Environmental Impact Statement
Niagara Village Residential Development

2592693 Ontario Inc.
c/o 4308 Village Centre Court
Mississauga ON L4Z 1S2

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1.0 Introduction

1.1 Study Area

R.J. Burnside & Associates Limited (Burnside) has been retained by 2592693 Ontario Inc. to conduct an Environmental Impact Study (EIS) in support of the Official Plan amendment, Zoning by-law amendment and Draft Plan of Subdivision for the Niagara Village residential development project. This development is proposed to be located on part of city lots 189, 195, 215, 216, and 217, parts of Lots 1 and 3, Plan 4, Blocks A, B, C, and F, Plan 9, and part of several road allowances within the geographic Township of Stamford, Regional Municipality of Niagara (hereafter to be referred to as the Study Area). The lands are currently part of the existing Thundering Waters Golf Club (TWGC), as shown on Figure 1.

Many of the natural heritage features and functions of the Study Area has been heavily modified due to the presence and maintenance of the TWGC; large areas of existing fairway and greens are comprised of manicured turf. Remnant deciduous/mixed forests and swamps are present, most of which occur within the eastern portion of the property. A section of woodlands within the western extent of the property has been designated as part of the Niagara Falls Slough Forest Complex Provincially Significant Wetland (PSW). A network of open aquatic features is also present; these ponds are used both as water hazards for the golf course and as a source of water for irrigation of the grounds.

The Study Area and surrounding lands are located within the Niagara River Subwatershed and fall under the jurisdiction of the Niagara Peninsula Conservation Authority (NPCA). Two watercourses have been identified within the Study Area. The first, the Conrail Drainage Channel (an artificial linear watercourse), runs parallel and adjacent to the rail corridor that travels southwest to northeast; and the second is an unnamed intermittent watercourse that connects water features on the golf course. The property is bisected by a Canadian Pacific Railway (CPR) and associated corridor allowances.

1.2 Scope of Work

An EIS is required due to this proposed development's proximity to a Natural Heritage or Key Hydrologic Feature (Niagara Falls Slough Forest Complex PSW). According to the Niagara Falls Official Plan (NFOP) and Niagara Region Official Plan (NROP), any proposed development within 120 m of a PSW or regulated wetlands greater than or equal to 2 ha must first demonstrate no net negative impacts to Natural Heritage Features as a result of planned works (Niagara Falls, 2017; Niagara Region, 2014).

This EIS is prepared in accordance with, and with reference to, the approved EIS Terms of Reference (Appendix A – Terms of Reference), Section 2.1 (Natural Heritage) of the Provincial Policy Statement (PPS) (Ministry of Municipal Affairs and Housing (MMAH),

2014), the Natural Heritage Reference Manual for Natural Heritage Policies of the PPS (Ministry of Natural Resources and Forestry (MNRF), 2010) and the Significant Wildlife Habitat Technical Guide (SWHTG; MNRF, 2000). As such, this EIS includes:

- A review of applicable environmental policies and regulations affecting the Study Area;
- A review of existing secondary source data to identify any known natural features;
- Pre-submission consultation with various agencies to identify additional features and to confirm field study methodologies;
- A summary of field studies and a natural resources inventory to confirm the presence, significance and sensitivity of any natural features;
- A description of the proposed development;
- An evaluation of the environmental impacts;
- Mitigation measures to prevent, reduce or offset anticipated environmental impacts; and
- A recommended monitoring program for implementation and maintenance of the mitigation measures.

Specific consideration is given to the Niagara Falls Slough Forest PSW Complex both on and adjacent to the Study Area, aquatic habitats (the Conrail Drainage Channel and an unnamed tributary to the Welland River), the identification and assessment of any Significant Forest Areas as defined under the NROP and the NFOP, and the identification of any specific onsite challenges or requirements (e.g., hydrogeological conditions) that were identified in the Terms of Reference.

2.0 Planning Context

The following sections review the policies, acts, regulations and designations that apply to the Study Area.

2.1 Niagara Escarpment Plan (2017)

The approved EIS TOR identified that the Niagara Escarpment Commission (NEC) jurisdiction would be reviewed to determine if the Niagara Escarpment Plan Area or NEC's Area of Development Control applies to the site and it is confirmed that it does not apply.

2.2 Federal Fisheries Act, 1985

The federal *Fisheries Act, 1985* is administered by Fisheries and Oceans Canada (DFO) and provides protection for fish habitat across Canada. Section 34.4 of the Act states that:

> *No person shall carry on any work, undertaking or activity, other than fishing, that result in the death of fish.*

Section 35 (1) of the Act states that:

> *No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat.*

The Act defines fish habitat as waters frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas. If works will proceed below the annual high-water mark, then a Request for Project Review should be made to the Fish and Fish Habitat Protection Program.

2.3 Migratory Birds Convention Act, 1994

The *Migratory Birds Convention Act, 1994* (MBCA) and the *Migratory Bird Regulations* (MBR) are federal legislative requirements that are binding on members of the public and all levels of government, including federal and provincial governments. The legislation protects certain species[1], controls the harvest of others, and prohibits commercial sale of all species.

One key responsibility under the MBCA is described in Section 6 of the associated MBR:

> *Subject to subsection 5(9), no person shall*
>
> - *Disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird, or*
>
> - *Have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit therefor.*

The *incidental take* of migratory birds and the disturbance, destruction or taking of the nest of a migratory bird is prohibited. *Incidental take* is the killing or harming of migratory birds due to actions, such as economic development, which are not primarily focused on taking migratory birds. No permit can be issued for the incidental take of migratory birds or their nest or eggs as a result of economic activities. These prohibitions apply throughout the year. Environment Canada and the Canadian Wildlife Service have compiled nesting calendars that show the variation in nesting intensity, by habitat type

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[1] Bird species not regulated under the Act include: Rock Dove, American Crow, Brown-headed Cowbird, Common Grackle, House Sparrow, Red-winged Blackbird, and European Starling. In addition, raptors are not regulated under the MBCA. However, they are protected under provincial legislation which restricts and regulates the taking or possession of eggs and nests. Furthermore, if the species identified is protected under Ontario's Endangered Species Act, 2007 or the federal Species at Risk Act, additional restrictions may apply.

and nesting zone, within broad geographical areas distributed across Canada. While this does not mean nesting birds will not nest outside of these periods, the calendars can be used to greatly reduce the risk of encountering a nest. Environment Canada advises avoidance as the best approach.

2.4 Species at Risk Act (2002)

The *Species at Risk Act, 2002* (SARA), provides protection for Species at Risk (SAR) and their habitat. Schedule 1 of SARA is considered the official list of wildlife species at risk that receive legal protection under the Act and includes species that have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COESWIC) as Extirpated, Endangered, Threatened, or Special Concern.

To ensure the protection of SAR, Section 32(1) and (2) of SARA state,

> *(1) No person shall kill, harm, harass, capture, or take an individual of a wildlife species that is listed as an extirpated species, an endangered species, or a threatened species*
>
> *(2) No person shall possess, collect, buy, sell, or trade an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species, or any part or derivative of such an individual*

And Section 33 of SARA states,

> *No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered or threatened species, or that is listed as an extirpated species if a recovery strategy has recommended reintroduction of the species into the wild in Canada*

SARA prohibitions pertaining to private lands include:

- Aquatic species listed on Schedule 1 as endangered, threatened or extirpated.
- Migratory birds listed in the MBCA and also listed on Schedule 1 as endangered, threatened or extirpated.
- May apply through an order, to other species listed on Schedule 1 (i.e., not an aquatic or migratory bird species) as endangered, threatened or extirpated, if provincial/territorial legislation or voluntary measures do not adequately protect the species and its habitat.

Although Environment and Climate Change Canada (ECCC) is the overall administrator of SARA, responsibility for implementation of the Act is shared by ECCC and the Canadian Wildlife Service, Parks Canada, and DFO. On private lands, ECCC oversees matters related to migratory birds, while DFO oversees matters related to aquatic

species. In most cases pertaining to non-aquatic species on private lands, provincial laws (e.g., the *Endangered Species Act, 2007*) provide protection for critical habitat (i.e., habitat that is necessary for the survival or recovery of a listed Extirpated, Endangered, Threatened species). Alternatively, SARA prohibitions can be applied by an order, as described above, or through federal legislation (including SARA).

2.5 Provincial Policy Statement (2014)

The PPS (MMAH, 2014) provides general policies on land use patterns, resources, and public health and safety that guide development across Ontario. Specifically related to this location is the requirement to identify Natural Heritage Systems (NHS) in southern Ontario (Ecoregions 6E and 7E), Policy 2.1.3. This report will address Section 2.1 Natural Heritage.

Eight types of natural heritage features are identified in Sections 2.1.4 and 2.1.5 of the PPS, as follows:

1. *Significant wetlands in Ecoregions 5E, 6E and 7E;*
2. *Significant coastal wetlands;*
3. *Significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E;*
4. *Significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);*
5. *Significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and St. Marys River);*
6. *Significant wildlife habitat;*
7. *Significant areas of natural and scientific interest; and,*
8. *Coastal wetlands in Ecoregions 5E, 6E and 7E that are not subject to policy 2.1.4(b)*

According to Section 2.1.5, development and site alteration shall not be permitted in these features unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

Sections 2.1.6 and 2.1.7 identify two additional natural features where development and site alteration are not permitted:

1. *Fish habitat except in accordance with provincial and federal requirements; and,*

2. *Habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.*

According to Section 2.1.8, development and site alternation are not permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5, and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

2.6 Provincial Endangered Species Act, 2007

The *Endangered Species Act* 2007 (ESA) provides protection for SAR and their habitat. The ESA is administered by the Ministry of Environment, Conservation, and Parks (MECP) and provides policies for the protection of Extirpated, Endangered and Threatened species, as well as species of special concern. These four categories of species form the Species at Risk in Ontario List (i.e., SARO), which are classified by the Committee on the Status of Species at Risk in Ontario (COSSARO). It is noted that COSSARO is also responsible for maintaining criteria for assessing and classifying SAR.

Sections 9 and 10 of the ESA extends protection to threatened, endangered, or extirpated species and their habitats. Section 9(1)(a) of the ESA states,

> *no person shall kill, harm, harass, capture or take a living member of a species that is listed on the Species at Risk in Ontario List as extirpated, endangered or threatened.*

Section 10(1)(a) of the ESA states,

> *no person shall damage or destroy the habitat of a species that is listed on the Species at Risk in Ontario List as an endangered or threated species.*

The ESA includes a general habitat regulation as well as species-specific habitat regulations. Species uplisted to endangered or threatened automatically receive general habitat protection under the ESA until such time that a species habitat regulation comes into force.

The SARO list is constantly being updated, therefore, it is the proponent's responsibility to practice due diligence in order to ensure that the ESA and its regulations are not violated.

Prior to April 2019, the ESA was administered by the MNRF.

As part of this EIS, aquatic and terrestrial inventories were undertaken in the relevant field season and no SAR were identified within the Study Area. Refer to Section 4.0 of this report for further details.

2.7 Niagara Peninsula Conservation Authority Regulations

The PPS, 2014, described in Section 2.5 of this Report, also outlines policies for managing development within, or adjacent to, natural hazard-prone lands. These policies are generally enacted through the *Development, Interference with Wetlands and Alternations to Shorelines and Watercourses* regulations, administered by Conservation Authorities.

Portions of the subject lands are located within the NPCA Regulation limit. The NPCA administers *Ontario Regulation 155/06: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*. Through this regulation, NPCA has the ability to:

- Prohibit, regulate or require the permission of the authority for straightening, changing, diverting or interfering in any way with the existing channel of a river, creek, stream or watercourse, or for changing or interfering in any way with a wetland; and
- Prohibit, regulate or require the permission of the authority for development, if in the opinion of the authority, the control of flooding, erosion, dynamic beaches or pollution or the conservation of land may be affected by the development.

The proposed development would require a permit application under Ontario Regulation 155/06. NPCA will assess the application in order to determine if the proposed works will be affected by the above, in accordance with their programs and policies.

The EIS will provide recommendations to ensure that regulated features found within the subject lands are not negatively impacted and, where applicable, will recommend habitat enhancement. The other objectives, as they apply to this development, will be addressed by the Functional Servicing Report (FSR).

Within the Policies, Procedures and Guidelines for the Administration of Ontario Regulation 155/06 and Land Use Planning Policy document (NPCA, 2011) setback requirements for Fish Habitat are described. There are three types of fish habitat; Type 1, Type 2 and Type 3. Type 1 Fish Habitat is defined as fish habitat which have a high productive capacity, are rare, highly sensitive to development or have a critical role in sustaining fisheries (e.g., spawning and nursery habitat, groundwater discharge area). Type 2 Fish Habitat is fish habitat which is moderately sensitive to development and although important to the fish population, they are not considered critical (e.g., feeding area, open water habitats of lakes). Type 3 Fish Habitat is fish habitat that has a low productive capacity or are highly degraded and do not currently contribute directly to fish productivity. They often have the potential to be improved significantly.

2.8 Official Plans

Niagara Region Official Plan (2014)

The Niagara Region Official Plan (NROP), also referred to as the *Regional Official Plan – August 2014* is the long-range planning document that is used to guide the physical, economic and social development of the Regional Municipality of Niagara. The Regional Official Plan implements the Niagara Region Growth Management Strategy (Niagara 2031) and its content supports the Provincial Growth Plan for the Great Golden Horseshoe, the PPS and the Greenbelt Plan.

All lands within the project boundary are designated in Schedule C of the NROP as Urban Area. The Study Area features two creeks (the Conrail Drainage Channel and an unnamed tributary of the Welland River) and is adjacent to multiple areas designated as Environmental Conservation Areas (ECA); the majority of these ECA areas are designated as the Niagara Falls Slough Forest Complex PSW. There is also a section of PSW within the Study Area boundaries associated with this PSW complex that is not mapped on the NROP. The plan considers identified PSWs to be part of their Environmental Protection Areas (EPA), so confirmation of whether these areas should be considered ECA or EPA requires confirmation of the Region.

Table 7.1 of the NROP indicates that developments are not permitted within PSW areas, and EIS studies are required for developments within 120 m of identified PSWs. Projects that involve works within adjacent lands must prepare an EIS in accordance with NROP policies 7.B.2.1 through 7.B.2.5. Additionally, all-natural areas within the Study Area should be assessed for significance through criteria outlined in 7.B.1.5 and 7.B.1.8.

Amendment 187 of the OP for the Niagara Planning Area addresses Environmental Policies in Section 7 of the OP and is important for this project as it refers to Significant Woodlands and both their designation criteria and their recommended protection. Should areas of the Study Area be determined to be Significant Woodlands based on the criteria outlined in the amendment, the applicable policies will be discussed, and recommendations will be provided herein.

EIS documents are to be prepared to the satisfaction of Environmental Impact Study Guidelines as adopted by the Regional Council (Niagara Region, 2012).

City of Niagara Falls Official Plan (2017)

The Niagara Falls Official Plan (NFOP) outlines the long-term trajectory for the growth and development of the City of Niagara Falls (Niagara Falls, 2017). Schedule A (Future Land Use) identifies most lands within the project boundary as “Open Space”, though sections of land northwest of the Canadian Pacific Railway (CPR) line that bisects the area are designated as “Residential”.

According to Section 12.3 of the NFOP:

> *Where land designated Open Space is the subject of a proposed development, Council will ensure that the lands be developed in a*

> *manner complementing the open space character of the land and preserving the natural environment.*

These Open Space areas are also part of Special Policy Area #39 (SPA39) as shown on Schedule A and as defined within Section 13.39 of the NFOP. This section defines the requirements and concessions involved in developing the area into a golf course and associated amenities. It maintains that Open Space land use policies continue to apply to the area.

Residential lands are predominantly set aside for dwelling units of all types as defined within Part 2, Section 1 of the NFOP. The residential lands are also part of Special Policy Area #56 (SPA56). As per Section 13.56, development within this area is to occur in accordance with a secondary plan to be adopted as an amendment to the NFOP, and no development or site alteration is allowed in areas designated as Environmental Protection Area (EPA).

Schedule A-1 (Natural Heritage Features and Adjacent Lands) defines portions of the landscape as “Adjacent Land” and “Wetland Buffer Areas” due to the proximity of nearby treed areas identified as part of the Niagara Falls Slough Forest Wetland Complex PSW. It should be noted that the majority of subject lands that fall within Special Policy Area #56 have been reevaluated as PSW as well during the updated delineation of the complex undertaken by Dougan and Associates in the Thundering Waters Secondary Plan (Dougan & Associates, 2016).

According to Section 11.2.13:

> *The EPA designation shall apply to Provincially Significant Wetlands, NPCA regulated wetlands greater than 2 ha in size, Provincially Significant Life ANSIs, significant habitat of threatened and endangered species, floodways and erosion hazard areas and environmentally sensitive areas.*

Development within areas designated as PSW are not permitted by the NFOP, and a minimum vegetated buffer of at least 30 m is required as stated in Section 11.2.16. Section 14.2.4 dates that an Environmental Impact Study (EIS) is required for any development proposals located on or adjacent to:

> *lands containing natural heritage features; lands within 120 m of a Provincially Significant Wetland or a wetland regulated by the NPCA which is greater than 2 ha; 50 m of a Significant Habitat of a Threatened or Endangered Species, a Provincially Significant Life Science ANSI or any lands designated as Environmental Conservation Area within the Plan; or 30 m of a fish habitat, flood/erosion hazard, or a Wetland regulated by the NPCA and less than 2 ha in size.*

3.0 Environmental Screening

A comprehensive desktop assessment was completed to compile and review existing natural heritage information available for the Study Area. All areas within 120 m of the subject lands were reviewed as part of the high-level assessment in order to identify significant natural heritage features located within or directly adjacent to the subject lands that may be impacted by the proposed works. Information acquired through this screening process was used to help guide field efforts and evaluate the significance of on-site observations. Information was reviewed from the following sources:

- Aerial photographic imaging from Google Earth and 1:10,000 Ontario Base Mapping (OBM);
- Ontario Hydrology Network (OHN) mapping;
- MNRF Natural Heritage Information Centre (NHIC) database for significant species and designated natural features within 120 m of the subject lands;
- MNRF Land Information Ontario (LIO) database;
- Natural heritage data including SAR records, wetland evaluations and records, ANSI evaluations and records, Significant Wildlife Habitat (SWH), aquatic data (e.g., fish sampling stations and records, watercourse thermal regimes, recommended in-water works timing windows, SAR) from the MNRF Vineland reporting office received on May 9, 2018;
- Natural heritage data, including SAR records, natural heritage policy areas, aquatic data from the NPCA online explorer;
- NPCA regulated features, mapping and formation;
- Niagara Region Official Plan (2014) and City of Niagara Falls Official Plan (2017) mapping for presence of Environmental Protection Areas (ESAs), Environmental Conservation Areas (ECA) and other areas with environmental considerations;
- Amendment 187 to the Official Plan for the Niagara Planning Area as approved by the Ontario Municipal Board, April 16, 2008;
- DFO Aquatic SAR Distribution and Critical Habitat mapping (2018);
- Atlas of Breeding Birds of Ontario (2001-2005); and
- Ontario Reptile and Amphibian Atlas (2018).

3.1 Natural Heritage Information Centre

The NHIC collects, reviews, manages and distributes information for species of conservation concern, rare and exemplary plant communities, wildlife concentration areas, and natural areas (MNRF, 2018a). These databases are provided to the public as screening tools for planning and research. The NHIC database was queried on December 1, 2017 for records on, or adjacent to, the Study Area.

The subject lands are contained within six 1 km^2 search areas. The 35 records of significant species, including one “restricted record”, were identified by the NHIC query as potentially being present within 120 m of the subject lands. The search results are

included in the SAR Screening Table for the Study Area in Appendix B - NHIC and in incorporated in Section 4.0 below.

4.0 Existing Conditions

The majority of the Study Area is occupied by the Thundering Waters Golf Course, comprised of greens (18 holes), club house, ponds / water traps, cart tracks and accessory buildings. The rail corridor divides the course into north and south portions. There are undeveloped and naturalizes areas of forest, hardwood swamp, cultural woodlot, hedgerows, cultural meadows / thickets within the grounds and at the limits that were more contiguous before the clearing of lands in 2004 for the construction of the TWGC.

Lands north of the site are mainly residential. The Niagara Falls Slough Forest PSW is found immediately west and southwest of the site, with the Welland River beyond it. The lands south and east of the site are predominantly industrial and the MarineLand amusement park (west of Stanley Avenue).

4.1 Physiography and Soils

The lands on and surrounding the Study Area are located on the Haldimand Clay Plain overlaying a Middle Silurian dolostone bedrock parent layer (Chapman and Putnam, 1984). The Study Area, like much of the Niagara Peninsula south of the Escarpment, is dominated by stratified clay overlying glacial till deposited post-glacially by Lake Warren.

According to Niagara Region Soil Mapping, the local area is a mixture of mainly lacustrine heavy clay and miscellaneous man-modified land units (OMAFRA, 1989). The latter is testament to a history of agricultural practices and railway operations on and around the Study Area.

Anthropogenic activities within the Study Area have modified the local topography and microtopography to be moderately flat/rolling. This contrasts the more natural slough microtopography of remnant forest pockets in the area.

Surface soil sampling was carried out using a Dutch auger and a shovel. The most common soil type was Clay Loam, and mottles were typically found at depths shallower than 30 cm depth. The majority of the Study Area was assessed as having a moisture regime of 6 (very moist) (University of Guelph, 2009).

4.2 Surface Water Conditions

Burnside staff observed several surface water features within the Study Area when completing the ecological field studies. There are six ponds (Ponds A-F) located within the Study Area as well as two watercourses. Ponds A and B are the two northernmost ponds within the Study Area and these ponds are not connected to any other ponds or

watercourses. The ponds are large and used by the golf course for irrigation purposes (OA areas on Figure 2).

The Conrail Drainage Channel flows generally from northeast to southwest within the Study Area. The drain is linear in nature and receives stormwater contributions from upstream developments.

An unnamed intermittent watercourse flows between four ponds (Ponds C-F) within the Study Area. This watercourse flows from northeast to southwest discharging into Pond E. Pond E outlets into a reach of the watercourse which flows generally from north to south out of the study area eventually discharging into the Welland River. It was observed that flows within the unnamed intermittent watercourse are controlled by the invert elevations of the culverts at the outlets of the ponds. This intermittent watercourse lacks diversity in channel bottom depth, substrate and morphology.

4.3 Vegetation Communities and Species

Background Review

Background review for vegetation communities included identifying rare ELC communities within the Niagara Region as listed within Appendix M of the Significant Wildlife Habitat Technical Guide (MNRF, 2015a). A review of rare and SAR plants with records in the Study Area and surrounding lands was also conducted by way of an NHIC review (NHIC, 2018).

Additional SAR plant species were identified through correspondence with MNRF biologists (Appendix C - Correspondences). A comprehensive list of candidate SAR flora was created prior to ELC/vegetation surveys to ensure that these plants were specifically targeted if suitable habitat was encountered.

ELC communities were initially parceled out based on broad vegetative characteristics observed through aerial imagery prior to field studies.

Field Methodology

Vegetation communities were assessed during a three-season vegetation analysis. Community classification followed the Ecological Land Classification system for Ontario, using both the First Approximations (Lee *et al*. 1998) and the 2015 updated draft system (Wester *et al*. 2015) where applicable. This study included a three-season botanical inventory. Fieldwork was completed by Burnside staff through field visits completed on May 14, August 20, and September 18, 2018. All onsite vegetation communities were extensively reviewed for vascular plant species, vegetation community classification, habitat features and functions. A full list of vascular plants identified within the Study Area is included in Appendix D – Vegetation Lists.

Vegetation Communities

Vegetation communities are listed in Table 1 and shown on Figure 2. Detailed descriptions of the communities are provided after the table.

Table 1: ELC Polygons

Polygon #	Polygon Code	Polygon Name
1	MAM2/G142N	Phragmites Mineral Meadow Marsh
2	SWT/G134S	Willow - Gray Dogwood Mineral Thicket Swamp
3	CUT/G112S	Gray Dogwood-European Buckthorn Cultural Thicket/Moist, Fine Gray Dogwood-European Buckhorn Shrub Ecosite
4	CUW/G121oTt	Red Oak Cultural Woodlot/Moist, Fine: Oak Hardwood Forest
5	CUW/G119Tt	Trembling Aspen Cultural Woodlot/Moist, Fine: Aspen – Birch Hardwood Forest
6	SWT/G134S	Gray Dogwood Mineral Thicket Swamp
7	CUH/CUT	Oak – Maple Cultural Hedgerow/European Buckthorn Cultural Thicket
8	CUH/CUT	Oak – Maple Cultural Hedgerow/European Buckthorn Cultural Thicket
9	CUW	Deciduous Cultural Woodlot
10	CUH	Red Oak - Maple Cultural Hedgerow
11	CUM/CUT	Cultural Meadow/Cultural Thicket Complex
12	FOD9-2/G125Tt	Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple - Red Oak Mixed Wood Forest
13	FOD9-1/G124Tt	Fresh – Moist Oak - Sugar Maple Deciduous Forest/Moist, Fine: Maple Hardwood Forest
14	SWD1-2/G132Tt	Bur Oak Mineral Deciduous Swamp/Oak Hardwood Swamp
15	CUW	Trembling Aspen Cultural Woodland
16	CUT/G112S	Cultural Thicket/Moist, Fine: Shrub Thicket
17	CUM	Graminoid-dominated Cultural Meadow
18	CUM/CUT	Cultural Meadow/Cultural Thicket Complex
19	MAS2-9/G153X-N	Forb Mineral Shallow Marsh/Constructed Water Collectors
20	MAS2-9/G153X-N	Forb Mineral Shallow Marsh/Constructed Water Collectors
21	CUH	Oak – Maple Cultural Hedgerow
22	CUH	American Beech Cultural Hedgerow
23	FOD9-2/G125Tt	Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple/Red Oak Mixed Wood Forest
24	CUT/G112S	Gray Dogwood-European Buckthorn Cultural Thicket/Moist, Fine Gray Dogwood-European Buckhorn Shrub Ecosite

Polygon #	Polygon Code	Polygon Name
25	FOD9-2/G125Tt	Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple - Red Oak Mixed Wood Forest
26	SWD1/G132Tt	Red Oak Mineral Slough Forest/Oak Hardwood Swamp

ELC Polygon Descriptions

#1 – MAM2/G142N – Phragmites Mineral Meadow Marsh

This small ecosite along the eastern edge of the Study Area is dominated by *Phragmites australis*. Other common vegetation included sedge species (*Carex intumescens* and *Carex disperma*), Sensitive Fern (*Onoclea sensibilis*) and Fowl Manna Grass (*Glyceria striata*). This meadow marsh was observed to extend eastwards to the adjoining property. The offsite extent of this polygon was not verified due to restricted property access.

#2 – SWT/G134S – Salix – Gray Dogwood Mineral Thicket Swamp

A narrow band of Gray Dogwood (*Cornus racemosa*) and Willow (*Salix* sp.) borders Polygon #1. The groundcover is consistent with that found in the adjacent meadow marsh, though *Phragmites australis* does not persist as the deciduous canopy fills out.

#3 – CUT/G112S – Gray Dogwood – European Buckthorn Cultural Thicket/Moist, Fine Gray Dogwood – European Buckthorn Shrub Ecosite

This polygon appears to have once been a Green Ash (*Fraxinus pennsylvanica*) - dominated woodlot. A high proportion of standing dead ash were found here. With reduced competition for sunlight, European Buckthorn (*Rhamnus cathartica*) is able to thrive here in competition with Gray Dogwood and Hawthorn (*Crataegus* sp.). The understory of this polygon is dominated by Green Ash regeneration, Poison Ivy (*Toxicodendron radicans*), and Multiflora Rose (*Rosa multiflora*).

#4 – CUW/G121oTt – Red Oak Cultural Woodlot/Moist, Fine: Oak Hardwood Forest

The canopy of this woodlot is dominated by Red Oak (*Quercus rubra*), with both Red Maple (*Acer rubrum*) and Shagbark Hickory (*Carya ovata*) being common constituents. Bur Oak (*Quercus macrocarpa*) appears occasionally. Green Ash regeneration is common in the understory, as is Poison Ivy. Dominant shrubs include Gray Dogwood, Hawthorn, and European Buckthorn at the interface with the adjacent fairway.

This treed ecosite was assessed as cultural woodlot (CUW) as opposed to deciduous forest (FOD) according to the ELC First Approximations (Lee *et al*. 1998) because the canopy was determined to include < 60% cover, and evidence of anthropogenic stressors were present (dumping, aggregate, litter). It is also assumed that golf course operations (including the adjacent fairway and irrigation pond/water hazard) result in a

drying effect on the very retentive clayey soil substrate, which exerts a constant influence on ground vegetation composition.

Five small areas of vernal pooling were observed following spring freshet in this ecosite, but these areas were found to be dry before the onset of summer (Figure 2).

#5 – CUW/G119Tt – Trembling Aspen Cultural Woodlot/Moist, Fine: Aspen-Birch Hardwood

This small area represented a transition in canopy composition from Oak dominated to Trembling Aspen (*Populus tremoloides*) dominated. The understory was similar to, but drier than, Polygon #4. No vernal pooling was noted here in the spring.

#6 – SWT/G134S – Gray Dogwood Mineral Thicket Swamp

A small depression on the northeastern corner of the Study Area is dominated with Gray dogwood. Bladder Sedge (*Carex intumescens*) and Sensitive Fern were common groundcover species; however, most of the ground layer is bare. The area is surrounded by Trembling Aspen and occasional Eastern Cottonwood (*Populus deltoides*). This polygon was one of the only areas of the Study Area where soil samples revealed gley (at 5 cm), indicating a permanently elevated water-table.

#7 #8 – CUH/CUT – Oak - Maple Cultural Hedgerow/European Buckthorn Cultural Thicket

These vegetation communities include thin strips of woody vegetation adjacent to roads/drains, paths that separate fairways, or property lines. Red Oak, Bur Oak, Red Maple, Sugar Maple (*Acer saccharum*), and Silver Maple (*Acer saccharinum*) were the dominant canopy species, with occasional occurrences of Trembling Aspen, American Elm (*Ulmus americana*), and Eastern Cottonwood. Dead standing Ash were also occasionally noted. The shrub layer was typically dominated by European Buckthorn, though stands of Staghorn Sumac (*Rhus typhina*) are present as well.

Polygon #8 was assessed from the south, as most of the hedgerow was present on private property. As such, herbaceous ground layer has not been verified in this section.

Areas within Polygon #7 all displayed significant edge effect influences, and as such the ground layer vegetation was typically consistent with open CUM areas within the golf-course; high occurrence of Common Mugwort (*Artemisia vulgaris*), Canada/Tall Goldenrod (*Solidago canadensis/altissima*), New England Aster (*Symphyotrichum novae-angliae*), Creeping Thistle (*Cirsium arvense*), White/Yellow Sweet Clover (*Melilotus albus/officinalis*), and Chicory (*Chicorium intybus*) were noted.

#9 – CUW – Deciduous Cultural Woodlot

These polygons represent small (> 0.15 ha) remnant woodlot patches characterized by high edge-effect influence. Vegetation composition of these areas is variable, but canopies are typically noted as either oak (Red/Bur) or poplar (Trembling Aspen/Eastern Cottonwood) dominated. Shrub layer was often dominated by European Buckthorn. Privet (*Ligustrum vulgare*), Multiflora Rose, Bebb's Willow (*Salix bebbiana*), Black Willow (*Salix nigra*), and Staghorn Sumac were abundant in areas as well.

The ground layer was found to be consistent with open CUM areas of the golf course (see Polygon #11), especially at the margins, with high occurrence of Common Mugwort, Canada/Tall Goldenrod, New England Aster, Creeping Thistle, White/Yellow Sweet Clover, and Chicory. Ground layer of interior areas, if present, were variable. Common species included Garlic Mustard (*Alliaria petiolata*), Poison Ivy, Wild Grape (*Vitis riparia*), and Virginia Creeper (*Parthenocissus quinquefolia*).

#10 – CUH – Red Oak – Maple Cultural Hedgerow

These trees were originally part of a larger woodlot that extended to the northwest; this area was apparently removed and developed in approximately 2011. The remaining feature is a sparse row of mature Red Oak and Sugar Maple trees with discontinuous canopy. Sections that are not manicured turf have understory consistent with other significant edge effect polygons at the north side of the Study Area (See Polygons #7, #8, #9).

#11 – CUM/CUT – Cultural Meadow/Cultural Thicket Complex

These polygons are small waste areas/rough hazards between cart paths and fairways. These areas are mostly open meadow and were found to be dominated in most places by Common Mugwort. Other common species include Chicory, Canada/Tall Goldenrod, New England Aster, Frost Aster (*Symphyotrichum pilosum*), Spotted Knapweed (*Centaurea maculosa*), Common Dandelion (*Taraxacum officinale*), Creeping Thistle, Wild Carrot (*Daucus carota*), Common Hawkweed (*Hieracium lachenalii*), Poison Ivy, and Red/White/Alsike clover (*Trifolium pratense/repens/hybridum*). Some small sections were dominated by *Phragmites australis*, while some others formed small thickets of Staghorn Sumac. Trees, where present, were mostly young Trembling Aspen.

#12 – FOD9-2/G125Tt – Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple – Red Oak Mixed Wood Forest

This forest area has a canopy co-dominated by Red Maple and Red Oak. Other common tree species include American Beech (*Fagus grandifolia*), Shagbark Hickory, Sugar Maple, and Bur Oak. The understory was dominated by maple/Green Ash regeneration. Common shrubs include Gray Dogwood, Wild Grape, and climbing Poison Ivy. Common herbs include Garlic Mustard, Poison Ivy, Yellow Trout Lily (*Erythronium*

americanum), Canada Mayflower (*Maianthemum canadense*), Wild Strawberry (*Fragaria vesca*), and Panicled Aster (*Symphyotrichum lanceolatum*).

Approximately 10% of this ecosite was found to experience vernal flooding following spring freshet. These vernal systems were dominated by Sedges, commonly Bladder Sedge and Fringed Sedge (*Carex crinita*), Spotted Jewelweed (*Impatiens capensis*), and Sensitive Fern.

#13 – FOD9-1/G124Tt – Fresh – Moist Oak – Sugar Maple Deciduous Forest/Moist, Fine: Maple Hardwood Forest.

The northern section of this linear woodlot appears to be drier than the southern portion (ELC polygons #13, #14 on Figure 2). It was also noted that the feature is encroached at the centre by a large and steep aggregate pile, which appears to have heavily degraded the integrity of the central portion (ELC polygon #15 on Figure 2).

The upper canopy of these communities is dominated by Sugar Maple, with high amounts of Red Maple. Other common/occasional canopy species include Red Oak, American Basswood (*Tilia americana*), Shagbark Hickory, Eastern Cottonwood, and Silver/Freeman's Maple (*Acer rubrum x saccharinum*). Trembling Aspen contributions to the canopy are much more pronounced within the segment north of Polygon #15. This section also has a higher proportion of open area species (European Buckthorn and Canada/Tall Goldenrod).

Understory shrubs include a high frequency of Gray dogwood, Virginia creeper, and Wild grape. Other species noted as occasional are Spicebush (*Lindera benzoin*), Choke cherry (*Prunus virginiana*), Wild Red Currant (*Ribes triste*), and Blackberry (*Rubus occidentalis*). Ground vegetation was dominated with Poison Ivy, and Garlic Mustard, Yellow Trout Lily, Enchanter's Nightshade (*Circaea lutetiana*), and Wild Strawberry were commonly found as well.

Vernal depressions were dominated by Sedges (Two-seeded/Bladder sedge), Sensitive Fern, and Fowl Manna Grass.

#14 – SWD1-2/G132Tt – Bur Oak Mineral Deciduous Swamp/Oak Hardwood Swamp

A slough-type microtopography is evident in this polygon, with upland and lowland habitats in close proximity to each other. The canopy in this swamp ecosite is dominated by Bur Oak and Red Oak, with high occurrence of Red/Silver/Freeman's Maple. Sugar Maple is less common but occasionally present. Other less common tree species include American Beech, Blue Beech (*Carpinus caroliniana*), Shagbark Hickory, Black Cherry (*Prunus serotina*), Ironwood (*Ostrya virginiana*), and American Elm.

The shrub layer is dominated by Gray Dogwood, with Hawthorn sp., Red-osier Dogwood (*Cornus sericea*), Blackberry, Multiflora Rose, and European Buckthorn (at the margins) present as well.

Ground layer was variable due to sloughy microtopography. Dry areas dominated by Canada/Tall Goldenrod were noted beside troughs dominated by Spotted Jewelweed and Northern Water-plantain (*Alisma triviale*). Poison Ivy is abundant within this polygon. Species common to drier areas include Wild Strawberry, Common Dandelion, Enchanter's Nightshade, Jumpseed (*Persicaria virginiana*), Field Horsetail (*Equisetum arvense*), Canada/Tall Goldenrod, and Panicled Aster. Wetter areas were typically dominated by Sedges (Brownish sedge - *Carex brunnescens*; Bladder sedge; Bebb's sedge – *Carex bebbiana*; Fringed sedge, Brown fox sedge – *Carex vulpinoidea*), Fowl Manna Grass, Spotted Jewelweed, Jack-in-the-pulpit (*Arisaema triphyllum*) and Ricecut Grass (*Leersia oryzoides*).

#15 – CUW – Trembling Aspen Cultural Woodlot

This feature is on top of a mound of deposited fill tapering to steep, poorly consolidated slopes. Historical air photos (2002) indicate that this area was previously cleared and used by rail operations. The canopy is dominated almost exclusively by young Trembling Aspen, indicating an early successional community. The substrate is sandy and dry; as such a number of species from the meadow to the south were noted to be present here. The margins of this community are influenced by adjacent vegetation assemblies to the north and south.

#16 - CUT/G112S – Cultural Thicket/Moist, Fine: Shrub

The canopy composition of this ecosite is variable in this polygon. Staghorn Sumac thickets are in patches, but most areas are consistently dominated by either European Buckthorn or Gray Dogwood. Very young Trembling Aspen and Green Ash regeneration are also common. Several mature Eastern Cottonwood occur along the interface between this ecosite and Polygon #14 to the north.

Ground vegetation is dominated by Canada/Tall Goldenrod or Common Mugwort. Kentucky Bluegrass (*Poa pratensis*), Quackgrass (*Elymus repens*), Bird's-foot Trefoil (*Lotus corniculatus*), Yellow/White Sweet Clover, Spotted Knapweed, Red/White/Alsike Clover, Creeping Thistle, Green Foxtail (*Seteria virdis*), New England Aster, Late-flowering Thoroughwort (*Eupatorium serotinum*), Reed Canary Grass (*Phalaris arundinacea*), and Frost Aster also appear with high frequency. Small patches of this polygon, especially along the margins of treed ecosites to the north, are dominated by *Phragmites australis*.

#17 – CUM – Graminoid-dominated Cultural Meadow

Originally planned as a driving range, this previous cleared area has succeeded to an old-field meadow. It is possible that the area is tile drained; an outlet culvert was observed along the path adjacent to the Conrail Drainage Channel to the north.

No trees were observed here, and Virginia Creeper/Wild Grape only appear at the margins associated with a chain-link fence to the south. Ground vegetation is variable, but dominated by grass species (Quackgrass, Kentucky bluegrass, Reed Canary Grass, Meadow Fescue (*Festuca pratensis*). Other common species in this ecosite include Wild Carrot, Cow Vetch (*Viccia cracca*), White/Yellow Sweet Clover, Red/White/Alsike Clover, Bird's-foot Trefoil, Philadelphia Fleabane (*Erigeron philadelphicus*), Creeping Thistle, Canada/Tall Goldenrod, and Common Mugwort.

#18 – CUT/CUM – Cultural Meadow – Cultural Thicket Complex

The composition of these areas is very similar to the open areas described for Polygon #11, but with a slightly higher proportion of shrub, and some observed thicket areas. Scattered small stands of Trembling Aspen and Eastern Cottonwood are present, and some Cottonwood saplings were noted, but overall there very sparse tree cover.

Common shrubs include Staghorn Sumac, Bebb's Willow, Sandbar Willow (*Salix exigua*), and Black Willow. Staghorn Sumac, when present, forms dense thickets.

Ground-layer species composition is similar to that described in Polygon #11. Common Mugwort was the most frequently documented species and formed dense colonies throughout many of the open areas on the course. Canada/Tall Goldenrod, Kentucky Bluegrass, Reed Canary Grass, Quackgrass, Fescue sp., and *Phragmites australis* dominated areas of these polygons as well.

#19 – MAS2-9/G153X-N – Forb Mineral Shallow Marsh/Constructed Water Collectors

The unnamed intermittent channel segments south of the railroad displayed characteristics of mineral shallow marsh ecosites. Common species include Broad-leaved Cattail (*Typha latifolia*), Narrow-leaved Cattail (*Typha angustifolia*), Floating Arrowhead (*Sagittaria cuneata*), Northern Water-plantain, and Duckweed Sp.

Consistent with most constructed channels, the transition between aquatic and upland communities was narrow, with Polygon #18 vegetation extending to the water's edge in most cases.

#20 – MAS2-9/G153X-N – Forb Mineral Shallow Marsh/Constructed Water Collectors

The Conrail Drainage Channel is a riprap-lined linear feature that flows northeast to southwest through the middle of the Study Area. The channel bed and, in some cases, the upper bank were vegetated, though the riprap areas have sparse vegetation. Common shrubs include Black Willow and Multiflora Rose. Herbaceous vegetation was variable, but included Narrow-leaved and Broad-leaved cattail, Common Milkweed (*Asclepias syriaca*), Spotted Jewelweed, Purple Loosestrife (*Lythrum salicaria*), Northern Water-plantain, Common Water Smartweed (*Persicaria amphibia*), Soft-stemmed Bulrush (*Schoenoplectus tabernaemontani*), and Wild Mint (*Mentha canadensis*). Some patches were completely dominated by *Phragmites australis*.

#21 – CUH – Oak – Maple Cultural Hedgerow

This feature includes a narrow band of remnant woodlot along the southeastern edge of the Study Area. It is separated from the adjacent forest along the property line by a fence and what appears to be an old access road to the south.

Silver Maple dominates the canopy to the east and Red Oak to the west. Other common tree species include American Beech, Green Ash, Red Maple, and Bur Oak. Gray Dogwood is the dominant species in the shrub layer. Other common shrubs include Privet, Choke cherry, Spicebush, European buckthorn, Hawthorn sp., Buttonbush (*Cephalanthus occidentalis*), Speckled Alder (*Alnus incana*), Virginia Creeper, and Wild Grape.

Large mature oaks at the margin of these areas have been incorporated in the adjacent fairway and are surrounded by manicured turf.

#22 – CUH – American Beech Cultural Hedgerow

Polygon #22 is a narrow band of remnant woodlot along the southwestern edge of the Study Area. It is bordered to the south by a fence and Ramsey Road beyond. The canopy is dominated by American Beech. Other common canopy species include Red Oak, Shagbark Hickory, Red Maple, and Green Ash. The shrub layer is dominated by Gray Dogwood, with Wild Grape, Virginia Creeper, Privet, and Eastern Buckthorn also common. Understory is dominated by Poison Ivy, though patches of *Phragmites australis* monoculture areas were also noted. Canada/Tall Goldenrod, Garlic Mustard, Creeping Thistle, Wild Strawberry, Enchanter's Nightshade, and Panicled Aster are also common.

#23 – FOD9-2/G125Tt – Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple – Red Oak Mixed Wood Forest

The canopy of this deciduous forest polygon was dominated by Red Oak, but commonly includes Sugar Maple, Red Maple, and Bur Oak. Other common/occasional canopy

trees include Shagbark Hickory, Green Ash (including abundant regeneration), American Basswood, and Trembling Aspen. The shrub layer is dominated by Gray Dogwood and Red-osier Dogwood, with European Buckthorn, Privet, Virginia Creeper, Wild Grape, and climbing Poison Ivy also common. The herbaceous layer was predominantly composed of Poison Ivy, with Common Dandelion, Garlic Mustard, Wild Strawberry, Yellow Trout Lily, Enchanter's Nightshade, and Spinulous Wood Fern (*Dryopteris carthusiana*) also commonly found. The narrowest sections of this forest show evidence of degradation due to edge effect (i.e. weed invasion).

This area was documented with approximately 10-15% coverage by vernal pools in the spring season.

#24 - CUT/G112S – Gray Dogwood – European Buckthorn Cultural Thicket/Moist, Fine: Gray Dogwood – European Buckthorn Shrub

This area was dominated by Gray Dogwood and European Buckthorn, and commonly includes Hawthorn sp. Green Ash regeneration was also frequently observed at the ground layer. Sections along the margin of this polygon are dominated by *Phragmites australis*.

Ground layer was consistent with Polygon #23, but transitions from a tree-dominated FOD9-2 to a moist cultural thicket.

#25 – FOD9-2/G125Tt – Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple – Red Oak Mixed Wood Forest

This ecosite is dominated by mature Red Oak, with Red Maple, Sugar Maple, Silver Maple associates. Occasional Bur Oak, with Shagbark Hickory, Green Ash, Trembling Aspen, and White Elm making up the majority of subcanopy composition.

Gray dogwood dominated the shrub layer, which also commonly includes European Buckthorn, Choke Cherry, Bebb's Willow, Virginia Creeper, Wild Grape, and climbing Poison Ivy. Poison Ivy also dominated the ground layer, with high occurrence of Garlic Mustard, Jack-in-the-pulpit, Heath Aster (*Symphyotrichium ericodes*), Rough-stemmed Goldenrod (*Solidago rugosa*), Wild Strawberry, Yellow Trout Lily, Enchanter's Nightshade, Coltsfoot (*Tussilago farfara*), and Canada/Tall Goldenrod. Similar to Polygon #23, the narrower areas of this forest are heavily influenced by edge effects.

It was found that less than 5% cover of this polygon by vernal pools following the spring freshet in 2018 (Figure 2).

#26 – SWD1/G132Tt – Red Oak Mineral Slough Forest/Oak Hardwood Swamp

This swamp features a Red Oak dominated canopy, with occasional representation of Red Maple, Silver Maple, and Bur Oak. Sub-canopy is dominated by Red Oak, with associates of Green Ash, Red Maple, and Shagbark Hickory. The understory is

dominated by immature Shagbark Hickory, Green Ash regeneration and Gray Dogwood and European Buckthorn. Hawthorn sp., Wild Grape, Virginia Creeper, Spicebush, Multiflora Rose, Speckled Alder, and Red Raspberry (*Rubus idaeus*) are also abundant.

Poison Ivy dominated most areas of the ground layer that were not within areas of standing water. Common species within vernal/low-lying areas include Spotted Jewelweed, Spotted Water Hemlock (*Cicuta maculata*), Canada Rush (*Juncus canadensis*), Fowl Manna grass, 3-Seeded Sedge, Sensitive Fern, and Bladder Sedge. Other common species include Jack-in-the-pulpit, Garlic Mustard, Wild Strawberry, Yellow Trout Lily, Spinulose Wood Fern, and Enchanter's nightshade.

This ecosite was noted as exhibiting the highest proportion of vernal pools following spring freshet with the exception of Polygon #14 (the southern portion of the PSW). It is estimated that up to 50% of the ecosite was flooded in the spring.

4.4 Fish and Fish Habitat

Aquatic habitat background, methodologies, and findings can be found within the Aquatic Habitat and Fisheries Assessment (Appendix E – Aquatic Assessment Report).

Background Review

Burnside Aquatic Ecology staff completed a background information review and desktop assessment of the Study Area. The following sources of data were reviewed as part of this desktop review:

- Niagara Peninsula Conservation Authority (NPCA) Watershed Explorer (2017), Pre-Consultation Meeting with NPCA Ecologist (December 7, 2017);
- Savanta Inc, Riverfront Community Official Plan Amendment (OPA), Environmental Impact Study (EIS), Niagara Falls Ontario (2017);
- Department of Fisheries and Oceans (DFO) Canada Species at Risk (SAR) mapping (2017);
- Natural Heritage Information Centre (NHIC) (2018);
- Ministry of Natural Resources and Forestry (MNRF) Aquatic Resource Area (ARA) mapping (2015);
- Aerial Orthophotography;
- Ministry of Agriculture, Food, and Rural Affairs Mapping (OMAFRA) (2018);
- Aerial orthophotography (2015);
- Lower Welland River and South Niagara Falls Watershed Report Card (2012);
- Lower Welland River Study Area Characterization Report (2011); and
- Dougan and Associates Ecological Consulting and Design and C. Portt and Associates, Thundering Waters Secondary Plan Characterization and Environmental Impact Study (2016).

In addition to the Conrail Drainage Channel, there are also numerous ponds (irrigation/water features) and a meandering drain-like watercourse (unnamed

intermittent watercourse) flowing through the golf course property which is connected to four of the ponds (refer to Figure 3 for pond and watercourse locations). On NPCA Watershed mapping, the meandering watercourse within the golf course property is mapped as intermittent with connectivity to the downstream watercourse which flows beneath Dorchester Road, west of Kister Road (Figure 3). Our field studies did not indicate that the watercourses in the Study Area receives flow from any agricultural drains based on the review of the 2017 OMAFRA Mapping.

A review of the 2017 DFO SAR mapping identified aquatic SAR as potentially inhabiting the Conrail Drainage Channel and the downstream reaches of the intermittent watercourse to the southwest of the Study Area. The aquatic SAR include 2 mussel species: Round hickorynut *(Obovaria subrotunda)* and Kidneyshell *(Ptychobranchus fasciolaris),* and 2 fish species: Grass pickerel *(Esox americanus vermiculatus)* and Spotted sucker (*Minytrema melanops*). A review of the NHIC mapping indicates that Eastern pond mussel *(Ligumia nasuta)* and Round hickorynut have also been historically observed within the Study Area 1988 and 1931, respectively.

There is no MNRF ARA summary data for the thermal regime or fish species which potentially inhabit the Conrail Drainage Channel or the thermal regime of any watercourse or pond within the Study Area. The Conrail Drainage Channel is not ecologically connected with any upstream features, indicating that it receives storm water contribution and surface runoff only. A review of historical aerial orthophotography shows that the land use has changed within the Study Area in recent history. Between 2002 and 2004 the construction of the golf course began and, by 2006, the current golf course was in place. Prior to the construction of the golf course in 2002, the on-site ponds were not present, and it is not clear if the watercourse that flows between these manmade ponds was in place or not, although it has been modified to accommodate the current land use as a golf course.

A review of NPCA mapping indicated that the watercourse is located mostly within the Lower Welland River Subwatershed. The Niagara Falls Slough Forest Wetland complex is present within this subwatershed southwest of the Study Area. Perched culverts have been identified as barriers to fish movement within the Lower Welland Subwatershed. Surface water quality, assessed through phosphorus and *E. coli* concentrations, was given an overall grade of D, which indicates “poor” water quality in the subwatershed (NPCA, 2012).

On December 7, 2017, Burnside’s ecologists, representatives of the owner and the NPCA Ecologist (Lee-Anne Hamilton) had a meeting to discuss Study Area conditions and aquatic and terrestrial background information regarding the Thundering Waters Golf Course. The NPCA has conducted aquatic surveys within the Conrail Drainage Channel and agreed that it was a stormwater management feature and typically dries up in the summer. The NPCA agreed that the potential for aquatic SAR to exist within the Conrail Drainage Channel was not likely due to limited suitable substrate, seasonal conditions and water quality.

The Lower Welland River Study Area Characterization Report states that the Conrail Drainage Channel and the northeast to southwest flowing unnamed intermittent watercourse are unclassified with no data pertaining to the habitat type. Downstream, the Welland River contains Type 1 and Type 2 habitat. Type 1 habitat is the most sensitive habitat, containing spawning and rearing locations and requires the most protection. Type 2 is less sensitive than Type 1, requiring less protection.

Review of 2016 Secondary Plan for Thundering Waters - Characterization Report and Environmental Impact Study

Dougan and Associates Ecological Consulting and Design (D&A) and C. Portt and Associates (CPA) completed an EIS for the lands commonly known as Thundering Waters in 2016. These lands do not include the current Study Area of the proposed Niagara Village development. The EIS included background information review and field sampling of the aquatic resources in the Conrail Drainage Channel and other watercourses associated with the Thundering Waters Golf Course. The EIS states that MNRF did not have any information pertaining to fish community assemblage of the Conrail Drainage Channel or other surface water features and that Study Area investigations should be completed to determine fish access to the Conrail Drainage Channel and whether Northern pike (*Esox lucius*) utilize the wetlands near the Welland River for spawning. D&A and CPA sampled two watercourses that are also associated with the Thundering Waters Golf Course. These watercourses are identified as Watercourse 2 (the watercourse that connects to the ponds in the golf course) and Watercourse 3 (the Conrail Drainage Channel) in the EIS.

Northern pike were not observed spawning or inhabiting any watercourses associated with the Study Area including the Conrail Drainage Channel. Surveys included visual observation of spawning habitat in the spring and electrofishing in the fall. “Young of the Year” (YOY) Northern pike were not observed during the fall electrofishing. No other species of fish were observed spawning in the Conrail Drainage Channel or in Watercourse 2. The EIS states that there are thick, failing gabion baskets in the lower reaches of the Conrail Drainage Channel as well as a steep bottom slope and thick rooted vegetation which prevents the movement of larger bodied fish from the Power Canal into the Conrail Drainage Channel. These conditions would only allow the passage of fish under the highest flows and Brook stickleback were the only fish sampled during electrofishing surveys in the Conrail Drainage Channel.

D&A and CPA did not capture any fish species in June 2015 in Watercourse 2. In October D&A aquatic ecology staff sampled 18 YOY White sucker, 7 juvenile Largemouth bass, 1 adult Central mudminnow, 1 juvenile Brown bullhead, 1 adult Bluntnose minnow and 2 adult Golden shiners. In June 2015 they electrofished the Conrail Drainage Channel as well and observed 5 Brook stickleback. D&A and CPA did not electrofish the Conrail Drainage Channel in the October 2015 sampling window.

D&A and CPA concluded that Watercourse 2 is capable of providing fish habitat, though they state that it is relatively simple and unproductive. Watercourse 2 is a permanent and natural watercourse which occurs within a small valley feature. Watercourse 3, the Conrail Drainage Channel, is an artificial watercourse through which large bodied fish cannot pass. It is relatively unproductive and does not provide spawning habitat.

Field Methodology

Fieldwork was completed by Burnside staff on the dates specified in the table below (Table 2). Burnside Aquatic Ecologists visited the Study Area on October 5 and November 21, 2017. The watercourses and ponds were assessed within the Study Area for form, function and fish habitat. During the Study Area visits the ponds, the unnamed intermittent watercourse flowing between them, and the Conrail Drainage Channel all contained water. The weather during the October and November Study Area visits was sunny with no precipitation.

Burnside Aquatic Ecologists also visited the Study Area on April 23, 25, and 26, 2018 and completed an aquatic habitat assessment of the ponds and watercourses within the Study Area on April 26. The ponds were inspected for fish habitat, form and function. The characterization of watercourse channel morphology is generally based on the *MTO Environmental Guide for Fish and Fish Habitat* (MTO, 2009). The nearshore aquatic environment was assessed from the banks of the ponds and watercourses. Pond lengths and widths were measured using a laser range finder. Please refer to Figure 3 for locations of ponds and watercourses. Please refer to Appendix E – Aquatic Assessment Report for the data sheets completed during the aquatic habitat assessment.

Site-specific fish community inventory sampling was conducted in April and July of 2018. Burnside Aquatic Ecology staff set 10 minnow traps (G-traps) in in the watercourses and ponds at various depths in the Study Area on April 25, returning on April 26 to identify and enumerate the fish species captured. Burnside also used a 0.5-inch mesh size seine net to sample the unnamed intermittent watercourse downstream of a barrier to fish movement on April 25th, 2018 (see Figure 4). On July 16, 2018 Burnside completed seine net sampling of ponds B, D and the smaller section of Pond A. Multiple sweeps in different locations of each pond were completed as part of the sampling conducted on July 16, 2018.

Table 2: Summary of Fish and Fish Habitat Surveys

Date	Observer(s)	Time of Day (Start/End) (24 hour)	Weather Conditions	Additional Notes
October 5, 2017	Chris Pfohl	1000 - 1400	Sunny with no precipitation	
November 21, 2017	Chris Pfohl, Devin Soeting	1030-1400	Sunny with no precipitation	
April 23, 2018	Matthew Moote	0900-1500	Sunny, no precipitation	
April 25, 2018	Matthew Moote, Chris Pfohl	0900-1400	Rain and cloud	Seasonally cool (12°C), 8mm of rain in previous 24 hours.
April 26, 2018	Matthew Moote, Chris Pfohl	0900-1400	Sun-cloud mix	Seasonally cool (10°C)
July 16, 2018	Matthew Moote, Chris Pfohl	0800-1530	Sunny	Warm and humid (30°C)

Findings

October 2017 Aquatic Habitat Assessment

During the October 5th Study Area visit, the bottom of the banks of the Conrail Drainage Channel were densely vegetated with forbs, grasses and shrubs (Photo 1 from Appendix E – Aquatic Assessment Report). The density of this vegetation potentially restricts flows and movement of fish during periods of low flow. The slope of the banks and the base of the channel were hardened with angular stone/rip rap (Photo 1 and 2). Riparian trees were intermittently present along the banks of the Conrail Drainage Channel through the Study Area. The wetted width and depth of the Conrail Drainage Channel was assessed as 1.0 and 0.2 m respectively. The water was very turbid during the October Study Area visit (Photo 2) from a previous thunderstorm and heavy rain event. The Conrail Drainage Channel was flowing at a very low velocity and was laminar throughout the assessed length. Artificial hardening was present in large stretches of the watercourse through the assessed length in the form of armor stone retaining walls, angular stone/rip rap and gabion baskets (Photo 1). A large pipe arch culvert (CSP) was also present near the western edge of the Study Area within the Conrail Drainage Channel (Photo 2). Where visible, the substrate was comprised of silt, muck and some organic material in the form of fallen leaves and grasses. Angular stone (rip rap) was present within the base of the watercourse which confirms that it is not a natural channel and was constructed to support stormwater management and drainage (i.e., Conrail Drainage Channel).

Burnside staff did not enter the ponds but made visual observations from the shorelines. The ponds were large and very turbid during the October Study Area visit (Photo 3). Some of the ponds are connected by an unnamed intermittent watercourse which receives flows from the ponds when the water levels are high enough to allow overflow into the channel. Within the watercourse/drainage feature there was floating vegetation (duckweed) present as well as submerged and emergent vegetation (Photo 4). There was some shading of this intermittent watercourse provided by mature riparian trees and the banks were vegetated with forbs, shrubs and grasses. The intermittent watercourse appeared to be stagnant and there was no discernible flow velocity during the survey. It appeared that the intermittent watercourse was designed to accept under drainage from irrigation tile and overflow from ponds that are connected.

November 2017 Aquatic Habitat Assessment

During the November 21st aquatic habitat assessment, Burnside aquatic staff assessed the Conrail Drainage Channel, golf course ponds (Ponds A to F) and the intermittent watercourse south of the Study Area. Weather conditions during this habitat assessment were clear with no precipitation.

Burnside assessed the Conrail Drainage Channel further upstream near John Daly Way to determine existing aquatic conditions and look for indications of aquatic life (remnant mussel shells and fish). The Conrail Drainage Channel flowed through a concrete siphon culvert (barrier to fish movement) with a metal safety grate at the inlet and outlet upstream of the golf course property, beneath John Daly Way (Photos 5 and 6). Upstream of the culvert a concrete/rip rap barrier was also noted by Burnside staff. Upstream and downstream of this culvert the Conrail Drainage Channel was moderately vegetated with shrubs, grasses and reeds (Photo 7 and 8). The banks were not well vegetated and hardened with artificial materials (riprap angular stone). Downstream of this concrete culvert the watercourse flows through the channel and appeared intermittent with several portions of the Conrail Drainage Channel not containing water (water was flowing under the rip rap stone). A few deeper scour pools were present through the assessed length of the watercourse downstream, although most of the morphology consisted of flats and runs. The banks had a steep grade as well and the slope was not vegetated (lined with rip rap). The substrate was more visible during the November habitat assessment and consisted of fine-grained material and organic matter underlain with riprap in slow sections with angular stone visible in faster sections (Photo 9 and 10). Large angular stone was present within the base of the watercourse and a significant impassable concrete barrier was located upstream of the siphon culvert. It was also apparent during the November Study Area visits that there were several corrugated steel pipe outlets with grates on them which convey underground drainage to the Conrail Drainage Channel.

The ponds and the unnamed intermittent watercourse that flows between them were very turbid during the habitat assessment (Photo 11-14). Outlet culvert inverts at the ponds are set at an elevation to retain water levels in the ponds for irrigation and as

water features for the golf course play area. The water elevation in the ponds was at a level that conveyed limited water flow through the CSP culverts into the watercourse. Some ponds were partially vegetated along the banks although where it meets the golf course fairway or play area, manicured grass was cut to the edge of the pond. Filamentous algae were observed within some locations in the golf course ponds.

Burnside Aquatic Ecology staff assessed the unnamed intermittent watercourse south of the TWGC property which discharges into the Welland River, south of Dorchester Road and West of Kister Road (Photos 15-19). The watercourse discharges to the Welland River at a concrete culvert outlet which was flowing at the time of the habitat assessment. NPCA Watershed Explorer illustrates this intermittent watercourse originating within the Thundering Waters Golf Course.

April 2018 Aquatic Habitat Assessment - Ponds

Pond A is a large off-line pond that is comprised of two separate ponds which are connected to each other but do not connect to the other ponds or the watercourse. The larger portion of Pond A (Photo 20) is northwest and downstream of the smaller portion of Pond A. The surface conditions of the larger portion of Pond A were rippled and water colour was yellow-brown at the time of the aquatic habitat assessment. The land surrounding the pond was comprised mostly of golf course fairway with a mature woodlot located on a small section of the south bank. The larger portion of Pond A was measured to be 187 m long and 75 m wide at maximum. The banks of the larger portion of Pond A were very steep (45%) and majority of the surface area of the banks (80%) were vegetated with manicured grasses. The remainder of the banks were vegetated with mature riparian trees and rough hazards associated with the golf course. Cattail species were also present on the banks of the drain. The majority of the sediment in the larger portion of Pond A was comprised of silt with detritus and organics present as well.

During the aquatic habitat assessment, the surface conditions in the smaller portion of Pond A were categorized as calm and the water colour was turbid and yellow brown. The majority of the banks of Pond A were vegetated with manicured grasses, however approximately 20% of the bank vegetation was comprised of more rough hazards and mature trees. The land use surrounding Pond A included forested lands and the golf course property. Underwater cover that was visible during the aquatic habitat assessment included fallen logs and trees, organic debris and aquatic macrophytes. The banks were very steep and no littoral zone or aquatic vegetation were present in the pond. The nearshore substrate was comprised of a silty muck and organic debris in the form of fallen leaves. During the aquatic habitat assessment approximately 10% of the surface area of Pond A was covered with floating aquatic macrophytes (Duckweed sp.).

Pond B is a round-shaped pond that is also offline and does not appear to outlet to the unnamed intermittent watercourse which connects most of the ponds within the Study Area. During the aquatic habitat assessment, the surface conditions were calm, and the water colour was clear green in Pond B (Photo 21). The maximum length and width of

Pond B were measured to be 75 m and 45 m respectively. Nearshore slope was measured to range between 10-30%. The banks were determined to be stable. Aquatic macrophytes were not observed within Pond B. The shoreline substrate was comprised of organic debris and manicured grasses and the substrate of the pond was comprised of muck (70%) and detritus (30%). Logs, trees and organic debris were all within the pond representing aquatic habitat. A wetland swamp associated with ELC polygon #26 is present behind the southwest bank of Pond B; it was observed that this pond flows, seasonally, into ELC polygon #26 (Figure 2).

Pond C is a 77m long approximately 10m wide pond located in the east boundary of the Study Area (Photo 22 of Appendix E – Aquatic Assessment Report). During the aquatic habitat assessment Pond C was calm and yellow brown in colour. The land surrounding the pond was comprised of golf course lands and a woodlot. This pond collects runoff from the surrounding lands and is connected to other ponds through the unnamed intermittent watercourse which flows within the Study Area. The substrate of the pond was comprised completely of muck. Bank slope ranged between 15-45% and the shoreline substrate was comprised of organic debris and fallen leaves. The banks were stable and contained some limited stands of Red-osier dogwood. Underwater cover was limited to fallen trees, logs and organic debris. Seasonal barriers to migration were identified within the unnamed intermittent watercourse including the elevated inverts of the culverts and obstructions within the watercourse downstream of the outlet culvert of Pond C. A Muskrat den was located on the east bank in the southern half of Pond C, and 10 Painted turtles were observed basking within Pond C.

Pond D was measured to be 195 m long and 26 m wide at maximum (Photo 23). The land use surrounding Pond D included manicured fairway and mature woodlot associated with ELC polygon #22 (Figure 2). The slope of the shoreline of the pond was severe, and it ranged between 45 and 100%. Shoreline substrate was comprised of muck and organic debris. Within Pond D underwater aquatic habitat was comprised of boulders, logs, trees and organic debris. Emergent and floating aquatic macrophytes were observed in limited locations during the aquatic habitat assessment. Filamentous algae species and bottom stands of aquatic macrophytes (i.e., Chara sp.) were present in the Pond. It was noted that within Pond D there is a discharge outlet that is used to pump water to Pond D from the Welland River, where it then stored and used for irrigation purposes in the Study Area. Burnside noted that Pond D does not receive water from other ponds or the unnamed intermittent watercourses however, it does convey flows to them.

Pond E is connected to ponds C, D and F through the connecting unnamed intermittent watercourse. Pond E is 76 m long and 38 m wide (Photo 24). The unnamed intermittent watercourse flows into Pond E from the north and the east. Pond E outlets into the unnamed intermittent watercourse from a CSP culvert located within the south bank. This flow is then conveyed to Pond F. Another branch of the unnamed intermittent watercourse flows into Pond E, conveying flows from Ponds C and D. Surrounding land uses were comprised of golf course land and a woodlot. The bank slope ranged

between 10-45% and the shoreline substrate was comprised of organic debris. Substrate within Pond E was comprised completely of muck and organic debris. Small stands of Cattail species were present on the banks of Pond E. Some minor unidentified (due to water clarity) submergent aquatic macrophytes were also observed within Pond E. The west bank was steep and densely vegetated with mature trees. The northwest bank was vegetated with manicured grasses and the other banks were vegetated with mature trees and unmanicured rough hazards associated with the adjacent fairways. Underwater cover was comprised of limited boulders, aquatic macrophytes and organic debris.

Pond F is a Y-shaped pond that was measured to be 57 m long and 12 m wide and is connected to the other ponds and the unnamed intermittent watercourse (Photo 25 of Appendix E – Aquatic Assessment Report). The unnamed intermittent watercourse flows into Pond F from Ponds E and G. The watercourse enters Pond F within the northern shoreline. Surface conditions were calm, the water colour was yellow-brown, and clarity was turbid. Flows from Ponds E and D enter Pond F where it then flows into the connecting watercourse which flows south out of the unnamed intermittent watercourse. The banks of Pond F were steep with a slope measured at over 45% and were vegetated with manicured grasses and mature trees with additional rough hazard areas present on the east bank. The shoreline substrate composition ranged from silty-clay to clay-loam with some organic material as well. The substrate of the pond was comprised of silt and muck. Downstream of Pond F within the unnamed intermittent watercourse a barrier to fish movement was present in the form of a concrete and rock barrier (>1.0 m). This barrier was observed upstream of the cart path running along the south side of the golf course.

April 2018 Aquatic Habitat Assessment - Conrail Drainage Channel

Burnside assessed the Conrail Drainage Channel on April 23, 25 and 26, 2018 for fish habitat and SAR mussel presence. Burnside noted the presence of several barriers to fish migration within the Conrail Drainage Channel. Beneath John Daly Way there is a large syphon culvert that conveys the flow of the Conrail Drainage Channel (Photos 26 and 27) under the road. During the April 2018 Study Area visits, water was flowing through this culvert. An outlet pool was present downstream of John Daly Way. Downstream the morphology consisted of mainly runs and flats. Riffles, characteristic of higher velocity streams, were not present in the Conrail Drainage Channel. It was noted in the field that several stormwater sewer outfalls are present within the Conrail Drainage Channel downstream of John Daly Way. Upstream of John Daly Way there was a seasonal concrete barrier to fish movement within the Conrail Drainage Channel that prevented the upstream movement of fish species (Photo 28).

Within the Conrail Drainage Channel the substrate was comprised of very fine sediment in the form of silt and muck. Some larger substrate in the form of broken concrete was present in sections of the Conrail Drainage Channel. The substrate was very soft and a large amount of it had accumulated within the Conrail Drainage Channel bottom

(>0.2 m). As observed in October and November of 2017, the bottom of the slopes on the banks of the Conrail Drainage Channel were lined with rip-rap and the drain flows in a linear alignment (Photo 29 and 30). On April 26th Burnside aquatic ecologists visited the Conrail Drainage Channel south of the Study Area at the Dorchester Road crossing. Beneath Dorchester Road there is a Corrugated Steel Pipe Arch (CSPA) culvert that was present with a trash grate on the inlet of the culvert. This trash gate contained a significant buildup of anthropogenic waste (tires, wooden skids, etc.) and represented a partial barrier to fish migration in the watercourse (Photo 31). Based on correspondence with NPCA ecology staff, a barrier to fish movement upstream from the Welland River exists on the Conrail Drainage Channel at the outlet.

While assessing the Conrail Drainage Channel for fish habitat Burnside was also visually observing for signs of mussel SAR (shells in the drain, in rafted material on the banks etc.). Burnside did not observe any sign of potential mussel presence within the Conrail Drainage Channel during the aquatic habitat assessment in April 2018.

April 2018 Fish Community Sampling Results

The species captured during the April 2018 fish community sampling are available below in Table 3: Fish Species Captured During April 2018 Fish Community Sampling. During the April 2018 fish community sampling gee minnow traps and seine nets were used to sample the intermittent watercourse, the ponds and the Conrail Drainage Channel. For full results and photos from the sampling please refer to Appendix E – Aquatic Assessment Report. In addition to the species listed below Burnside captured, identified and released one Yellow bullhead (*Ameiurus natalis*) and three Green sunfish (*Lepomis cyanellus*) while sampling the intermittent watercourse with a seine net. Please refer to Figure 4 for the seining location downstream of the barrier to fish movement.

Table 3: Fish Species Captured During April 2018 Fish Community Sampling

Species Name	Scientific Name	Number of Individuals Captured
Bluegill	*Lepomis macrochirus*	8
Brook stickleback	*Culaea inconstans*	153
Central mudminnow	*Umbra limi*	5
Crayfish spp.		11
Fathead minnow	*Pimephales promelas*	2
Golden shiner	*Notemigonus crysoleucas*	22
Green sunfish	*Lepomis cyanellus*	21

July 2018 Fish Community Sampling

The species captured during the July 16, 2018 fish community sampling are presented below in Table 4. The fish community in Ponds A, B and D were sampled using seine nets. It is noted that Pond D receives water via pumping for irrigation purposes. Water temperatures during the July 2018 sampling were measured at 25.5°C. Common carp

were observed within Pond D and were not captured with a seine net. Please refer to Appendix E – Aquatic Assessment Report for the fish community sampling results and photos.

Burnside noted during the fish community inventory that the watercourses which connect the ponds was stained with sediment and had a large amount of floating aquatic macrophytes in the form of Duckweed (*Lemna minor*). In some locations, the unnamed watercourse did not contain a sufficient amount of water to provide fish habitat. Also, it is noted that the depth of sediment observed in most sections of the watercourse, being potentially unsafe to wade and in some instances over 1 m deep.

Table 4: Fish Species Captured During the July 16, 2018 Fish Community Sampling

Pond	Seining Time	Species Captured
A	1 hour	Approximately 140 Green sunfish (*Lepomis cyanellus*) were captured in the pond. Size ranged from 25 mm to 90 mm.
B	1 hour	Approximately 350 crayfish were captured as well as 4 tadpoles. No fish were captured.
D	1 hour 15 minutes	Largemouth bass (*Micropterus salmoides*) (6) Common shiner (*Luxilus cornutus*) (5) Common carp (*Cyprinus carpio*) (2, observed) Round goby (*Neogobius melanostomus*) (4) Common white Sucker (*Catostomus commersonii*) (3) Green Sunfish (*Lepomis cyanellus*) (17) Golden shiner (*Notemigonus crysoleucas*) (5)

Ponds that were inundated with filamentous algae and macrophytes were not seined due to inefficiencies related to pulling the net through underwater obstructions, extensive algal blooms and macrophyte beds. These ponds were sampled using minnow traps to determine fish presence (Appendix E – Aquatic Assessment Report).

4.5 Terrestrial Species and Habitat

Mammals (Bats)

Background Review

Since 2013, four bat species have been listed as Endangered under the ESA due to rapid declining population sizes caused by White-nose Syndrome (WNS). Under the ESA, SAR bat species and their general habitat are protected. This protection includes maternity roosting habitat used by SAR bat species to raise their young during spring and summer seasons.

Among the four listed species, three are known to form maternity roosting colonies in forested habitats: Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Perimyotis subflavus*). Little Brown Myotis and Northern Myotis are known to form maternity roosting colonies in tree "snags"; free standing dead or dying trees that have begun to exhibit signs of decay (i.e., dead branches, cracks, crevices, or fungal corks) (Watt and Caceres, 1999). Tri-coloured bats are known to roost in dead foliage of trees, with a preference for maple and oak trees.

The Study Area features a large area of treed habitats which may support bat species. Correspondence with MNRF biologists indicated that the potential presence of at-risk bat species should be included as part of the EIS process.

Methods

Survey methodology was based on the Guelph District Ministry of Natural Resources Survey Protocol for Species at Risk Bats within Treed Habitats (MNRF, 2017).

Treed communities were identified based on a review of aerial photography and background reports. According to the protocol, coniferous, deciduous and mixed wooded ecosites, including treed swamps, that include trees that are at least 10 cm diameter-at-breast height should be considered candidate maternity roost habitat (MNRF 2017). For cultural treed areas, such as plantations, discussion with MECP biologists is required to determine if surveys are required.

- Small habitat areas (< 10 ha) require a comprehensive walkthrough of the ecosite to look for snag trees, as opposed to larger sites where sub samples and snag density surveys are more appropriate. Given that each forested community survey was < 10 ha, comprehensive walkthrough surveys were completed for both leaf-off and leaf-on surveys.

Leaf-off Survey

A leaf-off survey was conducted on November 29, 2017 to review for candidate bat maternity roosting habitat within treed areas within the Study Area.

Leaf-off surveys of treed habitat for maternity/roosting colonies focus on Little Brown Myotis and Northern Myotis. These species prefer to roost in tree cavities or under loose bark, cracks and crevices of snags.

The following criteria were recorded for each candidate tree identified during this survey:

- Tree snag height;
- Number of cavities or crevices often originating as cracks, scars, knot holes or woodpecker cavities;
- Snag diameter breast height (DBH) (>25 cm);
- Proximity to other identified snags;

- Amount of loose, peeling bark (naturally occurring/due to decay);
- Location of cracks, crevices, and loose/peeling bark high on the tree (>10 m) or is chimney-like with a low entrance;
- Tree species;
- Open area/forest gap; and
- Snag Decay Class (1 to 6).

The quality of each candidate tree identified was analyzed using the criteria above, listed in order of importance.

In addition to the criteria recorded above, each candidate tree was recorded with a GPS waypoint and a photo inventory. Incidental observations were also recorded during the surveys. These surveys identified 67 candidate BMH trees (Figure 5).

Leaf-on Survey

A partial leaf-on habitat assessment was conducted on May 28, 2018, to survey for candidate BMH that may be present within the areas of impact of treed habitat present within the Study Area.

Leaf-on surveys focus on the BMH of Tri-colored bats. Unlike Little Brown and Northern Myotis, Tri-colored bats prefer roosting in dead foliage and clusters of hanging leaves. They exhibit a strong preference for oak trees, however maple trees are also selected as maternity roosting habitat.

The following candidate trees were surveyed in order to determine suitability for BMH:

- Any oak tree ≥10 cm DBH;
- Any maple tree ≥10 cm DBH IF the tree included dead/dying leaf clusters;
- Any maple tree ≥25 cm DBH;
- Criteria recorded for each candidate tree identified during this survey included:
- Tree species;
- DBH (cm);
- Presence of dead/dying leaf cluster;
- Presence of tree cavities;
- Location of tree relative to forested area (Interior, open area/forest gap or forest edge); and
- Presence of preferred tree species within 10 m.

These leaf-on surveys revealed an abundance of appropriately sized oak and maple trees within most treed areas. No trees were identified with hanging dead foliage, but, as per the protocol, all oaks ≥10 cm DBH and all maples ≥25 cm DBH were catalogued within areas surveyed. Leaf-on surveys amounted to just under four 8-hour days of sampling effort. Surveys identified and catalogued 607 appropriately-sized oak and maple trees within the subject lands.

Acoustic Surveys

According to the survey methodology, the next step in determining presence/absence of SAR bat species involves an acoustic survey. Due to restrictive timing constraints of acoustic monitoring, it was assumed that treed areas where leaf-on surveys were not completed likely feature candidate Tri-colored BMH habitat at densities similar to areas where leaf-on surveys were completed due to similarities observed in vegetation composition. This assumption represents a conservative approach to assessing BMH potential within the Study Area. Acoustic monitoring locations were therefore chosen by focusing on the quality of leaf-off habitat assuming that leaf-on habitat is relatively consistent within the subject lands. This strategy was deemed acceptable by MNRF biologists (Appendix C - Correspondences).

There were 14 acoustic monitoring stations that were selected by Burnside staff to assess the presence of SAR bats within the Study Area (Figure 5). Details regarding the selection of the monitoring stations is outlined in a memorandum provided to the MNRF Vineland office in June 2018 (Appendix C - Correspondences).

Passive acoustic monitoring was conducted by Natural Resource Solutions Inc. (NRSI) between June 21 and July 4, 2018 for a total of 14 nights at all monitoring stations. Acoustic detectors were set to record bat passes for a total of five hours each night during the monitoring period, commencing at sunset.

Findings

Results from NRSI were assessed using auto-classification software (Appendix F - NRSI Bat Report). The most commonly-recorded species (approximately 80% of all call sequences) was Big Brown Bat (*Epesticus fuscus*). Less common species call sequences were identified as Hoary Bat (*Lasiurus cinereus*) (13.3% of call sequences) and Silver-haired Bat (*Lasionycteris noctivagans*) (8.7% of call sequences). Finally, 0.1% of calls were identified from Eastern Red Bat (*Lasiurus borealis*).

NRSI conclude that the study results suggest strong evidence of Big Brown Bat, Hoary Bat, and Silver-haired Bat, and weaker likelihood for the presence of Eastern Red Bat.

No SAR bats were identified from the total of 8943 bat call sequences recorded during acoustic surveys at the Study Area. Of these calls, 50 high-frequency bat-pass sequences were noted by the auto-classifier. Of these, 46 were not identified due to poor quality of recordings, one was classified with no certainty, and the remaining three were classified as Eastern Red Bat.

In Ontario, high-frequency bat pass sequences are emitted by SAR bats as well as Eastern Red Bat, which has no SAR status.

Breeding Birds

Background Review

The subject lands fall within OBBA Region 11, Squares 17PH56. See Appendix B - Background Screening for a complete list of species recorded within this square during the first (1981 to 1985) and/or second atlas (2001 to 2005) (OBBA, 2005).

The OBBA review indicated records of 96 avian species within the Study Area and surrounding lands. Of these, 42 are ranked S5 or S5B (Secure) and 48 are ranked S4 or S4B (Apparently Secure). One species (Purple Martin – *Progne subis*) is ranked S3S4 (Vulnerable/Apparently Secure). The remaining five species are ranked SNA, as they are non-native/introduced species.

Four threatened species have recorded presence within the Study Area [Barn Swallow *Hirundo rustica*; Bobolink (*Delichonyx oryzivorus*); Chimney Swift (*Chaetura pelagica*); Eastern Meadowlark (*Sturnella magna*)]. An additional two species listed as Special Concern have also been observed in the area [Eastern Wood-pewee (*Contopus virens*); Wood Thrush (*Hylocichlia mustelina*)].

NHIC data indicate old records (1900) for Northern Bobwhite (*Colinus virginianus*), and relatively recent records (1991) for Black-crowned Night-heron (*Nycticorax nycticorax*). The former is listed as Endangered, while the latter is ranked S3B (vulnerable).

Field Methodology

Standard breeding bird surveys were completed by Burnside's avian ecologist, James Holdsworth (sub-consultant), with protocol described below and in Table 1. Surveys were conducted according to the *Ontario Breeding Bird Atlas (OBBA) Guide for Participants* (Bird Studies Canada March 2001), tailored to the needs of this project. The survey methodology is summarized below and in Table 5.

- Surveys were conducted between May 24 and July 10 which is the recommended date range for surveying for breeding birds in southern Ontario (BCA, 2001);
- The OBBA Guide states that surveys shall conform to the following weather conditions requirements: counts should not be done if it is raining, there is thick fog, or if winds are greater than 19 km per hour (i.e., >3 on the Beaufort scale). Generally, weather conditions were conducive for auditory and visual surveys, with winds less than 19 km per hour, and no precipitation; and
- All birds observed and heard were recorded at each habitat unit location, including level of breeding evidence (refer to Appendix G – Avian Report).

The standard breeding bird surveys were conducted in four habitat units labelled as Area Q1, Q2, Q3, and Q4 on Figure 6 and are described as follows:

- Area Q1: Lands adjacent to golf course entry road and north of rail-line;
- Area Q2: As divided by the central rail-line, north side golf course lands and woodlands;

- Area Q3: As divided by the central rail-line, south side golf course lands and woodlands; and
- Area Q4: Provincially significant wetland, northwest corner of Study Area.

Table 5: Summary of Breeding Bird Survey Conditions Conducted by Burnside Sub-consultant

Breeding Bird Survey Date	Observer	Time of Day (Start/End) (24 hour)	Weather Conditions (Air Temp °C/ Beaufort Sky Code[1]/Wind Scale[2])
05-June-18	James Holdsworth	07:00-12:00	Start: 11°C; End: 18°C Sky: 1 Wind: 1-2
08-June-18	James Holdsworth	07:00-12:00	Start: 14°C; End: 25°C Sky: 1 Wind: 2-3
14-June-18	James Holdsworth	06:00-11:00	Start: 14°C; End: 22°C Sky: 0 Wind: 2-3
21-June-18	James Holdsworth	06:00-12:00	Start: 15°C; End: 24°C Sky: 1 Wind: 2
28-June-18	James Holdsworth	07:00-12:00	Start: 18°C; End: 28°C Sky: 2 Wind: 2

[1]NAAMP/ Beaufort Sky Codes
0 = clear (no cloud cover)
1 = partly cloudy (scattered or broken) or variable
2 = cloudy or overcast
3 = sandstorm, dust storm or blowing snow
4 = fog, smoke, thick dust, or haze
5 = drizzle or light rain
6 = rain
7 = snow or snow/rain mix
8 = showers
9 = thunderstorms

[2]Beaufort Wind Scale
0 = calm, smoke rises vertically (0-2km/hr)
1 = Light air movement, smoke drifts (3-5)
2 = Slight breeze, wind felt on face; leaves rustle (6-11)
3= Gentle breeze, leaves & twigs in constant motion (12-19)
4= Moderate breeze, small branches moving, raises dust & loose paper (20-30);
5= Fresh breeze, small trees begin to sway (31-39)
6= Strong breeze, large branches in motion (40-50)

Breeding bird surveys were undertaken on 5 separate dates to provide two morning surveys per habitat unit, separated by at least one week.

Findings

A total of 59 summer resident bird species exhibiting some level of breeding evidence (possible, probable or confirmed) were observed in the Study Area during targeted breeding bird surveys (see Appendix G - Avian Report).

Seven species were observed in the Study Area during the breeding bird window but no breeding evidence (i.e., suitable breeding habitat or breeding behavior) was recorded:

Chimney Swift , Double-crested Cormorant (*Phalacrocorax auritus*), Great Egret (*Ardea alba*), Herring Gull (*Larus argentatus*), Purple Martin (*Progne subis*), Ring-billed Gull (*Larus delawarensis*), and Rock Pigeon (*Columba livia*).

- Two Chimney Swifts were observed flying over the Study Area and foraging in the area. This species typically nests in brick chimneys (Cadman *et. al*., 2007) which were not present in the Study Area. Although mature hardwood trees with cavities were present in the Study Area for nesting, it is far more likely that this species would be nesting in the chimneys on buildings in the City of Niagara Falls.
- 14 Double-crested Cormorants were observed flying over the Study Area. This species typically nests on the Great Lakes wherever there are islands or sometimes in inland lakes (Cadman *et. al*., 2007). Although Lake Ontario is near to the Study Area, there is no suitable nesting habitat present for this species.
- Four Great Egrets were observed flying over the Study Area. This species typically nests in colonies on islands (Cadman *et. al*., 2007). There is therefore no suitable nesting habitat for this species in the Study Area.
- 11 Herring Gulls were observed flying over the Study Area. This species typically nests in colonies on rocky islands in the Great Lakes or inland lakes (Cadman *et. al*., 2007). There is therefore no suitable nesting habitat for this species in the Study Area.
- Four Purple Martins were observed flying over the Study Area. This species typically nests in artificial nest boxes or other artificial structures (Cadman *et. al*., 2007). These nest boxes or other suitable structures were not present in the Study Area.
- 56 Ring-billed Gulls were observed flying over the Study Area. This species typically nests on urban islands and peninsulas (Cadman *et. al*., 2007). There is therefore no suitable nesting habitat for this species in the Study Area.
- Two Rock Pigeons were observed flying over the Study Area. This species typically nests on buildings or artificial features such as bridges (Cadman *et. al*., 2007). Buildings were present in the Study Area however it is possible that these buildings did not have the specific features (e.g., ledges, external ornaments) that is typical of Rock Pigeon nesting habitat (Cadman *et. al*., 2007). This species mainly nests outside of the peak breeding bird survey season (Cadman *et. al*., 2007) therefore it is also possible that these Rock Pigeons were not nesting when the surveys were conducted.

According to MNRF's Significant Wildlife Habitat Technical Guide (MNRF, 2000), some species require large areas of suitable habitat for long term population survival. Fragmentation of essential habitats can result in overall declines in populations.

Five "area-sensitive" bird species, as defined by the MNRF, were observed in the Study Area during the breeding bird surveys: American Redstart (*Setophaga ruticilla*), Cooper's Hawk (*Accipiter cooperii*), Scarlet Tanager (*Piranga olivacea*), Tufted Titmouse (*Baeolophus bicolor*), and White-Breasted Nuthatch (*Sitta carolinensis*).

The American Redstart is most abundant in deciduous or mixed woods with closed canopy consisting of either tall shrubs, dense young trees or mature trees; woodland edges; in upland or lowland habitat (MNRF, 2000). While this species thrives in forest habitat of greater than 100 ha (MNRF, 2000), it is often found in smaller habitat patches where the availability of more suitable, alternative nesting opportunities is in short supply, particularly in Southern Ontario. The limits of the Study Area are mainly comprised of mowed areas for the golf course as well as deciduous swamp, however the area is surrounded by woodlots. These woodlots surrounding the Study Area may support nesting habitat for this species.

The Cooper's Hawk is most abundant in dense, extensive mixed or deciduous forests usually near pools of water or streams and prefers woodlots interspersed with open fields, floodplain forests and wooded swamps (MNRF, 2000). While this species thrives in forest habitat greater than 50 ha (MNRF, 2000), it has adapted to nesting in smaller habitat patches in or near urban areas where there is a large abundance of avian prey (Cadman *et. al*., 2007). The Study Area provides urban habitat for the species to hunt with plenty of forest habitat for nesting in the surrounding area.

The Scarlet Tanager is most abundant in upland, undisturbed, mature deciduous or mixed forests and nests in thick growth of small trees bordering forests of larger trees, it will also nest in damp areas with alder or willow thickets (MNRF, 2000). This species requires at least 20 ha of forest (MNRF, 2000). The Study Area is surrounded by deciduous forest of over 20 ha in size, providing suitable nesting habitat for this species.

The Tufted Titmouse is most abundant in mixed or deciduous forests with moist bottomlands and swamps and nests in natural cavities or woodpecker holes with trees of greater than 10 cm diameter at breast height (DBH) (MNRF, 2000). It requires at least 4 ha of shrub and sapling growth near water (MNRF, 2000). The Study Area consists of deciduous swamps with trees greater than 10 cm DBH, some with cavities, and surrounding deciduous forest. The Study Area therefore may support nesting habitat for this species.

White-breasted Nuthatch is most abundant in woodland habitats where natural cavities in hardwood trees greater than 30 cm DBH are present. They typically require at least 10 ha of continuous forest, although are often found in smaller habitat patches in parts of Southern Ontario where forests have been highly fragmented due to agricultural practices and urban development (Cadman *et. al*., 2007). They can also be found in shade trees in urban areas. The individual in the Study Area was found in Q4 where the deciduous swamp is, adjacent to the large deciduous woodlot just outside the Study Area. These areas may support nesting habitat for this species.

Two species of conservation concern were observed in the Study Area: Great Egret and Black-crowned Night Heron (The Great Egret is an S2B species and typically nests in colonies on islands (Cadman *et. al*., 2007). The Black-Crowned Night Heron is an S3B and S3N species and typically nests on islands and shores of the Great Lakes (Cadman

et. al., 2007). It is unlikely that either species was nesting in the Study Area due to the unsuitability of the habitat.

Four bird species listed as both provincially and federally significant were observed in the Study Area during breeding bird surveys: Barn Swallow (*Hirundo rustica*) (Threatened), Chimney Swift (*Chaetura pelagica*) (Threatened), Eastern Wood-Pewee (Special Concern) and Wood Thrush (Special Concern). A SAR Screening Table for SCC and SAR in the Study Area are included in Appendix H – SAR Screening. Barn Swallow was recorded as a confirmed breeder, Chimney Swift was recorded with no breeding evidence, Eastern Wood-Pewee was recorded as a probable breeder and Wood Thrush was recorded as a probable breeder. The significance of these species is discussed in more detail in Section 5.0 of this Report.

Amphibians and Reptiles

Background Review

The Study Area falls within Ontario Reptile and Amphibian Atlas (ORAA) grid square 17PH56 (ORAA, 2018). There are 21 herpetofaunal species recorded within the Study Area and surrounding lands. Of these, ten are ranked S5 (Secure) and five are ranked S4 (Apparently Secure). Five are ranked S3 (Vulnerable) and one (Jefferson Salamander/Blue-spotted Salamander Complex) is ranked S2 (Imperiled).

Of these species, one is listed under the *ESA* as Endangered (Jefferson Salamander – *Ambystoma jeffersonianum*), one is listed as threatened (Blanding's Turtle – *Emydoidea blandingii*) and four are considered Special Concern (Eastern Musk Turtle – *Sternotherus odoratus*; Eastern Ribbonsnake – *Thamnophis sauritus*; Northern Map Turtle – *Graptemys geographica*; Snapping Turtle – *Chelydra serpentina*).

Records exist in the NHIC for Timber Rattlesnake (*Crotalus horridus*) from 1941 (historical), but this species is known to be extirpated from the Province of Ontario, and its presence will not be considered within the Study Area.

Field Methodology

Burnside staff conducted three amphibian surveys adjacent to wooded and ephemeral habitats. These surveys were conducting using Environment Canada's Marsh Monitoring Program for Surveying Amphibians protocol (BSC, 2009). Survey locations for breeding surveys are shown on Figure 7.

Five turtle basking surveys were also conducted at all open aquatic waterbodies on the golf course between May 1 and June 14 (Table 6, Figure 7). These surveys followed the *Survey Protocol for Blanding's Turtle (Emydoidea blandingii*) *in Ontario* (MNRF, 2015b).

Habitat sweeps were also conducted during vernal pool delineation and included searching microhabitat (under logs, rocks, in vernal pools) for amphibian species. These

surveys were conducted on the same days as the first two evening amphibian breeding surveys.

Table 6: Summary of Herpetofaunal Field Surveys

Survey	Date	Observer(s)	Time of Day (Start/End) (24 hour)	Conditions	
Amphibian Breeding Surveys	April 23, 2018	Peter DeCarvalho Stewart Gibson	2035 - 2138	T_{start} : 17 °C	T_{end} : 10 °C
				Precipitation:	None
				Wind:	0-2
				BG Noise:	1-2
	May 8, 2018	Peter DeCarvalho Stewart Gibson	2109 - 2158	T_{start} : 22 °C	T_{end} : 19 °C
				Precipitation:	None
				Wind:	0-1
				BG Noise:	1-2
	May 30, 2018	Peter DeCarvalho Stewart Gibson	2121 - 2205	T_{start} : 29 °C	T_{end} : 19 °C
				Precipitation:	None
				Wind:	1-3
				BG Noise:	0-2
Turtle Basking Surveys	May 1, 2018	Stewart Gibson	1016-1330	T_{start} :	15 °C
				Precipitation:	None
				Cloud Cover (10^{th}):	2.5
	May 8, 2018	Stewart Gibson	1045-1400	T_{start} :	15 °C
				Precipitation:	None
				Cloud Cover (10^{th}):	0
	May 14, 2018	Stewart Gibson	0955-1330	T_{start} :	15 °C
				Precipitation:	None
				Cloud Cover (10^{th}):	3
	May 30, 2018	Stewart Gibson	1000-1330	T_{start} :	28 °C
				Precipitation:	None
				Cloud Cover (10^{th}):	1

Survey	Date	Observer(s)	Time of Day (Start/End) (24 hour)	Conditions	
	June 14, 2018	Stewart Gibson	1050-1400	T_{start} :	18 °C
				Precipitation:	None
				Cloud Cover (10^{th}):	0
Amphibian Microhabitat Sweeps	April 23, 2018	Peter DeCarvalho Stewart Gibson	1000-1800	T_{start} :	10°C
				Precipitation:	None
				Wind:	0-2
				Cloud Cover (10^{th}):	0-4
	May 8, 2018	Peter DeCarvalho Stewart Gibson	0930-1800	T_{start} : 17°C	16°C
				Precipitation:	None
				Wind:	0-2
				Cloud Cover (10^{th}):	1-4

Findings

Amphibian Breeding Surveys

Amphibian breeding surveys in spring identified a total of six anuran species during breeding surveys (American Toad – *Anaxyrus americanus*; Gray Tree Frog – *Hyla versicolor*; Green Frog – *Lithobates clamitans*; Northern Leopard Frog – *Lithobates pipiens*; Spring Peeper – *Pseudacris crucifer*; Western Chorus Frog – *Pseudacris triseriata*).

All areas had calling frogs at one point during the three field visits. Two of the survey points (#3 and #4 on Figure 7) had five or less total calling anurans throughout the sampling season.

The three survey points corresponding to Polygon #26 on Figure 2 identified two species (Spring Peeper and Western Chorus Frog) calling at full chorus levels during Surveys 1 and 2.

Turtle Basking Surveys

Turtle basking surveys found Midland Painted Turtle (*Chrysemys picta*) at six of the survey's locations throughout the spring (TWT - 1, TWT - 2, TWT - 3, TWT - 5, TWT - 7, TWT - 8). A single juvenile Snapping Turtle was also found in the water at TWT - 8.

Three sampling sites were found to have five or more basking turtles at least once during the survey season (TWT - 2, TWT - 3, TWT - 5).

Amphibian Habitat Sweeps

Amphibian habitat sweeps were carried out in all wooded ecosites within the Study Area on April 23 and May 8, 2018. This involved wading into ephemeral pools and searching under microhabitat such as logs and other detritus to observe for amphibians. During the surveys an abundance of Green frog, Spring peeper, and Western chorus frog were commonly observed throughout most of the vernal pools searched (corresponding with ELC Polygons #12, #14, #19, #23, and #25) (Figure 2). Vernal pools in these Polygons were also found to support fairy shrimp (*Anostraca* sp.), which are vernal pool-obligate organisms on terrestrial landscapes.

Habitat searches also identified a single Red-backed salamander (*Plethodon cinerus*) under a log at ELC Polygon #25 and a single mole salamander (*Ambystoma* c.f. *laterale*) under a rock in Polygon #14.

Incidental Wildlife Observations

Several incidental wildlife observations were noted over the course of all field surveys.

Barn swallow were observed nesting under the roof of the snack bar south of the railroad tracks during May field visits.

Eastern garter snakes (*Thamnophis sirtalis*) were found to be abundant in areas close to ELC Polygons #13, #14, #15, #16, and #17. A single Dekay's brownsnake (*Storeria dekayi*) was also found in this area.

At least two flyover bats (unidentified) were observed foraging over aquatic habitat north of ELC Polygon #22.

Monarch (*Danaus plexippus*) were observed foraging multiple times over the open areas associated with ELC Polygons #16 and #17.

5.0 Identification of Provincially Significant Features

5.1 Provincially Significant Wetlands

The Niagara Falls Slough Forest Complex PSW is present and adjacent to the Study Area within the southwestern portion of the golf course. A small section of this PSW complex extends into the Study Area between the railway and the Conrail Drainage Channel to the southwestern range of the course (the westernmost ELC Polygon #14 on Figure 2). This portion of wetland is also regulated by the NPCA.

The inclusion of this parcel to the PSW complex appears to have been relatively recent (within the past 2-3 years). Burnside requested that MNRF biologists accompany staff ecologists on a wetland staking to confirm/refine the wetland boundary of this feature. MNRF responded that PSW files are open, and that an OWES-certified ecologist may assess the wetland and submit new information for MNRF consideration.

It was determined during wetland staking that the easternmost section of the PSW segment is comparatively dry, and was assessed to be more closely represented by an FOD9-1/G124Tt ELC definition; it is assumed that adjacency to the active golf course and/or cleared sections presumed to be tile drained (ELC Polygon #17) has a drying influence on this ecosite.

Additionally, the middle segment of the PSW was noted to be greatly impacted by encroachment of an aggregate pile associated with ELC Polygon #15.

In June 2019, MNRF biologists amended the PSW boundary to exclude the eastern portion of the wetland system within the Thundering Waters Golf Course (Appendix I).

Removal of this eastern portion from the PSW designated lands will allow for the area to be included in the development lands. Compensation for loss of function will occur for all vegetation communities that are impacted within this eastern portion.

5.2 Significant Valleylands

There are no Significant Valleylands within the Study Area vicinity.

5.3 Significant Woodlands

The Official Plan for the Niagara Planning Area Policy Section 7.B.1.3. indicates that environmental protection areas include significant ecological and landscape features including significant woodlands. Policy Section 7.B.1.5. identifies significant woodlands as meeting one or more of the following criteria:

a) Contain threatened or endangered species or species of concern;

b) In size, be equal to or greater than:
   - 2 hectares, if located within or overlapping Urban Area

c) Boundaries;
   - 4 hectares, if located outside Urban Areas and north of the Niagara Escarpment;
   - 10 hectares, if located outside Urban Areas and south of the Escarpment;

d) Contain interior woodland habitat at least 100 metres in from the woodland boundaries;

e) Contain older growth forest and be 2 hectares or greater in area;

f) Overlap or contain one or more of the other significant natural heritage features listed in Policies 7.B.1.3 or 7.B.1.4; or

g) Abut or be crossed by a watercourse or water body and be 2 or more hectares in area.

No wooded areas within the Study Area were assessed to meet the criteria listed above. It has been noted that Niagara Region strives to maintain a conservative outlook on significant woodlands. One wooded area associated with ELC Polygon #26 (Figure 2) was assessed to meet the descriptions of ecological functionality that significant woodlands represent in the Natural Heritage Reference Manual (MNRF, 2005).

The Official Plan for the Niagara Planning Area Policy Section 7.B.1.22 prescribes the regulations associated with significant woodlands within the policy area as follows:

> *The vegetation protection zone required under Policy 7.B.1.21 shall be a minimum 30 m wide in the case of wetlands, seepage areas and springs, fish habitat, permanent and intermittent streams, lakes and significant woodlands.*

5.4 Significant Areas of Natural and Scientific Interest

There are no Areas of Natural and Scientific Interest (ANSI) within the Study Area vicinity. The closest ANSI is the Niagara River Bedrock Gorge, which begins at the Niagara River near the falls and extends north towards Lake Ontario.

5.5 Significant Wildlife Habitat

Determination of SWH is broadly categorized and described in the Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 (NHRM) (MNRF, 2010). Additionally, the MNRF's Significant Wildlife Habitat Technical Guide (SWHTG) (MNRF, 2000) and SWH Criteria Schedules for Eco-regions 6E and 7E (MNRF, 2015a) are additional supplemental documents intended to assist in identifying SWH. The four categories of SWH are identified as:

1. Habitats of seasonal concentrations of animals;

2. Rare vegetation communities or specialized habitat for wildlife;

3. Habitat of species of conservation concern; and

4. Animal movement corridors.

Of the four types of SWH above, there is moderate, high, or confirmed potential for habitats of seasonal concentrations of animals, specialized habitat for wildlife, and habitat of species of conservation concern within the Study Area (Appendix J – SWH Screening).

Habitats of Seasonal Concentration Areas

As defined in MNRF's Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (*SWHTG)* (2015), the term "seasonal concentration areas" refers to areas where wildlife species occur annually in aggregations at certain times of year. Wildlife and wildlife habitat was noted during each site visit and in all surveys from April through September.

There are three habitat types assessed as having moderate or higher potential presence within the Study Area, and two confirmed habitat types as defined by the SWHCS (MNRF, 2015a). These SWH are listed below and assessed in the following sections:

- Waterfowl Stopover and Staging Areas – Aquatic (WSSA-A);
- Bat Maternity Colonies (BMC) – *Confirmed*;
- Turtle Wintering Areas (TWA);
- Reptile Hibernacula (RH); and
- Colonially-nesting Bird Breeding Habitat – Tree/Shrub (CBBH-TS).

Waterfowl Stopover and Staging Areas (Aquatic)

This SWH is comprised of vegetated open water and flooded areas that support both local and migrant waterfowl during spring and fall migrations. It was determined that there is moderate potential for WSSA-A habitat. There are SWD ecosites within the Study Area that are known to experience high rates of flooding in the spring, though these areas may be too small to support species in the numbers required to qualify as confirmed SWH (700 waterfowl-use days). There is potential for this SWH within ELC Polygon #26 (Figure 2).

The ponds that exist within the Study Area are managed as irrigation reservoirs and water-hazards for the golf course. They do not satisfy the criteria for WSSA-A habitat.

Bat Maternity Colonies

All deciduous and mixed forest and swamp ecosites may be candidate BMC. Acoustic surveys conducted within the Study Area indicated presence of Big Brown Bat at all recording stations (Refer to Section 4.5 and Figure 5). Though acoustic surveys are not able to provide definitive numbers, the high number of bat passes collected at the Study Area have been determined as satisfactory proof that the minimum threshold of bat usage as stated by the SWHCS (> 10 Big Brown Bats or >5 adult female Silver-haired Bats) is present within all forest and swamp ecosites with mature deciduous trees within the Study Area.

Turtle Wintering Areas

Turtle wintering areas are typically considered part of a species' core habitat. As such, basking survey results have been taken as an approximation for overwintering numbers. Three sampling sites were found to have five or more individual basking turtles at least once during the survey season (TWT - 2, TWT - 3, TWT - 5) (see Section 5). This meets the SWHCS threshold to confirm TWA SWH.

The ponds in question have been heavily modified by golf course construction and operations. Correspondence has been sought by the MNRF to comment on the suitability of these ponds as SWH.

Reptile Hibernacula

Reptile hibernacula may be found most ecosites with the exception of those that are very wet or have a high water-table. Suitable RH must be above the frost-line, and can include disused burrows, rock crevices, building foundations, piles of aggregate, etc.

Snakes were not specifically surveyed for, but incidental observations of Eastern Garter Snake and Dekay's Brownsnake occurred with frequency around ecosite Polygons #13, #14, #15, #16, and #17. It has been noted that ecosite Polygon #15 is over top of a

large pile of unconsolidated materials/aggregate. This feature may contribute to high quality RH habitat within the area, and project works here should be carried out with assurance that no net negative impacts to candidate RH SWH will occur as a result.

Colonially-nesting Bird Breeding Habitat (Tree/Shrub)

This SWH is defined as mixed/deciduous swamp or treed fen that can support large colonies of breeding birds. There were several SWD ecosites noted in the Study Area (Polygons #14 and #26). Both areas had sections of standing water in the spring but were dry by mid-summer.

Breeding bird surveys in the southern half of the Study Area did provide evidence for the presence of Great blue heron, Green heron, Great egret, and Black-crowned night heron, all of which utilized CBBH-TS as nesting habitat. The presence of this habitat on Polygon #26 has not been confirmed, but there is moderate potential that this ecosite may be CBBH-TS SWH.

Rare Vegetation Communities or Specialized Habitat for Wildlife

The SWHTG defines “rare vegetation communities” as areas containing provincially, regionally, or locally rare vegetation community features and functions. These communities are listed in Appendix M of the SWHTG (MNRF, 2000). No rare vegetation communities for the Niagara Region were identified as present within the Study Area.

“Specialized habitats” are areas that support species with narrow or specific habitat requirements, areas with high species or community diversity, or areas that contribute to a species’ survival. There are two specialized habitat types assessed as having moderate or higher potential presence within the Study Area, and one confirmed habitat type as defined by the SWHCS (MNRF, 2015a). These SWH are listed below and assessed in the following sections:

- Bald Eagle and Osprey Nesting, Foraging and Perching Habitat (BEONFP);
- Amphibian Breeding Habitat – Woodland (ABH-WO) *Confirmed*; and
- Amphibian Breeding Habitat – Wetland (ABH-WE).

Bald Eagle and Osprey Nesting, Foraging and Perching Habitat

Waterfowl nesting areas include treed forest and swamp ecosites directly adjacent to shorelines of rivers, lakes, ponds, and wetlands. Though there are several FOD/SWD ecosites adjacent to water-hazard ponds, the quality of forage within these ponds is likely to be marginal at best. These areas have been assessed as having low/moderate potential to support BEONFP habitat, and no Bald Eagles or Osprey were noted during breeding bird surveys.

Mitigation for impacts to BEONFP SWH are not anticipated to be required when assessing impacts to FOD/SWD ecosites next to water features within the Study Area. Potential presence of this SWH is not considered further in this study.

Amphibian Breeding Habitat – Woodland

Habitats within forest and swamp that experience vernal pooling in the spring are important for breeding amphibians due to the absence of predators and the abundance of invertebrate food sources within these systems.

Amphibian breeding surveys were carried out adjacent to most treed areas within the Study Area. One ecosite (ELC Polygon #26) met or exceeded the threshold for confirmed ABH-WO (two or more listed species with Call Level Codes of 3 (full chorus)). According to the *Significant Wildlife Habitat Criteria Schedule for 7E*, this confirms that this SWD ecosite is significant Amphibian Breeding Habitat (Woodland) (MNRF, 2015a).

Amphibian Breeding Habitat – Wetland

Non-treed wetland ecosites greater than 500 m^2 may be considered ABH-WE. Shallow aquatic and meadow marsh ecosites exist within the ecosite, but these are typically small and isolated. Those identified within the Study Area are associated with the drainage channels connected to the irrigation ponds on the southern portion of the golf course. According to the draft 2015 ELC Guide for the Great Lakes-St. Lawrence Region, these small channels fall under the definition of “Constructed Water Collectors” (See Section 0 and Figure 2). Therefore, these systems are not being considered as candidate ABH-WE SWH.

Species of Conservation Concern

As defined in the SWHTG, the term “*species of conservation concern”* is used to describe species that are identified as: nationally Endangered or Threatened by COSEWIC, which are not protected under the Ontario *Endangered Species Act, 2007* (*ESA)*; species identified as Special Concern provincially, under the *ESA*; species that are listed as rare or historical in Ontario based on NHIC records (S1-S3 ranks); species whose populations are known to be experiencing substantial declines in Ontario; species that have a high percentage of their global population in Ontario and are rare or uncommon in the planning area; species that are rare within the planning area, even though they may not be provincially rare; species that are subjects of recovery programs; and species that are considered important to the municipality, based on recommendations from the Conservation Advisory Committee. The Study Area was identified as highly likely to contain Terrestrial Crayfish habitat. Additionally, recorded presence has been confirmed for the following Special Concern and Rare wildlife species:

- Avian
  - Black-crowned Night Heron;
  - Eastern Wood-pewee;
  - Great Egret; and
  - Wood Thrush.
- Herpetofauna
  - Snapping Turtle
- Lepidoptera
  - Monarch

Terrestrial Crayfish Habitat (TCH)

Terrestrial crayfish can be found within wet meadows and the edges of shallow marsh ecosites, but they can also be found within or adjacent to swamp areas. It is anticipated that TCH may be present in the Study Area around lands associated with ELC Polygons #14 and #26, though no chimney structures were encountered during field studies.

Special Concern and Rare Wildlife Species

Avian

Black-crowned night heron and Great egret were both identified within the southern half of the Study Area during breeding bird surveys. These species hold S3 subnational ranks, indicating that they are vulnerable. Both species are noted as nesting in trees or shrubs in close proximity to water, though Great egret typically prefers larger open-water areas for foraging than Black-crowned Night Heron. Potential habitat that may support these species within the southern half of the Study Area are associated with ELC Polygon #26.

Eastern wood-pewee is ranked as Special Concern in Ontario. It is a mid-canopy species that prefers forest clearings and sparse understory vegetation. A number of woodlot, forest, and swamp ecosites feature areas that would offer suitable habitat for this species, including ELC Polygons #4, #12, #13, #14, #23, #25, and #26; areas with wet depressions that flood ephemerally were noted to have sparse understory as a result. This species' presence was confirmed during breeding bird surveys.

Wood thrush is also ranked as Special Concern in Ontario. This species thrives in moist deciduous forests; they are also known to utilize smaller stands of trees. Any treed ecosite, including CUW, may be considered potential habitat for this species. Wood thrush was detected as present during breeding bird surveys.

Herpetofaunal

A single juvenile Snapping turtle was observed during basking surveys at TWT – 8 (Figure 7). Conservatively, this indicates that the SWH for this species extends to all pond features attached to TWT – 8, including those at TWT – 1, TWT - 2, and TWT – 10.

This species, ranked as Special Concern in Ontario, prefers shallower open water with soft mud or leaf-litter substrate in which to hide from predators. Anecdotal reports from groundskeepers at the golf course indicate that this a large adult Snapping turtle has also been known to be present in the Study Area.

Lepidoptera

Common milkweed, the Monarch's host plant, was noted throughout open areas of the Study Area. Monarch individuals were observed within ELC Polygons #16 and #17. There is high potential that suitable supporting habitat is present within these areas.

Small pockets of open waste areas also contribute to wildflower habitat to support adult Monarchs (ELC Polygons #11 and #18). These areas are fragmented, feature high occurrence of non/native or invasive species, and are not considered as SWH for this species.

5.6 Habitat of Endangered and Threatened Species

The term "*species at risk*" (SAR) refers to provincially designated species at risk under the Schedule 1 of the *Species at Risk Act, 2002* and species designated as provincially threatened or endangered under the ESA. The following sections discuss SAR within and adjacent to the subject lands based on a review of available background information and site investigations. SAR screening is represented on Appendix H – SAR Screening.

Background Review

A comprehensive background source review and correspondence with MNRF area biologists was used to create a list of endangered/threatened SAR with potential to be found within the Study Area and surrounding areas. Overall, Burnside ecologists assessed the potential for presence of 45 species protected under the ESA or SARA. Detailed screening information for the potential presence of these species can be found in Appendix H – SAR Screening. Findings for endangered and threatened species in the Study Area are summarized in Table 7 and discussed in the following subsections.

Table 7: Confirmed and Candidate Habitat for Endangered and Threatened Species in Study Area and Vicinity

	On-site Study Area (within 120 m of proposed project area)
Confirmed species present through targeted surveys	**Avian** Barn Swallow (ESA - THR) Wood Thrush (SARA – THR)

	On-site Study Area (within 120 m of proposed project area)
Species not observed during specialized surveys	**Avian** Acadian Flycatcher (ESA – END) Bobolink (ESA – THR) Eastern Meadowlark (ESA – THR) Henslow's Sparrow (ESA – END) Red-headed Woodpecker (SARA – THR) **Herpetofaunal** Blanding's Turtle (ESA - THR) **Mammalian** Little Brown Myotis (END) Northern Myotis (END) Tri-colored Bat (END) **Aquatic** Grass pickerel (ESA-SC) Spotted sucker (ESA-SC) Round hickorynut (ESA-END) Kidneyshell (ESA-END)
Candidate habitat present, species not observed	**Flora** American Chestnut (ESA - END) American Ginseng (ESA – END) American Water-willow (ESA – THR) Butternut (ESA – THR) Deerberry (ESA – THR) Dense Blazing Star (ESA – THR) Drooping Trillium (ESA – END) Eastern Flowering Dogwood (ESA – END) Kentucky Coffee Tree (ESA – END) Red Mulberry (ESA – END) Round-leaved Greenbrier (ESA – THR) Spotted Wintergreen (ESA – END) White Wood Aster (ESA – THR) Herpetofaunal Jefferson Salamander (ESA – END)

Species at Risk with Confirmed Presence

Two SAR were directly observed during surveys conducted within the Study Area.

Barn Swallow

Barn Swallow were observed nesting within sheltered areas associated with a concession structure south of the railway tracks. One active mud nest was noted, and signs of previous mud nests were also observed.

Wood Thrush

Wood Thrush were identified within the Study Area during breeding bird surveys (Appendix G – Avian Report). This species is assessed as Special Concern under the ESA and Threatened under the SARA.

SAR not observed during specialized surveys

Aquatic Species

Targeted surveys for mussel SAR (Round hickorynut and Kidneyshell) were completed in the Conrail Drainage Channel on September 13, 2018 with DFO SAR Biologist David Ballint. No SAR mussel species were observed or captured, and David Ballint provided communication that the Conrail Drainage Channel is not considered to be mussel SAR habitat. DFO provided a letter confirming that mussel SAR was not observed in the Conrail Drainage Channel (See Aquatic Assessment Report Correspondence). Burnside's Aquatic Ecology staff also conducted fisheries sampling in the Conrail Drainage Channel, the golf course ponds and the intermittent watercourse. Methods of fisheries sampling included minnow traps, dip-netting and seine netting. No SAR mussels or fish (Grass pickerel and Spotted sucker) were captured or observed during these sampling events.

Avian Species

A number of SAR birds were identified through background review as being potentially present within the Study Area. No SAR bird species were identified during breeding bird surveys.

Blanding's Turtle

Basking turtle surveys followed the MNRF Blanding's Turtle Protocol (MNRF, 2015b). No Blanding's Turtles were observed during these surveys.

Bat Species

Comprehensive studies were conducted within the Study Area for SAR bats. Leaf-off, Leaf-on, and acoustic surveys were carried out according to MNRF methods. No SAR bats were identified during acoustic surveys within the Study Area.

Species at Risk assessed with potential for presence but not observed during general surveys

Flora

The Study Area is within the Carolinian zone; this results in higher species diversity and creates potential for rare and SAR species. A comprehensive three-season vegetation inventory was conducted in conjunction with ELC field studies. The vegetation inventory was carried out using a wandering transect methodology that focused on sampling micro-habitats and identifying distinct vegetation communities as well as on identifying the overarching dominant trends within ecosites within the Study Area. No SAR flora species were identified during the vegetation inventory. For details regarding vegetation surveys and ELC analysis, refer to Section 4.3. For complete species list, broken down by ELC Polygons, refer to Appendix D – Vegetation List.

Herpetofauna

Survey efforts to assess presence/absence of Jefferson Salamander or Jefferson-dominant unisexual populations consisted of micro-habitat sweeps within wet treed habitats and adjacent to vernal systems in the Spring of 2018. A single *Ambystoma* c.f. *laterale* was found within the southwestern portion of the PSW woodland (ELC Polygon #14 on Figure 2). No genetic testing was carried out on this individual.

It should be noted that a study on a larger section of the Niagara Falls Slough Forest Complex immediately north of the Conrail Drainage Channel completed by Dougan and Associates carried out extensive genetic sampling of *Ambystoma* populations within the area; these surveys identified no Jefferson-dominant polyploids within the same wetland complex (Dougan and Associates, 2016).

6.0 Proposed Development

The site will be redeveloped as a residential subdivision, comprised of the following components:

- Single detached residential units;
- Street townhouses;
- Retirement singles;
- Medium density residential units;
- Mixed-use medium density residential units;
- Parks and parkettes;
- 2 stormwater management ponds;
- The realigned Conrail Drainage Channel;
- Walkways; and
- A multi-use trail.

Approximately 15 of the total 64 hectares are proposed to be Open Space, comprised of the protected natural features (wetlands and woodlands) and their buffers. Enhancements to the Open Space are proposed to support the most ecologically

significant components of the natural heritage system, as well as retention of portions of hedgerows within the development and providing enhanced measures within the stormwater management ponds (SWMPs) to offset potential lost or reduced ecological functions.

6.1 Stormwater Management Plan

The FSR report and associated figures prepared by Burnside, dated February 2020, illustrate the stormwater management is currently managed and will be managed in the post-development condition.

Currently, overland flow is directed towards the intermittent unnamed watercourse, the existing Conrail Drainage Channel, onsite golf course ponds and offsite lands.

Post-construction stormwater from the subdivision will be mainly directed toward 2 stormwater management ponds (SWMPs). The south SWMP will outlet to the existing watercourse. The north SWMP outlet will be directed toward the realigned Conrail Drainage Channel.

Also, the proposed re-grading in the south portion of the Study Area will take drainage from Catchments EXT1 and EXT2 and direct it toward Polygon #26 within the Open Space block. This change in stormwater flow will result in an additional 0.708 m3/s to the woodlot during the 100-year storm event compared to existing conditions.

Low Impact Development (LID) measures such as soak-away pits, infiltration trenches, and roof downspout disconnects are being considered to improve infiltration.

6.2 Water and Wastewater Servicing

The existing watermain extends eastward through the site along the Oldfield Road extension to connect with an easement that abuts and runs parallel to Conrail Drainage Channel. A proposed watermain will be installed through the Oldfield Road Extension that is directed southward and connect with the Ramsey Road watermain. Watermain service will be connected throughout the internal road network.

Sanitary servicing for the south portion of the site will run parallel to the existing trunk sanitary sewer on Ramsey Road and connect with the existing trunk sewer on Stanley Road. The north portion of the site will connect to the existing service at Drummond Road and Oldfield Road.

7.0 Evaluation of Environmental Impacts

7.1 Vegetation Communities

Vegetation communities will be retained fully within the Open Space block at the east limit of the site, creating a contiguous block of wetland and treed areas. A minimum 15 m buffer will be applied to the west edge of Polygon #26 to reduce adjacent impacts. The additional stormwater that will be directed toward this feature during the 100-year storm is not anticipated to impact this feature that has swamp components within it.

The onsite portion of the PSW will also be retained with the west limit of the realigned section of the Conrail Drainage Channel maintaining a minimum distance of 30 m between the wetland limit and any disturbance (including grading). The portion of land discussed in Section 5.1 that was incorrectly identified as PSW by others will be subject to clearing to accommodate Block 242 (Retirement Single Detached), the realigned Conrail Drainage Channel and the slough / pit and mound restoration area.

Portions of hedgerows will be retained at the south and north limits of the site to preserve some of their ecological function, provide screening and enhance aesthetics. A hedgerow central to the site and south of the rail corridor will be retained within the park block. Removal of portions of these communities will be required to accommodate roads, grading, sidewalks / trails and servicing. Final determination of preservation of the trees within the hedgerows will be carried out as part of the Site Plan submission, where a Tree Preservation Plan will be prepared in conjunction with the grading plan.

All of the water and treed vegetation communities not mentioned above will be removed to accommodate the development elements. The forest communities within the proposed clearing areas are remnants of the larger forest / swamp that covered most of the Study Area prior to the golf course development. They are also anticipated to be similar to the forested communities cleared to accommodate the recent developments to the north of the site, located on Lionshead Avenue, Green Vista Gate and Eaglewood Drive. The removal includes Open aquatic (OA) communities on the site, that are sustained by pumped water from the Welland River.

7.2 Birds

Onsite shrubs and trees growing as individuals or in groupings may support bird populations during certain parts of the year. There is potential for the disturbance or destruction of migratory breeding birds and their habitat during the construction phase if the works occur during the active breeding window. In the event that the active breeding window cannot be avoided, prohibitions under the *Migratory Birds Convention Act, 1994* (MBCA) and/or *ESA, 2007* will apply.

7.3 Fish and Fish Habitat

Conrail Drainage Channel

Overall, the Conrail Drainage Channel was assessed as providing marginal Type 3 fish habitat to tolerant, low sensitive fish species based on receiving storm water and surface runoff from the surrounding area. There was limited habitat features in the Conrail Drainage Channel due to the channel morphology (linear and trapezoidal) and substrate type (rip rap bed and banks). Marginal habitat features were present including aquatic macrophytes (cattails), woody debris (from storm events), and suitable substrate (sand and organics washed in from run-off). The only substrate that would provide habitat and cover is the large angular stone (rip rap) that has been used to line the channel. During the November site visit upstream portions of the Conrail Drainage Channel were dry and an instream barrier was observed upstream of the siphon culvert under John Daly Way. There are limited refuge pools present within the Conrail Drainage Channel which may provide habitat to tolerant warm water species during periods of low flow and overwintering.

On September 13, 2018, during a site meeting with Burnside, it was confirmed by David Ballint (DFO SAR Biologist) and Caroline Boros (Fisheries Protection Biologist), of the Fisheries Protection Program within the Department of Fisheries and Oceans that the Conrail Drainage Channel is not deemed to be suitable habitat for Species at Risk mussels. DFO and Burnside walked and surveyed the section of the Conrail Drainage Channel within the Thundering Waters Golf Course property and upstream of Dorchester Road. Based on the results of the site visit, DFO did not request that a mussel survey be completed for the Conrail Drainage Channel. Confirmation that SAR habitat is not present in the Conrail Drainage Channel has been provided in an email correspondence with DFO and attached in Appendix E.

Burnside completed the fish community inventory of the Conrail Drainage Channel in April 2018 through the use of Gee minnow traps. Burnside captured tolerant low sensitivity species (brook stickleback and green sunfish) during this fisheries assessment. The Conrail Drainage Channel is considered to be fish habitat as defined by the *Fisheries Act* although classified as marginal, Type 3, fish habitat. Alteration of the Conrail Drainage Channel (i.e., realignments, enclosure etc.) will potentially cause a HADD to fish habitat although the death of fish can be mitigated during any alteration of the Conrail Drainage Channel (fish salvage, working within in-water works timing windows).

Golf Course Ponds

Ponds A and B are man-made features that are not connected to the unnamed intermittent watercourse or to the other ponds, and therefore they are not considered to be fish habitat as defined by the *Fisheries Act* and causing Harmful Alteration, Destruction, Disruption (HADD) to fish habitat as defined under the Act is not applicable to Ponds A and B. Causing the death of fish by means other than fishing, as defined in the Act, is also not applicable to species of fish within Ponds A and B based on the fact that they are man-made ponds, not connected to a watercourse and therefore, not considered fish habitat.

Ponds C through F are connected to each other via the unnamed intermittent watercourse. These man-made ponds and related drainage features were not designed to provide fish habitat although they do provide water features and irrigation within a golf course landscape. These ponds are also augmented by human activity and they only contain a significant amount of water due to the pumping performed by the golf course seasonally for irrigation. Without this pumping the volume of water contained within the ponds may not be sufficient to provide year-round fish habitat. There is potential that these ponds experience “winterkill” based on depth and potential anoxic conditions. It is uncertain how the fish have entered these ponds, but due to the barrier to fish movement upstream in the intermittent tributary the fish would not have migrated upstream from the Welland River. It is suspected that the fish are brought into the ponds through the pumping from the Welland River for golf course irrigation as proven by the capture of round goby (invasive fish species). The ponds are anthropogenic in nature and although they contain water and provide habitat to pollution tolerant warm-water species, they should not be considered sensitive fish habitat that would require off-setting. Without the water pumping to the ponds by the golf course, it is unlikely fish would inhabit them and it is also unlikely that there would be an adequate volume of water to provide suitable fish habitat. In the proposed development the water pumping to the ponds from the Welland River will not continue and the ponds will be infilled and removed from the landscape.

Burnside has observed that based on the presence of the fish in the ponds that would be considered to be fish habitat as defined by the *Fisheries Act*. The ponds are man-made and are augmented through pumping and underlying drainage to the pond from irrigation. Ponds A and B are not connected to the intermittent watercourse and thus they are not considered to be fish habitat. Overall, ponds C-F are considered to provide marginal, Type 3, Fish Habitat and considered to provide low sensitivity fish habitat for warm water species. The ponds are man-made, augmented through pumping and drainage, and only outlet when water levels reach an elevation to outlet to the intermittent watercourse. Alteration to Ponds C-F (i.e., infilling, realignment etc.) will potentially result in causing HADD or the death of fish by means other than fishing.

Unnamed Intermittent Watercourse

The intermittent watercourse which connects the ponds is an altered watercourse which receives flow from the ponds and drainage features that support the golf course during precipitation events, pumping from the Welland River and daily irrigation. Water from the drainage features and ponds discharge when they reach a level that water will flow into the outlets (culverts) and the connected channel. A concrete and rock barrier (>1.0 m in height) was observed upstream of the cart path along the south side of the golf course. This barrier appears to be part of the water control within the golf course lands and may hold back water to support water features and irrigation. It is unknown at this time why the barrier exists although it would limit the migration of any fish species from the Welland River upstream into the subject lands.

The unnamed intermittent watercourse that flows through the golf course property provides a seasonal flow regime and marginal fish habitat that is only suitable for warmwater tolerant species. This watercourse lacked natural habitat features including large woody debris, submergent macrophytes and substrate capable of providing quality habitat and refuge. The unnamed intermittent watercourse water depth during periods of low flow would prevent the movement of larger bodied fish through the watercourse from the Welland River. The unnamed intermittent watercourse is considered to be fish habitat as defined by the *Fisheries Act*, as it is frequented by fish as observed in April of 2018. However, these fish likely have entered the pond via pumping from the Welland River as the barrier to fish movement restricts their migration from downstream reaches of the watercourse to the section of the watercourse within the Study Area. It only contains water when the water levels in the ponds reach an elevation at which the water overflows into the watercourse. These water levels would only be achieved through the pumping for golf course irrigation, during a brief period of runoff after the irrigation events, and runoff during the spring freshet. Fish cannot migrate from the downstream reach of the unnamed intermittent watercourse into the proposed development area as the permanent barrier restricts upstream fish movement.

7.4 Significant Wildlife Habitat

Ecosites within the Study Area have been assessed as supporting seven different Significant Wildlife Habitat types. Additionally, four species of conservation concern were noted as being present during the completion of field studies. For detailed assessment of SWH, refer to Appendix I – SWH Screening and Section 5.5.

Waterfowl Stopover and Staging Areas - Aquatic

The deciduous swamp at ELC Polygon #26 was assessed as having moderate potential for WSSA-A habitat. No impacts to Polygon #26 are anticipated.

Bat Maternity Colonies

Bat Maternity Colonies are confirmed to be present within all FOD and SWD ecosites on the Study Area; this includes ELC Polygons #12, #13, #14, #23, #25, and #25 on Figure 2.

Anticipated impacts include direct removal of suitable habitat from some of these ecosite areas. Any project activities which may impact forested or treed swamp ecosites must first demonstrate no net negative impacts to BMC habitat in the local area as a result of proposed works. Compensation through the installation of bat boxes within the large blocks of the retained natural features (e.g. Polygon #26 or the onsite PSW) is recommended.

Turtle Wintering Areas

Turtle basking surveys were taken as proxy for over-wintering surveys. The ponds associated with survey stations TWT – 2, TWT – 3, and TWT – 5 were all confirmed to support five or more Midland Painted Turtles.

Direction has been sought by MNRF biologists to determine whether the irrigation ponds on the golf course can be considered SWH. In the event that these systems are considered SWH, it will have to be demonstrated that no negative impacts to TWA SWH or its ecological function will result from proposed works.

The ecological function of these ponds appears to be severely impaired due to the active golf course. Most areas have no emergent vegetation and manicured grass extending to the edge of water.

Reptile Hibernacula

The high prevalence of snakes around the area of ELC Polygon #15 indicates strong likelihood that the large mound associated with this ecosite supports reptile hibernacula (Figure 2).

This candidate SWH is anticipated to be impacted by proposed works through partial removal of habitat. Any activities that may impact the substrate of this ecosite should ensure that no net negative impacts to RH or overwintering snakes will result from proposed works within the local area. It is recommended that some of this material is salvaged and used in hibernacula to be installed in the two large Open Space blocks.

Colonially-nesting Bird Breeding Habitat – Tree/Shrub

It is anticipated but not confirmed from the results of breeding bird surveys and from analysis of available habitat features that ELC Polygon #26 has potential to support CBBH-TS SWH (Figure 2).

No impacts to ELC Polygon #26 are anticipated.

Amphibian Breeding Habitat – Woodland

It was confirmed through amphibian call surveys that ELC Polygon #26 supports ABH-W SWH (Figure 2). No impacts to ELC Polygon #26 are anticipated.

Terrestrial Crayfish

There is strong likelihood that wetter areas of the Study Area can support populations of terrestrial crayfish. The most likely candidates for TC SWH are directly adjacent to ELC Polygons #14 and #26. These areas within prescribed buffer zones for these wetland ecosites and are therefore not anticipated to be impacted by project works.

Special Concern and Rare Wildlife Species

Four species listed either as Special Concern under the ESA or with a subnational rank of S1-S3 were identified in habitats suitable to support breeding populations within the Study Area.

Black-crowned Night Heron

It was found that suitable habitat for Black-crowned Night Heron exists within ELC Polygon #26 (Figure 2). The species was observed within this habitat during breeding bird surveys. This species has been assessed a subnational rank of S3 (vulnerable) in Ontario; as a result, habitats that support the Black-crowned Night Heron are considered SWH. No impacts to ELC Polygon #26 are anticipated.

Eastern Wood-pewee

Eastern Wood-pewee are listed as Special Concern under the ESA. This species was noted as present during breeding bird surveys. Suitable habitat is present within the majority of treed ecosites on the Study Area (ELC Polygons #'s 4, 12, 13, 14, 23, 25, and 26).

Removal of Polygon #'s 12, 13, 23, and 25 will result in loss of a portion of their habitat. Any project activities which may impact treed ecosites must first demonstrate no net negative impacts to Eastern Wood-pewee habitat in the local area as a result of proposed works.

Wood Thrush

Wood Thrush are listed as Special Concern under the ESA. This species was noted as present during breeding bird surveys. Suitable habitat is present within the majority of treed ecosites on the Study Area.

Impacts are anticipated within a number of ecosites that may support this species. This includes direct removal of habitat. Any project activities which may impact treed ecosites must first demonstrate no net negative impacts to Wood Thrush habitat in the local area as a result of proposed works.

Snapping Turtle

Snapping Turtle are listed as Special Concern under the ESA. This species was noted present during turtle basking surveys within the system of open-aquatic features associated with TWT – 8, TWT – 1, TWT – 2, and TWT – 10 (Figure 7).

Direction has been sought by MNRF biologists to determine whether the irrigation ponds on the golf course can be considered SWH. In the event that these systems are considered SWH, it will have to be demonstrated that no negative impacts to Snapping Turtle habitat will result from proposed works.

Monarch

Monarch are listed as Special Concern under the ESA. Adults of this species were noted as present during vegetation surveys within ELC Polygons #16 and #17. Common Milkweed was frequently encountered in these areas.

Impacts are anticipated within both ELC Polygons and include direct removal of habitat. Removal of habitat during sensitive life-stages, especially where high numbers of Monarch caterpillars are present, must be avoided during project works.

7.5 Species at Risk

Barn Swallow

Barn Swallow are a medium-sized songbird designated as Threatened by the *ESA*. They live in close proximity to humans and their nesting habitats are frequently associated with human structures such as open barns, bridges, and culverts (MNRF, 2016). This species exhibits high fidelity to nesting structures year after year, so the removal of nesting sites can have highly adverse effects on the nesting population in an area.

Barn Swallow were noted as being present during breeding bird surveys as well as other spring/summer terrestrial surveys conducted on the golf course south of the railway at a concession stand (as labelled on Figure 6).

Recommendations to mitigate impacts to barn swallow habitat are described in Section 8.8.

7.6 Landscape Connectivity

The existing condition of the golf course has wooded areas, hedgerows, ponds and thickets that are no longer contiguous, since the clearing of most of the site for the development of the golf course (starting approximately in 2004). The majority of coverage by manicured turf, presence of golfers and maintenance equipment and adjacent residential and industrial land use is a significant barrier to providing meaningful connectivity functions. These functions include but are not limited to safe passage for wildlife and supporting and connecting core natural features.

The proposed development is not anticipated to impact the limited connectivity within the site.

8.0 Recommended Mitigation Measures

Extensive mitigation and restoration measures are be recommended that will provide significant improvements to wildlife habitat, connected vegetation communities and offset impacts to and loss of natural features.

8.1 Mitigation Masterplan

The mitigation masterplan is intended to conceptually illustrate measures that will benefit a number of components of the residual natural heritage features and functions in the post-development context. These measures, such as planting to re-establish portions of the original slough forest, will provide benefits to wildlife and enhance the function of the retained wooded and wetland features.

Forest Enhancement

An area north of the retained Polygon #26 is currently manicured turf in the proposed open space block. It is recommended that this area is planted with native species of upland trees and shrubs to provide the retained open water feature enhance screening, shading and natural cover that already is found along the south and west limits of the pond. Species will complement the vegetation found within the woodlot to create an overall larger forested block.

Hedgerow Enhancement

These vegetation communities are generally found at the outer limits of the site as well as within the proposed central park block. Existing hedgerows that will be subject to impacts reduction in width or length to accommodate the development including grading or roads, but retention of components is anticipated. Opportunities for select removal of invasive species (e.g. European Buckthorn), removal of high risk and poor condition trees and enhancement with native or non-invasive ornamental tree species interplanted with the existing trees can be considered in the identified areas.

Slough / Pit and Mound Restoration

The existing fairway that will be incorporated into the Open Space block provides an opportunity to greatly enhance wooded wetland habitat in the east portion of the site. The creation of pits and mounds (microtopography) within this area will complement the existing sloughs in adjacent vegetation communities. The created pits will be designed to seasonally retain water to support wildlife that depends on ephemeral wetlands for portions of their lifecycles. The area will be seeded with a mix of grasses and wildflowers tolerant of dry, mesic and wet soil conditions following the recontouring and then a mix of native trees and shrubs to colonize this currently open area.

Another area recommended for Pit and Mound Restoration is located east of the PSW, within Polygon #17, a graminoid-dominated meadow. The creation of ephemeral wetlands will enhance the existing PSW and promote its expansion through colonization of wetland woody species that will replace the seed mix as the community matures.

Buffer Enhancement

The 15 m buffer between the dripline of the retained woodlot and the medium density blocks of the development will be a combination of walking trail and naturalized buffer. This area is currently manicured turf and will be installed with native trees and shrubs to provide protection from the adjacent development. This enhancement will increase the overall size of the woodlot as the plantings mature and the woodlot vegetation is allowed to colonize the buffer through seed rain and root suckering.

Habitat Enhanced SWMP

A number of measures can be implemented within the two proposed SWMPs enhance habitat for wildlife that may use them. These ponds will be vegetated with native species of trees, shrubs and seed of wildflowers and grasses which can support refuge and food supply to beneficial wildlife with selection of the appropriate plant material and configurations (e.g. planting in modules rather than as individuals). Additional habitat enhancements that are recommended are:

- Turtle nesting structures and basking logs;
- Nesting boxes and platforms for birds; and
- Snake hibernacula.

Invasive Species Management

There are areas within the proposed Open Space block that contain significant representation of aggressive native species that reduce the existing habitat contribution and may undermine the effectiveness of proposed restoration efforts within the block.

Targeted European Buckthorn removal within retained portions of ELC polygon # 7 (north end of the woodlot) and ELC polygon #3 will allow the oaks and maples, and the understory and ground layer vegetation to reestablish.

Additional Enhancements

Further habitat enhancement can be achieved through implementing the following measures within the retained natural heritage features or integrating measures into new development elements:

- Bat boxes at the edges of treed areas within the Open Space block and retained PSW feature;
- Brush piles from materials cut from the site to provide refuge for small wildlife;
- Seeding of the realigned Conrail Drainage Channel with native grasses and wildflowers; and
- Removal of non-natural debris (including construction and household waste) from retained natural features and the Conrail Drain.

Based on the existing natural heritage conditions and the proposed development, general recommended best management practices and mitigation measures include, but are not limited to, the following:

- Disturbances must remain outside of the buffers established for the retained natural features including wetlands and woodlands.
- All efforts should be made to minimize the operation of equipment in and adjacent watercourses and drainage features, and construction should be completed efficiently to minimize the duration of such work.
- No refueling of equipment or stockpiling of material should occur within 30m of the watercourses or ditch areas and all stationary equipment should be equipped with drip pans to prevent/contain oil spills.
- Weather forecasts should be monitored, and construction should be scheduled during anticipated periods of low flow.
- Stockpiled material should be stored and stabilized away from all wetland areas and known fish habitat. All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering the water.
- Water quality impacts related to surface water runoff should be mitigated to avoid downstream and wetland impacts by controlling surface water runoff within the boundaries of the Study Area. Preparation, implementation and monitoring of an Erosion and Sediment Control (ESC) plan will be required.

- Changes to surface water runoff and infiltration on the subject lands has the potential to alter hydrology in the watercourse and wetlands. This water quality impairment could negatively affect the functions of the watercourse, including the type of wildlife species and habitats this corridor support. Water balance mitigation through the use of LID measures for stormwater management will be considered as part of the FSR, to maintain the existing conditions.

Specific mitigation for ecological features is described in subsequent sections below.

8.2 Aquatic Habitat

Ponds C-F and the intermittent watercourse are considered to be fish habitat as defined by the Fisheries Act. As such mitigation for these ponds and the watercourse (fish rescue, working within the in-water works timing window etc.) will be required for any alteration or infilling of the ponds.

The Conrail Drainage Channel is also considered to be fish habitat as defined by the Fisheries Act. The following mitigation measures will be implemented to minimize or avoid harm to fish and fish habitat during alteration of the Conrail Drainage Channel within the Study Area:

- All in-water works must not occur during the in-water works timing window applicable for the species of fish located within the Study Area (or otherwise directed by MNRF);
- All in-water work must occur in dry or de-watered conditions;
- Flow from upstream to downstream must be maintained at all times;
- Any fish within the Conrail Drainage Channel must be captured, identified, enumerated and released, alive, downstream of a location where in-water works are taking place. This fish salvage must be completed by a qualified professional and it must take place under a License to Collect Fish for a Scientific Purpose (LCFSP) issued by the MNRF;
- Stabilization works should follow the natural contour and profile of the watercourses, using natural channel design techniques (i.e. riverstone and plantings);
- Any stockpiled materials will be stored and stabilized away from the Conrail Drainage Channel;
- Vehicle and equipment refueling, and maintenance will be conducted a minimum of 30m away from the Conrail Drainage Channel;
- Any part of equipment entering the Conrail Drainage Channel should be free of fluid leaks and cleaned/degreased to prevent deleterious substances from entering the water;
- Only clean material free of fine particulates should be placed in the Conrail Drainage Channel;
- General erosion control notes will be part of the engineering drawings, to be provided to the contractor;

- Sediment and erosion control measures should be implemented prior to work and maintained during the work phase to prevent entry of sediment into the water;
- All sediment and erosion control measures should be inspected daily to ensure they are functioning properly and upgraded or maintained as required;
- If the sediment and erosion controls are not functioning properly no further work should occur until the sediment and/or erosion control problem is addressed;
- Sediment and erosion control measures should be left in place until all disturbed areas in the construction area are stabilized;
- All disturbed areas should be stabilized and re-vegetated as soon as possible following construction to preconstruction conditions or better; and
- All erosion and sediment controls should be removed once the disturbed area is deemed stable. Any accumulated silt or sediment will be removed with care once stabilization is established.

The ponds and intermittent watercourse will be impacted based on the proposed development and loss of water pumping that currently supports golf course operations. Since the ponds and connectivity to the intermittent watercourse was designed and constructed approximately 15 years ago, the existing conditions are man-made and maintained through golf course operations. Opportunities to transfer preferred species to the isolated ponds could provide future benefit to the overall ecology within the setbacks and parkland areas. It will be determined by DFO what level of compensation may be required during the Fisheries Act Authorization for loss of fish and fish habitat based on the proposed development plan.

8.3 Provincially Significant Wetlands

The PSW will be retained and protected within an open space block and a minimum 30 m buffer will be applied. Also, retention of the adjacent wooded features within the buffer, Polygon #16 (Cultural Thicket) and a portion of Polygon #15 (Cultural Woodland) will maintain the well-established natural protection from potential adjacent impacts and no additional mitigation is required.

8.4 Wetlands

Wetlands that will be retained along the east limit of the property and will be protected within the open space block with Polygon #26. Some of the lost function provided by the wetlands that are not being retained may be recreated within the manicured turf areas located within the Open Space block through the creation of a linear sloughs or pit/mound microtopography within the existing fairways and greens. These new features will enhance the block and, when combined with naturalization plantings, can create an eventual overall larger forested / swamp block.

Many of the open aquatic areas that act as water traps and are proposed for removal are subject to fluctuations in levels when irrigation of the turf is required. It is anticipated that

many habitat functions present within these open aquatic areas may be replicated within the two large stormwater blocks. Natural landscaping of the stormwater ponds will allow for the installation of trees, shrubs, seeding and aquatic plants that will provide better adjacent natural cover than the current condition of fertilized and mowed cool season grasses up to the edges of the water traps.

8.5 Significant Woodlands

Polygon #26, the slough forest / swamp, will be retained within a larger open space block and a buffer of 15 m will be applied where the feature is adjacent to proposed development. The buffer that is currently manicured turf will be enhanced with woody plantings of native trees and shrubs to reduce development impacts and create a larger naturalized area. Additional information about enhancement and restoration measures will be detailed in a landscape restoration plan.

8.6 Significant Wildlife Habitat

Ecosites on the Study Area have been assessed as supporting seven different Significant Wildlife Habitat types. Additionally, four species of conservation concern were noted as being present during the completion of field studies. For detailed assessment of SWH, refer to Appendix I - SWH Screening and Section 5.5.

Waterfowl Stopover and Staging Areas

ELC Polygon #26 was assessed to potentially support WSSA SWH. Mitigation of potential impacts to WSSA SWH include ESC measures during construction and implementing buffers to protect this feature in the long-term.

Bat Maternity Colonies

All ecosites with mature deciduous trees were confirmed to support bat habitat within the Study Area. Direct impacts to bats can be mitigated by limiting tree removal to outside of the active bat season (April 1 to October 31) to avoid mortality of roosting individuals. Impacts to BMC SWH can be mitigated in the local area by installing compensation habitat in the form of high-capacity bat boxes; bat boxes can be installed around areas where trees are to be conserved or around areas with high forage potential such as stormwater features. Quantity and extent of habitat compensation will depend on the amount and perceived quality of habitat to be removed as a result of project works.

Turtle Wintering Areas

It has been assessed that the ecological integrity of these ponds is low, due mostly to operations of the golf course. It is anticipated that the SWMP will replace potential turtle wintering areas that may be lost from the removal of the ponds within the development areas. Additional measures such as turtle nesting sites can be installed to support

additional turtle lifecycles such as nesting structures that will further encourage use of the ponds.

It is anticipated that this habitat improvement combined with wildlife salvage of existing ponds may result in a net-positive impact to turtle habitat within the local landscape.

Reptile Hibernacula

The large mound feature associated with ELC Polygon #15 is anticipated to support snake hibernacula functions. Regrading, removal, or other disruption of this feature will likely impact hibernacula habitat.

This area is not a natural hibernaculum, having been created as a result of past railway operations, and should not be considered SWH. This area may be an ideal candidate for constructed hibernacula to compensate for the removal of the old railway platform feature. It is recommended that the location of new hibernacula is installed in Open Space features as part of the detailed mitigation plans.

Colonially-nesting Bird Breeding Habitat – Tree/Shrub

ELC Polygon #26 was assessed to potentially support CBBH-TS. Mitigation of potential impacts to CBBH-TS include maintaining buffers and ESC measures around this ELC Polygon.

Amphibian Breeding Habitat – Woodland

ELC Polygon #26 was assessed to potentially support ABH-W. Mitigation of potential impacts to ABH-W include maintaining buffers and ESC measures/ temporary wildlife exclusion fencing around this ELC Polygon.

Terrestrial Crayfish

ELC Polygons #14 and #26 were assessed to potentially support TC habitat. Mitigation of potential impacts to terrestrial crayfish and habitats include maintaining buffers and ESC measures/wildlife exclusion fencing around these ELC Polygons.

Special Concern and Rare Wildlife Species

Four species listed either as Special Concern under the ESA or with a subnational rank of S1-S3 were identified in habitats suitable to support breeding populations within the Study Area.

Black-crowned Night Heron

ELC Polygon #26 was assessed to potentially support Black-crowned Night Heron. Mitigation of potential impacts to ABH-W include maintaining buffers and ESC measures/wildlife exclusion fencing around this ELC Polygon.

Eastern Wood-pewee

To mitigate negative impacts to this species through the loss of some of the treed communities, removal of trees should be restricted to outside the active breeding bird period (April 1st to August 31st). If tree removal is to take place within the active breeding bird window, trees must be assessed for the presence of active nests by a qualified avian biologist. In the event that active nests are found, project activities will cease until hatchlings have fledged.

Creation of newly treed areas, particularly east of Polygon #26, will eventually result in a larger, more contiguous Open Space feature for supporting this species.

Wood Thrush

To mitigate negative impacts to this species by removing FOD, SWD, CUW, and CUH ecosites, removal of trees should be restricted to outside the active breeding bird period (April 1st to August 31st). If tree removal is to take place within the active breeding bird window, trees must be assessed for the presence of active nests by a qualified avian biologist. In the event that active nests are found, project activities will cease until hatchlings have fledged.

Creation of newly treed areas, particularly east of Polygon #26, will eventually result in a larger, more contiguous Open Space feature for supporting this species, as well.

Snapping Turtle

Correspondence has been sought by MNRF biologists regarding whether the ponds on the golf course can be considered SWH. If the ponds are assessed as SWH, development will not be permitted within the system of ponds associated with Snapping Turtle habitat (TWT – 8, TWT – 1, TWT – 2, and TWT – 10 on Figure 7) unless no negative impacts may result to the feature or its ecological function.

It has been assessed that the ecological integrity of these ponds is low, due mostly to operations of the golf course. There is potential that habitat creation within the SWMPs combined with wildlife salvage of existing ponds may result in a net-positive impact to Snapping Turtle within the local landscape.

Monarch

Mitigation to Monarch butterflies should focus on avoidance of breeding habitat removal during periods where Monarch caterpillars are immobile and vulnerable to mortality. Habitat removal should take place outside of July 1 to September 31, where reasonable.

Inclusion of Common Milkweed seed within the seed mixes applied to the SWMPs and restoration areas will support new Monarch habitat on the site.

8.7 Migratory Birds

Recommended Mitigation Measures

Mitigation measures are recommended to protect breeding birds as follows:

- To reduce the risk of contravening the MBCA, timing constraints shall be applied to avoid vegetation clearing (including grubbing), during the breeding bird period - broadly from April 1st to August 31st for most species (regardless of the calendar year).
- Active nests (nests with eggs or young birds) of protected migratory birds, including SAR protected under the ESA, 2007, cannot be destroyed at any time of the year.
- If a nesting migratory bird (or SAR protected under the ESA) is identified within, or adjacent to the construction site (or during operations and maintenance activities), and the activities are such that continuing works in that area would result in a contravention of the MBCA or ESA all activities will stop. At that time, the Contract Administrator (with assistance from an Avian Biologist) shall discuss mitigation measures with the City and Region. The MNRF and Environment Canada will also be contacted to discuss mitigation options. The Contract Administrator shall instruct the Contractor on how to proceed based on the mitigation measures established through discussions with the City and Region, the MNRF and/or Environment Canada.

8.8 SAR Mitigation Measures

Barn Swallow

Barn Swallow and their habitats are protected in Ontario. Removal of their habitat associated with the southern concession stand can only occur after all provincial requirements are met, including registration and construction of a compensation structure in accordance with barns swallow regulations under the ESA, 2007.

Structures with known active nests should not be removed during the active breeding season (April 1 - August 31). If demolition occurs after April 1st, a qualified avian ecologist will need to survey the structures prior to demolition to ensure that no breeding

has commenced. If active nests are found, demolition will need to be delayed until all birds have fledged.

If work must occur during the active season for Barn Swallow, birds should be prevented from building nests or entering the structure prior to the commencement of the active season. This can be accomplished by ensuring that all entry and exit points are completely sealed off using plastic tarping or other durable material. Regular monitoring (i.e., every 1-2 days) of the outside of the structures should be completed to ensure that Barn Swallow do not attempt to nest on the exterior of the structures. Structures where active nests exist cannot be removed until it has been confirmed that the nests are no longer active.

A compensation structure with at least 5 cups will be installed before the breeding season or before the barns are removed. The structure design will meet all requirements under the ESA.

To avoid disturbances to birds from foot traffic during the active season, it is recommended that the structure be placed in an open area that minimizes disturbances from vehicles and foot traffic. It should also ideally be placed within close proximity (300 m) of suitable foraging area (such as open aquatic or wetland systems). The location of the structure will be confirmed with the MNRF.

9.0 Recommended Monitoring Program

Monitoring for impacts to natural heritage features and functions and the successful implementation of associated mitigation that occur prior to, during and post construction is required for ensuring conformity with policies and protection of vegetation communities and wildlife. The monitoring program must be revisited as part of the detailed design and consider integration with other components of the development design (e.g. stormwater management).

Monitoring Type	Personnel Responsible	Frequency	Maintenance
Prior to Construction			
Erosion control measures and natural feature protection fence	Environmental monitor	Following installation	Fix deficiencies
During Construction			
Plantings (damage)	Environmental monitor	As needed, when adjacent construction	Replace plantings following damage
Erosion control measures and	Environmental monitor	Weekly or after significant weather	Fix measures immediately

Monitoring Type	Personnel Responsible	Frequency	Maintenance
natural feature protection fence		events, as specified by the ESC plan	
Post Construction			
Hazard tree inspection	Project arborist	Once, prior to resident occupancy and conveyance of lands to public ownership	Remove hazardous limbs and trees that may cause damage or injury
Plantings (workmanship and establishment)	Project landscape architect	Once, following substantial completion Additional visits based on warranty requirements	Replace plantings
Invasive species control	Project ecologist	Will vary, depending on species and methods used	Monitor to determine effectiveness of control
Throughout Construction			
Wildlife	All workers	When encounters occur	Ensure exclusion measures are in place

10.0 Summary and Conclusions

Burnside has been retained by the proponent to complete an EIS for proposed Niagara Village residential development at the former Thundering Waters Golf Course in Niagara Falls. This EIS provides a comprehensive analysis and discussion of the natural features within the Study Area.

One section of the Niagara Falls Slough Forest Complex PSW exists within the southwest portion of the golf course. No woodlands were assessed to meet the regional or municipal size definition for significant features, though it was determined that ELC Polygon #26 may meet the ecological functionality of a Significant Woodland.

There are four candidate and two confirmed SWHs within the Study Area (Waterfowl Stopover and Staging Areas – Aquatic, Bat Maternity Colonies (confirmed), Turtle Wintering Areas, Reptile Hibernacula, and Colonially-nesting Bird Breeding Habitat, Species of Conservation Concern – Black-crowned Night Heron, Eastern Wood-pewee, Great Egret, Wood Thrush, Snapping Turtle, Monarch (Confirmed).

Three SAR were identified as present during surveys (Barn Swallow, Wood Thrush, Monarch).

Aquatic surveys determined that Type 1 and Type 2 fish habitat are not present within the Study Habitat. Type 3 (Marginal) habitat is present within the ponds, the Conrail Drainage Channel, and the unnamed intermittent watercourse within the Golf Course. It was confirmed by DFO that SAR mussel habitat is not present in the Conrail Drainage Channel.

The proposed development has been reviewed and anticipated impacts have been provided. A Mitigation Masterplan has been provided that will support and enhance the natural heritage functions of the retained natural heritage features. Mitigation recommendations specific to habitats and species have also been provided.

It is Burnside's opinion that no significant or net impacts to the PSW, potentially Significant Woodland and wildlife will occur with the implementation of the mitigation measures. Re-evaluation of impacts and mitigation will be required if changes to the development occur and as future studies such as the Tree Preservation Plan allow for further review of natural features at the detailed design stage.

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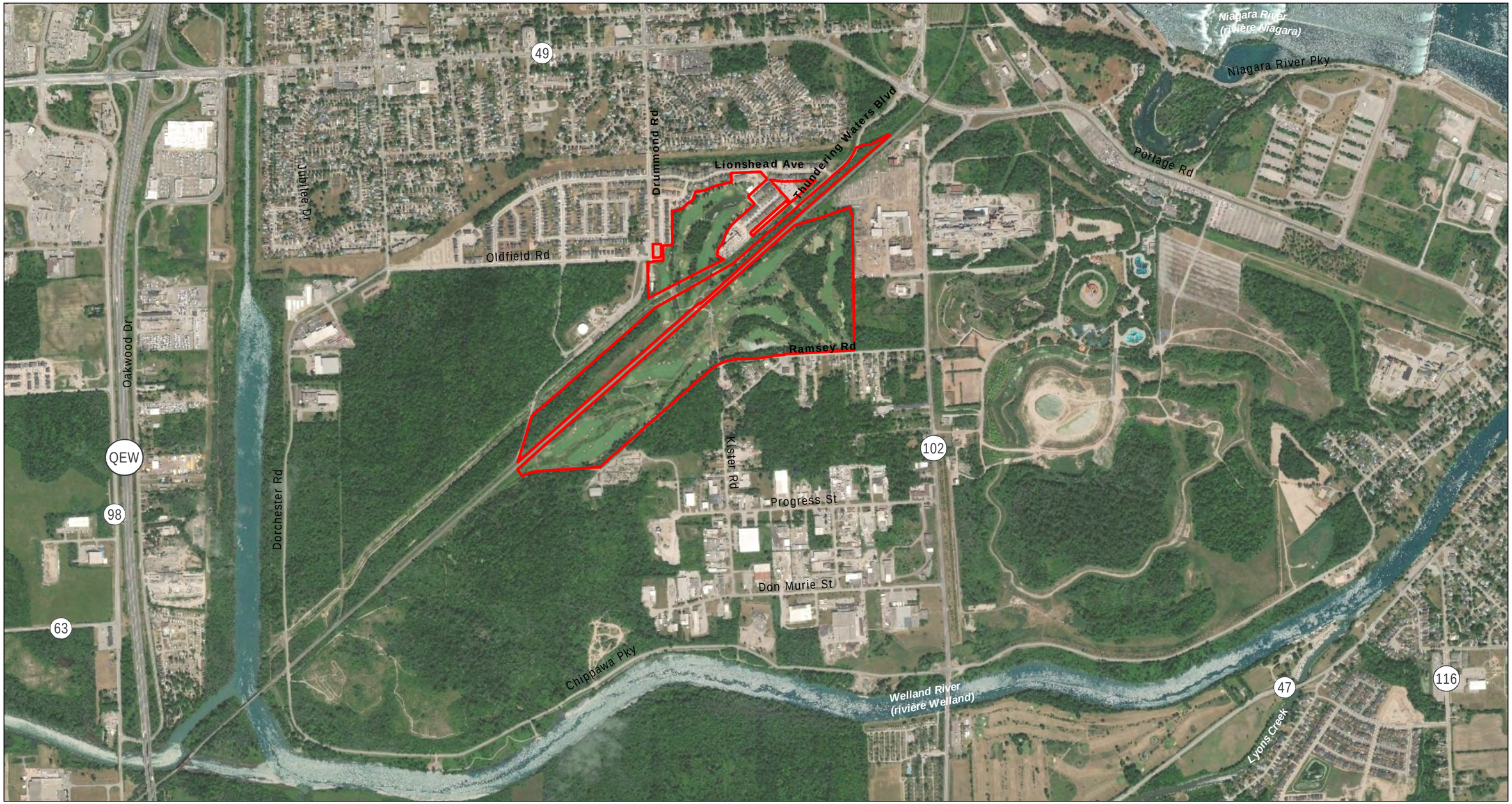
Figures



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Metres

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Site Boudary

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Figure Title

NIAGARA VILLAGE EIS
STUDY AREA

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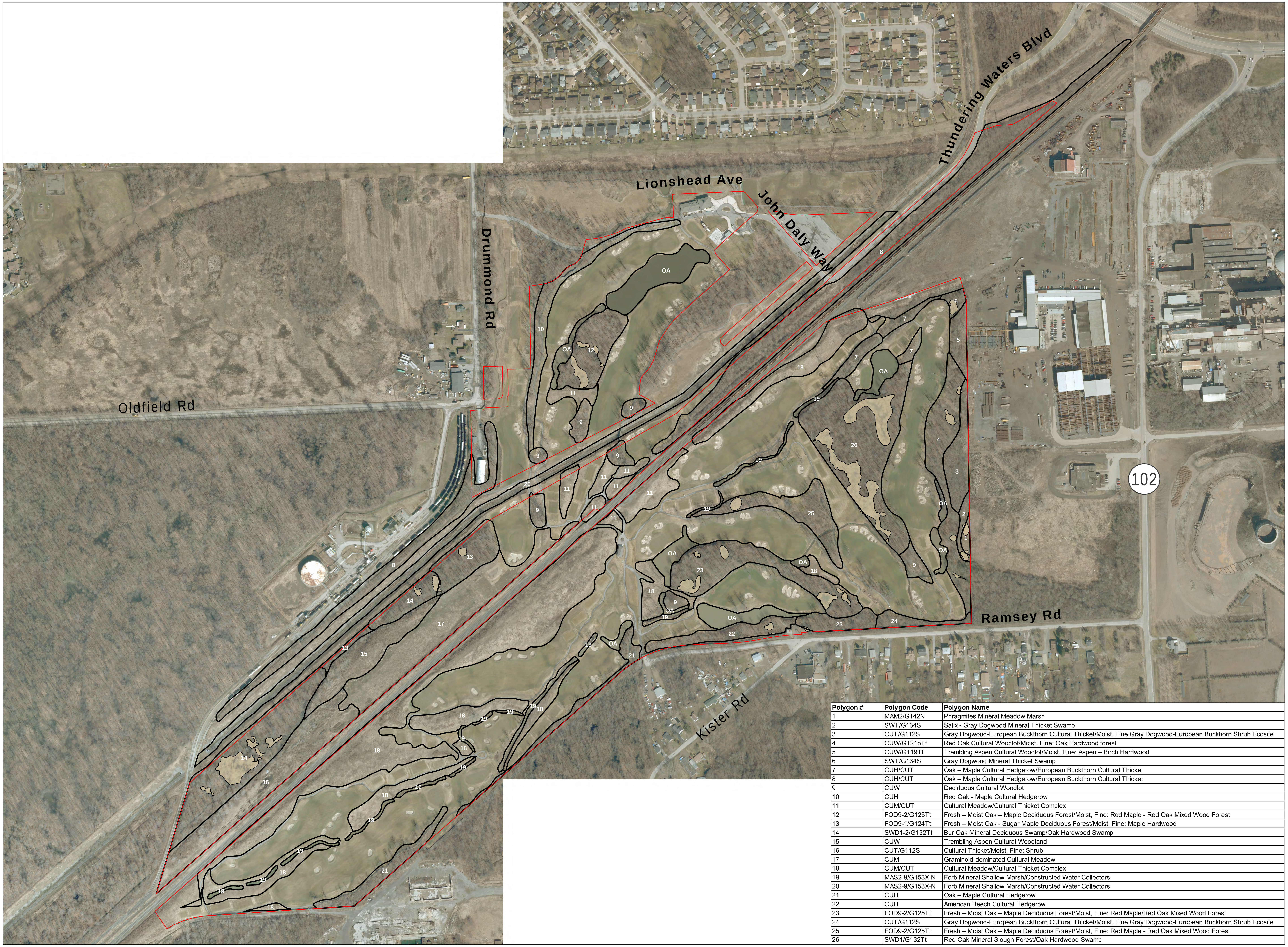

Site Boudary
ELC Boundary
Vernal Pool

Polygon #	Polygon Code	Polygon Name
1	MAM2/G142N	Phragmites Mineral Meadow Marsh
2	SWT/G134S	Salix - Gray Dogwood Mineral Thicket Swamp
3	CUT/G112S	Gray Dogwood-European Buckthorn Cultural Thicket/Moist, Fine Gray Dogwood-European Buckthorn Shrub Ecosite
4	CUW/G121oTt	Red Oak Cultural Woodlot/Moist, Fine: Oak Hardwood forest
5	CUW/G119Tt	Trembling Aspen Cultural Woodlot/Moist, Fine: Aspen – Birch Hardwood
6	SWT/G134S	Gray Dogwood Mineral Thicket Swamp
7	CUH/CUT	Oak – Maple Cultural Hedgerow/European Buckthorn Cultural Thicket
8	CUH/CUT	Oak – Maple Cultural Hedgerow/European Buckthorn Cultural Thicket
9	CUW	Deciduous Cultural Woodlot
10	CUH	Red Oak - Maple Cultural Hedgerow
11	CUM/CUT	Cultural Meadow/Cultural Thicket Complex
12	FOD9-2/G125Tt	Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple - Red Oak Mixed Wood Forest
13	FOD9-1/G124Tt	Fresh – Moist Oak - Sugar Maple Deciduous Forest/Moist, Fine: Maple Hardwood
14	SWD1-2/G132Tt	Bur Oak Mineral Deciduous Swamp/Oak Hardwood Swamp
15	CUW	Trembling Aspen Cultural Woodland
16	CUT/G112S	Cultural Thicket/Moist, Fine: Shrub
17	CUM	Graminoid-dominated Cultural Meadow
18	CUM/CUT	Cultural Meadow/Cultural Thicket Complex
19	MAS2-9/G153X-N	Forb Mineral Shallow Marsh/Constructed Water Collectors
20	MAS2-9/G153X-N	Forb Mineral Shallow Marsh/Constructed Water Collectors
21	CUH	Oak – Maple Cultural Hedgerow
22	CUH	American Beech Cultural Hedgerow
23	FOD9-2/G125Tt	Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple/Red Oak Mixed Wood Forest
24	CUT/G112S	Gray Dogwood-European Buckthorn Cultural Thicket/Moist, Fine Gray Dogwood-European Buckthorn Shrub Ecosite
25	FOD9-2/G125Tt	Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple - Red Oak Mixed Wood Forest
26	SWD1/G132Tt	Red Oak Mineral Slough Forest/Oak Hardwood Swamp

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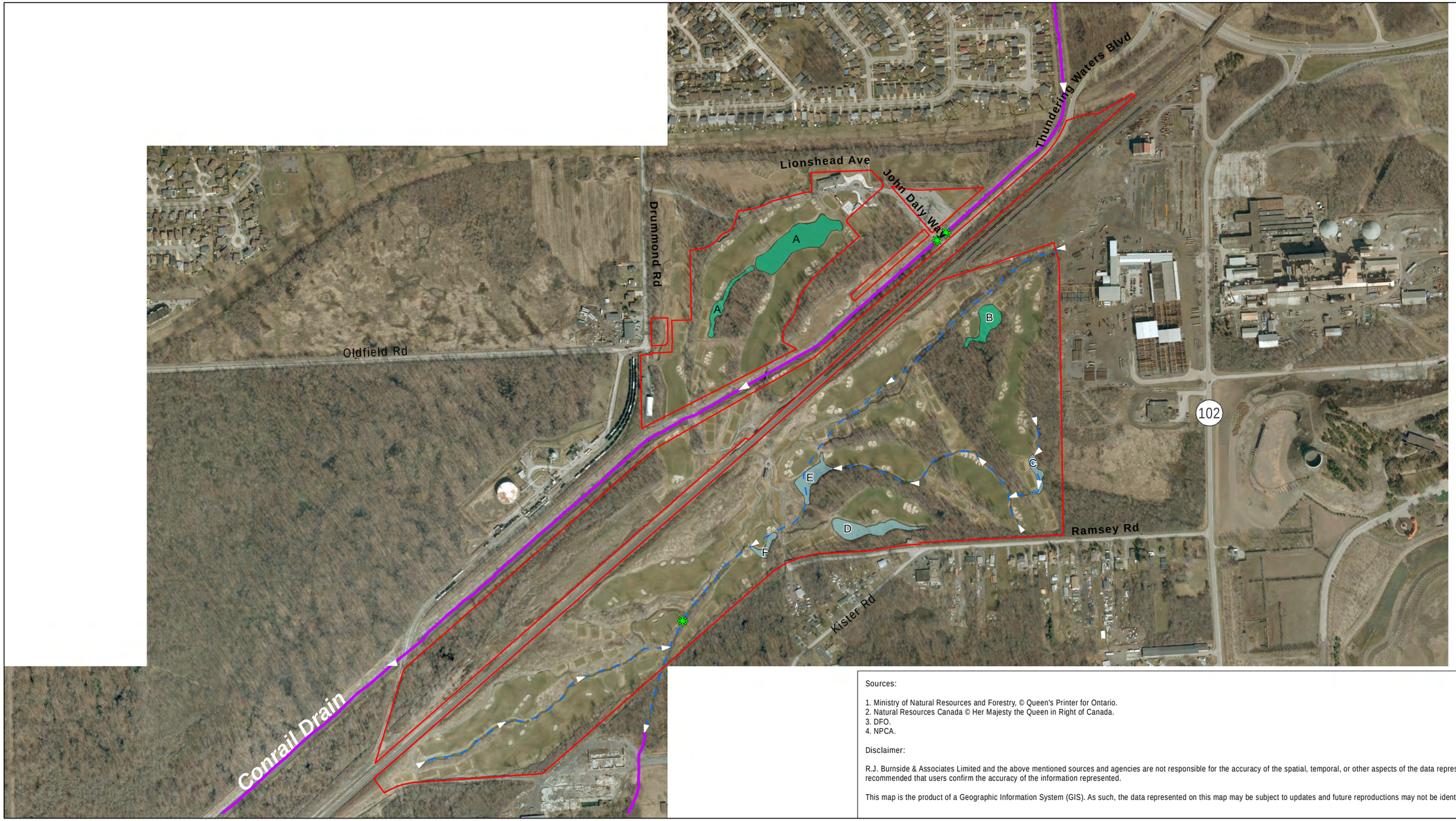

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Barrier to Fish Movement

Intermittent Watercourse*

Site Boudary

Area within which one or more species listed under SARA may be found:

Extirpated, Endangered or Threatened (DFO, 2017)

Offline Pond*

Online Pond*

**Watercourse or Waterbody is a potential fish habitat*

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Figure Title

NIAGARA VILLAGE EIS
WATERCOURSES AND PONDS

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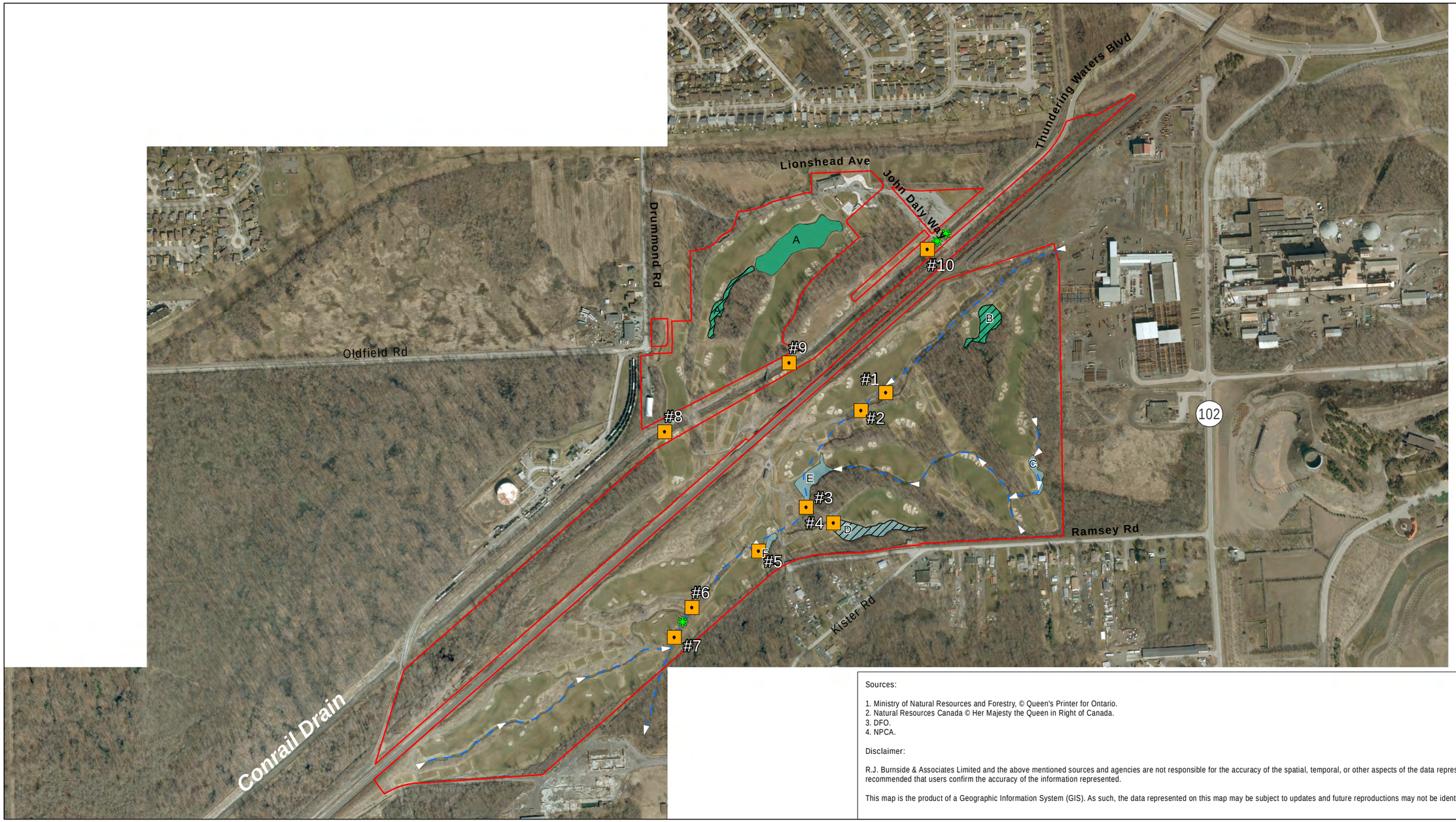

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- Minnow Trap Location
- Barrier to Fish Movement
- Intermittent Watercourse*
- Site Boudary
- Offline Pond*
- Online Pond*
- Pond Seined

*Watercourse or Waterbody is a potential fish habitat

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Figure Title

NIAGARA VILLAGE EIS
FISH SAMPLING LOCATIONS

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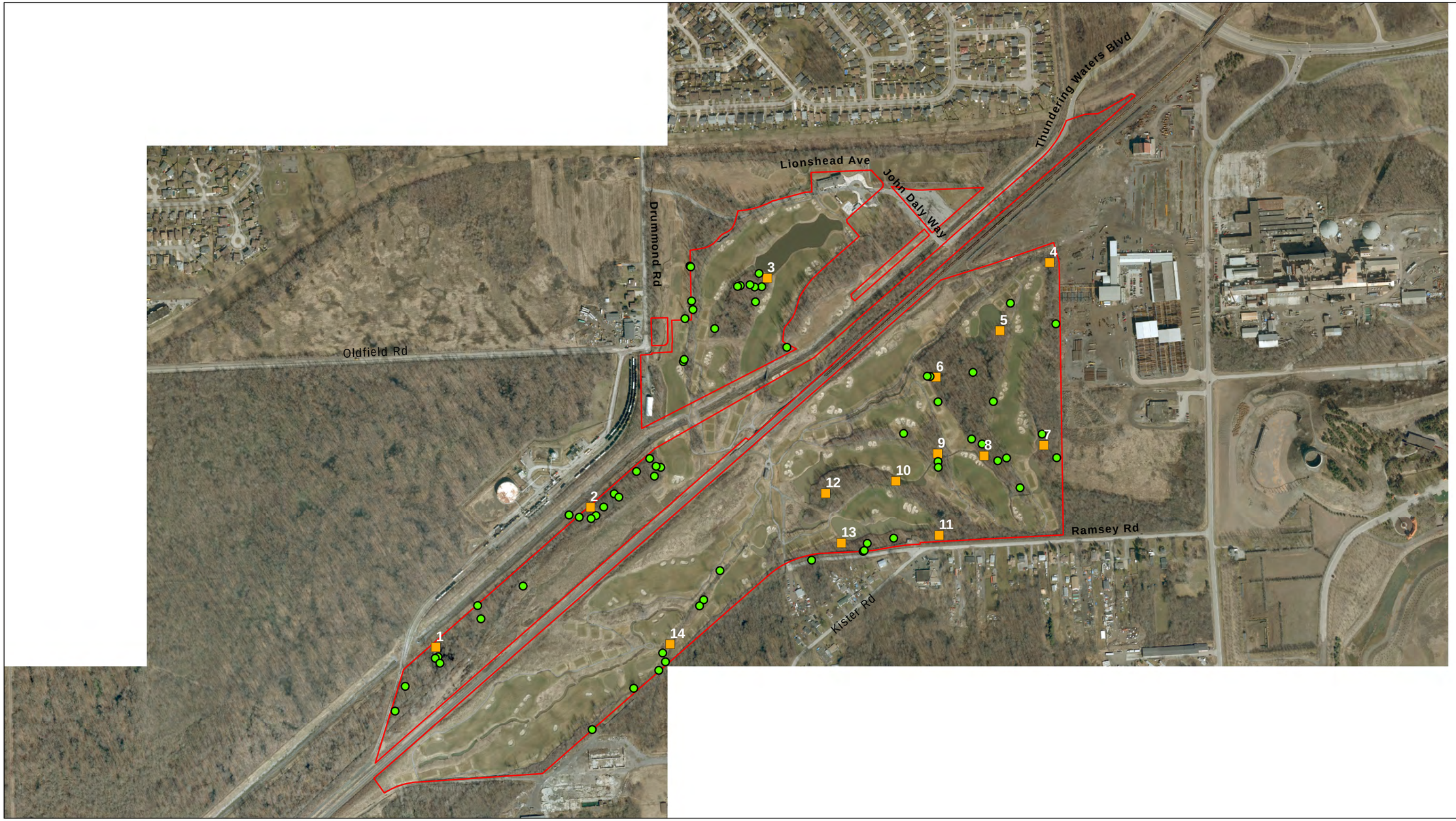

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Metres

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- Proposed Acoustic Recording Stations
- Candidate Leaf-off BMH Trees
- Site Boudary

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Figure Title

NIAGARA VILLAGE EIS

CANDIDATE LEAF-OFF BMH TREES AND ACOUSTIC MONITORING LOCATIONS

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BARS Nest

Site Boundary

Avian Study Quadrant

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Figure Title

NIAGARA VILLAGE EIS
AVIAN STUDIES

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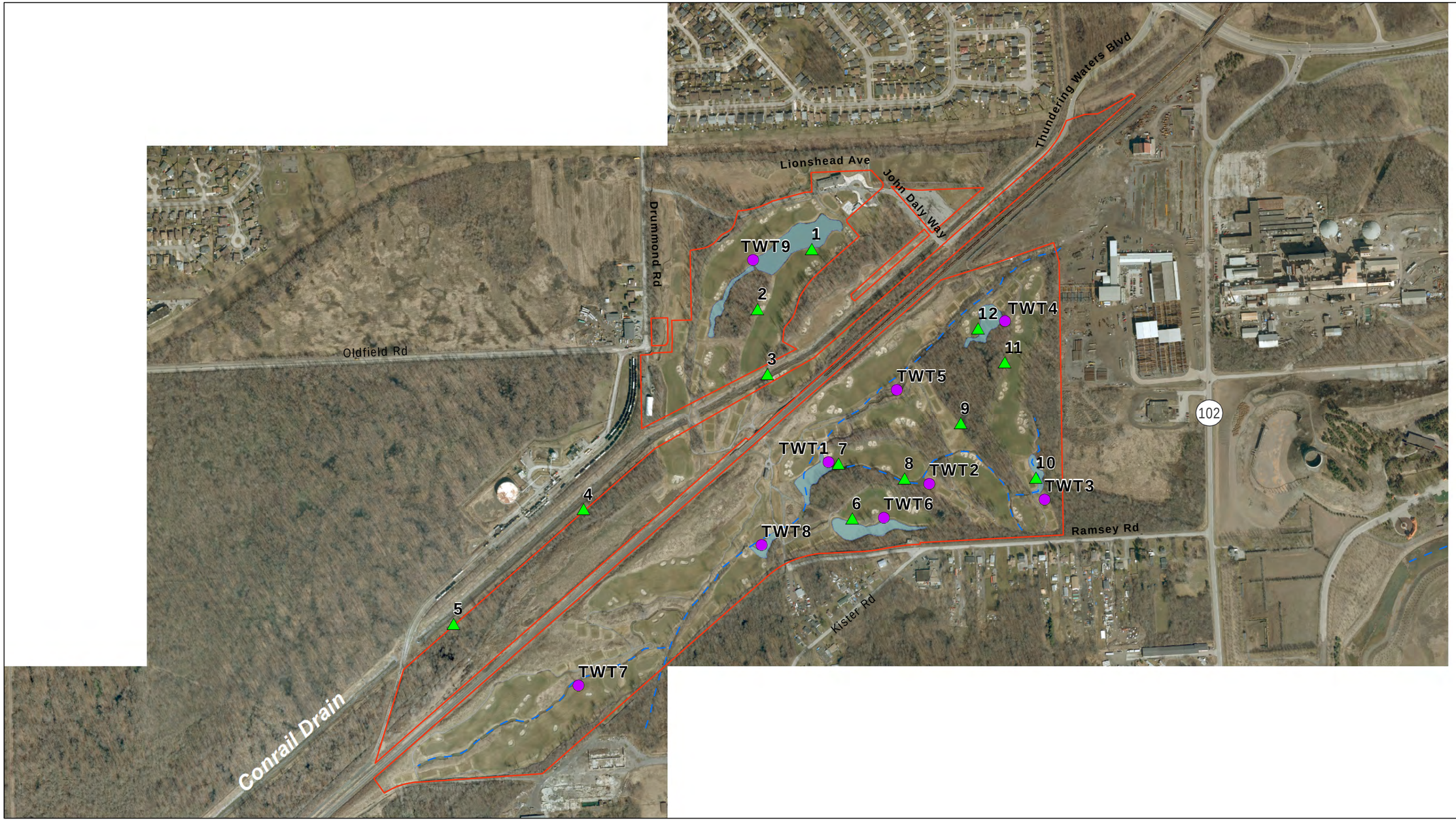

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- Turtle Basking Survey Location
- Amphibian Breeding Survey Location
- Site Boundary
- Intermittent Watercourse
- Pond

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Figure Title

NIAGARA VILLAGE EIS
HERPETOFAUNAL SURVEY LOCATIONS

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LEGEND

PROPERTY BOUNDARY

RESTORATION TREATMENTS

- BUFFER ENHANCEMENT
- FOREST ENHANCEMENT
- HABITAT ENHANCED SWMP
- HEDGEROW ENHANCEMENT
- SLOUGH / PIT AND MOUND RESTORATION

N

0 50 100 150 200 Metres

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Figure Title: NIAGARA VILLAGE EIS

RESTORATION CONCEPT

Client: 2592693 ONTARIO INC.

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Client: 2592693 ONTARIO INC.

Figure Title: NIAGARA VILLAGE EIS

PROPOSED DEVELOPMENT

Drawn	Checked	Date	Figure No.
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Appendix A

Environmental Impact Study Terms of Reference

R.J. Burnside & Associates Limited 292 Speedvale Avenue West Unit 20 Guelph ON N1H 1C4 CANADA
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July 26, 2018

Via: Email

Ms. Cara Lampman
Watershed Planner
Niagara Peninsula Conservation Authority
250 Thorold Rd. West; 3rd Floor
Welland ON L3C 3W2

Dear Ms. Lampman:

Re: EIS Terms of Reference (Itemized)
Niagara Village Development – Niagara Falls
Project No.: 300041230.0000

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by Prenix Associates International Limited Consulting Engineers to prepare an Environmental Impact Study (EIS) in support of preliminary engineering services for the Niagara Village residential development project at the existing Thundering Waters Golf Club (TWGC).

The subject lands are located on part of Township Lots 189, 195, 215, 216, and 217, parts of Lots 1 and 3, Plan 4, Blocks A, B, C, and F, Plan 9, and part of several road allowances within the geographic Township of Stamford, Regional Municipality of Niagara. The property is located east of Drummond Road extending southeast across the Canadian Pacific Railway line to Ramsey Road, and consists of approximately 150 acres of land. The location of the subject properties is outlined below in red on Figure 1.

2.0 Understanding of the Project

The property is located just north of the Welland River and southwest of Niagara Falls. Site conditions are dominated by the existing 18-hole TWGC. Two watercourses have been identified on the site. The first, Conrail Drain, runs parallel and adjacent to the train tracks that run SW-NE on the northern portion of the property. The second watercourse is an unnamed intermittent tributary to Welland River that runs through the middle of the golf course. In addition, multiple ponds associated with the TWGC can be found throughout the property.

Natural areas on the site are predominantly remnant deciduous forest, although some wetland areas and slough forest-swamp are present as well. A section of swamp at the southwestern extent of the subject lands is designated as part of the Niagara Falls Slough Forest Wetland Complex Provincially Significant Wetland; this area was identified during the updated

delineation of the complex undertaken by Dougan and Associates in the Thundering Waters Secondary Plan (Dougan & Associates, 2016).

The Niagara Village lands are located within the Niagara River sub-watershed and regulated by the Niagara Peninsula Conservation Authority (NPCA) watersheds through O. Reg. 155/06.

3.0 Methodology

The EIS study will follow the Niagara Region's Natural Resources Policies (Section 7, Official Plan) and EIS Guidelines (Version 1, September 2012).

Phase 1: Development of Terms of Reference

Burnside proposes the following Terms of Reference (ToR) for submission to the City of Niagara Falls. These ToR will guide and dictate the focus and content of the final EIS document:

1. Description of the site context: Land use of surrounding properties, subwatershed, etc.
2. Policies and regulations applicable to the site by agencies including NPCA, Niagara Escarpment Commission, The City of Niagara Falls, The Region of Niagara (RoN), the Province of Ontario, and the Federation of Canada.
3. Identification and analysis of regulated Natural Heritage Features as mapped by the MNRF, NPCA, as well as municipal and regional Official Plans.
4. Identification and assessment of fish and fish habitat and how it supports Commercial, Recreational and Aboriginal fisheries as regulated by the Department of Fisheries and Oceans Canada (DFO).
5. Description of site based on Ecological Land Classification (a single season botanical inventory) to be completed by October prior to frost. Incidental wildlife observations will be recorded; Linkages will also be mapped, where present.
6. Refinement and survey of wetland boundaries within the site that have been identified as PSW by the MNRF and NPCA, in collaboration with the appropriate authority representatives.
7. Formal wildlife/habitat evaluations to be completed include visual searches for amphibian breeding habitat, targeted avian surveys, breeding anuran call surveys, and aquatic habitat surveys as necessary.
8. Species at Risk (SAR) (e.g., Butternut) or SAR habitat (e.g., bat maternity habitat) will be identified, mapped and reported, as determined necessary with input from NPCA, DFO and/or MNRF area biologists.
9. Investigation of the site for species identified within NHIC records based on suitable habitat or presence (seasonally evident).
10. Description of the rezoning application and draft plan.
11. Investigation of the conformity of the rezoning application with policy. This investigation will include the implementation of buffers and setbacks applied to protected natural heritage features.
12. Identification of anticipated impacts and recommended guidelines to mitigation.

Mapping will be comprised of aerial photography, the proposed draft plan, vegetation communities (including wetland features), top(s) of bank (as determined by the survey), buffers, and mitigation areas.

Phase 2: Preparation of the Environmental Impact Study

The EIS will include three tasks, as follows:

Task 1 – Field Investigations and Baseline Conditions

In our experience on similar projects, the following work should be sufficient to adequately document conditions and assess impacts:

Completion of an on-site, three season ecological inventory which includes:

- Amphibian surveys (three surveys to be completed in the last two weeks of April, May and June);
- Amphibian microhabitat search (one survey to be completed in the months of May and June);
- Bat Maternity Habitat surveys through two seasons (leaf-off between October 2017-March 2018; leaf-on in May 2018);
- Breeding bird survey (two site visits between May 21 and July 3, 2018, conducted a minimum of one week apart);
- Spring ephemeral survey (to be completed Spring 2018).
- Ecological Land Classification (to be completed Spring and Summer 2018);
- Delineation of the wetland boundaries in conjunction with MNRF and/or NPCA mapping (To be completed Summer 2018);
- Delineation and assessment of vernal pools within forested areas (Completed on April 23, 2018);
- Detailed fish and fish habitat survey (watercourses and ponds) (to be completed Summer 2018);
- Identification and characterization of wildlife habitats (to be completed Summer/Fall 2018);
- Delineation of the precise boundaries of the Natural Heritage System (NHS) as designated by NPCA, municipal, and regional mapping (to be completed Summer/Fall 2018); and,
- Incidental wildlife observations.

If any species at risk or associated protected habitats are identified, additional studies, reporting and permitting may be necessary. A scope of work will be established, as required.

Task 2 – Impact Assessment

The EIS will provide an analysis of potential impacts, recommend mitigation measures to minimize impacts and demonstrate conformity with all applicable natural heritage policies.

Specifically, the EIS will include the following:

- A demonstration that the development is consistent with the requirements of the City of Niagara Falls and Niagara Region Official Plans, and the Provincial Policy Statement (PPS);

- Identification of the significance of natural features at a Provincial and Regional level, with reference to standard information sources from the Province and NPCA;
- Identification of the environmental features potentially impacted by development;
- Assessment of potential impacts to Species at Risk as well as the identification of any permitting requirements or necessary mitigation measures as defined through MNRF correspondence;
- A general description of the proposed development;
- Identification of the interdependencies between and relationships within the NHS boundaries and the water resources regime;
- A demonstration of how and where the proposed development can proceed without negative impact on the NHS and features and their ecological functions, and identification of mitigation and enhancement measures, where necessary;
- A general assessment of potential impacts associated with the proposed development; and
- Conclusions demonstrating conformity with all applicable natural heritage policies, including the City of Niagara Falls Official Plan, the Niagara Region Official Plan, and the PPS.

Task 3 – Reporting

All findings will be summarized in a report, complete with figures. A draft report will be provided to the Client for review prior to submission. Our draft report can only be finalized upon the completion of civil engineering reports, etc., as their findings need to be incorporated into our impact assessment.

Based on the findings of the impact assessment, mitigation and monitoring measures will be identified and outlined as appropriate to the site-specific features and functions of the NHS. Some of the proposed development features may represent a significant improvement to existing conditions on the site, especially with respect to the existing aquatic habitat conditions. The goal will be to establish a net improvement to the NHS as part of the proposed development.

4.0 Staff Qualifications

Nicholle Smith, B.A., EMPD is a Senior Terrestrial Ecologist and Project Manager with over 20 years of experience in both the public and private sectors. The first five years of her career were spent in the public sector as a Natural Heritage Ecologist at Credit Valley Conservation and the remainder of her career has been spent in consulting. Nicholle has extensive knowledge of the policies applicable to her area of expertise including local, municipal and regional planning policies within the Ontario multi-tier system, including the Provincial Policy Statement and Planning Act. Nicholle has completed a number of Sub-watershed and Settlement and Servicing Master Plans, as well as numerous Environmental Impact Statements, Environmental Implementation Reports, Natural Heritage evaluations within the Oak Ridges Moraine Planning area and Greenbelt Planning area and Level 1 and 2 Natural Environment Reports for applications under the Aggregate Resources Act. She has been a member on the Ontario Stone, Sand and Gravel Land Use and Rehabilitation committees over the past nine years. In addition, she has acted as the terrestrial ecology lead on several Environmental Assessments under the Canadian Environmental Assessment Act over the past five years. Nicholle was part of the pilot project team that developed the field methodologies for the Ecological Land Classification System for Southern Ontario and is certified by OMNR to complete Wetland Evaluations. Nicholle's field skills include both floral and faunal inventories

and natural community classification and delineation and mapping. More recently Nichole has had specific experience with the Endangered Species Act permit application and approvals process, including field surveys and compliance applications.

Christopher Pfohl, C.E.T., E.P., Can-CISEC is a Senior Aquatic Ecologist with a broad range of experience in Canada and Internationally, with over 20 years of professional experience in Environmental Assessment, habitat restoration, natural channel design, mitigation development, environmental monitoring and protection, fisheries and fish habitat assessment, Species at Risk, hydrology and hydrogeology. Mr. Pfohl has extensive knowledge of the Fisheries Act, Endangered Species Act, and Species at Risk Act, as it pertains to the protection of aquatic and terrestrial Species at Risk (SAR) and critical habitat. Mr. Pfohl is the Aquatics Group Team Lead responsible for project management, report review, permitting for various government agencies (MNRF, DFO, Conservation Authorities), impact assessment, environmental and construction monitoring, developing and conducting aquatic life salvage, aquatic assessment, and the preparation of technical reports based on project requirements. Mr. Pfohl has undertaken projects for a multitude of clients throughout the energy, transportation, mining and development sectors from local to remote areas of Canada and overseas. He is responsible for liaison with government agencies, First Nations, large corporations, and stakeholders.

Kevin Butt B.Sc. (Env.), Eco. Rest. Cert. is a ISA Certified Arborist & CAN-CISEC certified Terrestrial Ecologist with 19 years of experience working in the environmental industry, preparing natural heritage and tree studies throughout southern Ontario. These studies have been completed for both public and private clients and range in scale from single residential lots to major road corridor and multi-developer block plans. Study deliverables include environmental impacts studies, arborist reports, tree risk assessments, tree appraisals, preservation plans, ravine stewardship plans and mitigation designs. Kevin has liaised with government and review agencies, property owners and their agents and the general public through the approval stages, including project initiation and scope determination, public information centres, submission of materials, implementation assistance, construction supervision and monitoring.

Hannah Maciver, B.E.S. is a Terrestrial Ecologist with 13 years' experience in the environmental field, both in the private and public sector. She has been responsible for the collection, management and analysis of a broad range of environmental data associated with various project assignments, and in conducting visual and auditory surveys for avifauna, herpetofauna and mammals, with a focus on Species at Risk (SAR). Hannah is well versed in the implementation of the provincial *Endangered Species Act* (ESA 2007) and the federal *Species at Risk Act* (SARA), including the preparation and submission of permit applications and approvals and ensuring compliance with associated regulations and Acts. This work has included preparation and submission of data and triaging SAR presence for projects through liaison with MNRF and Conservation Authorities. Hannah is experienced in conducting targeted SAR surveys for species such as Barn Swallow, Bobolink, Eastern Meadowlark, Chimney Swift, Eastern Whip-poor-will, Jefferson Salamander, Blanding's Turtle, Northern Map Turtle, Eastern Massassauga, Eastern Milksnake, American Badger, and bats. Previous and current works include participation in the terrestrial natural environment component of projects for the public and private sector, including Class Environmental Assessments (Preliminary and Detail Design), Metrolinx Transit Project Assessment Process (TPAP), Route Planning Studies, Environmental Impact Studies, bridge and culvert rehabilitations/replacements, federal renewable energy projects, and environmental inspection and monitoring programs.

Peter De Carvalho, B.Sc. (Bio), Rest Cert, B.Eng. (Env), EIT, has a wide set of practical skills including knowledge of floral and faunal identification techniques, training in the Ecological Land Classification system, the Ontario Wetland Evaluation System, herpetofaunal survey techniques, and certification with the Ontario Benthos Biomonitoring Network. He has had exposure to numerous Ecoregions and associated plant communities throughout Canada, both with R. J. Burnside and Associates Limited and previously with the Alberta Biodiversity Monitoring Institute. Peter has also had experience working with such sustainable designs as intensive and extensive green roofing, bio-swale systems, and constructed storm water wetlands. Through his second degree in Environmental Engineering, he has had experience using numerous modelling applications; this has resulted in a working familiarity with programs such as HEC-RAS, HY-8, EPA SWMM, Civil3D, ArcGIS, and GeoStudios. His education has emphasized both surface and groundwater hydrology and storm water management for municipal and natural systems, and he has created and worked with models for floodplain drainage basins, municipal storm water ponding and management, and low-impact development for urban areas. He also has field experience with ground and surface-water monitoring and data collection.

Matthew Moote, H. B.Sc., CAN-CISEC-IT is an Aquatic Ecologist that has a dynamic skill set applicable to the natural sciences. In his time with Burnside he has gained experience working on a variety of projects in Ontario, including Environmental Assessments for transportation, water supply and waste management, Municipal Drain Improvements and Dam removal. During his education at Trent University and Durham College and through his employment with Burnside, Matthew has developed a good understanding and knowledge of the Fisheries Act, Endangered Species Act, and Species at Risk Act, as it pertains to the protection of fish and fish habitat including aquatic Species at Risk (SAR) and critical habitat. He is responsible for obtaining a variety of regulatory approvals from government agencies including the Department of Fisheries and Oceans (DFO), Conservation Authorities, Ministry of Natural resources and Forestry (MNRF), and municipalities. Matthew coordinates and conducts ecological constraints analysis, environmental field investigations, aquatic habitat assessments, fish salvage, construction inspection and monitoring and the preparation of technical reports based on project requirements. He has also been responsible for natural heritage background review, permit/approval acquisition, technical report writing and erosion and sediment control inspections. Matthew has undertaken projects for a multitude of clients throughout the transportation, agricultural and development sectors across southern Ontario. He is responsible for liaison with government agencies, large corporations, and stakeholders.

Nicholle, Chris, Kevin, Hannah, Peter, and Matthew will be assisted by Burnside support staff, including GIS specialists and administrative support. CVs for all staff are available upon request.

5.0 Schedule

Field data collection has commenced for the site, as discussed above. We anticipate the report can be submitted upon completion of all of the required field data collection and studies, which will be determined both by the City-approved TOR and the appropriate timing windows for the surveys, as referenced above. Correspondence with NPCA, MNRF and DFO biologists, as well as any permitting requirements under the ESA, may result in delays to completion of the study.

Upon completion of the final EIS report, the document will be forwarded to agency staff for review and approval.

We trust the scope outlined above meets the requirements for an EIS for this location and welcome any additional feedback. We assume that regulation and NHS mapping will be available for use as part of the EIS submission to determine constraints associated with the site. We would like access to this mapping at the earliest possible date as convenient for planning staff.

Please do not hesitate to contact the undersigned if you have any questions or concerns.

Yours truly,

R.J. Burnside & Associates Limited

Peter De Carvalho, B.Sc. (Bio), Rest Cert, B.Eng. (Env), EIT
Terrestrial Ecologist/Engineering Assistant
PD:sd

Niagara Village Proposed ToR.docx
26/07/2018 10:47 AM

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: 0	Scale Factor: 0.99960

N

True North

0 250 500 750 1,000

Metres

Site Boundary

Sources:
1. Image Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
2. MNRF
3. NPCA

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Client

PRENIX ASSOCIATES INTERNATIONAL LTD

Figure Title

NIAGARA VILLAGE

STUDY AREA

Drawn	Checked	Date	Figure No.
HN	CP	2018/04/19	1
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Appendix B

Background Species Assessment (NHIC, OBBA, ORAA, DFO)

NHIC

Grid Square 17PH5570

Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	Last Obs Date	EO ID
SPECIES	Deerberry	Vaccinium stamineum	S1	THR	THR	1896-05-26	2072
SPECIES	Violet Bush-clover	Lespedeza frutescens	S1			1891-07-16	2119
SPECIES	Appalachian Sedge	Carex appalachica	S2S3			1882-07-05	3028
SPECIES	Slim-flowered Muhly	Muhlenbergia tenuiflora	S2			1849-08-02	3463
SPECIES	Slim-flowered Muhly	Muhlenbergia tenuiflora	S2			8/20/1948	3466
SPECIES	Timber Rattlesnake	Crotalus horridus	SX	EXP	EXP	8/22/1941	4960
SPECIES	White Wood Aster	Eurybia divaricata	S2S3	THR	THR	1893	5076
SPECIES	Pink Milkwort	Polygala incarnata	S1	END	END	1823	11200
SPECIES	American Water-willow	Justicia americana	S2	THR	THR	9/16/2010	11378
RESTRICTED SPECIES	RESTRICTED SPECIES	RESTRICTED SPECIES				1943-PRE	16487
SPECIES	Northern Bobwhite	Colinus virginianus	S1	END	END	1900	21085
SPECIES	Stiff Gentian	Gentianella quinquefolia	S2			1894-09-03	33028
SPECIES	Hairy-jointed Meadow-parsnip	Thaspium barbinode	SH			7/4/1901	60111
SPECIES	American Chestnut	Castanea dentata	S1S2	END	END	1901-00-00	92206
SPECIES	Eastern Pondmussel	Ligumia nasuta	S1	END	END	6/16/1988	115599
SPECIES	Round Hickorynut	Obovaria subrotunda	S1	END	END	1931-00-00 (?)	115674

Grid Square 17PH5469

Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	Last Obs Date	EO ID
SPECIES	Deerberry	Vaccinium stamineum	S1	THR	THR	1896-05-26	2072
SPECIES	Round-leaved Greenbrier	Smilax rotundifolia	S2	THR	THR	2008-00-00	3548
SPECIES	Timber Rattlesnake	Crotalus horridus	SX	EXP	EXP	8/22/1941	4960
SPECIES	Pink Milkwort	Polygala incarnata	S1	END	END	1823	11200
SPECIES	Northern Bobwhite	Colinus virginianus	S1	END	END	1900	21085
SPECIES	Churchmouse Threeawn Grass	Aristida dichotoma	S1			9/13/1995	32852
SPECIES	Stiff Gentian	Gentianella quinquefolia	S2			1894-09-03	33028
SPECIES	Deer-tongue Panicgrass	Dichanthelium clandestinum	S2			9/13/1995	65007
SPECIES	Eastern Flowering Dogwood	Cornus florida	S2?	END	END	6/19/1986	95005
SPECIES	Eastern Pondmussel	Ligumia nasuta	S1	END	END	6/16/1988	115599
SPECIES	Round Hickorynut	Obovaria subrotunda	S1	END	END	1931-00-00 (?)	115674

Grid Square 17PH5569

Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	Last Obs Date	EO ID
SPECIES	Timber Rattlesnake	Crotalus horridus	SX	EXP	EXP	8/22/1941	4960
SPECIES	Pink Milkwort	Polygala incarnata	S1	END	END	1823	11200
SPECIES	Northern Bobwhite	Colinus virginianus	S1	END	END	1900	21085
SPECIES	Stiff Gentian	Gentianella quinquefolia	S2			1894-09-03	33028
SPECIES	Deer-tongue Panicgrass	Dichanthelium clandestinum	S2			9/13/1995	65007
SPECIES	Eastern Flowering Dogwood	Cornus florida	S2?	END	END	6/19/1986	95005
SPECIES	Eastern Pondmussel	Ligumia nasuta	S1	END	END	6/16/1988	115599
SPECIES	Round Hickorynut	Obovaria subrotunda	S1	END	END	1931-00-00 (?)	115674

Grid Square 17PH5468

Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	Last Obs Date	EO ID
SPECIES	Timber Rattlesnake	Crotalus horridus	SX	EXP	EXP	8/22/1941	4960
SPECIES	Northern Bobwhite	Colinus virginianus	S1	END	END	1900	21085
SPECIES	Churchmouse Threeawn Grass	Aristida dichotoma	S1			9/13/1995	32852
SPECIES	Stiff Gentian	Gentianella quinquefolia	S2			1894-09-03	33028
SPECIES	Biennial Gaura	Oenothera gaura	S3			9/13/1995	33691
SPECIES	Deer-tongue Panicgrass	Dichanthelium clandestinum	S2			9/13/1995	65007
SPECIES	Eastern Flowering Dogwood	Cornus florida	S2?	END	END	6/19/1986	95005
SPECIES	Eastern Pondmussel	Ligumia nasuta	S1	END	END	6/16/1988	115599
SPECIES	Round Hickorynut	Obovaria subrotunda	S1	END	END	1931-00-00 (?)	115674

Grid Square 17PH5670 (Niagara River)

Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	Last Obs Date	EO ID
SPECIES	Black-crowned Night-heron	Nycticorax nycticorax	S3B,S3N			6/4/1991	129
SPECIES	Deerberry	Vaccinium stamineum	S1	THR	THR	1896-05-26	2072
SPECIES	Violet Bush-clover	Lespedeza frutescens	S1			1891-07-16	2119
SPECIES	Appalachian Sedge	Carex appalachica	S2S3			1882-07-05	3028
SPECIES	Slim-flowered Muhly	Muhlenbergia tenuiflora	S2			1849-08-02	3463
SPECIES	Slim-flowered Muhly	Muhlenbergia tenuiflora	S2			8/20/1948	3466
SPECIES	Timber Rattlesnake	Crotalus horridus	SX	EXP	EXP	8/22/1941	4960
SPECIES	White Wood Aster	Eurybia divaricata	S2S3	THR	THR	1893	5076
SPECIES	Pink Milkwort	Polygala incarnata	S1	END	END	1823	11200
SPECIES	Red Mulberry	Morus rubra	S2	END	END	1890-pre	11351
SPECIES	American Water-willow	Justicia americana	S2	THR	THR	9/16/2010	11378
RESTRICTED SPECIES	RESTRICTED SPECIES	RESTRICTED SPECIES				1943-PRE	16487
SPECIES	Broad Beech Fern	Phegopteris hexagonoptera	S3	SC	SC	1890's	17278
SPECIES	Northern Bobwhite	Colinus virginianus	S1	END	END	1900	21085
SPECIES	Black-crowned Night-heron	Nycticorax nycticorax	S3B,S3N			1991	23025
SPECIES	Stiff Gentian	Gentianella quinquefolia	S2			1894-09-03	33028
SPECIES	Black Gum	Nyssa sylvatica	S3			6/3/1949	60032
SPECIES	Hairy-jointed Meadow-parsnip	Thaspium barbinode	SH			7/4/1901	60111
SPECIES	American Chestnut	Castanea dentata	S1S2	END	END	1901-00-00	92206
SPECIES	Spotted Wintergreen	Chimaphila maculata	S2	END	THR	1895	92208
SPECIES	Swamp Rose-mallow	Hibiscus moscheutos	S3	SC	SC	2004	92209
SPECIES	American Columbo	Frasera caroliniensis	S2	END	END	1890's	92417
SPECIES	Eastern Flowering Dogwood	Cornus florida	S2?	END	END	6/19/1986	95005
SPECIES	Lake Sturgeon (Great Lakes - Upper S	Acipenser fulvescens pop. 3	S2	THR	THR	2011-pre	104195
SPECIES	Butternut	Juglans cinerea	S2?	END	END	7/12/2007	115326
SPECIES	Fawnsfoot	Truncilla donaciformis	S2	END	END	6/30/1934	115572
SPECIES	Kidneyshell	Ptychobranchus fasciolaris	S1	END	END	6/20/1934	115622
SPECIES	Round Pigtoe	Pleurobema sintoxia	S1	END	END	6/20/1934	115767
SPECIES	Golden-eye Lichen	Teloschistes chrysophthalmus	S2S3			1896-Pre	116045
SPECIES	Fan Moss	Forsstroemia trichomitria	S1			1867-Pre	116318

NHIC Combined

Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	Last Obs Date	EO ID
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SPECIES	Eastern Flowering Dogwood	Cornus florida	S2?	END	END	6/19/1986	95005
SPECIES	Lake Sturgeon (Great Lakes - Upper St. Lawrence River population)	Acipenser fulvescens pop. 3	S2	THR	THR	2011-pre	104195
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SPECIES	Fawnsfoot	Truncilla donaciformis	S2	END	END	6/30/1934	115572
SPECIES	Eastern Pondmussel	Ligumia nasuta	S1	END	END	6/16/1988	115599
SPECIES	Kidneyshell	Ptychobranchus fasciolaris	S1	END	END	6/20/1934	115622
SPECIES	Round Hickorynut	Obovaria subrotunda	S1	END	END	1931-00-00 (?)	115674
SPECIES	Round Pigtoe	Pleurobema sintoxia	S1	END	END	6/20/1934	115767
SPECIES	Golden-eye Lichen	Teloschistes chrysophthalmus	S2S3			1896-Pre	116045
SPECIES	Fan Moss	Forsstroemia trichomitria	S1			1867-Pre	116318

OBBA

Searched September 20, 2017

17PH56

11	17PH56	Canada Goose	FY	CONF	1	Marcia Jacklin	1	3.85	0.3846	1
11	17PH56	Wood Duck	P	PROB	1	Brad Clements				
11	17PH56	Mallard	FY	CONF	1					
11	17PH56	Ring-necked Pheasant	T	PROB	1		1	3.85	0.0385	1
11	17PH56	Wild Turkey	FY	CONF	1					
11	17PH56	Green Heron	A	PROB	1	Marcia Jacklin				
11	17PH56	Turkey Vulture	H	POSS	1					
11	17PH56	Northern Harrier	H	POSS	1	Marcia Jacklin				
11	17PH56	Cooper's Hawk	FY	CONF	1	John E Black				
11	17PH56	Red-tailed Hawk	FY	CONF	1	Marcia Jacklin	2	7.69	0.0769	1
11	17PH56	American Kestrel	H	POSS	1	Marcia Jacklin				
11	17PH56	Virginia Rail	P	PROB	1	Marcia Jacklin				
11	17PH56	Sora	H	POSS	1	Marcia Jacklin				
11	17PH56	Sandhill Crane	FY	CONF	1					
11	17PH56	Killdeer	FY	CONF	1	Marcia Jacklin	4	15.4	0.1923	1
11	17PH56	Rock Pigeon	NY	CONF	1	Marcia Jacklin	1	3.85	0.1538	1
11	17PH56	Spotted Sandpiper	FY	CONF	1		3	11.5	0.1154	1
11	17PH56	Upland Sandpiper	FY	CONF	1	Marcia Jacklin				
11	17PH56	Common Snipe	T	PROB	1	John E Black				
11	17PH56	American Woodcock	FY	CONF	1	Brad Clements				
11	17PH56	Mourning Dove	FY	CONF	1	Marcia Jacklin	4	15.4	0.2308	1
11	17PH56	Yellow-billed Cuckoo	CF	CONF	1	Marcia Jacklin				
11	17PH56	Black-billed Cuckoo	FY	CONF	1	Marcia Jacklin				
11	17PH56	Eastern Screech-Owl	S	POSS	1	Marcia Jacklin				
11	17PH56	Great Horned Owl	AE	CONF	1					
11	17PH56	Chimney Swift	S	POSS	1	John E Black				
11	17PH56	Ruby-throated Hummingbird	NE	CONF	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Belted Kingfisher	H	POSS	1	John E Black				
11	17PH56	Red-bellied Woodpecker	FY	CONF	1					
11	17PH56	Downy Woodpecker	FY	CONF	1					
11	17PH56	Hairy Woodpecker	NY	CONF	1	Marcia Jacklin				
11	17PH56	Northern Flicker	H	POSS	1	Marcia Jacklin				
11	17PH56	Eastern Wood-Pewee	FY	CONF	1	Marcia Jacklin	3	11.5	0.1154	1
11	17PH56	Alder Flycatcher	T	PROB	1	Marcia Jacklin				
11	17PH56	Willow Flycatcher	T	PROB	1		2	7.69	0.1154	1
11	17PH56	Least Flycatcher	S	POSS	1	Marcia Jacklin				
11	17PH56	Eastern Phoebe	AE	CONF	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Great Crested Flycatcher	FY	CONF	1		2	7.69	0.1923	1
11	17PH56	Eastern Kingbird	CF	CONF	1	Marcia Jacklin				
11	17PH56	Yellow-throated Vireo	S	POSS	1	2 atlassers				
11	17PH56	Warbling Vireo	T	PROB	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Red-eyed Vireo	T	PROB	1	Marcia Jacklin	4	15.4	0.1538	1
11	17PH56	Blue Jay	CF	CONF	1	Marcia Jacklin	7	26.9	0.4231	1
11	17PH56	American Crow	AE	CONF	1	John E Black	5	19.2	0.2308	1
11	17PH56	Horned Lark	NE	CONF	1	Marcia Jacklin	2	7.69	0.0769	1
11	17PH56	Purple Martin	FY	CONF	1	Marcia Jacklin	6	23.1	0.2692	1
11	17PH56	Tree Swallow	AE	CONF	1	Marcia Jacklin	3	11.5	0.1923	1
11	17PH56	Northern Rough-winged Swallow	H	POSS	1	John E Black				
11	17PH56	Cliff Swallow	AE	CONF	1	Marcia Jacklin				
11	17PH56	Barn Swallow	FY	CONF	1	Marcia Jacklin	4	15.4	0.1923	1
11	17PH56	Black-capped Chickadee	FY	CONF	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Tufted Titmouse	T	PROB	1		1	3.85	0.0385	1
11	17PH56	Red-breasted Nuthatch	T	PROB	1					
11	17PH56	White-breasted Nuthatch	T	PROB	1		1	3.85	0.0385	1
11	17PH56	Brown Creeper	T	PROB	1					
11	17PH56	Carolina Wren	S	POSS	1	John E Black				
11	17PH56	House Wren	AE	CONF	1		3	11.5	0.1538	1
11	17PH56	Blue-gray Gnatcatcher	FY	CONF	1	Marcia Jacklin				
11	17PH56	Eastern Bluebird	AE	CONF	1	Marcia Jacklin				
11	17PH56	Veery	S	POSS	1	Marcia Jacklin	1	3.85	0.0769	1
11	17PH56	Wood Thrush	NE	CONF	1	John E Black	3	11.5	0.1154	1
11	17PH56	American Robin	FY	CONF	1	Marcia Jacklin	17	65.4	1.2308	1
11	17PH56	Gray Catbird	FY	CONF	1	Marcia Jacklin	4	15.4	0.1538	1
11	17PH56	Northern Mockingbird	FY	CONF	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Brown Thrasher	H	POSS	1	John E Black				
11	17PH56	European Starling	AE	CONF	1	Marcia Jacklin	12	46.2	1.7308	1
11	17PH56	Cedar Waxwing	P	PROB	1	Marcia Jacklin	3	11.5	0.1923	1
11	17PH56	Blue-winged Warbler	T	PROB	1	Marcia Jacklin				
11	17PH56	Yellow Warbler	CF	CONF	1	Marcia Jacklin	14	53.9	0.8077	1
11	17PH56	American Redstart	T	PROB	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Ovenbird	T	PROB	1	Marcia Jacklin				
11	17PH56	Northern Waterthrush	H	POSS	1	John E Black	1	3.85	0.0385	1
11	17PH56	Common Yellowthroat	T	PROB	1	Marcia Jacklin	9	34.6	0.4615	1
11	17PH56	Hooded Warbler	S	POSS	1	Marcia Jacklin				
11	17PH56	Eastern Towhee	T	PROB	1	Marcia Jacklin	2	7.69	0.0769	1
11	17PH56	Chipping Sparrow	CF	CONF	1		2	7.69	0.0769	1
11	17PH56	Field Sparrow	T	PROB	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Vesper Sparrow	T	PROB	1		1	3.85	0.0385	1
11	17PH56	Savannah Sparrow	CF	CONF	1	Marcia Jacklin	12	46.2	0.6154	1
11	17PH56	Grasshopper Sparrow	T	PROB	1	Marcia Jacklin				
11	17PH56	Song Sparrow	CF	CONF	1	Marcia Jacklin	16	61.5	1.2692	1
11	17PH56	Swamp Sparrow	T	PROB	1	Marcia Jacklin	4	15.4	0.2692	1
11	17PH56	Scarlet Tanager	T	PROB	1					
11	17PH56	Northern Cardinal	FY	CONF	1	Marcia Jacklin				
11	17PH56	Rose-breasted Grosbeak	FY	CONF	1	Marcia Jacklin	2	7.69	0.1154	1
11	17PH56	Indigo Bunting	CF	CONF	1	Marcia Jacklin	3	11.5	0.1154	1
11	17PH56	Bobolink	T	PROB	1	Marcia Jacklin	3	11.5	0.2308	1
11	17PH56	Red-winged Blackbird	CF	CONF	1	Marcia Jacklin	17	65.4	2.0385	1
11	17PH56	Eastern Meadowlark	T	PROB	1	Marcia Jacklin	3	11.5	0.1154	1
11	17PH56	Common Grackle	CF	CONF	1	Marcia Jacklin	9	34.6	0.5769	1
11	17PH56	Brown-headed Cowbird	NE	CONF	1	John E Black	3	11.5	0.1154	1
11	17PH56	Orchard Oriole	S	POSS	1	John E Black				
11	17PH56	Baltimore Oriole	NY	CONF	1	Marcia Jacklin	3	11.5	0.1538	1
11	17PH56	House Finch	T	PROB	1					
11	17PH56	American Goldfinch	P	PROB	1	Marcia Jacklin	9	34.6	0.4231	1
11	17PH56	House Sparrow	AE	CONF	1	Marcia Jacklin	4	15.4	0.2308	1

Searched April 10, 2018

Region	Square	Species	Breeding Evidence			Point Counts			
			Max BE	Categ	#Sq	Atlasser Name	#PC	%PC	Abun	#Sq
11	17PH57	Canada Goose	FY	CONF	1	Gene De St. Croix	1	4	0.08	1
11	17PH57	Wood Duck	P	PROB	1	Gene De St. Croix				
11	17PH57	Mallard	FY	CONF	1	Gene De St. Croix				
11	17PH57	Ring-necked Pheasant	FY	CONF	1	Gene De St. Croix	1	4	0.04	1
11	17PH57	Wild Turkey	FY	CONF	1	Gene De St. Croix				
11	17PH57	Pied-billed Grebe	P	PROB	1	Gene De St. Croix				
11	17PH57	Green Heron	H	POSS	1	Gene De St. Croix				
11	17PH57	Black-crowned Night-Heron	NY	CONF	1	John E Black	3	12	0.12	1
11	17PH57	Turkey Vulture	FY	CONF	1	Gene De St. Croix	1	4	0.04	1
11	17PH57	Northern Harrier	P	PROB	1	Gene De St. Croix				
11	17PH57	Cooper's Hawk	FY	CONF	1	Gene De St. Croix				
11	17PH57	Red-tailed Hawk	NY	CONF	1	Gene De St. Croix				
11	17PH57	American Kestrel	P	PROB	1	Gene De St. Croix				
11	17PH57	Peregrine Falcon	NY	CONF	1	Ted Armstrong				
11	17PH57	Killdeer	FY	CONF	1	Gene De St. Croix	1	4	0.08	1
11	17PH57	Rock Pigeon	FY	CONF	1	Gene De St. Croix	4	16	0.48	1
11	17PH57	Spotted Sandpiper	NY	CONF	1	Gene De St. Croix				
11	17PH57	American Woodcock	FY	CONF	1	Gene De St. Croix				
11	17PH57	Ring-billed Gull	NY	CONF	1	John E Black	15	60	35.64	1
11	17PH57	Herring Gull	NY	CONF	1	John E Black				
11	17PH57	Common Tern	NY	CONF	1	John E Black	1	4	0.08	1
11	17PH57	Mourning Dove	AE	CONF	1		9	36	0.8	1
11	17PH57	Black-billed Cuckoo	S	POSS	1	John E Black				
11	17PH57	Eastern Screech-Owl	T	PROB	1	John E Black				
11	17PH57	Great Horned Owl	AE	CONF	1	Gene De St. Croix				
11	17PH57	Common Nighthawk	T	PROB	1	Gene De St. Croix				
11	17PH57	Chimney Swift	AE	CONF	1	John E Black	3	12	0.16	1
11	17PH57	Ruby-throated Hummingbird	P	PROB	1	Gene De St. Croix				
11	17PH57	Belted Kingfisher	H	POSS	1	Gene De St. Croix				
11	17PH57	Red-bellied Woodpecker	CF	CONF	1	Gene De St. Croix	2	8	0.12	1
11	17PH57	Downy Woodpecker	FY	CONF	1	Gene De St. Croix	4	16	0.16	1
11	17PH57	Hairy Woodpecker	NY	CONF	1	Gene De St. Croix				
11	17PH57	Northern Flicker	FY	CONF	1	Gene De St. Croix	2	8	0.08	1
11	17PH57	Eastern Wood-Pewee	FY	CONF	1	Gene De St. Croix	1	4	0.12	1
11	17PH57	Acadian Flycatcher	S	POSS	1	John E Black				
11	17PH57	Alder Flycatcher	T	PROB	1	Gene De St. Croix				
11	17PH57	Willow Flycatcher	T	PROB	1	Gene De St. Croix	3	12	0.12	1
11	17PH57	Least Flycatcher	T	PROB	1	Gene De St. Croix				
11	17PH57	Eastern Phoebe	P	PROB	1	Gene De St. Croix				
11	17PH57	Great Crested Flycatcher	T	PROB	1	Gene De St. Croix	2	8	0.08	1
11	17PH57	Eastern Kingbird	NY	CONF	1	Brad Clements				
11	17PH57	Warbling Vireo	T	PROB	1	Gene De St. Croix	4	16	0.2	1
11	17PH57	Red-eyed Vireo	NY	CONF	1	Gene De St. Croix	4	16	0.2	1
11	17PH57	Blue Jay	CF	CONF	1	Gene De St. Croix	5	20	0.4	1
11	17PH57	American Crow	CF	CONF	1	Gene De St. Croix	8	32	0.52	1
11	17PH57	Horned Lark	FY	CONF	1	Gene De St. Croix	1	4	0.04	1
11	17PH57	Purple Martin	AE	CONF	1	Gene De St. Croix	1	4	0.04	1
11	17PH57	Tree Swallow	FY	CONF	1	Gene De St. Croix	1	4	0.2	1
11	17PH57	Northern Rough-winged Swallow	P	PROB	1	Gene De St. Croix				
11	17PH57	Bank Swallow	AE	CONF	1					

Region	Square	Species	Breeding Evidence			Point Counts			
			Max BE	Categ	#Sq	Atlasser Name	#PC	%PC	Abun	#Sq
11	17PH56	Canada Goose	FY	CONF	1	Marcia Jacklin	1	3.85	0.3846	1
11	17PH56	Wood Duck	P	PROB	1	Brad Clements				
11	17PH56	Mallard	FY	CONF	1					
11	17PH56	Ring-necked Pheasant	T	PROB	1		1	3.85	0.0385	1
11	17PH56	Wild Turkey	FY	CONF	1					
11	17PH56	Green Heron	A	PROB	1	Marcia Jacklin				
11	17PH56	Turkey Vulture	H	POSS	1					
11	17PH56	Northern Harrier	H	POSS	1	Marcia Jacklin				
11	17PH56	Cooper's Hawk	FY	CONF	1	John E Black				
11	17PH56	Red-tailed Hawk	FY	CONF	1	Marcia Jacklin	2	7.69	0.0769	1
11	17PH56	American Kestrel	H	POSS	1	Marcia Jacklin				
11	17PH56	Virginia Rail	P	PROB	1	Marcia Jacklin				
11	17PH56	Sora	H	POSS	1	Marcia Jacklin				
11	17PH56	Sandhill Crane	FY	CONF	1					
11	17PH56	Killdeer	FY	CONF	1	Marcia Jacklin	4	15.38	0.1923	1
11	17PH56	Rock Pigeon	NY	CONF	1	Marcia Jacklin	1	3.85	0.1538	1
11	17PH56	Spotted Sandpiper	FY	CONF	1		3	11.54	0.1154	1
11	17PH56	Upland Sandpiper	FY	CONF	1	Marcia Jacklin				
11	17PH56	Common Snipe	T	PROB	1	John E Black				
11	17PH56	American Woodcock	FY	CONF	1	Brad Clements				
11	17PH56	Mourning Dove	FY	CONF	1	Marcia Jacklin	4	15.38	0.2308	1
11	17PH56	Yellow-billed Cuckoo	CF	CONF	1	Marcia Jacklin				
11	17PH56	Black-billed Cuckoo	FY	CONF	1	Marcia Jacklin				
11	17PH56	Eastern Screech-Owl	S	POSS	1	Marcia Jacklin				
11	17PH56	Great Horned Owl	AE	CONF	1					
11	17PH56	Chimney Swift	S	POSS	1	John E Black				
11	17PH56	Ruby-throated Hummingbird	NE	CONF	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Belted Kingfisher	H	POSS	1	John E Black				
11	17PH56	Red-bellied Woodpecker	FY	CONF	1					
11	17PH56	Downy Woodpecker	FY	CONF	1					
11	17PH56	Hairy Woodpecker	NY	CONF	1	Marcia Jacklin				
11	17PH56	Northern Flicker	H	POSS	1	Marcia Jacklin				
11	17PH56	Eastern Wood-Pewee	FY	CONF	1	Marcia Jacklin	3	11.54	0.1154	1
11	17PH56	Alder Flycatcher	T	PROB	1	Marcia Jacklin				
11	17PH56	Willow Flycatcher	T	PROB	1		2	7.69	0.1154	1
11	17PH56	Least Flycatcher	S	POSS	1	Marcia Jacklin				
11	17PH56	Eastern Phoebe	AE	CONF	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Great Crested Flycatcher	FY	CONF	1		2	7.69	0.1923	1
11	17PH56	Eastern Kingbird	CF	CONF	1	Marcia Jacklin				
11	17PH56	Yellow-throated Vireo	S	POSS	1	2 atlassers				
11	17PH56	Warbling Vireo	T	PROB	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Red-eyed Vireo	T	PROB	1	Marcia Jacklin	4	15.38	0.1538	1
11	17PH56	Blue Jay	CF	CONF	1	Marcia Jacklin	7	26.92	0.4231	1
11	17PH56	American Crow	AE	CONF	1	John E Black	5	19.23	0.2308	1
11	17PH56	Horned Lark	NE	CONF	1	Marcia Jacklin	2	7.69	0.0769	1
11	17PH56	Purple Martin	FY	CONF	1	Marcia Jacklin	6	23.08	0.2692	1
11	17PH56	Tree Swallow	AE	CONF	1	Marcia Jacklin	3	11.54	0.1923	1
11	17PH56	Northern Rough-winged Swallow	H	POSS	1	John E Black				
11	17PH56	Cliff Swallow	AE	CONF	1	Marcia Jacklin				
11	17PH56	Barn Swallow	FY	CONF	1	Marcia Jacklin	4	15.38	0.1923	1

Region	Square	Species	Breeding Evidence				Point Counts			
			Max BE	Categ	#Sq	Atlasser Name	#PC	%PC	Abun	#Sq
11	17PH57	Cliff Swallow	FY	CONF	1	Gene De St. Croix				
11	17PH57	Barn Swallow	NY	CONF	1	Gene De St. Croix	5	20	0.48	1
11	17PH57	Black-capped Chickadee	FY	CONF	1	Gene De St. Croix	2	8	0.12	1
11	17PH57	Red-breasted Nuthatch	FY	CONF	1	Gene De St. Croix				
11	17PH57	White-breasted Nuthatch	P	PROB	1	Gene De St. Croix				
11	17PH57	Carolina Wren	N	PROB	1	Gene De St. Croix				
11	17PH57	House Wren	AE	CONF	1		2	8	0.12	1
11	17PH57	Winter Wren	N	PROB	1	Gene De St. Croix				
11	17PH57	Eastern Bluebird	NY	CONF	1					
11	17PH57	Veery	S	POSS	1	Gene De St. Croix				
11	17PH57	Wood Thrush	FY	CONF	1	Gene De St. Croix	1	4	0.08	1
11	17PH57	American Robin	AE	CONF	1		17	68	1.52	1
11	17PH57	Gray Catbird	FY	CONF	1	Gene De St. Croix	2	8	0.16	1
11	17PH57	Northern Mockingbird	NY	CONF	1	Gene De St. Croix	3	12	0.16	1
11	17PH57	Brown Thrasher	FY	CONF	1	Gene De St. Croix				
11	17PH57	European Starling	AE	CONF	1	Gene De St. Croix	18	72	2.92	1
11	17PH57	Cedar Waxwing	FY	CONF	1	Gene De St. Croix	8	32	0.64	1
11	17PH57	Yellow Warbler	CF	CONF	1	Gene De St. Croix	5	20	0.36	1
11	17PH57	American Redstart	CF	CONF	1	Gene De St. Croix				
11	17PH57	Common Yellowthroat	V	PROB	1	Gene De St. Croix	1	4	0.04	1
11	17PH57	Hooded Warbler	S	POSS	1	John E Black				
11	17PH57	Chipping Sparrow	FY	CONF	1	Gene De St. Croix	6	24	0.32	1
11	17PH57	Field Sparrow	FY	CONF	1	Gene De St. Croix				
11	17PH57	Vesper Sparrow	T	PROB	1	Gene De St. Croix				
11	17PH57	Savannah Sparrow	FY	CONF	1	Gene De St. Croix	2	8	0.12	1
11	17PH57	Grasshopper Sparrow	FY	CONF	1	Gene De St. Croix				
11	17PH57	Song Sparrow	AE	CONF	1	Gene De St. Croix	11	44	0.8	1
11	17PH57	Scarlet Tanager	CF	CONF	1	Gene De St. Croix	1	4	0.04	1
11	17PH57	Northern Cardinal	FY	CONF	1	Gene De St. Croix	7	28	0.36	1
11	17PH57	Rose-breasted Grosbeak	NY	CONF	1	Brad Clements				
11	17PH57	Indigo Bunting	NY	CONF	1	Gene De St. Croix	1	4	0.04	1
11	17PH57	Bobolink	NE	CONF	1	Gene De St. Croix				
11	17PH57	Red-winged Blackbird	NY	CONF	1	Gene De St. Croix	12	48	1.28	1
11	17PH57	Eastern Meadowlark	NE	CONF	1	Gene De St. Croix				
11	17PH57	Common Grackle	NY	CONF	1	Gene De St. Croix	18	72	1.88	1
11	17PH57	Brown-headed Cowbird	P	PROB	1	Gene De St. Croix	2	8	0.08	1
11	17PH57	Baltimore Oriole	AE	CONF	1	Gene De St. Croix	3	12	0.12	1
11	17PH57	House Finch	NY	CONF	1	Gene De St. Croix	6	24	0.44	1
11	17PH57	Pine Siskin	H	POSS	1	Gene De St. Croix				
11	17PH57	American Goldfinch	NY	CONF	1	Gene De St. Croix	7	28	0.4	1
11	17PH57	House Sparrow	NY	CONF	1	Gene De St. Croix	16	64	3.56	1

Region	Square	Species	Breeding Evidence				Point Counts			
			Max BE	Categ	#Sq	Atlasser Name	#PC	%PC	Abun	#Sq
11	17PH56	Black-capped Chickadee	FY	CONF	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Tufted Titmouse	T	PROB	1		1	3.85	0.0385	1
11	17PH56	Red-breasted Nuthatch	T	PROB	1					
11	17PH56	White-breasted Nuthatch	T	PROB	1		1	3.85	0.0385	1
11	17PH56	Brown Creeper	T	PROB	1					
11	17PH56	Carolina Wren	S	POSS	1	John E Black				
11	17PH56	House Wren	AE	CONF	1		3	11.54	0.1538	1
11	17PH56	Blue-gray Gnatcatcher	FY	CONF	1	Marcia Jacklin				
11	17PH56	Eastern Bluebird	AE	CONF	1	Marcia Jacklin				
11	17PH56	Veery	S	POSS	1	Marcia Jacklin	1	3.85	0.0769	1
11	17PH56	Wood Thrush	NE	CONF	1	John E Black	3	11.54	0.1154	1
11	17PH56	American Robin	FY	CONF	1	Marcia Jacklin	17	65.38	1.2308	1
11	17PH56	Gray Catbird	FY	CONF	1	Marcia Jacklin	4	15.38	0.1538	1
11	17PH56	Northern Mockingbird	FY	CONF	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Brown Thrasher	H	POSS	1	John E Black				
11	17PH56	European Starling	AE	CONF	1	Marcia Jacklin	12	46.15	1.7308	1
11	17PH56	Cedar Waxwing	P	PROB	1	Marcia Jacklin	3	11.54	0.1923	1
11	17PH56	Blue-winged Warbler	T	PROB	1	Marcia Jacklin				
11	17PH56	Yellow Warbler	CF	CONF	1	Marcia Jacklin	14	53.85	0.8077	1
11	17PH56	American Redstart	T	PROB	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Ovenbird	T	PROB	1	Marcia Jacklin				
11	17PH56	Northern Waterthrush	H	POSS	1	John E Black	1	3.85	0.0385	1
11	17PH56	Common Yellowthroat	T	PROB	1	Marcia Jacklin	9	34.62	0.4615	1
11	17PH56	Hooded Warbler	S	POSS	1	Marcia Jacklin				
11	17PH56	Eastern Towhee	T	PROB	1	Marcia Jacklin	2	7.69	0.0769	1
11	17PH56	Chipping Sparrow	CF	CONF	1		2	7.69	0.0769	1
11	17PH56	Field Sparrow	T	PROB	1	Marcia Jacklin	1	3.85	0.0385	1
11	17PH56	Vesper Sparrow	T	PROB	1		1	3.85	0.0385	1
11	17PH56	Savannah Sparrow	CF	CONF	1	Marcia Jacklin	12	46.15	0.6154	1
11	17PH56	Grasshopper Sparrow	T	PROB	1	Marcia Jacklin				
11	17PH56	Song Sparrow	CF	CONF	1	Marcia Jacklin	16	61.54	1.2692	1
11	17PH56	Swamp Sparrow	T	PROB	1	Marcia Jacklin	4	15.38	0.2692	1
11	17PH56	Scarlet Tanager	T	PROB	1					
11	17PH56	Northern Cardinal	FY	CONF	1	Marcia Jacklin				
11	17PH56	Rose-breasted Grosbeak	FY	CONF	1	Marcia Jacklin	2	7.69	0.1154	1
11	17PH56	Indigo Bunting	CF	CONF	1	Marcia Jacklin	3	11.54	0.1154	1
11	17PH56	Bobolink	T	PROB	1	Marcia Jacklin	3	11.54	0.2308	1
11	17PH56	Red-winged Blackbird	CF	CONF	1	Marcia Jacklin	17	65.38	2.0385	1
11	17PH56	Eastern Meadowlark	T	PROB	1	Marcia Jacklin	3	11.54	0.1154	1
11	17PH56	Common Grackle	CF	CONF	1	Marcia Jacklin	9	34.62	0.5769	1
11	17PH56	Brown-headed Cowbird	NE	CONF	1	John E Black	3	11.54	0.1154	1
11	17PH56	Orchard Oriole	S	POSS	1	John E Black				
11	17PH56	Baltimore Oriole	NY	CONF	1	Marcia Jacklin	3	11.54	0.1538	1
11	17PH56	House Finch	T	PROB	1					
11	17PH56	American Goldfinch	P	PROB	1	Marcia Jacklin	9	34.62	0.4231	1
11	17PH56	House Sparrow	AE	CONF	1	Marcia Jacklin	4	15.38	0.2308	1

OBBA Combined

Species

Acadian Flycatcher
Alder Flycatcher
American Crow
American Goldfinch
American Kestrel
American Redstart
American Robin
American Woodcock
Baltimore Oriole
Bank Swallow
Barn Swallow
Belted Kingfisher
Black-billed Cuckoo
Black-capped Chickadee
Black-crowned Night-Heron
Blue Jay
Blue-gray Gnatcatcher
Blue-winged Warbler
Bobolink
Brown Creeper
Brown Thrasher
Brown-headed Cowbird
Canada Goose
Carolina Wren
Cedar Waxwing
Chimney Swift
Chipping Sparrow
Cliff Swallow
Common Grackle
Common Nighthawk
Common Snipe
Common Tern
Common Yellowthroat
Cooper's Hawk
Downy Woodpecker
Eastern Bluebird
Eastern Kingbird
Eastern Meadowlark
Eastern Phoebe
Eastern Screech-Owl
Eastern Towhee
Eastern Wood-Pewee
European Starling
Field Sparrow
Grasshopper Sparrow
Gray Catbird
Great Crested Flycatcher
Great Horned Owl
Green Heron
Hairy Woodpecker
Herring Gull
Hooded Warbler
Horned Lark
House Finch
House Sparrow
House Wren
Indigo Bunting
Killdeer
Least Flycatcher
Mallard
Mourning Dove
Northern Cardinal
Northern Flicker
Northern Harrier
Northern Mockingbird
Northern Rough-winged Swallow
Northern Waterthrush
Orchard Oriole
Ovenbird
Peregrine Falcon
Pied-billed Grebe
Pine Siskin
Purple Martin
Red-bellied Woodpecker
Red-breasted Nuthatch
Red-eyed Vireo
Red-tailed Hawk
Red-winged Blackbird
Ring-billed Gull
Ring-necked Pheasant
Rock Pigeon
Rose-breasted Grosbeak
Ruby-throated Hummingbird
Sandhill Crane
Savannah Sparrow
Scarlet Tanager
Song Sparrow
Sora
Spotted Sandpiper
Swamp Sparrow
Tree Swallow
Tufted Titmouse
Turkey Vulture
Upland Sandpiper
Veery
Vesper Sparrow
Virginia Rail
Warbling Vireo
White-breasted Nuthatch
Wild Turkey
Willow Flycatcher
Winter Wren
Wood Duck
Wood Thrush
Yellow Warbler
Yellow-billed Cuckoo
Yellow-throated Vireo

ORAA

Searched September 20, 2017

17PH56

American Bullfrog	1	2009	August	7	447637	Allegheny Mountain Dusky Salamander
American Bullfrog	2	2009	June	14	43846	
American Bullfrog	3	2009	June	4	49738	
American Bullfrog	1	2008	May	29	43835	
American Bullfrog	1	1999	May	7	44088	
American Bullfrog	3	1998	June	12	44094	
American Bullfrog	3	1997	June	30	44951	
American Bullfrog	1	1997	June	5	44091	
American Bullfrog	1	1989	June	5	44817	
American Toad	1	2014	August	6	50671	
American Toad	1	2011	May	23	50886	
American Toad	2	2010	May	1	50491	
American Toad	2	2010	April	14	51025	
American Toad	6	2009	June	4	49737	
American Toad	3	2009	May	8	43841	
American Toad	2	2009	April	26	43838	
American Toad	9	2009	April	10	49739	
American Toad	2	2009	March	17	49736	
American Toad	2	2008	April	21	43836	
American Toad	3	1997	June	30	44950	
American Toad	2	1997	May	26	44948	
American Toad	7	1997	April	30	44946	
American Toad	1	1988	May	3	44886	
American Toad	1	1988	May	3	45172	
American Toad	1	1988	May	3	50578	
American Toad	1	1988	May	3	50637	
American Toad	1	1988	May	3	50652	
American Toad	1	1985			46942	
Blanding's Turtle	1	2011	May	10	43167	
Blanding's Turtle	1	1985			46938	
Blue-spotted Salamander	1	2017	September	9	457041	
Blue-spotted Salamander	1	2017	September	9	457075	
Blue-spotted Salamander	1	2014	June	9	50674	
Blue-spotted Salamander	3	2014	May	15	50424	
Dekay's Brownsnake	13	2017	September	9	457076	
Dekay's Brownsnake	1	2014	October	2	45103	
Dekay's Brownsnake	1	2008	October	15	447254	
Dekay's Brownsnake	1	2008	September	23	48256	
Eastern Gartersnake	2	2016	May	25	358952	
Eastern Gartersnake	1	2014	August	13	50672	
Eastern Gartersnake	2	2014	May	15	50423	
Eastern Gartersnake	1	2013	May	4	48867	
Eastern Gartersnake	1	2013	May	4	50477	
Eastern Gartersnake	1	2012	May	6	50479	
Eastern Gartersnake	1	2012	April	19	43465	
Eastern Gartersnake	1	2009	July	29	447264	
Eastern Gartersnake	1	2008	October	15	447447	
Eastern Gartersnake	1	2008	October	15	447448	
Eastern Gartersnake	1	2008	October	15	447449	
Eastern Gartersnake	1	2008	October	15	447450	
Eastern Gartersnake	1	1985			46944	
Eastern Musk Turtle	1	2011	October	7	407069	Eastern Newt
Eastern Red-backed Salamander	1	2017	May	8	448251	

Eastern Red-backed Salamander	1	2014	June	9	50675
Eastern Red-backed Salamander	1	2012	May	6	50466
Eastern Ribbonsnake	1	2012	April	29	43467
Gray Treefrog	1	2014	May	21	50323
Gray Treefrog	1	2014	May	21	50507
Gray Treefrog	1	2014	May	21	50937
Gray Treefrog	1	2012	May	6	50437
Gray Treefrog	1	2012	May	6	50480
Gray Treefrog	1	2011	May	23	50400
Gray Treefrog	1	2011	May	21	50661
Gray Treefrog	1	2011	May	21	50945
Gray Treefrog	1	2011	May	21	50971
Gray Treefrog	2	2010	June	13	50846
Gray Treefrog	2	2010	May	1	50490
Gray Treefrog	10	2009	June	5	50938
Gray Treefrog	1	2008	April	14	447704
Gray Treefrog	1	2006	October	21	50440
Gray Treefrog	1	2000	May	5	44092
Gray Treefrog	1	1989	June	11	43497
Gray Treefrog	1	1989	June	5	43587
Gray Treefrog	1	1989	June	5	43617
Gray Treefrog	1	1989	June	5	44812
Green Frog	1	2014	May	3	50449
Green Frog	1	2013	September	17	48061
Green Frog	1	2013	July	4	48060
Green Frog	3	2012	May	6	50436
Green Frog	1	2012	April	19	43489
Green Frog	15	2012	April	18	43463
Green Frog	1	2011	September	28	48753
Green Frog	2	2010	June	13	43466
Green Frog	4	2010	June	13	50845
Green Frog	1	2010	May	1	50489
Green Frog	1	2009	September	16	447736
Green Frog	1	2009	September	9	447734
Green Frog	1	2009	August	7	447726
Green Frog	1	2009	July	29	447723
Green Frog	1	2009	July	29	447724
Green Frog	1	2009	July	28	447722
Green Frog	1	2009	June	30	48832
Green Frog	3	2009	June	30	50939
Green Frog	4	2009	June	24	43843
Green Frog	1	2009	June	14	43845
Green Frog	3	2009	June	12	48833
Green Frog	1	2009	April	26	43839
Green Frog	2	2008	June	21	43837
Green Frog	2	1999	June	8	44097
Green Frog	4	1998	June	12	44096
Green Frog	2	1997	June	5	44095
Green Frog	1	1989	June	5	46922
Green Frog	1	1989	June	5	47671
Green Frog	1	1987	July	27	43398
Green Frog	1	1985			46943
Green Frog	1	1983	October	9	46949
Jefferson/Blue-spotted Salamander Complex	1	2012	May	6	50467
Midland Painted Turtle	8	2014	May	15	50425
Midland Painted Turtle	3	2014	May	3	50450

Midland Painted Turtle	7	2014	May	3	50496	
Midland Painted Turtle	4	2012	May	6	50426	
Midland Painted Turtle	3	2012	May	6	50451	
Midland Painted Turtle	1	2010	May	1	50488	
Midland Painted Turtle	1	2009	August	5	448007	
Midland Painted Turtle	1	2009	July	30	448006	
Midland Painted Turtle	1	2009	July	29	448005	
Midland Painted Turtle	1	2009	July	28	448004	
Midland Painted Turtle	6	2009	May	2	50485	
Midland Painted Turtle	1	2008	June	24	448029	
Midland Painted Turtle	1	1988	May	4	48156	
Midland Painted Turtle	1	1985			46939	
Midland Painted Turtle	1	1967			46941	
Milksnake	1	2009	July	29	431305	Mudpuppy
Northern Leopard Frog	1	2016	April	23	358746	Northern Dusky Salamander
Northern Leopard Frog	1	2014	August	13	50673	
Northern Leopard Frog	1	2013	September	30	48057	
Northern Leopard Frog	1	2013	May	14	48059	
Northern Leopard Frog	1	2013	May	9	48058	
Northern Leopard Frog	1	2012	May	6	50435	
Northern Leopard Frog	2	2010	April	2	50848	
Northern Leopard Frog	1	2008	October	17	447903	
Northern Leopard Frog	1	2008	April	22	447874	
Northern Leopard Frog	1	2008	April	21	447872	
Northern Leopard Frog	1	1999	April	7	44085	
Northern Leopard Frog	1	1997	April	14	44076	
Northern Leopard Frog	1	1995	September	13	50591	
Northern Leopard Frog	1	1989	September	4	43534	
Northern Leopard Frog	1	1988	May	4	49779	
Northern Leopard Frog	1	1988	May	3	44850	
Northern Leopard Frog	1	1988	May	3	44883	
Northern Leopard Frog	1	1988	May	3	45170	
Northern Leopard Frog	1	1987	July	27	43396	
Northern Leopard Frog	1	1985			46937	
Northern Leopard Frog	1	1983	October	9	46950	
Northern Leopard Frog	1	1958	April	5	46947	
Northern Map Turtle	1	2009	May	2	436468	
Northern Watersnake	1	1967			46946	Red-bellied Snake
Snapping Turtle	1	2012	July	6	43125	
Snapping Turtle	1	2009	August	7	438735	
Snapping Turtle	1	2009	August	7	445097	
Snapping Turtle	1	2009	July	30	438734	
Snapping Turtle	1	2009	July	30	445086	
Snapping Turtle	1	2009	July	29	438733	
Snapping Turtle	1	2009	July	29	445081	
Snapping Turtle	1	2008	June	17	444576	
Snapping Turtle	1	2008	June	17	445659	
Snapping Turtle	1	1952	July		439193	
Snapping Turtle	1	1952	July		439407	
Snapping Turtle	1	1952	July		440204	
Snapping Turtle	1	1952	July		440319	
Spring Peeper	2	2010	May	19	50844	Spotted Salamander
Spring Peeper	2	2010	May	1	50492	
Spring Peeper	3	2010	April	14	50884	
Spring Peeper	3	2010	April	14	50943	
Spring Peeper	3	2010	April	14	51026	
Spring Peeper	4	2010	April	2	50842	
Spring Peeper	5	2009	May	8	43842	
Spring Peeper	2	2009	May	2	50486	

Spring Peeper	5	2009	April	26	43840	
Spring Peeper	1	2008	May	24	447962	
Spring Peeper	1	2008	April	14	447917	
Spring Peeper	1	2008	April	14	447919	
Spring Peeper	1	2008	April	14	447921	
Spring Peeper	1	2008	April	14	447922	
Spring Peeper	1	2008	April	14	447923	
Spring Peeper	1	2000	May	5	44090	
Spring Peeper	1	2000	April	13	44082	
Spring Peeper	2	1999	May	7	44089	
Spring Peeper	1	1999	April	7	44101	
Spring Peeper	1	1998	May	4	44087	
Spring Peeper	3	1998	April	12	44077	
Spring Peeper	2	1997	May	19	44086	
Spring Peeper	1	1997	April	30	44947	
Spring Peeper	1	1997	April	14	44080	
Spring Peeper	1	1988	May	3	43303	
Spring Peeper	1	1988	May	3	44884	
Spring Peeper	1	1988	May	3	45169	
Spring Peeper	1	1988	May	3	49871	
Spring Peeper	1	1988	May	3	49923	
Spring Peeper	1	1988	May	3	50577	
Spring Peeper	1	1988	May	3	50631	
Spring Peeper	1	1988	May	3	50636	
Spring Peeper	1	1988	May	3	50647	
Western Chorus Frog	1	2014	May	3	50452	Timber Rattlesnake
Western Chorus Frog	1	2014	May	3	50456	
Western Chorus Frog	1	2014	May	3	50463	
Western Chorus Frog	1	2013	April	28	50947	
Western Chorus Frog	1	2013	April	28	51089	
Western Chorus Frog	1	2013	April	27	50946	
Western Chorus Frog	1	2013	April	27	51088	
Western Chorus Frog	3	2012	March	17	50921	
Western Chorus Frog	5	2010	May	19	50843	
Western Chorus Frog	3	2010	April	14	50883	
Western Chorus Frog	3	2010	April	14	50942	
Western Chorus Frog	2	2010	April	14	51024	
Western Chorus Frog	1	2010	April	2	50847	
Western Chorus Frog	2	2009	May	2	50487	
Western Chorus Frog	1	2009	May	2	437404	
Western Chorus Frog	5	2009	April	26	43844	
Western Chorus Frog	10	2009	March	30	50718	
Western Chorus Frog	1	2009	March	30	437400	
Western Chorus Frog	10	2009	March	17	48791	
Western Chorus Frog	1	2009	March	17	437392	
Western Chorus Frog	1	2008	April	21	43834	
Western Chorus Frog	1	2000	June	18	44098	
Western Chorus Frog	1	2000	May	5	44093	
Western Chorus Frog	1	2000	May	5	44099	
Western Chorus Frog	3	1999	April	7	44078	
Western Chorus Frog	1	1999	April	7	44100	
Western Chorus Frog	2	1998	April	12	44081	
Western Chorus Frog	4	1998	April	12	44084	
Western Chorus Frog	3	1997	May	26	44949	
Western Chorus Frog	1	1997	May	19	44083	
Western Chorus Frog	3	1997	April	14	44079	
Wood Frog	1	2016	April	23	358602	
Wood Frog	1	2013	May	4	50443	
Wood Frog	1	2013	May	4	50448	

Wood Frog	1	2012	April	19	43490
Wood Frog	1	2012	April	18	43488
Wood Frog	1	2011	June	7	43486
Wood Frog	2	2010	April	14	50944
Wood Frog	1	2009	September	16	447972
Wood Frog	1	1989	September	4	43533
Wood Frog	1	1989	June	11	43496
Wood Frog	1	1987	July	27	43397
Wood Frog	1	1987			51023
Wood Frog	1	1985			46945

Searched April 10

17PH57 ** Includes Niagara Gorge

- Allegheny Mountain Dusky Salamander
- American Bullfrog
- American Toad
- Dekay's Brownsnake
- Eastern Gartersnake
- Eastern Newt
- Eastern Red-backed Salamander
- Gray Treefrog
- Green Frog
- Jefferson/Blue-spotted Salamander Complex
- Midland Painted Turtle
- Milksnake
- Mudpuppy
- Northern Dusky Salamander
- Northern Leopard Frog
- Northern Watersnake
- Red-bellied Snake
- Snapping Turtle
- Spotted Salamander
- Spring Peeper
- Timber Rattlesnake
- Western Chorus Frog
- Wood Frog

17PH56

- American Bullfrog
- American Toad
- Blanding's Turtle
- Blue-spotted Salamander
- Dekay's Brownsnake
- Eastern Gartersnake
- Eastern Musk Turtle
- Eastern Red-backed Salamander
- Eastern Ribbonsnake
- Gray Treefrog
- Green Frog
- Jefferson/Blue-spotted Salamander Complex
- Midland Painted Turtle
- Milksnake
- Northern Leopard Frog
- Northern Map Turtle
- Northern Watersnake
- Snapping Turtle
- Spring Peeper
- Western Chorus Frog
- Wood Frog

ORAA Combined

17PH57 ** Includes Niagara Gorge
17PH56

Species

- Allegheny Mountain Dusky Salamander
- American Bullfrog
- American Toad
- Blanding's Turtle
- Blue-spotted Salamander
- Dekay's Brownsnake
- Eastern Gartersnake
- Eastern Musk Turtle
- Eastern Newt
- Eastern Red-backed Salamander
- Eastern Ribbonsnake
- Gray Treefrog
- Green Frog
- Jefferson/Blue-spotted Salamander Complex
- Midland Painted Turtle
- Milksnake
- Mudpuppy
- Northern Dusky Salamander
- Northern Leopard Frog
- Northern Map Turtle
- Northern Watersnake
- Red-bellied Snake
- Snapping Turtle
- Spotted Salamander
- Spring Peeper
- Timber Rattlesnake
- Western Chorus Frog
- Wood Frog

DFO SAR Mapping

Map 18 of 34 - Ontario South West

habitat for Extirpated, Endangered, or Threatened Species Conrail Drain and all watercourses connected to Welland Canal

Common Name*	Population	Scientific Name	Taxon	Species at Risk Status
Deepwater Sculpin	Great Lakes - Western St. Lawrence	*Myoxocephalus thompsonii*	Fishes	Special Concern
Eastern Pondmussel	None	*Ligumia nasuta*	Molluscs	Endangered
Grass Pickerel	None	*Esox americanus vermiculatus*	Fishes	Special Concern
Kidneyshell	None	*Ptychobranchus fasciolaris*	Molluscs	Endangered
Lake Chubsucker	None	*Erimyzon sucetta*	Fishes	Endangered
Mapleleaf	Great Lakes - Western St. Lawrence	*Quadrula quadrula*	Molluscs	Threatened
Northern Brook Lamprey	Great Lakes - Upper St. Lawrence	*Ichthyomyzon fossor*	Fishes	Special Concern
Round Hickorynut	None	*Obovaria subrotunda*	Molluscs	Endangered
Round Pigtoe	None	*Pleurobema sintoxia*	Molluscs	Endangered

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

Correspondence

Ministry of
Natural Resources
And Forestry

Ministère des
Richesses naturelles
et des Forets

Box 5000
4890 Victoria Ave. N.
Vineland Station, Ontario
LOR 2E0

Telephone: (905) 562-4147
Facsimile: (905) 562-1154

05/09/2018

Peter De Carvalho,
R.J. Burnside & Associates Limited
292 Speedvale Ave. West, Unit 20
Guelph ON N1H 1C4
www.rjburnside.com

RE: THUNDERING WATERS GOLF CLUB DEVELOPMENT
6000 MARINELAND PARKWAY, CITY OF NIAGARA FALLS, ON

Dear Mr. Carvalho,

The Ministry of Natural Resources and Forestry (MNRF), Guelph District – Vineland Field Office, has reviewed the natural heritage information available for the above-noted property and surrounding area (the "study area"), and offers the following comments:

WETLANDS

The Ministry has identified the following provincially significant wetland (PSW) within the study area:

- Niagara Falls Slough Forest Wetland Complex

AREAS OF NATURAL AND SCIENTIFIC INTEREST

The Ministry notes that there are no Areas of Natural and Scientific Interest (ANSIs) within the study area.

FISHERIES

Restricted activity timing windows are applied to protect fish from impacts of undertakings in and around water during critical life cycle stages. The recommended timing restrictions for watercourses on the subject property are March 1st to July 1st (Note: dates represent when work should be avoided).

The MNRF notes that the following fish species have been documented in the area;

- Conrail Drain- *Brook Stickleback*
- Unnamed Tributary to Chippawa Channel- *bluntnose minnow, brown bullhead, central mudminnow, golden shiner, largemouth bass, and white sucker*

SPECIES AT RISK

There are records in the area for the following species at risk (SAR):

- Eastern Wood-Pewee *(Contopus virens)* (Special Concern)
- Barn Swallow *(Hirundo rustica)* (Threatened)
- Wood Thrush *(Hylocichla mustelina)* (Special Concern)
- Grass Pickerel *(Esox americanus vermiculatus)* (Special Concern)
- Round Hickorynut *(Obovaria subrotunda)* (Endangered)
- Kidneyshell *(Ptychobranchus fasciolaris)* (Endangered)
- Eastern Pondmussel *(Ligumia nasuta)* (Endangered)
- Round-leaved Greenbrier *(Smilax rotundifolia)* (Threatened)
- Acadian Flycatcher *(Empidonax virescens)* (Endangered)
- Chimney Swift *(Chaetura pelagica)* (Threatened)
- Bank Swallow *(Riparia riparia)* (Threatened)
- Eastern Flowering Dogwood (Cornus florida) (Endangered)
- Dense Blazing Star *(Liatris spicata)* (Threatened)
- Kentucky Coffee-tree *(Gymnocladus dioicus)* Threatened

Threatened and Endangered Species receive both individual species and habitat protection under the *Endangered Species Act, 2007* (ESA). SAR habitat prescribed under regulation is listed in Ont. Reg. 242/08 (https://www.ontario.ca/laws/regulation/080242).

Please be advised that because the province has not been surveyed comprehensively for the presence of listed species, the absence of a record does not necessarily indicate the absence of SAR from an area. To determine the presence of SAR for a given study area, the District's recommended approach is as follows:

I. Habitat Inventory

The Ministry recommends undertaking a comprehensive botanical inventory of the entire area that may be subject to direct and indirect impacts from the proposed activity. The vegetation communities should be classified as per the "Ecological Land Classification (ELC) for Southern Ontario" system, to either the "Ecosite" or "Vegetation Type" level. For aquatic habitats in the study area, we recommend that you collect data on the physical characteristics of the waterbodies and inventory the riparian zone vegetation, so that these habitats can be classified as per the Aquatic Ecosites described in the ELC manual.

II. Potential SAR within the Study Area

A list of SAR that have the potential to occur in the area can be produced by cross-referencing the ecosites described during the habitat inventory with the habitat descriptions of SAR known to occur within the planning area. The list of SAR known to occur in the **City of Niagara Falls** is attached for your reference. The species-specific COSEWIC status reports (https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife.html) are a good source of information on habitat needs and will be helpful in determining the suitability of the study areas ecosites for a given species.

Please note that the Species at Risk in Ontario (SARO) List is a living document that is periodically amended as a result of species assessment and re-assessments conducted by the Committee on the Status of Species at Risk in Ontario (COSSARO). The SARO List can

be accessed on the following webpage: https://www.ontario.ca/environment-and-energy/species-risk-ontario-list.

COSSARO also maintains a list of species to be assessed in the future. It is recommended that you take COSSARO's list of anticipated assessments into consideration, especially when the proposed start date of an activity is more than 6 months away, or the project will be undertaken over a period greater than 6 months. This list can be viewed at: https://www.ontario.ca/page/how-comment-protecting-species-risk.

III. SAR Surveys

The Ministry recommends that each potential SAR identified under Step II is surveyed for, regardless of whether or not the species has been previously recorded in the area. The survey report should describe how each SAR was surveyed for, and provide a rationale for why certain species were not afforded a survey (e.g., habitat within the study area is not suitable for a specific SAR). Please note that some targeted surveys may require provincial authorizations (e.g., ESA permit or Wildlife Scientific Collector's Permit).

ADDITIONAL INFORMATION

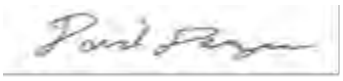
Natural heritage features (e.g. wetlands, ANSIs) can be viewed for a given study area through the MNRF's "Make a Map" web application: https://www.ontario.ca/page/make-natural-heritage-area-map. Digital data layers can be obtained through the Land Information Ontario (LIO) geowarehouse https://www.ontario.ca/page/land-information-ontario.

Additionally, the MNRF recommends contacting the municipality and the conservation authority to determine if they have any additional information or records of interest for the study area.

Please be advised that it is your responsibility to comply with all other relevant provincial or federal legislation, municipal by-laws, other MNRF approvals or required approvals from other agencies. If your investigations reveal the presence of Threatened or Endangered species, please contact the MNRF at esa.guelph@ontario.ca for further direction.

I trust that the above information is of assistance.

Sincerely,



David Denyes
Management Biologist

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Technical Memorandum

Date: June 2018 **Project No.:** 300041230.0000

Project Name: Niagara Village Residential Development

Client Name: Prenix Associates International Limited Consulting Engineers

Submitted To: David Denyes, Management Biologist, MNRF Vineland Office

Submitted By: Peter De Carvalho, Terrestrial Ecologist/Engineering Assistant

Reviewed By: Nicholle Smith, Senior Terrestrial Ecologist

R.J. Burnside & Associates Limited (Burnside) has been retained by Prenix Associates International Limited Consulting Engineers to complete an Environmental Impact Study for the proposed residential development located on the Thundering Waters Golf Course, in the City of Niagara Falls (herein referred to as the Subject Lands). Refer to Figure 1 for the location of each parcel.

The subject lands contain forested communities that may have the potential to provide bat maternity roosting habitat for three of the four species at risk (SAR) bat species in Ontario regulated under the *Endangered Species Act, 2007* (ESA); Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*) and Tri-Colored Bat (*Perimyotis subflavus*).

On November 29, 2017, terrestrial ecologists completed leaf-off surveys for maternity roosting habitat in all forested communities located within the subject lands. On May 28, 2018, a leaf-on assessment for Tri-colored Bat habitat was conducted. Both surveys followed the methodology described in the Ministry of Natural Resources and Forestry (MNRF) Guelph District Survey Protocol for Species at Risk Bats within Treed Habitats (April 2017), as outlined below.

1.0 Background

Since 2013, four bat species have been listed as Endangered under the ESA due to rapid declining population sizes caused by White-nose Syndrome (WNS). Under the ESA, Species at Risk (SAR) bat species and their general habitat are protected. This protection includes maternity roosting habitat used by SAR bat species to raise their young during spring and summer seasons.

Among the four listed species, three are known to form maternity roosting colonies in forested habitats: Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), and Tri-colored Bat (*Pipistrellus subflavus*). Little Brown Myotis and Northern Myotis are known to form maternity roosting colonies in tree "snags"; free standing dead or dying trees that have begun to exhibit signs of decay (i.e., dead branches, cracks, crevices, or fungal corks) (Watt and Caceres, 1999). The Tri-coloured bats are known to roost in dead foliage of trees, with a preference for maple and oak trees.

Preliminary Ecological Land Classification of the subject lands was produced by Burnside staff in 2018. Woodlands on the property have been broadly assessed as remnant deciduous slough forest, with areas of Dry-Fresh Sugar Maple – Oak Deciduous Forest (FOD5-3) alternating with areas of FOD9-3 (Fresh-Moist Oak- Maple Decidous Forest), with small areas of Cultural Hedgerow (CUH) and Dry-Fresh Poplar Deciduous Forest (FOD3-1) also identified.

This report describes the methods used to assess maternity roosting habitat found within the study area, the results obtained, as well as proposed next steps.

2.0 Methodology

Survey methodology was based on the Guelph District Ministry of Natural Resources Survey Protocol for Species at Risk Bats within Treed Habitats (April, 2017).

Forest communities were identified based on a review of aerial photography and background reports. According to the protocol, coniferous, deciduous and mixed wooded ecosites, including treed swamps, that include trees that are at least 10 cm diameter-at-breast height should be considered suitable maternity roost habitat (MNRF 2017). For cultural treed areas, such as plantations, discussion with the MNRF is required to determine if surveys are required.

Small habitat areas (< 10 ha) require a comprehensive walkthrough of the ecosite to look for snag trees, as opposed to larger sites where sub samples and snag density surveys are more appropriate. Given that each forested community survey was < 10 ha, comprehensive walkthrough surveys were completed for both leaf-off and leaf-on surveys.

Leaf-off Surveys

A leaf-off survey was conducted on November 29, 2017 to survey for candidate bat maternity roosting habitat within seven treed areas that are anticipated to be impacted as part of the proposed development.

Leaf-off surveys of treed habitat for maternity/roosting colonies focus on Little Brown Myotis and Northern Myotis. These species prefer to roost in tree cavities or under loose bark, cracks and crevices of snags.

The following criteria were recorded for each candidate tree identified during this survey:

- Tree snag height.
- Number of cavities or crevices often originating as cracks, scars, knot holes or woodpecker cavities.
- Snag diameter breast height (DBH) (>25 cm).
- Proximity to other identified snags.
- Amount of loose, peeling bark (naturally occurring/due to decay).
- Location of cracks, crevices, and loose/peeling bark high on the tree (>10 m) or is chimney-like with a low entrance.
- Tree species.
- Open area/forest gap.
- Snag Decay Class (1 to 6).

The quality of each candidate tree identified was analyzed using the criteria above, listed in order of importance.

In addition to the criteria recorded above, each candidate tree was recorded with a GPS waypoint and a photo inventory. Incidental observations were also recorded during the surveys.

Leaf-on Surveys

A partial leaf-on habitat assessment was conducted on May 28, 2018, to survey for candidate bat maternity habitat (BMH) that may be present within the areas of impact of treed habitat present within the study area.

Leaf-on surveys focus on the BMH of Tri-colored bats. Unlike Little Brown and Northern Myotis, Tri-colored bats prefer roosting in dead foliage and clusters of hanging leaves. They exhibit a strong preference for oak trees, however maple trees are also selected as maternity roosting habitat.

The following candidate trees were surveyed in order to determine suitability for BMH:

- Any Oak tree ≥10 cm DBH.
- Any Maple tree ≥10 cm DBH IF the tree included dead/dying leaf clusters.
- Any maple tree ≥25 cm DBH.

Criteria recorded for each candidate tree identified during this survey included:

- Tree species.
- DBH (cm).
- Presence of dead/dying leaf cluster.
- Presence of tree cavities.
- Location of tree relative to forested area (Interior, open area/forest gap or forest edge).
- Presence of preferred tree species within 10 m.

As with leaf-off surveys, each tree identified to provide potential maternity roosting habitat was recorded with a GPS waypoint and a photo inventory.

3.0 Results

During leaf-off surveys, we identified 67 trees that possess qualities that indicate BMH potential. Leaf-on surveys revealed the presence of an abundance of appropriately sized oak and maple trees within most forested and slough areas. No trees were identified with hanging dead foliage, but, as per the protocol, all oaks ≥10 cm DBH and all maples ≥25 cm DBH were catalogued within areas surveyed. Leaf-on surveys amounted to just under four 8-hour days of sampling effort. Surveys identified and catalogued 607 appropriately-sized oak and maple trees within the subject lands. Due to restrictive timing constraints of acoustic monitoring, we have assumed that remaining forested areas support Tri-colored BMH at densities similar to areas where leaf-on surveys were completed; this assumption is based on the consistency of vegetation community types and represents a conservative approach to assessing BMH potential on the property. As such, we have proposed acoustic monitoring locations by focusing on the quality of leaf-off habitat assuming that leaf-on habitat is relatively consistent within the subject lands.

A visual representation of identified snag trees during Leaf-off can be found on Figure 1.

4.0 Acoustic Monitoring

According to the survey methodology described in Guelph District Ministry of Natural Resources Survey Protocol for Species at Risk Bats within Treed Habitats (April 2017), the next step in determining presence/absence of SAR bat species involves an acoustic survey.

Given the high density of snags found within the majority of forested ecosites, this report recommends acoustic monitoring to determine if Little Brown Myotis, Northern Myotis and/or Tri-colored Bat are utilizing forested areas within the development footprint as BMH. We have selected 14 acoustic monitoring sites as shown in Figure 1. Acoustic stations were selected by emphasizing density of snag trees for Little Brown and Northern Myotis, proximity to foraging habitat, broken canopy areas, and overall coverage of the property.

A visual representation of identified snag trees during Leaf-off can be found on Figure 1.

Acoustic field data collection will be carried out as per the MNRF Guelph District protocol. Data collection are proposed in the evenings between June 1 and June 30; the size of the property in question may necessitate extending monitoring into July. Recording will begin at dusk and continue for five hours, for up to ten nights, or until maternity roosting habitat is confirmed.

5.0 Conclusion

67 candidate trees were identified as candidate BMH during leaf-off surveys conducted within the subject lands. It was also determined that most wooded areas on the landscape have an abundance of appropriately sized oak and maple trees which would serve as candidate Tri-colored Bat habitat.

We have taken the results of leaf-on and leaf-off surveys on the site and, combined with other physical factors including available foraging area and canopy breaks, proposed 14 acoustic monitoring stations. We feel that the placement of these stations will provide comprehensive coverage of the site in assessing the presence/absence of SAR bats.

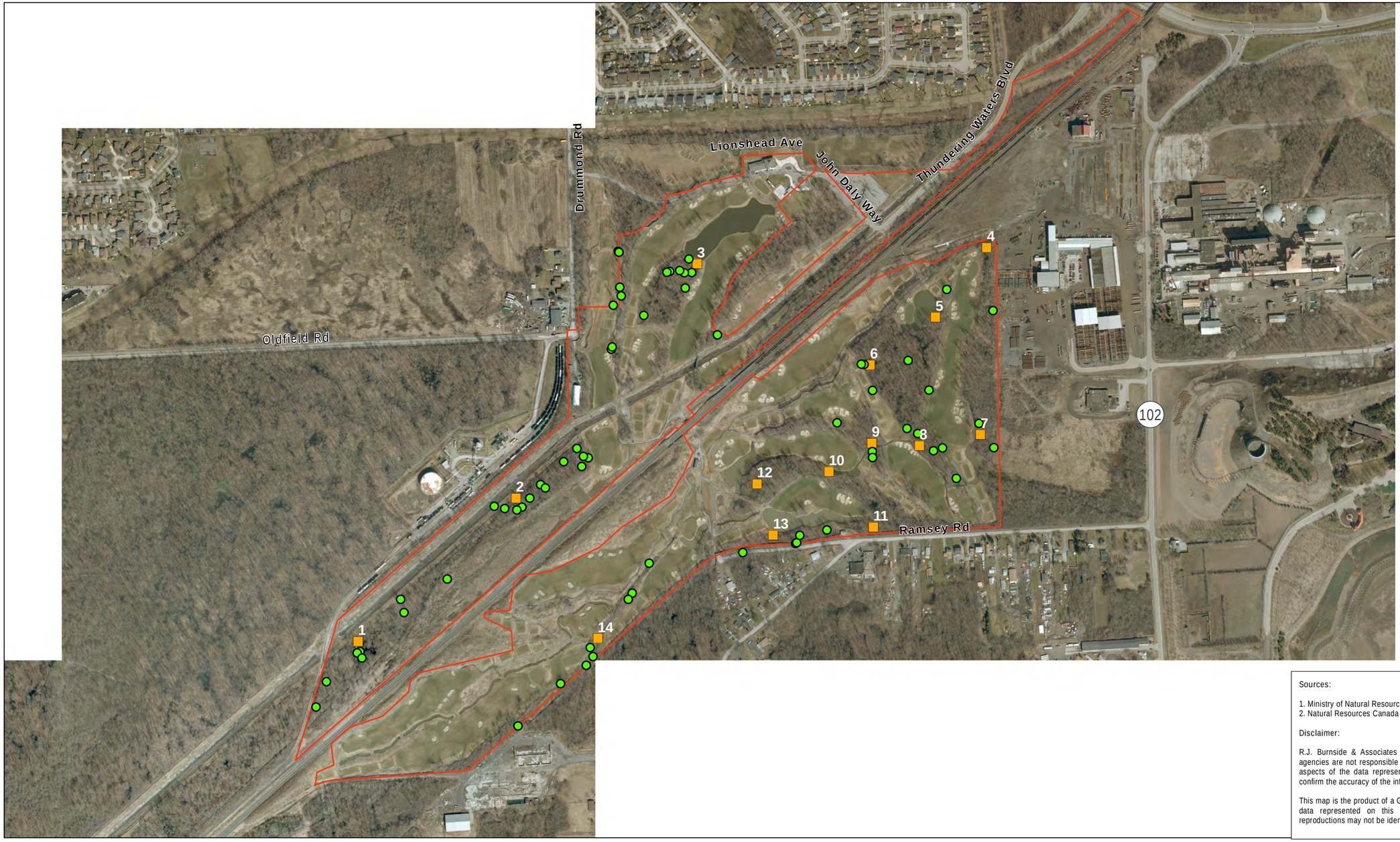
We are seeking direction from the MNRF to assess the appropriateness of our proposed next steps in assessing the presence/absence of SAR bat species on the Thundering Waters golf course and associated lands. Any feedback that could assist in refining or improving our methodology and/or acoustic station placement would be most helpful.

R.J. Burnside & Associates Limited

Peter De Carvalho, B. Sc. (Bio), EIT
Terrestrial Ecologist/Engineering Assistant

PD:sgd

Enclosure(s) Figure 1



Sources:

1. Ministry of Natural Resources, © Queen's Printer for Ontario
2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the spatial, temporal, or other aspects of the data represented on this map. It is recommended that users confirm the accuracy of the information represented.

This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: 0	Scale Factor: 0.99960

N
True North

0 100 200 300 400 500
Metres

- Proposed Acoustic Recording Stations
- Candidate Leaf-off BMH Trees
- Site Boundary

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Client
PRENIX ASSOCIATES INTERNATIONAL LTD

Figure Title
NIAGARA VILLAGE
PROPOSED BMH ACOUSTIC MONITORING LOCATIONS

Drawn	Checked	Date	Figure No.
HN	PD	2018/06/06	1
Scale		Project No.	
H 1:7,500		300041230	

File Path: \\elmo\Shared Work Areas\041230-THUNDERING WATERS\GIS\Map\041230 BMH Leaf Off.mxd Print Date: 2018/06/06 Time: 03:16 PM

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Appendix D

Vegetation Species Lists

P #4

Trees		
Red Oak	*Quercus rubra*	S5
Green Ash	*Fraxinus pennsylvanica*	S4
Red Maple	*Acer rubrum*	S5
Sugar Maple	*Acer saccharum*	S5
Shagbark Hickory	*Carya ovata*	S5
Wild Apple	*Malus pumila*	SNR
American Elm	*Ulmus americana*	S5
Norway Maple	*Acer platanoides*	SNA
Black Cherry	*Prunus serotina*	S5
Trembling Aspen	*Populus tremuloides*	S5
Bur Oak	*Quercus macrocarpa*	S5

Groundlayer		
Common Reed	*Phragmites australis*	SNA
Manna Grass	*Glyceria striata*	S5
Sensitive Fern	*Onoclea sensibilis*	S5
Jumpseed	*Polygonum virginianum*	S4
Grass-leaved Goldenrod	*Euthamia graminifolia*	S5
Dark Green Bulrush	*Scirpus atrovirens*	S5
Heal-all	*Prunella vulgaris*	S5
Two-seeded Sedge	*Carex disperma*	S5
Rough Avens	*Geum laciniatum*	S4
Hairy Willowherb	*Epilobium ciliatum*	S5
Common Nipplewort	*Lapsana communis*	SNA
Canada Goldenrod	*Solidago canadensis*	S5
Common Cinquefoil	*Potentilla simplex*	S5
Virgina Strawberry	*Fragaria virginiana*	S5
Dandelion	*Taraxacum officinale*	SNA
Garlic Mustard	*Alliaria petiolata*	SNA
Jack in the Pulpit	*Arisaema triphyllum*	S5
Blue Cohosh	*Caulophyllum thalictroides*	S5
Eastern Poison Ivy	*Toxicodenron radicans*	S5
Bloodroot	*Sanguinaria canadensis*	S5
Water Hemlock	*Cicuta maculata*	S5
Common Boneset	*Eupatorium perfoliatum*	S5
Coltsfoot	*Tussilago farfara*	SNA
Mayapple	*Podophyllum peltatum*	S5
Indian Hemp	*Apocynum cannabinum*	SNR

Shrubs		
Bebb's Willow	*Salix bebbiana*	S5
Red Osier Dogwood	*Cornis sericea*	S5
European Privet	*Ligustrum vulgare*	SNA
European Buckthorn	*Rhamnus cathartica*	SNA
Gray Dogwood	*Cornus racemosa*	S5
Hawthorn sp.	*Crataegus sp.*	
Multiflora Rose	*Rosa Multiflora*	SNA
Tartarian Honeysuckle	*Lonicera tatarica*	SNA
Staghorn Sumac	*Rhus typhina*	S5
Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Red Raspberry	*Rubus idaeus*	S5
Blackberry	*Rubus allegheniensis*	SNR
Choke Cherry	*Prunus virginiana*	S5

P #11

Trees

Wild Pear	*Pyrus communis*	SNA
Eastern Cottonwood	*Populus deltoides*	S5
Trembling Aspen	*Populus tremuloides*	S5
Bur Oak	*Quercus macrocarpa*	S5
Green Ash	*Fraxinus pennsylvanica*	S4
American Elm	*Ulmus americana*	S5
Red Oak	*Quercus rubra*	S5

Groundlayer

Common Milkweed	*Asclepias syriaca*	S5
Common Reed	*Phragmites australis*	SNA
Yellow Sweet Clover	*Melilotus officinalis*	SNA
White Sweet Clover	*Melilotus alba*	SNA
Black Medick	*Medicago lupulina*	SNA
Teasel	*Dipsacus fullonum*	SNA
Poison Ivy	*Toxicodendron radicans*	S5
Annual Sow Thistle	*Sonchus oleraceus*	SNA
Quackgrass	*Elymus repens*	SNA
Dandelion	*Taraxacum officinale*	SNA
Frost Aster	*symphyiotrichum pilosum*	S5
New-England Aster	*Symphyiotrichum novae-angliae*	S5
Canada Goldenrod	*Solidago canadensis*	S5
Tall Goldenrod	*Solidago altissima*	S5
Common Mugwort	*Artemesia vulgaris*	SNA
Heath Aster	*Symphyotrichum ericoides*	S5
Spotted Knapweed	*Centaurea stoebe*	SNA
Everlasting	*Lathyrus latifolius*	SNA
Philadelphia Fleabane	*Erigeron philadelphicus*	S5
Cow Vetch	*Vicia cracca*	SNA
Coltsfoot	*Tussilago farfara*	SNA
Canada Thistle	*Cirsium arvense*	SNA
Bull Thistle	*Cirsium vulgare*	SNA
Ground Ivy	*Glechoma hederacea*	SNA
Grass-leaved Goldenrod	*Euthamia graminifolia*	S5
Common Ragweed	*Ambrosia artemisiifolia*	S5
Wild Carrot	*Daucus carota*	SNA
Common Hawkweed	*Hieracium canadense*	SU
Red Clover	*Trifolium pratense*	SNA
White Clover	*Trifolium repens*	SNA
Alsike Clover	*Trifolium hybridum*	SNA
Wild Buckwheat	*Polygonum convolvulus*	SNA
Chicory	*Chicorium intybus*	SNA
Butter and Eggs	*Linaria vulgaris*	SNA

Shrubs

Bebb's Willow	*Salix bebbiana*	S5
European Privet	*Ligustrum vulgare*	SNA
White Willow	*Salix alba*	SNA
Red Osier Dogwood	*Cornis sericea*	S5
Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Staghorn Sumac	*Rhus typhina*	S5
European Buckthorn	*Rhamnus cathartica*	SNA
Choke Cherry	*Prunus virginiana*	S5
Gray Dogwood	*Cornus racemosa*	S5
Hawthorn sp.	*Crataegus sp.*	
Multiflora Rose	*Rosa multiflora*	SNA

P #12

Trees		
Shagbark Hickory	*Carya ovata*	S5
Green Ash	*Fraxinus pennsylvanica*	S4
White Oak	*Quercus alba*	S5
Red Maple	*Acer rubrum*	S5
Red Oak	*Quercus rubra*	S5
American Beech	*Fagus grandifolia*	S4
American Basswood	*Tilia americana*	S5
Trembling Aspen	*Populus tremuloides*	S5
Bur Oak	*Quercus macrocarpa*	S5
American Elm	*Ulmus americana*	S5

Groundlayer		
Three-leaved Soloman's Seal	*Maianthemum trifolium*	S5
Canada Mayflower	*Maianthemum canadense*	S5
Eastern Poison Ivy	*Toxicodenron radicans*	S5
Enchanter's Nightshade	*Circaea lutetiana*	S5
Jack in the Pulpit	*Arisaema triphyllum*	S5
Bladder Sedge	*Carex intumescens*	S5
Fringed Sedge	*Carex crinita*	S5
Garlic Mustard	*Alliaria petiolata*	SNA
Dandelion	*Taraxacum officinale*	SNA
Sensitive Fern	*Onoclea sensibilis*	S5
Sweet-scented Bedstraw	*Galium odoratum*	SNA
Ground Ivy	*Glechoma hederacea*	SNA
Virgina Strawberry	*Fragaria virginiana*	S5
Spotted Jewelweed	*Impatiens capensis*	S5
Yellow Trout Lily	*Erythronium americanum*	S5
Common Nipplewort	*Lapsana communis*	SNA
New-England Aster	*Symphyiotrichum novae-angliae*	S5
Rough-stemmed Goldenrod	*Solidago rugosa*	S5
Panicled Aster	*Symphyotrichum lanceolatum*	S5

Shrubs		
Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Gray Dogwood	*Cornus racemosa*	S5
Multiflora Rose	*Rosa multiflora*	SNA
Red Raspberry	*Rubus idaeus*	S5
Choke Cherry	*Prunus virginiana*	S5
Blackberry	*Rubus allegheniensis*	SNR
Prickly Gooseberry	*Ribes cynosbati*	S5
Staghorn Sumac	*Rhus typhina*	S5
Red Osier Dogwood	*Cornis sericea*	S5
Pin Cherry	*Prunus pensylvanica*	S5
Smooth Wild Rose	*Rosa blanda*	S5

P #13

Trees		
American Beech	*Fagus grandifolia*	S4
American Basswood	*Tilia americana*	S5
Chinquapin Oak	*Quercus muehlenbergii*	S4
Sugar Maple	*Acer saccharum*	S5
Red Maple	*Acer rubrum*	S5
Silver Maple	*Acer saccharinum*	S5
Green Ash	*Fraxinus pennsylvanica*	S4
Red Oak	*Quercus rubra*	S5
Blue Beech	*Carpinus caroliniana*	S5
Shagbark Hickory	*Carya ovata*	S5

Groundlayer		
Joe Pyeweed	*Eupatorium purpureum*	S4
Enchanter's Nightshade	*Circaea lutetiana*	S5
Virgina Strawberry	*Fragaria virginiana*	S5
White Avens	*Geum canadense*	S5
Eastern Poison Ivy	*Toxicodenron radicans*	S5
Fowl Mannagrass	*Glyceria striata*	S5
Two-seeded Sedge	*Carex disperma*	S5
Climbing Nightshade	*Solanum dulcamara*	SNA
Panicled Aster	*Symphyotrichum lanceolatum*	S5
Rough Leaf Goldernrod	*Solidago rugosa*	S5
Garlic Mustard	*Alliaria petiolata*	SNA

Shrubs		
European Buckthorn	*Rhamnus cathartica*	SNA
Choke Cherry	*Prunus virginiana*	S5
Wild Black Currant	*Ribes americanum*	S5
Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Gray Dogwood	*Cornus racemosa*	S5
Spicebush	*Lindera benzoin*	S4

P #14

Trees		
Red Maple	*Acer rubrum*	S5
Silver Maple	*Acer saccharinum*	S5
Freeman Maple	*Acer x freemanii*	SNA
Shagbark Hickory	*Carya ovata*	S5
American Beech	*Fagus grandifolia*	S4
Blue Beech	*Carpinus caroliniana*	S5
Sugar Maple	*Acer saccharum*	S5
Black Cherry	*Prunus serotina*	S5
Green Ash	*Fraxinus pennsylvanica*	S4
American Basswood	*Tilia americana*	S5
american hophornbeam	*Ostrya virginiana*	S5
Bur Oak	*Quercus macrocarpa*	S5
American Elm	*Ulmus americana*	S5
Red Oak	*Quercus rubra*	S5

Groundlayer		
Wild Geranium	*Geranium maculatum*	S5
Sensitive Fern	*Onoclea sensibilis*	S5
Eastern Poison Ivy	*Toxicodenron radicans*	S5
Virgina Strawberry	*Fragaria virginiana*	S5
Garlic Mustard	*Alliaria petiolata*	SNA
Dandelion	*Taraxacum officinale*	SNA
White Trout Lily	*Erythronium albidum*	S4
Carolina Spring Beauty	*Claytonia caroliniana*	S5
Spotted Jewelweed	*Impatiens capensis*	S5
Jack in the Pulpit	*Arisaema triphyllum*	S5
Canada Mayflower	*Maianthemum canadense*	S5
Canada Anemone	*Anemone canadensis*	S5
Greater Bladder Sedge	*Carex intumescens*	S5
Climbing Nightshade	*Solanum dulcamara*	SNA
Northern Stickseed	*Hackelia deflexa*	S5
Fringed Sedge	*Carex crinita*	S5
Stinging Nettle	*Urtica dioica*	S5
Green Sedge	*Carex viridula*	S5
Common Horsetail	*Equisetum arvense*	S5
Tall Goldenrod	*Solidago altissima*	S5
Rice cutgrass	*Leersia oryzoides*	S5
Narrowleaf water-plantain	*Alisma gramineum*	S4
Fowl Mannagrass	*Glyceria striata*	S5
Bebb's Sedge	*Carex bebbii*	S5
Brownish Sedge	*Carex brunnescens*	S5
Rough Leaf Goldernrod	*Solidago rugosa*	S5
Panicled Aster	*Symphyotrichum lanceolatum*	S5

Shrubs		
Northern Spicebush	*Lindera benzoin*	S4
Prickly Gooseberry	*Ribes cynosbati*	S5
Multiflora Rose	*Rosa multiflora*	SNA
European Buckthorn	*Rhamnus cathartica*	SNA
Blackberry	*Rubus allegheniensis*	SNR
Red Osier Dogwood	*Cornis sericea*	S5
Gray Dogwood	*Cornus racemosa*	S5
Hawthorn sp.	*Crataegus sp.*	
Choke Cherry	*Prunus virginiana*	S5
Virginia Creeper	*Parthenocissus quinquef*	S4?
Wild Grape	*Vitis ripiaria*	S5

P #16

Trees

Green Ash (Saplings)	*Fraxinus pennsylvanica*	S4
Eastern Cottonwood	*Populus deltoides*	S5
Trembling Aspen	*Populus tremuloides*	S5

Groundlayer

Canada Goldenrod	*Solidago canadensis*	S5
Tall Goldenrod	*Solidago altissima*	S5
Kentucky Bluegrass	*Poa pratensis*	S5
Wild Carrot	*Daucus carota*	SNA
White Sweet Clover	*Melilotus alba*	SNA
Black Medick	*Medicago lupulina*	SNA
Bird's-foot Trefoil	*Lotus corniculatus*	SNA
Common Milkweed	*Asclepias syriaca*	S5
Poison Ivy	*Toxicodendron radicans*	S5
Yarrow	*Achillea millefolium*	SNA
Spotted Knapweed	*Centaurea stoebe*	SNA
Common Hawkweed	*Hieracium canadense*	SU
Daisy Fleabane	*Erigeron hyssopifolius*	S5
Purple Loosestrife	*Lythrum salicaria*	SNA
Wild Strawberry	*Fragaria virginiana*	S5
Ox-eye Daisy	*Leucanthemum vulgare*	SNA
Heal-all	*Prunella vulgaris*	S5
Common Reed	*Phragmites australis*	SNA
Wild Geranium	*Geranium maculatum*	S5
Cow Vetch	*Vicia cracca*	SNA
Red Clover	*Trifolium pratense*	SNA
Canada Thistle	*Cirsium arvense*	SNA
Bull Thistle	*Cirsium vulgare*	SNA
Timothy	*Phleum pratense*	SNA
Early Goldenrod	*Solidago juncea*	S5
Orchard Grass	*Dactylis glomerata*	SNA
Teasel	*Dipsacus fullonum*	SNA
Boneset	*Eupatorium perfoliatum*	S5
Common Horsetail	*Equisetum arvense*	S5
Scouring Rush	*Equisetum hyemale*	S5
Fox Sedge	*Carex vulpinoidea*	S5
Terrey's Rush	*Juncus torreyi*	S5
Path Rush	*Juncus tenuis*	S5
Switch Grass	*Panicum virgatum*	S4
Green Foxtail	*Setaria virdis*	SNA
New-England Aster	*Symphyiotrichum novae-angliae*	S5
Common Mugwort	*Artemesia vulgaris*	SNA
Frost Aster	*Symphyiotrichum pilosum*	S5
Heath Aster	*Symphyotrichum ericoides*	S5
Reed Canary Grass	*Phalaris arundinacea*	S5
Everlasting	*Lathyrus latifolius*	SNA
Tall Boneset	*Eupatorium altissimum*	S1
Common Ragweed	*Ambrosia artemisiifolia*	S5
Philadelphia Fleabane	*Erigeron philadelphicus*	S5

Shrubs

Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Gray Dogwood	*Cornus racemosa*	S5
Staghorn Sumac	*Rhus typhina*	S5
Black Willow	*Salix nigra*	S4?
European Buckthorn	*Rhamnus cathartica*	SNA
Sandbar Willow	*Salix interior*	S5
Red Raspberry	*Rubus idaeus*	S5

P #17

Trees

Groundlayer

Kentucky Bluegrass	*Poa pratensis*	S5
Black Medick	*Medicago lupulina*	SNA
Wild Carrot	*Daucus carota*	SNA
Common Reed	*Phragmites australis*	SNA
Cow Vetch	*Vicia cracca*	SNA
Quackgrass	*Elymus repens*	SNA
Common Hawkweed	*Hieracium canadense*	SU
White Sweet Clover	*Melilotus alba*	SNA
Bird's-foot Trefoil	*Lotus corniculatus*	SNA
Canada Goldenrod	*Solidago canadensis*	S5
Common Milkweed	*Asclepias syriaca*	S5
Spotted Knapweed	*Centaurea stoebe*	SNA
Red Clover	*Trifolium pratense*	SNA
White Clover	*Trifolium repens*	SNA
Canada St. John's Wort	*Hypericum perforatum*	SNA
Timothy	*Phleum pratense*	SNA
Dandelion	*Taraxacum officinale*	SNA
Curled Dock	*Rumex crispus*	SNA
Teasel	*Dipsacus fullonum*	SNA
Chicory	*Chicorium intybus*	SNA
Meadow Fescue	*Festuca pratense*	SNA
Orchard Grass	*Dactylis glomerata*	SNA
English Plantain	*Plantago lanceolata*	SNA
Common Plantain	*Plantago major*	SNA
Green Foxtail	*Setaria virdis*	SNA
New-England Aster	*Symphyiotrichum novae-angliae*	S5
Common Mugwort	*Artemesia vulgaris*	SNA
Frost Aster	*symphyiotrichum pilosum*	S5
Heath Aster	*Symphyotrichum ericoides*	S5
Everlasting	*Lathyrus latifolius*	SNA
Reed Canary Grass	*Phalaris arundinacea*	S5
Tall Boneset	*Eupatorium altissimum*	S1
Common Ragweed	*Ambrosia artemisiifolia*	S5
Philadelphia Fleabane	*Erigeron philadelphicus*	S5

Shrubs

Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5

P #18

Trees		
Eastern Cottonwood	*Populus deltoides*	S5
Trembling Aspen	*Populus tremuloides*	S5

Groundlayer		
Teasel	*Dipsacus fullonum*	SNA
Common Reed	*Phragmites australis*	SNA
New-England Aster	*Symphyiotrichum novae*	S5
Canada Goldenrod	*Solidago canadensis*	S5
Tall Goldenrod	*Solidago altissima*	S5
Common Mugwort	*Artemesia vulgaris*	SNA
Canada Thistle	*Cirsium arvense*	SNA
Common Horsetail	*Equisetum arvense*	S5
English Plantain	*Plantago lanceolata*	SNA
Common Plantain	*Plantago major*	SNA
Common Milkweed	*Asclepias syriaca*	S5
Yellow Sweet Clover	*Melilotus officinalis*	SNA
White Sweet Clover	*Melilotus alba*	SNA
Butter and Eggs	*Linaria vulgaris*	SNA
Quackgrass	*Elymus repens*	SNA
Kentucky Bluegrass	*Poa pratensis*	S5
Red Clover	*Trifolium pratense*	SNA
White Clover	*Trifolium repens*	SNA

Shrubs		
Staghorn Sumac	*Rhus typhina*	S5
Bebb's Willow	*Salix bebbiana*	S5
Sandbar Willow	*Salix interior*	S5
Black Willow	*Salix nigra*	S4

P #19

Trees

Groundlayer

Common Cattail	*Typha latifolia*	S5
Duckweed sp.		
Common Arrowhead	*Sagittaria latifolia*	S5
Water Plantain	*Alisma triviale*	S5

Shrubs

Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
European Buckthorn	*Rhamnus cathartica*	SNA

P #20

Trees		
Green Ash	*Fraxinus pennsylvanica*	S4
Red Maple	*Acer rubrum*	S5
Largetooth Aspen	*Populus grandidentata*	S5
Eastern Cottonwood	*Populus deltoides*	S5

Groundlayer		
Narrow-leaved Cattail	*Typha angustifolia*	SNA
Common Milkweed	*Asclepias syriaca*	S5
Purple Loosestrife	*Lythrum salicaria*	SNA
Spotted Jewelweed	*Impatiens capensis*	S5
Curled Dock	*Rumex crispus*	SNA
Common Reed	*Phragmites australis*	SNA
Wild Mint	*Mentha canadensis*	SNR
Water Plantain	*alisma triviale*	S5
Common Water Smartweed	*Polygonum amphibium*	S5
Fragile Bulrush	*Schoenoplectus subterminalis*	S4S5
Broad-leaf Water Hemlock	*Cicuta maculata*	S5
Teasel	*Dipsacus fullonum*	SNA
Coltsfoot	*Tussilago farfara*	SNA

Shrubs		
Multiflora Rose	*Rosa multiflora*	SNA
Black Willow	*Salix nigra*	S4
Sandbar Willow	*Salix interior*	S5

P #21

Trees

American Basswood	*Tilia americana*	S5
Black Cherry	*Prunus serotina*	S5
Silver Maple	*Acer saccharinum*	S5
Eastern Cottonwood	*Populus deltoides*	S5
American Elm	*Ulmus americana*	S5
Balsam Poplar	*Populus balsamifera*	S5
American Beech	*Fagus grandifolia*	S4
american hophornbeam	*Ostrya virginiana*	S5
Green Ash	*Fraxinus pennsylvanica*	S4
Red Oak	*Quercus rubra*	S5
Trembling Aspen	*Populus tremuloides*	S5
Red Maple	*Acer rubrum*	S5
Largetooth Aspen	*Populus grandidentata*	S5
White Willow	*Salix alba*	SNA
Bur Oak	*Quercus macrocarpa*	S5
Shagbark Hickory	*Carya ovata*	S5

Groundlayer

Few-seeded Sedge	*Carex disperma*	S5
Yellow Sweet Clover	*Melilotus officinalis*	SNA
Fringed Blue Aster	*Symphyotrichum oolentangiense*	S4
Jumpseed	*Polygonum virginianum*	S4
Common Cinquefoil	*Potentilla simplex*	S5
New-England Aster	*Symphyiotrichum novae-angliae*	S5
Kentucky Bluegrass	*Poa pratensis*	S5
Dandelion	*Taraxacum officinale*	SNA
Garlic Mustard	*Alliaria petiolata*	SNA
Common Reed	*Phragmites australis*	SNA
Canada Anemone	*Anemone canadensis*	S5
Eastern Poison Ivy	*Toxicodenron radicans*	S5
Common Horsetail	*Equisetum arvense*	S5
Sensitive Fern	*Onoclea sensibilis*	S5
Blue Cohosh	*Caulophyllum thalictroides*	S5
Carolina Spring Beauty	*Claytonia caroliniana*	S5
Bloodroot	*Sanguinaria canadensis*	S5
Wild Strawberry	*Fragaria virginiana*	S5
Smooth Bedstraw	*Galium mollugo*	SNA
Coltsfoot	*Tussilago farfara*	SNA
Orchard Grass	*Dactylis glomerata*	SNA
Indian Hemp	*Apocynum cannabinum*	SNR
Canada Goldenrod	*Solidago canadensis*	S5
Tall Goldenrod	*Solidago altissima*	S5
Enchanter's Nightshade	*Circaea lutetiana*	S5
White Sweet Clover	*Melilotus alba*	SNA
Canada Thistle	*Cirsium arvense*	SNA
Purple Loosestrife	*Lythrum salicaria*	SNA

Shrubs

Choke Cherry	*Prunus virginiana*	S5
European Privet	*Ligustrum vulgare*	SNA
Speckled Alder	*Alnus incana*	S5
Black Willow	*Salix nigra*	S4
Blackberry	*Rubus allegheniensis*	SNR
Northern Spicebush	*Lindera benzoin*	S4
Common Buttonbush	*Cephalanthus occidentalis*	S5
Bebb's Willow	*Salix bebbiana*	S5
Round-leaved Dogwood	*Cornus rugosa*	S5
Red Raspberry	*Rubus idaeus*	S5
Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Staghorn Sumac	*Rhus typhina*	S5
Red Osier Dogwood	*Cornis sericea*	S5
European Buckthorn	*Rhamnus cathartica*	SNA
Gray Dogwood	*Cornus racemosa*	S5
Hawthorn sp.	*Crataegus sp.*	

P #22

Trees		
Trembling Aspen	*Populus tremuloides*	S5
American Beech	*Fagus grandifolia*	S4
Red Maple	*Acer rubrum*	S5
Manitoba Maple	*Acer negundo*	S5
Green Ash	*Fraxinus pennsylvanica*	S4
Shagbark Hickory	*Carya ovata*	S5
Red Oak	*Quercus rubra*	S5
American Basswood	*Tilia americana*	S5
Eastern Cottonwood	*Populus deltoides*	S5
american hophornbeam	*Ostrya virginiana*	S5
Wild apple	*Malus pumila*	SNR
Largetooth Aspen	*Populus grandidentata*	S5
Balsam Poplar	*Populus balsamifera*	S5
Black Cherry	*Prunus serotina*	S5
White Willow	*Salix alba*	SNA
Bur Oak	*Quercus macrocarpa*	S5

Groundlayer		
Jumpseed	*Polygonum virginianum*	S4
Grass-leaved Goldenrod	*Euthamia graminifolia*	S5
Common Reed	*Phragmites australis*	SNA
Panicled Aster	*Symphyotrichum lanceolatum*	S5
Canada Goldenrod	*Solidago canadensis*	S5
Tall Goldenrod	*Solidago altissima*	S5
Eastern Poison Ivy	*Toxicodenron radicans*	S5
Blue Cohosh	*Caulophyllum thalictroides*	S5
Yellow Trout Lily	*Erythronium americanum*	S5
Canada Anemone	*Anemone canadensis*	S5
Garlic Mustard	*Alliaria petiolata*	SNA
Canada Thistle	*Cirsium arvense*	SNA
Common Mugwort	*Artemesia vulgaris*	SNA
Teasel	*Dipsacus fullonum*	SNA
Yellow Sweet Clover	*Melilotus officinalis*	SNA
White Sweet Clover	*Melilotus alba*	SNA
Wild Carrot	*Daucus carota*	SNA
Coltsfoot	*Tussilago farfara*	SNA
Enchanter's Nightshade	*Circaea lutetiana*	S5
Wild Rhubarb	*Arctium minus*	SNA
Wild Strawberry	*Fragaria virginiana*	S5
Indian Hemp	*Apocynum cannabinum*	SNR
Common Hawkweed	*Hieracium canadense*	SU

Shrubs		
Bebb's Willow	*Salix bebbiana*	S5
Tartarian Honeysuckle	*Lonicera tatarica*	SNA
European Privet	*Ligustrum vulgare*	SNA
Sandbar Willow	*Salix interior*	S5
Choke Cherry	*Prunus virginiana*	S5
Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Red Osier Dogwood	*Cornis sericea*	S5
Staghorn Sumac	*Rhus typhina*	S5
Gray Dogwood	*Cornus racemosa*	S5
European Buckthorn	*Rhamnus cathartica*	SNA
Multiflora Rose	*Rosa multiflora*	SNA
Common Buttonbush	*Cephalanthus occidentalis*	S5

P #23

Trees		
Red Oak	*Quercus rubra*	S5
American Beech	*Fagus grandifolia*	S4
Shagbark Hickory	*Carya ovata*	S5
Sugar Maple	*Acer saccharum*	S5
Bur Oak	*Quercus macrocarpa*	S5
Green Ash	*Fraxinus pennsylvanica*	S4
Red Maple	*Acer rubrum*	S5
Blue Beech	*Carpinus caroliniana*	S5
Black Cherry	*Prunus serotina*	S5
Balsam Poplar	*Populus balsamifera*	S5
American Elm	*Ulmus americana*	S5
White Oak	*Quercus alba*	S5
Silver Maple	*Acer Saccharinum*	S5
Wild apple	*Malus pumila*	SNR
American Basswood	*Tilia americana*	S5
Trembling Aspen	*Populus tremuloides*	S5
White Willow	*Salix alba*	SNA

Groundlayer		
Spinulose Wood Fern	*Dryopteris carthusiana*	S5
Daisy Fleabane	*Erigeron hyssopifolius*	S5
Heath Aster	*Symphyotrichum ericoides*	S5
Panicled Aster	*Symphyotrichum lanceolatum*	S5
Canada Goldenrod	*Solidago canadensis*	S5
Tall Goldenrod	*Solidago altissima*	S5
New-England Aster	*Symphyiotrichum novae-angliae*	S5
Common Mugwort	*Artemesia vulgaris*	SNA
Frost Aster	*symphyiotrichum pilosum*	S5
Tall Boneset	*Eupatorium altissimum*	S1
Poison Ivy	*Toxicodendron radicans*	S5
Enchanter's Nightshade	*Circaea lutetiana ssp. canadensis*	S5
Grass-leaved Goldenrod	*Euthamia graminifolia*	S5
Yellow Trout Lily	*Erythronium americanum*	S5
Jack-in-the-Pulpit	*Arisaema triphyllum*	S5
Canada Anemone	*Anemone canadensis*	S5
Wild Strawberry	*Fragaria virginiana*	S5
Common Reed	*Phragmites australis*	SNA
Garlic Mustard	*Alliaria petiolata*	SNA
Sensitive Fern	*Onoclea sensibilis*	S5
Blue Cohosh	*Caulophyllum thalictroides*	S5
Dandelion	*Taraxacum officinale*	SNA
Jumpseed	*Polygonum virginianum*	S4
Wild Carrot	*Daucus carota*	SNA

Shrubs		
European Privet	*Ligustrum vulgare*	SNA
Tartarian Honeysuckle	*Lonicera tatarica*	SNA
Leatherwood	*Dirca palustris*	S4
Gray Dogwood	*Cornus racemosa*	S5
Northern Spicebush	*Lindera benzoin*	S4
Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Hawthorn sp.	*Crataegus sp.*	
European Buckthorn	*Rhamnus cathartica*	SNA
Red Osier Dogwood	*Cornis sericea*	S5
Red Raspberry	*Rubus idaeus*	S5
Choke Cherry	*Prunus virginiana*	S5
Sandbar Willow	*Salix interior*	S5
Multiflora Rose	*Rosa multiflora*	SNA
Staghorn Sumac	*Rhus typhina*	S5
Pin Cherry	*Prunus pensylvanica*	S5

P #25

Trees		
American Elm	*Ulmus americana*	S5
Red Oak	*Quercus rubra*	S5
Green Ash	*Fraxinus pennsylvanica*	S4
Silver Maple	*Acer saccharinum*	S5
White Ash	*Fraxinus americana*	S4
Shagbark Hickory	*Carya ovata*	S5
Eastern Cottonwood	*Populus deltoides*	S5
Balsam Poplar	*Populus balsamifera*	S5
Black Cherry	*Prunus serotina*	S5
Blue Beech	*Carpinus caroliniana*	S5
Bur Oak	*Quercus macrocarpa*	S5
Trembling Aspen	*Populus tremuloides*	S5
Red Maple	*Acer rubrum*	S5

Groundlayer		
Dandelion	*Taraxacum officinale*	SNA
Eastern Poison Ivy	*Toxicodenron radicans*	S5
Garlic Mustard	*Alliaria petiolata*	SNA
Black Medick	*Medicago lupulina*	SNA
Jack in the Pulpit	*Arisaema triphyllum*	S5
Woolgrass	*Scirpus cyperinus*	S5
Heath Aster	*Symphyotrichum ericoides*	S5
Rough-stemmed Goldenrod	*Solidago rugosa*	S5
Jumpseed	*Polygonum virginianum*	S4
Yellow Trout Lily	*Erythronium americanum*	S5
Canada Anemone	*Anemone canadensis*	S5
Wild Strawberry	*Fragaria virginiana*	S5
Common Reed	*Phragmites australis*	SNA
Common Mugwort	*Artemesia vulgaris*	SNA
Coltsfoot	*Tussilago farfara*	SNA
Canada Goldenrod	*Solidago canadensis*	S5
Tall Goldenrod	*Solidago altissima*	S5
Wild Carrot	*Daucus carota*	SNA
Yarrow	*Achillea millefolium*	SNA
Butter and Eggs	*Linaria vulgaris*	SNA
Canada St. John's Wort	*Hypericum perforatum*	SNA

Shrubs		
Choke Cherry	*Prunus virginiana*	S5
European Buckthorn	*Rhamnus cathartica*	SNA
Gray Dogwood	*Cornus racemosa*	S5
Staghorn Sumac	*Rhus typhina*	S5
Bebb's Willow	*Salix bebbiana*	S5
European Privet	*Ligustrum vulgare*	SNA
Hawthorn sp.	*Crataegus sp.*	
Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Russian Olive	*Eleagnus angustifolia*	SNA
Tartarian Honeysuckle	*Lonicera tatarica*	SNA
Red Raspberry	*Rubus idaeus*	S5
Multiflora Rose	*Rosa multiflora*	SNA

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Trees

Green Ash	*Fraxinus pennsylvanica*	S4
American Elm	Ulmus americana	S5
Red Oak	Quercus rubra	S5
Red Maple	Acer Rubrum	S5
Black Cherry	Prunus serotina	S5
Silver Maple	Acer Saccharinum	S5
American Beech	Fagus grandifolia	S4
Blue Beech	Carpinus caroliniana	S5
American Basswood	Tilia americana	S5
Trembling Aspen	Populus tremuloides	S5
Bur Oak	Quercus macrocarpa	S5
Shagbark Hickory	*Carya ovata*	S5

Groundlayer

Common Reed	*Phragmites australis*	SNA
Garlic Mustard	*Alliaria petiolata*	SNA
Common Hawkweed	*Hieracium canadense*	SU
Dandelion	*Taraxacum officinale*	SNA
Mayapple	*Podophyllum peltatum*	S5
Spotted Jewelweed	*Impatiens capensis*	S5
Yellow Trout Lily	*Erythronium americanum*	S5
Jack in the Pulpit	*Arisaema triphyllum*	S5
Wild Strawberry	*Fragaria virginiana*	S5
Water Hemlock	*Cicuta maculata*	S5
Eastern Poison Ivy	*Toxicodenron radicans*	S5
Rough Avens	*Geum laciniatum*	S4
Rough-stemmed Goldenrod	*Solidago rugosa*	S5
Canada Rush	*Juncus canadensis*	S5
Spinulose Wood Fern	*Dryopteris carthusiana*	S5
Common Cinquefoil	*Potentilla simplex*	S5
Jumpseed	*Polygonum virginianum*	S4
Climbing Nightshade	*Solanum dulcamara*	SNA
Annual Sow Thistle	*Sonchus oleraceus*	SNA
Common Mugwort	*Artemesia vulgaris*	SNA
Manna Grass	*Glyceria striata*	S5
Three-seeded Sedge	*Carex trisperma*	S5
Philadelphia Fleabane	*Erigeron philadelphicus*	S5
Wild Rhubarb	*Arctium minus*	SNA
Canada Goldenrod	*Solidago canadensis*	S5
Tall Goldenrod	*Solidago altissima*	S5
Sensitive Fern	*Onoclea sensibilis*	S5
Bladder Sedge	*Carex intumescens*	S5
Enchanter's Nightshade	*Circaea lutetiana*	S5

Shrubs

European Buckthorn	*Rhamnus cathartica*	SNA
Gray Dogwood	*Cornus racemosa*	S5
Hawthorn sp.	*Crataegus sp.*	
Choke Cherry	*Prunus virginiana*	S5
Red Osier Dogwood	*Cornis sericea*	S5
Virginia Creeper	*Parthenocissus quinquefolia*	S4?
Wild Grape	*Vitis ripiaria*	S5
Tartarian Honeysuckle	*Lonicera tatarica*	SNA
Speckled Alder	*Alnus incana*	S5
Wild Black Current	*Ribes americanum*	S5
Red Raspberry	*Rubus idaeus*	S5
Multiflora Rose	*Rosa multiflora*	SNA
Staghorn Sumac	*Rhus typhina*	S5
Northern Spicebush	*Lindera benzoin*	S4

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

Aquatic Habitat Assessment Report

Aquatic Habitat and Fisheries Assessment
Niagara Village

Prenix Associates International Limited
Consulting Engineers

R.J. Burnside & Associates Limited
292 Speedvale Avenue West Unit 20
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October 2018
300041230.0000

Distribution List

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0	Yes	Yes	Prenix Associates International Limited

Record of Revisions

Revision	Date	Description
0	November 2, 2018	Initial Submission to Client

R.J. Burnside & Associates Limited

Report Prepared By:

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Executive Summary

R.J. Burnside & Associates Limited (Burnside) has been retained by Prenix Associates International Limited Consulting Engineers to conduct an Environmental Impact Study (EIS) in support of preliminary engineering services for the Niagara Village residential development project. This development is proposed to be located on part of Township Lots 189, 195, 215, 216, and 217, parts of Lots 1 and 3, Plan 4, Blocks A, B, C, and F, Plan 9, and part of several road allowances within the geographic Township of Stamford, Regional Municipality of Niagara (hereafter to be referred to as the Study Area). The lands are currently part of the existing Thundering Waters Golf Club (TWGC), as shown on Figure 1.

Much of the Study Area has been heavily modified due to the presence and maintenance of the TWGC; large areas of existing fairway and putting-greens are comprised of manicured lawn. There are 2 watercourses and 6 ponds located within the Study Area. Burnside Aquatic Ecology staff completed aquatic habitat assessments of the watercourses and ponds. The assessment was performed to determine conditions present in the ponds with respect to fish habitat. Burnside completed a background information review of agency data. There was a lack of data relevant to the fish community present within the Study Area. As a result, Burnside Aquatic Ecology staff also completed fish community sampling with the use of minnow traps and seine nets in order to determine the fish community assemblage present within the ponds and watercourses within the Study Area.

Through an evaluation of the fish community inventory and the aquatic habitat assessment results Burnside has provided an opinion of the fish habitat conditions present within the Study Area. Fish habitat is defined in the federal *Fisheries Act* as: “spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes.”

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Disclaimer

1.0 Policy and Regulation

R.J. Burnside and Associates Limited (herein Burnside) reviewed policy and regulation relevant to the aquatic environment present within the Study Area. Burnside also reviewed the Policies, Procedures and Guidelines for the Administration of Ontario Regulation 155/06 and Land Use Planning Policy document (NPCA, 2011) in order to determine the setback requirements for development adjacent to the watercourses within the Study Area. The NPCA document states that development is prohibited within 15 m of the stable top of bank of a valley system where a valley is apparent. Furthermore, a 30 m setback from the bankfull channel is required from Type 1 Fish Habitat (critical habitat) and a 15 m setback from the bankfull channel is required for Type 2 (important habitat) and Type 3 Fish Habitat (marginal habitat).

Type 1 Fish Habitat is defined as fish habitat which have a high productive capacity, are rare, highly sensitive to development or have a critical role in sustaining fisheries (e.g., spawning and nursery habitat, groundwater discharge area).

Type 2 Fish Habitat is fish habitat which is moderately sensitive to development and although important to the fish population, they are not considered critical (e.g., feeding area, open water habitats of lakes).

Type 3 Fish Habitat is fish habitat that has a low productive capacity or are highly degraded and do not currently contribute directly to fish productivity. They often have the potential to be improved significantly.

The federal *Fisheries Act* defines fish habitat as: “spawning grounds and any other areas, including nursery, rearing, food supply and migration areas, on which fish depend directly or indirectly in order to carry out their life processes.”

Section 35(1) of the *Fisheries Act* states that “No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery (CRA), or to fish that support such a fishery.” Serious harm is defined as:

- The death of fish;
- A permanent alteration to fish habitat of a spatial scale, duration or intensity that limits or diminishes the ability of fish to use such habitats as spawning grounds, or as nursery, rearing, or food supply areas, or as a migration corridor, or any other area in order to carry out one or more of their life processes; and,
- The destruction of fish habitat of a spatial scale, duration, or intensity that fish can no longer rely upon such habitats for use as spawning grounds, or as nursery, rearing, or food supply areas, or as a migration corridor, or any other area in order to carry out one or more of their life processes.

2.0 Background Information

As part of the *Fisheries Act* compliance, Burnside, completed a background information review and desktop assessment of the site Study Area. The following sources of data were reviewed as part of this desktop review:

- Niagara Peninsula Conservation Authority (NPCA) Watershed Explorer (2017), Pre-Consultation Meeting with NPCA Ecologist (December 7, 2017);
- Savanta Inc, Riverfront Community Official Plan Amendment (OPA), Environmental Impact Study (EIS), Niagara Falls Ontario (2017)
- Department of Fisheries and Oceans (DFO) Canada Species at Risk (SAR) mapping (2017);
- Ministry of Natural Resources and Forestry (MNRF) Aquatic Resource Area (ARA) mapping (2015);
- Aerial Orthophotography;
- Natural Heritage Information Centre (NHIC) (2016);
- Ministry of Agriculture, Food, and Rural Affairs Mapping (OMAFRA) (2015);
- Aerial orthophotography (2015);
- Lower Welland River and South Niagara Falls Watershed Report Card (2012);
- Lower Welland River Study Area Characterization Report (2011); and
- Dougan and Associates Ecological Consulting and Design and C. Portt and Associates, Thundering Waters Secondary Plan Characterization and Environmental Impact Study (2016).

2.1 Review of Agency Data

Based on a review of aerial photography and NPCA Watershed Explorer it was determined that an artificial stormwater management channel (Conrail Drain) that flows through the Study Area in a northeast to southwest direction eventually discharges into the Welland River Hydro Canal (Wellend River). The artificial channel is known as the Conrail Drain based on the Riverfront Community OPA, EIS by Savanta, 2017. There was also an unnamed watercourse that flows from northeast to southwest, south of the Thundering Waters Golf Club property that discharges into the Welland River, south of Dorchester Road and west of Kister Road. There were also numerous ponds (irrigation/water features) and a meandering drain like watercourse (unnamed intermittent watercourse) flowing through the golf course property which connected four of the ponds. On the NPCA Watershed Explorer program the meandering watercourse within the golf course property is mapped as intermittent with connectivity to the downstream watercourse which flows beneath Dorchester Road, west of Kister Road (See Figure 1). It did not appear that the watercourses in the Study Area receive flows from any agricultural drains based on the review of the 2017 OMAFRA Mapping.

A review of the 2017 DFO SAR mapping identified aquatic SAR as potentially inhabiting the Conrail Drain and the downstream reaches of the intermittent watercourse to the

southwest of the Study Area. The aquatic SAR includes 2 mussel species, Round Hickorynut *(Obovaria subrotunda)*, Kidneyshell *(Ptychobranchus fasciolaris)* and one fish species, Grass Pickerel *(Esox americanus vermiculatus).* A review of the NHIC mapping indicates that Eastern Pond Mussel *(Ligumia nasuta)* and Round Hickorynut have also been historically observed within the Study Area 1988 and 1931 respectively.

There is no MNRF ARA summary data for the thermal regime or fish species which potentially inhabit the Conrail Drain or the thermal regime of any watercourse or pond within the Study Area. These watercourses and ponds can be observed on the attached ecological maps (See Figure 1). The Conrail Drain is not ecologically connected with any upstream features, indicating that it receives storm water contribution and surface runoff only. A review of historical aerial orthophotography shows that the land use has changed within the Study Area in recent history. Currently the property is an 18-hole golf course, called the Thundering Waters Golf Course. Between 2002 and 2004 the construction of the golf course began and by 2006 the current golf course was in place. Prior to the construction of the golf course in 2002, the on-site ponds were not present, and it is not clear if the watercourse that flows between these manmade ponds was in place or not, although it has been modified to accommodate the current land use as a golf course.

The Study Area is located entirely within the NPCA jurisdiction. A review of NPCA mapping indicates that the watercourse is located mostly within the Lower Welland River Subwatershed. The Niagara Falls Slough Forest Wetland complex is present within this subwatershed southwest of the site. Perched culverts have been identified as barriers to fish movement within the Lower Welland Subwatershed. Surface water quality, assessed through phosphorus and *E. coli* concentrations, was given an overall grade of D, which indicates “poor” water quality in the subwatershed (NPCA, 2012).

On December 7, 2017, Burnside’s Ecologists, Prenix Associates and the NPCA Ecologist (Lee-Anne Hamilton, pers. comm.) had a meeting to discuss site conditions and any relevant aquatic and terrestrial background information regarding the Thundering Waters Golf Course. The NPCA has conducted aquatic surveys within the Conrail Drain and agreed that it was a stormwater management feature and typically dries up in the summer. A discussion regarding the potential for aquatic SAR to exist within the Conrail Drain was quickly negated based on limited suitable substrate, seasonal conditions and water quality.

The Lower Welland River Study Area Characterization Report states that the Conrail Drain and the northeast to southwest flowing unnamed intermittent watercourse are unclassified with no data pertaining to the habitat type. Downstream, the Welland River contains Type 1 and Type 2 habitat. Type 1 habitat is the most sensitive habitat, containing spawning and rearing locations and requires the most protection. Type 2 is less sensitive than Type 1, requiring less protection.

2.2 Review of 2016 Secondary Plan for Thundering Waters - Characterization Report and Environmental Impact Study

Dougan and Associates Ecological Consulting and Design (D&A) and C. Portt and Associates (CPA) completed an Environmental Impact Study (EIS) for the lands commonly known as Thundering Waters in 2016. The EIS included background information review and field sampling of the aquatic resources in the Conrail Drain and other watercourses associated with the Thundering Waters Golf Course. The EIS states that MNRF did not have any information pertaining to fish community assemblage of the Conrail Drain or other surface water features and that site investigations should be completed to determine fish access to the Conrail Drain and whether Northern Pike (*Esox lucius*) utilize the wetlands near the Welland River for spawning. D&A and CPA sampled two watercourses that are also associated with the Thundering Waters Golf Course. In the EIS these are Watercourse 2 (the watercourse that connects to the ponds in the golf course) and Watercourse 3 (the Conrail Drain).

Northern Pike were not observed spawning or inhabiting any watercourses associated with the site including the Conrail Drain. Surveys included visual observation of spawning habitat in the spring and electrofishing in the fall. “Young of the Year” (YOY) Northern Pike were not observed during the fall electrofishing. No other species of fish were observed spawning in the Conrail Drain or in Watercourse 2. The EIS states that there are thick, failing gabion baskets in the lower reaches of the Conrail Drain as well as a steep bottom slope and thick rooted vegetation which prevents the movement of larger bodied fish from the Power Canal into the Conrail Drain. These conditions would only allow the passage of fish under the highest flows and Brook Stickleback were the only fish sampled during electrofishing surveys in the Conrail Drain.

D&A and CPA did not capture any fish species in June 2015 in Watercourse 2. In October they sampled 18 YOY White Sucker, 7 juvenile Largemouth Bass, 1 adult Central Mud Minnow, 1 juvenile Brown Bullhead, 1 adult Bluntnose Minnow and 2 adult Golden Shiners. In June 2015 they electrofished the Conrail Drain as well and observed 5 Brook stickleback. D&A and CPA did not electrofish the Conrail Drain in the October 2015 sampling window.

D&A and CPA concluded that Watercourse 2 is capable of providing fish habitat, though they state that it is relatively simple and unproductive. Watercourse 2 is a permanent and natural watercourse which occurs within a small valley feature. Watercourse 3, the Conrail Drain, is an artificial watercourse through which large bodied fish cannot pass. It is relatively unproductive and does not provide spawning habitat.

3.0 Existing Conditions

Burnside Aquatic Ecologists visited the site on October 5 and November 21 of 2017. Burnside ecologists assessed the watercourses and ponds within the Study Area for

form, function and fish habitat. During the site visits the ponds, the unnamed intermittent watercourse flowing between them, and the Conrail Drain all contained water. The weather during the October and November site visits was sunny with no precipitation.

Burnside Aquatic Ecologists also visited the site on April 26, 2018 and completed an aquatic habitat assessment of the ponds and watercourses on the Thundering Waters Golf Course property. The ponds were inspected for fish habitat, form and function. Weather on April 26 was clear with rain events in the previous days. All photographs from the Aquatic Habitat Assessment and Fish Community Inventory are available in Appendix A of this report. Field notes and data sheets from the aquatic habitat assessments are available in Appendix B of this report.

3.1 Aquatic Habitat Assessment - October 2017

During the October 5 site visit, the bottom of the banks of the Conrail Drain were densely vegetated with forbs, grasses and shrubs (Photo 1). The density of this vegetation potentially restricts flows and movement of fish during periods of low flow. The slope of the banks and the base of the channel were hardened with angular stone/rip rap (Photo 1 and 2). Riparian trees were intermittently present along the banks of the Conrail Drain through the Study Area. The wetted width and depth of the Conrail Drain was assessed as 1.0 and 0.2 m respectively. The water was very turbid during the October site visit (Photo 2) from a previous thunderstorm and heavy rain event. The Conrail Drain was flowing at a very low velocity and was laminar throughout the assessed length. Artificial hardening was present in large stretches of the watercourse through the assessed length in the form of armor stone retaining walls, angular stone/rip rap and gabion baskets (Photo 1). A large pipe arch culvert (CSP) was also present near the western edge of the study area within the Conrail Drain (Photo 2). Where visible, the substrate was comprised of silt, muck and some organic material in the form of fallen leaves and grasses. Angular stone (rip rap) was present within the base of the watercourse which confirms that it is not a natural channel and was constructed to support stormwater management and drainage (i.e., Conrail Drain).

Burnside staff did not enter the ponds but made visual observations from the shorelines. The ponds were large and very turbid during the October site visit (Photo 3). Some of the ponds are connected by an unnamed intermittent watercourse which receives flows from the ponds when the water levels are high enough to allow overflow into the channel. Within the watercourse/drainage feature there was floating vegetation (duckweed (*lemna minor*)) present as well as submerged and emergent vegetation (Photo 4). There was some shading of this intermittent watercourse provided by mature riparian trees and the banks were vegetated with forbs, shrubs and grasses. The intermittent watercourse appeared to be stagnate and flow velocity was not discernible. It appeared that the intermittent watercourse was designed to accept “under drainage” from irrigation tile and overflow from ponds that are connected to this system.

3.2 Aquatic Habitat Assessment – November 2017

During the November 21st aquatic habitat assessment, Burnside assessed the Conrail Drain, golf course ponds (Ponds A to F) and the intermittent watercourse south of the Study Area. Weather conditions during the aquatic habitat assessment were clear with no precipitation.

Burnside also assessed the Conrail Drain further upstream near John Daly Way to determine existing aquatic conditions and look for indications of aquatic life (remnant mussel shells and fish). The Conrail Drain flowed through a concrete siphon culvert (barrier to fish movement) with a metal safety grate on the inlet and outlet upstream of the golf course property, beneath John Daly Way (Photos 5 and 6). Upstream of the culvert a concrete/rip rap barrier was also noted by Burnside staff. Upstream and downstream of this culvert the Conrail Drain was moderately vegetated with shrubs, grasses and reeds (Photo 7 and 8). The banks were not well vegetated and hardened with artificial materials (rip rap angular stone). Downstream of this concrete culvert the watercourse flows through the channel and appeared intermittent with several portions of the Conrail Drain not containing water (water was flowing under the rip rap stone). A few deeper scour pools were present through the assessed length of the watercourse downstream, although most of the morphology consisted of flats and runs. The banks had a steep grade as well and the slope was not vegetated. The substrate was more visible during the November habitat assessment and consisted of fine grained material and organic matter underlain with riprap in slow sections with angular stone visible in faster sections (Photo 9 and 10). Large angular stone was present within the base of the watercourse and a significant impassable concrete barrier was located upstream of the siphon culvert. It was also apparent during the November site visit that there were several corrugated steel pipe outlets with grates on them which convey underground drainage to the Conrail Drain.

The ponds and the unnamed intermittent watercourse that flows between them were very turbid during the habitat assessment (Photo 11-14). Outlet culvert inverts at the ponds are set at an elevation to retain water levels in the ponds for irrigation and as water features for the golf course play area. The water elevation in the ponds was at a level that conveyed limited water flow through the CSP culverts into the watercourse. Some ponds were partially vegetated along the banks although where it meets the golf course fairway or play area, manicured grass was cut to the edge of the pond. Filamentous algae was also observed within some locations in the golf course ponds.

Burnside Aquatic Ecology staff assessed the unnamed intermittent watercourse south of the TWGC property which discharges into the Welland River, south of Dorchester Road and West of Kister Road (Photos 15-18). The watercourse discharges to the Welland River at a concrete culvert outlet which was flowing at the time of the habitat assessment. NPCA Watershed Explorer illustrates this intermittent watercourse originating within the Thundering Waters Golf Course.

3.3 Aquatic Habitat Assessment - April 2018

During the April 26 aquatic habitat assessment Burnside assessed the ponds and the Conrail Drain on the Thundering Waters Golf Course property for form, function and fish habitat. The ponds were assessed following the MTO Environmental Guide for Fish and Fish Habitat. All of the ponds are deep and featured turbid water colour conditions, and thus substrate and fish habitat within them could not be identified throughout the area of the ponds. The ponds maximum length and width were measured with the use of a laser range finder.

3.4 Aquatic Habitat Assessment - Ponds

Pond A is a large off-line pond that is comprised of two separate ponds which are connected to each other but do not connect to the other ponds or the watercourse. The larger portion of Pond A (Photo 20) is northwest and downstream of the smaller portion of Pond A. The surface conditions of the larger portion of Pond A were rippled and water colour was yellow-brown at the time of the aquatic habitat assessment. The land surrounding the pond was comprised mostly of golf course fairway with a mature woodlot located on a small section of the south bank. The larger portion of Pond A was measured to be 187m long and 75m wide at maximum. The banks of the larger portion of Pond A were very steep (45%) and majority of the surface area of the banks (80%) were vegetated with manicured grasses. The remainder of the banks were vegetated with mature riparian trees and unkept grasses. Cattails were also present on the banks of the drain. The majority of the sediment in the larger portion of Pond A was comprised of silt with detritus and organics present as well.

During the aquatic habitat assessment, the surface conditions in the smaller portion of Pond A were categorized as calm and the water colour was turbid and yellow-brown. The majority of the banks of Pond A were vegetated with manicured grasses, however approximately 20% of the bank vegetation was comprised of unkept grasses and mature trees. The land use surrounding Pond A included forested lands and the golf course property. Underwater cover that was visible during the aquatic habitat assessment included fallen logs and trees, organic debris and aquatic macrophytes. The banks were very steep and no littoral zone or aquatic vegetation was present in the pond. The nearshore substrate was comprised of a silty muck and organic debris in the form of fallen leaves. During the aquatic habitat assessment approximately 10% of the surface area of Pond A was covered with floating aquatic macrophytes (duckweed).

Pond B is a round-shaped pond that is also offline and does not appear to outlet to the unnamed intermittent watercourse which connects most of the ponds within the Thundering Waters Golf Course. During the aquatic habitat assessment. the surface conditions were calm and the water colour was clear green in Pond B (Photo 21). The max length and width of Pond B were measured to be 75 m and 45 m respectively. Nearshore slope was measured to range between 10-30%. The banks were determined to be stable. Aquatic macrophytes were not observed within Pond B. The shoreline

substrate was comprised of organic debris and manicured grasses and the substrate of the pond was comprised of muck (70%) and detritus (30%). Logs, trees and organic debris were all within the pond representing aquatic habitat. A wetland is present behind the southwest bank and Pond B overflows, seasonally, into this treed wetland area.

Pond C is a 77 m long approximately 10 m wide pond located in the east boundary of the Thundering Waters Golf Course (Photo 22). During the aquatic habitat assessment Pond C was calm and yellow-brown in colour. The land surrounding the pond was comprised of golf course lands and a woodlot. This pond collects runoff from the surrounding lands and is connected to other ponds through the unnamed intermittent watercourse which flows within the Golf Course property. The substrate of the pond was comprised completely of muck. Bank slope ranged between 15-45% and the shoreline substrate was comprised of organic debris and fallen leaves. The banks were stabile and contained some limited stands of red osier dogwood. Underwater cover was limited to fallen trees, logs and organic debris. Seasonal barriers to migration were identified within the unnamed intermittent watercourse including the elevated inverts of the culverts and obstructions within the shallow unnamed intermittent watercourse downstream of the outlet culvert of Pond C. A muskrat den was located on the east bank in the southern half of Pond C, and 10 painted turtles were observed within Pond C.

Pond D was measured to be 195 m long and 26 m wide at maximum (Photo 23). The land use surrounding Pond D included the golf course lands and a mature woodlot. The slope of the pond was severe, ranging between 45 and 100%. Shoreline substrate was comprised of muck and organic debris. Within Pond D underwater aquatic habitat was comprised of boulders, logs, trees and organic debris. Emergent and floating aquatic macrophytes were not observed during the aquatic habitat assessment. Some filamentous algae and bottom stands of aquatic macrophytes (i.e., chara sp.) It was noted that within Pond D there is a discharge outlet that is used to pump water to Pond D where it then is used for irrigation purposes in the Thundering Waters Golf Course. Burnside noted that Pond D does not receive water from other ponds or the unnamed intermittent watercourses, however, it does convey flows to them.

Pond E is connected to ponds C, D and F through the connecting unnamed intermittent watercourse. Pond E is 76 m long and 38 m wide (Photo 24). The unnamed intermittent watercourse flows into Pond E from the north and the east and Pond E outlets into the unnamed intermittent watercourse from a CSP culvert located within the south bank. This flow is then continued to Pond F. Another branch of the unnamed intermittent watercourse flows into Pond E, conveying flows from Ponds C and D. Surrounding land uses were comprised of golf course land and a woodlot. The bank slope ranged between 10-45% and the shoreline substrate was comprised of organic debris. Substrate within Pond E was comprised completely of muck and organic debris. Small stands of cattails were present on the banks of Pond E. Some minor unidentified submergent aquatic macrophytes were also observed within Pond E. The west bank

was steep and densely vegetated with mature trees. The northwest bank was vegetated with manicured grasses and the other banks were vegetated with mature trees and unkept grasses. Underwater cover was comprised of limited boulders, aquatic macrophytes and organic debris.

Pond F is a y-shaped pond that was measured to be 57 m long and 12 m wide that is connected to the other ponds and the watercourse (Photo 25). The unnamed intermittent watercourse flows into Pond F from Ponds E and G. The watercourse enters Pond F within the northern shoreline. Surface conditions were calm, the water colour was yellow-brown and clarity was turbid. Flows from Ponds E and D enter Pond F where it then flows into the connecting watercourse which flows south out of the unnamed intermittent watercourse. The banks were steep with a slope measured at over 45% and were vegetated with manicured grasses and mature trees with unkept grasses present on the east bank. The shoreline substrate composition ranged from silty clay to clay-loam with some organic material as well. The substrate of the pond was comprised of silt and muck. Downstream of Pond F within the unnamed intermittent watercourse a barrier to fish movement was present in the form of a manmade concrete and rock barrier (>1.0 m). This barrier was observed upstream of the cart path crossing, along the south side of the golf course.

3.5 Aquatic Habitat Assessment - Conrail Drain

Burnside assessed the Conrail Drain on April 23, 25 and 26, 2018 for fish habitat and mussel SAR presence. Burnside noted the presence of several barriers to fish migration within the Conrail Drain. Beneath John Daly Way there is a large syphon culvert that conveys flow under the road (Photos 26 and 27). During the April 2018 visit the water was flowing through this culvert. An outlet pool was present downstream of John Daly Way. Downstream the morphology consisted mainly runs and flats. Riffles characteristic of higher velocity streams were not present in the Conrail Drain. It was noted in the field that several stormwater sewer outfalls are present within the Conrail Drain downstream of John Daly Way. Upstream of John Daly Way there was a manmade concrete barrier to fish movement within the Conrail Drain that prevented the upstream movement of fish species (Photo 28).

Within the Conrail Drain the substrate was comprised of very fine sediment in the form of silt and muck. Some larger substrate in the form of broken concrete and rip-rap was present in the Conrail Drain. The substrate was very soft and a large amount of it had accumulated within the Conrail Drain bottom (>0.3 m). As mentioned in section 3.1 the bottom of the slopes on the banks of the Conrail Drain were lined with rip-rap and the drain flows in a linear manner (Photo 29 and 30). On April 26 Burnside aquatic ecologists visited the Conrail Drain south of the Study Area at the Dorchester Road crossing. Beneath Dorchester Road there is a Corrugated Steel Pipe Arch (CSPA) culvert that was present with a trash grate on the inlet of the culvert. This trash gate contained a significant buildup of anthropogenic waste (tires, wooden skids, etc.) and

represented a partial barrier to fish migration in the watercourse (Photo 31). Based on correspondence with NPCA ecology staff, a barrier to fish movement upstream from the Welland Canal exists at the outlet of the Conrail Drain.

While assessing the Conrail Drain for fish habitat Burnside was also visually observing for signs of mussel SAR (muskrat mittens, remnant shells in the substrate, rafted material on the banks, etc.). Burnside did not observe any sign of potential mussel presence within the Conrail Drain during the aquatic habitat assessment in April 2018.

4.0 Fish Community Inventory

Due to the lack of historical information pertaining to the fish species and thermal regime within the Conrail Drain and the unnamed intermittent watercourse, a fish community inventory was conducted. Burnside completed the fish community inventory in the Conrail Drain, unnamed intermittent watercourse as well as the ponds in order to characterize the fish community within the Study Area. The fish presence survey was completed at ten stations within the Site Study Area (see Figure 2 of this Report). Burnside aquatic ecology staff utilized seine netting, minnow traps and dipnets, to sample for fish within the above-mentioned waterbodies. The fish community inventory was completed under a License to Collect Fish for a Scientific Purpose (License No.: 1088491) obtained from the Ministry of Natural Resources and Forestry. Burnside completed the sampling on April 25 and 26, 2018 and on July 16, 2018.

4.1 Methodology

4.1.1 April 2018 Sampling

Burnside set minnow traps (Gee Traps) in 10 locations in the Study Area overnight in the ponds, the unnamed intermittent watercourse, and the Conrail Drain. The traps were all baited with catfood and submerged completely underwater. Weather conditions during the sampling were 12°C and 8 mm of rain fell on the 25th. Burnside set minnow traps at the locations outlined in Figure 2. Traps 1 and 2 were set in the unnamed intermittent watercourse which connects the ponds within the Study Area (Photo 32). During the fish community inventory on April 25-26, 2018 this watercourse was flowing and contained some filamentous algae and floating aquatic macrophytes.

Traps 3-5 were set within ponds E, D and F respectively (Photos 33-35). Depths of the ponds was not confirmed during the fish community inventory. All of the ponds sampled contained some filamentous algae and were conveying flows to the connecting intermittent unnamed watercourse during the April 25-26 sampling.

Traps 6 and 7 were located upstream and downstream, respectively, of the barrier to fish movement identified in the unnamed intermittent watercourse near the downstream limit of the watercourse within the Study Area (Photos 36 and 37). In addition, dipnets and a seine net were used to sample the area downstream of Trap 7 and the results of the

seine and dipnetting are provided in section 4.2.1, below. Burnside noted that the substrate was comprised of very fine sediment in the watercourse where traps 6 and 7 were located and erosion protection measures were located on the banks in the form of armourstone. The banks of the watercourse in which traps 6 and 7 were placed were steep and vegetated with riparian trees, grasses, and shrub vegetation. The watercourse in this location was flowing in a flats type of morphology.

Traps 8, 9 and 10 were set in the Conrail Drain from downstream to upstream numerically (Photos 38-39). Traps 8 and 9 were set in the Drain where located in the golf course while Trap 10 was set in the Conrail Drain downstream of the culvert beneath John Daly Way. In the location where traps 8 and 9 were set the Conrail Drain was a rip-rap lined channel and the substrate was comprised of rip-rap, silt and organic materials. Remnant phragmites and emergent aquatic macrophytes (cattails) were present within the channel bottom of the Conrail Drain. The watercourse was marginally flowing during the fish community inventory. In the location where trap #10 was set the conditions were similar to where traps 8 and 9 were located with respect to substrate, rip-rap lining and remnant aquatic macrophytes. The trap was set in a deeper pool located within the channel.

4.1.2 July 2018 Sampling

On July 16, 2018 Burnside completed sampling of ponds B (Photos 40-42), D (photos (43-45) and the smaller section of Pond A (Photo 46). Weather conditions on this date were very hot and sunny with little wind. The sampling was completed with the use of a seine net with a 0.5-inch mesh size. Multiple sweeps of each pond were completed as part of the sampling. Pond A is an isolated pond that is not connected to the watercourses within the Study Area. Pond B is a deep pond and is not connected to the unnamed intermittent watercourse within the Study Area. Pond D is described above in section 2.1 and conditions were the same as they were in April 2018. The water within Pond B and D was very turbid during the fish community inventory.

4.2 Results

4.2.1 April 2018 Results

Water temperature was measured at 7°C during the April 25 sampling. Burnside aquatic ecology staff sampled the area downstream of the Trap #7 location by deploying a seine net and using dipnets. Trap 7 was located downstream of a barrier to fish movement identified during previous field visits. Burnside noted that in the unnamed intermittent watercourse that connects the ponds featured very deep (>0.5 m) and soft sediment in the form of silt. The banks of the watercourse were all very steep and high. In some locations, such as downstream of Trap #7, the banks were densely vegetated with trees and shrubs. In all locations the banks were vegetated with terrestrial grasses and shrubs. During the April site visit submerged aquatic macrophytes were not visible.

Downstream of the barrier to fish movement Burnside captured 1 yellow bullhead (*Ameiurus natalis*) and 3 green sunfish (*Lepomis cyanellus*).

Burnside also noted that there were major changes in water clarity within the ponds and the unnamed intermittent watercourse depending if the ponds were discharging to the watercourse through elevated culverts which convey high-flows. If the ponds were discharging to the watercourse then significant sediment staining and high turbidity was observed.

Burnside also set minnow traps within the Conrail Drain. Within the Conrail Drain Burnside noted the presence of anthropogenic debris in the form of refuse from stormwater run-off. The substrate of the Conrail Drain was comprised of rip-rap and very fine sediment. The Conrail Drain was very densely vegetated with stands of remnant phragmites from the previous season. In all minnow trap locations, the traps were set in the late morning or early afternoon on April 25 and then retrieved on April 26.

Table 1: Fish Species Captured During the April 25-26, 2018 Fish Community Sampling

Trap #	Time In on 4/25/2018	Time Out on 4/26/2018	Fish Species Sampled
1	1145	1125	Golden shiner (*Notemigonus crysoleucas*) (22) Fathead Minnow (*Pimephales promelas*) (2) Green Sunfish (*Lepomis cyanellus*) (2) Bluegill (*Lepomis macrochirus*) (5) **CPUE:**1.31 fish/hour
2	1149	1140	Bluegill (3) Crayfish (5) Green Sunfish (1) **CPUE:**0.389 fish/hour
3	1203	1148	Crayfish (2) **CPUE:**0.084 fish/hour
4	1209	1015	No Fish **CPUE:** 0 fish/hour
5	1218	1220	Crayfish (2) **CPUE:** 0.083 fish/hour
6	1228	1235	No Fish **CPUE:** 0 fish/hour
7	1234	1240	Central Mudminnow (*Umbra limi*) (5) Green Sunfish (6) Crayfish (2) **CPUE:** 0.290 fish/hour

8	1405	1255	Brook Stickleback (*Culaea inconstans*) (51) Green Sunfish (1) **CPUE:** 2.28 fish/hour
9	1410	1250	Brook Stickleback (38) Green Sunfish (1) **CPUE:** 1.72 fish/hour
10	1415	1400	Brook Stickleback (64) Green Sunfish (10) **CPUE:** 3.12 fish/hour

4.2.2 July 16, 2018 Results

Burnside completed the seining on July 16, 2018 in Ponds A, B and D. The fish species captured during this date are presented below in Table 2. It is noted that Pond D receives water via pumping for irrigation purposes from the Welland River. Based on the observation and capture of invasive species such as Round Goby (*Neogobius melanostomus*) and other species potentially inhabiting the Welland River, it is presumed that these species may have been introduced to Pond D through supplemental pumping for irrigation. Water temperatures during the July 2018 sampling were measured at 25.5°C. Common carp were observed within Pond D and were not captured with a seine net.

Burnside noted during the fish community inventory that the watercourses which connects the ponds was stained with sediment and had a large amount of floating aquatic macrophytes in the form of duckweed (*Lemna minor*). In some instances, the unnamed watercourse did not contain a sufficient amount of water to provide fish habitat.

Table 2: Fish Species Captured During the July 26, 2018 Fish Community Sampling

Pond	Seining Time	Species Captured
A	1 hour	Approximately 140 Green Sunfish were captured in the pond. Size ranged from 25 mm to 90 mm.
B	1 hour	Approximately 350 crayfish were captured as well as 4 tadpoles. No fish were captured.
D	1 hour 15 minutes	Largemouth bass (*Micropterus salmoides*) (6) Common shiner (Luxilus cornutus) (5) Common Carp (*Cyprinus carpio*) (2, observed) Round goby (*Neogobius melanostomus*) (4) Common White Sucker (Catostomus commersonii) (3) Green Sunfish (*Lepomis cyanellus*) (17) Golden shiner (*Notemigonus crysoleucas*) (5)

4.3 Discussion of Results

The results from the April 2018 fish sampling suggest that a variety of warm-water species are present in the watercourses which connect the ponds within the Study Area. Golden Shiner, Brook Stickleback, Green Sunfish, Central Mudminnow, Fathead Minnow and Bluegill are all pollution tolerant, warm-water species that were found in a high abundance within the watercourses. Within the Conrail Drain the composition of the fish species sampled (Traps 8-10) suggests that the conditions within the Conrail Drain are suitable for warm-water fish species tolerant of pollution and turbidity (i.e., brook stickleback and green sunfish).

Fish were also not captured using minnow traps within ponds E, D and F (traps 3-5); however adult fish species were captured within Pond D during the July 2018 fish sampling. Fish were captured in the intermittent watercourse during the April 2018 fish community inventory, which indicates that the conditions within in the unnamed intermittent watercourse are suitable to support tolerant species.

Fish were not captured in Pond B despite several sweeps of the pond with a ¼" mesh seine net. Over 350 crayfish and several tadpoles were captured, but no fish were observed indicating that fish have not been introduced to this offline pond. Burnside Aquatic Ecology staff also sampled Pond A, an offline pond, and captured over 140 Green Sunfish within it.

In Pond D Burnside's sampling resulted in several species of fish being captured within the pond, including an invasive species, the Round Goby. Warm-water pollution tolerant species were also captured during sampling efforts. It was noted during the fish sampling that Pond D is the location where water is pumped from outside sources (Welland Canal) for golf course irrigation purposes. Large common carp, white sucker and largemouth bass were all captured or observed during the fish sampling on July 16, 2018. It is Burnside's opinion that these fish must enter these ponds and subsequently the connecting watercourses through the water that is pumped to the ponds for irrigation purposes or through human introduction.

5.0 Fish Habitat

5.1 Conrail Drain

Overall the Conrail Drain was assessed as providing marginal fish habitat to tolerant species as it receives storm water and runoff from the surrounding area. During the October 2017 site visit the Conrail Drain was very turbid indicating it receives a significant amount of storm water contribution during precipitation events. There was limited habitat features in the Conrail Drain based on the channel morphology (linear and trapezoidal) and substrate type (rip rap lined channel). Marginal habitat features were present including aquatic macrophytes (cattails), woody debris (from storm events), and suitable substrate (sand and organics). The only granular substrate that would provide

habitat and cover is the large angular stone that has been used to line the channel. During the November site visit upstream portions of the Conrail Drain were dry and an instream barrier was observed upstream of the siphon culvert under John Daly Way. There are limited refuge pools present within the Conrail Drain which may provide habitat to tolerant warm water species during periods of low flow. As mentioned in section 2.1.1, DFO has highlighted the Conrail Drain as potentially being occupied by mussel SAR (round hickorynut and kidneyshell). A substantial effort to observe potential mussel shells in depositional areas and within suitable habitat was conducted by Burnside staff although no shells were observed despite clear water conditions during the November site visit. See Photos 1 and 2, and 5 to 10 including Figure 2 for location.

Burnside completed the fish community inventory of the Conrail Drain in April 2018 through the use of Gee minnow traps. Burnside captured tolerant species (brook stickleback and green sunfish) during this sampling. Burnside also observed poor fish habitat connectivity within the Conrail Drain. Burnside classifies the fish habitat as marginal, Type 3, fish habitat.

On September 14, 2018 it was confirmed by David Ballint (DFO SAR Biologist) and Caroline Boros, of the Fisheries Protection Program within the Department of Fisheries and Oceans that the Conrail Drain is not deemed to be suitable for Species at Risk mussels. DFO and Burnside walked and surveyed the section of the Conrail Drain within the Thundering Waters Golf Course property. Based on the results of the site visit DFO did not request that a mussel survey be completed for the Conrail Drain. See attached correspondence from DFO in Appendix C.

5.2 Ponds

Ponds (A through F) located within the golf course were considered to provide marginal fish habitat and are likely habitat for terrestrial species as well. Water quality within them is likely impaired due to their proximity to a highly manicured golf course environment, and the lack of a natural buffer on the banks of the ponds. Based on a preliminary review of habitat conditions within the main ponds, most of the perimeter and littoral zones were deep with limited potential to provide shallow water habitat or aquatic vegetation growth (suitable littoral zone depth). Vegetated riparian areas consisted of shrubs or trees with a steep bank potentially providing shade and edge structure. Ponds C through F located within the site are seasonally connected to the intermittent unnamed watercourse that flows from northeast to southwest into the Welland Canal. See Photos 3 to 4 and 11 through 14 including Figure 2 for location and size.

The man-made ponds and related drainage features were not designed to provide fish habitat although they do provide water features and irrigation within a golf course landscape. Despite being anthropogenic they still contain water and potentially provide habitat to pollution tolerant warm-water species. Two of the ponds (Pond A nearest to the clubhouse and Pond B) had no inlet/outlet or connectivity to any watercourses within

the site. These two ponds are man-made and do not connect to natural watercourses and thus they are not considered to be fish habitat.

The results of the July 2018 fish sampling show that fish that would be considered part of, or contribute to, a commercial, recreational and/or Aboriginal fishery are present within the ponds, including the ponds which connect to the unnamed watercourse which eventually flows out of the Study Area. However, Burnside did note that surface water is pumped to Pond D and that fish species located within the ponds could be introduced to the pond system through the pumping of this water. Overall, ponds C-F are considered to provide Type 3 habitat and considered to provide fish habitat for warm water species.

5.3 Unnamed Intermittent Watercourse

The unnamed intermittent watercourse which connects the ponds is an altered watercourse which receives flow from the ponds and drainage features that support the golf course during irrigation and precipitation events. Water from the drainage features and ponds discharge when they reach a level that water will flow into the outlets (culverts) and into the watercourse. A concrete and rock barrier (>1.0 m) was observed upstream of the cart path along the south side of the golf course. This barrier appears to be part of the water control within the golf course lands and may hold back water to support water features and irrigation. It is unknown at this time why the barrier exists although it would limit the migration of any fish species from the Welland River upstream into the subject lands.

There were limited habitat features within the unnamed intermittent watercourse although conditions improved downstream towards the southern end of the property. Substrate consisted primarily of fine grained sediments within the trapezoidal channel. Aquatic macrophytes consisting of emergent common arrowhead *(Sagittaria sp.)* and lily pad *(Nymphaea sp.)* were observed, along with bank vegetation (mixed grasses and shrubs) within a narrow riparian area at the downstream limits and southern edge of the site. Instream habitat was very limited based on the channel morphology (linear) and shape (trapezoidal) upstream of the impassable barrier (See Photos 15 through 19 and Figure 2 for location and flow direction).

The intermittent watercourse that flows through the golf course property is considered to be seasonal and Type 3 fish habitat that would only be suitable for warmwater tolerant species. This watercourse lacked natural habitat features including large woody debris and substrate capable of provided shelter and habitat. The depth of water in the unnamed intermittent watercourse during periods of low flow would prevent the movement of larger bodied fish through the watercourse from the Welland River.

6.0 Conclusion

As mentioned in Section 1.0 NPCA has regulations regarding developments setbacks from aquatic habitat based on the fish species present. Based on the fish community

inventory and the aquatic habitat assessment it is Burnside's opinion that Type 1 and Type 2 habitat are not present within the Study Area. It is Burnside's opinion that Type 3 (marginal) habitat is present within the ponds, the Conrail Drain and the unnamed intermittent watercourse. The lack of rare and sensitive species is the determining factor in deeming the habitat as Type 3 marginal fish habitat.

As mentioned in Section 1.0 of this report serious harm to fish that are part of or support a commercial, recreational or Aboriginal fishery is prohibited under Section 35(1) of the *Fisheries Act*. The species captured during the April and July fish community inventory described in section 5.0 would be considered fish that support a fishery, with the exception of the golf course ponds A and B. Both Ponds A and B are man-made and not connected to the intermittent unnamed watercourse or any of the other ponds or the Conrail Drain. As such serious harm to fish must be mitigated or avoided during the development within the Study Area except for the species and habitat located within Ponds A and B.

The DFO has confirmed that SAR mussel habitat is not present in the Conrail Drain, however they have not commented on the potential for SAR mussel habitat in the unnamed intermittent watercourse. Round Hickorynut and Kidneyshell mussel are both mapped by the DFO as inhabiting the unnamed intermittent watercourse downstream of the Study Area. Sampling for SAR mussel and alteration to the unnamed intermittent watercourse may require obtaining a SARA permit from the DFO.

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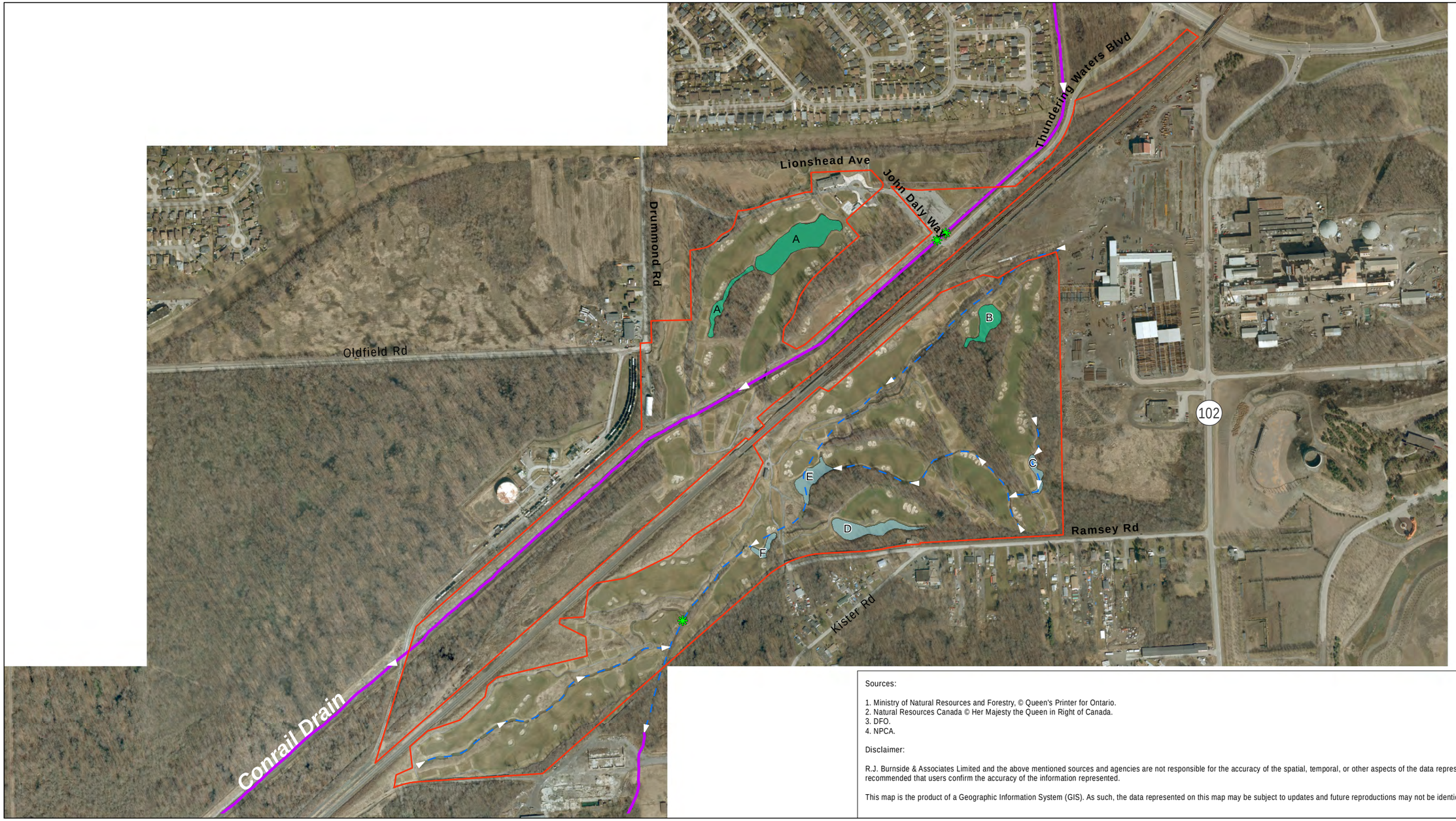
Figures



Sources:

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3. DFO.
4. NPCA.

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This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: 0	Scale Factor: 0.99960

N
True North

0 100 200 300 400 500
Metres

Barrier to Fish Movement

Intermittent Watercourse*

Site Boundary

Area within which one or more species listed under SARA may be found:

Extirpated, Endangered or Threatened (DFO, 2017)

Offline Pond*

Online Pond*

**Watercourse or Waterbody is a potential fish habitat*

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Figure Title

NIAGARA VILLAGE
WATERCOURSES AND PONDS
DRAFT

Drawn	Checked	Date	Figure No.
HN	CP	2018/10/31	1
Scale		Project No.	
H 1:7,500		300041230	

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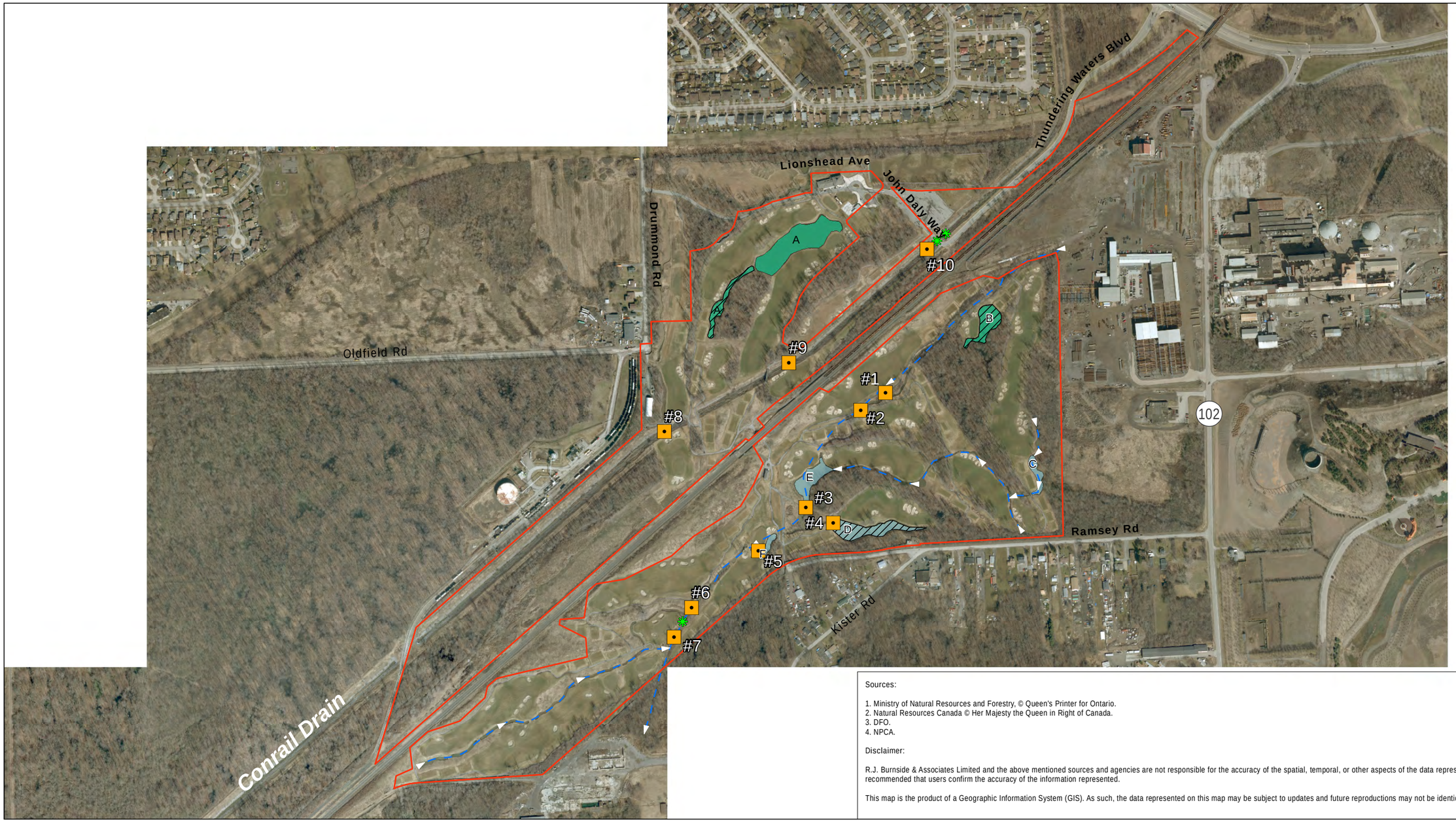

Sources:

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3. DFO.
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Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: 0	Scale Factor: 0.99960

N
True North

0 100 200 300 400 500
Metres

- Minnow Trap Location
- Barrier to Fish Movement
- Intermittent Watercourse*
- Site Boundary
- Offline Pond*
- Online Pond*
- Pond Seined

*Watercourse or Waterbody is a potential fish habitat

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Figure Title

NIAGARA VILLAGE
FISH SAMPLING LOCATIONS
DRAFT

Drawn	Checked	Date	Figure No.
HN	CP	2018/10/31	2
Scale		Project No.	
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Appendix A

Photographs

Photo 1: Looking northeast, at the linear watercourse (Conrail Drain) flowing through the TWGC property (October 2017).

Photo 2: Looking southwest, at the Conrail Drain flowing through the TWGC property (October 2017).

Photo 3: Looking northeast, at Pond A within the TWGC property (October 2017).

Photo 4: Looking North, the watercourse/drainage feature which flows between ponds on the TWGC (October, 2017).

Photo 5: Looking southwest at the concrete siphon culvert through which the Conrail Drain flows, upstream of John Daly Way (November, 2017).

Photo 6: Looking southwest at the concrete/rip rap barrier upstream of the siphon culvert through which the Conrail Drain flows, upstream of John Daly Way (November, 2017).

Photo 7: Looking southwest, at the outlet of the concrete siphon culvert beneath John Daly Way (November 2017).

Photo 8: Looking northeast, vegetation and hardened banks of the linear watercourse (Conrail Drain) within the TWGC property (November 2017).

Photo 9: Typical substrate composition within the Conrail drain within the TWGC (November 2017).

Photo 10: Angular stone substrate within the Conrail drain within the TWGC (November 2017).

Photo 11: Looking South, unnamed intermittent watercourse within the Thundering Waters Golf Course property (November 2017).

Photo 12: Looking South, Pond E within the Thundering Waters Golf Course property (November 2017).

Photo 13: Looking south, water flowing through a corrugated steel pipe. Note, water level is at a level that it is conveyed through the CSP culvert (November 2017).

Photo 14: Looking East, Pond F within the Thundering Waters Golf Course property. Note the manicured grasses to the edge of the ponds (November 2017).

Photo 15: Impassable barrier within the intermittent watercourse connecting the TWGC ponds.

Photo 16: Looking northeast, upstream of the impassable barrier on the intermittent watercourse (November 2017).

Photo 17: Looking southwest at a culvert that conveys the intermittent watercourse downstream to the Welland River (November 2017).

Photo 18: Looking north, inlet of the concrete pipe culvert conveying flow to the Welland River (November 2017).

Photo 19: Looking south, downstream of Dorchester Road watercourse outlet to the Welland River (November 2017).

Photo 20: Facing southwest, the large portion of Pond A (April 26, 2018).

Photo 21: Facing northeast, Pond B (April 26, 2018).

Photo 22: Facing north, Pond C (April 25, 2018).

Photo 23: Looking south, Pond D (August 26, 2018).

Photo 24: Facing northeast, Pond E (April 25, 2018).

Photo 25: Looking east, Pond F (April 26, 2018).

Photo 26: Looking south, the inlet of the syphon culvert beneath John Daly Way, downstream of the barrier to fish movement (April 23, 2018).

Photo 27: Looking south, the Conrail Drain downstream of the outlet beneath John Daly Way (April 23, 2018).

Photo 28: Looking north, the barrier to fish movement upstream of the syphon beneath John Daly Way (April 23, 2018).

Photo 29: Looking northwest, the conrail drain within the Thundering Waters golf Course property (April 23, 2018).

Photo 30: Looking northwest, the conrail drain within the Thundering Waters Golf Club (April 23, 2018).

Photo 31: Looking north, the inlet to the culvert beneath Dorchester Road south of the Thundering Waters Study area (April 26, 2018).

Photo 32: Facing north, the location of minnow traps 1 and 2 in the unnamed intermittent watercourse (April 25, 2018).

Photo 33: Facing north, the location of minnow trap 3 in Pond E (April 25, 2018).

Photo 34: Facing north, the location of minnow trap 4 in Pond D (April 25, 2018).

Photo 35: Facing east, the location of minnow trap 5 in Pond F (April 25, 2018).

Photo 36: Facing northwest, the area where minnow traps 6-7 were set (April 25, 2018).

Photo 37: Facing south, Burnside aquatic ecologist seine netting the unnamed intermittent watercourse downstream of the barrier to fish movement (April 25, 2018).

Photo 38: Facing north, the area where minnow traps 8-9 were set (April 25, 2018).

Photo 39: Facing north, the species captured in minnow trap 10 (April 26, 2018).

Photo 40: Facing west, Pond B (July 16, 2018).

Photo 41: Facing west, the seine net deployed within Pond B (July 16, 2018).

Photo 42: Facing west, the crayfish species captured within Pond B (July 16, 2018).

Photo 43: Facing north, Pond D (July 16, 2018).

Photo 44: Facing north, round goby (*Neogobius melanostomus*) captured from Pond D (July 16, 2018).

Photo 45: Facing north, Largemouth Bass (Micropterus salmoides) captured from Pond D (July 26, 2018).

Photo 46: Facing northeast, the small portion of Pond A which was sampled with a siene net (July 16, 2018).

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Appendix B

Field Notes

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION: NIAGARA VILLAGE	DAY: 21	MONTH: NOV	YEAR: 2017

Is STREAM REALIGNMENT required for this section:

Yes No Unknown (circled)

COLLECTORS:	WEATHER CONDITIONS:	TIME STARTED:	TIME FINISHED:
DEVIN SUETING CHRIS PFOHL	~5°C - CLEAR WINDY	10 30	

PHOTOS NUMBERS AND DESCRIPTIONS:

LOCATION

NAME OF WATERBODY:	DRAINAGE SYSTEM:	CROSSING #:	STATION #:
CONRAIL DRAIN			

LOCATION OF CROSSING:

UTM EASTING & NORTHING:	MTO CHAINAGE:
TOWNSHIP:	MNR DISTRICT:

LAND USE AND POLLUTION

SURROUNDING LAND USE:	SOURCES OF POLLUTION:
GOLF COURSE, RESIDENTIAL, RAIL LINE	

EXISTING STRUCTURE TYPE

Bridge	Box Culvert	Open Foot Culvert	CSP	N/A

Other Describe: Size (w x h) m2

SECTION TYPE AND MORPHOLOGY

SECTION IDENTIFIER:

SECTION LOCATION: (include on habitat map) GOLF COURSE BOISE

TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:
	DRAIN		✓			

TOTAL SECTION LENGTH (m):

CURRENT VELOCITY (m/s): <0.01m/sec

SUB-SECTION(S)	Run	Pool	Riffle	Flats ✓ 100	Inside culvert	Other
Percentage of area				100 %		
mean depth wetted (m)				≥0.2m - max 0.3		
mean width wetted (m)				~1.8 - 2.3m		
Mean bankfull width (m)				~3.0 - 3.5m		
Mean bankfull depth(m)				0.4 - 0.5m		
Substrate			bottom lined	RIP RAP'S; Sa, D		

Bedrock	Boulder	Cobble	Gravel	Sand	Silt	Clay	Muck	Detritus
Br	Bo	Co	Gr	Sa	SI	CI	Mu	D

BANK STABILITY

	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	RIP RAP			
Right Upstream Bank	RIP-RAP			

HABITAT

IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris	Organic debris	Vascular plants	None
	0	0	✓ Rip-rap overlain by finer stones	Instream ✓ 1% Overhanging ✓ 2%		Instream ✓ 10% phragmites, some grasses Overhanging ~ 50% phragmites, grasses	

SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None
		✓ ~80% in summer			

VEGETATION TYPE (%):	Submergent	Floating	Emergent ✓	None
Predominant Species			phragmites, grasses	

MIGRATORY OBSTRUCTIONS:	None	Seasonal ✓ WATER LEVEL, DEBRIS	Permanent
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning	Evidence of Groundwater No	Other

POTENTIAL ENHANCEMENT OPPORTUNITIES:

COMMENTS:

- DRAIN CHANNEL BANKS ARE MUCH WIDER THAN ACTUAL BANKFULL WIDTH
- CHANNEL IS ALIGNED STRAIGHT & LIES AT BOTTOM OF OVERSIZED CHANNEL
- WATER CLARITY & COLOUR IS SIMILAR TO STORM WATER IMPACTED WATERCOURSES (grey, silt)
- SWM DISCHARGE PIPE OBSERVED UPSTREAM OF THIS LOCATION NEW RESIDENTIAL DEVELOPMENT
- DEBRIS WITHIN DRAIN → GOLF BALLS, SOME LITTER THOUGH NOT MUCH
- PHRAGMITES UPSTREAM OF STUDY CROSSING ALONG WETTED BANKS
- SOME LARGE SHRUBS GROWING IN LARGE CHANNEL, ALONG WETTED BANKS
- NO FISH OBSERVED IN VESSELS
- SOME BRUSHING HAS OCCURRED ALONG HIGH WATER MARK
- DRAIN WETTED WIDTH WIDENS D/S NEW CSP

Additional Notes Appended? No Yes number of pages

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION:	DAY: 21	MONTH: MAY	YEAR: 2017

Is STREAM REALIGNMENT required for this section:

Yes No Unknown

COLLECTORS:	WEATHER CONDITIONS:	TIME STARTED:	TIME FINISHED:

PHOTOS NUMBERS AND DESCRIPTIONS:

LOCATION

NAME OF WATERBODY:	DRAINAGE SYSTEM:	CROSSING #:	STATION #:
CONRAIL DRAIN			

LOCATION OF CROSSING:

UTM EASTING & NORTHING:	MTO CHAINAGE:
TOWNSHIP:	MNR DISTRICT:

LAND USE AND POLLUTION

SURROUNDING LAND USE:	SOURCES OF POLLUTION:

EXISTING STRUCTURE TYPE

Bridge	Box Culvert	Open Foot Culvert	CSP ✓	N/A

Other Describe: Size (w x h) m2 elliptical ~6m

SECTION TYPE AND MORPHOLOGY

SECTION IDENTIFIER:	SECTION LOCATION: (Include on habitat map)

TYPE:	Stream / river	Channelized DRAIN	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:

TOTAL SECTION LENGTH (m): ~75m	CURRENT VELOCITY (m/s): 0.12 m/s → 0.2

SUB-SECTION(S)	Run	Pool	Riffle	Flats ✓	Inside culvert	Other
Percentage of area				100%		
mean depth wetted (m)				~0.2m – 0.3m		
mean width wetted (m)				~3-5m		
Mean bankfull width (m)				~5-6m		
Mean bankfull depth(m)				~0.5m		
Substrate				RIP-RAP, Si, D, Sa		

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

BANK STABILITY

	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	✓			
Right Upstream Bank	✓			

HABITAT

IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Large Woody Debris	Organic debris	Vascular plants	None
	N/A	N/A	✓ Rip Rap	Instream ✓ Brushed shrubs Overhanging ✓	✓ CT. ~35% Leaf matter	Instream ✓ CT. ~ 60% Overhanging ✓ CT. forbs	

SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60 – 30%	30 – 1%	None
		✓ ~80%			

VEGETATION TYPE (%):	Submergent	Floating	Emergent	None
	✓ 2%		✓	
Predominant Species	Algae		cattails	

MIGRATORY OBSTRUCTIONS:	None	Seasonal ✓ water level debris	Permanent
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning No	Evidence of Groundwater No	Other

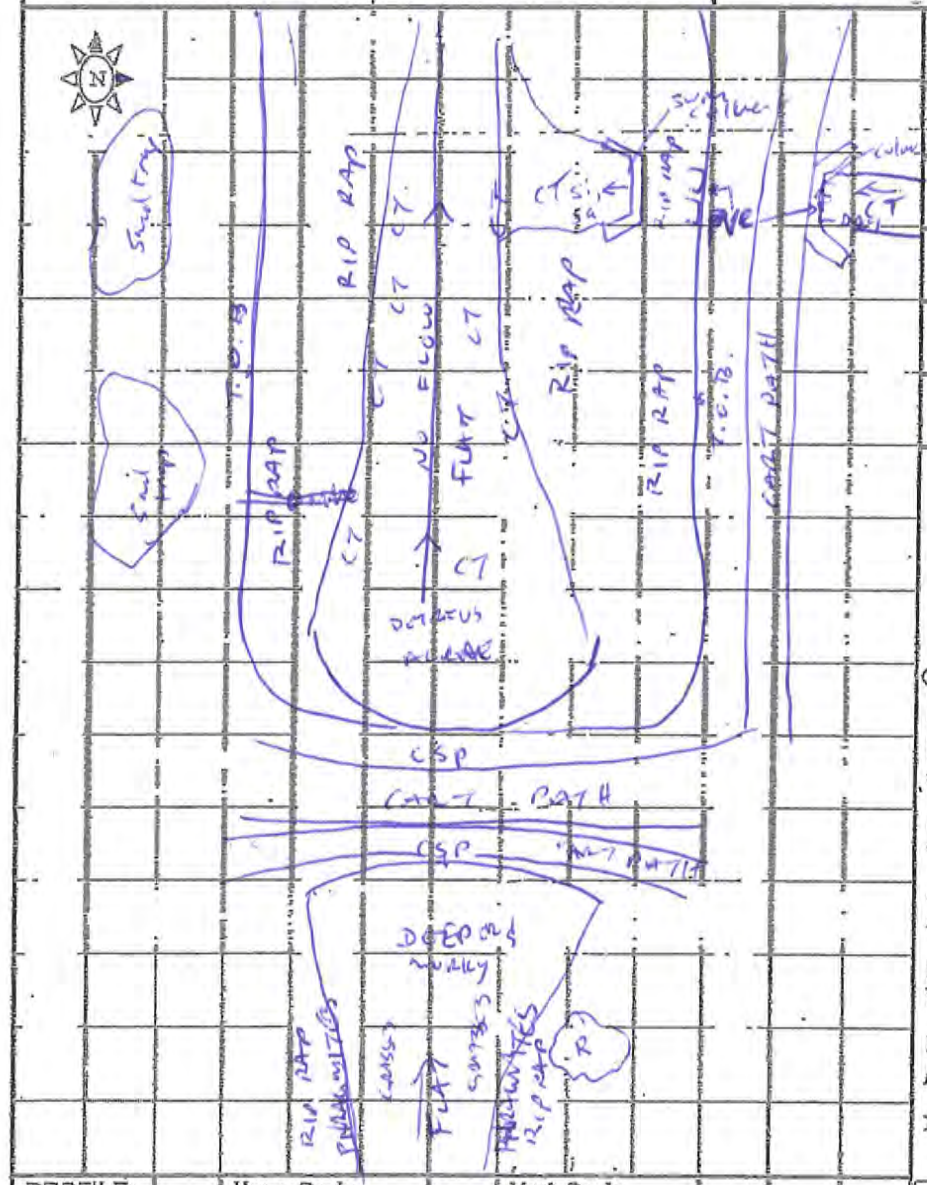
POTENTIAL ENHANCEMENT OPPORTUNITIES:

COMMENTS:

- Rip Rap. Channelized drain - trapezoidal channel
- cattails present throughout
- ~~dredged~~ channel widens substantially in this section - ✓slow/ no flow evident
- bank brushing has previously occurred
- sewer input shown in bank near property boundary & maintenance shed
- No fish or mussels observed
- Fine substrate underlain by rip rap

Additional Notes Appended? No Yes number of pages

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):



PROFILE: Horz. Scale Vert. Scale

PROJECT #:

MAPPER:

NAME OF WATERBODY:

CROSSING #:

STATION #:

DATE: DD-MMM-YY
21-Nov-17

LEGEND

10d depth (cm)
6w width

⇒ Riffle
⇨ Run/Glide
◯ Pool
▒ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble/Boulder
*** Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

Seep/Spring
Undercut Bank

— Barrier to Fish Movement
-S- Seasonal Barrier

-x-x- Fence line
Culvert

FISH COMMUNITY FIELD COLLECTION RECORD - (page 1)

Project #	Name of Waterbody	Day	Month	Year
Niagara Village	POND A (isolated)	16	07	2018

Location of Station Pond on # 18 near clubhouse

Upstream

Downstream

Hwy ROW

Station Length (m) >100m

Collectors: Chris Pfohl / Matthew Moote

Weather Conditions: Sunny + hot > 28°C

Time Started:	Time Finished:	Sampling Duration:
12:40	1:40	1hr.

WATER CHEMISTRY: Water temp. (°C)	Air temp. (°C)	Conductivity (µS)
84°F	33°C	

GEAR:

Electrofisher ☐	Seine ☒	Minnow Trap ☐	Surber ☐
Length (m) _____	# hauls 1	# _____	
Seconds _____	Trap Net ☐	Dip Net ☐	Other ☐
Settings _____			

Size of Net:	Mesh Size:	Depth of Capture:
Length (m): 50' seine	Smallest (cm): 1/4"	Minimum (m):
	Largest (cm):	Maximum (m):

Fish kept?	# of Bags	Preservative:
☐ Yes ☒ No	NA	☐ Formalin ☐ Frozen ☐ Alcohol ☐ Other

Comments

- isolated pond from Conrail Drain
- steep banks some emergent macrophytes along edge
- silty substrate
- Fish Captured - 100% green sunfish
- ≈ 140 range 25mm YOY to 90mm (3 captured) ≈ 2% adult

FISH COMMUNITY FIELD COLLECTION RECORD - (page 1)

Project #	Name of Waterbody	Day	Month	Year
Niagara Village	POND B	16	07	2018

Location of Station Pond on #16 Par 3

Upstream

Downstream POND B

Hwy ROW

Station Length (m) NA ≈ 100m of shoreline

Collectors: Chris Pfohl, Matt Moote

Weather Conditions: Sunny hot, low winds ≈ no previous rain

Time Started:	Time Finished:	Sampling Duration:
8:30 am	9:30 am	1 hr.

WATER CHEMISTRY: Water temp. (°C)	Air temp. (°C)	Conductivity (µS)
84°F	≈ 24°C	

GEAR:

Electrofisher ☐	Seine ☑	Minnow Trap ☐	Surber ☐
Length (m) _____	# hauls 2	# _____	
Seconds _____	Trap Net ☐	Dip Net ☐	Other ☐
Settings _____			

Size of Net:	Mesh Size:	Depth of Capture:
Length (m): 50'	Smallest (cm): 1/2"	Minimum (m): 0.0m
	Largest (cm):	Maximum (m): 1.5m

Fish kept?	# of Bags	Preservative:
☐ Yes ☒ No		☐ Formalin ☐ Frozen ☐ Alcohol ☐ Other

Comments

Pond conditions are very turbid, could be from under drainage on #15.

2 seine pulls – ≈ 350 crayfish (Orconectes sp.) captured
– ≈ 4 tadpoles
– no fish

FISH COMMUNITY FIELD COLLECTION RECORD - (page 1)

Project #	Name of Waterbody	Day	Month	Year
Niagara Village	POND D	16	07	2018

Location of Station
Upstream: Pond on #11 (discharge of input water)
Downstream:
Hwy ROW

Station Length (m): >150m

Collectors: Chris Pfohl / Matthew Moote

Weather Conditions: Sunny hot, >28°C

Time Started:	Time Finished:	Sampling Duration:
10:45	11:45	>1hr

WATER CHEMISTRY: Water temp. (°C)	Air temp. (°C)	Conductivity (µS)
78°F	>28°C	

GEAR:

Electrofisher ☐	Seine ☑	Minnow Trap ☐	Surber ☐
Length (m) _____	# hauls 4	# _____	
Seconds _____	Trap Net ☐	Dip Net ☐	Other ☐
Settings _____			

Size of Net:	Mesh Size:	Depth of Capture:
Length (m): 50Ft.	Smallest (cm): 1/4" mesh	Minimum (m): 0.0m
	Largest (cm): w bag	Maximum (m): 1.5m

Fish kept?	# of Bags	Preservative:
☐ Yes ☒ No		☐ Formalin ☐ Frozen ☐ Alcohol ☐ Other

Comments

POND C - small w all surface area covered w duckweed + algae
POND D - outlet discharge from welland canal
- colour of water is more blue green from Welland

Fish captured	# fish	Length (mm) MIN	MAX (mm)
LMB	- 6	<40mm (YOY)	150 mm
GWS	- 2+1	190mm	210mm + 350mm
R Goby	- 2+2	60mm	
Pumpkinseed	- 1	70 mm	
Green sunfish	- 5+12	65m	130mm
Common Shiner	- 1+4	80+105 →	350 mm

Common Carp x2 > 400mm Observed
→ Golden Shiner - 5 60 140-150m

GENERAL INFORMATION				
PROJECT #: 041230	PROJECT DESCRIPTION: TW	DAY: 25-26	MONTH: 04	YEAR: 2018
COLLECTORS: Matt Moote & Chris Pfohl		TIME STARTED:		TIME FINISHED:
WEATHER CONDITIONS: sun/cloud mix		SURFACE CONDITIONS (if applicable):		
		Calm O	Rippled O	Wavy O	Rough O

GENERAL LOCATION	
NAME OF WATERBODY: Trib in TWBC	LOCATION OF STATION:
TOWNSHIP:	MNR DISTRICT:

SAMPLING LOCATIONS AND WATER CHEMISTRY						
LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown O	Blue/green O	Turbid O	Other O

GEAR		
ELECTROFISHER: O		
Length (m):	Settings:	Seconds:
NETS and TRAPS:		
MINNOW TRAP: ● # 7	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify
HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 11:45	Clear time 1125
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION					
FISH KEPT? O Yes ● No	# OF BAGS	PRESERVATIVE:			
		Formalin O	Frozen O	Alcohol O	Other O

COMMENTS:
Additional Notes Appended? o No o Yes number of pages _____

CAPTURE INFORMATION

PROJECT NO.: **STATION NO.:**

NO.	SCIENTIFIC NAME / COMMON NAME	PHYSICAL CONDITION		TOP PREDATOR	
		# fish with blackspot	# fish with lesions, tumours, maturity etc.	Length (mm) F= total fork or (L)= total length	AGE CLASS YOY / Adult
22	Golden Shiner	Ø	Ø	45/110	
2	Fathead Minnow	Ø	Ø	75/80	
2	Green Sunfish	Ø	Ø	65/70	
5	Bluegill	Ø	Ø	65/70	

Circle number if a sample was kept

PAGE _____ of _____ **Number all pages**

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION:	DAY:	MONTH:	YEAR:
041230	TW Development	25-26	04	2016

COLLECTORS:	TIME STARTED:	TIME FINISHED:
MJM, CMP		

WEATHER CONDITIONS:	SURFACE CONDITIONS (if applicable):			
	Calm	Rippled	Wavy	Rough
Sun-cloud mix	O	O	O	O

GENERAL LOCATION

NAME OF WATERBODY:	LOCATION OF STATION:
Tributary to TWDC	
TOWNSHIP:	**MNR DISTRICT:**

SAMPLING LOCATIONS AND WATER CHEMISTRY

LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown O	Blue/green O	Turbid O	Other O

GEAR

ELECTROFISHER: O

Length (m):	Settings:	Seconds:

NETS and TRAPS:

MINNOW TRAP: ● # 2	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify

HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 1149	Clear time 1160
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION

FISH KEPT?	# OF BAGS	PRESERVATIVE:			
		Formalin O	Frozen O	Alcohol O	Other O
O Yes O No					

COMMENTS:

Additional Notes Appended? o No o Yes number of pages _____

CAPTURE INFORMATION

PROJECT NO.: **STATION NO.:**

NO.	SCIENTIFIC NAME / COMMON NAME	PHYSICAL CONDITION		TOP PREDATOR	
		# fish with blackspot	# fish with lesions, tumours, maturity etc.	Length (mm) F= total fork or (L)= total length	AGE CLASS YOY / Adult
3	Bluegill	Ø	Ø	30, 65	
1	Brown Sunfish	Ø	Ø		
5	Crayfish Sp.	Ø	Ø	65	

Circle number if a sample was kept

PAGE _____ of _____ **Number all pages**

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION:	DAY:	MONTH:	YEAR:
041230	TW Development	25-26	04	2018

COLLECTORS:	TIME STARTED:	TIME FINISHED:
Matt Moote, Chris Pfohl		

WEATHER CONDITIONS:	SURFACE CONDITIONS (if applicable):			
	Calm	Rippled	Wavy	Rough
Sun - Cloud mix	O	O	O	O

GENERAL LOCATION

NAME OF WATERBODY:	LOCATION OF STATION:
Pond E	D/S, outlet, Pond E
TOWNSHIP:	**MNR DISTRICT:**

SAMPLING LOCATIONS AND WATER CHEMISTRY

LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown ●	Blue/green O	Turbid O	Other O

GEAR

ELECTROFISHER: O

Length (m):	Settings:	Seconds:

NETS and TRAPS:

MINNOW TRAP: ● # 3	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify

HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 1203	Clear time 1148
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION

FISH KEPT?	# OF BAGS	PRESERVATIVE:			
O Yes O No		Formalin O	Frozen O	Alcohol O	Other O

COMMENTS:

Additional Notes Appended? o No o Yes **number of pages** _____

CAPTURE INFORMATION

PROJECT NO.:		**STATION NO.:**			
NO.	**SCIENTIFIC NAME / COMMON NAME**	**PHYSICAL CONDITION**		**TOP PREDATOR**	
		# fish with blackspot	**# fish with lesions, tumours, maturity etc.**	**Length (mm) F= total fork or L = total length**	**AGE CLASS YOY / Adult**
2	Crayfish	—	—	—	

Circle number if a sample was kept

PAGE _____ of _____ Number all pages

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION:	DAY:	MONTH:	YEAR:
041230	TW Development	25-26	04	2018

COLLECTORS:	TIME STARTED:	TIME FINISHED:
Matt Moore, Chris Pfohl		

WEATHER CONDITIONS:	SURFACE CONDITIONS (if applicable):			
	Calm	Rippled	Wavy	Rough
Sun - Cloud Mix	O	O	O	O

GENERAL LOCATION

NAME OF WATERBODY:	LOCATION OF STATION:
Pond D	Outlet Pond - D
TOWNSHIP:	**MNR DISTRICT:**

SAMPLING LOCATIONS AND WATER CHEMISTRY

LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown ●	Blue/green O	Turbid O	Other O

GEAR

ELECTROFISHER: O

Length (m):	Settings:	Seconds:

NETS and TRAPS:

MINNOW TRAP: ● # 4	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify

HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 1209	Clear time 1015
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION

FISH KEPT?	# OF BAGS	PRESERVATIVE:			
		Formalin O	Frozen O	Alcohol O	Other O
O Yes ● No					

COMMENTS:

Additional Notes Appended? o No o Yes number of pages _____

CAPTURE INFORMATION					
PROJECT NO.:		**STATION NO.:**			
NO.	**SCIENTIFIC NAME / COMMON NAME**	**PHYSICAL CONDITION**		**TOP PREDATOR**	
		# fish with blackspot	**# fish with lesions, tumours, maturity etc.**	**Length (mm) F= total fork or L = total length**	**AGE CLASS YOY / Adult**

Circle number if a sample was kept

PAGE _____ of _____ Number all pages

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION:	DAY:	MONTH:	YEAR:
041230	TW - Development	25-26	09	2018

COLLECTORS:	TIME STARTED:	TIME FINISHED:
Matt Moote, Chris Pfohl		

WEATHER CONDITIONS:	SURFACE CONDITIONS (if applicable):			
	Calm	Rippled	Wavy	Rough
Sun cloud Mix	O	O	O	O

GENERAL LOCATION

NAME OF WATERBODY:	LOCATION OF STATION:
Pond F	Outlet Pond F
TOWNSHIP:	MNR DISTRICT:

SAMPLING LOCATIONS AND WATER CHEMISTRY

LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown ◉	Blue/green O	Turbid O	Other O

GEAR

ELECTROFISHER: O

Length (m):	Settings:	Seconds:

NETS and TRAPS:

MINNOW TRAP: ◉ # 5	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify

HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 1218	Clear time 1220
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION

FISH KEPT?	# OF BAGS	PRESERVATIVE:			
		Formalin O	Frozen O	Alcohol O	Other O
O Yes ◉ No					

COMMENTS:

Additional Notes Appended? o No o Yes number of pages _____

CAPTURE INFORMATION

PROJECT NO.:		**STATION NO.:**			
NO.	**SCIENTIFIC NAME / COMMON NAME**	**PHYSICAL CONDITION**		**TOP PREDATOR**	
		# fish with blackspot	**# fish with lesions, tumours, maturity etc.**	**Length (mm) F= total fork or L = total length**	**AGE CLASS YOY / Adult**
2	Crayfish Sp.	—	—	—	—

Circle number if a sample was kept

PAGE _____ of _____ Number all pages

GENERAL INFORMATION				
PROJECT #: 041230	PROJECT DESCRIPTION: TW- Development	DAY: 25 26	MONTH: 04	YEAR: 2018
COLLECTORS: Matthew Moore - Chris Pfohl		TIME STARTED:		TIME FINISHED:
WEATHER CONDITIONS:		SURFACE CONDITIONS (if applicable):		
		Calm O	Rippled O	Wavy O	Rough O

GENERAL LOCATION	
NAME OF WATERBODY: Tributary to TW to C	LOCATION OF STATION: U/S Barrier, Fish movement
TOWNSHIP:	MNR DISTRICT:

SAMPLING LOCATIONS AND WATER CHEMISTRY						
LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown O	Blue/green O	Turbid O	Other O

GEAR		
ELECTROFISHER: O		
Length (m):	Settings:	Seconds:
NETS and TRAPS:		
MINNOW TRAP: ● # 6	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify
HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 1228	Clear time 1235
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION					
FISH KEPT? O Yes O No	# OF BAGS	PRESERVATIVE:			
		Formalin O	Frozen O	Alcohol O	Other O

COMMENTS:
Additional Notes Appended? o No o Yes number of pages _____

CAPTURE INFORMATION

PROJECT NO.:		**STATION NO.:**			
NO.	**SCIENTIFIC NAME / COMMON NAME**	**PHYSICAL CONDITION**		**TOP PREDATOR**	
		# fish with blackspot	**# fish with lesions, tumours, maturity etc.**	**Length (mm) F= total fork or L = total length**	**AGE CLASS YOY / Adult**
Ø	—	—	—	—	—

Circle number if a sample was kept

PAGE _____ of _____ Number all pages

GENERAL INFORMATION				
PROJECT #: 041230	PROJECT DESCRIPTION:	DAY: 25-26	MONTH: 04	YEAR: 2018
COLLECTORS: Matt Moore, Chris Pfohl		TIME STARTED:		TIME FINISHED:
WEATHER CONDITIONS: Sun-cloud mix		SURFACE CONDITIONS (if applicable):		
		Calm O	Rippled O	Wavy O	Rough O

GENERAL LOCATION	
NAME OF WATERBODY: Tributary in TW6C	LOCATION OF STATION: D/S Barrier to fish movement
TOWNSHIP:	MNR DISTRICT:

SAMPLING LOCATIONS AND WATER CHEMISTRY						
LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown O	Blue/green O	Turbid O	Other O

GEAR		
ELECTROFISHER: O		
Length (m):	Settings:	Seconds:
NETS and TRAPS:		
MINNOW TRAP: ● # 7	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify
HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 1234	Clear time 1240
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION					
FISH KEPT? O Yes O No	# OF BAGS	PRESERVATIVE:			
		Formalin O	Frozen O	Alcohol O	Other O

COMMENTS:
Additional Notes Appended? o No o Yes number of pages _____

CAPTURE INFORMATION

PROJECT NO.:		**STATION NO.:**			
NO.	**SCIENTIFIC NAME / COMMON NAME**	**PHYSICAL CONDITION**		**TOP PREDATOR**	
		# fish with blackspot	**# fish with lesions, tumours, maturity etc.**	**Length (mm) F= total fork or L = total length**	**AGE CLASS YOY / Adult**
5	Central Mudminnow	—	—	65-105	
6	Green Sunfish	—	—	45-80	

Circle number if a sample was kept

PAGE _____ of _____ Number all pages

GENERAL INFORMATION				
PROJECT #: 041230	PROJECT DESCRIPTION: TW-Development	DAY: 25-26	MONTH: 04	YEAR: 2018
COLLECTORS: Mat Moote, Chris Atchison		TIME STARTED:	TIME FINISHED:	
WEATHER CONDITIONS: Sun-cloud mix	SURFACE CONDITIONS (if applicable):			
	Calm O	Rippled O	Wavy O	Rough O

GENERAL LOCATION	
NAME OF WATERBODY: Canrail Drain	LOCATION OF STATION: CR Drain in TW 6 C
TOWNSHIP:	MNR DISTRICT:

SAMPLING LOCATIONS AND WATER CHEMISTRY						
LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown O	Blue/green O	Turbid O	Other O

GEAR		
ELECTROFISHER: O		
Length (m):	Settings:	Seconds:
NETS and TRAPS:		
MINNOW TRAP: ● # 8	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify
HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 1405	Clear time 1250
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION					
FISH KEPT? O Yes O No	# OF BAGS	PRESERVATIVE:			
		Formalin O	Frozen O	Alcohol O	Other O

COMMENTS:
Additional Notes Appended? o No o Yes number of pages _____

CAPTURE INFORMATION

PROJECT NO.: **STATION NO.:**

NO.	SCIENTIFIC NAME / COMMON NAME	PHYSICAL CONDITION		TOP PREDATOR	
		# fish with blackspot	# fish with lesions, tumours, maturity etc.	Length (mm) F= total fork or T= total length	AGE CLASS YOY / Adult
51	Brook Stickleback	—	—	35 - 60	
1	Green Sunfish	—	—	70	

Circle number if a sample was kept

PAGE _____ of _____ **Number all pages**

GENERAL INFORMATION				
PROJECT #: 041230	PROJECT DESCRIPTION: TW-Development	DAY: 25-26	MONTH: 04	YEAR: 2018
COLLECTORS: Matt Moote, Chris Pfohl		TIME STARTED:		TIME FINISHED:
WEATHER CONDITIONS: Sun-cloud mix		SURFACE CONDITIONS (if applicable):		
		Calm O	Rippled O	Wavy O	Rough O
GENERAL LOCATION				
NAME OF WATERBODY: Conrail Drain		LOCATION OF STATION: CR Drain in TW 6C		
TOWNSHIP:		MNR DISTRICT:		

SAMPLING LOCATIONS AND WATER CHEMISTRY						
LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown O	Blue/green O	Turbid O	Other O

GEAR		
ELECTROFISHER: O		
Length (m):	Settings:	Seconds:
NETS and TRAPS:		
MINNOW TRAP: ● # 9	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify
HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 1410	Clear time 1250
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION					
FISH KEPT? O Yes ● No	# OF BAGS	PRESERVATIVE:			
		Formalin O	Frozen O	Alcohol O	Other O

COMMENTS:
Additional Notes Appended? o No o Yes number of pages _____

CAPTURE INFORMATION

PROJECT NO.: **STATION NO.:**

NO.	SCIENTIFIC NAME / COMMON NAME	PHYSICAL CONDITION		TOP PREDATOR	
		# fish with blackspot	# fish with lesions, tumours, maturity etc.	Length (mm) F= total fork or L = total length	AGE CLASS YOY / Adult
38	Brook Stickleback	—	—	30-65	
1	brown Sunfish	—	—	40	

Circle number if a sample was kept

PAGE _____ of _____ **Number all pages**

GENERAL INFORMATION				
PROJECT #: 04/1230	PROJECT DESCRIPTION: TW-Development	DAY: 25-26	MONTH: 04	YEAR: 2018
COLLECTORS: Matt Moote, Chris Pfohl		TIME STARTED:		TIME FINISHED:
WEATHER CONDITIONS: Sun-cloud mix		SURFACE CONDITIONS (if applicable):		
		Calm O	Rippled O	Wavy O	Rough O

GENERAL LOCATION	
NAME OF WATERBODY: Conrail Drain	LOCATION OF STATION: D/S of John Daly Way
TOWNSHIP:	MNR DISTRICT:

SAMPLING LOCATIONS AND WATER CHEMISTRY

LOCATION:	LENGTH (m)	AIR TEMP. (°C)	pH	DISSOLVED OXYGEN (mg/L)	WATER TEMP (°C)	CONDUCTIVITY (µS/cm)
Upstream						
Downstream						
Culvert / Hwy ROW						

WATER COLOUR:	Colourless O	Yellow/brown O	Blue/green O	Turbid O	Other O

GEAR

ELECTROFISHER: O

Length (m):	Settings:	Seconds:

NETS and TRAPS:

MINNOW TRAP: ● # 16	DIP NET O	TRAP NET O
SEINE: O	GILL O	OTHER O specify
HAULS (#):	Period Of Time (24 hour clock):	
	Set Time 1415	Clear time 1400
LENGTH (m):	MESH SIZE:	DEPTH OF CAPTURE:
	Smallest (cm):	Minimum (m):
	Largest (cm):	Maximum (m):

SAMPLE COLLECTION

FISH KEPT? O Yes ● No	# OF BAGS	PRESERVATIVE: Formalin O	Frozen O	Alcohol O	Other O

COMMENTS:

Additional Notes Appended? o No o Yes number of pages _____

CAPTURE INFORMATION

PROJECT NO.:		**STATION NO.:**			
NO.	**SCIENTIFIC NAME / COMMON NAME**	**PHYSICAL CONDITION**		**TOP PREDATOR**	
		# fish with blackspot	**# fish with lesions, tumours, maturity etc.**	**Length (mm) F= total fork or L= total length**	**AGE CLASS YOY / Adult**
64	Brook Stickleback	—	—	30-65	
10	Green Sunfish	—	—	35-80	

Circle number if a sample was kept

PAGE _____ of _____ Number all pages

PONDS / LAKES FIELD COLLECTION RECORD

Project #:	Name of Waterbody:	Day	Month	Year
300041230	Pond A	26	04	2018

Location of Station: Thundering Waters Golf Course – **Station #:**

Collectors: CP/MM

Weather Conditions: Sunny w some clouds

Time Started:	Time Finished:	Sampling Duration:
1:40		

Type of Waterbody

☐ Large Lake ☐ Small Lake ☒ Pond – isolated

☐ Dug-out ☐ Run-Off ☐ Spring-fed ☐ Connected ☐ By-Pass ☐ In-Stream

Plant Type (% surface area)

Submergent _____ % Floating 10 % Emergent _____ % None

e.g. _____ e.g. duckweed e.g. _____

Bottom Type (%)

Rock _____ Boulder _____ Rubble _____ Gravel _____ Sand _____ Silt 100%

Clay _____ Muck _____ Marl _____ Detritus _____ Other _____

Dimensions: Length (m) 94 smside Mean Width 21 smside Max. Depth

Nearshore Slope (%): 45%

Shoreline Substrate: silt muck / leaves

WATER CHEMISTRY:

pH: _____ Secchi Depth: _____

Surface Conditions: ☒ calm ☐ rippled ☐ wavy ☐ rough

Conductivity (µS): _____

WATER COLOUR:

☐ Colourless ☒ turbid ☐ clear ☐ Blue/green ☒ yellow/brown ☐ other

D.O. / Temperature Profile: Time:

Depth (m)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Water Temp. (°C)											
D.O. (mg/L)											
Depth (m)	**5.0**	**5.5**	**6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**9.0**	**9.5**	**10.0**
Water Temp. (°C)											
D.O. (mg/L)											

Bank Characteristics (stability, slopes, vegetation etc): Steep, no littoral zone, no aquatic veg

Surrounding Land Use/Terrain: Golf course, woodlot

Underwater Cover (% of area):

Undercut Banks _____ Boulders _____ Logs & Trees _____ Organic Debris _____ w/c Macrophytes _____ Combination _____ None ✓

Additional Data: (Pollution, Migratory Obstructions, etc.)

isolated pond but connected to larger pond

PONDS / LAKES FIELD COLLECTION RECORD

Project #:	Name of Waterbody:	Day	Month	Year
300041230	Pond A	26	4	18

Location of Station: Thundering Waters GC — **Station #:**

Collectors: MJM CMP

Weather Conditions: Sunny, wind

Time Started:	Time Finished:	Sampling Duration:
150		

Type of Waterbody

☐ Large Lake ☐ Small Lake ☒ Pond

☐ Dug-out ☐ Run-Off ☐ Spring-fed ☐ Connected ☐ By-Pass ☐ In-Stream

Plant Type (% surface area)

Submergent 0 % e.g. _____

Floating 0 % e.g. _____

Emergent 10-15 % e.g. cattails

None

Bottom Type (%)

Rock _____ Boulder _____ Rubble _____ Gravel _____ Sand _____ Silt ~90%

Clay _____ Muck _____ Marl _____ Detritus 10% Other _____

Dimensions:			Nearshore Slope (%)	Shoreline Substrate
Length (m) 187	Mean Width 20-75	Max. Depth	45 %	muck, organic

WATER CHEMISTRY:

pH	Secchi Depth	Surface Conditions	Conductivity (µS)
		☐ calm ☒ rippled ☐ wavy ☐ rough	

WATER COLOUR:

☐ Colourless ☐ turbid ☐ clear

☐ Blue/green ☒ yellow/brown ☐ other

D.O. / Temperature Profile: Time:

Depth (m)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Water Temp. (°C)											
D.O. (mg/L)											
Depth (m)	**5.0**	**5.5**	**6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**9.0**	**9.5**	**10.0**
Water Temp. (°C)											
D.O. (mg/L)											

Bank Characteristics (stability, slopes, vegetation etc): 80% manicured grass 20% unkept grass, trees

Surrounding Land Use/Terrain: Golf course, Forested

Underwater Cover (% of area):

Undercut Banks 0 Boulders 0 Logs & Trees 2 Organic Debris 30 w/c Macrophytes 10-15 Combination x None _____

Additional Data: (Pollution, Migratory Obstructions, etc.)

Large pond outlets to the smaller pond.

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):

PROJECT #:

MAPPER:

NAME OF WATERBODY:

CROSSING #:

STATION #:

DATE: DD-MMM-YY

LEGEND

10d depth (cm)
6w width

⇨ Riffle
⇨ Run/Glide
◯ Pool
▒ Island/Bar

▒ Fine Substrate
Gravel Substrate

oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

◯ Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

⊢⊳ Seep/Spring
------ Undercut Bank

═ Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
└┘ Culvert

PROFILE: Horz. Scale Vert. Scale

PONDS / LAKES FIELD COLLECTION RECORD

Project #:	Name of Waterbody:	Day	Month	Year
3000411230	Pond on 16. Pond B	26	4	18

Location of Station: Thundering Waters Golf course

Station #:

Collectors: MJM, CMP

Weather Conditions: Sunny

Time Started:	Time Finished:	Sampling Duration:
10'55	11:20	25 Minutes.

Type of Waterbody

☐ Large Lake ☐ Small Lake ☒ Pond

☐ Dug-out ☐ Run-Off ☐ Spring-fed ☐ Connected ☐ By-Pass ☐ In-Stream

Plant Type (% surface area)

Submergent _____ % Floating 5 % Emergent _____ % None

e.g. _____ e.g. _____ e.g. _____

Bottom Type (%)

Rock _____ Boulder _____ Rubble _____ Gravel _____ Sand _____ Silt _____

Clay _____ Muck 70 Marl _____ Detritus 30 Other _____

Dimensions:

Length (m) ~~[illegible]~~ 15 Mean Width 4.5 Max. Depth

Nearshore Slope (%) 30-10 % slope

Shoreline Substrate - organic debris - manicured grass

WATER CHEMISTRY:

pH	Secchi Depth	Surface Conditions	Conductivity (µS)
		☒ calm ☐ rippled ☐ wavy ☐ rough	

WATER COLOUR:

☐ Colourless ☐ turbid ☐ clear ☐ Blue/green ☒ yellow/brown ☐ other

D.O. / Temperature Profile: Time:

Depth (m)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Water Temp. (°C)											
D.O. (mg/L)											
Depth (m)	**5.0**	**5.5**	**6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**9.0**	**9.5**	**10.0**
Water Temp. (°C)											
D.O. (mg/L)											

Bank Characteristics (stability, slopes, vegetation etc): - manicured grass, stable, overflow to wetland area

Surrounding Land Use/Terrain: - wetland, golf course, Forested - vernal pool

Underwater Cover (% of area):

Undercut Banks 0 Boulders 0 Logs & Trees 25% Organic Debris 40% w/c Macrophytes 0 Combination 0 None _____

Additional Data: (Pollution, Migratory Obstructions, etc.)

- Pond 30' Deep according to maintenance staff - chorus frog, wood frog
- clarity ~30-60cm - overflow to wetland / vernal pool

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):

PROJECT #:

MAPPER:

NAME OF WATERBODY:

CROSSING #:

STATION #:

DATE: DD-MMM-YY

LEGEND

10d depth (cm)
6w width

⇒ Riffle
⇨ Run/Glide
◯ Pool
▒ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

◯ Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

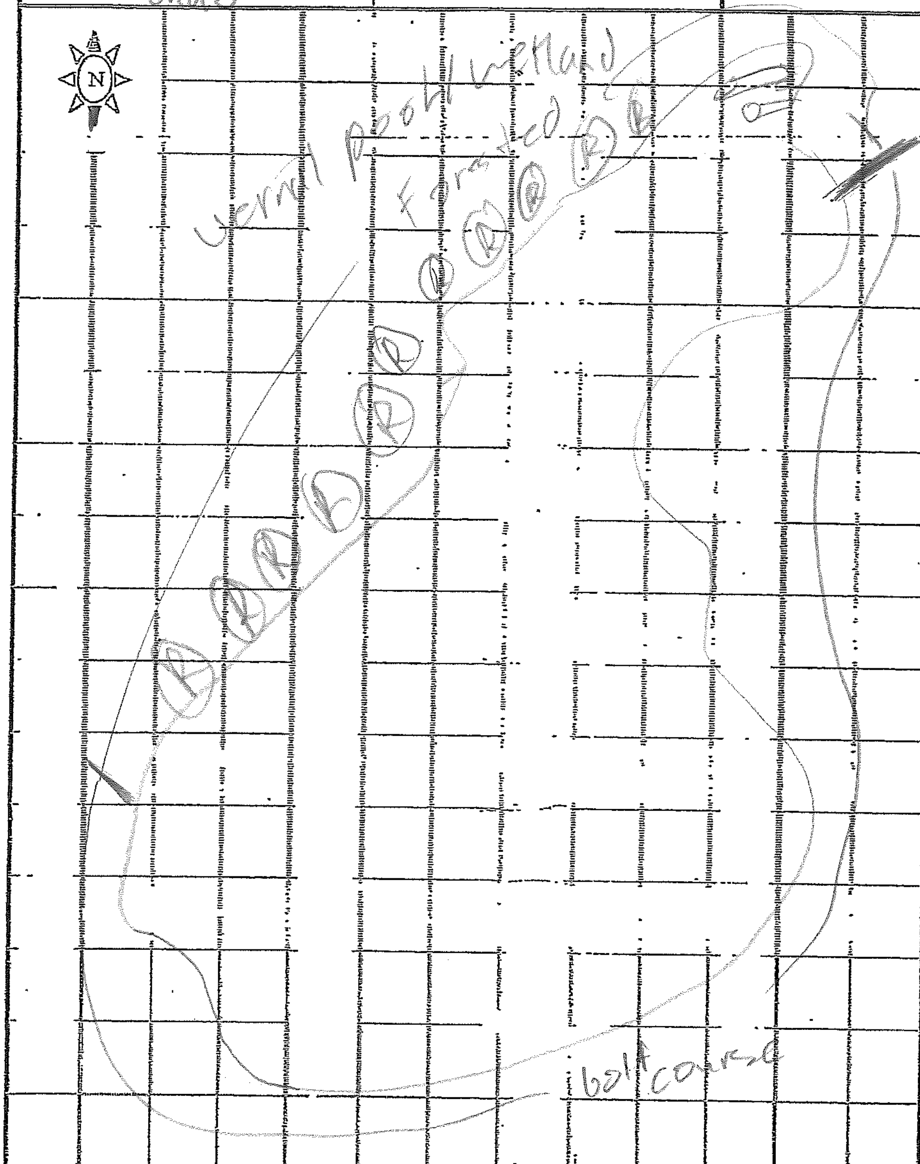
⊢⊳ Seep/Spring
------ Undercut Bank

═ Barrier to Fish Movement
-S- Seasonal Barrier

-x-x- Fence line
└┘ Culvert

PROFILE: Horz. Scale Vert. Scale

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
Pond 'B'			



PROJECT #:

MAPPER: MJM

NAME OF WATERBODY: Pond on 16

CROSSING #:

STATION #:

DATE: DD-MMM-YY 26-4-18

LEGEND

10d depth (cm)
6w width

⇒ Riffle
⇨ Run/Glide
⬭ Pool
Island/Bar

Fine Substrate
Gravel Substrate

oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

Instream Log/Tree
ΛΛΛ Dam/Weir/Obstruction

® Riparian Tree

Seep/Spring
-------- Undercut Bank

═ Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
Culvert

PROFILE: Horz. Scale Vert. Scale

PONDS / LAKES FIELD COLLECTION RECORD

Project #:	Name of Waterbody:	Day	Month	Year
300041230	Pond "C"	26	04	2018

Location of Station: Thundering Waters Golf Course

Station #: Pond "C"

Collectors: CP/MM

Weather Conditions: Partly Cloudy - cooler

Time Started:	Time Finished:	Sampling Duration:
10:00 am		

Type of Waterbody

☐ Large Lake ☐ Small Lake ☐ Pond
☐ Dug-out ☑ Run-Off ☐ Spring-fed ☑ Connected ☐ By-Pass ☐ In-Stream

Plant Type (% surface area)

Submergent _____ % e.g. _____
Floating 30 % e.g. duckweed
Emergent _____ % e.g. _____
None

Bottom Type (%)

Rock _____ Boulder _____ Rubble _____ Gravel _____ Sand _____ Silt _____
Clay _____ Muck 100% Marl _____ Detritus _____ Other _____

Dimensions:	Nearshore Slope (%)	Shoreline Substrate
Length (m) 77 Mean Width ≈10 Max. Depth ?m	15-45%	detritus/leaves

WATER CHEMISTRY:

pH	Secchi Depth	Surface Conditions	Conductivity (µS)
		☒ calm ☐ rippled ☐ wavy ☐ rough	

WATER COLOUR:

☐ Colourless ☐ turbid ☐ clear
☐ Blue/green ☒ yellow/brown ☐ other

D.O. / Temperature Profile: Time:

Depth (m)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Water Temp. (°C)											
D.O. (mg/L)											
Depth (m)	**5.0**	**5.5**	**6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**9.0**	**9.5**	**10.0**
Water Temp. (°C)											
D.O. (mg/L)											

Bank Characteristics (stability, slopes, vegetation etc): Stabil manicured slope, sparse ROB

Surrounding Land Use/Terrain: Golf Course, forest woodlot

Underwater Cover (% of area):

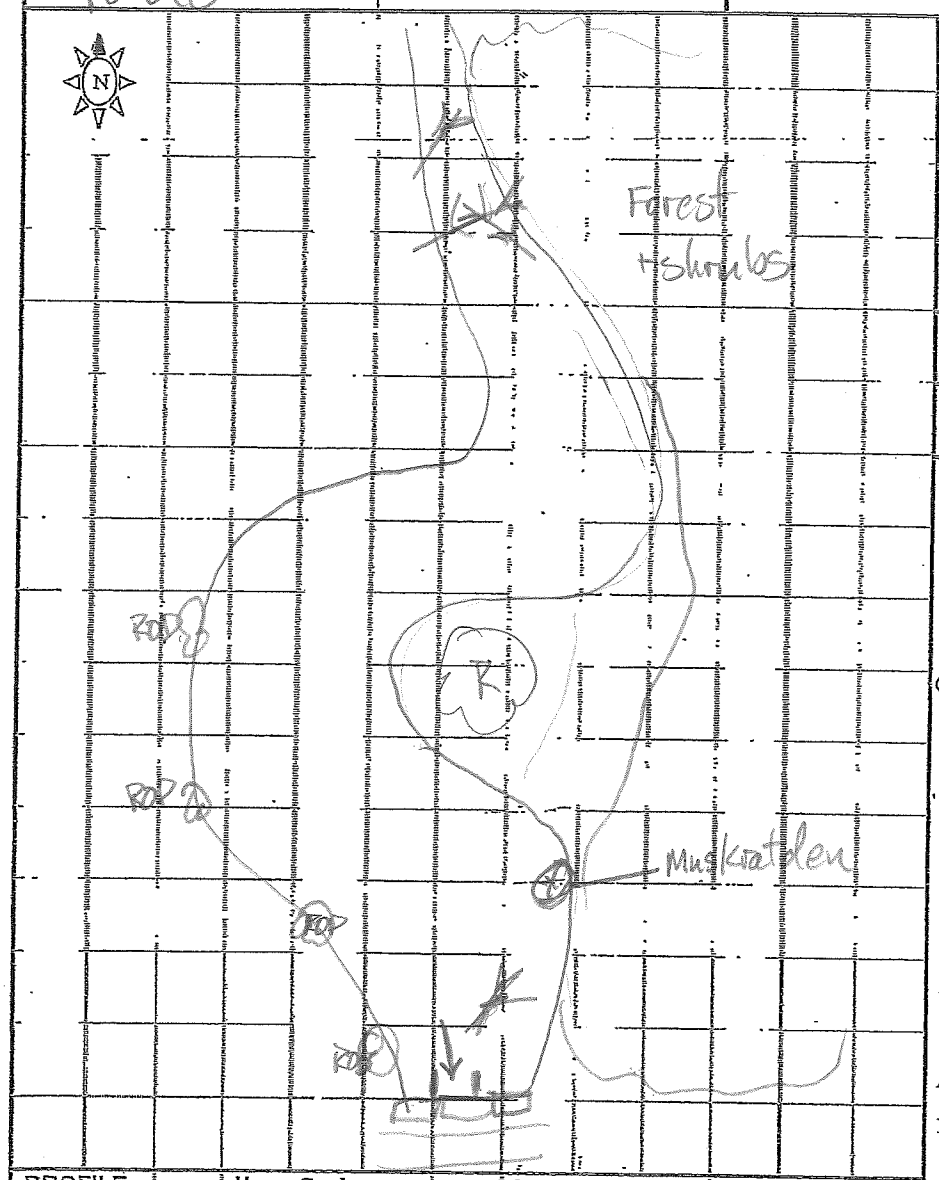
Undercut Banks _____ Boulders _____ Logs & Trees 10% Organic Debris 80% w/c Macrophytes _____ Combination _____ None _____

Additional Data: (Pollution, Migratory Obstructions, etc.)

upstream end of drainage (watercourse), seasonal migratory obstructions (drainage shallow), culverts (inverts) Many turtles (painted) observed on 04/26/18

(D) overwintering habitat >10 observed, Dead crayfish

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
Pond C			



PROFILE: Horz. Scale Vert. Scale

PROJECT #:

MAPPER: CP

NAME OF WATERBODY: Pond C

CROSSING #:

STATION #:

DATE: DD-MMM-YY 25/04/2019

LEGEND

10d depth (cm)
6w width

⇨ Riffle
⇨ Run/Glide
◯ Pool
▒ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

◯ Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

Seep/Spring
------ Undercut Bank

═ Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
└┘ Culvert

PONDS / LAKES FIELD COLLECTION RECORD

Project #:	Name of Waterbody:	Day	Month	Year
3000412-30	Pond "D"	26	4	2014

Location of Station: Pond D, Thundering Waters GC

Station #:

Collectors: MJM, CMP

Weather Conditions: Overcast, some sun

Time Started:	Time Finished:	Sampling Duration:
930am		

Type of Waterbody

☐ Large Lake ☐ Small Lake ☒ Pond

☐ Dug-out ☐ Run-Off ☐ Spring-fed ☒ Connected ☐ By-Pass ☐ In-Stream

Plant Type (% surface area)

Submergent _____ % Floating _____ % Emergent _____ % None

e.g. _____ e.g. _____ e.g. _____

Bottom Type (%)

Rock _____ Boulder _____ Rubble _____ Gravel _____ Sand _____ Silt _____

Clay _____ Muck 100% Marl _____ Detritus _____ Other Soft Bottom

Dimensions:	Nearshore Slope (%)	Shoreline Substrate
Length (m) 195m Mean Width 26m Max. Depth	45% 100%	Detritus (Leaf Litter)

WATER CHEMISTRY:

pH	Secchi Depth	Surface Conditions	Conductivity (µS)
		☐ calm ☒ rippled ☐ wavy ☐ rough	

WATER COLOUR:

☐ Colourless ☒ turbid ☐ clear

☐ Blue/green ☒ yellow/brown ☐ other

D.O. / Temperature Profile: **Time:**

Depth (m)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Water Temp. (°C)											
D.O. (mg/L)											
Depth (m)	**5.0**	**5.5**	**6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**9.0**	**9.5**	**10.0**
Water Temp. (°C)											
D.O. (mg/L)											

Bank Characteristics (stability, slopes, vegetation etc):

Surrounding Land Use/Terrain: Golf course, Forested

Underwater Cover (% of area):

Undercut Banks _____ Boulders 2% Logs & Trees 2% Organic Debris 50% w/c Macrophytes 0% Combination _____ None _____

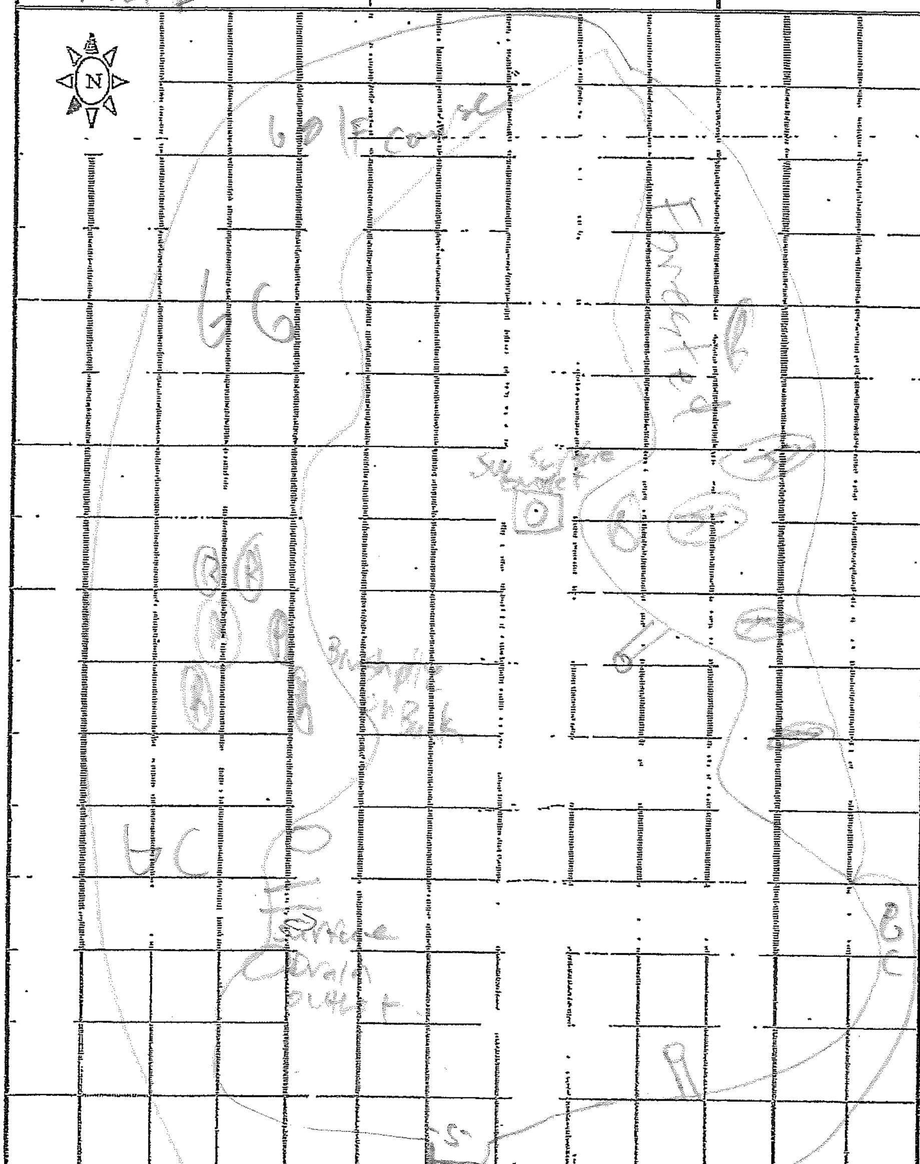
Additional Data: (Pollution, Migratory Obstructions, etc.)

- Golf course drainage, storm outlet outlet

- wood, chorus frog heard

code 3 chorus frog call

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
Pond D			



PROJECT #: 30004I230

MAPPER: MM

NAME OF WATERBODY:

CROSSING #:

STATION #:

DATE: DD-MMM-YY 26-4-18

LEGEND

10d depth (cm)
6w width

⇨ Riffle
⇨ Run/Glide
◯ Pool
Island/Bar

Fine Substrate
Gravel Substrate

oOooO Cobble /Boulder
*** Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

Instream Log/Tree
ΛΛΛ Dam/Weir/Obstruction

® Riparian Tree

Seep/Spring
-------- Undercut Bank

═ Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
Culvert

PROFILE: Horz. Scale Vert. Scale

Trap 4: 9:45 am.

PONDS / LAKES FIELD COLLECTION RECORD

Project #:	Name of Waterbody:	Day	Month	Year
30004230	"Pond E"	26	4	18

Location of Station: Thundering Waters golf course

Station #:

Collectors:

Weather Conditions: Sunny, wind

Time Started:	Time Finished:	Sampling Duration:
11:40	12:10	30 minutes

Type of Waterbody

☐ Large Lake ☐ Small Lake ☒ Pond
☐ Dug-out ☐ Run-Off ☐ Spring-fed ☒ Connected ☐ By-Pass ☐ In-Stream

Plant Type (% surface area)

Submergent 2 % e.g. unknown
Floating ____ % e.g. ____
Emergent 2 % e.g. cattail, phrag.
None

Bottom Type (%)

Rock ____ Boulder ____ Rubble ____ Gravel ____ Sand ____ Silt ____
Clay ____ Muck 100% Marl ____ Detritus ____ Other ____

Dimensions:

Length (m) 76m Mean Width 38 Max. Depth

Nearshore Slope (%) 45° 10°

Shoreline Substrate organic debris,

WATER CHEMISTRY:

pH	Secchi Depth	Surface Conditions	Conductivity (µS)
		☐ calm ☒ rippled ☐ wavy ☐ rough	

WATER COLOUR:

☐ Colourless ☐ turbid ☐ clear
☐ Blue/green ☒ yellow/brown ☐ other

D.O. / Temperature Profile: Time:

Depth (m)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Water Temp. (°C)											
D.O. (mg/L)											
Depth (m)	**5.0**	**5.5**	**6.0**	**6.5**	**7.0**	**7.5**	**8.0**	**8.5**	**9.0**	**9.5**	**10.0**
Water Temp. (°C)											
D.O. (mg/L)											

Bank Characteristics (stability, slopes, vegetation etc): manicured grass. Forested, steep slopes and stable

Surrounding Land Use/Terrain: golf course, forested

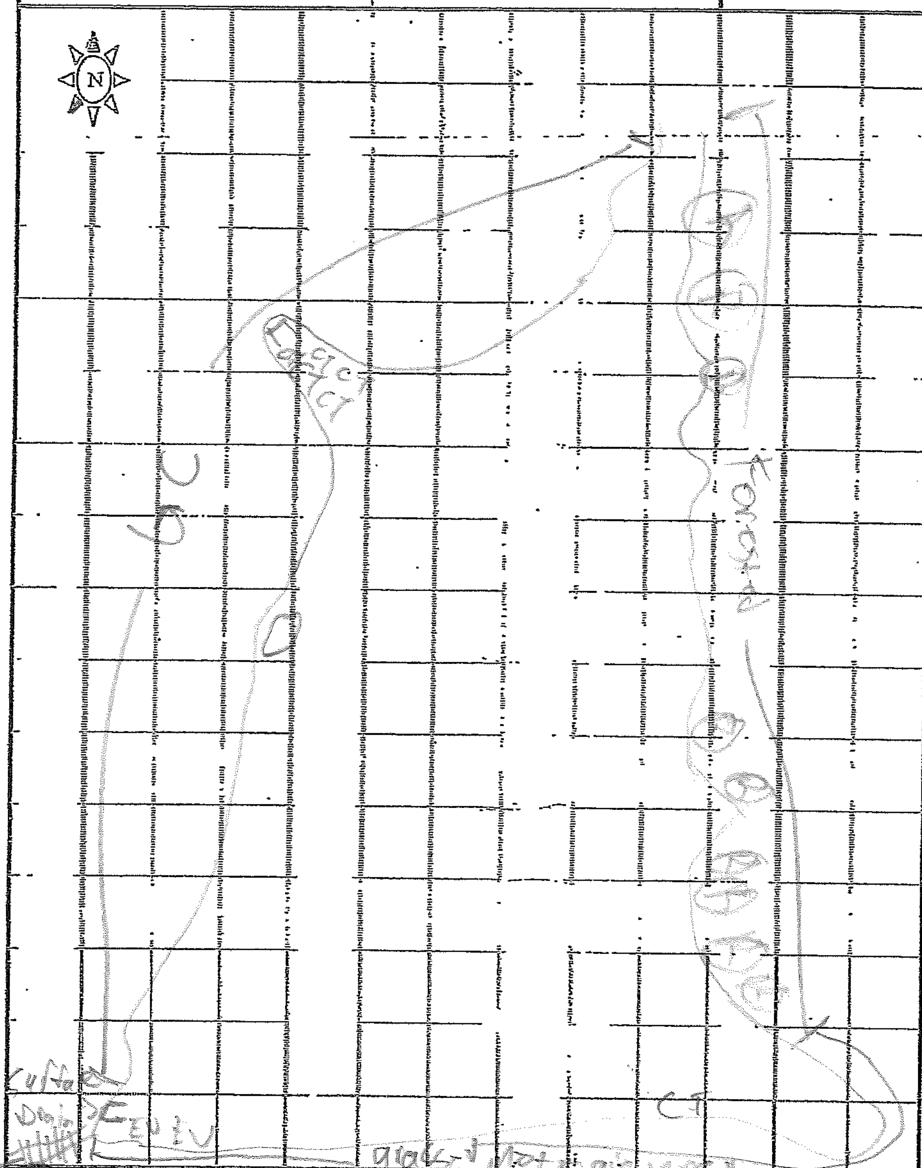
Underwater Cover (% of area):

Undercut Banks 0 Boulders 2 Logs & Trees 0 Organic Debris 20% w/c Macrophytes 2% Combination 2 None ____

Additional Data: (Pollution, Migratory Obstructions, etc.)

- steep forested banks
- chorus frogs calling
- outlet to ditch East corner
- border snakes observed
- manicured grass Banks N Sth
- 3 snakes observed.

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):



PROJECT #: 3000 40123

MAPPER: MJM

NAME OF WATERBODY: Pond E

CROSSING #:

STATION #:

DATE: DD-MMM-YY 26-04-2018

LEGEND

10d depth (cm)
6w width

⇨ Riffle
⇨ Run/Glide
⬭ Pool
▤ Island/Bar

▒ Fine Substrate
Gravel Substrate

oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

▭ Instream Log/Tree
ΛΛΛ Dam/Weir/Obstruction

® Riparian Tree

|▷ Seep/Spring
-------- Undercut Bank

═ Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
└┘ Culvert

PROFILE: Horz. Scale Vert. Scale

PONDS / LAKES FIELD COLLECTION RECORD

Project #:	Name of Waterbody:	Day	Month	Year
30004230	Pond "F"	26	04	2018

Location of Station: W of 11th Tee box

Station #:

Collectors: CP/MM

Weather Conditions: Sunny w cloudy periods - windy

Time Started: 12:30

Time Finished:

Sampling Duration:

Type of Waterbody

☐ Large Lake ☐ Small Lake ☐ Pond
☐ Dug-out ☐ Run-Off ☐ Spring-fed ☑ Connected ☐ By-Pass ☑ In-Stream

Plant Type (% surface area)

Submergent _____ % e.g. _____

Floating _____ % e.g. _____

Emergent _____ % e.g. _____

None

Bottom Type (%) see flowsheets

Rock _____ Boulder _____ Rubble _____ Gravel _____ Sand _____ Silt 100%

Clay _____ Muck 100% Marl _____ Detritus _____ Other _____

Dimensions: ⊗ Y shaped

Length (m) 57 Mean Width 12m Max. Depth

Nearshore Slope (%): >45%

Shoreline Substrate: Muck/leaves

WATER CHEMISTRY:

pH | Secchi Depth

Surface Conditions: ☒ calm ☐ rippled ☐ wavy ☐ rough

Conductivity (µS)

WATER COLOUR:

☐ Colourless ☒ turbid ☐ clear
☐ Blue/green ☒ yellow/brown ☐ other

D.O. / Temperature Profile: Time:

Depth (m)	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Water Temp. (°C)											
D.O. (mg/L)											
Depth (m)	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
Water Temp. (°C)											
D.O. (mg/L)											

Bank Characteristics (stability, slopes, vegetation etc): steep, vegetated alongs. side

Surrounding Land Use/Terrain: Golf Course/greens

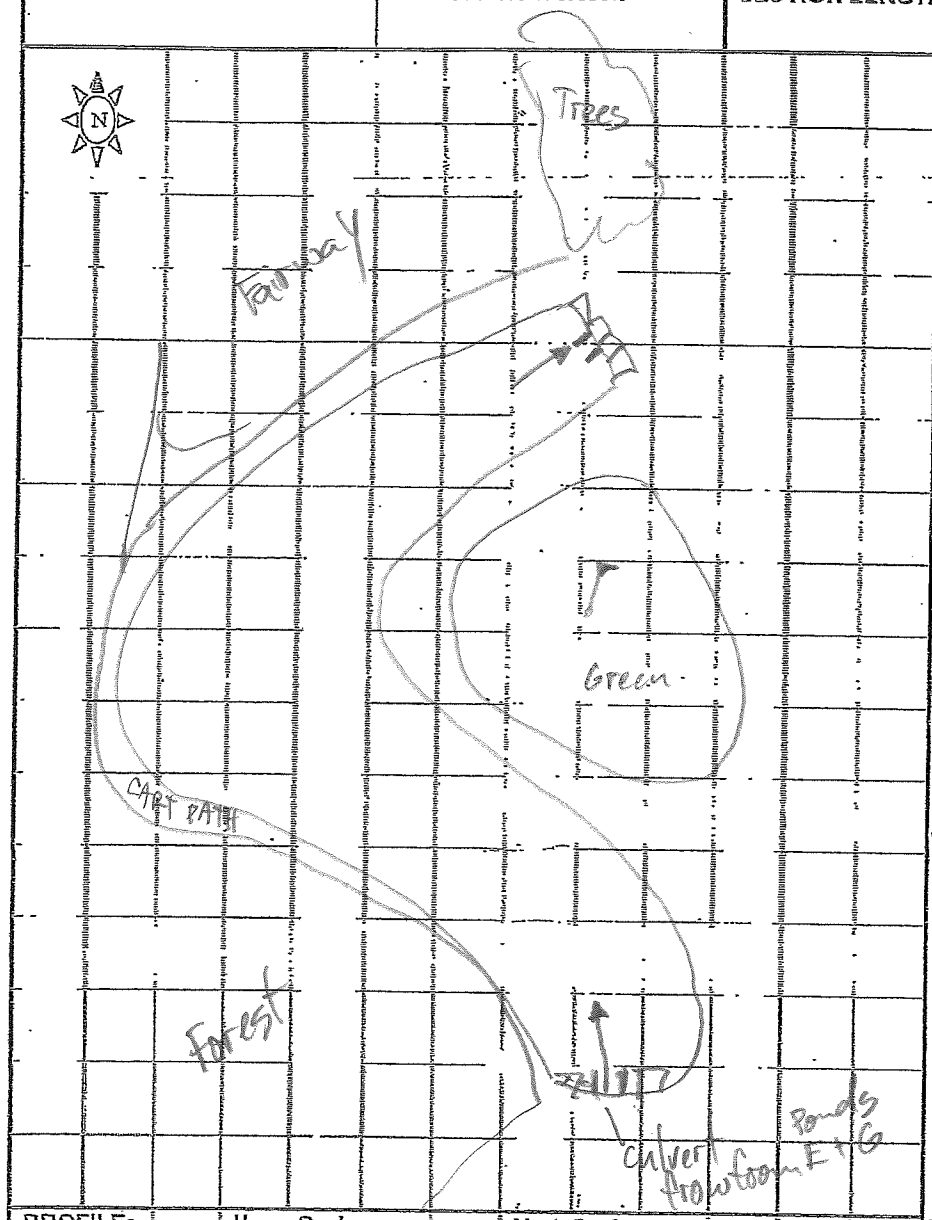
Underwater Cover (% of area):

Undercut Banks _____ Boulders _____ Logs & Trees _____ Organic Debris _____ w/c Macrophytes _____ Combination _____ None _____

Additional Data: (Pollution, Migratory Obstructions, etc.)

online, flow from E+G enter F then flow dls into watercourse

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):



PROFILE: Horz. Scale Vert. Scale

PROJECT #: 300041230

MAPPER: AR

NAME OF WATERBODY: Pond F

CROSSING #:

STATION #:

DATE: DD-MMM-YY

LEGEND

10d depth (cm)
6w width

⇨ Riffle
⇨ Run/Glide
◯ Pool
Island/Bar

Fine Substrate
Gravel Substrate

oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

Instream Log/Tree
ΛΛΛ Dam/Weir/Obstruction

® Riparian Tree

Seep/Spring
Undercut Bank

Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
Culvert

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

Correspondence

From: Boros, Caroline
To: Chris Pfohl
Cc: Balint, David
Subject: Conrail Drain, Niagara Falls (DFO file # 18-HCAA-00444) - site visit
Date: Friday, September 14, 2018 2:15:18 PM

Good Afternoon Chris,

This email is a follow up to the site visit completed for the Conrail Drain on September 13, 2018. After walking and surveying the section of watercourse that is proposed to be enclosed, DFO does not have concerns regarding Species at Risk mussels at this time. DFO will not be requesting a mussel survey be completed in Conrail Drain.

The file is still being reviewed and I will reach out in the upcoming weeks if I have any additional questions.

Kind Regards,

Caroline Boros
Fisheries Protection Program | Programme de Protection des Pêches
Fisheries and Oceans Canada | Pêches et Océans Canada
867 Lakeshore Road | 867 Chemin Lakeshore
Burlington, ON, L7S 1A1
Caroline.Boros@dfo-mpo.gc.ca
Tel | Tél: 905-336-4435
www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html
Government of Canada | Gouvernement du Canada

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix F

NRSI Bat Acoustic Survey Report

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Memo

Project No. 2135

To: **Peter De Carvalho, R.J. Burnside & Associates**

From: **Heather Fotherby**

Date: **August 29, 2018**

Re: **6000 Marineland Parkway, Niagara Falls, ON**
Bat Acoustic Monitoring Results

Natural Resource Solutions Inc. (NRSI) was retained by R.J. Burnside & Associates in June 2018 to complete acoustic surveys to assess the potential presence of bat Species at Risk (SAR) and their use of available habitats within the property located at 6000 Marineland Parkway, Niagara Falls, Ontario.

This memo provides a summary of the methods and results of this acoustic monitoring.

Methods
Acoustic monitoring for bats was completed within the Thundering Waters Golf Course property located at 6000 Marineland Parkway in Niagara Falls, Ontario. Monitoring followed the guidelines outlined within the MNRF Survey Protocol for Species at Risk (SAR) Bats within Treed Habitats for Little Brown Myotis, Northern Myotis & Tri-Colored Bats (MNRF 2017).

Acoustic Monitoring Station Locations
R.J. Burnside & Associates selected 13 candidate bat roost trees and one candidate bat foraging area within the study area to be monitored. Details of each candidate roost tree including its location, species, height, Diameter-at-Breast Height (DBH) and roost type is provided in Appendix I.

NRSI placed acoustic monitoring stations within 10 m of each candidate bat roost tree to assess the potential presence of SAR bats within the study area (Map 1). Within the candidate foraging habitat, an acoustic monitoring station was placed along the edge of the habitat to conceal the microphone from any foraging bats to avoid recording inspection calls.

A total of 14 acoustic recorders were deployed. A summary of the location and set-up details for each acoustic monitoring station is provided in Appendix II.

Acoustic Detector Settings

Bat activity was monitored with the use of an omnidirectional SMM-U1 microphone and Song Meter SM4 acoustic recorder (Wildlife Acoustics Inc., Massachusetts, USA). Table 1 summarizes the unit settings used for this project.

Table 1: SM4 acoustic recorder settings used for bat acoustic monitoring.

Parameter	Setting Used
Detector Type	Wildlife Acoustics Song Meter SM4BAT-FS [Full-spectrum]
Microphone Type	Wildlife Acoustics SMM-U1 [omnidirectional]
Microphone Attachments	Windscreen [no horn or other weather proofing]
Gain	12 dB
16 kHz High Pass Filter	Off
Sample Rate	384 kHz
Min Duration	1.5 ms
Max Duration	Off
Minimum Trigger Frequency	16 kHz
Trigger Level	12 dB
Trigger Window	3 sec
Maximum Length	00:15 min
Sunrise/Sunset Type	Solar
Timezone	UTC -04:00
Latitude	43.068333 N
Longitude	79.079166 W
Delay Start	Off
Schedule Start	Sunset + 00:00hrs
Schedule End	Sunset + 05:00hrs

Acoustic Monitoring Frequency and Timing

Passive acoustic monitoring was conducted between June 21 and July 4, 2018 for a total of 14 nights at all 14 monitoring stations. Acoustic detectors were set to record bat passes for a total of five hours each night during the monitoring period, commencing at sunset (approximately 21:00 to 02:00 hrs).

Acoustic Data Analysis

The acoustic recorders used for this study employ direct digital recording technology and are designed to collect records from the full spectrum of bat calls (15-120 kHz) for the entire duration of the monitoring period. This allows for a full analysis of activity in the vicinity of each acoustic monitoring station. Identification of call sequences to species level are typically possible with a quality ultrasound microphone (as used in this study) when recordings of bat echolocation calls are made in the open, the bat approaches close to the microphone, the bat produces echolocation calls typical for that species, and there are few things interfering with the passage of ultrasound from the bat to the microphone (wind, proximity to the ground, type and abundance of vegetation, etc.). However, this perfect scenario rarely exists. All of the above factors can influence the ability to identify a call sequence to the species level. In addition to these conditional

factors, many of the sounds produced by a particular species of bat are also produced by other species (i.e. They have overlapping ranges of call characteristics). The degree of overlap in call characteristics varies by species. These factors must all be taken into consideration when acoustic bat monitoring is undertaken.

Bat echolocation calls recorded between June 21 and July 4, 2018 during passive acoustic surveys were visualized with the software program SonoBat 4.2.2 for the North/Northeastern US, Southern Ontario Region and identified to species with the SonoBat Auto-classifier. Settings for the auto-classification of the acoustic data included the following:

- Autofilter: 5 kHz;
- Acceptable call quality: 0.70;
- Decision threshold: 0.90; and
- Maximum number of calls to consider per file: 16.

Upon review of the auto-classification results, only those bat pass sequences that were classified to species with certainty were included in the results and discussion below. That is, only those sequences where the classification to species was based on five or more call pulses were included in the results and considered to be a strong classification. None of the auto-classification results were manually vetted by NRSI biologists as this was out of scope for this acoustic monitoring program.

The auto-classification results provide an estimated likelihood of presence, also known as a maximum likelihood estimate (MLE). A MLE value provides an indication of the strength of evidence for the presence of a species. A MLE value of zero suggests that the data presents stronger evidence of species presence and a value of one suggests that the data presents weaker evidence of species presence. The MNRF has requested MLE values in the past and these are discussed in the results below at both the site and station-level. It is important to note that the likelihood estimate provides a probabilistic estimate and does not convey certainty.

Results and Discussion

Four bat species were documented as present during passive acoustic monitoring conducted within the study area throughout the monitoring period. All of these species are considered common in Ontario. Appendix III, and Figure 1 below, provide a summary of the auto-classification results.

The majority of bat call sequences collected were classified as Big Brown Bat (*Eptesicus fuscus*) (77.9%). Several call sequences were also classified to Hoary Bat (*Lasiurus cinereus*) (13.3%) and Silver-haired Bat (*Lasionycteris noctivagans*) (8.7%). A small proportion of calls were classified to Eastern Red Bat (*Lasiurus borealis*) (0.1%). Consistent with these findings, the site-level MLE values (across all monitoring stations throughout the entire monitoring period) for each species suggest that there is strong evidence for the presence of Big Brown Bat (MLE=0), Hoary Bat (MLE=0) and Silver-haired Bat (MLE=0) within the study area. The data suggests that there is weaker evidence for the presence of Eastern Red Bat within the study area (MLE=0.5). Station-level MLE values (per monitoring station) for each species is provided in Appendix III.

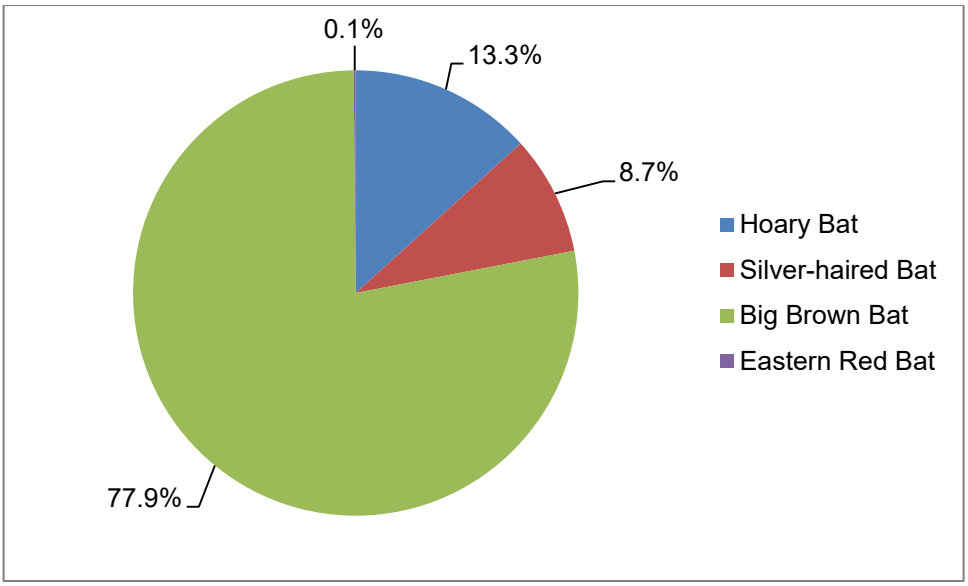


Figure 1. Bat species auto-classification results (all stations).

A total of 8,943 bat call sequences were recorded throughout the acoustic monitoring period within the study area. Of these, 50 were identified as high frequency bat pass sequences by the auto-classifier. The majority of these high frequency sequences (46) were not classified to the species level due to the quality of the recorded sequence (Table 2). One sequence was classified to the species level by the auto-classifier, however, not with any certainty (i.e. classification was based on four or fewer call pulses). The remaining three high frequency sequences were classified to Eastern Red Bat with confidence by the auto-classifier. While SAR bats are known to emit high frequency calls, Eastern Red Bat, a non-SAR, also has high frequency calls. Therefore, the presence of high frequency calls should not be considered probable evidence of the presence of SAR. It is recommended to manually vet high frequency calls to assess for the potential presence of SAR within the study area.

Table 2: Number of bat pass sequences recorded and classified per monitoring station.

Acoustic Monitoring Station	No. of Recorded Bat Pass Sequences	No. of Strong Bat Pass Sequence Classfications[1,2]	No. of Bat Pass Sequences not Classified to Species[1]	No. of High Frequency Bat Pass Sequences not Classified to Species[1]	No. of High Frequency Weak Bat Pass Sequence Classifications[1,3]	No. of Weak Bat Pass Sequence Classifications[1,3]
BAT-001	174	3	159	3	0	12
BAT-002	84	1	83	0	0	0
BAT-003	731	32	638	0	0	61
BAT-004	901	440	379	7	0	82
BAT-005	1188	136	920	4	0	132
BAT-006	558	223	284	3	0	51
BAT-007	481	62	354	2	0	65
BAT-008	532	165	319	6	1	48
BAT-009	503	45	397	3	0	61
BAT-010	686	132	479	7	0	75
BAT-011	148	21	143	0	0	5
BAT-012	510	388	441	1	0	48
BAT-013	917	394	450	6	0	79
BAT-014	1530	3	927	4	0	209
Totals	**8943**	**2042**	**5973**	**46**	**1**	**928**

[1]Classified by SonoBat 4.2.2 North/Northeastern US, Southern Ontario Region
[2]Strong classifications are those classifications where species identification was based on 5 or more call pulses
[3]Weak classifications are those classifications where species identification was based on 4 or fewer call pulses

Bat pass sequences were detected on all nights throughout the monitoring period. Bat activity peaked on the evening of June 26 where the highest number of bat pass sequences (245) were classified to species with confidence. The evenings of June 24 and June 25 had the lowest number of recorded bat pass sequences (41 and 48 sequences, respectively) classified to species with confidence. Figure 2 provides a summary of the number of recorded bat pass sequences that were auto-classified to species with confidence per monitoring night.

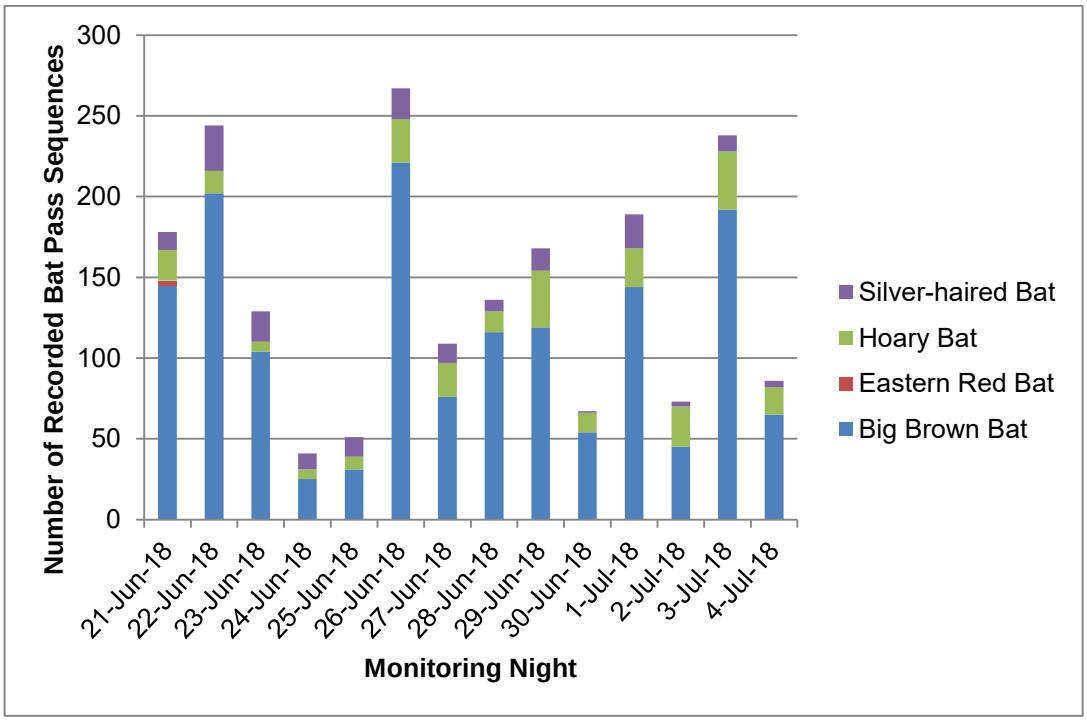


Figure 2. Bat species and relative abundance per monitoring night.

Variation in the number of bat pass sequences recorded per monitoring night may be due to several factors, including variation in corresponding weather conditions. Bats are more likely to leave the roost to drink, forage, and socialize on warm/mild nights (i.e., ambient temperature > 10°C) with low wind and no precipitation (MNRF 2017). Figure 3 presents the number of bat pass sequences recorded each night between 21:00 and 22:00 hrs in relation to ambient temperature and wind speed at sunset (21:00 hrs). In general, relatively higher numbers of bat pass sequences were recorded on warmer evenings with low wind. Emergence of individuals from their roost can also be influenced by the presence/absence of predators and insect activity. Appendix IV presents the weather conditions for each recording interval throughout the monitoring period.

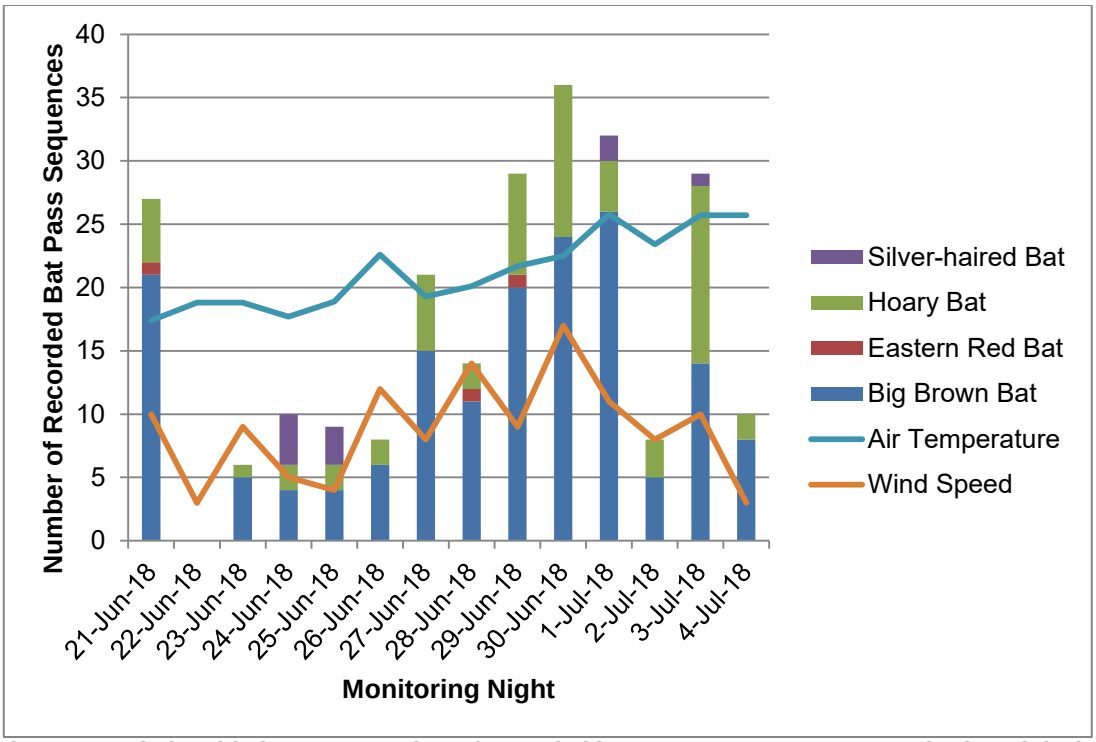


Figure 3. Relationship between number of recorded bat pass sequences per monitoring night (21:00 and 22:00 hrs) and weather conditions at sunset (21:00 hrs).

In total, 1,820 bat pass sequences were identified to species by the auto-classifier with confidence during the monitoring period within the study area. Acoustic monitoring stations BAT-004, BAT-014 and BAT-013 had the highest total number of bat pass sequences classified with 440 (25%), 394 (22%) and 388 (21%) records at each station respectively. The auto-classifier was only able to identify to species with confidence a total number of one and three bat pass sequences from monitoring stations BAT-001 and BAT-002, respectively. No bat pass sequences collected from station BAT-011 were classified to the species level with confidence by the auto-classifier. These three monitoring stations were located in high clutter areas meaning that dense vegetation may have interfered with the passage of ultrasound from the bat to the microphone, resulting in fewer high quality calls being recorded.

Figure 4 provides a summary of bat species and relative species abundances documented at each station throughout the monitoring period. Slight differences in species detected and the number of call sequences recorded was noted among all 14 monitoring stations, as illustrated in Figure 4. The following sections provide a more detailed description of the results for each monitoring station.

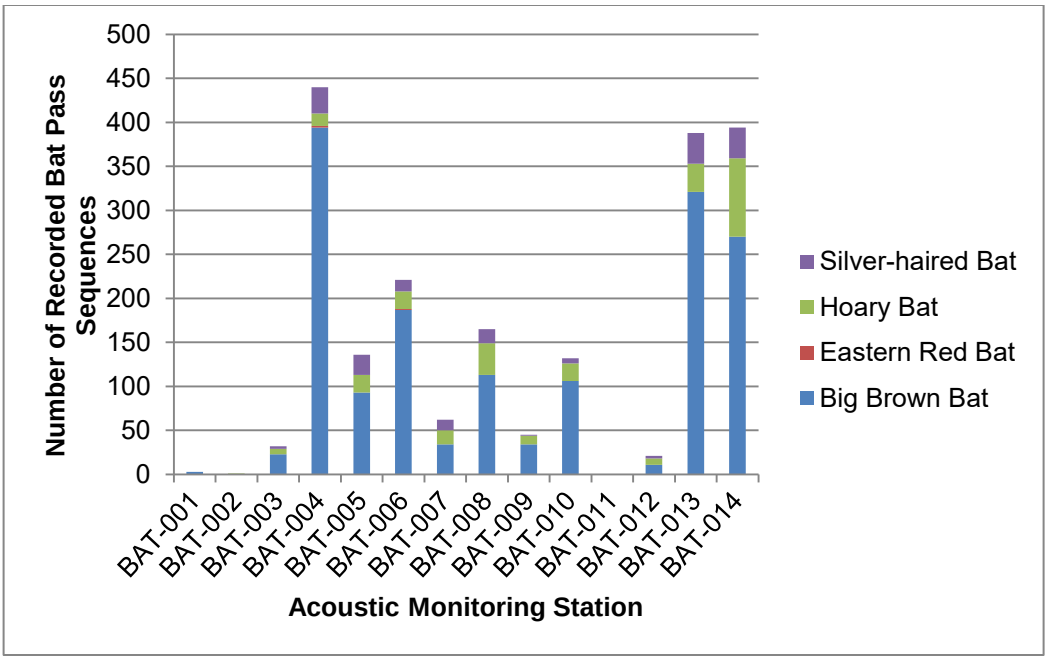


Figure 4. Bat species detected and relative abundance per acoustic monitoring station.

Acoustic Monitoring Station BAT-001

One bat species, Big Brown Bat, was confirmed as present through passive acoustic monitoring at station BAT-001. A total of 175 bat pass sequences were recorded at this station throughout the monitoring period, however, only three (1.71%) were confidently identified to species by the auto-classifier. This monitoring station was located in a high clutter environment and the presence of dense vegetation may have interfered with the passage of ultrasound from the bat to the microphone, resulting in fewer high quality calls being recorded. Bat pass sequences classified to Big Brown Bat were recorded at 22:00 hrs on June 26, 30 and July 3, 2018. The data suggests that there is fairly weak evidence for the presence of Big Brown Bat in the vicinity of this monitoring station (MLE= 0.05). Figures 5 and 6 provide a summary of the bat species detected at acoustic monitoring station BAT-001 by monitoring night and hour, respectively.

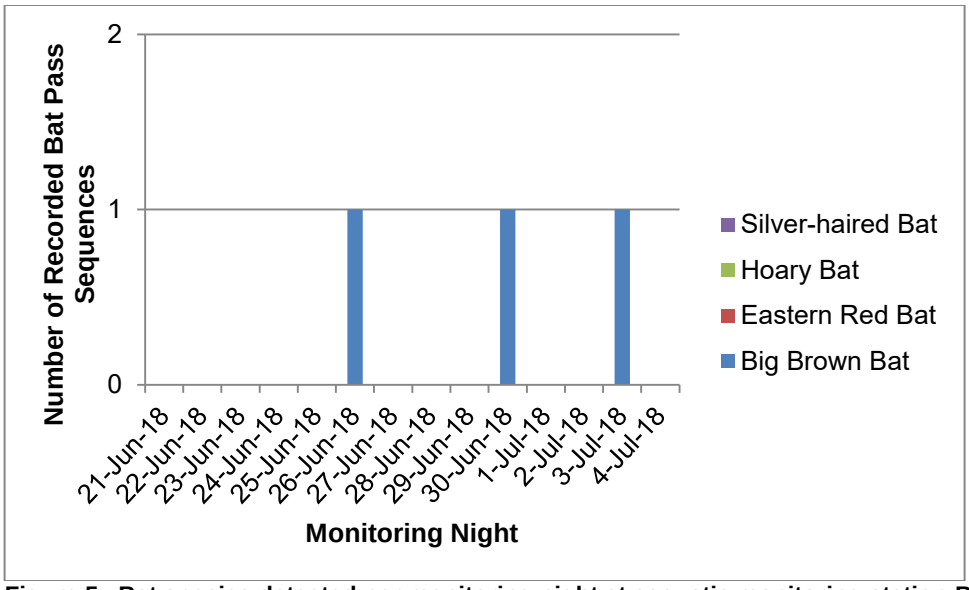


Figure 5. Bat species detected per monitoring night at acoustic monitoring station BAT-001.

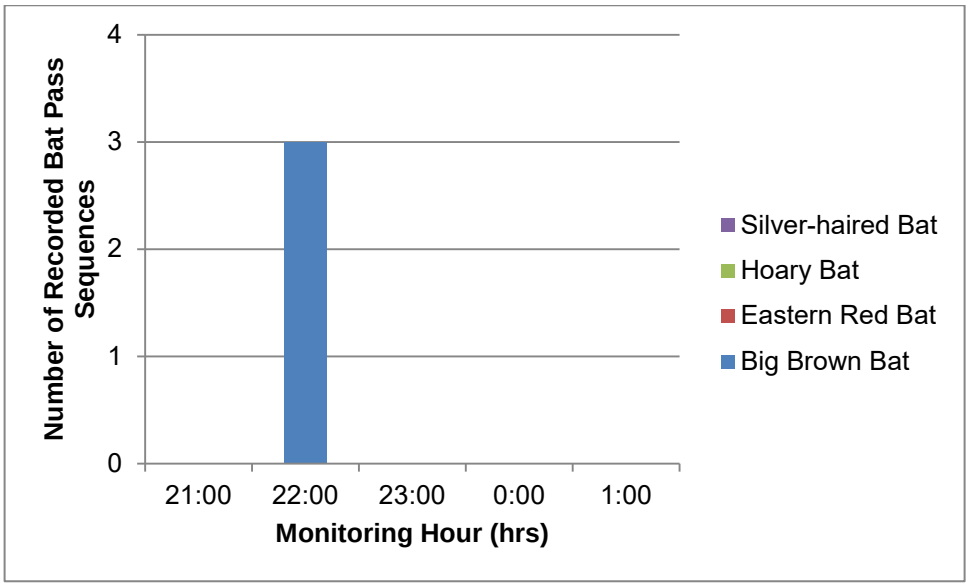


Figure 6. Bat species detected per monitoring hour at acoustic monitoring station BAT-001.

Acoustic Monitoring Station BAT-002

One bat species, Hoary Bat, was confirmed as present through passive acoustic monitoring at station BAT-002. A total of 84 bat pass sequences were recorded at this station throughout the monitoring period. Of these, one (1.19%) bat pass sequence was identified to species with confidence by the auto-classifier. Similar to monitoring station BAT-001, this station was located in a high clutter environment where fewer high quality calls were likely recorded as a result. The bat pass sequence classified as Hoary Bat was recorded at 23:00 hrs on June 29. The data suggests that there is some evidence that Hoary Bat was present in the vicinity of this monitoring station (MLE= 0.55). Figures 7 and 8 provide a summary of the bat species detected at acoustic monitoring station BAT-002 by monitoring night and hour, respectively.

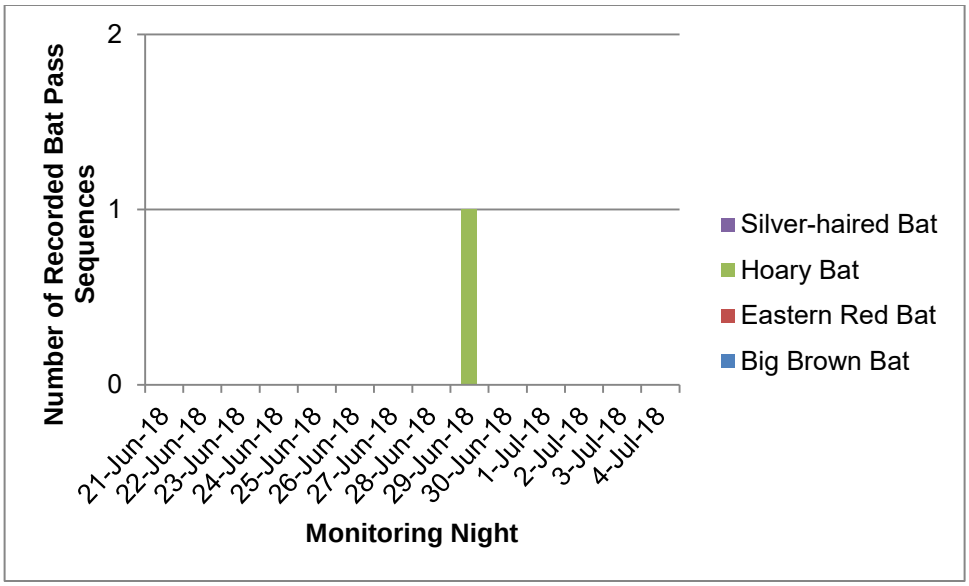


Figure 7. Bat species detected per monitoring night at acoustic monitoring station BAT-002.

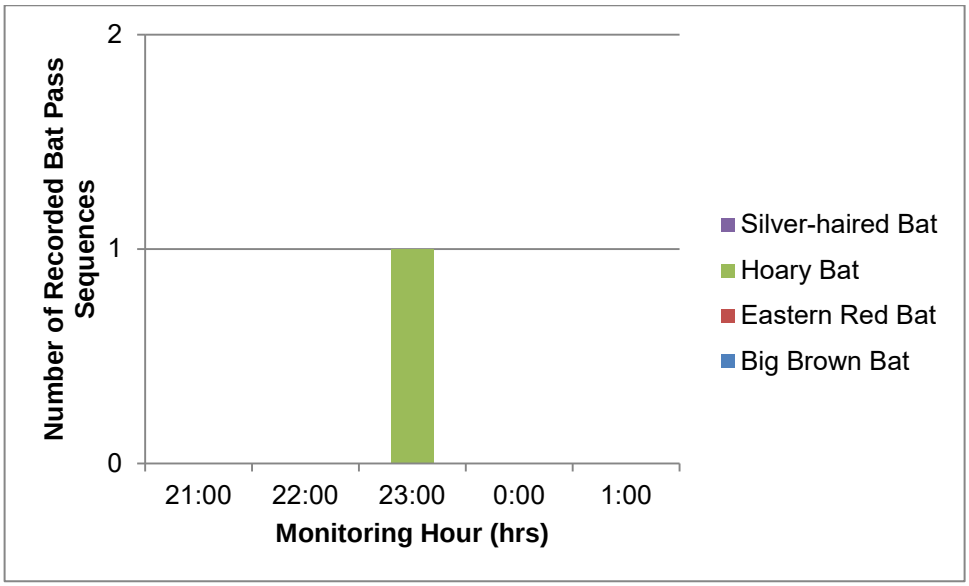


Figure 8. Bat species detected per monitoring hour at acoustic monitoring station BAT-002.

Acoustic Monitoring Station BAT-003

Three bat species were confirmed as present through passive acoustic monitoring at station BAT-003: Big Brown Bat, Hoary Bat and Silver-haired Bat. A total of 731 bat pass sequences were recorded at this station throughout the monitoring period with 32 (4.38%) of these identified to species with confidence by the auto-classifier. The high clutter (i.e. dense vegetation) surrounding the microphone at this monitoring station likely influenced the collection of high quality bat pass sequences and subsequently, the ability for the auto-classifier to classify the sequences to species level. The majority of bat pass sequences that were classified to species were identified as Big Brown Bat (72%). Big Brown Bat, Hoary Bat, and Silver-haired Bat were detected on 12 (86%), 5(36%), and 1 (7%) monitoring nights, respectively, throughout the monitoring period. Bat pass sequences classified to Big Brown Bat were recorded during all monitoring hours with the majority of passes documented between 22:00 and 00:00 hrs. The data

suggests that there is strong evidence for the presence of Big Brown Bat (MLE=0) and Hoary Bat (MLE=0) in the vicinity of monitoring station BAT-003. There is only weak evidence for the presence of Silver-haired Bat in the vicinity of this monitoring station (MLE=0.93). Figures 9 and 10 provide a summary of the bat species detected at acoustic monitoring station BAT-003 by monitoring night and hour, respectively.

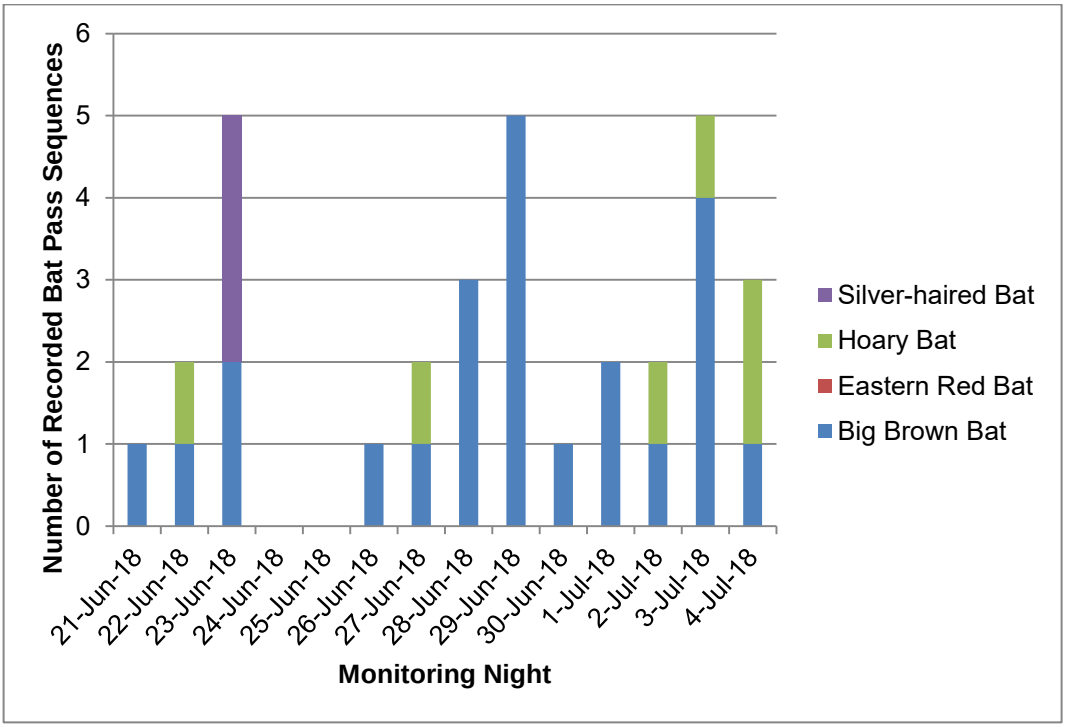


Figure 9. Bat species detected per monitoring night at acoustic monitoring station BAT-003.

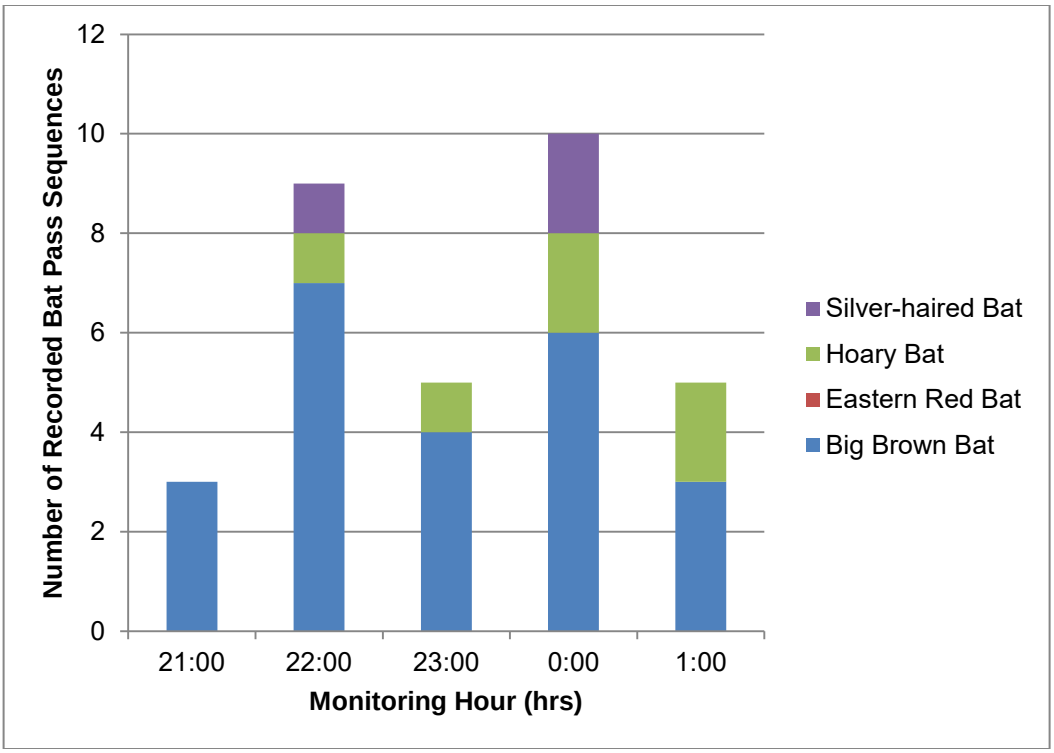


Figure 10. Bat species detected per monitoring hour at acoustic monitoring station BAT-003.

Acoustic Monitoring Station BAT-004

Four bat species, Big Brown Bat, Eastern Red Bat, Hoary Bat, and Silver-haired Bat, were confirmed as present through passive acoustic monitoring at station BAT-004. A total of 901 bat pass sequences were recorded at this station throughout the monitoring period with 440 (48.8%) of these identified to species with certainty by the auto-classifier. This monitoring station was located along a woodland edge where less vegetation clutter is present, increasing the likelihood for higher quality calls to be recorded. Two bat pass sequences were classified to Eastern Red Bat at this station on June 21, 2018. Slightly higher numbers of bat pass sequences were classified to Hoary Bat (0.03%) and Silver-haired Bat (0.07%). The majority (90%) of the bat pass sequences recorded at this station were classified to Big Brown Bat. A large number of the bat pass sequences classified to Big Brown Bat were detected at 22:00 hrs, indicating the potential presence of a roost site for this species within the vicinity of this monitoring station. The data suggests that there is strong evidence for Big Brown Bat (MLE=0) and Hoary Bat (MLE=0) to be present in the vicinity of this monitoring station. There is weak evidence for Silver-haired Bat (MLE=0.26) and Eastern Red Bat (MLE=0.17) to be present in the vicinity of this monitoring station. Figures 11 and 12 provide a summary of the bat species detected at acoustic monitoring station BAT-004 by monitoring night and hour, respectively.

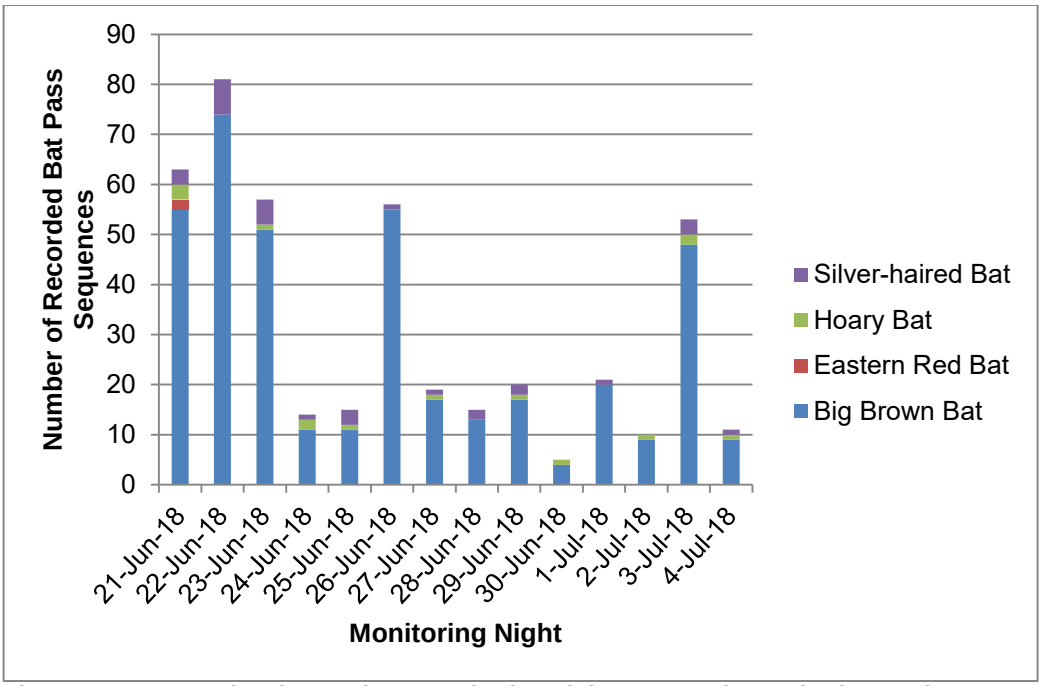


Figure 11. Bat species detected per monitoring night at acoustic monitoring station BAT-004.

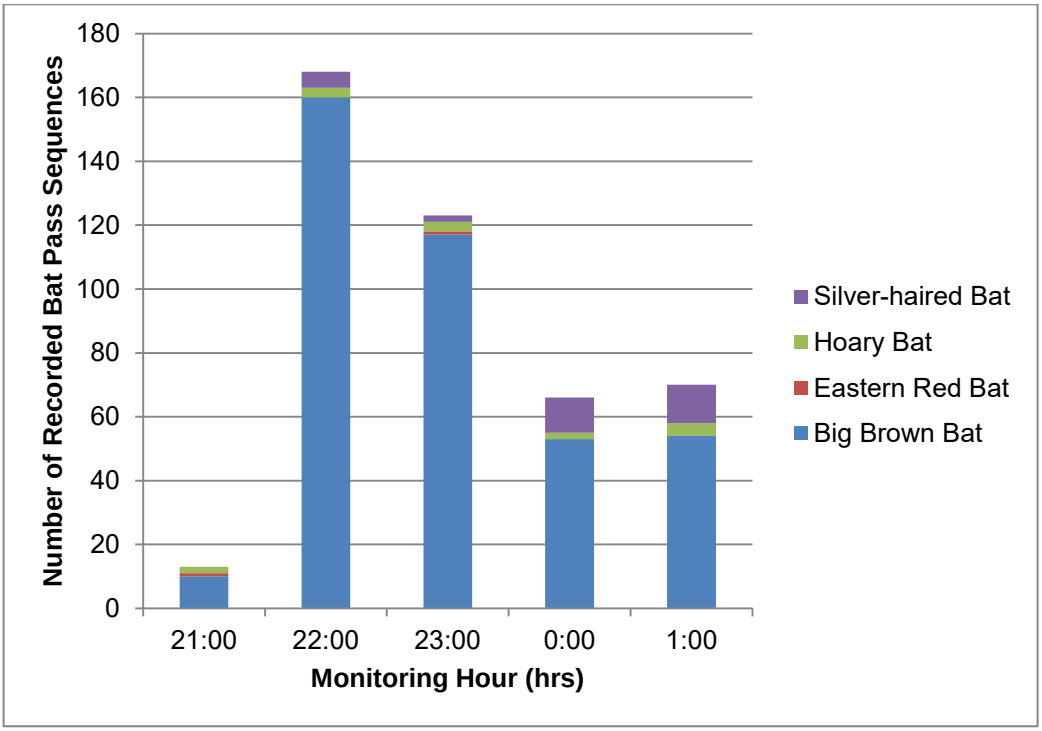


Figure 12. Bat species detected per monitoring hour at acoustic monitoring station BAT-004.

Acoustic Monitoring Station BAT-005

Three bat species, Big Brown Bat, Hoary Bat, and Silver-haired Bat, were confirmed as present through passive acoustic monitoring at station BAT-005. A total of 1188 bat pass sequences were recorded at this station throughout the monitoring period, however, only 136 (11.5%) of these were identified to species with confidence by the auto-classifier. The high vegetation clutter surrounding the microphone at this monitoring station likely resulted in fewer high quality calls being recorded. The majority of bat pass sequences were classified to Big Brown Bat (68%). Smaller numbers of Hoary Bat (15%) and Silver-haired Bat (17%) were detected throughout the monitoring period. The detection of the majority of Big Brown Bat passes at 22:00 hrs suggests the potential for a roost site for this species to be present within the vicinity of this monitoring station. The data suggests that there is strong evidence that Big Brown Bat (MLE=0), Silver-haired Bat (MLE=0) and Hoary Bat (MLE=0) are present in the vicinity of this monitoring station. Figures 13 and 14 provide a summary of the bat species detected at acoustic monitoring station BAT-005 by monitoring night and hour, respectively.

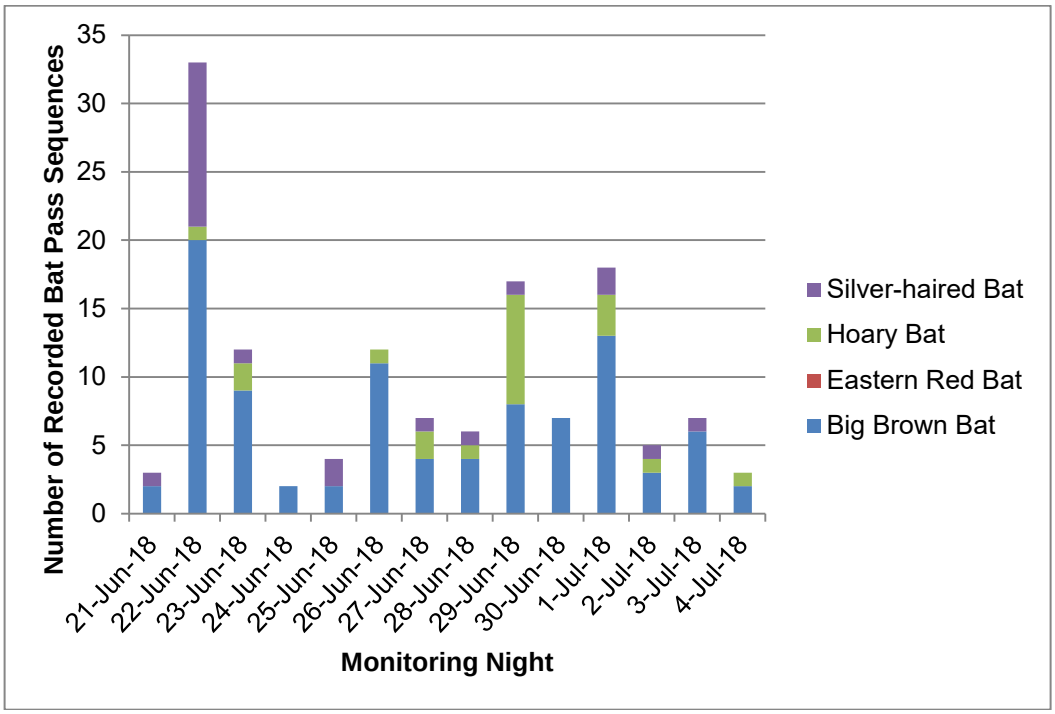


Figure 13. Bat species detected per monitoring night at acoustic monitoring station BAT-005.

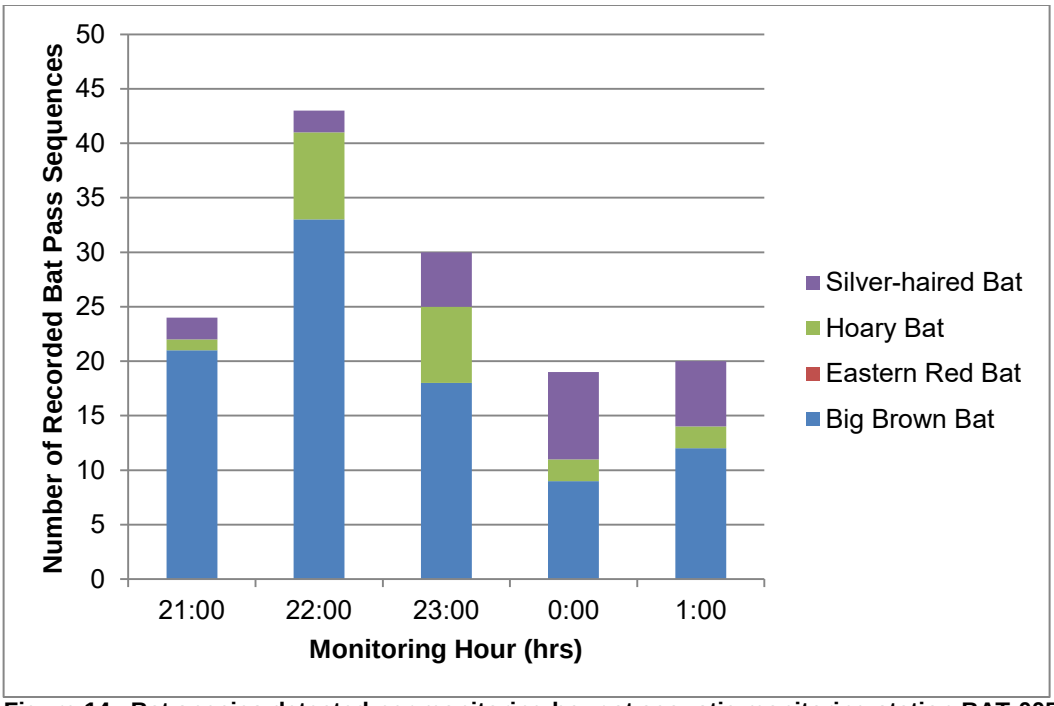


Figure 14. Bat species detected per monitoring hour at acoustic monitoring station BAT-005.

Acoustic Monitoring Station BAT-006

Four bat species, Big Brown Bat, Hoary Bat, Eastern Red Bat and Silver-haired Bat, were confirmed as present through passive acoustic monitoring at station BAT-005. A total of 558 bat pass sequences were recorded at this station throughout the monitoring period. Of these, 221 (39.6%) were identified to species with confidence by the auto-classifier. This monitoring station was located along a woodland edge where less vegetation clutter is present, increasing the likelihood for higher quality calls to be recorded. The majority of bat pass sequences were classified to Big Brown Bat (85%). Smaller numbers of bat pass sequences were classified to Eastern Red Bat (0.01%), Hoary Bat (0.09%) and Silver-haired Bat (0.06%). Most Big Brown Bat passes were detected at 22:00 hrs indicating the potential presence for a roost site within the vicinity of the monitoring station. The data suggests that there is strong evidence that Big Brown Bat (MLE=0) and Hoary Bat (MLE=0) are present in the vicinity of this monitoring station. There is weaker evidence for the presence of Silver-haired Bat (MLE=0.65) and Eastern Red Bat (MLE=0.55) in the vicinity of the monitoring station. Figures 13 and 14 provide a summary of the bat species detected at acoustic monitoring station BAT-006 by monitoring night and hour, respectively.

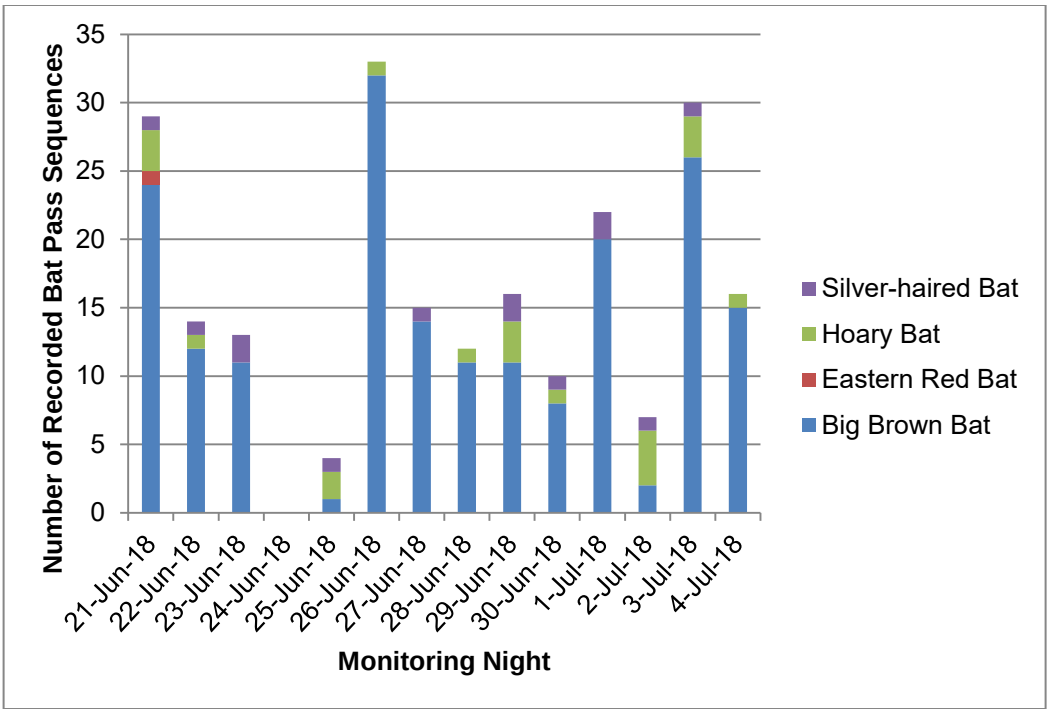


Figure 15. Bat species detected per monitoring night at acoustic monitoring station BAT-006.

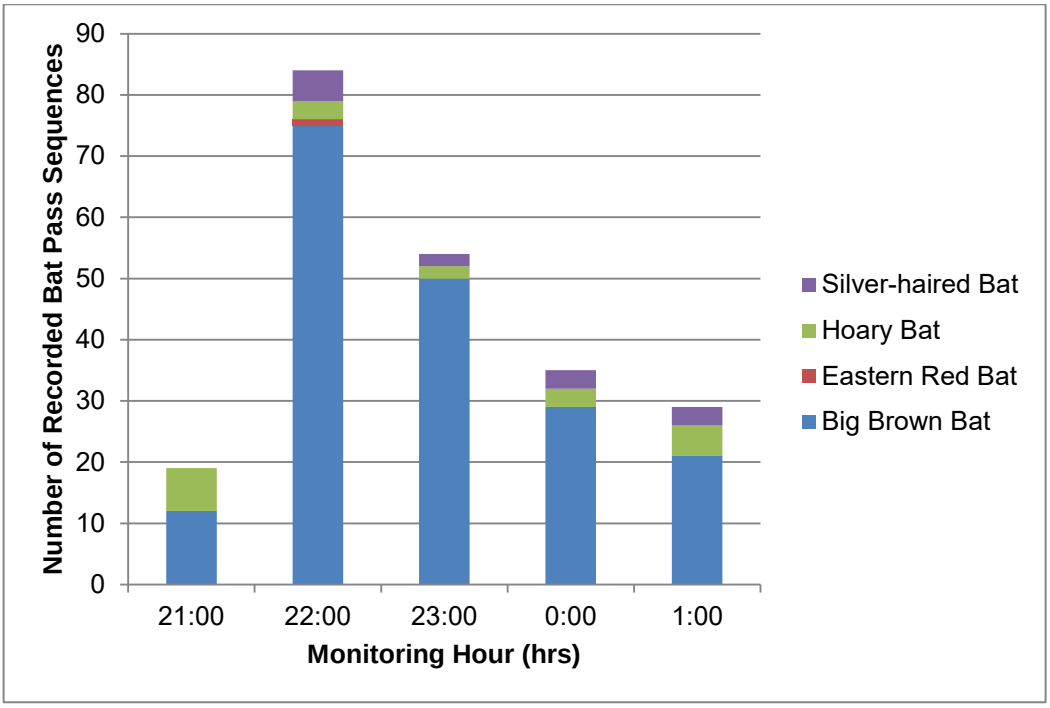


Figure 16. Bat species detected per monitoring hour at acoustic monitoring station BAT-006.

Acoustic Monitoring Station BAT-007

Three bat species, Big Brown Bat, Hoary Bat and Silver-haired Bat, were confirmed as present through passive acoustic monitoring at station BAT-007. A total of 481 bat pass sequences were recorded at this station throughout the monitoring period. Of these, 62 (12.9%) were identified to species with confidence by the auto-classifier. This monitoring station was located in a medium clutter environment meaning that some vegetation may have interfered with the passage of ultrasound from the bat to the microphone resulting in the collection of fewer higher quality calls. A large number of the bat pass sequences were classified to Big Brown Bat (55%). Smaller numbers of of bat pass sequences were classified to Hoary Bat (26%) and Silver-haired Bat (19%). The data suggests that there is strong evidence for the presence of Big Brown Bat (MLE=0), Hoary Bat (MLE=0) and Silver-haired Bat (MLE=0.02) in the vicinity of this monitoring station. Figures 17 and 18 provide a summary of the bat species detected at acoustic monitoring station BAT-007 by monitoring night and hour, respectively.

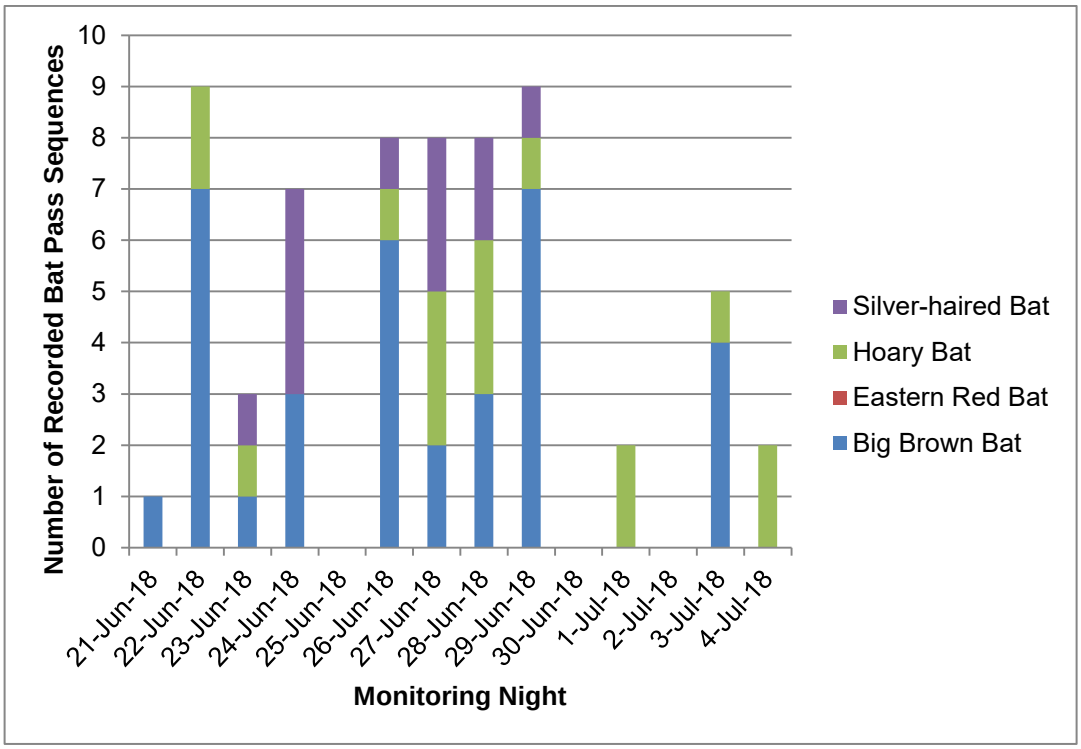


Figure 17. Bat species detected per monitoring night at acoustic monitoring station BAT-007.

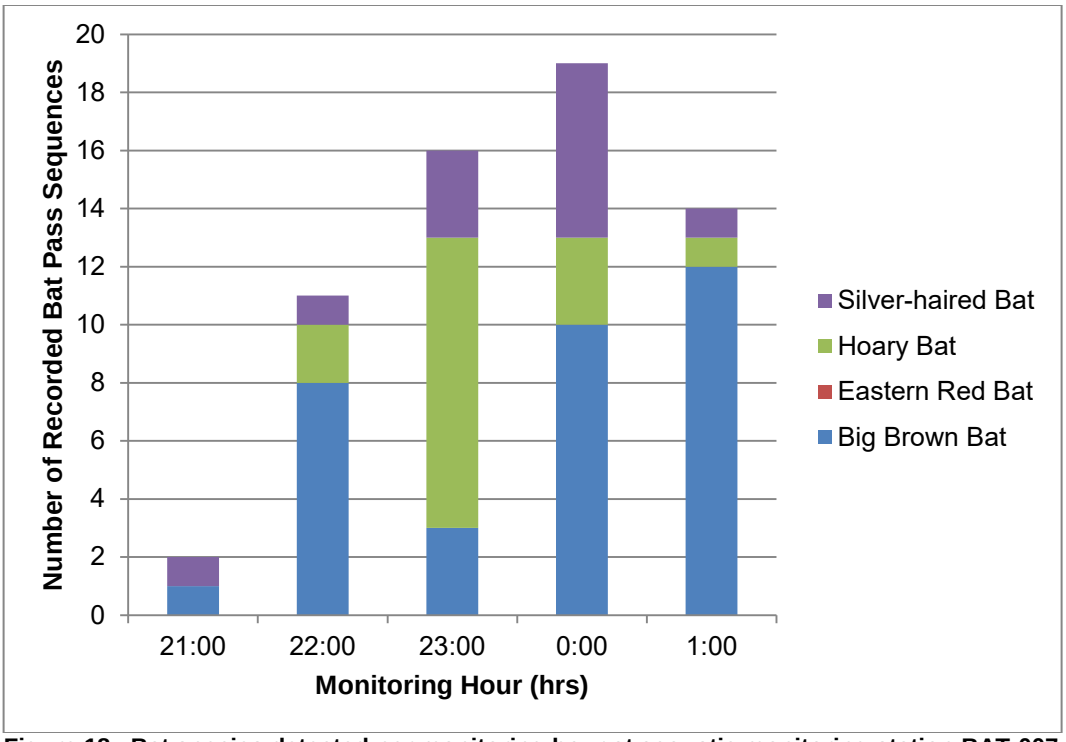


Figure 18. Bat species detected per monitoring hour at acoustic monitoring station BAT-007.

Acoustic Monitoring Station BAT-008

Three bat species, Big Brown Bat, Hoary Bat and Silver-haired Bat, were confirmed as present through passive acoustic monitoring at station BAT-008. A total of 532 bat pass sequences were recorded at this station throughout the monitoring period with 165 (31%) of these identified to species with confidence by the auto-classifier. This monitoring station was located in a high clutter environment where dense vegetation may have interfered with the passage of ultrasound from the bat to the microphone, resulting in fewer high quality calls being recorded. A large number of bat pass sequences were classified to Big Brown Bat (69%). Smaller numbers were classified to Hoary Bat (22%) and Silver-haired Bat (10%). The majority of bat pass sequences classified to Big Brown Bat were detected at 22:00 hrs indicating the potential presence of a roost site for this species within the vicinity of this monitoring station. The data suggests that there is strong evidence for the presence of Big Brown Bat (MLE=0), Hoary Bat (MLE=0) and Silver-haired Bat (MLE=0.2) in the vicinity of the station, BAT-008. Figures 19 and 20 provide a summary of the bat species detected at acoustic monitoring station BAT-008 by monitoring night and hour, respectively.

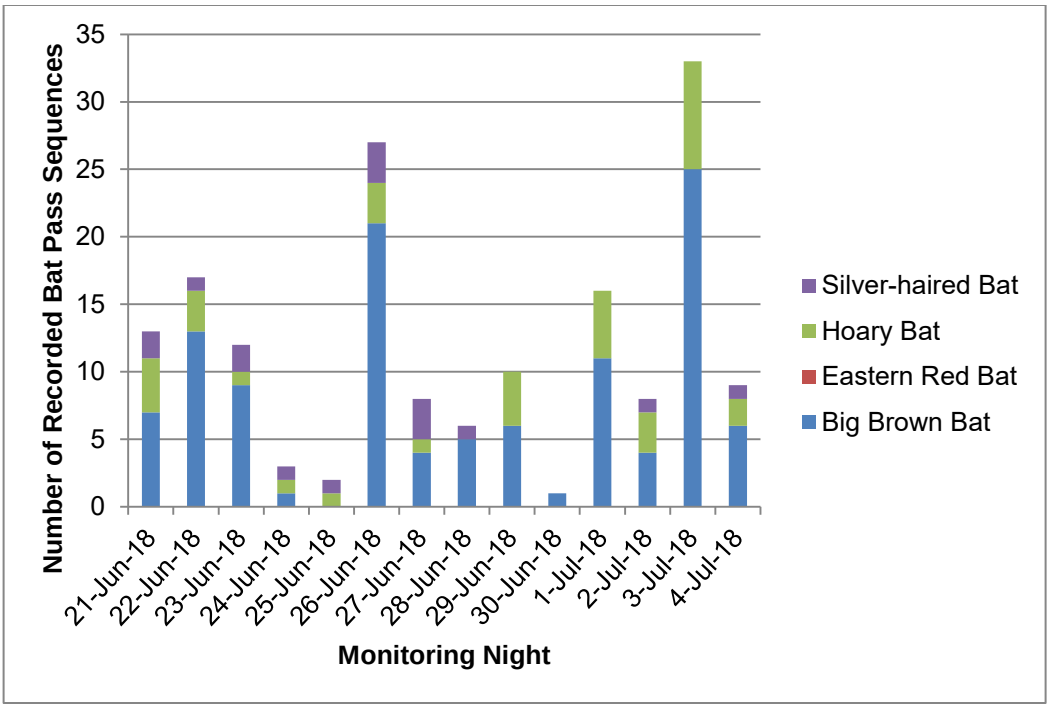


Figure 19. Bat species detected per monitoring night at acoustic monitoring station BAT-008.

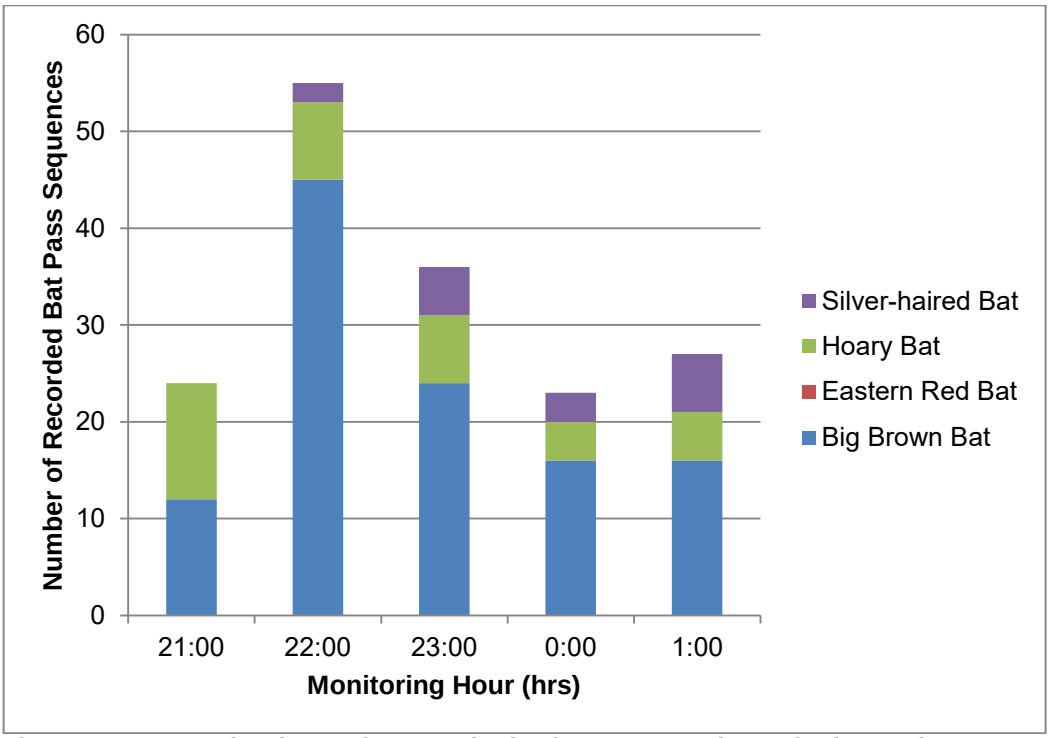


Figure 20. Bat species detected per monitoring hour at acoustic monitoring station BAT-008.

Acoustic Monitoring Station BAT-009

Three bat species, Big Brown Bat, Hoary Bat and Silver-haired Bat, were confirmed as present through passive acoustic monitoring at station BAT-009. A total of 503 bat pass sequences were recorded at this station throughout the monitoring period. Of these, 45 (8.94%) were identified to species with confidence by the auto-classifier. This monitoring station was located in a high clutter environment where dense vegetation may have interfered with the passage of ultrasound from the bat to the microphone, resulting in fewer high quality calls being recorded. A large number of bat pass sequences were classified to Big Brown Bat (76%). Smaller numbers were classified to Hoary Bat (22%). One bat pass sequence was classified to Silver-haired bat on July 3 at 01:00 hrs. The majority of bat pass sequences classified to Big Brown Bat were detected at 22:00 hrs indicating the potential presence of a roost site for this species within the vicinity of this monitoring station. The data suggests that there is strong evidence for the presence of Big Brown Bat (MLE=0) and Hoary Bat (MLE=0) in the vicinity of this monitoring station. There is weak evidence that Silver-haired Bat (MLE=0.73) is present in the vicinity of station BAT-009. Figures 21 and 22 provide a summary of the bat species detected at acoustic monitoring station BAT-009 by monitoring night and hour, respectively.

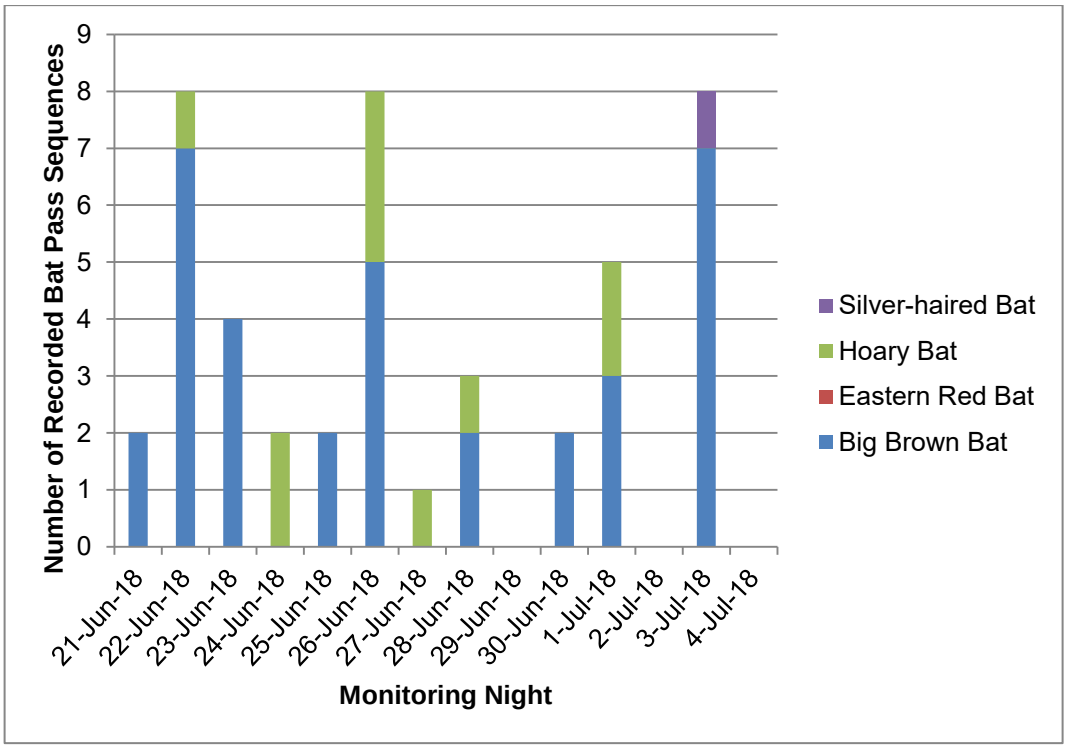


Figure 21. Bat species detected per monitoring night at acoustic monitoring station BAT-009.

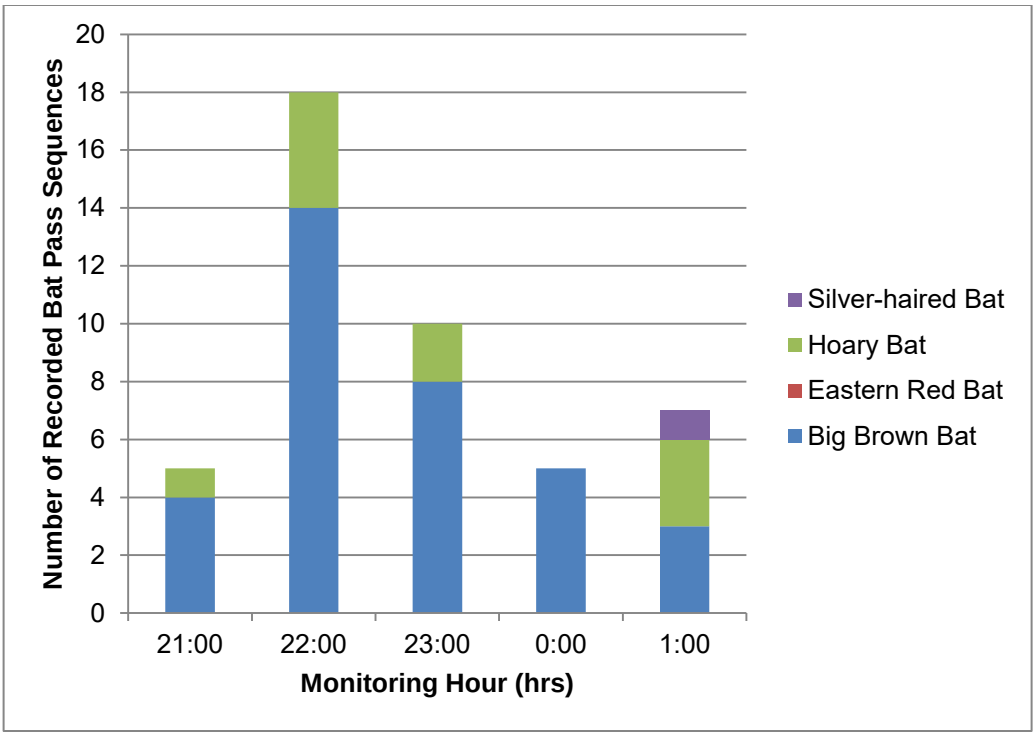


Figure 22. Bat species detected per monitoring hour at acoustic monitoring station BAT-009.

Acoustic Monitoring Station BAT-010

Three bat species, Big Brown Bat, Hoary Bat and Silver-haired Bat were confirmed as present through passive acoustic monitoring at station BAT-010. A total of 686 bat pass sequences were recorded at this station throughout the monitoring period. Of these, 132 (19.2%) were identified to species with confidence by the auto-classifier. This monitoring station was located in a medium clutter area meaning that some vegetation may have interfered with the passage of ultrasound from the bat to the microphone, possibly reducing the number of high quality calls recorded. Most of the bat pass sequences were classified to Big Brown Bat (80%). Smaller numbers were classified to Hoary Bat (15%) and Silver-haired Bat (5%). The majority of bat pass sequences classified to Big Brown Bat were detected at 22:00 hrs, which may indicate that there is potential for this species to be roosting within the vicinity of this monitoring station. The data suggests that there is strong evidence for the presence of Big Brown Bat (MLE=0) and Hoary Bat (MLE=0) in the vicinity of this monitoring station. There is weak evidence to support the presence of Silver-haired Bat (MLE=0.95) in the vicinity of this monitoring station. Figures 23 and 24 provide a summary of the bat species detected at acoustic monitoring station BAT-010 by monitoring night and hour, respectively.

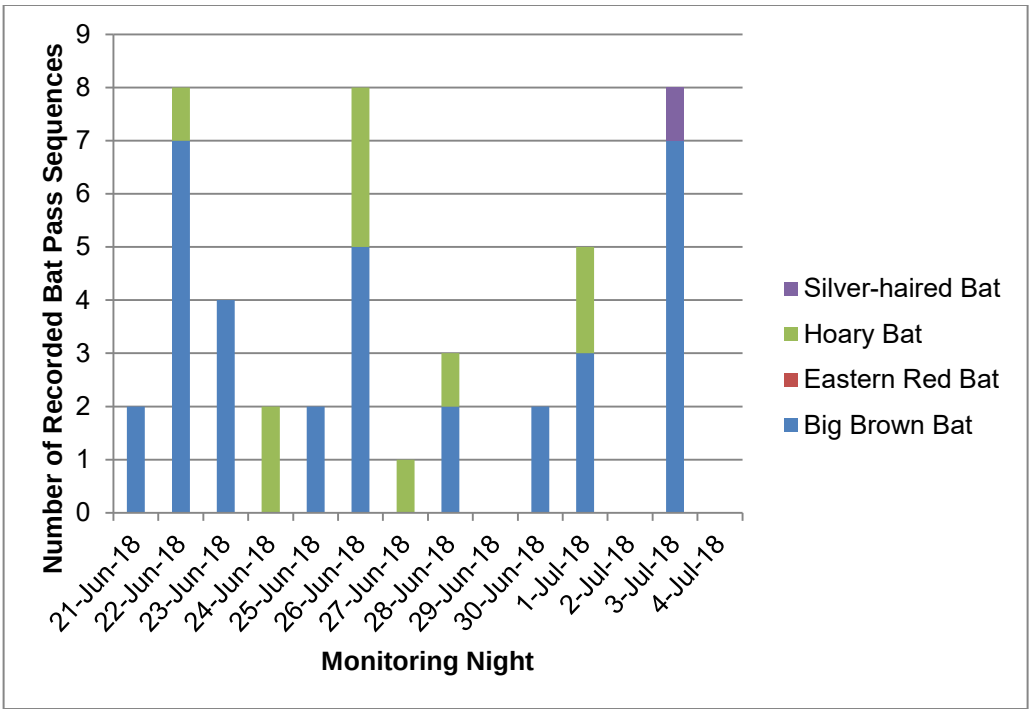


Figure 23. Bat species detected per monitoring night at acoustic monitoring station BAT-010.

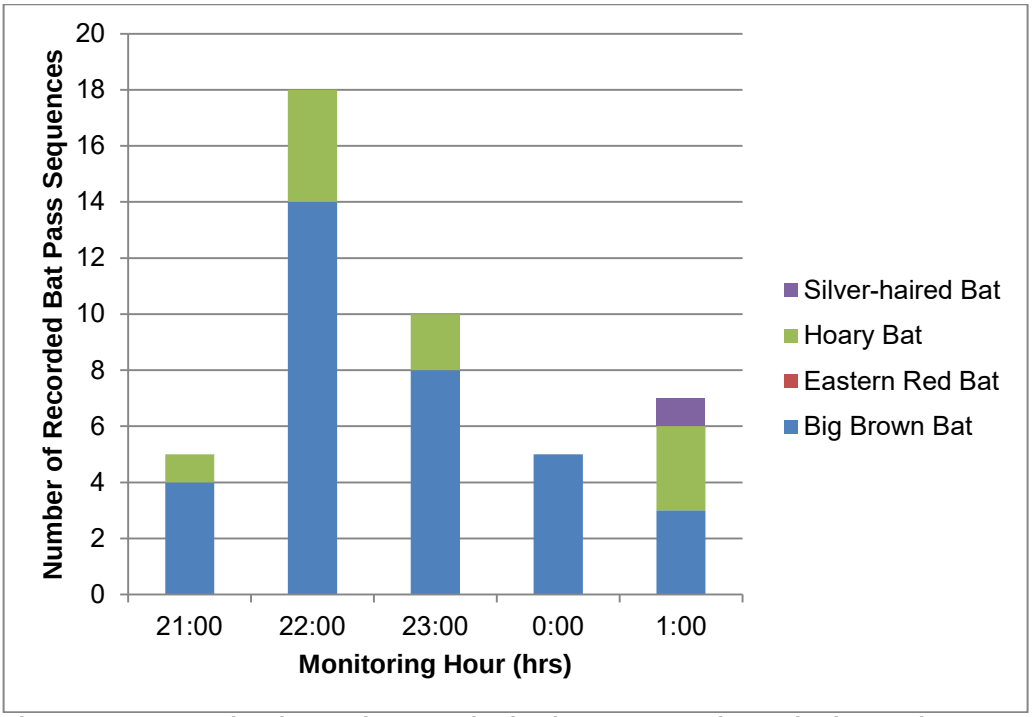


Figure 24. Bat species detected per monitoring hour at acoustic monitoring station BAT-010.

Acoustic Monitoring Station BAT-011

A total of 148 bat pass sequences were recorded at station BAT-011 throughout the monitoring period, however, none were identified to species with confidence by the auto-classifier. This monitoring station was located in a high clutter environment where dense vegetation may have interfered with the passage of ultrasound from the bat to the microphone resulting in fewer recorded high quality calls.

Acoustic Monitoring Station BAT-012

Three bat species, Big Brown Bat, Hoary Bat and Silver-haired Bat, were confirmed as present through passive acoustic monitoring at station BAT-012. A total of 510 bat pass sequences were recorded at this station throughout the monitoring period. Of these, 11(2.16%) were identified to species with confidence by the auto-classifier. This monitoring station was located in a high clutter environment where dense vegetation may have interfered with the passage of ultrasound from the bat to the microphone, resulting in fewer recorded high quality calls. Fifty-two percent of classified bat pass sequences were classified to Big Brown Bat. Smaller numbers were classified to Hoary Bat (33%) and Silver-haired Bat (14%). The majority of bat pass sequences classified to Big Brown Bat were detected at 22:00 hrs indicating the potential presence of a roost site for this species within the vicinity of this monitoring station. The data suggests that there is strong evidence for the presence of Big Brown Bat (MLE=0) and Hoary Bat (MLE=0) in the vicinity of this monitoring station. There is weaker evidence for the presence of Silver-haired Bat (MLE=0.13) in the vicinity of this monitoring station. Figures 25 and 26 provide a summary of the bat species detected at acoustic monitoring station BAT-012 by monitoring night and hour, respectively.

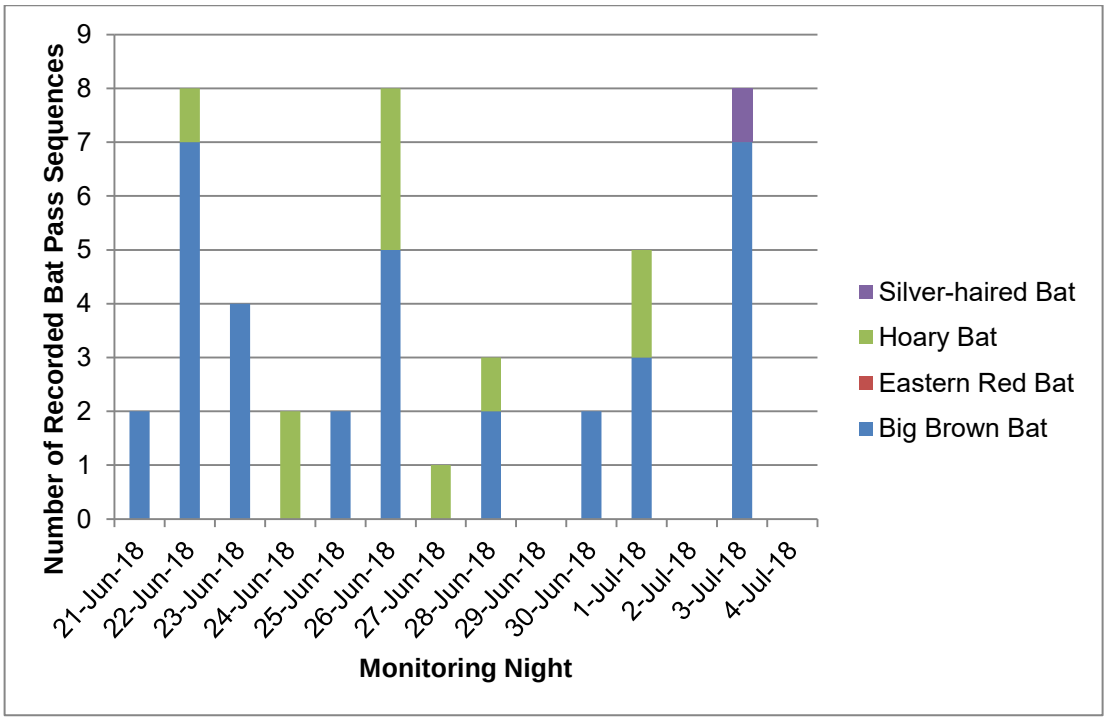


Figure 25. Bat species detected per monitoring night at acoustic monitoring station BAT-012.

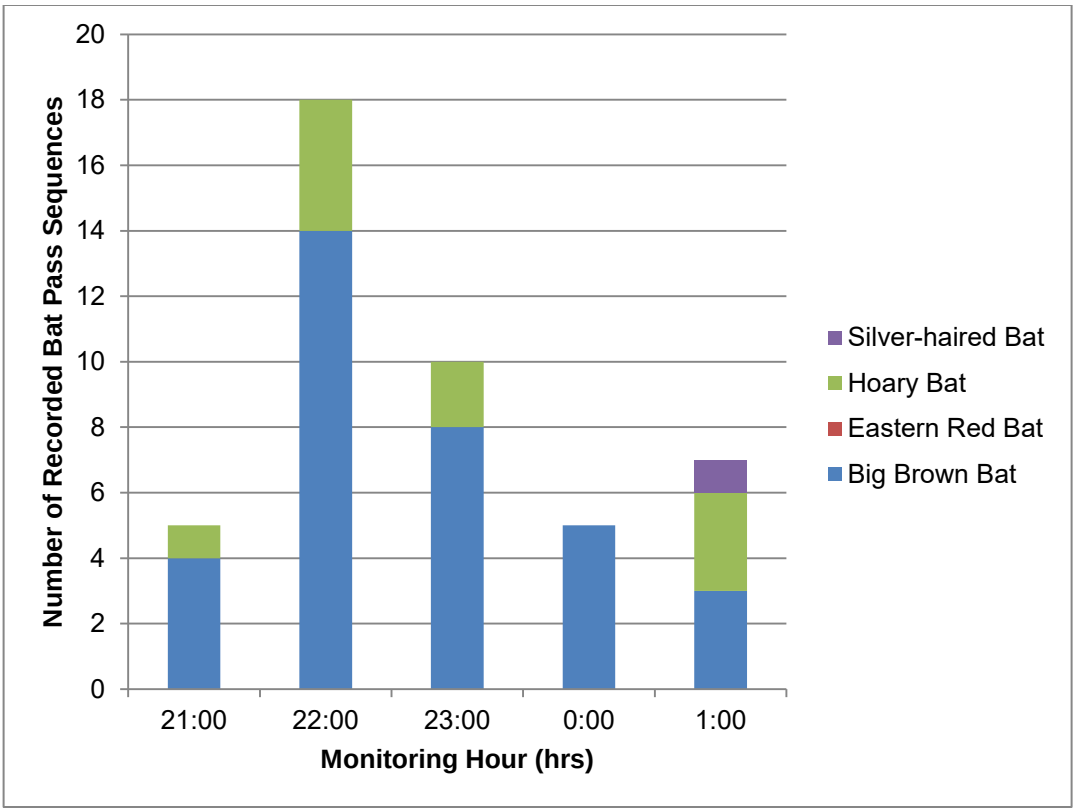


Figure 26. Bat species detected per monitoring hour at acoustic monitoring station BAT-012.

Acoustic Monitoring Station BAT-013

Three bat species, Big Brown Bat, Hoary Bat and Silver-haired Bat, were confirmed as present through passive acoustic monitoring at station BAT-013. A total of 917 bat pass sequences were recorded at this station throughout the monitoring period with 388 (42.3%) of these identified to species with confidence by the auto-classifier. This monitoring station was located in along a woodland edge where less vegetation clutter is present, increasing the likelihood for higher quality calls to be recorded. The majority of bat pass sequences were classified to Big Brown Bat (83%). Smaller numbers were classified to Hoary Bat (8%) and Silver-haired Bat (9%). Bat pass sequences for all three species were detected during all hours of the monitoring period (21:00 to 01:00 hrs). The data suggests that there is strong evidence for the presence of Big Brown Bat (MLE=0), Hoary Bat (MLE=0) and Silver-haired Bat (MLE=0.03) in the vicinity of this monitoring station. Figures 27 and 28 provide a summary of the bat species detected at acoustic monitoring station BAT-013 by monitoring night and hour, respectively.

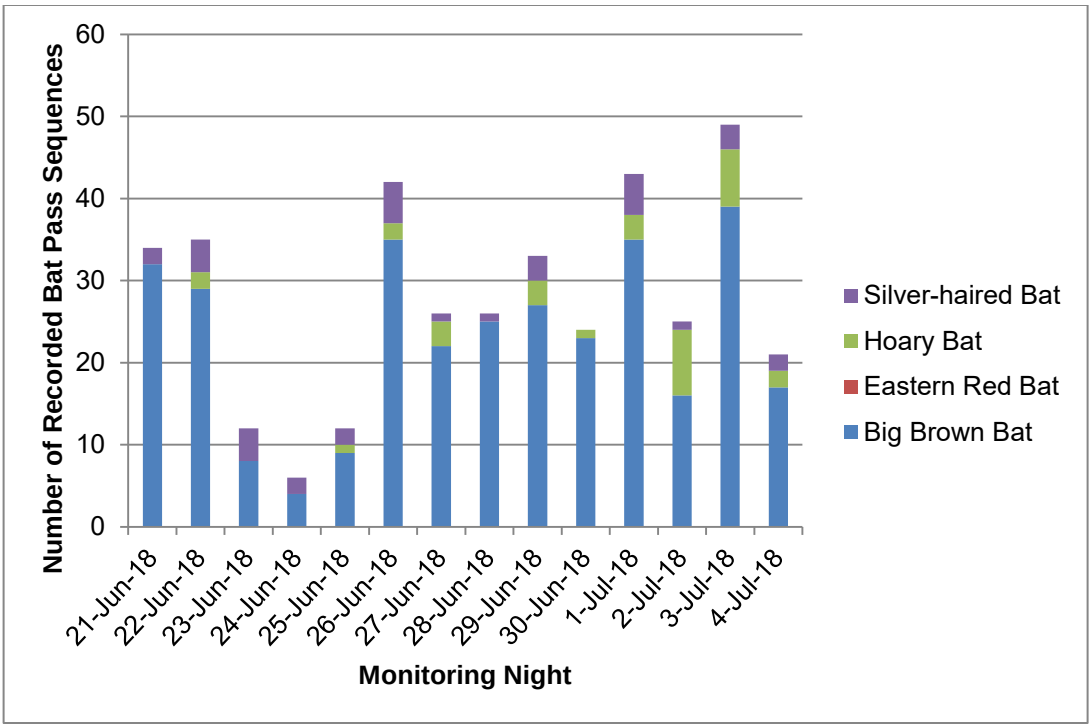


Figure 27. Bat species detected per monitoring night at acoustic monitoring station BAT-013.

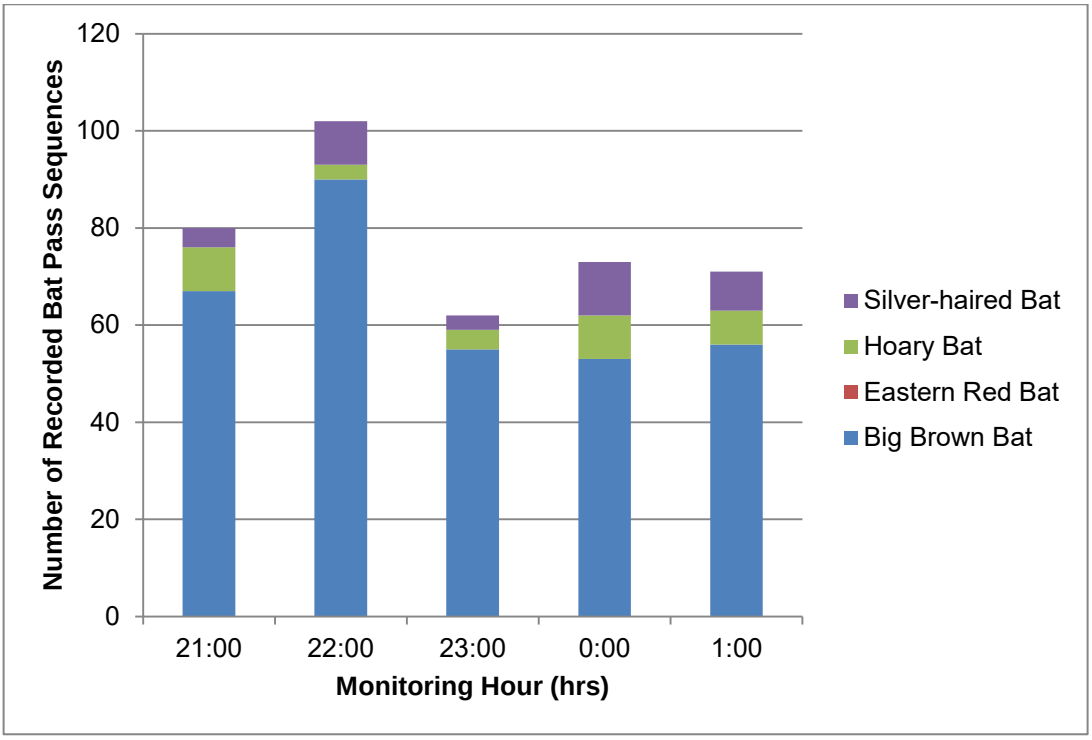


Figure 28. Bat species detected per monitoring hour at acoustic monitoring station BAT-013

Acoustic Monitoring Station BAT-014

Three bat species, Big Brown Bat, Hoary Bat and Silver-haired Bat, were confirmed as present through passive acoustic monitoring at station BAT-014. A total of 1530 bat pass sequences were recorded at this station throughout the monitoring period. Of these, 394 (25.8%) were identified to species with confidence by the auto-classifier. This monitoring station was located in a medium clutter environment where some vegetation may have interfered with the passage of ultrasound from the bat to the microphone, possibly reducing the number of high quality calls recorded. The majority of bat pass sequences were classified to Big Brown Bat (69%). Smaller numbers were classified to Hoary Bat (23%) and Silver-haired Bat (9%). Bat pass sequences for all three species were detected during all hours of the monitoring period (21:00 to 01:00 hrs). The data suggests that there is strong evidence for the presence of Big Brown Bat (MLE=0), Hoary Bat (MLE=0) and Silver-haired Bat (MLE=0.02) in the vicinity of this monitoring station. Figures 29 and 30 provide a summary of the bat species detected at acoustic monitoring station BAT-014 by monitoring night and hour, respectively.

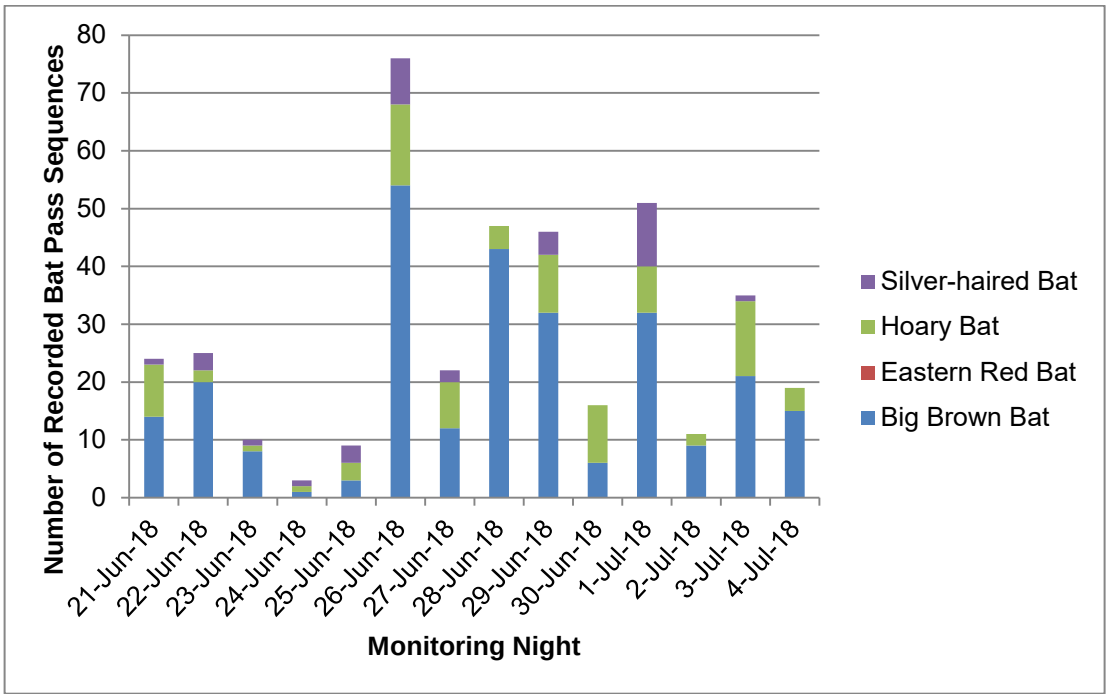


Figure 29. Bat species detected per monitoring night at acoustic monitoring station BAT-014.

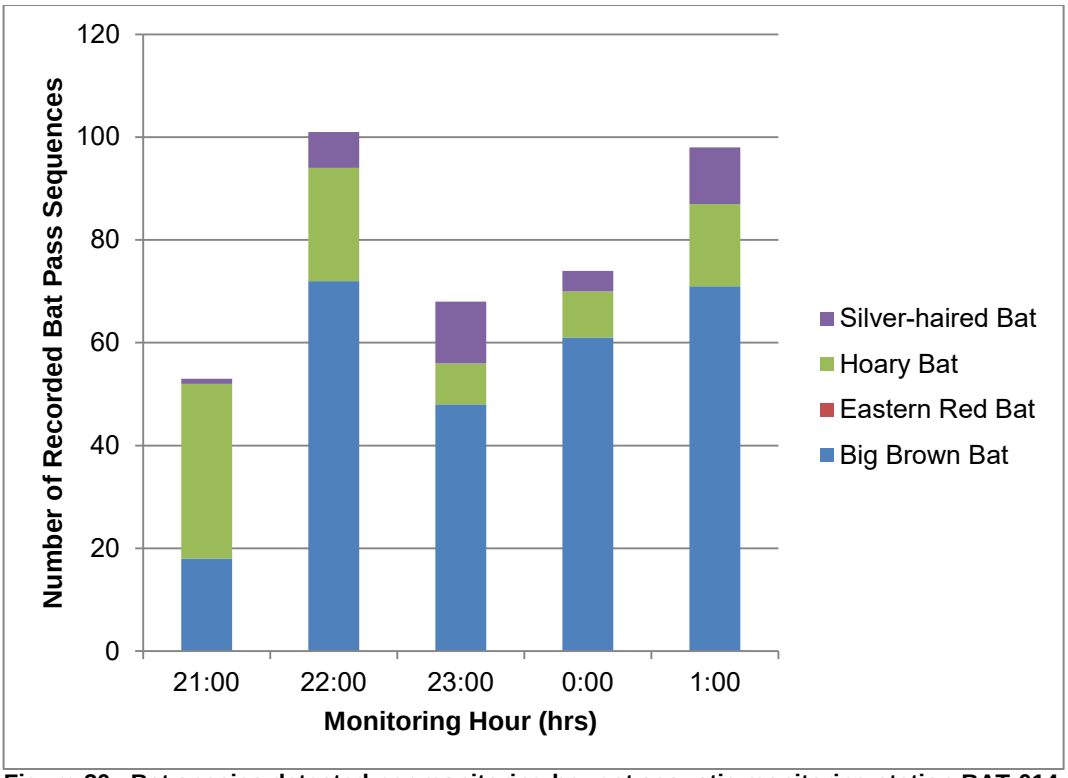


Figure 30. Bat species detected per monitoring hour at acoustic monitoring station BAT-014.

Summary

Passive bat acoustic monitoring completed within the study area identified the presence of four species, Big Brown Bat, Eastern Red Bat, Hoary Bat and Silver-haired Bat, all of which are considered common species in Ontario. None of the bat pass sequences recorded during monitoring efforts were identified with confidence as SAR by the SonoBat 4.2.2 Auto-classifier. However, 50 high frequency bat pass sequences were detected by the auto-classifier. Of these, 46 were not classified to the species level due to the quality of the recorded sequence. One sequence was classified to the species level by the auto-classifier, however, not with confidence (i.e. classification was based on four or fewer call pulses). The remaining three high frequency sequences were classified to Eastern Red Bat with confidence by the auto-classifier. While SAR bats are known to emit high frequency calls, Eastern Red Bat, a non-SAR, also has high frequency calls. Therefore, the presence of high frequency calls should not be considered probable evidence of the presence of SAR. It is recommended to manually vet high frequency calls that the auto-classifier was unable to identify to species to assess for the potential presence of SAR within the study area.

References

Ministry of Natural Resources and Forestry. 2017. Survey Protocol for Species at Risk Bats within Treed Habitats for Little Brown Myotis, Northern Myotis, and Tri-colored Bat. April 2017. 13pp.

Government of Canada. 2018. Weather, Climate, and Hazard: Historical Data. Last Updated July 20, 2018. Available from: http://climate.weather.gc.ca/historical_data/search_historic_data_e.html (Accessed August 17, 2018).

MAPS

654600 654900 655200 655500 655800

4769800 4769500 4769200 4768900

DRUMMOND RD
OLDFIELD RD
RAMSEY RD
KISTER RD

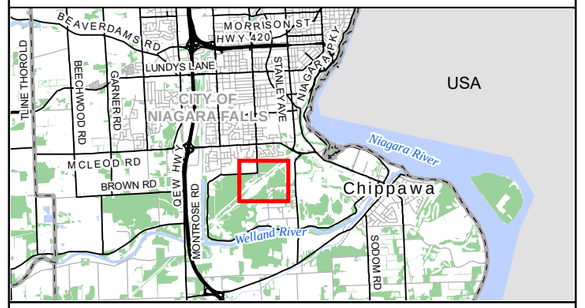
BAT-001
BAT-002
BAT-003
BAT-004 B
BAT-005
BAT-006
BAT-007
BAT-008
BAT-009
BAT-010
BAT-011
BAT-012
BAT-013
BAT-014

Path: X:\2135_MarinelandParkway\NRSI_2135_Map1_MonitoringLocations_5K_2018_08_29_LEH.mxd

Map 1

Marineland Parkway Bat Acoustic Monitoring

Candidate Bat Roost Trees and Acoustic Monitoring Station Locations



Legend

- Bat Acoustic Monitoring Station
- Candidate Bat Roost Tree (Selected by R.J. Burnside & Associates)
- Candidate Bat Roost Tree (Selected by NRSI)
- B Candidate Bat Foraging Area (Selected by R.J. Burnside & Associates)

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project: 2135
Date: August 29, 2018

NAD83 - UTM Zone 17
Size: 11x17"
1:4,500

N

0 100 200 300 Metres

APPENDIX I
Location and Description of Candidate Bat Roost Trees

Candidate Bat Roost Tree ID	Location (UTM Coordinates) Zone: 17T		Species (Common Name)	Species (Scientific Name)	DBH (cm)	Height (m)	Roost Type
	Easting	Northing					
1	654547.37	4769013.32	White Ash	*Fraxinus americana*	38	5	Loose Bark/Elongated knothole
2	654878.86	4769309.76	Red Oak	*Quercus rubra*	49	6	Loose Bark
3	655181.98	4769733.38	Deciduous (dead)	*N/A*	15	9	Cavity/Sloughing Bark
4	655732.96	4769769.18	No specific tree, identified as candidate foraging area	*N/A*	N/A	N/A	Potential leaf clusters
5	655647.03	4769645.00	Red Oak	*Quercus rubra*	50	9	Potential leaf clusters
6	655497.01	4769561.41	Sugar Maple	*Acer saccharum*	46	5	Cracks/cavity
7	655748.06	4769394.15	Deciduous (dead)	*N/A*	27	3	Sloughing Bark
8	655602.93	4769397.97	Red Oak	*Quercus rubra*	43	10.6	Potential leaf clusters
9	655523.22	4769390.53	Shagbark Hickory	*Carya ovata*	50	8	Typical loose bark associated with this species
10	655424.69	4769349.59	Red Oak	*Quercus rubra*	45	11	Potential leaf clusters
11	655537.90	4769262.00	Red Oak	*Quercus rubra*	25	8	Potential leaf clusters
12	655300.66	4769309.88	Silver Maple	*Acer saccharinum*	30	9	Potential leaf clusters
13*	655383.80	4769233.70	Deciduous (dead)	*N/A*	25	4	Sloughing Bark
	655395.00	4769251.00	Freeman's Maple	*Acer x freemanii*	25	7	Sloughing Bark
14	655017.91	4769063.96	Sugar Maple	*Acer saccharum*	33	9	Potential leaf clusters

*Candidate bat roost tree (deciduous (dead)) identified by R.J. Burnside & Associates biologists had fallen at the time of acoustic monitoring station deployment. A new candidate bat roost tree (Freeman's Maple) was selected by NRSI biologists.

APPENDIX II

Location and Set-up Details of Bat Acoustic Monitoring Stations

Acoustic Monitoring Station	Location (UTM Coordinates) Zone: 17T		Microphone Height (m)	Direction Microphone Facing (degrees)	Habitat Type	Clutter[1]
	Easting	Northing				
BAT-001	654547	4769013	5.2	70	Woodland	HIGH
BAT-002	654878	4769309	5.2	60	Woodland	HIGH
BAT-003	655181	4769733	5.2	250	Woodland	HIGH
BAT-004	655722	4769766	5.2	200	Woodland edge	EDGE
BAT-005	655647	4769645	5.2	90	Woodland	HIGH
BAT-006	655497	4769561	5.2	30	Woodland edge	EDGE
BAT-007	655748	4769394	5.2	70	Woodland	MED
BAT-008	655602	4769397	5.2	230	Woodland edge	HIGH
BAT-009	655523	4769390	5.2	300	Woodland	HIGH
BAT-010	655424	4769349	5.2	270	Woodland edge	MED
BAT-011	655537	4769262	5.2	320	Woodland	HIGH
BAT-012	655300	4769309	5.2	140	Woodland	HIGH
BAT-013	655395	4769251	5.2	260	Woodland edge adjacent to pond	EDGE
BAT-014	655017	4769063	5.2	350	Woodland edge	MED

[1]NO = stadium sized open meadow without vegetation or topography interfering with the airspace; LOW = large fields or other open areas bordered by hedgerows or tree lines; EDGE = significant vegetation, topography, or anthropogenic structures bordering a NO or LOW clutter open area; MED = large area with widely spaced trees and other topographic or anthropogenic structures; HIGH = understory travel corridors either along tree covered roads or within a forested clearing

APPENDIX III
Auto-classification Results

Bat ID Software Program Used	Software Version	Type of Data Analyzed (FS or ZC)	Acoustic Monitoring Station	Species	No. of Bat Pass Sequences Classified to Species with Confidence[1]	Maximum Likelihood Estimate (*p* -value)[2]
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-001	Big Brown Bat	3	0.05
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-002	Hoary Bat	1	0.55
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-003	Big Brown Bat	23	0
				Hoary Bat	6	0
				Silver-haired Bat	3	0.93
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-004	Big Brown Bat	394	0
				Eastern Red Bat	2	0.17
				Hoary Bat	14	0
				Silver-haired Bat	30	0.26
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-005	Big Brown Bat	93	0
				Hoary Bat	20	0
				Silver-haired Bat	23	0
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-006	Big Brown Bat	187	0
				Eastern Red Bat	1	0.55
				Hoary Bat	20	0
				Silver-haired Bat	13	0.65
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-007	Big Brown Bat	34	0
				Hoary Bat	16	0
				Silver-haired Bat	12	0.02
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-008	Big Brown Bat	113	0
				Hoary Bat	36	0
				Silver-haired Bat	16	0.2
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-009	Big Brown Bat	34	0
				Hoary Bat	10	0
				Silver-haired Bat	1	0.73
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-010	Big Brown Bat	106	0
				Hoary Bat	20	0
				Silver-haired Bat	6	0.95
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-011	None	N/A	N/A
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-012	Big Brown Bat	11	0
				Hoary Bat	7	0
				Silver-haired Bat	3	0.13
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-013	Big Brown Bat	321	0
				Hoary Bat	32	0
				Silver-haired Bat	35	0.03
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-014	Big Brown Bat	270	0
				Hoary Bat	89	0
				Silver-haired Bat	35	0.02

[1]Classification based on five or more call pulses

[2]Calculated by SonoBat 4.2.2 Auto-classifier

APPENDIX IV
Weather Conditions

Date	Survey Start (hrs)	Survey End (hrs)	Survey Start		Survey End		Total Precipitation on Date (mm)[1]
			Temperature (°C)[1]	Wind Speed (km/hr)[1]	Temperature (°C)[1]	Wind Speed (km/hr)[1]	
21-Jun-18	21:00	02:00	15.5	10	8.5	2	0
22-Jun-18	21:00	02:00	17.8	3	17.8	9	3
23-Jun-18	21:00	02:00	15.5	9	16.1	2	0
24-Jun-18	21:00	02:00	15.9	5	15.3	11	14
25-Jun-18	21:00	02:00	15.7	4	10.1	3	0
26-Jun-18	21:00	02:00	18.9	12	21.5	10	4.2
27-Jun-18	21:00	02:00	20.4	8	19.3	6	32.5
28-Jun-18	21:00	02:00	22.1	14	20.1	14	0.4
29-Jun-18	21:00	02:00	23.3	9	21.9	16	0
30-Jun-18	21:00	02:00	27.8	17	22.8	2	0
1-Jul-18	21:00	02:00	26.3	11	26.1	15	0
2-Jul-18	21:00	02:00	25.7	8	20.7	1	0
3-Jul-18	21:00	02:00	21.5	10	18.5	4	0
4-Jul-18	21:00	02:00	26.1	3	21.9	4	0

[1]Government of Canada 2018

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix G

Avian Breeding Bird Survey Report

Faunal Observations from the Thundering Waters Study Area, 2018

James Holdsworth / Consulting Biologist

Field Review / Chronology of Field Investigations / Fauna

June 5 - - breeding bird surveys and incidental wildlife observations

June 8 - - breeding bird surveys and incidental wildlife observations

June 14 - - breeding bird surveys and incidental wildlife observations

June 21 - - breeding bird surveys and incidental wildlife observations

June 28 -- breeding bird surveys and incidental wildlife observations

Site Visit Weather Conditions

Visit Date	Visit Time	Temp. Range [C]	Cloud Cover [%]	Wind Speed [Beaufort scale]
June 5	7 am – 12 pm	11 - 18	50 - 40	B1 – B2
June 8	7 am – 12 pm	14 - 25	25 - 5	B2 – B3
June 14	6 am – 11 am	14 - 22	0 - 0	B2 – B3
June 21	6 am – 12 pm	15 - 24	10 - 20	B2
June 28	7 am – 12 pm	18 - 28	100 - 50	B2

Species Lists for the Thundering Waters Site

Birds - Methodology

Breeding bird surveys were undertaken on 5 separate dates by a breeding bird expert under appropriate weather conditions. The 5 dates were required to provide two morning surveys per quadrant, separated by at least one week. Survey locations are shown on Figure ?? in Appendix ?? They are partitioned into 4 Wildlife Survey Quadrants, based on broad habitat characteristics and continuity.

These areas were thoroughly covered by walking random transects and recording presence, abundance and level of breeding evidence (using *Ontario Breeding Bird Atlas* [OBBA] protocols).

OBBA Breeding Evidence Codes

POSSIBLE
H-species observed in breeding season in suitable nesting habitat
S-singing male present or breeding calls heard in breeding season in suitable habitat

PROBABLE
P-pair observed in their breeding season in suitable habitat
T-permanent territory presumed through registration of territorial song or presence of adult bird in breeding habitat on at least 2 days, one week or more apart at the same place.
D-courtship or display between a male and female, or two males including courtship feeding and copulation.
V-visiting probable nest site.
A-agitated behavior or anxiety calls of adults
B-brood patch on adult female or cloacal protuberance on adult male
N-nest building or excavation of nest hole

CONFIRMED
DD-distraction display or injury feigning
NU-used nest or eggshell found [occupied/laid during atlas period]
FY-recently fledged young or downy young.
AE-adults leaving or entering nest site in circumstances indicating occupied nest
FS-adult carrying faecal sac
CF-adult carrying food for young
NE-nest containing eggs
NY-nest with young seen or heard

In the species columns, each species is assigned a breeding level, based on the highest level of breeding evidence observed, by quadrant. A species observed, showing no breeding evidence or where no suitable habitat is present, is marked 'X'.

The number recorded represents the highest one-day total for that species.

The table also lists the COSSARO [provincial] and COSEWIC [national] rank [if any], as well as the Natural Heritage Information Centre [NHIC, MNR] S rank. COSSARO is the Committee on the Status of Species at Risk in Ontario [MNR] and COSEWIC is the Committee on the Status of Endangered Wildlife in Canada.

For the purpose of wildlife surveys, the study area is composed of 4 habitat quadrants, defined below –

Q1. Lands adjacent to golf course entry road and north of rail-line

Q2. As divided by the central rail-line, north side golf course lands and woodlands

Q3. As divided by the central rail-line, south side golf course lands and woodlands

Q4. PSW, north-west corner of study area

Bird Species

SPECIES	Q1	Q2	Q3	Q4	Breeding Level	COSSARO/ COSEWIC	Comment
Great Blue Heron			1		H		
Great Egret		1	2	1	X/X/X	NHIC S3	
Green Heron			1		H		
Black-crowned Night Heron			2		H	NHIC S3	
Double-crested Cormorant				14	X		Over site
Canada Goose			4		H		
Mallard		2	14		H/FY		
Wild Turkey			1	8	H/FY		
Turkey Vulture		6	8	5	H/H/H		Over site
Cooper's Hawk		1	2		H/D		
Red-tailed Hawk			2		P		
Killdeer	2	2	2		A/A/NE		
Spotted Sandpiper	1				A		
American Woodcock			1	1	H/H		
Ring-billed Gull	30	10	10	6	X/X/X/X		Over site
Herring Gull	6		5		X/X		
Rock Pigeon	2				X		
Mourning Dove	4	1	4	2	T/H/H/T		
Yellow-billed Cuckoo	1			1	S/S		
Chimney Swift	**2**				**X**	**THR / THR**	**See SAR discussion**
Ruby-throated Hummingbird	1		1		H/H		
Downy Woodpecker	1	1	2	2	H/H/A/FY		
Hairy Woodpecker				1	H		
Red-bellied Woodpecker	1		2		H/CF		
Northern Flicker	1	2	4	1	T/H/H/H		
Eastern Kingbird		2	2	2	A/P/A		
Eastern Wood Pewee	**1**		**4**	**1**	**T/N/T**	**SC/SC**	**See SAR discussion**
Willow Flycatcher	1		3	1	T/T/S		
Great Crested Flycatcher			2	1	T/T		
Red-eyed Vireo		1	2	2	S/T/S		
Warbling Vireo	2	1	5	4	A/T/T/A		
Blue Jay	2	2	4		H/H/H		
American Crow			1		H		
Barn Swallow	7	2	10	7	X/H/H/X	**THR/THR**	**See SAR discussion**
Tree Swallow	2				H		
Northern Rough-winged Swallow		4	3		H/H		
Purple Martin	2		2		X/X		
Black-capped Chickadee	1	2		2	H/H/T		
Tufted Titmouse			1		S		
White-breasted Nuthatch				1	H		
House Wren	1		2	4	S/T/FY		
American Robin	6	6	25	11	FY/FY/FY/FY		
Wood Thrush	**1**			**1**	**T/T**	**SC/THR**	**See SAR discussion**
Gray Catbird	4	2	6	6	A/CF/CF/CF		

Brown Thrasher		2			S		
European Starling	8	11	6	6	FY/FY/FY/FY		
Cedar Waxwing	2		5	5	H/H/H		
Yellow Warbler	3	2	5	5	A/S/CF/FY		
American Redstart	1				S		
Common Yellowthroat	2	1	2	1	T/S/T/T		
Chipping Sparrow	1	1		2	S/S/T		
Field Sparrow				1	S		
Song Sparrow	6	5	5	11	CF/FY/FY/FY		
Eastern Towhee				2	FY		
Scarlet Tanager				1	T		
Northern Cardinal	2	2	6	2	P/FY/FY/T		
Rose-breasted Grosbeak	1		3	2	S/FY/T		
Indigo Bunting	1		2	2	T/S/T		
Red-winged Blackbird	11	6	10	9	FY/FY/FY/FY		
Common Grackle	4	8	19	4	FY/FY/FY/FY		
Brown-headed Cowbird	3	2	2		FY/H/FY		
Baltimore Oriole	2	3	6	4	FY/FY/FY/FY		
Orchard Oriole				1	H		
American Goldfinch	1	4	6	6	H/P/H/T		
House Finch			2		T		
House Sparrow	10	2	6		FY/H/T		

Species of Conservation Concern

Species status [for all fauna] was evaluated using the following sources:

- The COSEWIC list for national status designations (current list at time of report preparation);
- The Species At Risk Act for federally listed species (current at time of report preparation);
- The COSSARO list for provincial status designations (current list at time of report preparation);
- The NHIC / Biodiversity Explorer website for provincial rarity ranks (i.e. S-Ranks);
- The *Significant Wildlife Habitat Technical Guide* (OMNR 2000) – list of 'Area Sensitive' bird species

Of the 67 summer resident bird species [60 with some breeding evidence], the following species of conservation concern [e.g. species that are "designated" by COSEWIC and/or listed under the Species at Risk Act [SARA]; species "designated" by COSSARO, including Endangered and Threatened species listed and regulated under Ontario's ESA; and provincially rare species [NHIC S-rank of S1 to S3] were observed during field surveys

- 4 species are listed **Species at Risk (SAR) in Canada** (by COSEWIC):
  - Eastern Wood Pewee – *Special Concern*
  - Chimney Swift - *Threatened*
  - Barn Swallow – *Threatened*
  - Wood Thrush - *Threatened*

- 4 species are listed **Species at Risk (SAR) in Ontario** (by COSSARO):
  - Eastern Wood Pewee – *Special Concern*
  - Chimney Swift - *Threatened*
  - Barn Swallow – *Threatened*
  - Wood Thrush – *Special Concern*

Two bird species considered a **Rare Species [S1-S3]** were observed during field surveys

- Great Egret [S3]
- Black-crowned Night Heron [S3]

Both species are very likely foraging and / or post-breeding visitants. Both species are colonial breeders and both also partake in post-breeding dispersal, which results in observations far from breeding colonies. It is very unlikely that either species breeds within the study area as the habitat is mostly unsuitable and extensive surveys did not detect any sign of nesting or breeding behaviour.

SAR Bird Discussion

Eastern Wood Pewee –

Unit 1 – Singing male at 655878 / 4770198
Unit 3 – Singing male at 655647 / 4769616
Female on nest at 655515 / 4769410
Singing male at 655143 / 4769139
Singing male at 654807 / 4768864
Unit 4 - Singing male at 654898 / 4769322

At least 6 individuals noted, included confirmed breeding via a female on nest in Unit 3. All of the above records should be considered breeding pairs as habitat is suitable throughout much of the golf course lands. This species should be expected to occur almost anywhere suitable deciduous woodland and parkland habitat exists within the study area.

Chimney Swift – Two individuals flying over Q1. Q1 does not have the necessary natural or anthropogenic habitat for nesting and these birds should be considered foraging visitants only. Some areas of the study site have some potentially suitable habitat – mature hardwood trees with cavities – although it is far more likely that nesting would occur in industrial and residential chimneys in the City of Niagara Falls.

Barn Swallow – A maximum of 10 Barn Swallow were recorded in various areas of the study site. It is safe to say, at least to varying extents, that all open areas of the study site are foraging habitat for this species. Q1 and Q4 lack suitable anthropogenic nesting habitat for this species. Q2 and Q3 have numerous outbuildings and other structures likely suitable for nesting, although investigations of all found no evidence of recent nesting.

Wood Thrush –

Unit 1 – singing male at 655888 / 4770210
Unit 4 – singing male at 654543 / 4768999

Two singing males recorded. Both records should be considered breeding pairs as habitat is suitable. As with Eastern Wood Pewee, this species might be expected to occur throughout the study area, wherever suitable mature to semi mature deciduous / mixed woodland habitat exists.

Mammals – Methodology

Mammals were surveyed as part of 'general' wildlife surveys. These surveys involved general coverage recording all species observations and sign (e.g. tracks / trails, scat, burrows, dens, browse, vocalizations).

Mammals

SPECIES	Q1	Q2	Q3	Q4	COSSARO/ COSEWIC	Comments
Raccoon	1		1	1		
White-tailed Deer				4		
Coyote				1		
Gray Squirrel	2		2	3		
Eastern Cottontail	2	4	4	1		
Meadow Vole			1			
Muskrat		1	1			

Reptiles, Amphibians - Methodology

Searches for herptiles were conducted throughout the study site, primarily as incidental observations.

Herptiles

SPECIES	Q1	Q2	Q3	Q4	COSSARO / COSEWIC	Comments
Common Snapping Turtle		**3**	**2**		**SC/SC**	**Includes some egg-laying females**
Midland Painted Turtle		**4**	**18**		**SC/SC**	
Eastern Gartersnake			1	4		
Eastern Milksnake				1		photo
Dekay's Brownsnake				1		
Green Frog		4	10			
Northern Leopard Frog			2			
American Toad			20			tadpoles

Species of Conservation Concern

Two herpetofaunal species of conservation concern were observed within the study area during field investigations - Common Snapping Turtle and Midland Painted Turtle

- Common Snapping Turtle is designated "Special Concern" both federally (COSEWIC) and provincially (MNR/COSSARO) with an S-rank of S3.
- Midland Painted Turtle is designated "Special Concern" provincially (MNRF/COSSARO)

Three adult Common Snapping Turtle were recorded in Q1 – all egg-laying females. Two adult Common Snapping Turtle were recorded in Q3 – including one egg-laying female.

Four adult or near adult Midland Painted Turtle were recorded in Q2, with 18 recorded in Q3. Rather than list individual locations, it is prudent to assume that all wetland habitats within Q2 and Q3 are suitable for both species and both species should be expected to occur in and around all wetland habitat within the study area. Turtle nesting can be expected to occur in all adjacent areas where open and loose soil permits egg-laying for either species.

Lepidoptera and Odonata – Methodology

Lepidoptera (butterflies and skippers) and Odonata field surveys were completed on all field visits.

Butterflies

SPECIES	Q1	Q2	Q3	Q4	COSSARO/ COSEWIC/ S rank	Comments
Cabbage White	2	5	3	2		
Clouded Sulphur				2		
Azure sp.	2					
Silvery Blue				2		
Juvenal's Duskywing			2	1		
Dreamy Duskywing				1		
Wild Indigo Duskywing			1			
Banded Hairstreak				2		
Acadian Hairstreak				1		
Crescent sp.				10		
Eastern Comma				1		
Mourning Cloak			1			
Red-spotted Purple				1		
Viceroy				1		
Monarch				**2**	**SC/END**	**See SAR discussion**
Black Swallowtail				1		
Spicebush Swallowtail			1			
Eastern Tiger Swallowtail			1			
Little Wood Satyr	25		50	45		
Appalachian Brown	1			2		
Northern Pearly-eye				2		
Common Wood Nymph	2	5		15		
Common Ringlet				2		
Hobomok Skipper	10		1	2		
Least Skipper		2	1			
European Skipper				10		
Tawny-edged Skipper				1		
Peck's Skipper				2		
Dunn Skipper				1		
Northern Broken-dash				2		

Odonata

SPECIES	Q1	Q2	Q3	Q4	COSSARO/ COSEWIC/ S rank	Comments
Common Green Darner	2			2		
Common Baskettail	1			3		
Dot-tailed Whiteface			2	1		
Blue Dasher		2	3	2		
Eastern Pondhawk			1	1		
Eastern Amberwing			9			
Widow Skimmer	2			2		
Painted Skimmer			**1**		**NHIC S2**	**photo**
Twelve-spotted Skimmer	2		2	1		
Common Whitetail			11	15		
Ebony Jewelwing			6			
Emerald Spreadwing			2			
Bluet sp.	15					
Marsh Bluet	5					
Eastern Forktail		7	15	10		
Fragile Forktail		5	5	2		

Species of Conservation Concern

One Lepidoptera / Odonata species considered species of concern was observed during field surveys

- One species is designated as a **Species at Risk (SAR) in Canada** (by COSEWIC):
  - Monarch – *Endangered*
- One species is designated as a **Species at Risk (SAR) in Ontario** (by COSSARO):
  - Monarch – *Special Concern*

2 Monarch Butterfly were observed in Q4. The quadrant and the rest of the study site does possess life-cycle habitat for this species, as the host plant [Milkweed] is present.

One Lepidoptera / Odonata species considered a **Rare Species [S1-S3]** was observed during field surveys

- Painted Skimmer – S2

One individual present in Q3. This species is an irregular migrant and occasional breeder in the province. This record is thought to pertain to a migrant individual rather than part of a local population.

Cited Literature / References

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BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix H

Species at Risk Screening Table

300041230 Niagara Thundering Waters Environmental Impact Study
Appendix H: Background Review of Potential Species at Risk and Species of Conservation Concern in the Site Study Area

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
Birds								
Acadian Flycatcher (Source: MNRF)	*Empidonax virescens*	S2S3B	END	END	END	1	Generally requires large areas of mature, undisturbed forest; avoids the forest edge; often found in well wooded swamps and ravines.[6]	Suitable breeding habitat present. None observed during breeding bird surveys.
Bald Eagle (Source: MNRF)	*Haliaeetus leucocephalus*	S2N, S4B	SC	No status	No status	No schedule	Prefers deciduous and mixed deciduous forest and habitat close to water bodies such as lakes and rivers. They roost in "supercanopy" trees such as pine.[6]	No suitable breeding habitat present. None observed during breeding bird surveys.
Bank Swallow (Source: MNRF)	*Riparia riparia*	S4B	THR	THR	THR	1	Prefers open habitats including, farmland, lake/river shorelines, grasslands, and wetlands. Nests in exposed earthen banks along shorelines and in artificial sites such as gravel pits.[6]	No suitable breeding habitat present. None observed during breeding bird surveys.
Barn Swallow (Source: James Holdsworth, MNRF, OBBA)	*Hirundo rustica*	S4B	THR	THR	THR	1	Prefers farmland, lake/river shorelines, wooded clearings, urban populated areas, rocky cliffs, and wetlands. Nests inside or on exterior of buildings; under bridges and in road culverts; on rock faces, and in caves etc.[7]	Confirmed breeding habitat present (snack shack structure) in Q3 (See Figure 6). Foraging habitat present over the open areas of the Study Area.
Black-crowned Night Heron (Source: James Holdsworth, OBBA)	*Nycticorax nycticorax*	S3	No status	No status	No status	No schedule	This species is a colonial breeder, primarily nesting on islands and shores of the Great Lakes and St. Lawrence River. Generally prefers nesting in low shrubs (e.g. elderberry and dogwood); in small trees including White Cedar and Manitoba Maple; in stands of tall, fast-growing trees such as aspen and cottonwood; in large, mature trees; in vine-covered trees; in wetlands among emergent, herbaceous vegetation and on bare rock on islands.[6]	Confirmed foraging habitat present over the Study Area. No breeding habitat observed during breeding bird surveys.
Bobolink (Source: OBBA, MNRF)	*Dolichonyx oryzivorus*	S4B	THR	THR	THR	1	Generally prefers open grasslands and hay fields for nesting, typically featuring relatively tall vegetation. Sometimes uses large fields of winter wheat and rye in southwestern Ontario. Sensitive to vegetation structure and composition. Positively associated with high	No suitable breeding habitat found. None observed during breeding bird surveys.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
							grass-to-forb ratios; moderate litter depth; tolerate wetter portions of fields compared to Eastern Meadowlark (EAME) and more likely to nest closer to field centres rather than field margins. Lower tolerance to presence of patches of bare ground. Appear to prefer larger fields than EAME.[8]	
Chimney Swift (Source: James Holdsworth, MNRF, OBBA)	*Chaetura pelagica*	S4B,S4N	THR	THR	THR	1	Historically nested in large hollow trees, other tree cavities and cracks in cliffs. Currently, most are found in developed areas in large, uncapped chimneys. Proximity to lakes is also a preferred habitat feature as they will forage for flying insects close to water.[6]	Confirmed during breeding bird surveys as a foraging visitor only. No suitable breeding habitat present.
Common Nighthawk (Source: OBBA, MNRF)	*Chordeiles minor*	S4B	SC	SC	THR	1	Nests in open habitats, in forests and in urban areas. It prefers rock outcrops, alvars, sand barrens, bogs, fens, and in forests, openings created by clearcuts and burns. In southern Ontario, grasslands, agricultural fields, gravel pits, prairies, and alvars and at airports. In cities, it nests mostly on flat, graveled roofs but occasionally on railways and footpaths.[6]	No suitable breeding habitat present. None observed during breeding bird surveys.
Eastern Meadowlark (Source: OBBA, MNRF)	*Sturnella magna*	S4B	THR	THR	THR	1	Generally prefers grassy pastures, meadows and hay fields. Prefers moderately tall grass with abundant litter cover, a high proportion of grass cover, moderate forb density, low proportions of shrub and woody vegetation cover, and low percent of bare ground. Prefers to nest in drier sites and frequently nests around field margins.[8]	No suitable breeding habitat present. None observed during breeding bird surveys.
Eastern Whip-poor-will (Source: MNRF)	*Caprimlugus vociferus*	S4B	THR	THR	THR	1	Generally prefer semi-open deciduous forests or patchy forests with clearings; areas with little ground cover are also preferred. In Ontario, its preferred habitats include rock or sand barrens with scattered trees, savannahs, old burns in a state of early forest succession, and open conifer plantations.[6]	No suitable breeding habitat present. None observed during breeding bird surveys.
Eastern Wood-Pewee (Source: James Holdsworth, MNRF, OBBA)	*Contopus virens*	S4B	SC	SC	SC	1	Prefers open space near the nest in the form of forest edges, clearings, roadways, and water. Does not require large areas of woods but occurs less frequently in woodlots surrounded by development than in those without.[6]	Confirmed breeding habitat present in Q3 (See Figure 6),

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
Golden-Winged Warbler (Source: MNRF)	*Vermivora chrysoptera*	S4B	SC	THR	THR	1	Prefers breeding in successional scrub habitats surrounded by forests that are used for foraging and song posts.[6]	No suitable breeding habitat present. None observed during breeding bird surveys.
Grasshopper Sparrow (Source: OBBA)	*Ammodramus savannarum*	S4B	SC	SC	SC	1	Prefers drier, sparsely vegetated grasslands, particularly rough or unimproved pastures with scattered forb and shrub growth, at least 30 ha in size. It will occasionally also use cultivated hayfields and cereal crops.[6]	No suitable breeding habitat found. None observed during breeding bird surveys.
Great Egret (Source: James Holdsworth)	*Ardea alba*	S2B	No status	No status	No status	No schedule	A colonial breeder, choosing locations on islands with treed or shrubby habitat. In marsh habitat, this species will choose to nest at much lower heights in shrubs or even just above ground or water surface in shrubs or other marsh vegetation.[6]	Confirmed foraging habitat present over the Study Area. No breeding habitat observed during breeding bird surveys.
Henslow's Sparrow (Source: MNRF)	*Ammodramus henslowii*	SHB	END	END	END	1	Nests in large, open, usually moist to wet, often flat fields with a high graminoid to forb/shrub ratio. Vegetation must be dense and over 30 cm in height. In Ontario, this species has nested in regenerating old fields, lightly used pastures, hayfields, wet meadows, and sedge marshes.[6]	No to Low potential nesting/foraging habitat present in the Study Area. According to the OBBA 2001-2005, the number of Henslow's Sparrow in Ontario is estimated to be extremely low, and its distribution is scattered and somewhat unpredictable. Only two squares recorded more than one individual during the 2nd Atlas. No known pairs were reported during the 2nd Atlas.
Northern Bobwhite (Source: NHIC, MNRF)	*Colinus virginianus*	S1	END	END	END	1	Generally inhabits a variety of edge and grassland type - habitats including non-intensively farmed agricultural lands.[6]	No suitable breeding habitat present. None observed during breeding bird surveys. According to the OBBA 2001-2005, the only Northern Bobwhite native population occurs on Walpole Island. The other records are of non-native individuals that have been released or escaped from landowners with permits to keep them in captivity or use them for hunting purposes.[6]
Peregrine Falcon (Source: OBBA, MNRF)	*Falco peregrinus*	S3B	SC	NAR	SC	1	Nests on cliffs near water bodies, or at urban sites such as tall buildings, bridges, and smokestacks.[6]	No suitable breeding habitat found. None observed during breeding bird surveys.
Red-headed Woodpecker (Source: MNRF)	*Melanerpes erythrocephalus*	S4B	SC	END	THR	1	Breeds in open woodland and woodland edges, especially oak savannah and riparian forest. These habitats can occur in parks, golf courses, cemeteries, private woodlands, etc. Existence of large, dead, weathered trees or	Suitable breeding habitat present. None observed during breeding bird surveys.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
							live trees with large dead branches are an important characteristic of habitat.[6]	
Wood Thrush (Source: James Holdsworth, MNRF, OBBA)	*Hylocichla mustelina*	S4B	SC	THR	THR	1	Inhabits and breeds in woodlands ranging from small (3 ha) and isolated to large and contiguous. The presence of tall trees and a thick understorey are usually prerequisites for site occupancy.[6]	Confirmed breeding habitat present in Q1 and Q4 (see Figure 6).
Yellow-breasted Chat (Source: MNRF)	*Icteria virens*	S1B	END	END	END	1	Prefers scrubby, early successional habitats. In Ontario, the Yellow-breasted Chat uses regenerating old fields, forest edges, railway and hydro rights-of-way, young coniferous reforestations and occasionally wet willow-ash-elm thickets bordering wetlands. Tangles of grape and raspberry are also a habitat feature of most breeding sites.[6]	Marginal breeding habitat present. None observed during breeding bird surveys.
Fish								
American Eel (Source: MNRF)	*Anguilla rostrata*	S1?	END	THR	No status	No schedule	All fresh water, estuaries and coastal marine waters that are accessible to the Atlantic Ocean; 12-mile Creek watershed and Lake Ontario.[15]	No suitable habitat present. None observed during fish community sampling surveys or aquatic habitat assessments.
Grass Pickerel (Source: MNRF)	*Esox americanus vermiculatus*	S3	SC	SC	SC	1	Generally occur in wetlands with warm, shallow water and an abundance of aquatic plants; occur in the St. Lawrence River, Lake Ontario, Lake Erie, and Lake Huron.[15]	No suitable habitat present. None observed during fish community sampling surveys or aquatic habitat assessments.
Lake Chubsucker (Source: MNRF)	*Erimyzon sucetta*	S2	THR	END	END	1	Generally prefer marshes, wetlands and lakes with clear, still waters and abundant aquatic plants.[15]	No suitable habitat present. None observed during fish community sampling surveys or aquatic habitat assessments.
Lake Sturgeon (Source: MNRF)	*Acipenser fulvescens*	S2	THR	THR	No status	No schedule	Generally inhabits the bottoms of shallow areas of large freshwater lakes and rivers.[15]	No suitable habitat present. None observed during fish community sampling surveys or aquatic habitat assessments.
Insects								
Monarch (Source: MNRF, James Holdsworth)	*Danaus plexippus*	S2N, S4B	SC	END	SC	1	Throughout their life cycle, Monarchs use three different types of habitat. Only the caterpillars feed on milkweed plants and are confined to meadows and open areas where milkweed grows. Adult butterflies can be found in more diverse habitats where they feed on nectar from a variety of wildflowers. Monarchs spend the winter in Oyamel Fir forests found in central Mexico. The largest threat to Ontario	Species confirmed in habitat unit Q4 (see Figure 6). Milkweed observed throughout Study Area (host plant for Monarch larvae).

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
							Monarchs is habitat loss and fragmentation at overwintering sites in central Mexico where forests are being logged and converted into agricultural fields and pastures. Widespread pesticide and herbicide use throughout the Monarch's range may also limit recovery.[9]	
Painted Skimmer (Source: James Holdsworth)	*Libellula semifasciata*	S2	No status	No status	No status	No schedule	Boggy ponds and ditches with much emergent vegetation, usually associated with woodland.[13]	Species confirmed in Q3 (see Figure 6). This observation is thought to pertain to a migrant individual rather than part of a local population.
Rusty-patched Bumble Bee (Source: MNRF)	*Bombus affinis*	S1	END	END	END	1	Open habitat such as mixed farmland, urban settings, savannah, open woods and sand dunes. The most recent sightings in Ontario have been in a managed oak savannah habitat remnant.[9]	No suitable habitat present.
West Virginia White (Source: MNRF)	*Pieris virginiensis*	S3	SC	No status	No status	No schedule	Generally prefer moist, deciduous woodlands. The larvae feed only on the leaves of the two-leaved toothwort (Cardamine diphylla), which is a small, spring-blooming plant of the forest floor.[10] According to NHIC, exact number of Element Occurrences (EOs) is not known, although during an intensive survey in 1990, this species was recorded in a total of 64 sites. Abundance estimates indicate that this species is not uncommon within its favoured locations. Found in localized colonies (with three centres of abundance) throughout southern Ontario, associated with mature, rich deciduous forest. Threatened by loss of, or alteration to, its habitat.[17]	No Two-leaved Toothwort were identified during vegetation surveys on the site, though mature, rich deciduous forest ecosites are present on the Study Area.
Mammals								
Eastern Small-footed Myotis (Source: NRSI, MNRF)	*Myotis leibii*	S2S3	END	END	No status	No schedule	Overwintering habitat: Caves and abandoned mines. According to the Recovery Strategy for the Eastern Small-footed Myotis in Ontario, summer / roosting habitats used by the species in Ontario are poorly understood, but elsewhere in its range it primarily roosts in open, sunny rocky habitats, and, occasionally, in buildings. Summer roosts for this species are believed to be located in close proximity to their hibernacula (i.e., less than 100 m). The	No suitable habitat present. Bat acoustic surveys were conducted in the Study Area. This species was not recorded.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
							species' preference for rocky habitats in summer may limit an individual's home range to those rocky areas which also contain hibernacula (i.e., karst areas and Canadian Shield areas containing abandoned mines with adits).[12]	
Gray Fox (Source: MNRF)	*Urocyon cinereoargenteus*	S1	THR	THR	THR	1	Generally prefers deciduous forests, marshes, swampy areas, and urban areas.[20] For den sites, this species usually places them in dense shrubs close to a water site but they will also use rocky areas, hollow trees, and underground burrows dug by other animals.[9]	Suitable habitat is present, however there is very low potential for this species to be present. According to the MNRF, this species range has been reduced to west of Lake Superior in the Rainy River District and on Pelee Island in west Lake Erie. There have been occasional sightings close to the U.S. border in the Niagara, Thousand Islands and Windsor areas.[9]
Little Brown Myotis (Source: NRSI, MNRF)	*Myotis lucifugus*	S4	END	END	END	1	Overwintering habitat: Caves and mines that remain above 0 degrees Celsius. Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh).[11]	Suitable habitat is present as determined by leaf-off surveys. Bat acoustic surveys were conducted in the Study Area. This species was not recorded.
Northern Myotis (Source: NRSI, MNRF)	*Myotis septentrionalis*	S3	END	END	END	1	Overwintering habitat: Caves and mines that remain above 0 Maternal Roosts: Often associated with cavities of large diameter trees (25-44 cm dbh). Occasionally found in structures (attics, barns etc.).[11]	Suitable habitat is present as determined by leaf-off surveys. Bat acoustic surveys were conducted in the Study Area. This species was not recorded.
Tri-colored Bat (Source: NRSI, MNRF)	*Perimyotis subflavus*	S3?	END	END	END	1	Overwintering habitat: Deepest parts of caves and mines where temperature is the least variable. Maternal Roosts: Less is known about roosts of Tri-colored Bats. Most roost sites found within forested habitats. May roost in clumps of dead foliage and lichens. In more anthropogenically modified landscapes, maternity roosts may be barns or similar human-made structures.[11]	Suitable habitat is present as determined by leaf-on surveys. Bat acoustic surveys were conducted in the Study Area. This species was not recorded.
Mollusc								
Eastern Pondmussel (Source: NHIC, MNRF)	*Ligumia nasuta*	S1	SC	SC	END	1	Generally inhabit sheltered areas of lakes or slow streams in substrates of fine sand and mud.[9]	DFO confirmed that Conrail Drain is not suitable habitat. DFO has not confirmed if habitat is present in the unnamed watercourse that flows through the golf course ponds.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
Kidneyshell (Source: MNRF)	*Ptychobranchus fasciolaris*	S1	END	END	END	1	Generally found in small to medium sized rivers, where it prefers shallow areas with clear, swift-flowing water and substrates of firmly packed coarse gravel and sand.[7]	DFO confirmed that Conrail Drain is not suitable habitat. DFO has not confirmed if habitat is present in the unnamed watercourse that flows through the golf course ponds.
Round Hickorynut (Source: NHIC, MNRF)	*Obovaria subrotunda*	S1	END	END	END	1	Generally found in rivers with clay, sand or gravel bottoms. It also lives in shallow areas of lakes with firm sand. It prefers moderately fast moving water.[9]	DFO confirmed that Conrail Drain is not suitable habitat. DFO has not confirmed if habitat is present in the unnamed watercourse that flows through the golf course ponds.
Plants								
American Chestnut (Source: MECP, MNRF)	*Castanea dentata*	S1S2	END	END	END	1	Found in deciduous forest communities; this tree prefers arid forests with acid and sandy soils.[15]	Suitable habitat is present. None observed during ELC surveys.
American Ginseng (Source: MNRF)	*Panax quinquefolius*	S2	END	END	END	1	Grows in rich, moist, undisturbed and relatively mature deciduous woods in areas of neutral soil (such as over limestone or marble bedrock).[15]	Suitable habitat is present. None observed during ELC surveys.
American Water-willow (Source: MNRF)	*Justicia americana*	S2	THR	THR	THR	1	Generally grows along shorelines and sometimes in nearby wetlands, as well as along streams where the bottom is composed of gravel, sand or organic matter.[15]	Suitable habitat is present. None observed during ELC surveys.
Biennial Gaura (Source: NHIC)	*Oenothera gaura*	S3	No status	No status	No status	No schedule	Generally found on river banks, roadsides, fields and vacant lots.[16]	Suitable habitat is present. None observed during ELC surveys.
Butternut (Source: MECP, MNRF)	*Juglans cinerea*	S2?	END	END	END	1	Butternut grows best in rich, moist and well-drained soils or limestone gravel sites. They are less commonly found in dry, rocky and sterile soils. They generally grow alone or in small groups in deciduous forests that are commonly comprised of Basswood, Black Cherry, Beed, Black Walnut, Elm, Hemlock, Hickory, Oak, Red Maple, Sugar Maple, Poplar, White Ash and Yellow Birch. In Ontario, they can be found throughout southern Ontario, south of the Canadian Shield.[9]	Suitable habitat is present. None observed during ELC surveys.
Churchmouse Threeawn Grass (Source: NHIC)	*Aristida dichotoma*	S1	No status	No status	No status	No schedule	All southern Ontario records of this species are from disturbed sites, mostly railroad yards, and it is probably not native quite this far north and east.[16]	Suitable habitat is present. None observed during ELC surveys.
Common Hoptree (Source: MNRF)	*Ptelea trifoliata*	S3	SC	SC	THR	1	Generally grows in sandy soils in areas with a lot of natural disturbance - such as the outer	No suitable habitat present.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
							edge of shoreline vegetation, sand spits, and sand points.[15]	
Deerberry (Source: MECP, NHIC, MNRF)	*Vaccinium stamineum*	S1	THR	THR	THR	1	Generally occurs on sandy and well-drained soil, often in dry open woodlands (Niagara Gorge).[15]	Suitable habitat is present. None observed during ELC surveys.
Deer-tongue Panicgrass (Source: NHIC)	*Dichanthelium clandestinum*	S2	No status	No status	No status	No schedule	Generally found in moist and often sandy ground: floodplains and thickets on stream banks; aspen forests, borders, and clearings; marshy ground, ditches, etc.[16]	Suitable habitat is present. None observed during ELC surveys.
Dense Blazing Star (Source: MECP, MNRF)	*Liatris spicata*	S2	THR	THR	THR	1	Generally found in moist prairies, grassland savannahs, wet areas between sand dunes, and abandoned fields.[9]	Suitable habitat is present. None observed during ELC surveys.
Drooping Trillium (Source: MNRF)	*Trillium flexipes*	S1	END	END	END	1	Generally grows in dry, sandy loam, non-acidic soils of mature, deciduous woodlands that are usually associated with watercourses.[15]	Suitable habitat is present, however there is very low potential for this species to be present. According to the MNRF, this species range has been reduced to along the Syndenham River in Middlesex County and along the Thames River in Elgin County.
Eastern Flowering Dogwood (Source: MECP, NHIC, MNRF)	*Cornus florida*	S2?	END	END	END	1	Generally grows in deciduous and mixed forests, in the drier areas of its habitat, although it is occasionally found in slightly moist environments. Also grows around edges and hedgerows.[15]	Suitable habitat is present. None observed during ELC surveys.
Great Plains Ladies'-tresses (Source: NHIC)	*Spiranthes magnicamporum*	S3?	No status	No status	No status	No schedule	Wet calcareous meadows, fens, moist to dryish prairies and prairie-like habitats, in calcareous soils.[16]	Suitable habitat is present. None observed during ELC surveys.
Halberd-leaved Smartweed (Source: NHIC)	*Persicaria arifolia*	S3	No status	No status	No status	No schedule	Wet ground along streams and lakes and in swamps.[16]	Suitable habitat is present. None observed during ELC surveys.
Kentucky Coffee-tree (Source: MNRF)	*Gymnocladus dioicus*	S2	THR	THR	THR	1	Rich woods and marsh edges in the Carolinian Zone; open Hackberry woods on shallow soil over limestone on the Erie Islands.[17]	Suitable habitat is present. None observed during ELC surveys.
Red Mulberry (Source: MNRF)	*Morus rubra*	S2	END	END	END	1	Generally grows in moist forest habitats. In Ontario, these include slopes and ravines of the Niagara Escarpment, and sand spits and bottom lands; can grow in open areas such as hydro corridors.[15]	Suitable habitat is present. None observed during ELC surveys.
Round-leaved Greenbrier (Source: NHIC, MNRF)	*Smilax rotundifolia*	S2	THR	THR	THR	1	Generally grows in open moist to wet woodlands, often growing on sandy soils. Habitat is variable.[15]	Suitable habitat is present. None observed during ELC surveys.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
Shumard Oak (Source: MNRF)	*Quercus shumardii*	S3	SC	SC	SC	No schedule	Generally grows in deciduous forests, where the soils are poorly drained clay and clay loam. Requires full sunlight.[15]	Suitable habitat is present. None observed during ELC surveys.
Spotted Wintergreen (Source: MECP, MNRF)	*Chimaphila maculata*	S2	END	THR	END	1	Generally grow in sandy habitats in dry-mesic oak-pine woods.[15]	Suitable habitat is present. None observed during ELC surveys.
Swamp Rose-mallow (Source: MNRF)	*Hibiscus moscheutos*	S3	SC	SC	SC	1	Generally grows in open, coastal marshes, but it is also sometimes found in open wet woods, thickets and drainage ditches.[15]	No suitable habitat is present. None observed during ELC surveys.
Tall Boneset	*Eupatorium altissimum*	S1	No status	No status	No status	No schedule	This species grows in dry soils and prefers open areas where it can receive full sunlight. It is associated with Limestone.	Species confirmed present within ELC Polygons #16, #17 (see Figure 2).
White Wood Aster (Source: MNRF)	*Eurybia divaricata*	S2S3	THR	THR	THR	1	Generally grows in open, dry, deciduous forests. It has been suggested that it may benefit from some disturbance, as it often grows along trails.[15]	Suitable habitat is present. None observed during ELC surveys.
Reptiles and Amphibians								
Allegheny Mountain Dusky Salamander (Source: MNRF)	*Desmognathus ochrophaeus*	S1	END	END	THR	1	Generally found near forested brooks, springs or seeps. It uses this habitat to forage, as well as for overwintering and brooding. It nests in spring and seeps. Shelter is provided in wet cavities along stream edges or seeps, or under stones, leaf litter or logs.[15]	No suitable habitat present.
Blanding's Turtle (Source: ORAA, MNRF)	*Emydoidea blandingii*	S3	THR	END	THR	1	Generally occur in freshwater lakes, permanent or temporary pools, slow-flowing streams, marshes and swamps, fens, graminoid wet meadows. They prefer shallow water that is rich in nutrients, organic soil and dense vegetation. Adults are generally found in open or partially vegetated sites, and juveniles prefer areas that contain thick aquatic vegetation including sphagnum, water lilies and algae. They dig their nest in a variety of loose substrates, including sand, organic soil, gravel and cobblestone. Overwintering occurs in permanent pools that average about 1 m in depth, or in slow-flowing streams.[15]	No suitable habitat present. None observed during turtle basking surveys.
Eastern Milksnake (Source: ORAA)	*Lampropeltis triangulum*	S4	No status	SC	SC	1	Habitat generalist. Found in wide variety of habitats, from open woodlands, bogs, swamps, woodland edges, marshes, lakeshores, old fields, pastures, farmyards,	Suitable habitat present. None observed during wildlife surveys.

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
							parks, gardens. Often in or near farm outbuildings, barns, and sheds, and are attracted to piles of rocks, logs, firewood, or building materials, or any place that offers shelter to snakes and their prey (rodents).[10]	
Eastern Musk Turtle (Source: ORAA, MNRF)	*Sternotherus odoratus*	S3	SC	SC	SC	1	Inhabit a wide variety of permanent waters, including ponds, lakes, marshes, sloughs, and rivers. Most common in clear lakes or ponds with marl, sand, or gravel bottoms and a moderate growth of aquatic plants. Prefer slow current. Highly aquatic and rarely wander far from water. Typically nests within 45 m of water.[14]	No suitable habitat present.
Eastern Ribbonsnake (Source: ORAA, MNRF)	*Thamnophis sauritus*	S4	SC	SC	SC	1	Generally occur along the edges of shallow ponds, streams, marshes, swamps, or bogs bordered by dense vegetation that provides cover. Abundant exposure to sunlight is also required, and adjacent upland areas may be used for nesting.[15]	No suitable habitat present.
Jefferson Salamander (Source: ORAA)	*Ambystoma jeffersonianum*	S2	END	END	END	1	Inhabits deciduous and mixed deciduous forests with suitable breeding areas which generally consist of ephemeral (temporary) bodies of water that are fed by spring runoff, groundwater, or springs.[10]	Suitable habitat present. Species not present in the Study Area.
Midland Painted Turtle (Source: ORAA, James Holdsworth)	*Chrysemys picta marginata*	S4	NAR	SC	NAR	No schedule	Generally prefers waterbodies such as ponds, marshes, lakes and slow-moving creeks that have a soft bottom and provide abundant basking sites and aquatic vegetation.[10]	Suitable habitat present. Species confirmed in the Study Area.
Northern Dusky Salamander (Source: MNRF)	*Desmognathus fuscus*	S1	END	END	END	1	Generally prefer rocky woodland streams, seepages, and springs where water is running or trickling.[15]	No suitable habitat present.
Northern Map Turtle (Source: ORAA)	*Graptemys geographica*	S3	SC	SC	SC	1	Highly aquatic. Inhabit slow moving water in larger lakes, rivers, reservoirs, oxbow sloughs, and open marshes, including some of the bays and inlets of the Great Lakes themselves with soft mud to sand, gravel, or marl bottom substrates. Less common in smaller lakes and streams; juveniles may reside in small ponds. Require high-quality water that supports the female's mollusc prey.[14]	No suitable habitat present. None observed during turtle basking surveys.
Snapping Turtle (Source: MNRF OWES	*Chelydra serpentina*	S3	SC	SC	SC	1	Generally inhabit shallow waters where they can hide under the soft mud and leaf litter.	Suitable habitat present. Species confirmed in the Study Area, including

COMMON NAME **(Source)	SCIENTIFIC NAME	Provincial S-RANK[1]	Provincial SARO Status[2]	COSEWIC[3]	Federal SARA Status[3]	Federal SARA Schedule[4]	Habitat Description[5]	Habitat Present in Site Study Area?
results, ORAA, James Holdsworth)							Nesting sites usually occur on gravely or sandy areas along streams. Snapping Turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits.[9]	some egg-laying females.

** Sources: Natural Heritage Information Centre (NHIC) database of records searched on October 17, 2018 (12- 1x1 km^2 Squares: 17PH5369, 17PH5469, 17PH5569, 17PH5368, 17PH5468, 17PH5568.); Ontario Breeding Bird Atlas (2001-2005) searched on September 20, 2017 (Square 17PH56); Ontario Reptile and Amphibian Atlas (ORAA) searched on September 20, 2017 (Square 17PH56); MNRF SAR List for Study Area provided on May 9, 2018 (MNRF Vineland Field Office, David Denyes, Management Biologist); MNRF SAR List for City of Niagara Falls, provided on May 22, 2018 (MNRF Vineland Field Office, David Denyes, Management Biologist); MNRF OWES results for Niagara Falls Slough Forest Wetland Complex provided on May 22, 2018 (MNRF Vineland Field Office, David Denyes, Management Biologist).

[1]S-Ranks (provincial)
Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario (Please refer to: http://explorer.natureserve.org/nsranks.htm)

SX — Presumed Extirpated - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH — Possibly Extirpated (Historical) - Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20–40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
S1 — Critically Imperiled - Critically imperiled in the province or state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2 — Imperiled - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3 — Vulnerable - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4 — Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 — Secure - Common, widespread, and abundant in the province.
SNR — Unranked - Province conservation status not yet assessed.
SU — Unrankable - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA — Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S# — Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
S#? – Inexact or Uncertain - Denotes inexact or uncertain numeric rank.

Breeding Status Qualifiers
B – Breeding Conservation status refers to the breeding population of the species in the nation or state/province.
N – Nonbreeding Conservation status refers to the non-breeding population of the species in the province.
M – Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.

[2]SARO *Endangered Species Act, 2007*
(provincial status from http://www.ontario.ca/environment-and-energy/how-species-risk-are-listed#section-3)
The provincial review process is implemented by the MNRF's Committee on the Status of Species at Risk in Ontario (COSSARO).

Extinct - A species that no longer exists anywhere.
Extirpated (EXT) - Lives somewhere in the world, and at one time lived in the wild in Ontario, but no longer lives in the wild in Ontario.
Endangered (END) - Lives in the wild in Ontario but is facing imminent extinction or extirpation.
Threatened (THR) - Lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it.
Special concern (SC) - Lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats.
Not at Risk (NAR) - A species that has been evaluated and found to be not at risk.
Data Deficient (DD) - A species for which there is insufficient information for a provincial status recommendation.

[3]SARA (Federal *Species at Risk Act*) Status and Schedule (includes COSEWIC Status)
The Act establishes Schedule 1, as the official list of wildlife species at risk. It classifies those species as being either Extirpated, Endangered, Threatened, or Special Concern. Once listed, the measures to protect and recover a listed wildlife species are implemented.

Extinct - A wildlife species that no longer exists.
Extirpated (EXT) - A wildlife species that no longer exists in the wild in Canada,but exists elsewhere.
Endangered (END) - A wildlife species facing imminent extirpation or extinction.
Threatened (THR) - A wildlife species that is likely to become an endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC) - A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Data Deficient (DD) - A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.
Not At Risk (NAR) - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

[4]**SARA Schedule**
Schedule 1: is the official list of species that are classified as extirpated, endangered, threatened, and of special concern.
Schedule 2: species listed in Schedule 2 are species that had been designated as endangered or threatened and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.
Schedule 3: species listed in Schedule 3 are species that had been designated as special concern and have yet to be re-assessed by COSEWIC using revised criteria. Once these species have been re-assessed, they may be considered for inclusion in Schedule 1.

The Act establishes Schedule 1 as the official list of wildlife species at risk. However, please note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to species of special concern.

Species that were designated at risk by COSEWIC prior to October 1999 (Schedule 2 & 3) must be reassessed using revised criteria before they can be considered for addition to Schedule 1 of SARA. After they have been assessed, the Governor in Council may on the recommendation of the Minister, decide on whether or not they should be added to the List of Wildlife Species at Risk.

[5]**Sources:**

[6]Cadman, M.D., et al. (eds). 2007. Atlas of the Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706 pp
[7]Species at Risk Public Registry http://www.sararegistry.gc.ca
[8]McCracken, J.D. et al. 2013. Recovery Strategy for the Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario, viii + 88 pp.
[9]MNRF SARO List Species Descriptions (http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR_SAR_CSSR_SARO_LST_EN.html)
[10]Ontario Nature Reptile and Amphibian Atlas (https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/species/)
[11]Environment Canada. 2015. Recovery Strategy for Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*) and Tri-colored Bat (*Perimyotis subflavus*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. Ix + 110 pp.
[12]Humphrey, C. 2017. Recovery Strategy for the Eastern Small-footed Myotis (*Myotis leibii*) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vii + 76 pp.
[13]Paulson, D. 2011. Dragonflies and Damselflies of the East. Princeton University Press, Princeton, NJ.
[14]Harding, J.H., 1997. Amphibians and Reptiles of the Great Lakes Region. The University of Michigan Press. Ann Arbor, Michigan.
[15]MNRF. 2018. City of Niagara Falls Species at Risk Table. Guelph District.
[16]Michigan Flora found online at https://michiganflora.net/search.aspx
[17]Natural Heritage Information Centre (https://www.ontario.ca/page/get-natural-heritage-information)

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Appendix I

MNRF Wetland Memo

Ministry of Natural Resources and Forestry

Ministère des Richesses naturelles et des Forêts

Guelph District
4890 Victoria Ave North
P.O. Box 5000
Vineland Station, Ontario
L0R 2E0

Telephone: (905) 562-4147
Facsimile: (905) 562-1154

Ontario

June 28, 2019

Nicholle Smith
Senior Terrestrial Ecologist
R.J. Burnside & Associates Limited
292 Speedvale Avenue West, Unit 20
Guelph, Ontario N1H 1C4

Dear Nicolle:

Further to our correspondence earlier this year, this letter is to provide you with the rationale for the wetland boundary mapping as per the attached map.

Thank you for providing the technical information and analysis as requested. Based on this information, MNRF has updated the mapping to exclude the eastern half of the wetland polygon #12 (as identified in the wetland evaluation record for the Niagara Falls Slough Forest Wetland Complex PSW). Although there are wetland features in this portion of the polygon, the rationale for not including this area in the wetland complex is due to the small size, which is estimated as 0.38 hectares, and lack of connectivity to the wetland complex.

The rationale for retaining the western portion of this area in the provincially significant wetland complex is due to the distance, size, and functional connectivity of the wetland area. This is consistent with the direction found within the *Ontario Ministry of Natural Resources, 2014. Ontario Wetland Evaluation System, Southern Manual, 3rd edition, Version 3.3* regarding wetland complexes. The mapped boundary was determined based on all of the available information, and has been delineated to include some of the mature cottonwood trees along the interface with the ecosite to the south.

Note that the evaluation is conducted at a point in time; hence, it is the conditions described and facts noted at that time that are assessed within the context of all available information. The evaluation always remains as an open file, subject to change as more information becomes available or as a consequence of changes to the wetland itself.

Feel free to contact me with any comments or questions regarding the updated wetland boundary.

Sincerely,

Helen Hermansen
IRM Technical Specialist

Datum: North American 1983	
Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: 0	Scale Factor: 0.99960

N
True North

0 250 500 750 1,000
Metres

Sources:

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2. Natural Resources Canada © Her Majesty the Queen in Right of Canada.

Disclaimer:

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Site Boundary

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Figure Title

NIAGARA VILLAGE
STUDY AREA
DRAFT

Drawn	Checked	Date	Figure No.
HN	CP	2018/10/31	1
Scale		Project No.	
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File Path: \\elmo\Shared Work Areas\041230-THUNDERING WATERS\GIS\Map\041230 Study Area.mxd Print Date: 2018/10/31 Time: 08:55 AM

Polygon #	Polygon Code	Polygon Name
1	MAM2/G142N	Phragmites Mineral Meadow Marsh
2	SWT/G134S	Salix - Gray Dogwood Mineral Thicket Swamp
3	CUT/G112S	Gray Dogwood-European Buckthorn Cultural Thicket/Moist, Fine Gray Dogwood-European Buckhorn Shrub Ecosite
4	CUW/G121oTt	Red Oak Cultural Woodlot/Moist, Fine: Oak Hardwood forest
5	CUW/G119Tt	Trembling Aspen Cultural Woodlot/Moist, Fine: Aspen – Birch Hardwood
6	SWT/G134S	Gray Dogwood Mineral Thicket Swamp
7	CUH/CUT	Oak – Maple Cultural Hedgerow/European Buckthorn Cultural Thicket
8	CUH/CUT	Oak – Maple Cultural Hedgerow/European Buckthorn Cultural Thicket
9	CUW	Deciduous Cultural Woodlot
10	CUH	Red Oak - Maple Cultural Hedgerow
11	CUM/CUT	Cultural Meadow/Cultural Thicket Complex
12	FOD9-2/G125Tt	Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple - Red Oak Mixed Wood Forest
13	FOD9-1/G124Tt	Fresh – Moist Oak - Sugar Maple Deciduous Forest/Moist, Fine: Maple Hardwood
14	SWD1-2/G132Tt	Bur Oak Mineral Deciduous Swamp/Oak Hardwood Swamp
15	CUW	Trembling Aspen Cultural Woodland
16	CUT/G112S	Cultural Thicket/Moist, Fine: Shrub
17	CUM	Graminoid-dominated Cultural Meadow
18	CUM/CUT	Cultural Meadow/Cultural Thicket Complex
19	MAS2-9/G153X-N	Forb Mineral Shallow Marsh/Constructed Water Collectors
20	MAS2-9/G153X-N	Forb Mineral Shallow Marsh/Constructed Water Collectors
21	CUH	Oak – Maple Cultural Hedgerow
22	CUH	American Beech Cultural Hedgerow
23	FOD9-2/G125Tt	Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple/Red Oak Mixed Wood Forest
24	CUT/G112S	Gray Dogwood-European Buckthorn Cultural Thicket/Moist, Fine Gray Dogwood-European Buckhorn Shrub Ecosite
25	FOD9-2/G125Tt	Fresh – Moist Oak – Maple Deciduous Forest/Moist, Fine: Red Maple - Red Oak Mixed Wood Forest
26	SWD1/G132Tt	Red Oak Mineral Slough Forest/Oak Hardwood Swamp

Site Boundary

ELC Boundary

Vernal Pool

Sources:

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Coord. System: NAD 1983 CSRS UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°00.00'W	
False Easting: 500,000m	False Northing: 0m
Page Orientation: 0°	Scale Factor: 0.99960

N
True North

0 50 100 150 200
Metres

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Client
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Map Title
NIAGARA VILLAGE EIS
ECOLOGICAL LAND CLASSIFICATION
DRAFT

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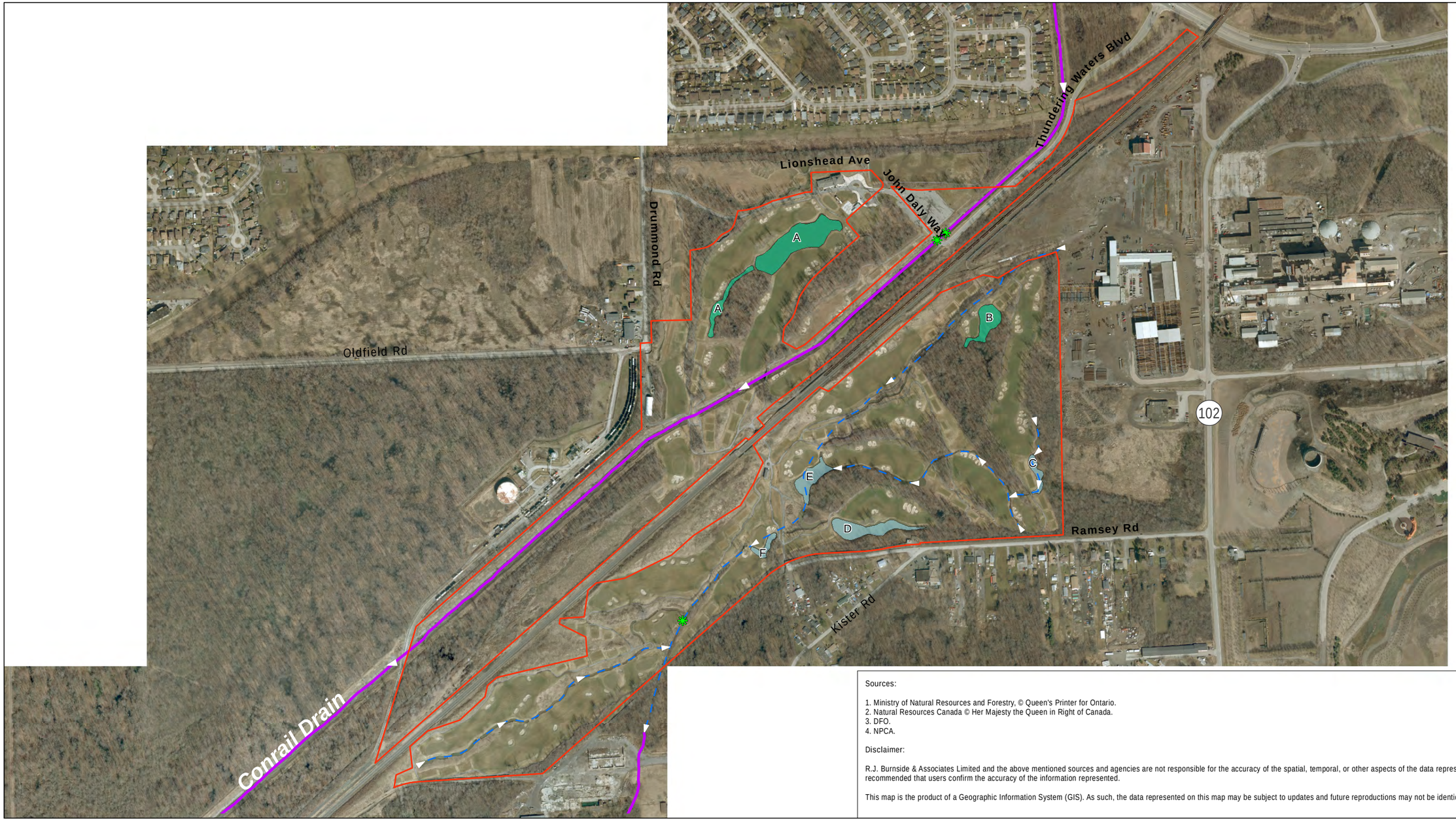

Sources:

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3. DFO.
4. NPCA.

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Coord. System: NAD 1983 UTM Zone 17N	
Projection: Transverse Mercator	
Central Meridian: 81°0'0.00"W	
False Easting: 500,000m	False Northing: 0m
Rotation: 0	Scale Factor: 0.99960

N
True North

0 100 200 300 400 500
Metres

Barrier to Fish Movement

Intermittent Watercourse*

Site Boundary

Area within which one or more species listed under SARA may be found:

Extirpated, Endangered or Threatened (DFO, 2017)

Offline Pond*

Online Pond*

**Watercourse or Waterbody is a potential fish habitat*

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Figure Title

NIAGARA VILLAGE
WATERCOURSES AND PONDS
DRAFT

Drawn	Checked	Date	Figure No.
HN	CP	2018/10/31	3
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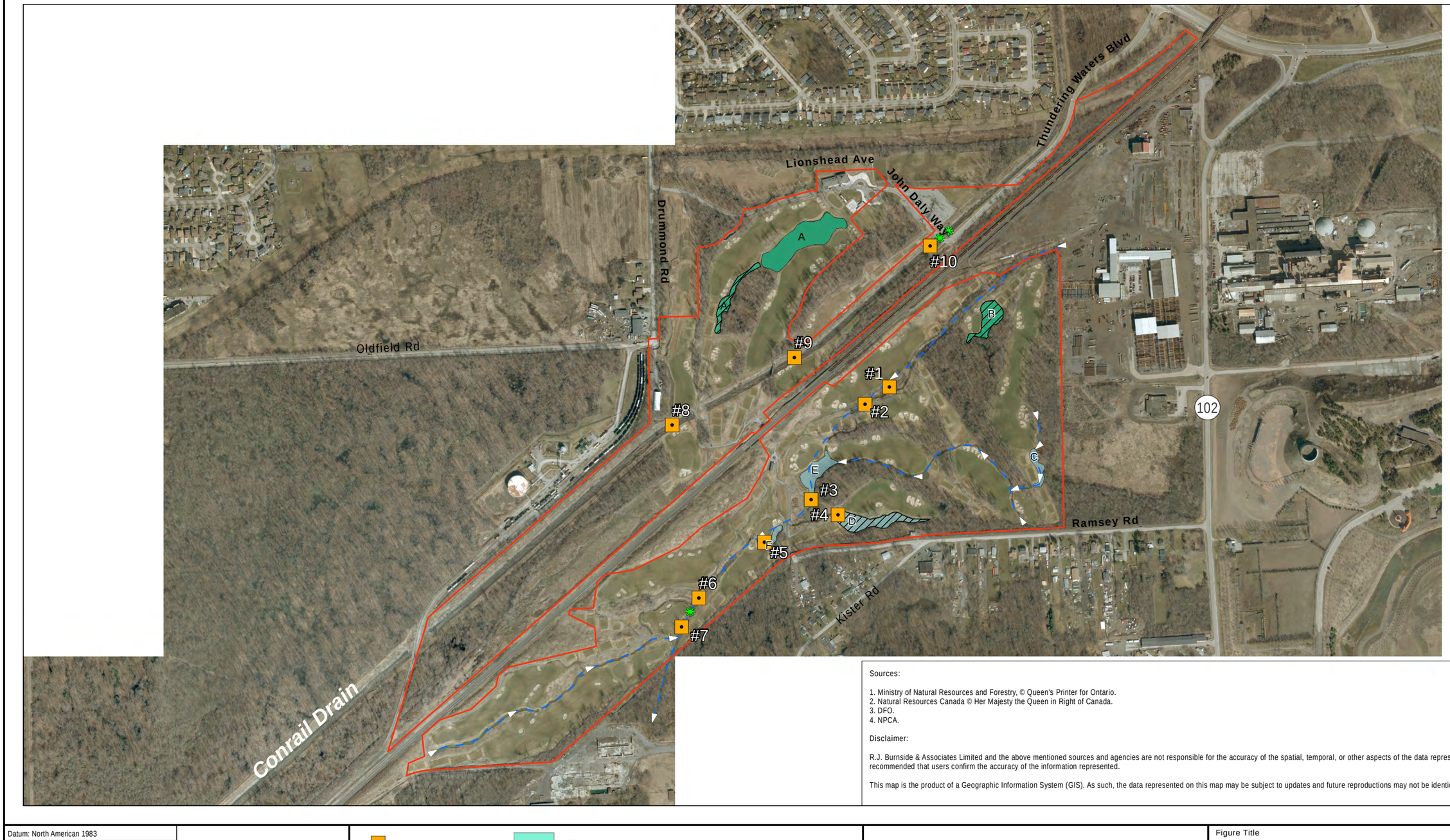

Sources:

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Rotation: 0	Scale Factor: 0.99960

N
True North

0 100 200 300 400 500
Metres

- Minnow Trap Location
- Barrier to Fish Movement
- Intermittent Watercourse*
- Site Boundary
- Offline Pond*
- Online Pond*
- Pond Seined

*Watercourse or Waterbody is a potential fish habitat

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Figure Title

NIAGARA VILLAGE
FISH SAMPLING LOCATIONS
DRAFT

Drawn	Checked	Date	Figure No.
HN	CP	2018/10/31	4
Scale		Project No.	
H 1:7,500		300041230	

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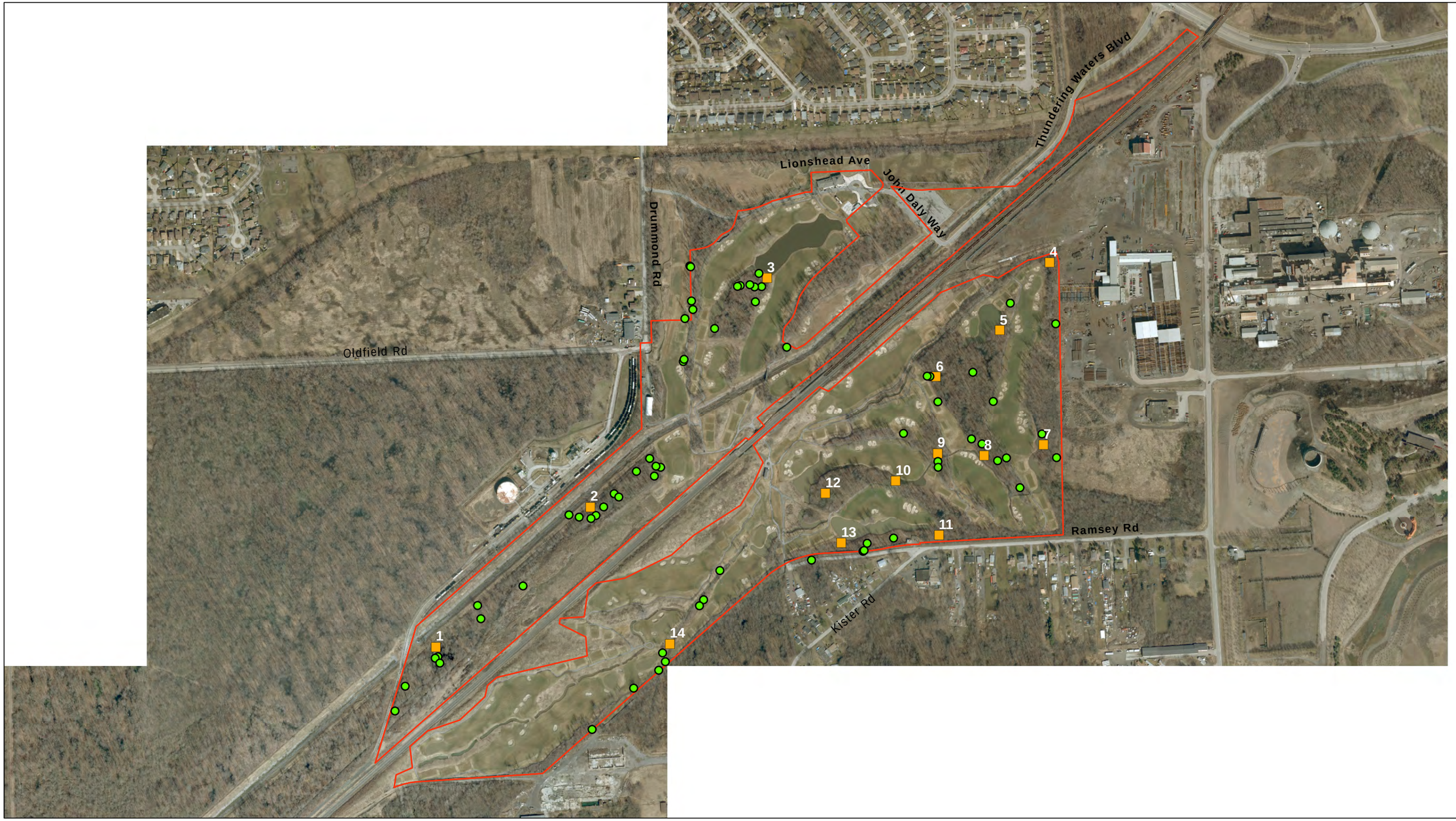

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Projection: Transverse Mercator	
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N

True North

0 100 200 300 400 500

Metres

Sources:

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- Proposed Acoustic Recording Stations
- Candidate Leaf-off BMH Trees
- Site Boundary

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Figure Title

NIAGARA VILLAGE

CANDIDATE LEAF-OFF BMH TREES AND ACOUSTIC MONITORING LOCATIONS

DRAFT

Drawn	Checked	Date	Figure No.
HN	PD	2018/10/31	5
Scale		Project No.	
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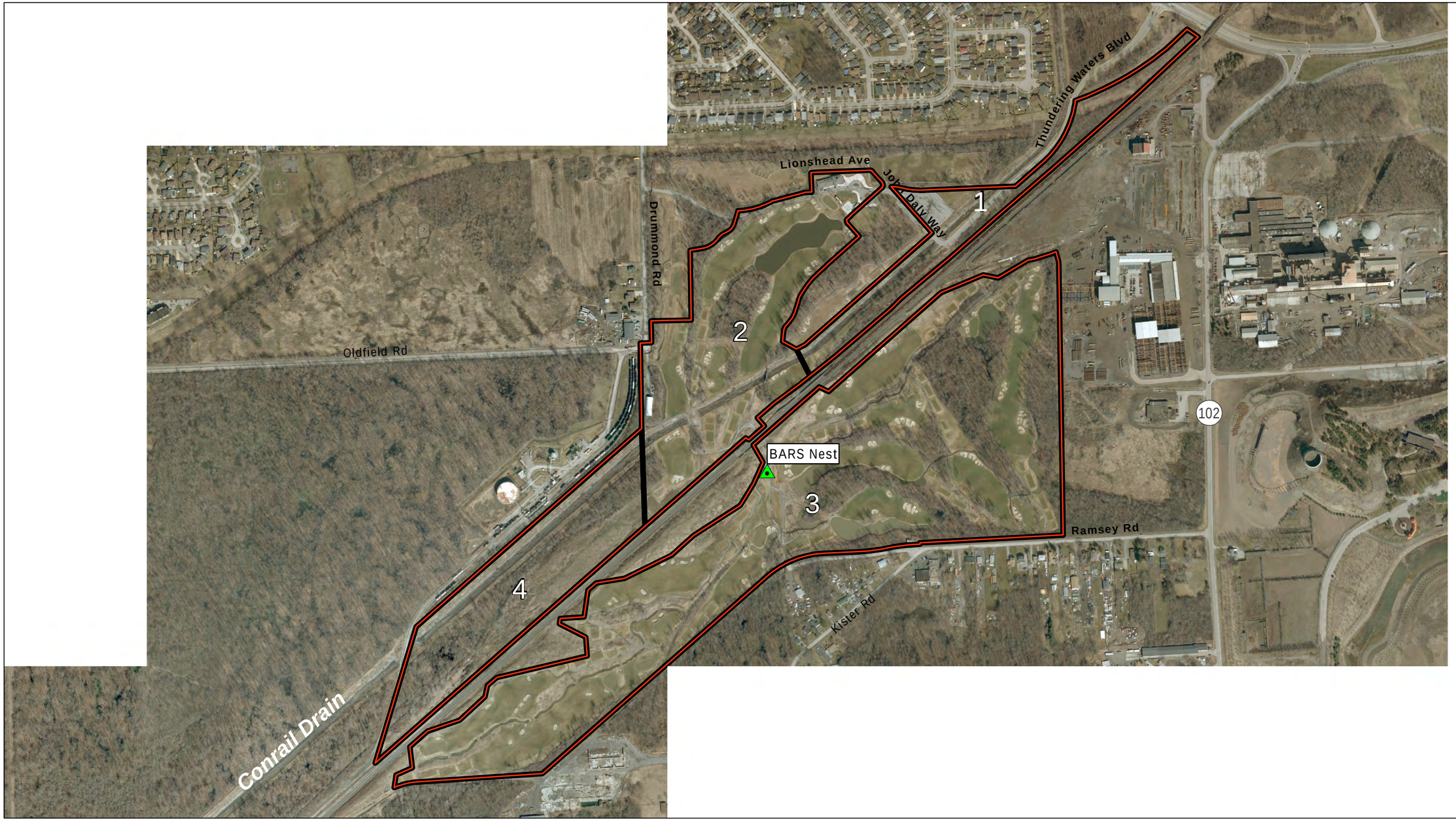

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Rotation: 0	Scale Factor: 0.99960

N
True North

0 100 200 300 400 500
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BARS Nest

Site Boundary

Avian Study Quadrant

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Figure Title

NIAGARA VILLAGE

AVIAN STUDIES

DRAFT

Drawn	Checked	Date	Figure No.
HN	PD	2018/10/30	6
Scale		Project No.	
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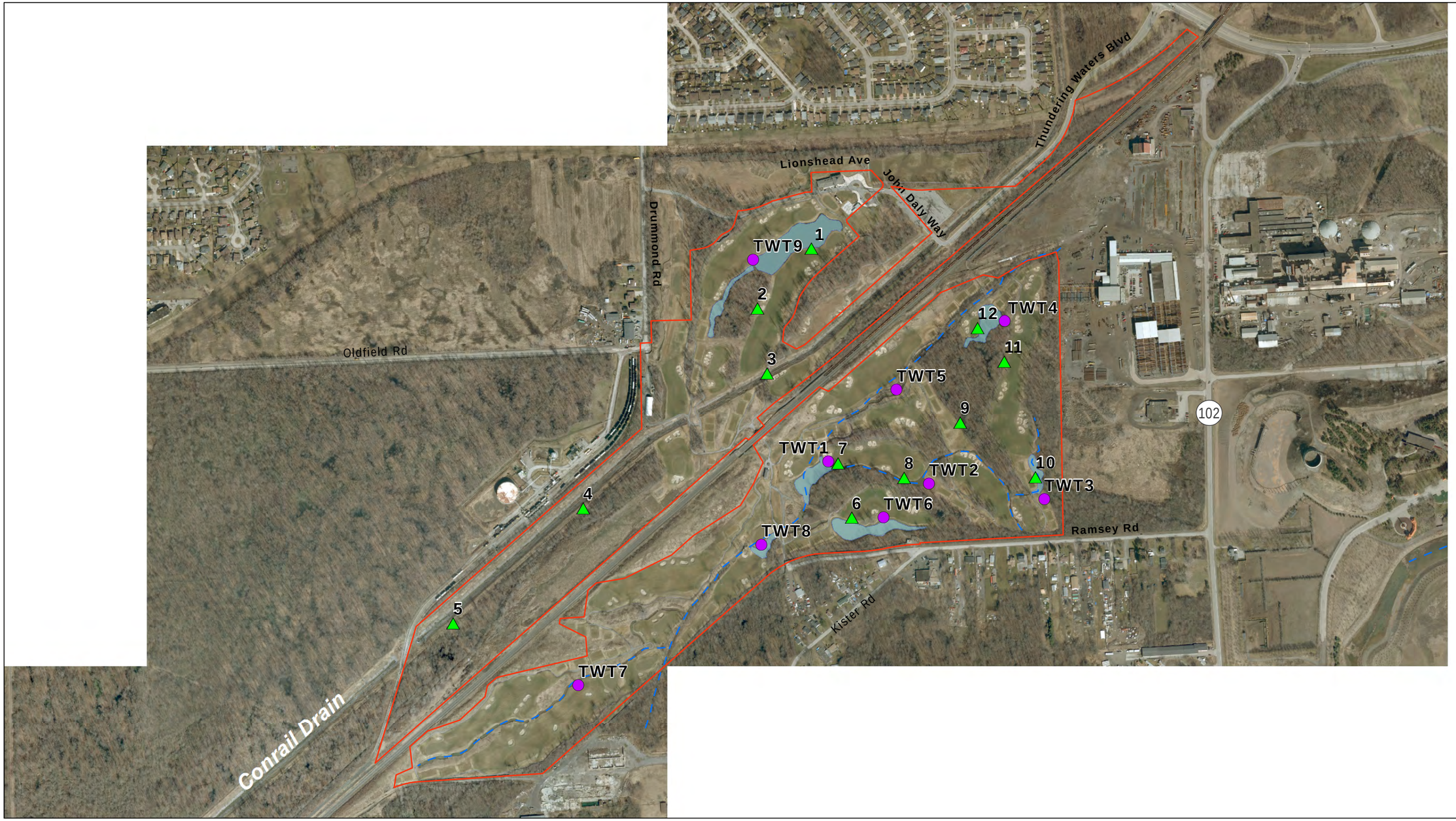

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N
True North

0 100 200 300 400 500
Metres

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- Turtle Basking Survey Location
- Amphibian Breeding Survey Location
- Site Boundary
- Intermittent Watercourse
- Pond

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Figure Title

NIAGARA VILLAGE

HERPETOFAUNAL SURVEY LOCATIONS

DRAFT

Drawn	Checked	Date	Figure No.
HN	PD	2018/10/30	7
Scale		Project No.	
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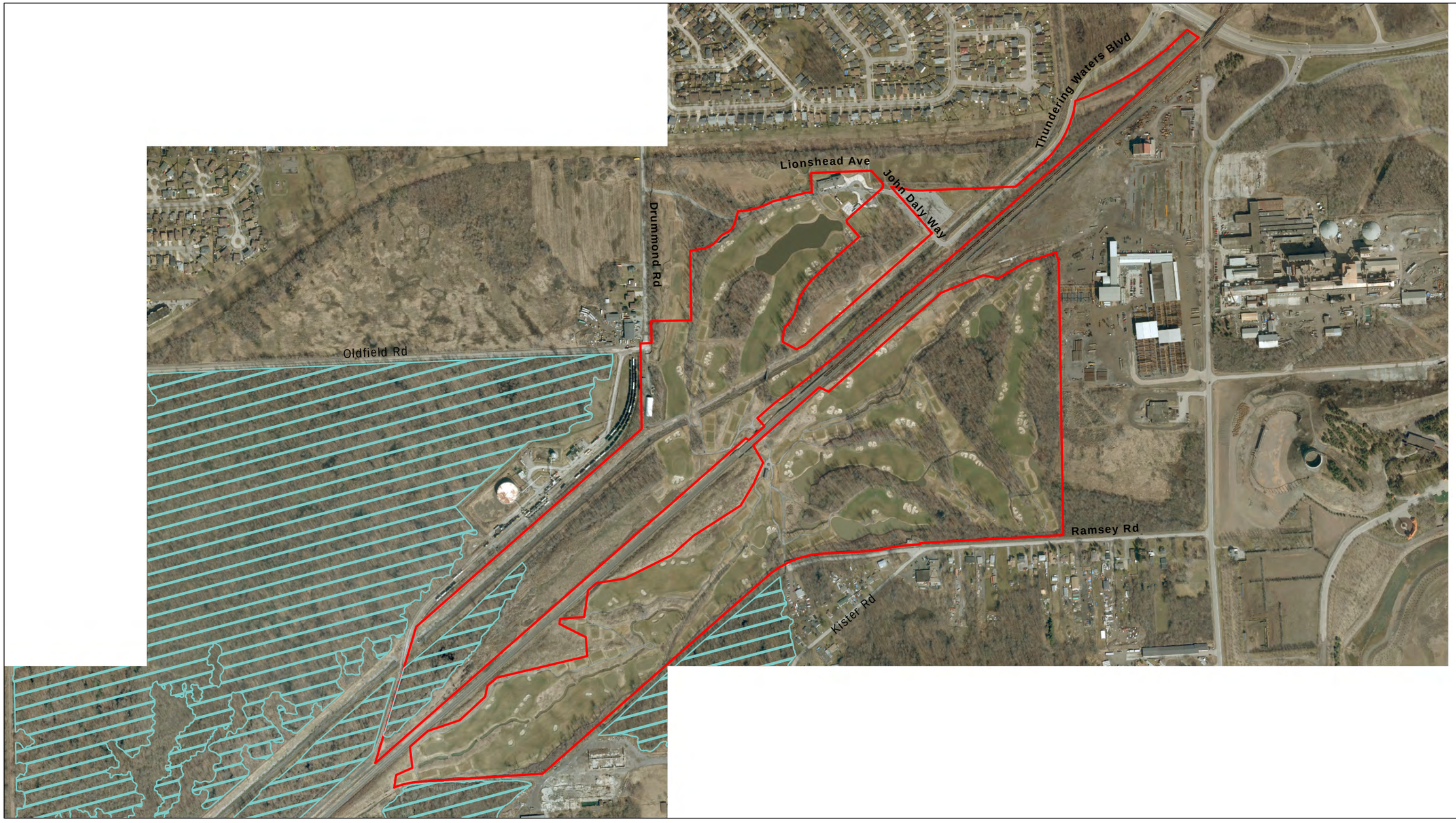

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Rotation: 0	Scale Factor: 0.99960

N

True North

0 100 200 300 400 500

Metres

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Amended PSW

Site Boundary

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Figure Title

NIAGARA VILLAGE

PSW

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Drawn	Checked	Date	Figure No.
HN	PD	2019/07/17	8
Scale		Project No.	
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Ontario

0 100 200 Meters

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Map Produced By : MNRF Guelph District - Vineland Field Office
Date Produced : June 28, 2019
Map Projection : (NAD 1983 UTM Zone 17N)
Data Sources : (Base Data - Land Information Ontario)
Map Purpose : Wetland Unit #12 Boundary Update map

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[THE DIFFERENCE IS OUR PEOPLE]

Appendix J

Significant Wildlife Habitat Screening Table

300041230 Thundering Waters/Niagara Village Environmental Assessment
Appendix J: Significant Wildlife Habitat Screening within the On-site Study Area and Study Area Vicinity – Ecoregion 7E Criteria (2015)

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
Seasonal Concentration Areas of Animals						
Waterfowl Stopover and Staging Areas (Terrestrial) **<u>Rationale</u>**: Habitat important to migrating waterfowl.	American Black Duck Northern Pintail Gadwall Blue-winged Teal Green-winged Teal American Wigeon Northern Shoveler Tundra Swan	CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these Ecosites. - Fields with seasonal flooding and waste grains in the Long Point, Rondeau, Lk. St. Clair, Grand Bend, and Pt. Pelee areas may be important to Tundra Swans.	Fields with sheet water during Spring (mid-March to May). • Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available.	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects": • Any mixed species aggregations of 100 or more individuals required. • The flooded field ecosite habitat plus a 100-300 m radius area, dependant on local site conditions and adjacent land use is the significant wildlife habitat. • Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates). • SWH MIST Index #7 provides development effects and mitigation measures.	Low potential. These habitat conditions were not identified within the Study Area. There is no evidence of annual spring flooding within open areas of the golf course. Most seasonal flooding occurs within FOD communities.	Low potential Surrounding areas are mostly forested or wetland ecosites and residential subdivision or commercial buildings. There is a CUM1 ecosite adjacent to the Study Area (a railway right-of-way) but it did not show evidence of sufficient spring flooding to support large aggregations of waterfowl.
Waterfowl Stopover and Staging Areas (Aquatic) **<u>Rationale:</u>** Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites	Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4	• Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond / lake does qualify. • These habitats have an	Studies carried out and verified presence of: • Aggregations of 100 or more of listed species for 7 days, results in >700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH. • The combined area of the ELC ecosites and a 100 m radius area is	Moderate potential There are SWD ecosites within the Study Area that are known to experience high rates of flooding in the spring, though these areas may be too small to support species in the numbers required to qualify as confirmed SWH.	High potential There are SWD ecosites within the Study Area Vicinity.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
identified are usually only one of a few in the eco-district.	Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed Duck Surf Scoter White-winged Scoter Black Scoter Ring-necked duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback Ruddy Duck	SWD5 SWD6 SWD7	abundant food supply (mostly aquatic invertebrates and vegetation in shallow water).	the SWH. • Wetland area and shorelines associated with sites identified within the SWHTG Appendix K are significant wildlife habitat. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded). • SWH MIST Index #7 provides development effects and mitigation measures.	The ponds that exist within the study area are managed as stormwater/irrigation reservoirs and are not anticipated to qualify as SWH.	
Shorebird Migratory Stopover Area **<u>Rationale</u>**: High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird’s Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel Ruddy Turnstone Sanderling	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	• Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. • Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. • Sewage treatment ponds and storm water ponds do not qualify as a SWH.	Studies confirming: • Presence of 3 or more of listed species and > 1000 shorebird use days during spring or fall migration period. (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period). • Whimbrel stop briefly (<24 hrs) during spring migration, any site with >100 Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100 m radius area. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” • SWH MiST Index #8 provides development effects and mitigation	No potential These habitat conditions are not present within the Study Area.	Low potential The air photo interpretation did not indicate the presence of any suitable ecosites within the Study Area Vicinity. Surrounding areas are mostly forested or SDW1 wetland ecosites and residential subdivision or commercial buildings.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
	Dunlin			measures.		
Raptor Wintering Area **Rationale**: Sites used by multiple species, a high number of individuals and used annually are most significant	Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl **Special Concern:** Short-eared Owl Bald Eagle	Hawks/Owls: Combination of ELC Community Series; need to have present one Community Series from each land class; Forest: FOD, FOM, FOC. Upland: CUM; CUT; CUS; CUW. Bald Eagle: Forest community Series: FOD, FOM, FOC, SWD, SWM or SWC on shoreline areas adjacent to large rivers or adjacent to lakes with open water (hunting area).	• The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. • Raptor wintering sites (hawk / owl) need to be >20 ha with a combination of forest and upland. • Least disturbed sites, idle / fallow or lightly grazed field / meadow (>15 ha) with adjacent woodlands. • Field area of the habitat is to be wind swept with limited snow depth or accumulation. • Eagle sites have open water, large trees and snags available for roosting	Studies confirm the use of these habitats by: • One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two of the listed hawk/owl species. • To be significant a site must be used regularly (3 in 5 years) for a minimum of 20 days by the above number of birds. • The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects.” • SWH MIST Index #10 and #11 provides development effects and mitigation measures.	Low potential Though forest and upland sites exist within the Study Area, most upland sites are waste places and highly fragmented due to the golf course. The forest communities are also not adjacent to large rivers or lakes. The PSW and adjacent CUM/CUT may provide RWA habitat within the context of the larger landscape scale.	Moderate potential Hawks/Owls – Larger tracts of forest exist adjacent to the Study Area, though the presence of suitable upland area was not confirmed through ground-truthing. Bald Eagle – Forest to the south and west border the Welland River, which would indicate that adjacent woodland does contribute to Bald Eagle RWA habitat.
Bat Hibernacula **Rationale**: Bat hibernacula are rare habitats in all Ontario landscapes.	Big Brown Bat Tri-coloured Bat	Bat Hibernacula may be found in these ecosites: CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)	• Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. • Active mine sites should not be considered as SWH • The locations of bat hibernacula are relatively poorly known.	• All sites with confirmed hibernating bats are SWH. • The habitat area includes a 200 m radius around the entrance of the hibernaculum for most development types and 1,000 m for wind farms. • Studies are to be conducted during the peak swarming period (Aug.–Sept.). Surveys should be conducted following methods outlined in the “Bats and Bat Habitats: Guidelines for Wind Power Projects”. • SWH MIST Index #1 provides development effects and mitigation measures.	No potential No cave or crevice ecosites found within Study Area.	No potential The air photo interpretation did not indicate did not indicate any cave or crevice ecosites within Study Area Vicinity.
Bat Maternity Colonies	Big Brown Bat Silver-haired Bat	Maternity colonies considered SWH are	• Maternity colonies can be found in tree cavities,	• Maternity Colonies with confirmed use by;	Confirmed	High potential

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
<u>Rationale:</u> Known locations of forested bat maternity colonies are extremely rare in all Ontario landscapes.		found in forested Ecosites. All ELC Ecosites in ELC Community Series: FOD FOM SWD SWM	vegetation and often in buildings (buildings are not considered to be SWH). • Maternity roosts are not found in caves and mines in Ontario. • Maternity colonies located in Mature deciduous or mixed forest stands with >10/ha large diameter (>25 cm dbh) wildlife trees. • Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3 or class 1 or 2. • Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred.	– >10 Big Brown Bats – >5 Adult Female Silver- haired Bats • The area of the habitat includes the entire woodland or a forest stand ELC Ecosite or an Ecoelement containing the maternity colonies. • Evaluation methods for maternity colonies should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects". • SWH MIST Index #12 provides development effects and mitigation measures.	Acoustic surveys completed by NRSI on the Study Area have confirmed the presence of BMH within all forested ecosites.	Forest ecosites extend south and west from the Study Area radius. It is assumed from air-photo interpretation that these forests are similar in age and composition to those identified through the ELC.
Turtle Wintering Areas **<u>Rationale:</u>** Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	Midland Painted Turtle **<u>Special Concern:</u>** Northern Map Turtle Snapping Turtle	Snapping and Midland Painted Turtles; ELC Community Classes; SW, MA, OA and SA, ELC Community Series; FEO and BOO Northern Map Turtle; Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.	• For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen. • Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH.	• Presence of 5 over-wintering Midland Painted Turtles is significant. • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant. • The mapped ELC ecosite area with the over-wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep-water pool where the turtles are over wintering is the SWH. • Over-wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept.–Oct.) or spring (Mar.–May).	Confirmed - contingent on MNRF Response There are SW and small pockets of SA ecosites within the Study Area, but the majority of standing water is found within the irrigation ponds/water hazards on the golf course. Three of these ponds were found to contain five or more turtles during basking surveys, which were used as proxy for over-wintering surveys (TWT 2, TWT 3, TWT 5).	High potential There are SW and SA ecosites within the Study Area Vicinity.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
				• Congregation of turtles is more common where wintering areas are limited and therefore significant. • SWH MIST Index #28 provides development effects and mitigation measures for turtle wintering habitat.		
Reptile Hibernaculum **Rationale**: Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	**Snakes**: Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake **Special Concern**: Milksnake Eastern Ribbonsnake	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice, Cave, and Alvar sites may be directly related to these habitats. Observations or congregations of snakes on sunny warm days in the spring or fall is a good indicator.	• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural or naturalized locations. The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line. • Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock groundcover.	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. or; individuals of two or more snake spp. near potential hibernacula (e.g., foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct) • Note: If there are Special Concern Species present, then site is SWH. • Note: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population (i.e., strong hibernation site fidelity). Other critical life processes (e.g., mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is located plus a 30 m radius area is the SWH. • SWH MIST Index #13 provides development effects and mitigation measures for snake hibernacula.	High potential Eastern Gartersnakes were frequently observed incidentally during field surveys adjacent to the FOD3-1 ecosite and the western portion of the Conrail Drain. One Brown Dakay Snake was also observed here. The FOD3-1 community appears to have formed on a large pile of loosely consolidated materials/aggregate. This area is much higher than the surrounding swamp/forest complex and has been assessed as being highly likely to support snake hibernacula.	Moderate to high potential Hibernacula areas may be associated with the railway corridor. No sampling effort was conducted outside of the Study Area to assess the presence of snakes.
Colonially-Nesting Bird Breeding Habitat (Bank and	Cliff Swallow Northern Rough-winged Swallow (this species is not	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles.	• Any site or areas with exposed soil banks, undisturbed or naturally	Studies confirming: • Presence of 1 or more nesting sites with 8 or more cliff swallow pairs	Low potential Some areas of bare slope are	Low potential There is no indication from

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
Cliff) **<u>Rationale</u>**: Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	colonial but can be found in Cliff Swallow colonies)	Cliff faces, bridge abutments, silos, barns. Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	eroding that is not a licensed / permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles. • Does not include a licensed / permitted Mineral Aggregate Operation.	and/or rough- winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50 m radius habitat area from the peripheral nests. • Field surveys to observe and count swallow nests are to be completed during the breeding season. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • SWH MIST Index #4 provides development effects and mitigation measures.	associated with the south-facing edge of the FOD3-1 ecosite to the southwest of the study area. No evidence of Cliff Swallow was observed during any field surveys in the area.	aerial imagery that naturally-occurring exposed banks exist in natural areas within the Study Area Vicinity.
Colonially-Nesting Bird Breeding Habitat (Tree / Shrubs) **<u>Rationale:</u>** Large colonies are important to local bird population, typically sites are only known colony in area and are used annually.	Great Blue Heron Black-crowned Night-Heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15 m from ground, near the top of the tree.	Studies confirming: • Presence of 2 or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300 m radius or extent of the Forest Ecosite containing the colony or any island <15.0 ha with a colony is the SWH. • Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells. • SWH MIST Index #5 provides development effects and mitigation measures.	Moderate/high potential SDW ecosites are present within Study Area. It was noted that no standing water remained on any of the SWD areas by mid-summer.	Moderate potential SDW ecosites are present within Study Area Vicinity.
Colonially-Nesting Bird Breeding Habitat (Ground) **<u>Rationale:</u>** Colonies are important to local bird population,	Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer’s Blackbird	Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1;50,000 NTS map). Close proximity to	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. • Brewers Blackbird colonies are found loosely on the	Studies confirming: • Presence of >25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern. • Presence of 5 or more pairs for Brewer’s Blackbird.	No potential Study Area is not on a rocky island or peninsula within a lake or large river.	No potential Study Area Vicinity is not on a rocky island or peninsula within a lake or large river.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
typically sites are only known colony in area and are used annually.		watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird). MAM1 to 6 MAS1 to 3 CUM CUT CUS	ground in low bushes in close proximity to streams and irrigation ditches within farmlands.	• Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant. • The edge of the colony and a minimum 150 m radius area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0 ha with a colony is the SWH. • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects". • SWH MIST Index #6 provides development effects and mitigation measures.		
Migratory Butterfly Stopover Areas **<u>Rationale:</u>** Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	Painted Lady Red Admiral <u>Special Concern</u> Monarch	Combination of ELC Community Series; need to have present one Community Series from each land class: Field: CUM; CUT; CUS Forest: FOC; FOD; FOM; CUP Anecdotally, a candidate site for butterfly stopover will have a history of butterflies being observed.	A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Ontario. • The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south. • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat. • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest	Studies confirm: • The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct). MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/day, significant variation can occur between years and multiple years of sampling should occur. • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD. • MUD of >5,000 or >3,000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. • SWH MIST Index #16 provides development effects and mitigation	No potential The Study Area is located more than 5 km from Lake Ontario.	No potential The Study Area Vicinity is located more than 5 km from Lake Ontario.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
			distance to cross the Great Lakes.	measures.		
Landbird Migratory Stopover Areas **<u>Rationale:</u>** Sites with a high diversity of species as well as high numbers are most significant.	All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.ec.gc.ca/nature/default.asp?lang=En&n=421B7A9D-1 All migrant raptors species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	Woodlots need to be >5 ha in size and within 5 km of Lake Ontario. • If multiple woodlands are located along the shoreline, woodland fragments 2-5 ha can be considered for this habitat. • Sites have a variety of habitats; forest, grassland and wetland complexes. • The largest sites are more significant. • Woodlots and forest fragments are important habitats to migrating birds, these features located along the shore and located within 5 km of Lake Ontario are Candidate SWH.	Studies confirm: • Use of the habitat by >200 birds/day and with >35 species with at least 10 bird species recorded on at least 5 different survey dates. This abundance and diversity of migrant bird species is considered above average and significant. • Studies should be completed during spring (Mar to May) and fall (Aug to Oct) migration using standardized assessment techniques. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • SWH MIST Index #9 provides development effects and mitigation measures.	No potential The Study Area is located more than 5 km from Lake Ontario.	No potential The Study Area Vicinity is located more than 5 km from Lake Ontario.
Deer Winter Congregation Areas **<u>Rationale:</u>** Deer movement during winter in the southern areas of Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions.	White-tailed Deer	All Forested Ecosites with these ELC Community Series: FOC FOM FOD SWC SWM SWD Conifer plantations much smaller than 50 ha may also be used.	• Woodlots >100 ha in size or if large woodlots are rare in a planning area, woodlots >50 ha. • Deer movement during winter in the southern areas of Ecoregion 7E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands. • Large woodlots >100 ha and up to 1,500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha.	Studies confirm: • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF. • Use of the woodlot by white- tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRF. • Studies should be completed during winter (Jan/Feb) when >20 cm of snow is on the ground using aerial survey techniques, ground or road surveys. or a pellet count deer density survey.	No potential No deer wintering areas were identified by the MNRF and there are no woolots >100 ha in size in the Study Area.	Low potential. No deer wintering areas were identified by the MNRF, however there is a large woodlot (FOD and/or SWD) south-west of Study Area

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
				• SWH MIST Index #2 provides development effects and mitigation measures.		
Rare Vegetation Communities						
Cliffs and Talus Slopes **<u>Rationale:</u>** Cliffs and Talus Slopes are extremely rare habitats in Ontario.		Any ELC Ecosite within Community Series: TAO CLO TAS CLS TAT CLT	A Cliff is vertical to near vertical bedrock >3 m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris Most cliff and talus slopes occur along the Niagara Escarpment.	• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes. • SWH MIST Index #21 provides development effects and mitigation measures.	No potential Ecosites not present.	No potential Ecosites not present.
Sand Barren **<u>Rationale:</u>** Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry.		ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always <u>≤</u> 60%.	A sand barren area >0.5 ha in size. Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered, but less than 60%.	• Confirm any ELC Vegetation Type for Sand Barrens • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic species). • SWH MIST Index #20 provides development effects and mitigation measures.	No potential Ecosites not present.	No potential Ecosites not present.
Alvar **<u>Rationale:</u>** Alvars are extremely rare habitats in Ecoregion 7E.		ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 **Five Alvar Indicator Species:**	An Alvar site > 0.5 ha in size. Alvar is particularly rare in Ecoregion 7E where the only known sites are found in the western islands of Lake Erie. An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The	• Field studies that identify four of the five Alvar Indicator Species at a Candidate Alvar site is Significant. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic species). • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses. • SWH MIST Index #17 provides development effects and mitigation	No potential Ecosites not present.	No potential Ecosites not present.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
		Carex crawei *Panicum philadelphicum* *Eleocharis compressa* *Scutellaria parvula* *Trichostema brachiatum* These indicator species are very specific to Alvars within Ecoregion 6E.	hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plants. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover.	measures.		
Old Growth Forest **<u>Rationale:</u>** Due to historic logging practices and land clearance for agriculture, old growth forest is rare in Ecoregion 7E.		Forest Community Series: FOD FOC FOM SWD SWC SWM	Woodland area is >0.5 ha. Old Growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris.	Field Studies will determine: • If dominant trees species of the are >140 years old, then the area containing these trees is Significant Wildlife Habitat. • The forested area containing the old growth characteristics will have experienced no recognizable forestry activities (cut stumps will not be present). • The area of forest ecosites combined or an eco-element within an ecosite that contains the old growth characteristics is the SWH. • Determine ELC vegetation types for the forest forest area containing the old growth characteristics. • SWH MIST Index #23 provides development effects and mitigation measures.	Low potential Old growth forest is rare in Ecoregion 7E. Because the area threshold for this SWH is so small (>0.5 ha), any mature forest stand in this Ecoregion has the potential to be considered remnant old-growth forest, and thus SWH. It should be noted that old aerial photos indicate that much of this land was farmed prior to the construction of the golf course.	Moderate potential Old growth forest is rare in Ecoregion 7E. Because the area threshold for this SWH is so small (>0.5 ha), any mature forest stand in this Ecoregion has the potential to be considered SWH.
Savannah **<u>Rationale:</u>** Savannahs are		TPS1 TPS2 TPW1 TPW2	No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered	Field studies confirm one or more of the Savannah indicator species listed in Appendix N should be present. Note: Savannah plant spp. list from Ecoregion	No potential Ecosites not present.	No potential Ecosites not present.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
extremely rare habitats in Ontario.		CUS2	to be SWH. A Savannah is a tallgrass prairie habitat that has tree cover between 25–60%. In Ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie Shoreline, in Brantfor and in the Toronto area (north of Lake Ontario.	7E should be used. • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • SWH MIST Index #18 provides development effects and mitigation measures.		
Tallgrass Prairie **<u>Rationale:</u>** Tallgrass Prairies are extremely rare habitats in Ontario.		TPO1 TPO2	No minimum size to site. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has <25% tree cover. In Ecoregion 7E, known tallgrass prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie Shoreline, in Brantfor and in the Toronto area (north of Lake Ontario.	Field studies confirm one or more of the Prairie indicator species listed in Appendix N of SWHTG should be present. Note: Prairie plant spp. list from Ecoregion 7E should be used. • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic species). • SWH MIST Index #19 provides development effects and mitigation measures.	No potential Ecosites not present.	No potential Ecosites not present.
Other Rare Vegetation Communities **<u>Rationale:</u>**		Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG.	ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in Appendix M of SWHTG.	Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG.	No potential No ecosites listed as rare within the SWHTG Appendix M were found within the study	Low potential. MNRF did not identify any additional rare vegetation communities.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
Plant communities that often contain rare species which depend on the habitat for survival.		Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	The OMNRF / NHIC will have up to date listing for rare vegetation communities. Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	• Area of the ELC Vegetation Type polygon is the SWH. • SWH MIST Index #37 provides development effects and mitigation measures.	area.	
Specialized Habitat for Wildlife						
Waterfowl Nesting Area **<u>Rationale:</u>** Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.	American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 Note: includes adjacency to Provincially Significant Wetlands	A waterfowl nesting area extends 120 m from a wetland (>0.5 ha), or a wetland (>0.5 ha) and any small wetlands (0.5 ha) within 120 m, or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur. • Upland areas should be at least 120 m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40 cm dbh) in woodlands for cavity nest sites.	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding Mallards, or; • Presence of 10 or more nesting pairs for listed species including Mallards. • Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April-June). Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects” • A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m from the wetland and will provide enough habitat for waterfowl to successfully nest. • SWH MIST Index #25 provides development effects and mitigation measures.	Low potential. SDW exists within the Study Area, including a Provincially Significant Wetland (PSW) within and adjacent to the Study Area. Only small sections of undisturbed upland habitat suitable as nesting sites exist within the Study Area; most sections are cleared and landscaped as fairway.	High potential. SDW exists within the Study Area Vicinity, including Provincially Significant Wetland (PSW). There are also larger areas of relatively in-tact upland CUM and CUT areas observed through remote sensing.
Bald Eagle and Osprey Nesting,	Osprey	ELC Forest Community Series:	Nests are associated with lakes, ponds, river or wetlands along	Studies confirm the use of these nests by:	Moderate potential	High potential

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
Foraging and Perching Habitat **<u>Rationale:</u>** Nest sites are fairly uncommon in Eco-region 7E and are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	**Special Concern** Bald Eagle	FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands.	forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. • Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms).	• One or more active Osprey or Bald Eagle nests in an area. • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH, maintaining undisturbed shorelines with large trees within this area is important. • For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH. Area of the habitat from 400-800 m is dependent on site lines from the nest to the development and inclusion of perching and foraging habitat. • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for >3 years or suspected of not being used for >5 years before being considered not significant. • Observational studies to determine nest site use, perching sites and foraging areas need to be done from mid March to mid August. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #26 provides development effects and mitigation measures.	There are several FOD and SWD ecosites within the Study Area, but these ecosites are typically adjacent to modified ponds utilized on the course for stormwater management and irrigation. Some of these ponds are considered fish habitat.	Large swaths of deciduous forest/swamp can be found to the west and south of the property, some of which abut the Welland River.
Woodland Raptor Nesting Habitat	Northern Goshawk Cooper's Hawk Sharp-shinned Hawk	May be found in all forested ELC Ecosites.	All natural or conifer plantation woodland/forest stands >30 ha with >4 ha of interior habitat.	Studies confirm: • Presence of 1 or more active nests from species list is considered	Low potential. No forests exist within the	High potential. Forested area exists to the

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
Rationale: Nests sites for these species are rarely identified; these area sensitive habitats and are often used annually by these species.	Red-shouldered Hawk Barred Owl Broad-winged Hawk	May also be found in SWC, SWM, SWD and CUP3.	Interior habitat determined with a 200 m buffer • Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small off-shore islands. • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest.	significant. • Red-shouldered Hawk and Northern Goshawk – A 400 m radius around the nest or 28 ha area of habitat is the SWH. (the 28 ha habitat area would be applied where optimal habitat is irregularly shaped around the nest) • Barred Owl – A 200m radius around the nest is the SWH • Broad-winged Hawk and Coopers Hawk,– A 100m radius around the nest is the SWH. • Sharp-Shinned Hawk – A 50 m radius around the nest is the SWH. • Conduct field investigations from mid-March to end of May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • SWH MIST Index #27 provides development effects and mitigation measures.	Study Area that meet the size criteria for this SWH. Though these forests are adjacent to candidate Woodland Raptor Nesting Habitat, the treed habitats within the study area are fragmented by the Conrail Drain and the rail-line.	south-west of the Study Area that meet the size criteria for this SWH.
Turtle Nesting Areas **Rationale:** These habitats are rare and when identified will often be the only breeding site for local populations of turtles.	Midland Painted Turtle Special Concern Species: Northern Map Turtle Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100 m) or within the following ELC Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	• Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals. • For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments	Studies confirm: • Presence of 5 or more nesting Midland Painted Turtles. • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH. • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100 m around the nesting area dependant on slope, riparian vegetation and adjacent land use is the SWH. • Travel routes from wetland to nesting area are to be considered	Low Potential – Contingent on MNRF response Only small amounts of SA habitat were observed on the golf course. Painted and Snapping Turtles were observed within the irrigation ponds on the Golf Course. It was assessed that sand-traps within fairways are likely the most suitable nesting areas for turtles within golf-	Moderate Potential It is anticipated that turtle nesting habitat may be found within the Study Area vicinity.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
			and shoulders are not SWH. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used.	within the SWH as part of the 30-100 m area of habitat. • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • SWH MIST Index #28 provides development effects and mitigation measures for turtle nesting habitat.	course ponds.	
Seeps and Springs **<u>Rationale:</u>** Seeps / Springs are typical of headwater areas and are often at the source of coldwater streams.	Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps / Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps / springs.	Any forested area (with <25% meadow / field / pasture) within the headwaters of a stream or river system. • Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species.	Field Studies confirm: • Presence of a site with 2 or more seeps / springs should be considered SWH. • The area of a ELC forest ecosite or an ecoelement within ecosite containing the seeps / springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat. • SWH MIST Index #30 provides development effects and mitigation measures	No potential No seeps/springs were found within the Study Area	Unknown potential There may be seeps/springs within forested areas in the Study Area vicinity.
Amphibian Breeding Habitat (Woodland) **<u>Rationale:</u>** These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD Breeding pools within the woodland or the shortest distance from forest	• Presence of a wetland, pond or woodland pool (including vernal pools) >500 m^2 (about 25 m diameter) within or adjacent (within 120 m) to a woodland (no minimum size). Some small wetlands may not be mapped and may be important breeding pools for amphibians. • Woodlands with permanent ponds or those containing water in most years until mid-	Studies confirm: • Presence of breeding population of 1 or more of the listed newt / salamander species or 2 or more of the listed frog species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog species with Call Level Codes of 3. • A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are	Confirmed There is extensive spring flooding within most of the forested ecosites in the Study Area. Amphibian Breeding Surveys confirmed 2 or more listed frog species with Call Level Codes of 3 (Western Chorus Frog, Spring Peeper) within ELC Polygon #26 (Figure ELC).	High potential SWD and FOD ecosites extend southwest from the Study Area.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
		habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians.	July are more likely to be used as breeding habitat.	concentrated around suitable breeding habitat within or near the woodland / wetlands. • The habitat is the wetland area plus a 230 m radius of woodland area. If a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. • SWH MIST Index #14 provides development effects and mitigation measures.		
Amphibian Breeding Habitat (Wetlands) **<u>Rationale:</u>** Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within Central Ontario landscapes.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	ELC Community Classes SW, MA, FE, BO, OA and SA. Typically these wetland ecosites will be isolated (>120 m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g., Bull Frog) may be adjacent to woodlands.	• Wetlands >500 m^2 (about 25 m diameter), supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats. • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators. • Bullfrogs require permanent water bodies with abundant emergent vegetation.	Studies confirm: • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species with at least 20 individuals (adults or eggs masses) or 2 or more of the listed frog/toad species with Call Level Codes of 3 or; Wetland with confirmed breeding Bullfrogs are significant. • The ELC ecosite wetland area and the shoreline are the SWH. • A combination of observational study and call count surveys will be required during the spring (March-June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule.	Moderate potential SA/MA ecosites exist within the Study Area, but they are small and isolated. Those identified within the Study Area are typically associated with drainage channels connected to the irrigation ponds on the southern portion of the golf course.	High potential The PSW extending south-west of the Study Area is a SW ecosite.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
				• SWH MIST Index #15 provides development effects and mitigation measures.		
Woodland Area-Sensitive Bird Breeding Habitat **<u>Rationale</u>:** Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren Pileated Woodpecker **Special Concern:** Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha. • Interior forest habitat is at least 200 m from forest edge habitat.	Studies confirm: • Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. • Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH. • Conduct field investigations in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • SWH MIST Index #34 provides development effects and mitigation measures.	No potential. No forests exist within the Study Area that meet the size criteria for this SWH.	No potential. No forests exist within the Study Area Vicinity that meet the size criteria for this SWH.
Habitat for Species of Conservation Concern (not including Endangered or Threatened Species)						
Marsh Breeding Bird Habitat **<u>Rationale:</u>** Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	American Bittern Virginia Rail Sora Common Moorhen American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Green Heron Trumpeter Swan **Special Concern:** Black Tern Yellow Rail	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1 For Green Heron: All SW, MA and CUM1 sites.	• Nesting occurs in wetlands. • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present. • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water.	Studies confirm: • Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or or 1 pair of Sandhill Cranes; or breeding by any combination of 5 or more of the listed species. • Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH. • Area of the ELC ecosite is the SWH. • Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. • Evaluation methods to follow “Bird and Bird Habitats: Guidelines for	Low potential SA/MA ecosites exist within the Study Area, but they are small and isolated. Those identified within the Study Area are typically associated with drainage channels connected to the irrigation ponds on the southern portion of the golf course.	Moderate/high potential It is anticipated that surrounding areas in the Study Area Vicinity with larger tracts of relatively undisturbed slough forest and wetland are suitable as marsh breeding bird habitat.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
				Wind Power Projects". • SWH MIST Index #35 provides development effects and mitigation measures.		
Open Country Bird Breeding Habitat **<u>Rationale:</u>** This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow **Special Concern** Short-eared Owl	CUM1 CUM2	• Large grassland areas (includes natural and cultural fields and meadows) >30 ha. • Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e., no row cropping or intensive hay or livestock pasturing in the last 5 years). • Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older. • The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species.	Field Studies confirm: • Presence of nesting or breeding of 2 or more of the listed species. • A field with 1 or more breeding Short-eared Owls is to be considered SWH. • The area of SWH is the contiguous ELC ecosite field areas. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" • SWH MIST Index #32 provides development effects and mitigation measures.	No potential The majority of open lands within the Study Area are managed as golf fairway and would be unsuitable as open country bird breeding habitat. Those natural CUM areas that exist are fragmented to the point where they do not meet the area requirement of this SWH criteria.	No/low potential Aerial imagery appears to indicate that no open country ecosites exist within the Study Area Vicinity that meet the size criteria for this SWH.
Shrub / Early Successional Bird Breeding Habitat **<u>Rationale:</u>** This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records.	**Indicator Spp:** Brown Thrasher Clay-coloured Sparrow **Common Spp.** Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher **Special Concern:** Yellow-breasted Chat Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species	• Large field areas succeeding to shrub and thicket habitats >10 ha in size. • Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e., no row-cropping, haying or live-stock pasturing in the last 5 years). • Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species. • Shrub and thicket habitat sites	Field Studies confirm: • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species. • A habitat with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat. • The area of the SWH is the contiguous ELC ecosite field/thicket area. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories.	No potential Shrub ecosites >10 ha in size are not present in the Study Area.	No potential No shrub ecosites exist within the Study Area Vicinity that meet the size criteria for this SWH.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
			considered significant should have a history of longevity, either abandoned fields or pasturelands.	• Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”. • SWH MIST Index #33 provides development effects and mitigation measures.		
Terrestrial Crayfish **<u>Rationale:</u>** Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare.	Chimney or Digger Crayfish (*Fallicambarus fodiens*) Devil Crayfish or Meadow Crayfish (*Cambarus Diogenes*)	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM CUM1 with inclusions of above meadow marsh or swamp ecosites can be used by terrestrial crayfish.	Wet meadow and edges of shallow marshes (no minimum size) should be surveyed for terrestrial crayfish. • Constructs burrows in marshes, mudflats, meadows, the ground can’t be too moist. Can often be found far from water. • Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed.	Studies Confirm: • Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable meadow marsh, swamp or moist terrestrial sites. • Area of ELC ecosite or an ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH. • Surveys should be done April to August in temporary or permanent water. Note the presence of burrows or chimneys are often the only indicator of presence, observance or collection of individuals is very difficult. • SWH MIST Index #36 provides development effects and mitigation measures.	High potential SWD, MAM, and/or MAS ecosites exist within the Study Area.	High potential SWD ecosites exist within the Study Area Vicinity to the southwest.
Special Concern and Rare Wildlife Species **<u>Rationale:</u>** These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre (NHIC).	All plant and animal element occurrences (EO) within a 1 or 10 km grid. Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy.	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites.	Studies Confirm: • Assessment / inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs be easily mapped and cover an	Confirmed (for candidate species see Table SAR SCREENING) *Avian* Black-crowned Night Heron Eastern Wood-pewee Great Egret Wood Thrush *Herpetofauna* Snapping Turtle *Lepidoptera* Monarch Butterfly	High potential Higher quality slough forest exists outside of the project area, therefore it is anticipated that adjacent habitats support SC and rare wildlife species as well.

Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Potential Presence in the On-site Study Area	Potential Presence in the Study Area Vicinity (500 m radius from On-site Study Area)
		ELC Ecosite Codes	Habitat Criteria	Defining Criteria		
				important life stage component for a species, e.g., specific nesting habitat or foraging habitat. • SWH MIST Index #37 provides development effects and mitigation measures.		
Animal Movement Corridors						
Amphibian Movement Corridors **<u>Rationale:</u>** Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.	Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	Corridors may be found in all ecosites associated with water. Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1	Movement corridors between breeding habitat and summer habitat. Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 (Amphibian Breeding Habitat – Wetland) of this Schedule.	• Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites. • Corridors should consist of native vegetation, with several layers of vegetation. Corridors unbroken by roads, waterways or bodies, and undeveloped areas are most significant • Corridors should have at least 15m of vegetation on both sides of waterway or be up to 200m wide of woodland habitat and with gaps <20m. • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat • SWH MIST Index #40 provides development effects and mitigation measures	Low potential SWD ecosites are fragmented with low/no interconnectivity, and the majority of open water within the Study Area is heavily fragmented; these areas are also associated with the irrigation system of the golf course. The Conrail drain offers the highest potential as an amphibian movement corridor. Though the channel is linear and lined with rip-rap, the channel bed is naturalized in areas with emergent and hydro-tolerant plant species.	High potential It is anticipated that the unfragmented segments of the Niagara Slough Forest Complex are large enough that they can be considered AMC connecting the land with the Welland River and any associated wetland areas.