juglans cinerea</i>	SARA - END ESA - END COSEWIC - END SRANK - S2?	Although not identified during field investigations, the study area does provide suitable growing habitat. Areas that will be subject to vegetation removal prior to construction should be intensively surveyed for this species to confirm its presence or absence.

ECOLOGICAL CONSTRAINTS AND OPPORTUNITIES

5.0 Ecological Constraints and Opportunities

5.1 Constraints Map and Analysis

The primary ecological constraints associated with the Creek Road study area include:

- PSW located directly adjacent to the road along watercourses and in woodlands;
- Fish habitat at three watercourse crossings, including SAR habitat for Grass Pickerel, Mapleleaf, and Lilliput mussels at Oswego Creek and Creek Road bridges;
- SWH for breeding amphibians and Special Concern species;
- Potential SAR bat roost trees adjacent to the road and in nearby woodlands; and
- Nesting habitat for Barn Swallow.

Encroachment on or damage to the listed constraints should be avoided where possible; in some cases, impacts to these features may have regulatory requirements (**Figure 3**).

5.2 Opportunities

The replacement of the existing crossing structures could allow for improved terrestrial/riparian habitat connectivity and wildlife movement along watercourse banks. Inclusion of 'dry land' corridors within the new bridges would allow wildlife to cross beneath the road rather than accessing the road surface and risking collision with vehicles. Additionally, the openness ratio of the new structures can be increased to better accommodate the passage of more secretive wildlife species.

As a further step, the reconstruction of the road offers the opportunity to install amphibian tunnels (i.e., small, dry culverts intended for amphibian and other small animal passage) through the CA lands where road mortality was noted to be particularly high. The use of milkweeds in seed mixes for post-construction restoration could increase the breeding habitat potential for Monarchs in the study area.

Elevated concentrations of total phosphorus may be the cause of water quality impairment in the Welland River (NPCA, 2014). High phosphorus in the Welland River is expected to have increased the occurrence of algae and duckweed throughout the watershed (NPCA, 2017). The eventual death and decomposition of these algae species may lead to eutrophication in the waterbody, depleting dissolved oxygen, and potentially causing severe stress to its aquatic inhabitants. Planting large riparian trees along the shoreline of the watercourse is expected to decrease total phosphorus, improve fish habitat, reduce water temperatures, and provide additional bank stabilization.

The existing Oswego Creek Bridge and Creek Road Bridge were observed to be constricting the natural watercourse channel widths and respective watercourse flows. Replacement of these structures with larger bridges provides the opportunity to reinstate original channel widths and natural flow processes under Creek Road. As such, this would increase the amount of direct fish habitat at both locations.

RECOMMENDED ALTERNATIVES

6.0 Recommended Alternatives

Based on an assessment of the needs of the corridors and the evaluation of alternatives and design concepts, the recommended scope of work includes:

- Reconstruction of Creek Road to address pavement deterioration, to meet regional roadway standards, to improve roadway safety, and to provide active transportation facilities;
- Intersection reconfiguration to improve safety, particularly poor sight lines; and,
- Bridge replacement to address structural deficiencies and substandard roadway widths on the bridge.

6.1 Creek Road

Creek Road will be reconstructed to improve the road surface, to address locations that do not meet geometric design standards, and to accommodate safer facilities for cyclists and pedestrians. Through most of the study area, Creek Road will consist of:

- 2 x 3.5 m travel lanes, one per direction;
- 2 x 1.5 m paved shoulder to accommodate cyclists and pedestrians; and,
- 2 x 1.0 m granular shoulder.

In more urban areas near the Wellandport Hamlet, Creek Road will consist of:

- 2 x 3.5 m travel lanes, one per direction;
- 2 x 1.5 m on-road bike lanes; and,
- Sidewalks being considered in consultation with the Township of Wainfleet.

6.2 Horizontal and Vertical Alignment

In general, the proposed horizontal alignment along Creek Road matches the existing alignment, except for a widened paved ROW and changes at the three key intersections. Geometric improvements were designed for Creek Road to meet the Region's design standards and to minimize or avoid impacts to adjacent features, such as existing property and natural features.

The vertical alignment of Creek Road will match the existing elevation, except for the approaches at Oswego Creek Bridge. The Oswego Creek Bridge will also be raised to address flooding issues.

6.3 Intersection Improvements

6.3.1 CREEK ROAD (REGIONAL ROAD 45) / CANBOROUGH ROAD (REGIONAL ROAD 63)

Creek Road will be slightly realigned to the east of the existing intersection to create a "T" intersection.

6.3.2 WELLANDPORT ROAD (REGIONAL ROAD 4) / RIVER ROAD (REGIONAL ROAD 27)

The intersection will be realigned to the south of the existing intersection, with Wellandport Road being curved to create a "T" intersection.

6.3.3 CREEK ROAD (REGIONAL ROAD 45) / RIVER ROAD (REGIONAL ROAD 27)

The intersection will be closed with Creek Road ending in a cul-de-sac. There will be no direct access between River Road and Creek Road.

6.4 Oswego Creek Bridge

Oswego Creek Bridge will be replaced along its existing alignment with a single span steel I-girder structure with a span length of 32 m. The bridge will consist of:

- 2 x 3.5 m travel lanes, one per direction;
- 2 x 1.8 m paved shoulder to accommodate cyclists and pedestrians; and,
- 1.4 m high bike rails.

The grade of the bridge was also raised to address flooding and safety concerns. The roadway approaches will also be backfilled and graded to match the increase in roadway elevation. 800 mm high concrete parapet walls with 600 mm high bicycle railings will be constructed on both sides of the structure for a total height of 1.4 m.

To accommodate wildlife passage under the structure, a 1.5-m wide level area will be constructed along the west embankment and covered with wildlife-friendly material to form a walkway.

6.5 Creek Road Bridge

Creek Road Bridge will be replaced along its existing alignment with a single span precast concrete box culvert structure with a span length of 5.0 m and inside height of 3.5 m. Six precast box culvert units would be used with a structure width of 11.29 m. The bridge will consist of:

- 2 x 3.5 m travel lanes, one per direction; and,
- 2 x 1.8 m paved shoulder to accommodate cyclists and pedestrians.

The elevation of the new bridge deck soffit will match the elevation of the existing bridge deck. 800 mm high concrete parapet walls with 600 mm high bicycle railings will be constructed on both sides of the structure for a total height of 1.4 m.

POTENTIAL IMPACTS AND MITIGATION MEASURES

7.0 Potential Impacts and Mitigation Measures

The following sections identify preliminary impacts and the associated mitigation recommendations based on the Recommended Alternatives and high-level early design information. Potential impacts have been divided into short-term and long-term categories to address the different impacts expected during and post-construction (i.e., direct/immediate vs. indirect/residual). The mitigation strategy will need to be reviewed and amended as necessary during detailed design to address design-specific impacts that cannot be quantified at this time. All requirements for later stages of this project have been identified below.

7.1 Short Term Impacts and Mitigation

7.1.1 LOSS OF TERRESTRIAL VEGETATION

Some permanent removal of vegetation will be unavoidable in order to widen Creek Road through the project limits, though the extent of vegetation removal is anticipated to be minimal. A large portion of the study area is open with minimal vegetation adjacent to the existing road, but there are areas where natural habitat is present: at the Oswego Creek crossing, through the CA lands, and east of the CA where the Chippawa Creek Slough Forest PSW abuts the existing Creek Road. In these areas, particularly, the removal of roadside vegetation may also impact terrestrial and aquatic wildlife habitat by directly removing suitable habitat and potentially causing erosion.

A detailed inventory of vegetation to be removed should be completed once the exact areas for vegetation removal are known at the detailed design stage. This inventory will provide the number and species of plants that will be lost, which will in turn inform the development of a post-construction landscaping/restoration plan. It will also confirm the absence of SAR tree Butternut (*Juglans cinerea*) in removal areas.

During construction, the contractor should install highly visible fencing to delineate the approved work areas and prevent workers, vehicles, and equipment from damaging vegetation that will be retained.

7.1.2 GENERAL WILDLIFE IMPACTS

During construction, there is the potential for wildlife to enter the work area and be at risk of injury or death due to conflicts with construction equipment. To ensure that no wildlife is harmed during construction, wildlife protection measures should be included in the construction contract package, including actions to be taken by workers if wildlife is encountered in an active work area. Typically, wildlife should be left in peace and allowed to leave the area under their own power. Capture and relocation of some animals may be necessary if they are unwilling to move or are at risk of immediate harm, but this should only be done by individuals who are experienced in the safe handling of wildlife. Any wildlife that is injured by construction activities should be delivered into the keeping of a NDMNRF-approved wildlife rehabilitator.

7.1.3 IMPACTS TO MIGRATORY BIRDS

Removal of vegetation during the bird nesting season has the potential to disturb or destroy the active nests of birds which are protected under the MBCA. Removal of woody or herbaceous vegetation should not occur between April 1 to August 31 of the construction year to avoid destroying active nests. Preventative measures such as netting should be installed under bridges and over culvert entrances prior to April 1 to exclude structure-nesting birds. Removal of abandoned nest structures should also occur prior to April 1.

If vegetation removal is required during the breeding bird nesting season (April 1 – August 31), a qualified biologist must complete a bird nest sweep for active bird nests up 72 hours prior to the removal of the vegetation. If an active nest is

discovered during the bird nest sweep, clearing or construction activity cannot occur near an active nest until the young have fledged.

7.1.4 LOSS OF BAT HABITAT

Parsons identified the potential for bat (including SAR bat) roosting in trees adjacent to the current Creek Road alignment throughout the study area, particularly within the Chippawa Creek CA. Once vegetation removal areas are confirmed during detailed design, bat habitat assessments and/or acoustic surveys should be carried out to confirm the presence or absence of SAR bats in the area and attempt to locate specific locations which may be valuable for bat maternity. If SAR bats are confirmed in the area, the habitat is protected under the ESA and compensation may be required.

Timing and effort of acoustic monitoring should follow the MNR (2017) Survey Protocol for Species at Risk Bats within Treed Habitats: Little Brown Myotis, Northern Myotis, and Tri-colored Bat.

Removal or damage of suitable roosting trees in the Creek Road corridor may be required, since the current road profile is very narrow and the widening of the road will require vegetation removal on adjacent lands. Compensation for lost habitat should be considered in the form of artificial roosting structures (e.g., bat condos, “rocket boxes”, BrandenBark, etc.). Such structures would be most successful away from the road and its associated noise disturbance and activity; the CA lands could perhaps be negotiated as a site for the installation of these habitat features.

Removal of bat roosting trees would eliminate some potential roosting/maternity sites. Tree removal should not occur between April 1 and October 31 to avoid the bat active season. If bat SAR are identified during bat acoustic monitoring, exit surveys, or permits under the ESA may be required.

7.1.5 FISH AND AQUATIC HABITAT

Potential impacts to fish and aquatic habitat can be identified as: a direct loss of habitat; direct injury to fish because of construction; or indirect changes to fish habitat that may occur in the long and short term as well as downstream of the Project and into the Welland River.

In general, bridge and culvert work along the same or similar alignment, as proposed, tends to minimize negative residual footprint impacts (i.e., overprinting) as most of the existing roadway will be reused to replace the bridges, including reusing existing foundations and abutments. Provided that specific mitigation measures and operational constraints are in place to avoid or lessen negative effects on fish and aquatic habitats, the likelihood of causing the death of fish and/or a HADD of fish habitat can be significantly minimized. However, if measures are not implemented and/or fail during construction, the following impacts can occur due to these types of activities:

- Infilling fish habitat by encroachment of the water crossing footprint to accommodate access and/or the design;
- Harmful substrate alteration of fish habitat (e.g., blockage of groundwater upwellings, critical SAR habitat, spawning areas);
- Removal of riparian vegetation and cover along the banks;
- Removal of edge habitat (e.g., undercut bank, shallower areas with lower velocity, aquatic vegetation) creation of barriers to fish movement (e.g., perched crossings, velocity barriers, alteration of the natural stream gradient);
- Alteration of channel flow velocity and/or depth (e.g., oversized culvert resulting in insufficient depth for fish passage at low flow or undersized culvert resulting in a flow velocity barrier at high flow);
- Alteration of channel morphology and sediment transport processes caused by the physical structure of the crossing resulting in upstream and downstream sediment aggradation/erosion;
- Re-entry of sediment that was removed/stockpiled into the watercourse;
- Erosion downstream from sudden release of water due to the failure of site isolation;
- Stranding of fish in isolated ponds following de-watering of the site;
- Impingement or entrainment of fish when de-watering pumps are used; and
- Short term or chronic transport of deleterious substances, including sediment, into fish habitat from construction or road drainage.

7.1.5.1 Oswego Creek and Creek Road Bridges

Based on the preliminary design completed to date, wider and higher bridge dimensions proposed to accommodate Creek Road widening will require larger, supporting side slopes as the road approaches the watercourse from either direction. As a result, fill is required immediately adjacent to the existing abutments in all four corners, which will be below the creek's high-water level (i.e., top of bank) and into the water. As proposed, there will be a direct loss of seasonal habitat (i.e., between the top of bank and the normal water mark) and an alteration of existing habitat below the normal water line (i.e., from creek bed to rock embankment). Specifics with respect to construction methods and materials to be used and quantification of habitat impacts will be determined and finalized during detailed design; however, it is anticipated that given the presence of sensitive fish habitat at each location, including the presence of SAR mussels, a detailed impact assessment and review by DFO will be required to determine permitting needs under the *Fisheries Act* and the *Species at Risk Act*.

7.1.5.2 Unnamed Tributary to Welland River Culvert

Based on the design completed to date, it is anticipated that road widening at this location will require a culvert extension(s) to accommodate the proposed widened road platform. The length and width and type of culvert replacement/extension proposed is not known at this time; however, given that fish habitat is seasonal at this location and indirect upstream of Creek Road, minor extensions and replacement are not anticipated to cause the death of fish or a HADD of fish habitat provided appropriate mitigation (e.g., timing window and ESC) and site restoration measures are implemented during construction.

7.1.5.3 Centreline Culverts

The remaining centreline culverts within the study area are also expected to be extended to align with the widened road platform, including relocated ditch lines and connections to the culverts. The remaining watercourses that cross Creek Road function as either indirect habitat or road drainage conveyance only. With sufficient mitigation measures in place during culvert and ditching work, impacts to fish and fish habitat downstream or in adjacent areas are expected to be fully mitigated and not in need of review by DFO. Please note that crossings labeled as indirect habitat (**Figure 3**) are required to adhere to the appropriate timing window for in-water work if there is water and flow present at the time of construction. This is in place to protect downstream direct fish habitat during sensitive periods, including at the shoreline of the Welland River.

7.1.5.4 Mitigation Measures

Mitigation guidance to protect fish and fish habitat can be found on the DFO website; however, specific measures and construction methods to avoid and/or minimize impacts will be determined during detailed design in consultation with regulators and contractors. It is anticipated that the following measures will be included in permit applications and the contract package and will need to be confirmed during detailed design and permitting.

- A warmwater in-water construction timing window of July 16 to March 14 will be implemented at the crossings where water and flow are present. No in-water works will be permitted between March 15 and July 15 of any given year;
- Vehicular and equipment maintenance and refueling will be undertaken in designated areas a minimum of 30 m from a watercourse and drainage features and controlled to prevent any discharge of equipment fuels and fluids onto the ground or into a watercourse;
- All machinery is to be washed a minimum of 30 m from a watercourse or waterbody;
- All machinery and equipment used will arrive on-site in a clean condition, free of fluid leaks, invasive species (e.g., *Phragmites australis*) and noxious weeds;
- No construction equipment shall enter a watercourse without isolation from water and flow;
- In-stream sediment controls (i.e., cofferdams) will be installed to create dry working conditions and to minimize impacts to adjacent creek bed;

- The pumping system used for dewatering for the construction of the bridges will be sized appropriately and monitored at all times;
- Any pipes/hoses conveying water in any watercourse during construction will be screened to prevent the entrainment and impingement of fish;
- If dewatering is required, sediment laden discharge water will be pumped into a vegetated area > 30 m from a watercourse or into a settling basin or similar measure to prevent the entry of deleterious substances from entering the watercourse;
- Both during and following the construction activities, a full restoration plan will be undertaken with phased implementation in conjunction with the construction activities;
- The construction access, work areas and associated requirements for removal of riparian vegetation will be minimized to the extent required for the construction activities, and these areas then delineated in the field using properly installed protective silt fencing. All temporarily disturbed areas will be re-stabilized following construction using appropriate means;
- During construction, areas required for construction works will be isolated from the main flow path of the watercourse. After complete isolation and prior to in-water works, professional ecologists must catch and relocate trapped fish and mussels downstream of the proposed work area using appropriate methods (e.g., electrofishing, seine netting) and under a license to collect fish from the NDMNRF. The mussel relocation must be carried out under an Endangered Species Act (ESA) Schedule C Permit from MECP to address aquatic SAR.

7.1.6 SURFACE WATER AND WETLANDS

Worksite isolation which requires water taking >50,000 L per day will require a Permit to Take Water or Environmental Activity and Sector Registry under the *Ontario Water Resources Act, R.S.O. 1990, c. 0.40*. However, it is anticipated that surface and/or groundwater will be returned directly back to the same waterbody during in-water construction activities. As such, no impacts to up- or downstream water levels are anticipated.

7.1.7 SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN

Construction noise should be minimized near the Chippawa Creek CA and associated woodlands. Excessive noise could disturb or deter nesting birds including Eastern Wood-pewee, which is provincially ranked Special Concern.

The bridges and culverts should be inspected for Barn Swallow and other migratory bird nests prior to construction. A Notice of Activity must be registered with the MECP if existing, inactive Barn Swallow nests are to be removed. A Barn Swallow kiosk with one artificial nest cup per nest removed must be installed within 1 km of each bridge or culvert with nests to provide temporary habitat during construction. If the new bridge or culverts will not provide suitable nesting sites for Barn Swallow, the kiosk should be maintained for three years following the end of construction.

7.1.8 EROSION AND SEDIMENTATION

Soils exposed via vegetation removal, grading, excavation, and similar activities are at an increased risk of erosion, which could result in sediment loading in watercourses due to contaminated runoff. This is of particular concern around sensitive watercourses and wetlands found in the study area. As such a thorough Erosion and Sediment Control (ESC) Plan will be utilized to prevent deleterious substances from entering the nearby waterbodies. The ESC Plan will outline the schedule of major land disturbing activities, identify local drainage factors, analyze soil information, identify topographic features (including environmentally sensitive areas), describe ESC measures to be used during construction (types, location, dimensions, and design considerations) and the schedule of general maintenance and inspection of ESC activities.

Seeding of exposed soil should be completed as soon as possible following the completion of grading activities. Temporary seeding of fast-growing cover crops should be done on areas where construction will be suspended for extended periods of time (e.g., prior to winter shutdown, or in areas where final grade cannot be achieved until other construction is completed); alternatively, other methods of erosion control (such as placement of rolled erosion control blanket) may be used to stabilize the soil surface and minimize erosion. Erosion control products with plastic netting or mesh should be avoided, as these can lead to the entanglement and subsequent mortality of wildlife.

Appropriate ESC will be necessary during construction around all drainage features and wetlands. These should have a primary focus on erosion control (i.e., cover on exposed slopes, fibre filtration tubes along slope contours adjacent to Welland River, Oswego Creek and unnamed tributaries) and a secondary focus on sediment control (i.e., silt fence, etc.). A complete isolation of any in-water work areas from the open or flowing watercourse will be necessary to avoid introducing sediment or other construction-related deleterious substances into the watercourse.

7.2 Long-term Impacts and Mitigation

7.2.1 TERRESTRIAL VEGETATION

The widened road profile will require the permanent loss of minimal amounts of vegetation. Compensatory plantings within the ROW may not be feasible due to the limited space within the ROW; however, compensatory plantings may be feasible elsewhere.

7.2.2 WILDLIFE AND TERRESTRIAL HABITAT

The permanent removal of terrestrial vegetation is expected to result in decreased wildlife habitat surrounding the ROW. However, roadside vegetation is generally considered to provide marginal habitat for disturbance-tolerant species so overall impacts to the surrounding natural ecosystem are anticipated to be minimal.

The road widening could provide opportunities to decrease wildlife mortality within the road corridor through the installation of measures to facilitate wildlife passage, such as dry land passage under the bridge. Increase passage for wildlife could provide a long-term net benefit to the natural environment if passage is improved and road mortality is decreased. However, passage culverts would require installation of fencing for efficacy, which may be economically unfeasible. If dry passage is installed, rip-rap should not be used for bank stabilization as it creates uneven footing for wildlife.

7.2.3 FISH AND AQUATIC HABITAT

With the application of standard mitigation measures and operational constraints, the majority of construction-related impacts are expected to be mitigated; however, as a result of infilling to achieve the 2:1 side slopes at each bridge location, approximately 250 m² of existing aquatic habitat will be permanently lost or altered in Oswego Creek and approximately 27 m² at Creek Road Bridge location. In addition, poorly installed or maintained mitigation measures have the potential to significantly impact downstream reaches that will be difficult to access and remediate. Therefore, it is paramount that an appropriate ESC Plan and Spill Prevention Plan is in place and monitoring consistently during construction to prevent offsite impacts.

Given the amount of infill required at Oswego Creek Bridge and Creek Road Bridge in combination with known SAR mussels present, DFO may require a Habitat Offsetting Plan be developed to counterbalance the unavoidable impacts of the Project with the goal of protecting and conserving fish and fish habitat as well as addressing limiting factors to fish production. Suitable offsetting measures, if required, will need to be developed in consultation with the Region, DFO, and the NPCA during project permitting and contract preparation.

7.2.4 SPECIES AT RISK AND SPECIES OF CONSERVATION CONCERN

Opportunities to improve or create wildlife habitat, particularly for SAR or SoCC, should be pursued where feasible. This may include seeding Common Milkweed (*Asclepias syriaca*) in restoration plantings to provide long-term habitat for Monarch or designing the new bridge and culverts to include rough surfaces and overhangs suitable for Barn Swallow nesting. Post-construction monitoring of compensation measures such as Barn Swallow kiosks or bat houses may be a requirement of ESA or other permits.

7.2.5 RESTORATION AND MONITORING

Long-term erosion concerns result from poor vegetation establishment post-construction, creation of steep embankment slopes, etc. New vegetated side slopes particularly upstream and downstream of the new bridge structure at Oswego Creek will have direct connectivity to the surrounding marshlands. As such, exposed soils due to grading operations shall be seeded with a non-invasive lowland mix. In detail design, restoration planting plans will include native replanting of marshland native species to restore the natural vegetation which may be impacted during construction activity. Replanting of large riparian tree species will be considered during restoration planting to provide permanent erosion control and nutrient uptake from Oswego Creek. Flow velocities throughout the projected work area are generally quite minimal. To mitigate impacts to fish habitats, naturalized erosion controls (willow wattles, live fascines, brush layering, etc.) will be preferred over hardened engineering techniques (rip rap, armour stone, etc.).

Given the likelihood of a fish and mussel salvage and relocation prior to in-water works beginning, construction and post-construction monitoring is anticipated to be required as per project permits. In addition, DFO Habitat Offsetting Plans, if required, will require annual post-construction monitoring, including documenting the success of site stability and restoration measures in order to correct any deficiencies and remain in compliance with project permits. All monitoring conditions and mandatory documentation will be clearly outlined within project permitting and approvals.

On-site inspection should be undertaken as required during construction to ensure that only specified trees are removed, fencing is intact and there is no damage caused to the remaining trees and adjacent vegetation communities. Construction and/or ESC fencing will be repaired if it is damaged. Post-planting monitoring of restoration areas is recommended for one year after installation to confirm survival of plantings and/or seed mix. Should the plantings and/or seed mix not survive, additional seeding and/or plantings should be undertaken one year thereafter with one additional monitoring visit in the following growing season.

8.0 Summary and Conclusions

The objectives of this EIS were to identify natural features and constraints within the study area, inform the design and configuration of the work, determine the impacts associated with the Recommended Alternative, and identify mitigation and/or compensation measures for any unavoidable negative impacts that will need to be incorporated into the design and construction plan(s).

Parsons has provided key measures that should be taken to avoid or minimize impacts to natural features, including species-specific timing windows, surveys to identify species and habitats prior to construction commencement, and aquatic species surveys and relocations (Table 9).

Permits are expected to be required under the SARA, ESA, and potentially the *Fisheries Act* for relocation of species or the anticipated alteration/destruction of habitat. Habitat compensation may be required under the terms of each permit. Next steps for the project during detailed design include the development of monitoring programs for landscape restoration, road mortality and wildlife passage use, erosion and sediment control and spills plan, and wildlife habitat compensation (such as Barn Swallow kiosk usage), where applicable.

Due to the potential presence of the endangered Lilliput mussel within the project limits, including known critical habitat in Oswego Creek at the bridge, submission of an Information Gathering Form (IGF) will be required to the MECP. The IGF will inform the Ministry's determination of whether a proposed activity is likely to contravene Subsections 9(1) or 10(1) of the ESA and whether it is advisable for the proponent to apply for an Overall Benefit Permit under Section 17 of the ESA prior to proceeding with the activity.

Due to proposed infilling at the Oswego Creek Bridge and Creek Road Bridge, including general construction activities likely planned in habitat suitable for SAR, submission of a Request for Review application to the DFO will be required to determine *Fisheries Act* and SARA requirements. If the Project is determined likely to cause death of fish or a SAR and/or a HADD of fish habitat, then a SARA-compliant Project Authorization (Paragraph 35(2)(b) *Fisheries Act* Authorization from the Minister of Fisheries and Oceans) will be required to ensure compliance with the Acts.

TABLE 9 - SUMMARY OF POTENTIAL IMPACTS AND MITIGATION MEASURES

Item of Concern	Potential Impacts	Recommended Mitigation
Terrestrial Vegetation	Permanent reduction in terrestrial and aquatic wildlife habitat through permanent vegetation removal	Development of a post-construction landscaping/restoration plan. Delineation of approved work areas to prevent damage to retained vegetation.
Wildlife and Terrestrial Habitat	Direct injury or mortality due to construction equipment	Wildlife protection measures to be included in construction contract package. Opportunity to incorporate wildlife passage options into bridge/culvert design, to provide long-term net benefit by decreasing road mortality.
	Destruction or disturbance of migratory bird nests during vegetation removal	Vegetation removal should occur outside the breeding bird season (April 1 to August 31). Preventative measures can be installed to deter structure-nesting birds from nesting under bridge and in culverts.
	Destruction of bat habitat during vegetation removal	Acoustic surveys should be carried out in vegetation removal areas to confirm presence or absence of SAR bats and identify potential maternity roosts. Compensation for destroyed bat habitat should be considered in the form of artificial roosting structures.
Fish and Aquatic Habitat	Sedimentation of Welland River or Oswego Creek and unnamed tributaries	ESC installed and maintained until vegetative cover establishes. Limit construction equipment access on banks. In-water work areas will be isolated from the open watercourse. Dewatering effluent shall be treated prior to release back into the drain and shall be discharged in a manner which does not erode the receiving watercourse.
	Interruption of sensitive periods of local fishery	In-water timing window will be adhered to, preventing impacts to fish migration during sensitive lifecycles.

		During bridge replacements, waterways will remain open to always allow natural fish passage.
	Stranding, impingement, or other physical harm to fish and/or mussels.	<p>Fish and mussels stranded within the isolated in-water work areas shall be removed by a qualified Fisheries Biologist prior to dewatering or work under applicable licenses and permits.</p> <p>Fish screens will be placed on all pump intakes as per the DFO End-of-Pipe guidelines (DFO, 1995).</p> <p>At no time shall industrial equipment access any portion of the waterbody that is not isolated and has been de-fished.</p>
	Loss of fish habitat.	<p>None. Limited infilling is required at both bridge locations to accommodate the proposed side slopes and will require a review by DFO.</p> <p>Critical habitat for Lilliput is present at Oswego Creek bridge, which may prompt a redesign to avoid in-water work at this location.</p>
	Change in cover, food, riparian structure, thermal regime.	Riparian vegetation will be replaced, with seed and cover or landscaping with native plants.
Surface Water and Wetlands	Change in upstream or downstream water levels due to water taking >50,000 L per day	Surface and/or groundwater will be returned directly to the same waterbody during in-water works, so no water level impacts are anticipated.
Species of Conservation Concern	Removal of potential bat roosting/maternity sites	Tree removal should not occur between April 1 and October 31 to avoid the bat active season.
	Disturbance of SAR habitat due to construction noise	Construction noise should be minimized near the Chippawa Creek CA and associated woodlands.
	Barn Swallow nest removal during bridge and culvert works	<p>A Notice of Activity form must be submitted to MECP if existing Barn Swallow nests are to be removed.</p> <p>Habitat compensation in the form of a Barn Swallow kiosk may be required.</p>
Erosion and Sedimentation	Input of sediment to watercourses during construction.	Install appropriate measures on the construction site to limit surface erosion and control the movement of water and suspended sediment.
	Long-term erosion issues due to site instability.	Utilize permanent erosion controls such as turf reinforcement mats if there is the potential for scouring or other erosion concerns.

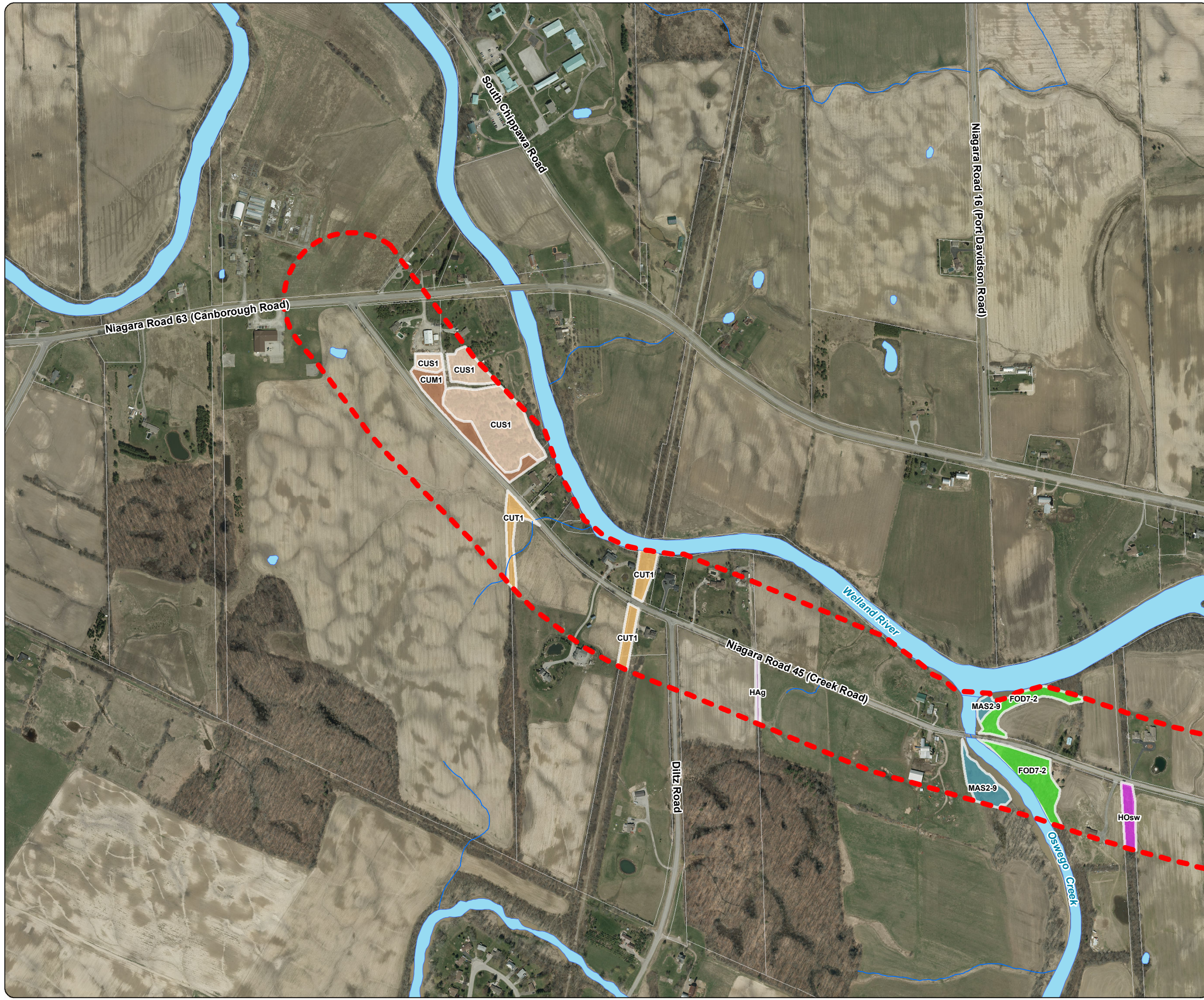
REFERENCES

9.0 References

- Bird Studies Canada. 2009. Marsh Monitoring Program Participant's Handbook for Surveying Amphibians. In cooperation with Environment Canada and the U.S. Environmental Protection Agency.
- Chapman, L. J. and D. F. Putnam. 1984. The Physiography of Southern Ontario, Third Edition.
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2003. COSEWIC assessment and status report on the Butternut *Juglans cinerea* in Canada.
- COSEWIC. 2005. COSEWIC assessment and status report on the Grass Pickerel *Esox americanus vermiculatus* in Canada.
- COSEWIC. 2006. COSEWIC assessment and status report on the Mapleleaf Mussel *Quadrula quadrula* (Saskatchewan-Nelson population and Great Lakes-Western St. Lawrence population) in Canada.
- COSEWIC. 2013. COSEWIC assessment and status report on the Lilliput *Toxolasma parvum* in Canada.
- eBird. 2021. eBird Canada. Available online at: <https://ebird.org/canada/home>.
- Fisheries and Oceans Canada (DFO). 1995. Freshwater Intake End-of-Pipe Fish Screen Guideline. Available online at: <https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html>.
- DFO. 2019. Aquatic Species at Risk Online Distribution Mapping Tool. Available online at: <https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html>.
- Government of Canada. 2017. *Migratory Birds Convention Act, 1994* (S.C. 1994, c. 22). Available online at: <https://laws-lois.justice.gc.ca/eng/acts/m-7.01/>
- Government of Canada. 2019. *Fisheries Act (R.S.C., 1985, c. F-14)*. Available online at: <https://laws-lois.justice.gc.ca/eng/acts/f-14/>.
- Government of Canada. 2021. *Species at Risk Act* (S.C. 2002, c. 29). Available online at: <https://laws-lois.justice.gc.ca/eng/acts/s-15.3/>.
- Government of Ontario. 2013. Ontario Regulation 155/06: Niagara Peninsula Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses under *Conservation Authorities Act, R.S.O. 1990, c. C.27*. Available online at: <https://www.ontario.ca/laws/regulation/060155>.
- Government of Ontario. 2020. *Endangered Species Act, 2007, S.O. 2007, c. 6*. Available online at: <https://www.ontario.ca/laws/statute/07e06>.
- iNaturalist. 2021. iNaturalist Home. Available online at: <https://www.inaturalist.org/>.
- Kipp, R. 2013. *Gammarus fasciatus*: Fact Sheet. USGS Nonindigenous Aquatic Species Database, Gainesville, FL. Available online at <http://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=26>.
- Land Information Ontario. 2021. Ontario GeoHub. Available online at: <https://geohub.lio.gov.on.ca/>.
- Lee, H. T., W. D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. Ecological Land Classification for Southern Ontario: First Approximation and its Application.
- Municipal Engineers' Association. 2015. Municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 & 2015). Available online at: <https://municipalclassea.ca/manual/page1.html>.
- Natural Heritage Information Centre (NHIC). 2020. Ontario Plants List. Ontario Ministry of Natural Resources, Peterborough, Ontario.

- Niagara Peninsula Conservation Authority (NPCA). 2017. Water Quality Report. Available online at: doi:https://npca.ca/sites/default/files/2017%20NPCA%20Water%20Quality%20Report_Draft_Reduced.pdf
- Oldham, M.J. 2017. List of the Vascular Plants of Ontario's Carolinian Zone (Ecoregion 7E). Carolinian Canada and Ontario Ministry of Natural Resources and Forestry. Peterborough, ON. 132 pp.
- Ontario Ministry of Municipal Affairs and Housing. 2020. Provincial Policy Statement Under the Planning Act. Available online at: <https://files.ontario.ca/mmah-provincial-policy-statement-2020-accessible-final-en-2020-02-14.pdf>.
- Ontario Ministry of Natural Resources (MNR). 2000. Significant Wildlife Habitat Technical Guide. 151 pp.
- MNR. 2010. Natural Heritage Reference Manual for Natural Heritage Policies of the *Provincial Policy Statement, 2005*. Available online at: <https://docs.ontario.ca/documents/3270/natural-heritage-reference-manual-for-natural.pdf>.
- Ontario Ministry of Natural Resources and Forestry (MNRF). 2015. Significant Wildlife Habitat Criterion Schedule for Ecoregion 7E. Available online at: <https://dr6j45jk9xcmk.cloudfront.net/documents/4776/schedule-7e-jan-2015-access-vers-final-s.pdf>.
- MNRF. 2017. Survey Protocol for Species at Risk Bats within Treed Habitats: Little Brown Myotis, Northern Myotis & Tricolored Bat. Guelph District. 13 pp.
- MNRF. 2020. Natural Heritage Information Centre Make a Map: Natural Heritage Areas. Available online at: <http://www.giscopeapp.lrc.gov.on.ca/web/MNR/NHLUPS/NaturalHeritage/Viewer/Viewer.html>.
- Ontario Nature. 2021. Ontario Reptile and Amphibian Atlas. Available online at: <https://www.ontarioinsects.org/herp/>.
- Regional Municipality of Niagara. 2020. By-law No. 2020-79: A By-law to Prohibit or Regulate the Destruction or Injuring of Trees in Woodlands in the Regional Municipality of Niagara. Available online at: <https://www.niagararegion.ca/government/bylaws/pdf/by-law-2020-79%20-woodlands.pdf>.
- Regional Municipality of Niagara. 2014. Regional Official Plan. Available online at: <https://www.niagararegion.ca/living/icp/policy-plan.aspx>.
- Regional Municipality of Niagara. 2018. Environmental Impact Study Guidelines. Available online at: <https://www.niagararegion.ca/culture-and-environment/pdf/environmental-impact-study-guidelines.pdf>
- Soil Mat Engineers and Consultants Ltd. 2016. Geotechnical Investigation: Road Reconstruction – Regional Road 45 (Creek Road): River Road to Canborough Road, Wainfleet, Ontario. Prepared for Parsons Inc. 137 pp.
- Township of Wainfleet. 2016. Official Plan. Available online at: https://www.wainfleet.ca/en/build-and-invest/resources/Documents/Wainfleet-Official-Plan--OMB-Approved-2016-Consolidation_6NOV17.pdf.

Appendix A, Figure 1
Vegetation Communities



Legend

- Study Area
- Watercourses
- Waterbodies

Vegetation Communities

Forest

- Fresh-Moist Sugar Maple-Hardwood Deciduous Forest (FOD6-5)
- Fresh-Moist Ash Lowland Deciduous Forest (FOD7-2)
- Fresh-Moist Oak-Maple-Hickory Deciduous Forest (FOD9)
- Mixed Forest (FOM)
- Dry-Fresh White Pine-Sugar Maple Mixed Forest (FOM2-2)

Wetland

- Reed Canary Grass Mineral Meadow Marsh (MAM2-2)
- Mineral Shallow Marsh (MAS2)
- Forb Mineral Shallow Marsh (MAS2-9)
- Green Ash Mineral Deciduous Swamp (SWD2-2)
- Grey Dogwood Mineral Thicket Swamp (SWT2-9)

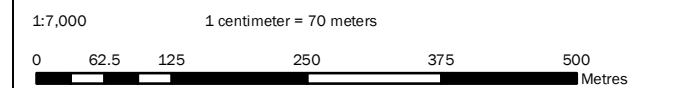
Cultural

- Mineral Cultural Meadow (CUM1)
- Coniferous Plantation (CUP3)
- Mineral Cultural Savannah (CUP1)
- Hawthorn Cultural Savannah (CUS1-1)
- Mineral Cultural Thicket (CUT1)
- Mineral Cultural Woodland (CUW1)

Hedgerow

- Common Apple Hedgerow (HAc)
- Green Ash Hedgerow (HAg)
- Swamp White Oak Hedgerow (HOsw)

Scale:



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Data Sources: Parsons; City of London






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Appendix A, Figure 2
Vegetation Communities








Legend






-  Study Area
-  Watercourses
-  Waterbodies

Vegetation Communities







Forest

-  Fresh-Moist Sugar Maple-Hardwood Deciduous Forest (FOD6-5)
-  Fresh-Moist Ash Lowland Deciduous Forest (FOD7-2)
-  Fresh-Moist Oak-Maple-Hickory Deciduous Forest (FOD9)
-  Mixed Forest (FOM)
-  Dry-Fresh White Pine-Sugar Maple Mixed Forest (FOM2-2)




Wetland

-  Reed Canary Grass Mineral Meadow Marsh (MAM2-2)
-  Mineral Shallow Marsh (MAS2)
-  Forb Mineral Shallow Marsh (MAS2-9)
-  Green Ash Mineral Deciduous Swamp (SWD2-2)
-  Grey Dogwood Mineral Thicket Swamp (SWT2-9)

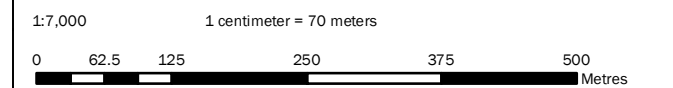
Cultural

-  Mineral Cultural Meadow (CUM1)
-  Coniferous Plantation (CUP3)
-  Mineral Cultural Savannah (CUP1)
-  Hawthorn Cultural Savannah (CUS1-1)
-  Mineral Cultural Thicket (CUT1)
-  Mineral Cultural Woodland (CUW1)

Hedgerow

-  Common Apple Hedgerow (HAc)
-  Green Ash Hedgerow (HAG)
-  Swamp White Oak Hedgerow (HOSw)

Scale:



Parsons Job No:
603118

Date:
19 Sep, 2016

Draft By:
W.V.

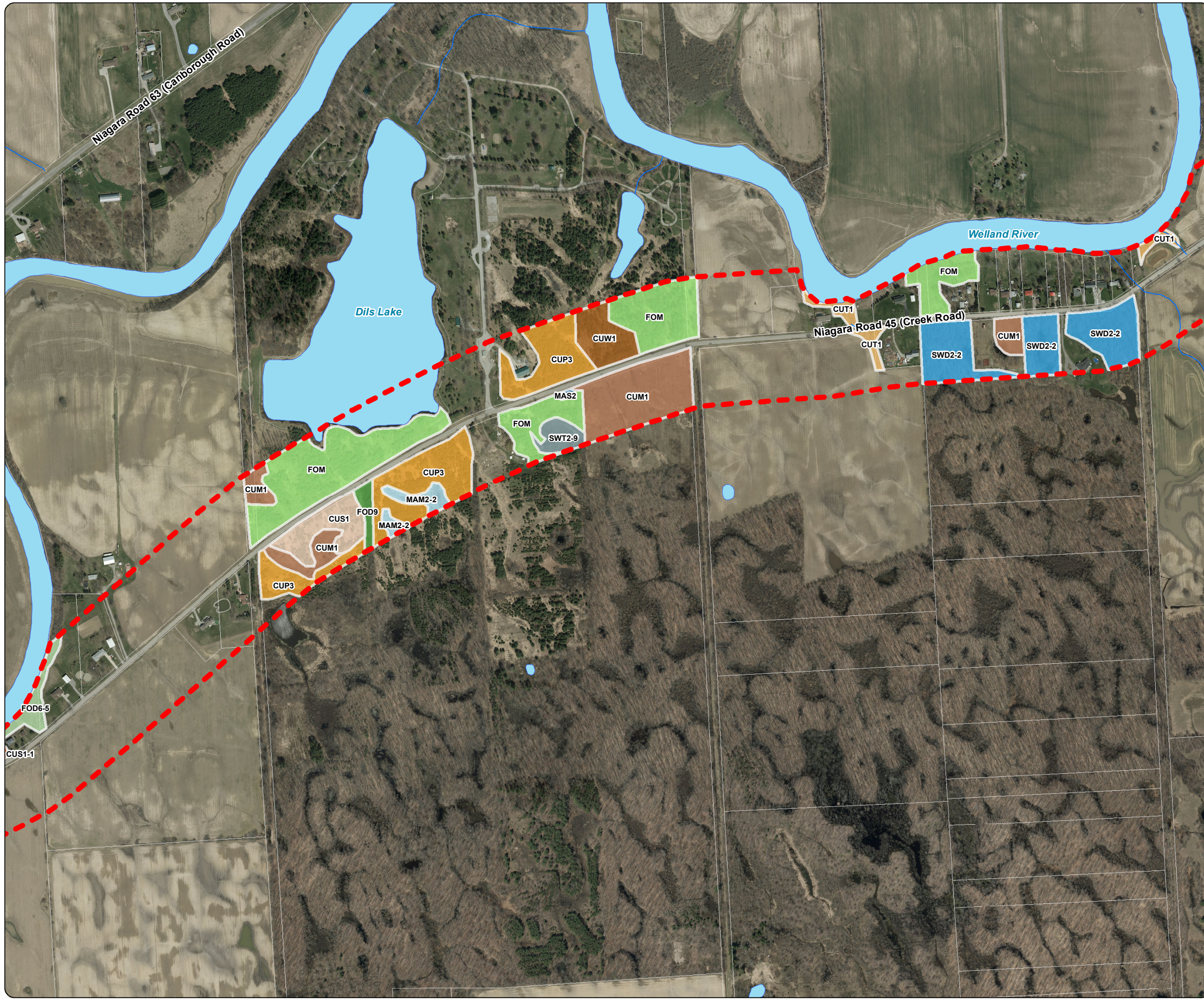
Data Sources: Parsons; City of London



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Appendix A, Figure 3
Vegetation Communities



Legend

- Study Area
- Watercourses
- Waterbodies

Vegetation Communities

Forest

- Fresh-Moist Sugar Maple-Hardwood Deciduous Forest (FOD6-5)
- Fresh-Moist Ash Lowland Deciduous Forest (FOD7-2)
- Fresh-Moist Oak-Maple-Hickory Deciduous Forest (FOD9)
- Mixed Forest (FOM)
- Dry-Fresh White Pine-Sugar Maple Mixed Forest (FOM2-2)

Wetland

- Reed Canary Grass Mineral Meadow Marsh (MAM2-2)
- Mineral Shallow Marsh (MAS2)
- Forb Mineral Shallow Marsh (MAS2-9)
- Green Ash Mineral Deciduous Swamp (SWD2-2)
- Grey Dogwood Mineral Thicket Swamp (SWT2-9)

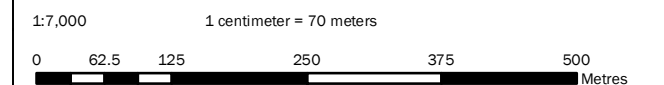
Cultural

- Mineral Cultural Meadow (CUM1)
- Coniferous Plantation (CUP3)
- Mineral Cultural Savannah (CUP1)
- Hawthorn Cultural Savannah (CUS1-1)
- Mineral Cultural Thicket (CUT1)
- Mineral Cultural Woodland (CUW1)

Hedgerow

- Common Apple Hedgerow (HAc)
- Green Ash Hedgerow (HAg)
- Swamp White Oak Hedgerow (HOsw)

Scale:



Parsons Job No:
603118

Date:
19 Sep, 2016

Draft By:
W.V.

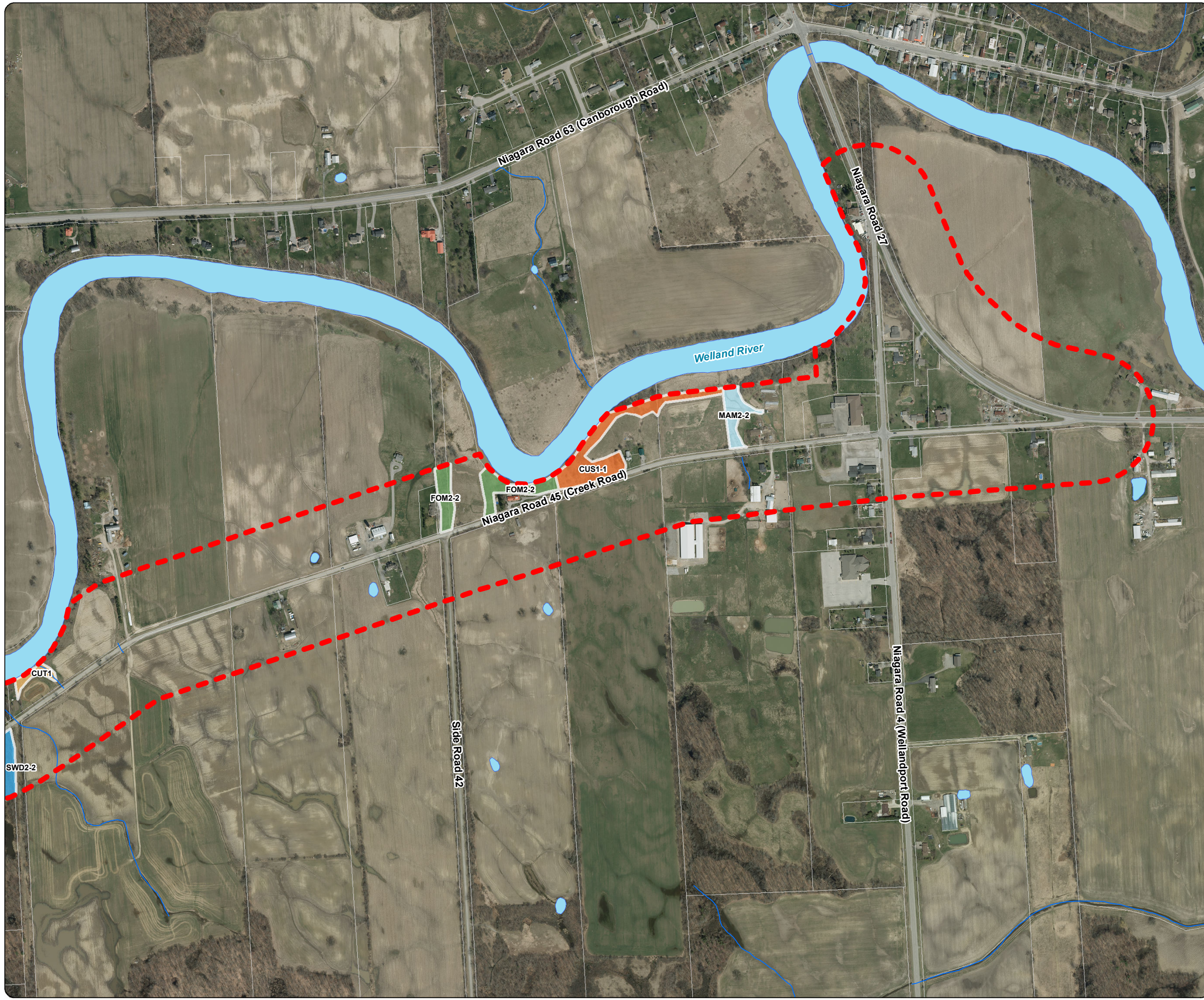
Data Sources: Parsons; City of London






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Appendix A, Figure 4
Vegetation Communities








Legend






-  Study Area
-  Watercourses
-  Waterbodies

Vegetation Communities







Forest

-  Fresh-Moist Sugar Maple-Hardwood Deciduous Forest (FOD6-5)
-  Fresh-Moist Ash Lowland Deciduous Forest (FOD7-2)
-  Fresh-Moist Oak-Maple-Hickory Deciduous Forest (FOD9)
-  Mixed Forest (FOM)
-  Dry-Fresh White Pine-Sugar Maple Mixed Forest (FOM2-2)




Wetland

-  Reed Canary Grass Mineral Meadow Marsh (MAM2-2)
-  Mineral Shallow Marsh (MAS2)
-  Forb Mineral Shallow Marsh (MAS2-9)
-  Green Ash Mineral Deciduous Swamp (SWD2-2)
-  Grey Dogwood Mineral Thicket Swamp (SWT2-9)

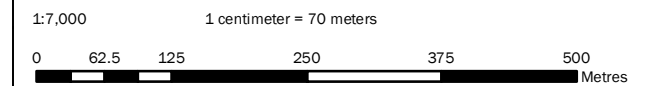
Cultural


-  Mineral Cultural Meadow (CUM1)
-  Coniferous Plantation (CUP3)
-  Mineral Cultural Savannah (CUP1)
-  Hawthorn Cultural Savannah (CUS1-1)
-  Mineral Cultural Thicket (CUT1)
-  Mineral Cultural Woodland (CUW1)

Hedgerow

-  Common Apple Hedgerow (HAc)
-  Green Ash Hedgerow (HAg)
-  Swamp White Oak Hedgerow (H0sw)

Scale:



Parsons Job No: 603118	Date: 19 Sep, 2016	Draft By: W.V.	
Data Sources: Parsons; City of London			

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Appendix B

Definitions

DATA SOURCES

NHIC - Natural Heritage Information Centre online database of Species at Risk observations. Indicated species above have past observation records for the area in the vicinity of the study area.

Parsons - species observed by Parsons’ staff during field investigations.

iNaturalist – species reported by members of the public or other researchers using the iNaturalist website.

STATUS

ESA - Ontario Endangered Species Act. Species are listed as Endangered (**END**), Threatened (**THR**), and Special Concern (**SC**).

SARA - Canadian Species at Risk Act. **END**, **THR**, and **SC** categories as above.

COSEWIC - The Committee on the Status of Endangered Wildlife in Canada. **END**, **THR**, and **SC** categories as above.

Subnational rankings for Ontario: **S1** - extremely rare; **S2** - very rare; **S3** - rare to uncommon; **S4** - common and apparently secure; **S5** - very common and demonstrably secure; **SNA** - not ranked, usually refers to non-native species. ‘**B**’ and ‘**N**’ are used as appropriate to indicate differences in breeding vs. non-breeding range status.

Table C-1: Plant Species List

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	SRANK	RRANK	EXOTIC STATUS	VEGETATION COMMUNITY
Manitoba Maple	<i>Acer negundo</i>	Parsons	S5	X		
Red Maple	<i>Acer rubrum</i>	Parsons	S5	X		
Sugar Maple	<i>Acer saccharum</i>	Parsons	S5	X		
Freeman Maple	<i>Acer x freemanii</i>	Parsons	SNA	hyb		
Common Yarrow	<i>Achillea millefolium</i>	Parsons	S5	C		
Creeping Bentgrass	<i>Agrostis stolonifera</i>	Parsons	SNA	IC	SE5	
Carpet Bugle	<i>Ajuga reptans</i>	Parsons	SNA	IR	SE2	Naturalized in road ditch
Meadow Garlic	<i>Allium canadense</i>	Parsons	S5	U		
Common Ragweed	<i>Ambrosia artemisiifolia</i>	Parsons	S5	C		
Giant Ragweed	<i>Ambrosia trifida</i>	Parsons	S5	C		
Canada Anemone	<i>Anemone canadensis</i>	Parsons	S5	C		
Stinking Chamomile	<i>Anthemis cotula</i>	Parsons	SNA	IR	SE5	
Swamp Milkweed	<i>Asclepias incarnata</i>	Parsons	S5	C		
Common Milkweed	<i>Asclepias syriaca</i>	Parsons	S5	C		
Spear Saltbush	<i>Atriplex patula</i>	Parsons	SNA	IU	SE5	
Oats	<i>Avena sativa</i>	Parsons	SNA	IH	SE2	
Yellow Rocket	<i>Barbarea vulgaris</i>	Parsons	SNA	IC	SE5	
Lawn Daisy	<i>Bellis perennis</i>	Parsons	SNA	IR	SE5	
Nodding Beggarticks	<i>Bidens cernua</i>	Parsons	S5	C		
Devil's Beggarticks	<i>Bidens frondosa</i>	Parsons	S5	C		
Smooth Brome	<i>Bromus inermis</i>	Parsons	SNA	IC	SE5	
Downy Brome	<i>Bromus tectorum</i>	Parsons	SNA	IU	SE5	
Canada Bluejoint	<i>Calamagrostis canadensis</i>	Parsons	S5	C		
Eastern Woodland Sedge	<i>Carex blanda</i>	Parsons	S5	C		

Lake Sedge	<i>Carex lacustris</i>	Parsons	S5	C	
Nerveless Woodland Sedge	<i>Carex leptonevia</i>	Parsons	S5	R	
Bitternut Hickory	<i>Carya cordiformis</i>	Parsons	S5	C	
Shagbark Hickory	<i>Carya ovata</i>	Parsons	S5	C	
Buttonbush	<i>Cephalanthus occidentalis</i>	Parsons	S5	C	
Spotted Knapweed	<i>Centaurea stoebe</i>	Parsons	SNA	IU	SE5
Common Chickweed	<i>Cerastium fontanum</i>	Parsons	SNA	IC	SE5
Chicory	<i>Cichorium intybus</i>	Parsons	SNA	IC	SE5
Canada Thistle	<i>Cirsium arvense</i>	Parsons	SNA	IC	SE5
Bull Thistle	<i>Cirsium vulgare</i>	Parsons	SNA	IC	SE5
Field Bindweed	<i>Convolvulus arvensis</i>	Parsons	SNA	IC	SE5
Silky Dogwood	<i>Cornus amomum</i>	Parsons	S5	C	
Eastern Flowering Dogwood	<i>Cornus florida</i>	NHIC	S2?	U	
Grey Dogwood	<i>Cornus racemosa</i>	Parsons	S5	C	
Red-osier Dogwood	<i>Cornus sericea</i>	Parsons	S5	U	
Cockspur Hawthorn	<i>Crataegus crus-galli</i>	Parsons	S5	C	
Dotted Hawthorn	<i>Crataegus punctata</i>	Parsons	S5	C	
Succulent Hawthorn	<i>Crataegus succulenta</i>	Parsons	S5	U	
Orchard Grass	<i>Dactylis glomerata</i>	Parsons	SNA	IC	SE5
Wild Carrot	<i>Daucus carota</i>	Parsons	SNA	IC	SE5
Swamp Loosestrife	<i>Decodon verticillatus</i>	Parsons	S5	R	
Fuller's Teasel	<i>Dipsacus fullonum</i>	Parsons	SNA	IC	SE5
Large Barnyard-grass	<i>Echinochloa crus-galli</i>	Parsons	SNA	IC	SE5
Walter's Barnyard-grass	<i>Echinochloa walteri</i>	Parsons	S3	R	In marsh along Oswego Creek, ~50 m north of bridge
Autumn Olive	<i>Elaeagnus umbellata</i>	Parsons	SNA	IU	SE3
Quackgrass	<i>Elymus repens</i>	Parsons	SNA	IC	SE5

Virginia Wild Rye	<i>Elymus virginicus</i>	Parsons	S4	C	
Hairy Willowherb	<i>Epilobium hirsutum</i>	Parsons	SNA	IC	SE5
Annual Fleabane	<i>Erigeron annuus</i>	Parsons	S5	C	
Horseweed	<i>Erigeron canadensis</i>	Parsons	S5	C	
Yellow Trout-lily	<i>Erythronium americanum</i>	Parsons	S5	C	
European Spindletree	<i>Euonymus europaeus</i>	Parsons	SNA	IU	SE2
Common Boneset	<i>Eupatorium perfoliatum</i>	Parsons	S5	C	
Spotted Joe-Pye-weed	<i>Eutrochium maculatum</i>	Parsons	S5	C	
Wild Strawberry	<i>Fragaria virginiana</i>	Parsons	S5	C	
White Ash	<i>Fraxinus americana</i>	Parsons	S4	C	
Green Ash	<i>Fraxinus pennsylvanica</i>	Parsons	S4	C	
Smooth Bedstraw	<i>Galium mollugo</i>	Parsons	SNA	IC	SE5
Spotted Geranium	<i>Geranium maculatum</i>	Parsons	S5	C	
Honey-locust	<i>Gleditsia triacanthos</i>	Parsons	S2	R	Exotic at this location
Daylily	<i>Hemerocallis fulva</i>	Parsons	SNA	IX	SE5
Foxtail Barley	<i>Hordeum jubatum</i>	Parsons	S5	IX	
Common St. John's-wort	<i>Hypericum perforatum</i>	Parsons	SNA	IC	SE5
Black Walnut	<i>Juglans nigra</i>	Parsons	S5	C	
Rice Cut-grass	<i>Leersia oryzoides</i>	Parsons	S5	C	
Oxeye Daisy	<i>Leucanthemum vulgare</i>	Parsons	SNA	IC	SE5
Butter-and-eggs	<i>Linaria vulgaris</i>	Parsons	SNA	IC	SE5
Tulip Tree	<i>Liriodendron tulipifera</i>	iNaturalist	S4	C	
Limber Honeysuckle	<i>Lonicera dioica</i>	Parsons	S5	C	
Morrow's Honeysuckle	<i>Lonicera morrowii</i>	Parsons	SNA	IU	SE3
Bell's Honeysuckle	<i>Lonicera x bella</i>	Parsons	SNA	hyb	SE2
Bird's-foot Trefoil	<i>Lotus corniculatus</i>	Parsons	SNA	IC	SE5

Creeping Jenny	<i>Lysimachia nummularia</i>	Parsons	SNA	IC	SE5
Purple Loosestrife	<i>Lythrum salicaria</i>	Parsons	SNA	IC	SE5
Wild Crabapple	<i>Malus coronaria</i>	Parsons	S4	U	
Common Apple	<i>Malus pumila</i>	Parsons	SNA	IC	SE4
Unidentified Watermilfoil	<i>Myriophyllum</i> sp.	Parsons			
Common Yellow Pond-lily	<i>Nuphar variegata</i>	Parsons	S5	U	
Waterlily	<i>Nymphaea odorata</i>	Parsons	S5	U	
Biennial Evening-primrose	<i>Oenothera biennis</i>	Parsons	S5	C	
Virginia Creeper	<i>Parthenocissus quinquefolia</i>	Parsons	S4?	U	
Spotted Lady's-thumb	<i>Persicaria maculosa</i>	Parsons	SNA	IC	SE5
Pennsylvania Smartweed	<i>Persicaria pennsylvanica</i>	Parsons	S5	C	
Arrow-leaved Tearthumb	<i>Persicaria sagittata</i>	Parsons	S4	C	
Reed Canary Grass	<i>Phalaris arundinacea</i>	Parsons	S5	C	
Timothy	<i>Phleum pratense</i>	Parsons	SNA	IC	SE5
Common Reed	<i>Phragmites australis</i>	Parsons	SNA	IC	SE5
Norway Spruce	<i>Picea abies</i>	Parsons	SNA	IC	SE3
White Spruce	<i>Picea glauca</i>	Parsons	S5	IU	
Clearweed	<i>Pilea pumila</i>	Parsons	S5	C	
Meadow Hawkweed	<i>Pilosella caespitosa</i>	iNaturalist	SNA	IC	
Eastern White Pine	<i>Pinus strobus</i>	Parsons	S5	C	
Ribwort Plantain	<i>Plantago lanceolata</i>	iNaturalist	SNA	IC	
Pickeralweed	<i>Pontederia cordata</i>	Parsons	S5	R	
Norwegian Cinquefoil	<i>Potentilla norvegica</i>	Parsons	S5	C	
Common Cinquefoil	<i>Potentilla simplex</i>	Parsons	S5	C	
American Plum	<i>Prunus americana</i>	Parsons	S4	R	
Black Cherry	<i>Prunus serotina</i>	Parsons	S5	C	

Choke Cherry	<i>Prunus virginiana</i>	Parsons	S5	C	
Common Pear	<i>Pyrus communis</i>	Parsons	SNA	IC	SE4
White Oak	<i>Quercus alba</i>	Parsons	S5	C	
Swamp White Oak	<i>Quercus bicolor</i>	Parsons	S4	C	
Bur Oak	<i>Quercus macrocarpa</i>	Parsons	S5	U	
Northern Red Oak	<i>Quercus rubra</i>	Parsons	S5	C	
Field Buttercup	<i>Ranunculus acris</i>	Parsons	SNA	IC	SE5
Hooked Crowsfoot	<i>Ranunculus recurvatus</i>	Parsons	S5	C	
Cursed Crowsfoot	<i>Ranunculus sceleratus</i>	Parsons	S5	C	
Staghorn Sumac	<i>Rhus typhina</i>	Parsons	S5	C	
Black Locust	<i>Robinia pseudoacacia</i>	Parsons	SNA	IC	SE5
Smooth Wild Rose	<i>Rosa blanda</i>	Parsons	S5	C	
Dog Rose	<i>Rosa canina</i>	Parsons	SNA	IR	SE2
Multiflora Rose	<i>Rosa multiflora</i>	Parsons	SNA	IC	SE5
Swamp Rose	<i>Rosa palustris</i>	Parsons	S5	C	
Curled Dock	<i>Rumex crispus</i>	Parsons	SNA	IC	SE5
Southern Water-plantain	<i>Alisma subcordatum</i>	Parsons	S4?	X	
Grass-leaved Arrowhead	<i>Sagittaria graminea</i>	Parsons	S4		
Broad-leaved Arrowhead	<i>Sagittaria latifolia</i>	Parsons	S5	C	
Bebb's Willow	<i>Salix bebbiana</i>	Parsons	S5	C	
Pussy Willow	<i>Salix discolor</i>	Parsons	S5	C	
Black Willow	<i>Salix nigra</i>	Parsons	S5	C	
Black Elderberry	<i>Sambucus canadensis</i>	Parsons	S5	C	
Meadow Fescue	<i>Schedonorus pratensis</i>	Parsons	SNA	IC	SE5
Soft-stemmed Bulrush	<i>Schoenoplectus tabernaemontani</i>	Parsons	S5	C	
Dark-green Bulrush	<i>Scirpus atrovirens</i>	Parsons	S5	C	

Woolgrass	<i>Scirpus cyperinus</i>	Parsons	S5	C	
Smooth Greenbrier	<i>Smilax herbacea</i>	Parsons	S4	C	
Canada Goldenrod	<i>Solidago canadensis</i>	Parsons	S5	C	
Early Goldenrod	<i>Solidago juncea</i>	Parsons	S5	C	
Grey Goldenrod	<i>Solidago nemoralis</i>	Parsons	S5	C	
Rough Goldenrod	<i>Solidago rugosa</i>	Parsons	S5	C	
Sow-thistle	<i>Sonchus arvensis</i>	Parsons	SNA	IC	SE5
Branching Bur-reed	<i>Sparganium androcladum</i>	NHIC	SH	H	
Broad-fruited Bur-reed	<i>Sparganium eurycarpum</i>	Parsons	S5	C	
White Meadowsweet	<i>Spiraea alba</i>	Parsons	S5	C	
Panicled Aster	<i>Symphyotrichum lanceolatum</i>	Parsons	S5	C	
Calico Aster	<i>Symphyotrichum lateriflorum</i>	Parsons	S5	C	
New England Aster	<i>Symphyotrichum novae-angliae</i>	Parsons	S5	C	
Frost Aster	<i>Symphyotrichum pilosum</i>	Parsons	S5	C	
Purple-stemmed Aster	<i>Symphyotrichum puniceum</i>	Parsons	S5	C	
Common Dandelion	<i>Taraxacum officinale</i>	Parsons	SNA	IC	SE5
Skunk Meadow-rue	<i>Thalictrum amphibolum</i>	NHIC	S2S3		
Purple Meadow-rue	<i>Thalictrum dasycarpum</i>	iNaturalist	S4?		
Tall Meadow-rue	<i>Thalictrum pubescens</i>	Parsons	S5	C	
Eastern White Cedar	<i>Thuja occidentalis</i>	Parsons	S5	U	
Climbing Poison Ivy	<i>Toxicodendron radicans</i>	Parsons	S5	C	
Shrubby Poison Ivy	<i>Toxicodendron rydbergii</i>	Parsons	S5	C	
Salsify	<i>Tragopogon porrifolius</i>	iNaturalist	SNA	IR	
Narrow-leaved Cattail	<i>Typha angustifolia</i>	Parsons	SNA	IC	SE5
Broad-leaved Cattail	<i>Typha latifolia</i>	Parsons	S5	C	
White Elm	<i>Ulmus americana</i>	Parsons	S5	C	

Slippery Elm	<i>Ulmus rubra</i>	Parsons	S5	U	
Blue Vervain	<i>Verbena hastata</i>	Parsons	S5	C	
Nannyberry	<i>Viburnum lentago</i>	Parsons	S5	C	
Southern Arrowwood	<i>Viburnum recognitum</i>	Parsons	S4	C	
American Cranberry Viburnum	<i>Viburnum trilobum</i>	Parsons	S5	C	
Cow Vetch	<i>Vicia cracca</i>	Parsons	SNA	IC	SE5
Riverbank Grape	<i>Vitis riparia</i>	Parsons	S5	C	

Appendix C

Definitions

DATA SOURCES

eBird – records summarized from 13 public bird checklist submissions in close proximity to the Creek Rd. study area.

OBBA - Ontario Breeding Bird Atlas. Organizes observations on a grid of 10 km by 10 km squares. As this does not provide precise locations for observations as related to the study area, and since more precise data is available in the form of direct field observations and eBird records, this appendix does not list every species noted in the OBBA for the squares containing the study area. Rather, the OBBA has been used to supplement and comment only on Species at Risk and other noteworthy species that have been documented as breeding in the vicinity.

ORAA - Ontario Reptile and Amphibian Atlas. Similar to the Ontario Breeding Bird Atlas, this resource organizes observations on a grid of 10 x 10 km squares. Although the atlas does not provide precise locations for the observations related to the study area, it has been used as a resource here to supplement field investigations since many species can be difficult to detect. Species listed in the table are those with observation records available for the squares containing the study area.

NHIC - Natural Heritage Information Centre online database of Species at Risk observations. Indicated species above have past observation records for the area in the vicinity of the study area.

Parsons - species observed by Parsons' staff during field investigations.

STATUS

ESA - Ontario *Endangered Species Act*. Species are listed as Endangered (**END**), Threatened (**THR**), and Special Concern (**SC**).

SARA - Canadian *Species at Risk Act*. **END**, **THR**, and **SC** categories as above.

COSEWIC - The Committee on the Status of Endangered Wildlife in Canada. **END**, **THR**, and **SC** categories as above.

Subnational rankings for Ontario: **S1** - extremely rare; **S2** - very rare; **S3** - rare to uncommon; **S4** - common and apparently secure; **S5** - very common and demonstrably secure; **SNA** - not ranked, usually refers to non-native species. 'B' and 'N' are used as appropriate to indicate differences in breeding vs. non-breeding range status.

Table D-1: Birds

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	DISCUSSION/COMMENTS
Snow Goose	<i>Chen caerulescens</i>	eBird	S5B	Welland River corridor	Early spring observation – probable migrant
Tundra Swan	<i>Cygnus columbianus</i>	eBird	S4	Welland River corridor	Very early spring observation - probable migrant
Ring-necked Duck	<i>Aythya collaris</i>	iNaturalist	S5	Chippewa Creek Conservation Area	
Hooded Merganser	<i>Lophodytes cucullatus</i>	eBird	S5B, S5N	Welland River corridor	Very early spring observation - probable migrant
Common Merganser	<i>Mergus merganser</i>	eBird	S5B, S5N	Chippewa Creek Conservation Area	Winter observation
Great Blue Heron	<i>Ardea herodias</i>	Parsons	S4	Chippewa Creek Conservation Area	Observed as flyover, but there is a known heronry nearby
Turkey Vulture	<i>Cathartes aura</i>	Parsons, eBird	S5B	n/a	Flyovers
Bald Eagle	<i>Haliaeetus leucocephalus</i>	eBird, OBBA	SARA - no status ESA – SC COSEWIC - not at risk S2N, S4B	Chippewa Creek Conservation Area	Winter observation on eBird. Confirmed breeder in square as per 2005 atlas summary.
Northern Harrier	<i>Circus cyaneus</i>	eBird	S4B	n/a	
American Kestrel	<i>Falco sparverius</i>	iNaturalist	S4	Chippewa Creek Conservation Area	
Cooper’s Hawk	<i>Accipiter cooperii</i>	eBird	S4	n/a	
Red-tailed Hawk	<i>Buteo jamaicensis</i>	eBird	S5	n/a	
Rough-legged Hawk	<i>Buteo lagopus</i>	iNaturalist	S1B, S4N	n/a	
Killdeer	<i>Charadrius vociferus</i>	Parsons, eBird	S5B, S5N	Throughout	Abundant in study area
American Woodcock	<i>Scolopax minor</i>	eBird	S4B	Chippewa Creek Conservation Area	
Herring Gull	<i>Larus argentatus</i>	eBird	S5B, S5N	Chippewa Creek Conservation Area	Winter observation
Caspian Tern	<i>Hydroprogne caspia</i>	eBird	S3B	Chippewa Creek Conservation Area	
Mourning Dove	<i>Zenaida macroura</i>	Parsons, eBird	S5	Throughout	
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Parsons	S4B	Near Oswego Creek crossing	
Common Nighthawk	<i>Chordeiles minor</i>	eBird	SARA – THR ESA – SC COSEWIC – THR S4B	Chippewa Creek Conservation Area	

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	DISCUSSION/COMMENTS
Chimney Swift	<i>Chaetura pelagica</i>	OBBA	SARA – THR ESA – THR COSEWIC – THR S4B, S4N	n/a	Probable breeder in square as per the 2005 atlas summary. Not observed during field investigations.
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	Parsons	S5B	n/a	
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	eBird	S4	n/a	Winter observation
Downy Woodpecker	<i>Picoides pubescens</i>	Parsons, eBird	S5	n/a	
Hairy Woodpecker	<i>Picoides villosus</i>	eBird	S5	n/a	Winter observation
Northern Flicker	<i>Colaptes auratus</i>	Parsons	S4B	n/a	
Eastern Wood-pewee	<i>Contopus virens</i>	Parsons	SARA - no status ESA – SC COSEWIC – SC S4B	Chippewa Creek Conservation Area, wooded area near river	
Acadian Flycatcher	<i>Empidonax vireescens</i>	NHIC	SARA – END ESA – END COSEWIC – END S2S3B	n/a	Not observed during field investigations.
Least Flycatcher	<i>Empidonax minimus</i>	Parsons	S4B	At tributary crossing	
Willow Flycatcher	<i>Empidonax traillii</i>	Parsons		Chippewa Creek Conservation Area (open scrubby portion)	
Eastern Phoebe	<i>Sayornis phoebe</i>	Parsons	S5B	Chippewa Creek Conservation Area	
Great Crested Flycatcher	<i>Myiarchus crinitus</i>		S4B	n/a	
Eastern Kingbird	<i>Tyrannus tyrannus</i>	Parsons	S4B	Hayfield near eastern study area limits	
Warbling Vireo	<i>Vireo gilvus</i>	Parsons	S5B	n/a	
Red-eyed Vireo	<i>Vireo olivaceus</i>	Parsons	S5B	n/a	
Blue Jay	<i>Cyanocitta cristata</i>	eBird	S5	n/a	
American Crow	<i>Corvus brachyrhynchos</i>	Parsons, eBird	S5B	n/a	
Purple Martin	<i>Progne subis</i>	Parsons	S4B	Martin house next to residence near tributary crossing	
Tree Swallow	<i>Tachycineta bicolor</i>	Parsons, eBird	S4B	Near tributary crossing	

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	DISCUSSION/COMMENTS
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	Parsons, eBird	S4B	Oswego Creek bridge; eBird also reported it elsewhere along the river corridor	
Bank Swallow	<i>Riparia riparia</i>	eBird	SARA - no status ESA - THR COSEWIC - THR S4B	River corridor near east study area limits	
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	eBird	S4B	River corridor near east study area limits	
Barn Swallow	<i>Hirundo rustica</i>	Parsons, eBird	SARA - no status ESA - THR COSEWIC - THR S4B	Throughout	Barns and bridges provide suitable habitat in the study area
Black-capped Chickadee	<i>Poecile atricapillus</i>	Parsons, eBird	S5	Wooded areas	
Tufted Titmouse	<i>Baeolophus bicolor</i>	eBird	S4	n/a	Winter observation
White-breasted Nuthatch	<i>Sitta carolinensis</i>	eBird	S5	n/a	Winter observation
Brown Creeper	<i>Certhia americana</i>	eBird	S5B	Chippewa Creek Conservation Area	Winter observation
House Wren	<i>Troglodytes aedon</i>	Parsons	S5B	n/a	
Carolina Wren	<i>Thryothorus ludovicianus</i>	Parsons	S4	n/a	
Golden-crowned Kinglet	<i>Regulus satrapa</i>	eBird	S5B	Chippewa Creek Conservation Area	Winter observation
Hermit Thrush	<i>Catharus guttatus</i>	iNaturalist	S5B	Chippewa Creek Conservation Area	
Wood Thrush	<i>Hylocichla mustelina</i>	eBird	SARA - no status ESA - SC COSEWIC - THR S4B	Chippewa Creek Conservation Area	
American Robin	<i>Turdus migratorius</i>	Parsons, eBird	S5B	Throughout	
Gray Catbird	<i>Dumetella carolinensis</i>	Parsons	S4B	Throughout	
Northern Mockingbird	<i>Mimus polyglottos</i>	iNaturalist	S4	Chippewa Creek Conservation Area	
European Starling	<i>Sturnus vulgaris</i>	Parsons, eBird	SNA	Throughout	
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Parsons	S5B	Chippewa Creek Conservation Area	
Common Yellowthroat	<i>Geothlypis trichas</i>	Parsons	S5B	Watercourses and wetlands	
American Redstart	<i>Setophaga ruticilla</i>	Parsons	S5B	Chippewa Creek Conservation Area	
Yellow-rumped Warbler	<i>Setophaga coronate</i>	iNaturalist	S5B	Chippewa Creek Conservation Area	

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	DISCUSSION/COMMENTS
Yellow Warbler	<i>Setophaga petechia</i>	Parsons, eBird	S5B	Throughout - wooded locations and edges	
American Tree Sparrow	<i>Spizelloides arborea</i>	eBird	S4B	Throughout	Winter observation – not a locally breeding species
Chipping Sparrow	<i>Spizella passerina</i>	eBird	S5B	Throughout	
Savannah Sparrow	<i>Passerculus sandwichensis</i>	Parsons	S4B	Hayfields	
Song Sparrow	<i>Melospiza melodia</i>	Parsons, eBird	S5B	Throughout	
Swamp Sparrow	<i>Melospiza georgiana</i>	Parsons	S5B	Welland River corridor	
Dark-eyed Junco	<i>Junco hyemalis</i>	eBird	S5B	Throughout	Winter observation – not a locally breeding species
Northern Cardinal	<i>Cardinalis cardinalis</i>	Parsons, eBird	S5	Throughout	
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	Parsons	S4B	Chippewa Creek Conservation Area	
Indigo Bunting	<i>Passerina cyanea</i>	Parsons	S4B	Chippewa Creek Conservation Area	
Bobolink	<i>Dolichonyx oryzivorus</i>	OBBA	SARA - no status ESA - THR COSEWIC - THR S4B	n/a	Probable breeder in square as per 2005 atlas summary. Not observed during Parsons' breeding bird surveys.
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Parsons, eBird	S4	Throughout	
Eastern Meadowlark	<i>Sturnella magna</i>	OBBA	SARA - no status ESA - THR COSEWIC - THR S4B	n/a	Probable breeder in square as per 2005 atlas summary. Not observed during Parsons' breeding bird surveys.
Common Grackle	<i>Quiscalus quiscula</i>	Parsons, eBird	S5B	Throughout	
Brown-headed Cowbird	<i>Molothrus ater</i>	Parsons, eBird	S4B	Throughout	
Baltimore Oriole	<i>Icterus galbula</i>	Parsons, eBird	S4B	Near Oswego Creek bridge	
House Finch	<i>Haemorhous mexicanus</i>	eBird	SNA	n/a	
American Goldfinch	<i>Spinus tristis</i>	Parsons, eBird	S5B	Throughout	

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	DISCUSSION/COMMENTS
House Sparrow	<i>Passer domesticus</i>	Parsons, eBird	SNA	Throughout, in association with buildings	

Table D-2: Snakes

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	COMMENTS/DISCUSSION
Dekay's Brownsnake	<i>Storeria dekayi</i>	ORAA	S5	n/a	Historical data – most recent ORAA record is dated 1988
Eastern Garter Snake	<i>Thamnophis sirtalis sirtalis</i>	Parsons	S5	Two observed: one near eastern edge of Conservation Area property, one at (next woodlot further east)	Observed dead on road
Eastern Milksnake	<i>Lampropeltis triangulum</i>	NHIC	SARA – SC ESA – SC COSEWIC – SC S3	n/a	Not observed during Parsons' field investigations, but tends to be secretive and hard to find even by dedicated snake surveys.
Eastern Ribbonsnake	<i>Thamnophis sauritus</i>	ORAA	SARA – SC ESA – SC COSEWIC – SC S3	n/a	Historical data – most recent ORAA record is dated 1988
Northern Watersnake	<i>Nerodia sipedon sipedon</i>	ORAA	S5	n/a	Historical data – most recent ORAA record is dated 1994. Suitable habitat is present along study area watercourses, however.
Red-bellied Snake	<i>Storeria occipitomaculata</i>	ORAA	S5	n/a	Historical data – most recent ORAA record is dated 1994
Smooth Greensnake	<i>Opheodrys vernalis</i>	ORAA	S4	n/a	Historical data – most recent ORAA record is dated 1989

Table D-3: Turtles

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	COMMENTS/DISCUSSION
Blanding's Turtle	<i>Emydoidea blandingii</i>	ORAA	SARA – THR ESA – THR COSEWIC – THR S3	n/a	Historical data – most recent ORAA record is dated 1988
Midland Painted Turtle	<i>Chrysemys picta marginata</i>	Parsons, ORAA	S5	Eastern edge of Conservation Area property	Dead on road
Snapping Turtle	<i>Chelydra serpentina</i>	ORAA	SARA – SC ESA – SC COSEWIC – SC S3	n/a	Very likely to occur in the Welland River and Chippawa Creek systems due to availability of suitable habitat.

Table D-4: Amphibians

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	COMMENTS/DISCUSSION
American Bullfrog	<i>Lithobates catesbeianus</i>	Parsons	S4	Welland River and Oswego Creek	See Appendix F for detailed amphibian survey results
American Toad	<i>Anaxyrus americanus</i>	ORAA	S5	n/a	Historical data – most recent ORAA record is dated 1990
Blue-spotted Salamander	<i>Ambystoma laterale</i>	iNaturalist	S4	Canborough Road and Highway 16	
Eastern Newt	<i>Notophthalmus viridescens</i>	ORAA	S5	n/a	Historical data – most recent ORAA record is dated 1990
Eastern Red-backed Salamander	<i>Plethodon cinereus</i>	ORAA	S5	n/a	Historical data – most recent ORAA record is dated 1990
Four-toed Salamander	<i>Hemidactylium scutatum</i>	ORAA	S4	n/a	Historical data – most recent ORAA record is dated 1990
Gray Treefrog	<i>Hyla versicolor</i>	Parsons	S5	Woodlands with wet areas	See Appendix F for detailed amphibian survey results
Jefferson/Blue-spotted Salamander Complex		ORAA	n/a	n/a	Historical data – most recent ORAA record is dated 1990
Green Frog	<i>Lithobates clamitans</i>	Parsons	S5	n/a	See Appendix F for detailed amphibian survey results
Northern Leopard Frog	<i>Lithobates pipiens</i>	ORAA	S5	n/a	
Pickerel Frog	<i>Lithobates palustris</i>	ORAA	S4	n/a	Historical data – most recent ORAA record is dated 1995
Spring Peeper	<i>Pseudacris crucifer</i>	ORAA	S5	n/a	
Western Chorus Frog	<i>Pseudacris triseriata</i>	ORAA	SARA – THR ESA - not at risk COSEWIC – THR S4	n/a	Great Lakes / St. Lawrence - Canadian Shield population. Study area is near the northern range limit for this species as indicated in the atlas.
Wood Frog	<i>Lithobates sylvaticus</i>	ORAA	S5	n/a	

Table D-5: Mammals

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	COMMENTS/DISCUSSION
Beaver	<i>Castor canadensis</i>	iNaturalist	S5	Canborough Road and Highway 15	
Eastern Chipmunk	<i>Tamias striatus</i>	Parsons	S5	Throughout - wooded areas	
Eastern Cottontail	<i>Sylvilagus floridanus</i>	Parsons	S5	Throughout - fields, roadsides, and edges	
Eastern Gray Squirrel	<i>Sciurus carolinensis</i>	Parsons	S5	Throughout	One found dead on road
Red Fox	<i>Vulpes vulpes</i>	Parsons	S5	Agricultural field beside Conservation Area	
Red Squirrel	<i>Tamiasciurus hudsonicus</i>	Parsons	S5	Near wooded areas	
Striped Skunk	<i>Mephitis mephitis</i>	Parsons	S5		Dead on road
White-tailed Deer	<i>Odocoileus virginianus</i>	Parsons	S5	Fields near Conservation Area	

Table D-6: Invertebrates

COMMON NAME	SCIENTIFIC NAME	DATA SOURCE	STATUS	LOCATION	COMMENTS/DISCUSSION
American Lady	<i>Vanessa virginiensis</i>	iNaturalist	S5	Chippewa Creek Conservation Area	
Banded Garden Spider	<i>Argiope trifasciata</i>	iNaturalist	S5	Chippewa Creek Conservation Area	
Cabbage White	<i>Pieris rapae</i>	Parsons	SNA	Throughout	
Clouded Sulphur	<i>Colias philodice</i>	Parsons	S5	Throughout	
Common House Spider	<i>Parasteatoda tepidariorum</i>	iNaturalist	SNA	Chippewa Creek Conservation Area	
Eastern Calligrapher	<i>Toxomerus geminatus</i>	iNaturalist	S5	At Welland River	
Eastern Eyed Click Beetle	<i>Alaus oculatus</i>	iNaturalist	SNR	Chippewa Creek Conservation Area	
Eastern Tailed Blue	<i>Cupido comyntas</i>	Parsons	S5	Fields near Conservation Area	
Monarch	<i>Danaus plexippus</i>	Parsons	SARA - SC COSEWIC - END ESA - SC S2N, S4B	Small numbers throughout	Present along roadside
Northern Crescent	<i>Phyciodes cocyta</i>	Parsons	S5	Roadside through Conservation area lands	
Orange Sulphur	<i>Colias eurytheme</i>	Parsons	S5	Fields near Conservation Area	
Painted Lady	<i>Vanessa cardui</i>	iNaturalist	S5	Chippewa Creek Conservation Area	
Pearl Crescent	<i>Phyciodes tharos</i>	Parsons	S4	Roadside through Conservation area lands	
Swamp Milkweed Leaf Beetle	<i>Labidomera clivicollis</i>	iNaturalist	SNR	Chippewa Creek Conservation Area	
Virginian Tiger Moth	<i>Spilosoma virginica</i>	iNaturalist	S5	At Welland River tributary	
White-marked Tussock Moth	<i>Orgyia leucostigma</i>	iNaturalist	S5	Chippewa Creek Conservation Area	
Widow Skimmer	<i>Libellula luctuosa</i>	iNaturalist	S5	Chippewa Creek Conservation Area	

Appendix D

Definitions

STATUS

ESA - Ontario Endangered Species Act. Species are listed as Endangered (**END**), Threatened (**THR**), and Special Concern (**SC**).

SARA - Canadian Species at Risk Act. **END**, **THR**, and **SC** categories as above.

COSEWIC - The Committee on the Status of Endangered Wildlife in Canada. **END**, **THR**, and **SC** categories as above.

Subnational rankings for Ontario: **S1** - extremely rare; **S2** - very rare; **S3** - rare to uncommon; **S4** - common and apparently secure; **S5** - very common and demonstrably secure; **SNA** - not ranked, usually refers to non-native species. 'B' and 'N' are used as appropriate to indicate differences in breeding vs. non-breeding range status.

BREEDING EVIDENCE

Fly-overs, migrants, or other observations with no evidence of breeding (**X**)

Possible Breeding (**PO**):

- species observed during the breeding season in suitable nesting habitat (**H**)
- singing male present in suitable nesting habitat during the breeding season (**S**)

Probable Breeding (**PR**):

- pair observed in suitable nesting habitat during breeding season (**P**)
- permanent territory present as determined by territorial song over time (**T**)
- courtship displays observed (**D**)
- adults observed visiting a probable nest site (**V**)
- adults giving agitated behaviour or anxiety calls (**A**)
- nest-building or excavation of nest hole observed (**N**)

Confirmed Breeding (**CO**):

- adults giving distraction display or feigning injury (**DD**)
- used nest or egg shell found (**NU**)
- recently fledged or downy young observed (**FY**)
- adults observed leaving or entering a nest site (**AE**)
- adult observed carrying faecal sac (**FS**)
- adult observed carrying food for young (**CF**)
- nest containing eggs (**NE**)
- nest with young seen or heard (**NY**)

COMMON NAME	SCIENTIFIC NAME	STATUS	BREEDING EVIDENCE	LOCATION	DISCUSSION/COMMENTS
<i>Herons and Bitterns</i>					
Great Blue Heron	<i>Ardea herodias</i>	S4	X	Chippawa Creek Conservation Area	Multiple individuals observed flying over the road
<i>Vultures</i>					
Turkey Vulture	<i>Cathartes aura</i>	S5B	X		Multiple flyovers
<i>Plovers</i>					
Killdeer	<i>Charadrius vociferus</i>	S5B, S5N	CO-DD	Throughout	Abundant in study area
<i>Pigeons and Doves</i>					
Mourning Dove	<i>Zenaida macroura</i>	S5	PO-S	Throughout	Abundant in study area
<i>Cuckoos and Anis</i>					
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	S4B	PO-S	Near Oswego Creek crossing	One heard during June survey only
<i>Hummingbirds</i>					
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	S5B	PO-H	Woodlands east of Chippawa Creek Conservation Area	
<i>Woodpeckers</i>					
Downy Woodpecker	<i>Picoides pubescens</i>	S5	PR-P		
Northern Flicker	<i>Colaptes auratus</i>	S4B	PO-H		
<i>Tyrant Flycatchers</i>					
Eastern Wood-pewee	<i>Contopus virens</i>	SARA - no status ESA - SC COSEWIC - SC S4B	PO-S	Chippawa Creek Conservation Area, wooded area near river	
Least Flycatcher	<i>Empidonax minimus</i>	S4B	PO-S	Near tributary crossing	Only one seen
Willow Flycatcher	<i>Empidonax traillii</i>	S5B	PO-S	Chippawa Creek Conservation Area (open scrubby portion)	Only one seen
Eastern Phoebe	<i>Sayornis phoebe</i>	S5B	PO-S	Chippawa Creek Conservation Area	
Eastern Kingbird	<i>Tyrannus tyrannus</i>	S4B	PO-H	Hayfield near eastern study area limits	Only one seen
<i>Vireos</i>					
Warbling Vireo	<i>Vireo gilvus</i>	S5B	PO-S		

COMMON NAME	SCIENTIFIC NAME	STATUS	BREEDING EVIDENCE	LOCATION	DISCUSSION/COMMENTS
Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	PO-S		
<i>Crows and Jays</i>					
American Crow	<i>Corvus brachyrhynchos</i>	S5B	X		
<i>Swallows</i>					
Purple Martin	<i>Progne subis</i>	S4B	PR-V	Martin house next to residence near tributary crossing	
Tree Swallow	<i>Tachycineta bicolor</i>	S4B	PO-H	Near tributary crossing	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	S4B	n/a	Oswego Creek bridge; eBird also reported it elsewhere along the river corridor	
Barn Swallow	<i>Hirundo rustica</i>	SARA - no status ESA - THR COSEWIC - THR S4B	PO-H	Throughout	Fairly abundant in area. Barns and bridges provide suitable habitat in the study area. Observed in numbers around the Oswego Creek bridge but not observed nesting on underside of structure.
<i>Chickadees and Titmice</i>					
Black-capped Chickadee	<i>Poecile atricapillus</i>	S5	PO-S	Wooded areas	Abundant in area
<i>Wrens</i>					
House Wren	<i>Troglodytes aedon</i>	S5B	PO-S		
Carolina Wren	<i>Thryothorus ludovicianus</i>	S4	PR-T		Only one observed
<i>Thrushes</i>					
American Robin	<i>Turdus migratorius</i>	S5B	PO-H	Throughout	Abundant in area
<i>Mockingbirds and Thrashers</i>					
Gray Catbird	<i>Dumetella carolinensis</i>	S4B	PO-S	Throughout	Multiple observations throughout
<i>Starlings</i>					
European Starling	<i>Sturnus vulgaris</i>	SNA	PO-H	Throughout	
<i>Waxwings</i>					
Cedar Waxwing	<i>Bombycilla cedrorum</i>	S5B	PO-S	Chippawa Creek Conservation Area	
<i>Wood-warblers</i>					

COMMON NAME	SCIENTIFIC NAME	STATUS	BREEDING EVIDENCE	LOCATION	DISCUSSION/COMMENTS
Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	PO-S	Watercourses and wetlands	
American Redstart	<i>Setophaga ruticilla</i>	S5B	PO-S	Chippawa Creek Conservation Area	
Yellow Warbler	<i>Setophaga petechia</i>	S5B	PO-S	Throughout - wooded locations and edges	
<i>Sparrows</i>					
Savannah Sparrow	<i>Passerculus sandwichensis</i>	S4B	PO-S	Hayfields	Two separate observations in suitable habitat
Song Sparrow	<i>Melospiza melodia</i>	S5B	PO-S	Throughout	
Swamp Sparrow	<i>Melospiza georgiana</i>	S5B	PO-S	Welland River corridor	
<i>Cardinals and Allies</i>					
Northern Cardinal	<i>Cardinalis cardinalis</i>	S5	PO-S	Throughout	
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	S4B	PO-S	Chippawa Creek Conservation Area	
Indigo Bunting	<i>Passerina cyanea</i>	S4B	PO-S	Chippawa Creek Conservation Area	
<i>Blackbirds</i>					
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	S4	PO-S	Throughout	
Common Grackle	<i>Quiscalus quiscula</i>	S5B	PO-H	Throughout	
Brown-headed Cowbird	<i>Molothrus ater</i>	S4B	PO-H	Throughout	
Baltimore Oriole	<i>Icterus galbula</i>	S4B	PO-S	Near Oswego Creek bridge	
<i>Finches</i>					
American Goldfinch	<i>Spinus tristis</i>	S5B	PO-S	Throughout	Abundant in area
<i>Old World Sparrows</i>					
House Sparrow	<i>Passer domesticus</i>	SNA	PO-S	Throughout, in association with buildings	

Appendix E

Definitions

WIND (BEAUFORT SCALE)

- 0 - Calm, 0-2km/h, smoke rises vertically
 - 1 - Light air movement, 3-5km/h, smoke drifts
 - 2 - Slight breeze, 6-11km/h, wind felt on face
 - 3 - Gentle breeze, 12-19km/h, leaves and small twigs in constant motion
 - 4 - Moderate breeze, 20-30km/h, small branches moving, raising dust and loose paper
- Frog surveys should not be conducted at wind scale 4 or higher*

BACKGROUND NOISE

- 0 - No appreciable effect (e.g., owl calling)
- 1 - Slightly affecting sampling (e.g., distant traffic, dog barking, car passing)
- 2 - Moderately affecting sampling (e.g., distant traffic, 2-5 cars passing)
- 3 - Seriously affecting sampling (e.g., continuous traffic nearby, 6-10 cars passing)
- 4 - Profoundly affecting sampling (e.g., continuous traffic passing, construction noise)

CALLING CODE

- 0 - No calls heard
- 1 - Individuals can be counted, calls not overlapping (# of individuals heard provided in brackets)
- 2 - Some individuals can be counted, other calls overlapping (estimate of # heard provided in brackets)
- 3 - Full chorus, calls continuous and overlapping, cannot be counted

SPECIES

- AMTO - American Toad, *Anaxyrus americanus*
- GRTR - Grey Tree Frog, *Hyla versicolor*
- SPPE - Spring Peeper, *Pseudacris crucifer*
- CHFR - Chorus Frog, *Pseudacris triseriata*
- GRFR - Green Frog, *Lithobates clamitans*
- BULL - American Bullfrog, *Lithobates catesbeianus*

Site Descriptions

A1 – Oswego Creek crossing at bridge. Count site included contiguous aquatic and riparian habitat on both north and south sides of the road.

A2 – Tributary crossing at culvert. Count site included contiguous aquatic and riparian habitat on both north and south sides of the road.

A3 – Conservation Area lands south of the road. Woodland habitat with small vernal pools and wetlands present. Calls heard from Dils Lake north of Creek Road were not counted as this feature will not be disturbed for this assignment.

A4 – Conservation Area lands. South of the road is woodland habitat with small wetted features present. North of the road is woodland habitat with the Welland River beyond and some ponded features.

A5 – The Welland River is found north of road at this location (close enough to be clearly audible). South of the road is woodland with some wet pockets.

Creek Road – Amphibian Survey Results Summary

SURVEY DATE	SITE ID	TIME (24 HR)	AIR TEMPERATURE	WIND	BACKGROUND NOISE	SPECIES	CALLING CODE	COMMENTS
16-June-2016	Creek Rd. A1	21:34	22°C	2	2	GRTR	1 (4)	Calling from near Welland R. confluence
						BULL	1 (1)	
	Creek Rd. A2	21:40	22°C	1	2	GRTR	1 (1)	
						GRFR	1 (1)	
						BULL	1 (2)	
	Creek Rd. A3	21:51	22°C	1	2	GRTR	3	Calling from south of road in woodland
	Creek Rd. A4	21:57	21°C	1	1	BULL	1 (1)	Calling from river to north of road
	Creek Rd. A5	22:05	21°C	1	2	GRTR	3	Calling from south of road in woodland
						GRFR	1 (1)	
	10-April-2017	Creek Rd. A1	20:30	18 °C	2	1	-	0
Creek Rd. A2		20:38	18 °C	1	1	-	0	Nothing calling right at culvert, but AMTO, SPPE, CHFR calling further out
Creek Rd. A3		20:44	18 °C	2	1	SPPE	3	Calling mainly from south of road in woodland
						CHFR	3	Calling mainly from south of road in woodland
Creek Rd. A4		20:49	18 °C	2	1	SPPE	2 (14)	Bordering on a full chorus
						CHFR	3	
Creek Rd. A5		20:56	18 °C	2	1	SPPE	3	Woodland south of road was full of frogs, calling throughout
	CHFR					3	Woodland south of road was full of frogs, calling throughout	
24-May-2017	Creek Rd. A1	20:48	16 °C	1	1	BULL	1 (1)	
						AMTO	2 (11)	
						GRFR	1 (1)	
	Creek Rd. A2	20:58	16 °C	1	1	GRTR	2 (15)	
	Creek Rd. A3	21:10	16 °C	1	1	GRTR	2 (15)	
	Creek Rd. A4	21:16	16 °C	1	1	GRTR	2 (15)	Calling from both sides of road
						AMTO	2 (15)	Calling from south of road
Creek Rd. A5	21:21	16 °C	1	1	GRTR	1 (3)		

Creek Road – Conclusion on Significant Wildlife Habitat

SITE ID	SPECIES	HIGHEST CALLING CODE	TOTAL INDIVIDUALS HEARD	CONCLUSION ON SIGNIFICANT WILDLIFE HABITAT
Creek Rd. A1	American Bullfrog (BULL)	1 (1)	2	Significant Amphibian Breeding Habitat <ul style="list-style-type: none"> • Presence of American Bullfrog
	American Toad (AMTO)	2 (11)	11	
	Green Frog (GRFR)	1 (1)	1	
	Grey Treefrog (GRTR)	1 (4)	4	
Creek Rd. A2	American Bullfrog (BULL)	1 (2)	2	Significant Amphibian Breeding Habitat <ul style="list-style-type: none"> • Presence of American Bullfrog
	Green Frog (GRFR)	1 (1)	1	
	Grey Treefrog (GRTR)	2 (15)	16	
Creek Rd. A3	Grey Treefrog (GRTR)	3	>20	Significant Amphibian Breeding Habitat <ul style="list-style-type: none"> • Greater than 20 individuals counted across all three surveys
	Spring Peeper (SPPE)	3	>20	
	Western Chorus Frog (CHFR)	3	>20	
Creek Rd. A4	American Bullfrog (BULL)	1 (1)	1	Significant Amphibian Breeding Habitat <ul style="list-style-type: none"> • Presence of American Bullfrog • Greater than 20 individuals counted across all three surveys
	American Toad (AMTO)	2 (15)	15	
	Grey Treefrog (GRTR)	2 (15)	15	
	Spring Peeper (SPPE)	2 (14)	14	
	Western Chorus Frog (CHFR)	3	>20	
Creek Rd. A5	Green Frog (GRFR)	1 (1)	1	Significant Amphibian Breeding Habitat <ul style="list-style-type: none"> • Greater than 20 individuals counted across all three surveys
	Grey Treefrog (GRTR)	3	>20	
	Spring Peeper (SPPE)	3	>20	
	Western Chorus Frog (CHFR)	3	>20	

Appendix F

Definitions

STATUS

ESA - Ontario Endangered Species Act. Species are listed as Endangered (**END**), Threatened (**THR**), and Special Concern (**SC**).

SARA - Canadian Species at Risk Act. **END**, **THR**, and **SC** categories as above.

COSEWIC - The Committee on the Status of Endangered Wildlife in Canada. **END**, **THR**, and **SC** categories as above.

SRANK - Subnational rankings for Ontario: **S1** - extremely rare; **S2** - very rare; **S3** - rare to uncommon; **S4** - common and apparently secure; **S5** - very common and demonstrably secure; **SNA** - not ranked, usually refers to non-native species; **SH** - historical; **SX** - extirpated; **SNR/SU** - unranked/unknown, usually due to insufficient data. 'B' and 'N' are used as appropriate to indicate differences in breeding vs. non-breeding range status.

PROBABILITY OF OCCURRENCE

For each significant species identified in background sources, the probability of that species occurring in the study area for each project location was assessed. Probabilities were determined as follows:

Confirmed	The species was identified at that location during field investigations.
High	There are recent occurrence records for the species at that location AND there is suitable habitat in the study area.
Low	1) Occurrence records for the species at that location are historical (more than 25 years old); 2) There are recent occurrence records for the species at that location BUT there is no suitable habitat in the study area.
None	The species is noted to be extirpated at that location by the MNRF.
Unknown	There is insufficient information to determine the probability of occurrence.

DATA SOURCES

- NHIC search results from 1 km squares: 17PH1660, 17PH1760, 17PH1959, 17PH1960, 17PH2060, 17PH2061, 17PH2161, and 17PH2261
- Wainfleet Township SAR list provided by MNRF (September, 2016)

SCIENTIFIC NAME	COMMON NAME	STATUS	HABITAT REQUIREMENTS	PROBABILITY OF OCCURRENCE
<i>Vascular Plants</i>				
<i>Castanea dentata</i>	American Chestnut	ESA – END SARA – END COSEWIC – END SRANK – S2	Moist to well drained forests on sand, occasionally heavy soils (MNRF, 2000)	Moderate – Not observed during field investigations. May be present in the woodlands surrounding the Chippawa Creek Conservation Area.
<i>Cornus florida</i>	Eastern Flowering Dogwood	ESA – END SARA – END COSEWIC – END SRANK - S2?	Typically occurs as an understory or edge tree of open dry to slightly moist deciduous or mixed forests, on sand to sandy loam or occasionally on clay loam soils, typically in mid-age to mature forests (COSEWIC, 2007).	Low - The most recent occurrence in the NHIC database for the study area is dated 2007, and it is probably still present in deciduous and mixed forest stands in the area at large. However, it was not observed during Parsons' vegetation inventories, and given the highly altered condition of the forests in the study area the habitat is not considered high quality.
<i>Cuscuta cephalanthi</i>	Buttonbush Dodder	ESA – no status SARA – no status COSEWIC – not assessed SRANK - S2	Moist ditches, creek and pond edges and floodplain woods – parasitic on <i>Aster</i> , <i>Decodon</i> , <i>Lythrum</i> , <i>Polygonum</i> , <i>Pycnanthemum</i> , <i>Solidago</i> (MNRF, 2000).	High – NHIC record is dated 1985 and is therefore a historical occurrence. However, this is an easily overlooked species and could be present on emergent aquatic plants in Oswego Creek and other deep watercourses.
<i>Eurybia divaricata</i>	White Wood Aster	ESA – THR SARA – THR COSEWIC – SC SRANK – S2	Mesic to dry deciduous woods (MNRF, 2000)	Moderate – Not identified during field investigations. May be present in the woodlands surrounding the Chippawa Creek Conservation Area.
<i>Juglans cinerea</i>	Butternut	ESA – END SARA – END COSEWIC – END SRANK – S2?	Commonly found in riparian habitats, but also found on rich, moist, well-drained loams and well-drained gravels, especially those of limestone origin. Intolerant of shade. Widespread mortality due to introduced canker (COSEWIC, 2003).	High – Not identified during field investigations but the study area does provide suitable habitat. Specific vegetation removal areas should be inventoried prior to clearing to confirm the absence of Butternut.

<i>Ptelea trifoliata</i>	Common Hoptree	ESA – THR SARA – THR COSEWIC – SC SRANK – S3	Shorelines and other dry sites (MNRF, 2000)	Low – Not identified during field investigations. Suitable habitat not present in study area.
<i>Sparganium androcladum</i>	Branching Bur-reed	ESA – no status SARA – no status COSEWIC – not assessed SRANK - SH	Shallow water and muddy shores of ponds, lake margins and marshes (MNRF, 2000).	High – NHIC record is dated 1986 and is therefore a historical occurrence (as acknowledged by the “SH” provincial status). However, this is an easily overlooked species and could potentially be present in Oswego Creek and other watercourses.
<i>Thalictrum revolutum</i>	Skunk Meadow-rue	ESA – no status SARA – no status COSEWIC – not assessed SRANK - S2	Rich alluvial woods, marsh edges and mossy creek beds (MNRF, 2000).	Low – NHIC record is dated 1950 and is therefore a historical occurrence. Habitat in the study area is too disturbed to support this species.
Birds				
<i>Asio flammeus</i>	Short-eared Owl	ESA - SC SARA - SC COSEWIC – SC SRANK – S2N, S4B	Grasslands, open areas or meadows that are grassy or bushy; marshes, bogs or tundra; both diurnal and nocturnal habits; ground nester; destruction of wetlands by drainage for agriculture is an important factor in the decline of this species; home range 25 - 125 ha; requires 75-100 ha of contiguous open habitat (MNRF, 2000)	Low – There are no contiguous large areas of suitable nesting habitat in the study area. Owls could occur incidentally while hunting or migrating.
<i>Caprimulgus vociferus</i>	Eastern Whip-poor-will	ESA - THR SARA - THR COSEWIC – THR SRANK – S4B	Dry, open, deciduous woodlands of small to medium trees; oak or beech with lots of clearings and shaded leaf litter; wooded edges, forest clearings with little herbaceous growth; pine plantations; associated with >100 ha forests; may require	Moderate – The habitats that abut Creek Road in the Conservation Area and further east could potentially provide habitat for this species, as these areas consist of forests with many clearings and open patches. However, it was not observed by Parsons and was not reported in the area by eBird.

			500 to 1000 ha to maintain population (MNRF, 2000)	
<i>Cardellina canadensis</i>	Canada Warbler	ESA - SC SARA - THR COSEWIC – THR SRANK – S4B	An interior forest species; dense, mixed coniferous, deciduous forests with closed canopy, wet bottomlands of cedar or alder; shrubby undergrowth in cool moist mature woodlands; riparian habitat; usually requires at least 30 ha (MNRF, 2000)	Low - Not observed during breeding bird surveys, not reported by eBird. Forests in the study area tend to be fragmented and/or highly disturbed, making them less than ideal habitat for this species.
<i>Chaetura pelagica</i>	Chimney Swift	ESA – THR SARA – THR COSEWIC – THR SRANK - S4B, S4N	Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water (MNRF, 2000)	Low - Not observed during breeding bird surveys, not reported by eBird. The only potential nesting habitat for this species is in buildings adjacent to the roadway.
<i>Chordeiles minor</i>	Common Nighthawk	ESA – SC SARA – THR COSEWIC – THR SRANK - S4B	Open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs (MNRF, 2000)	Confirmed – reported in the area via eBird, in association with the Chippawa Creek Conservation Area.
<i>Contopus virens</i>	Eastern Wood-pewee	ESA - SC SARA – no status COSEWIC – SC SRANK - S4B	Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks (MNRF, 2000)	Confirmed – observed by Parsons during breeding bird surveys. Probable breeder in forest habitats associated with Chippawa Creek Conservation Area.
<i>Dolichonyx oryzivorus</i>	Bobolink	ESA – THR SARA – no status COSEWIC – THR SRANK - S4B	Large, open, expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50 ha (MNRF, 2000)	Low - Not observed during breeding bird surveys which targeted potentially suitable habitat areas. Also not reported by eBird in the vicinity.
<i>Empidonax virescens</i>	Acadian Flycatcher	ESA – END SARA – END COSEWIC - END SRANK - S2S3B	Mature, shady, deciduous forests; heavily wooded ravines; creek bottoms or river swamps; availability of good quality habitat is limiting factor; needs	Low – NHIC record is dated 1983 and is therefore a historical occurrence. Natural area in the study area are too disturbed and fragmented to provide good quality habitat for this species.

			at least 30 ha of forest (MNRF, 2000).	
<i>Haliaeetus leucocephalus</i>	Bald Eagle	ESA - SC SARA - no status COSEWIC - not at risk SRANK - S2N, S4B	Require large continuous area of deciduous or mixed woods around large lakes, rivers; require area of 255 ha for nesting, shelter, feeding, roosting; prefer open woods with 30 to 50% canopy cover; nest in tall trees 50 to 200 m from shore; require tall, dead, partially dead trees within 400 m of nest for perching; sensitive to toxic chemicals (MNRF, 2000)	Confirmed – reported in the area via eBird, in association with the Chippawa Creek Conservation Area. Most likely to be found hunting along watercourses. Stick nests were not observed in trees along the road corridor.
<i>Hirundo rustica</i>	Barn Swallow	ESA - THR SARA – no status COSEWIC – THR SRANK – S4B	Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water (MNRF, 2000)	Confirmed – observed by Parsons during breeding bird surveys throughout the study area. The bridge and culvert sites along the roadway provide potential nesting habitat; one nest consistent with Barn Swallow construction was observed in the culvert conveying the tributary to the Welland River, although this nest appeared to have been taken over by another species of bird.
<i>Hylocichla mustelina</i>	Wood Thrush	ESA - SC SARA – no status COSEWIC – THR SRANK – S4B	Carolinian and Great Lakes-St. Lawrence forest zones; undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges; must have some trees higher than 12 m (MNRF, 2000)	High - Not observed during breeding bird surveys, but reported via eBird in the Chippawa Creek Conservation Area. Suitable breeding habitat is present in forested areas adjacent to the road.
<i>Icteria virens</i>	Yellow-breasted Chat	ESA - END SARA - SC COSEWIC – END SRANK – S2B	Thickets, tall tangles of shrubbery beside streams, ponds; overgrown bushy clearings with deciduous thickets; nests above ground in bush, vines etc. (MNRF, 2000)	Low - Not observed during breeding bird surveys, not reported by eBird. However, small areas of suitable habitat for this species do occur in the study area.

<i>Ixobrychus exilis</i>	Least Bittern	ESA - THR SARA - THR COSEWIC – THR SRANK – S4B	Deep marshes, swamps, bogs; marshy borders of lakes, ponds, streams, ditches; dense emergent vegetation of cattail, bulrush, sedge; nests in cattails; intolerant of loss of habitat and human disturbance (MNRF, 2000)	Low – Not observed during field investigations. The study area lacks large cattail marshes and is highly affected by human disturbance.
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	ESA - SC SARA - THR COSEWIC – THR SRANK – S4B	Open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees; feeds on insects and stores nuts or acorns for winter; loss of habitat is limiting factor; requires cavity trees with at least 40 cm dbh; require about 4 ha for a territory (MNRF, 2000)	Low – Suitable potential habitat is present, but this species was not observed during breeding bird surveys, and was not reported by eBird in the area.
<i>Riparia riparia</i>	Bank Swallow	ESA – THR SARA – no status COSEWIC – THR SRANK - S4B	Sand, clay or gravel river banks or steep riverbank cliffs; lakeshore bluffs of easily crumbled sand or gravel; gravel pits, road-cuts, grassland or cultivated fields that are close to water; nesting sites are limiting factor for species presence (MNRF, 2000)	High - Not observed during breeding bird surveys, but reported in the study area via eBird along the river corridor near the eastern project limits. Suitable breeding habitat could potentially occur along the Welland River banks.
<i>Setophaga cerulea</i>	Cerulean Warbler	ESA - THR SARA - SC COSEWIC – END SRANK – S3B	Mature deciduous woodland of Great Lakes- St. Lawrence and Carolinian forests, sometimes coniferous; swamps or bottomlands with large trees; area sensitive species needing extensive areas of forest (>100 ha) (MNRF, 2000)	Low - Not observed during breeding bird surveys, not reported by eBird. The largest patches of potentially suitable forest habitat are found in the Chippawa Creek Conservation Area.
<i>Sturnella magna</i>	Eastern Meadowlark	ESA - THR	Open, grassy meadows, farmland, pastures, hayfields or	Low - Not observed during breeding bird surveys which targeted potentially suitable

		SARA - no status COSEWIC - THR SRANK - S4B	grasslands with elevated singing perches; cultivated land and weedy areas with trees; old orchards with adjacent, open grassy areas >10 ha in size (MNRF, 2000)	habitat areas; also not reported by eBird in the area.
<i>Vermivora chrysoptera</i>	Golden-winged Warbler	ESA - SC SARA - THR COSEWIC - THR SRANK - S4B	Early successional habitat; shrubby, grassy abandoned fields with small deciduous trees bordered by low woodland and wooded swamps; alder bogs; deciduous, damp woods; shrubby clearings in deciduous woods with saplings and grasses; brier-woodland edges; requires >10 ha of habitat (MNRF, 2000)	Low - Not observed during breeding bird surveys, not reported by eBird. Successional thicket habitat is present in small areas, mostly not directly adjacent to the existing roadway.
Reptiles				
<i>Chelydra serpentina</i>	Snapping Turtle	ESA - SC SARA - SC COSEWIC - SC SRANK - S3	Permanent, semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddy banks or bottoms; often uses soft soil or clean dry sand on south-facing slopes for nest sites; may nest at some distance from water; often hibernate together in groups in mud under water; home range size ~28 ha (MNRF, 2000)	High - Suitable habitat is present in the Welland River, Chippawa Creek, and large tributary channels. Could enter road corridor to bask on asphalt or seek gravelly nesting sites.
<i>Clemmys guttata</i>	Spotted Turtle	ESA - END SARA - END COSEWIC - END SRANK - S2	Unpolluted, shallow bodies of water such as streams, ponds, wet meadows, marshes or swamps with aquatic vegetation, logs or clumps of vegetation for basking; nest is dug near water in fine-textured soil (e.g. sand) or moss; vulnerable to factors affecting water quality, vegetation composition and	Low - The Welland River and its tributaries were all highly turbid during field investigations and are likely to be affected by surrounding developments (e.g., cattle with unrestricted access to the water from adjacent farms).

			structure; average home range size 3.7 ha (MNRF, 2000)	
<i>Emydoidea blandingii</i>	Blanding's Turtle	ESA - THR SARA - THR COSEWIC - THR SRANK - S3	Shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps, or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs; not readily observed (MNRF, 2000)	High – Both the Welland River and Oswego Creek are deep, permanent watercourses and provide potential habitat.
<i>Graptemys geographica</i>	Northern Map Turtle	ESA - SC SARA - SC COSEWIC - SC SRANK - S3	Large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water; home range size is larger for females (about 70 ha) than males (about 30 ha) and includes hibernation, basking, nesting and feeding areas; aquatic corridors (e.g. stream) are required for movement; not readily observed (MNRF, 2000)	High – Both the Welland River and Oswego Creek are deep, permanent watercourses and provide potential habitat.
<i>Lampropeltis triangulum</i>	Eastern Milksnake	ESA - SC SARA - SC COSEWIC - SC SRANK - S3	Farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings; often uses communal nest sites (MNRF, 2000).	High – NHIC record is dated 1963 and is therefore a historical occurrence. However, this is a relatively widespread species in the region and could easily occur in the area, especially given the number of abandoned structures and other potential hibernacula. Milksnakes are often secretive and hard to detect even by dedicated snake surveys.
<i>Pantherophis spiloides</i>	Grey Ratsnake	ESA - END	Shrubby, old field, deciduous or mixed forests, thickets, field	Moderate – Although it was not observed during field investigations, suitable

	(Carolinian Population)	SARA - END COSEWIC – END SRANK – S1	edges, rocky hillsides, river bottoms; talus slopes; uses talus slopes, unused wells or cisterns for hibernation; will hibernate in groups with other snakes (MNRF, 2000)	potential habitat is present in the study area.
<i>Sistrurus catenatus</i>	Massassauga Rattlesnake (Carolinian Population)	ESA - END SARA - THR COSEWIC – END SRANK – S1	Use upland, old field in summer; marsh, shrub swamp or bog; rivers and streams that provide sedge or low vegetative growth; in fall and winter; hibernate underground in mammal burrows, under rotting stumps, in rock crevices (MNRF, 2000)	Low – Although suitable potential habitat is present in the study area, records of Massassauga in Niagara Region are rare.
<i>Thamnophis sauritus</i>	Eastern Ribbonsnake	ESA - SC SARA - SC COSEWIC – SC SRANK – S3	Sunny grassy areas with low dense vegetation near bodies of shallow permanent quiet water; wet meadows, grassy marshes or sphagnum bogs; borders of ponds, lakes or streams; hibernates in groups (MNRF, 2000)	High – Although it was not observed during field investigations, suitable potential habitat is present along the study area watercourses and in adjacent open, grassy areas.
Amphibians				
<i>Anaxyrus fowleri</i>	Fowler’s Toad	ESA - END SARA - END COSEWIC – END SRANK – S2	Restricted in Ontario to shores of Lake Erie; requires sandy soils for burrowing to escape sun; hibernates during winter in burrows >1m deep in sand; suitable areas are along shorelines, river valleys or beaches that provide adequate insect supply; requires shallow water for breeding (MNRF, 2000)	Low – the study area is outside of the known range limits for this species.
Fish				
<i>Esox americanus vermiculatus</i>	Grass Pickerel	ESA - SC SARA - SC COSEWIC – SC	Warm, slow moving streams, isolated pools of such streams, and shallow bays of lakes. It is always associated with extensive	Low – Although it was not observed during field investigations and considered remnant in Welland River by MNRF, suitable potential habitat is present in the

		SRANK – S3	submergent and emergent aquatic vegetation characteristic of the fishes in this family (COSEWIC, 2005).	study area at Oswego Creek and Unnamed Tributary to Welland River at Culvert Two.
Freshwater Mussels				
<i>Toxolasma parvum</i>	Lilliput	ESA - THR SARA - END COSEWIC – END SRANK – S2	Lilliput is found in a variety of habitats, from small to large rivers to wetlands and the shallows of lakes, ponds and reservoirs. It prefers to burrow in soft substrates (river and lake bottoms) made of mud, sand, silt or fine gravel	High – Although it was not observed during field investigations, suitable habitat is present in the study area at Oswego Creek and Unnamed Tributary to Welland River at Culvert Two.
<i>Quadrula quadrula</i>	Mapleleaf	ESA - SC SARA - SC COSEWIC – SC SRANK – S2	Occurs in a variety of habitats ranging from medium to large rivers with slow to moderate current, lakes and reservoirs in mud, sand, or gravel substrates. In Manitoba and Ontario <i>Q. quadrula</i> is most typically recovered from medium to large rivers in firmly packed coarse gravel and sand to firmly packed clay/mud substrate (COSEWIC, 2006)	Confirmed – Dead valves belonging to Mapleleaf Mussel were found at the confluence of Oswego Creek and Welland River.
Insects				
<i>Bombus affinis</i>	Rusty-patched Bumble Bee	ESA - END SARA - END COSEWIC – END SRANK – S1	Has been recorded from diverse habitats including mixed farmland, sand dunes, marshes, urban and wooded areas. It has been recorded feeding from a variety of plant genera for pollen and nectar. It usually nests underground in abandoned rodent burrows (COSEWIC, 2010b).	Low – the only records of this species in the past two decades are far outside of the study, in Pinery Provincial Park on Lake Huron.
<i>Danaus plexippus</i>	Monarch	ESA - SC SARA - SC	Breeding habitat is confined to sites where milkweeds, the sole	Confirmed – Observed by Parsons in open habitats and along roadsides in the study

		COSEWIC – END SRANK – S2N, S4B	food of the caterpillars, grow. Different milkweed species grow in a variety of environments and are also planted in gardens. Migratory; overwinters mostly in Central Mexico (COSEWIC, 2010a).	area. Milkweed plants are present to provide potential breeding sites.
<i>Pieris virginiensis</i>	West Virginia White	ESA - SC SARA – no status COSEWIC – not assessed SRANK – S3	Moist, deciduous woodlots with a supply of toothwort (<i>Cardamine spp.</i>), the only food source for larvae.	Low – records of toothwort do not exist for the study area.
Mammals				
<i>Myotis leibii</i>	Eastern Small-footed Myotis	ESA - END SARA – no status COSEWIC – not assessed SRANK – S2S3	Roosts in caves, mine shafts, crevices or buildings that are in or near woodland; hibernates in cold dry caves or mines; maternity colonies in caves or buildings; hunts in forests (MNRF, 2000)	Low – main habitat features (caves and mines) are not present; buildings adjacent to the road could provide habitat for these bats but these will not be affected by the project.
<i>Myotis lucifugus</i>	Little Brown Myotis	ESA - END SARA - END COSEWIC – END SRANK – S4	Uses caves, quarries, tunnels, hollow trees, or buildings for roosting; winters in humid caves; maternity sites in dark warm areas such as attics and barns; feeds primarily in wetlands, forest edges (MNRF, 2000)	High – Large-diameter dead or dying trees with potentially suitable loose bark and/or cavities were observed adjacent to the existing roadway. Hibernation habitat is not present.
<i>Myotis septentrionalis</i>	Northern Myotis	ESA - END SARA - END COSEWIC – END SRANK – S3	Hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, manmade structures but prefers hollow trees or under loose bark; hunts within forests, below canopy (MNRF, 2000)	High – Large-diameter dead or dying trees with potentially suitable loose bark and/or cavities were observed adjacent to the existing roadway. Hibernation habitat is not present.

<i>Perimyotis subflavus</i>	Tri-coloured Bat	ESA - END SARA - END COSEWIC – END SRANK – S3?	Open woods near water; roosts in trees, cliff crevices, buildings or caves; hibernates in damp, draft-free, warm caves, mines or rock crevices (MNRF, 2000). Prefers roosts in foliage within or below the canopy, mostly in oak species but also sometimes in maples. Clusters of dead or dying leaves on live branches are preferred (MNRF, 2017).	High – Many large oak trees with dead branch clusters were observed adjacent to the existing roadway (see Appendix G). Forests associated with the Chippawa Creek Conservation Area are likely to provide hunting habitat. Hibernation habitat is not present.
<i>Urocyon cinereoargenteus</i>	Gray Fox	ESA - THR SARA - THR COSEWIC – THR SRANK - S1	Hardwood forests with a mix of fields and woods; swamps; wooded, brushy or rocky habitats; woodland farmland edge; old fields with thickets; dens in hollow log or tree; individual has numerous winter dens throughout its range which is > 40 ha (MNRF, 2000)	Low – the current range of Gray Fox in Ontario is restricted to Pelee Island, which is far outside the study area.

Reconstruction of Regional Road 45 (Creek Road) Environmental Impact Study



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