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Xinyi Glass Plant – Stratford

Environmental Impact Study (EIS)

Prepared for:

Xinyi Canada Glass Limited
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NATURAL RESOURCE SOLUTIONS INC.

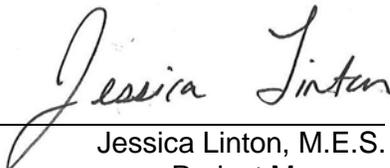
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1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained by Xinyi Canada Glass Limited (the proponent) in October 2018 to undertake an Environmental Impact Study (EIS) for a proposed glass manufacturing facility near Stratford, Ontario. The lands that encompass the proposed development area (referred to herein as the subject property) are Lots 2 and 3, Concession 5 Downie, Township of Perth South, Perth County, Ontario. The subject property is approximately 71 ha in size and is bound by an existing rail line to the northwest, Gibb Road to the north, agricultural lands and Highway 7 to the east, and active agricultural lands to the south (Map 1). Natural features within and adjacent to the property include regulated wetlands, a drainage channel, and woodlands.

The majority of the subject property is currently agricultural land but contains one residential dwelling and associated outbuildings and a small wooded wetland. The proponent is proposing to construct a large float glass manufacturing facility which requires the lands to be rezoned. The lands will also be annexed into the City Stratford.

Designated natural heritage features exist within, and adjacent to, the subject property according to the Perth County Official Plan (2018) Land Use Plan mapping (Schedule 'A'), and have triggered the requirement of an EIS. Additionally, the subject property falls within the Upper Thames River Conservation Authority (UTRCA 2006) regulation limit due to the presence of unevaluated wetland features and a watercourse (Hislop Drain).

The UTRCA (2006) requires that when development or site alteration is proposed within a natural heritage feature or within the adjacent lands, Planning Applications need to be supported by an EIS. The EIS must:

- Confirm the extent of the natural heritage feature and the relationship of the specific feature to other features in the area;
- Confirm the significance of the feature;
- Identify any potential impact of the development or site alteration on the natural heritage feature or natural heritage functions;
- Identify avoidance and mitigation strategies; and
- Integrate natural hazard, natural resource and/or servicing considerations.

This EIS has been prepared in accordance with relevant guidelines for identifying and delineating natural heritage features and the City of Stratford and UTRCA's (2006) EIS guidelines.

The proposed development consists of numerous buildings including a large warehouse, auxiliary buildings, and an office building, with a total footprint of approximately 185,000m² (2,000,000 ft²). Asphalt roadways and parking areas will also be developed. A large stormwater management facility is proposed in the northwestern portion of the subject property. Railway spur lines will be constructed along the western edge of the subject property abutting the existing CN Rail right-of-way. These lines will accommodate storage and movement for the locomotives and rail cars delivering raw material to the facility. In addition to this above ground infrastructure, a deep underground furnace, extending to approximately 15 m below finished floor elevation, is to be constructed within the building footprint.

The facility is expected to operate 24 hours a day, 7 days a week for a minimum period of 12 years, at which point a pre-planned shutdown of the operations will occur for the purposes of maintenance of the furnace. The facility will thereafter continue to operate until the next planned shutdown. The proposed servicing strategy for the site incorporates redundancies to ensure that the facility can continue to operate for this prolonged period (WatlerFedy 2019).

2.0 Project Scoping

The study area includes the subject property where the development is proposed, and the lands within 120m of the property to ensure adjacent natural heritage features were considered. The subject property is generally characterized as active agriculture (i.e. row crops). A residential dwelling, barn, and storage silos are located in the southeastern corner of the subject property. These will be severed from the proposed development and left as a separate lot. There is one isolated treed feature within the subject property that is mapped as 'Natural Resources/Environment' according to the Perth Natural Heritage Systems Study (PNHSS) (2018) and identified as wetland in mapping provided by UTRCA (2006). There are also wetlands and wooded areas immediately adjacent to the eastern, western, and southern boundaries of the property. The Hislop Municipal Drain is a regulated, open channel watercourse located along the northeastern boundary of the property. From the subject property it continues north under Gibb Road and along the CN Rail right-of-way.

An extensive review of background information and a screening exercise were conducted by NRSI biologists to determine if habitat for species at risk or significant wildlife habitat occurred in the study area. The results of this review were used to inform the proposed Terms of Reference for the EIS which was circulated to the UTRCA and City of Stratford. This Terms of Reference, and the results of the screening exercise are provided in Appendix I.

2.1 Relevant Policies, Legislation and Planning Studies

Table 1 summarizes the legislation, policies and planning studies that are specifically relevant to the proposed development in relation to requirements for protection and mitigation during development in Perth County, Ontario.

Table 1. Relevant Legislation, Policies and Planning Studies

Policy/Legislation	Description	Project Relevance
Provincial Policy Statement (OMMAH 2014)	<ul style="list-style-type: none"> • Issued under the authority of Section 3 of the <i>Planning Act</i>, this came into effect on April 30, 2014, replacing the 2005 PPS (OMMAH 2005). • Section 2.1 of the PPS – Natural Heritage establishes clear direction on the adoption of an ecosystem approach and the protection of resources that have been identified as 'significant'. • The Natural Heritage Reference Manual (OMNR 2010) and the Significant Wildlife Habitat Technical Guide (OMNR 2000, OMNR 2015) were prepared by the MNRF to provide guidance on identifying natural features and in interpreting the Natural Heritage sections of the PPS. 	<ul style="list-style-type: none"> • Two natural features were identified within the study area which have potential implications under the PPS: <ul style="list-style-type: none"> • Significant Wildlife Habitat, and • SAR/SCC
Ontario <i>Endangered Species Act (ESA)</i> (2008)	<ul style="list-style-type: none"> • The original ESA, written in 1971, underwent a year-long review which resulted in a number of changes which came into force in 2007. • The ESA prohibits killing, harming, harassing or capturing Endangered and Threatened species and protects their habitats from damage and destruction. 	<ul style="list-style-type: none"> • The potential for species at risk protected by the <i>Endangered Species Act</i> to occur in the study area were identified during the project scoping phase of the project and were considered when developing the Terms of Reference.
Migratory Birds Convention Act (2017)	<ul style="list-style-type: none"> • Established in 1917 and updated in 1997. • Contains regulations to protect migratory birds, their eggs, and their nests from hunting, trafficking and commercialization. • Also outlines protection for birds during development. 	<ul style="list-style-type: none"> • For any development that requires the removal or disturbance of vegetation as part of the construction process, it is necessary to ensure that these activities do not result in harm or disturbance to bird habitat and nests during the breeding season. • Through proper assessment, the threat to bird species covered by the <i>Migratory Birds Convention Act</i> can be assessed and appropriately mitigated if appropriate timeframes are chosen and clearance is permitted.
	<ul style="list-style-type: none"> • Regulation issued under <i>Conservation Authorities Act</i>, R.S.O. 1990. 	<ul style="list-style-type: none"> • The UTRCA is responsible for the regulation and protection of watercourses and drainage areas such as the one found within the subject property.

Policy/Legislation	Description	Project Relevance
Ontario Regulation 157/06	<ul style="list-style-type: none"> Through this regulation, the UTRCA has the responsibility to regulate activities in natural and hazardous areas (i.e., areas in and near rivers, streams, floodplains, wetlands, and slopes). UTRCA requires that an EIS be undertaken in accordance with their <i>Environmental Planning Policy Manual for the Upper Thames River Conservation Authority</i> (2006) 	<ul style="list-style-type: none"> Permitting from the UTRCA must be obtained for proposed works within regulated areas or changes to the drainage features.
<i>Fish and Wildlife Conservation Act</i> (Government of Ontario 1997)	<ul style="list-style-type: none"> The FWCA provides protection for certain bird species, not protected under the MBCA (e.g., raptors), as well as furbearing mammals and their dens or habitual dwellings, asides from the Red Fox (<i>Vulpes vulpes</i>) and Striped Skunk (<i>Mephitis mephitis</i>). 	<ul style="list-style-type: none"> The timing of construction activities, especially vegetation clearing and site grading must have consideration for bird nesting and den sites for furbearing mammals.
Perth Natural Heritage Systems Study (Perth County 2018)	<ul style="list-style-type: none"> The PNHSS provides characterization and identification of natural heritage components throughout Perth County as guided by the Provincial Policy Statement (PPS, 2014) regarding significant ecologically important features and systems. 	<ul style="list-style-type: none"> The wooded area within the subject property is characterized within the PNHSS as: <ul style="list-style-type: none"> An Ecologically important Vegetation Patch; and A Significant Ecologically Important Woodland
Perth County Official Plan (2019)	<ul style="list-style-type: none"> Outlines policies for planning and development within the jurisdiction of the County of Perth. Includes natural environment policies. 	<ul style="list-style-type: none"> The Development Land is located adjacent to the boundary of the City of Stratford within Perth County. As a woodland within the subject property is within Perth County and is considered a Significant Woodland by the County's Official Plan, the proposed development should have regard for the Perth County Official Plan
Perth County Woodlot Tree By-law, No. 3557-2016	<ul style="list-style-type: none"> A by-law to regulate the destruction or injuring of trees in woodlands and woodlots in the County of Perth. 	<ul style="list-style-type: none"> Tree cutting must be completed in accordance with the by-law as per the associated limits, timeframes and mitigations. The exemptions of the by-law include the injuring or destruction of trees imposed as a condition to the approval of a site plan, a plan of subdivision or a consent under the <i>Planning Act</i>.

3.0 Field Methods

Terrestrial field surveys were conducted within the subject property to characterize and identify significant natural heritage features and species that have the potential to be adversely affected by the proposed development. A comprehensive field program was developed and detailed in the TOR (Appendix I). The field program was initiated in October 2018 and was completed by July, 2019. A total of 11 site visits were carried out between late-October, 2018 and mid-July, 2019 to complete a variety of field surveys which are described and summarized below in Table 2.

Following the completion of the bat habitat assessment described in the Terms of Reference, the need for a comprehensive bat monitoring program was identified. The details of this monitoring program and results are provided in the Bat Acoustic Monitoring Report (NRSI 2019) (Appendix II).

Table 2. Summary of Field Survey Methods

Survey Type	Protocol ¹	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed (Beaufort Scale)	Cloud Cover (%)	Precipitation	Observers
Ecological Land Classification (ELC)	Lee et. al. (1998)	October 23, 2018	10:00-16:00	4	2	100	Light Rain	A. Dean
Vascular Flora Inventory (Fall)								
Ecological Land Classification (ELC)	Lee et. al. (1998)	May 22, 2019	10:00-16:00	13	5-6	90	None	A. Dean J. McCarter
Vascular Flora Inventory (Spring)								
Vascular Flora Inventory (Summer)	Lee et al. (1998)	June 28, 2019	10:15-12:00	25	1-2	80	None	A. Dean
Anuran Survey / Amphibian Habitat Assessment*	BSC (2009)	April 23, 2019	18:30-21:30	5	2	100	Light Rain	N. Miller
Bat Habitat Assessment	MNRF (2016 and 2017b)	March 19, 2019	09:00-16:00	4	1	50	None	A. Dean
Bat Acoustic Monitoring	(MNRF 2017)	May 30, 2019 (set up)	12:30-15:15	17-20	1-3	95-100	None	H. Fotherby A. Reinert O. Foster
		June 12, 2019 (equipment check)	15:00-17:00	21	2	50	None	K. MacLellan

Survey Type	Protocol ¹	Date	Start and End Time (24 hrs)	Temp. (°C)	Wind Speed (Beaufort Scale)	Cloud Cover (%)	Precipitation	Observers
		June 21, 2019 (take down)	10:00-16:00	20	2	0	None	K. MacLellan S. Hofstetter
Breeding Bird Survey	OBBA (2001)	June 5, 2019	06:30-10:15	21	5	100	None	E. Gosnell
		June 28, 2019	07:10-10:15	18	1	60	None	A. Dean D. Riley

¹ See Terms of Reference in Appendix I for a detailed description of the methods employed during each survey.

* due to the confirmed absence of amphibian habitat only one survey was completed

4.0 Existing Conditions

4.1 Soil, Terrain and Drainage

Background information indicates that the dominant soil type within the study area is Plainfield soils with imperfect drainage (Chapman and Putnam 1984). Surficial soils are fine-textured glaciolacustrine deposits, glaciofluvial deposits, and sandy till as the study area is situated within the physiographic region of the Stratford Till Plain (Chapman & Putnam 1984). In this region, clay and other glacial sediments were deposited by glacial meltwater covering Stratford and most of the Perth County drainage basin where the underlying bedrock consists of limestone, dolostone, and shale (Chapman and Putnam 1984).

The topography within the subject property ranges from an elevation of approximately 372 m at the center of the site, to approximately 364 m along Gibb Road, and approximately 367 m along Highway 7 (WalterFedy 2019). The hill on the site splits surface drainage to two municipal drain outlets: the Waldie Drain and the Hislop Drain. These municipal drains flow northward towards the City of Stratford (refer to Figure 3 of WalterFedy 2019 for the existing drainage catchment areas).

4.2 Vegetation

4.2.1 Vegetation Communities

Vegetation communities within and adjacent to the subject property are summarized in Table 3 and shown on Map 2. ELC data sheets are provided in Appendix III.

Table 3. Vegetation Communities Identified within the Study Area

ELC Ecosite Type/Location	ELC Description	Environmental Characteristics
Deciduous Swamp		
SWD3-3 Woodland B Woodland A Woodland D Woodland E	Swamp Maple Mineral Deciduous Swamp Type	This swamp community is represented by a small feature (Woodland B) within the subject property and three features adjacent to the property boundary (Woodland A, Woodland D, and Woodland E). The community's canopy layer is dominated by Freeman's Maple (<i>Acer X freemanii</i>), White Elm (<i>Ulmus americana</i>), and Green Ash (<i>Fraxinus pennsylvanica</i>). Similarly, within the sub-canopy; Freeman's Maple, Green Ash and White Elm are dominate. Green Ash, European Buckthorn (<i>Rhamnus cathartica</i>), and Canada Elderberry (<i>Sambucus canadensis</i>) are common within the understory. Groundcover is largely dominated by Dwarf Raspberry (<i>Rubus pubescens</i>), White Avens (<i>Geum canadense</i>), and Sensitive Fern (<i>Onoclea sensibilis</i>).
Sugar Maple Deciduous Forest		
FOD5 Woodland C	Deciduous Forest	Located adjacent to the subject property (southwest), this small community's canopy layer is dominated by Sugar Maple (<i>Acer saccharum</i>), American Basswood (<i>Tilia americana</i>), and Black Cherry (<i>Prunus serotina</i>). The sub-canopy is dominated by Sugar Maple, White Elm and White Ash (<i>Fraxinus americana</i>). Understorey species include Choke Cherry (<i>Prunus virginiana</i>), and Alternate-leaved Dogwood (<i>Cornus alternifolia</i>) and ground cover is dominated by Trout Lily (<i>Erythronium americanum</i>), Giant Blue Cohosh (<i>Caulophyllum giganteum</i>), and Starry False Solomon's Seal (<i>Smilacina stella</i>).
Sugar Maple Hardwood Deciduous Forest		
FOD6-5 Woodland D	Maple Forest	Located outside the subject property (southwest), this community surrounds a maple swamp. The canopy is dominated by Sugar Maple, American Basswood, White Elm and American Beech (<i>Fagus grandifolia</i>). The sub-canopy layer is dominated by Sugar Maple, Hop Hornbeam (<i>Ostrya virginiana</i>), and White Ash. Understorey species include Choke Cherry, Alternate-leaved Dogwood and Red Elderberry, and the ground cover layer is dominated by Trout Lily, Running Strawberry (<i>Euonymus obovata</i>), and Early Meadow-rue (<i>Thalictrum dioicum</i>).

ELC Ecosite Type/Location	ELC Description	Environmental Characteristics
Lowland Deciduous Forest Ecosite		
FOD 7 Woodland A Woodland B	Lowland Forest	This forest community surrounds a deciduous swamp in both Woodland A and Woodland B within the study area. Although moist, it represents a transition to an upland community. The community's canopy layer is dominated by Freeman's Maple, White Elm, and Green Ash. Similarly, within the sub-canopy; Freeman's Maple, Green Ash and White Elm are dominate. Green Ash, European Buckthorn, and Canada Elderberry are common within the understory. Groundcover is largely dominated by Dwarf Raspberry, White Avens, and Sensitive Fern.
Open Agricultural Fields		
Agricultural Row Crop		Lands within the subject property adjacent to the identified swamp and forest communities contain row crops which sustain agricultural production within the study area. Agricultural areas are often heavily disturbed and contain a variety of invasive species and low-quality habitat for most species. Rotational crops may maintain various ground nesting birds and areas for foraging for various wildlife but provide little diversity regarding vegetation communities.

4.2.2 Vascular Flora

Detailed vegetation inventories resulted in the identification of 94 plant species in ELC polygons within the study area. The majority of the study area is agricultural row crop which provides little vegetation diversity and nearly 20% of species observed are exotic (Oldham et al. 1995). In total, NRSI biologists identified roughly 11% of the plant species reported from the region (Oldham 1993). A complete list of vascular flora species observed within the subject property is provided in Appendix III.

4.3 Wildlife

4.3.1 Birds

In total, 101 bird species are reported from the vicinity of the study area based on data from Ontario Breeding Bird Atlas (OBBA) Squares 17MH90, 17MH99, and 17NH09 (BSC et al. 2006). The data from the OBBA includes those species that have been observed within the 10km x 10km squares overlapping the study area, are reported to nest within the study area, and/or have exhibited evidence of breeding. During 2019 breeding bird surveys, 32 of the total bird species were observed by NRSI biologists within the study area. Of these species, 21 were

observed exhibiting probable signs of breeding, such as males singing or birds carrying food or nesting materials. In total, two species were confirmed to be breeding within the subject property: American Robin (*Turdus migratorius*), and European Starling (*Sturnus Vulgaris*). A complete list of bird species reported from the subject property along with the highest evidence of breeding observed is provided in Appendix IV.

Eastern Wood-Pewee is a SCC as it is listed as Special Concern provincially and federally. Habitat for the species is not protected under the ESA; however, confirmed breeding habitat within appropriate woodland is considered Significant Wildlife Habitat (SWH) under the MNRFs guidelines for SWH (OMNR 2000, MNRF 2015b). Eastern Wood-pewee is predominantly found in deciduous forests, specifically along edge habitats and wet areas near bodies of water (Watt et al. 2017). This species was documented in Woodland A, B, D, and E during the breeding bird surveys on June 5 and June 28, 2019. Singing males on territory were recorded at these locations, with suitable nesting habitat found in the subject property throughout the deciduous woodland and swamp communities. Further discussion in addressing SWH for this species is provided in Section 5.2.

4.3.2 Herpetofauna

In total, 13 herpetofauna species are reported from the vicinity of the study area based on data according to the Ontario Reptile and Amphibian Atlas (ORAA) Squares 17MH90, 17MH99, and 17NH09 (Ontario Nature 2018). Field surveys conducted by NRSI biologists in 2019 confirmed the absence of suitable amphibian breeding habitat within the study area and only one amphibian (American Toad (*Anaxyrus americanus*)) was observed adjacent to the subject property. No other amphibians or reptiles were observed and no features considered suitable for breeding or hibernation were documented. A complete list of herpetofauna species reported from within the subject property is provided in Appendix V.

4.3.3 Mammals

According to the Mammal Atlas of Ontario (Dobbyn 1994), 35 mammal species are reported from the vicinity of the subject property. Three species of mammals or their signs (e.g. tracks, scat, dens) were observed incidentally during site visits including White-tailed Deer (*Odocoileus virginianus*), Northern Raccoon (*Procyon lotor*), and Eastern Gray Squirrel (*Sciurus carolinensis*). During targeted bat surveys Hoary Bat (*Lasiurus cinereus*), Silver-haired Bat (*Lasionycteris noctivagans*), Eastern Red Bat (*Lasiurus borealis*), Little Brown Myotis (*Myotis lucifugus*), and Big Brown Bat (*Eptesicus fuscus*) were documented flying within the study area.

The detailed results of the bat monitoring program are provided in Appendix II and a complete list of mammal species reported from the vicinity of the study area is provided in Appendix VI.

4.3.4 Butterflies

According to the Ontario Butterfly Atlas (MacNaughton et al. 2018), 12 Lepidoptera (butterfly & moth) species are reported from within the vicinity of the study area. A single butterfly species at risk, Monarch (*Danaus plexippus*), is reported from the vicinity of the study area however meadow and open habitats with abundant Milkweed (*Asclepias* spp.), their larval food plant, is absent from the subject property. In general, habitat for butterflies is limited within the subject property to common species typically associated with disturbed or agricultural habitats. No targeted surveys for butterflies were therefore conducted to inform this EIS.

4.3.5 Odonata

According to the Ontario Odonata Atlas (OMNR 2005; MNRF 2018), no odonata (dragonfly and damselfly) species are reported from the vicinity of the study area. Additionally, during field surveys, NRSI biologists did not observed any odonata species.

5.0 Significance and Sensitivity of Natural Features

5.1 Woodlands and Wetlands

The small (0.96 ha) wooded area within the subject property is characterized by a swamp area with a perimeter of disturbed upland woodland. It was not observed to provide amphibian breeding habitat or suitable habitat for reptile hibernation. Birds showing probable signs of breeding or confirmed to be breeding within the feature are common within the agricultural landscape of Ontario. The vegetation within the wooded area is characterized by very common or common species in Ontario, many of which are exotic in the province. The form and limited ecological function of this feature is typical given it is fragmented, small, and has been exposed to disturbance associated with agricultural activities for several decades. The most important function of this feature identified was its apparent importance in providing foraging habitat for local bats, especially Big Brown Bats.

5.2 Significant Wildlife Habitat

Based on background information and a desktop analysis, seven candidate SWH types were identified as having the potential to occur within the subject property: Bat Maternity Colonies, Snake Hibernaculum, Seeps and Springs, Habitat of Amphibian Breeding (Woodland), Habitat of Marsh Bird Breeding, Habitat of Terrestrial Crayfish, and Habitat of Special Concern and Rare Wildlife Species. Based on the results of field surveys, no SWH types were identified as confirmed or candidate within the subject property. A single SWH type was confirmed within the study area, on lands adjacent to the subject property: Special Concern and Rare Wildlife Species (Eastern Wood-pewee).

Special Concern and Rare Wildlife Species (Eastern Wood-pewee) confirmed SWH identified on adjacent lands is discussed in further detail below.

Special Concern and Rare Wildlife Species (Eastern Wood-Pewee)

Species of Conservation Concern are species with a provincial S-rank of S1 to S3, species listed as species of Special Concern provincially, or species listed as Endangered or Threatened nationally with no provincial designation (i.e. not protected by the *Endangered Species Act*). Confirmed habitat for Species of Conservation Concern is considered Significant Wildlife Habitat where suitable habitat is present (OMNR 2000).

Although Eastern Wood-Pewee was observed on the subject property, a review of the criteria included in Appendix Q of the SWHTG (OMNR 2000) for the determination of significance of habitat for Species of Conservation Concern shows that habitat for Eastern Wood-Pewee in the subject property (Woodland B) should not be considered significant. The wooded area is small, isolated within the agricultural landscape, and disturbed. SWH is however present in adjacent lands (Woodlands A and D) where suitably-sized habitat is found. This conclusion is based on several factors described below in Table 4.

Table 4. Habitat of Species of Conservation Concern Significant Wildlife Habitat Evaluation (Eastern Wood-Pewee)

Important Evaluation Criteria (OMNR 2000)	Suggested Guidelines (OMNR 2000)	Evaluation Comments
Degree of rarity of species found at site	<ul style="list-style-type: none"> -Habitats of the rarest species are more significant than those of less rare species. For example, habitats for species ranked S1 and S2 should be considered more significant than habitats for species ranked S3. Species ranked as vulnerable by the OMNR should also be considered significant. -Less rare species and their habitats in the planning area may be deemed species of conservation concern by the municipality based on such factors as the number of known occurrences, total extent of remaining habitat, degree of threat or risk to habitat, and/or local interest in a particular species. -If a species' habitat is to be protected, sufficient area (based on the species' known requirements) should be retained to ensure a viable and sustainable population. 	The Eastern Wood-Pewee is an abundant breeder in Ontario and is ranked S4B. However, it has been designated a species of Special Concern both provincially and nationally and is considered regionally significant and rare.
Documented significant decline in a species and/or its critical habitat	<ul style="list-style-type: none"> -The habitat for species experiencing the greatest declines is most significant. -The habitat for declining species that has the lowest representation in the planning area is more significant. -Those habitats that provide the best opportunity for the long-term sustainability of the declining species are most significant (e.g., large well-protected sites; sites that best meet the species' habitat requirements; sites with good connections to other similar habitats). 	Eastern Wood-Pewee has experienced >50% decline in population in Ontario from 1970 to present day (COSEWIC 2012()), despite abundant habitat throughout its range. Suitably sized habitat (>2ha) is not present within the subject property (Woodland B).

Important Evaluation Criteria (OMNR 2000)	Suggested Guidelines (OMNR 2000)	Evaluation Comments
Species whose range is solely in Ontario	<ul style="list-style-type: none"> -Habitat for those species with the poorest representation within the region is more significant. -These species and their habitats are significant even if well represented in the planning area, due to high provincial responsibility for their protection. 	Habitat for Eastern Wood-Pewee is relatively common throughout southern Ontario and Perth County in isolated and connected woodlands.
Condition of existing habitat on site	<ul style="list-style-type: none"> -Sites that provide habitat that best meets the survival requirements of the target species and that also include a natural buffer zone are most significant (i.e. most likely to sustain species/population over the long-term). -Sites that contain the fewest non-native species of potential threat to the target species are significant. -Undisturbed or least-disturbed habitats (e.g., no/few deleterious impacts from roads, human activities) are significant. -Sites capable of producing a large number of individuals of a single species of conservation concern are significant. -Highly diverse sites that support one or more species of conservation concern are most significant. 	The woodland on the subject property may provide breeding habitat for a single pair of Eastern Wood-Pewee in some years, however suitably-sized habitat which could maintain multiple Eastern Wood-Pewee breeding territories is not present. There is no natural buffer zone around the habitat and it has a high proportion of non-native species.
Size of species population at site	<ul style="list-style-type: none"> -Habitats supporting large populations of a several species of conservation concern are most significant. -Habitat supporting large populations of a single species is significant. 	No other species of conservation concern or large populations of any species were documented in the woodland.
Size and location of habitat	<ul style="list-style-type: none"> -Large sites supporting large populations of several species of conservation concern are most significant. -Large sites are generally more significant than most comparable but smaller sites. -Sites large enough to ensure long-term support and viability of species of conservation concern are significant. -Sites with large areas of suitable habitat that are also connected to other potentially suitable habitat and/or natural areas are most significant. 	The subject property provides a relatively limited area (<1ha) of naturalized habitat for long-term support or connectivity to other areas of suitable habitat.
Potential for long term protection of the habitat	<ul style="list-style-type: none"> -Habitats that provide the best opportunity for long-term protection are usually more significant than similar habitats with little opportunity for protection or facing an uncertain future due to potential threats (e.g., habitat 	Main threats to Eastern Wood-Pewee are not primarily related to suitable breeding habitat loss but rather the loss of wintering habitat. The subject property is relatively isolated within the

Important Evaluation Criteria (OMNR 2000)	Suggested Guidelines (OMNR 2000)	Evaluation Comments
	<p>found in a large natural area vs. an isolated site close to an expanding residential development).</p> <p>-Habitats threatened with degradation or loss are more significant than similar, but currently unthreatened habitats, if they can be protected.</p> <p>- Habitats of species currently experiencing severe population declines in Ontario (e.g., grassland bird species) due to habitat loss are most significant.</p> <p>-Habitats of species currently experiencing significant population declines in the municipality are significant.</p>	<p>existing landscape which is dominated by row-crop agriculture.</p>
Representation of species/habitat within the municipality	<p>-Poorly represented habitats for species of conservation concern are significant.</p> <p>-Habitats that could be lost or severely degraded and cannot be replaced by similar habitats in the planning area, are highly significant.</p>	<p>Habitats for Eastern Wood-Pewee are well represented in Perth County Woodlands are recognized as an important part of the natural heritage system but a compensated replacement is to be established.</p>
Evidence of use of the habitat	<p>Sites with documented traditional use by species are most significant.</p>	<p>Historical data on the use of the site by Eastern Wood-Pewee is not available, however it is likely that suitable habitat has been present historically within the study area.</p>
Species of particular interest to the planning authority	<p>Sites providing the best examples of habitat that will ensure the long-term sustainability of the species are significant.</p>	<p>Eastern Wood-Pewee are found in abundance in areas outside of the planning authority.</p>

Based on the criteria outlined in Table 4, woodland habitat within the subject property represent suitable breeding habitat for Eastern Wood-Pewee but are not considered SWH due to their small extent, character, and position within the landscape. Significant Eastern Wood-Pewee habitat is however may be present in the lands directly adjacent to the subject property in Woodlands A and D.

5.3 Habitat for Species at Risk

One species at risk afforded protection under the *Endangered Species Act* (ESA), Little Brown Myotis, was detected within the study area. This species was documented during acoustic

surveys along the edge of the woodland within the subject property. Therefore, this feature is considered candidate foraging and movement/travel corridor habitat for bats.

The proposed development will require the removal of the entire 0.96 ha woodland. The MECP has indicated that to proceed with woodland removal there needs to be a confidence that 1) the woodland is not maternity roost for SAR bats, and 2) that if the woodland provides foraging habitat that it will not be limiting the species if removed (M. Karam pers. comm. 2019). Based on the small number of Little Brown Myotis (n=2) and potential Myotis (n=10) bat pass sequences recorded and the timing of these recordings, the data does not suggest that the woodland provides maternal roosting habitat. There is evidence that a small number of bats use the woodland as foraging and/or as a travel corridor, however, alternate foraging areas and movement or travel corridors are available within close proximity of the subject property. Furthermore, the development will result in a large, landscaped stormwater management area which is likely to provide an increased area of foraging habitat within the subject property. Based on this analysis, in combination with the mitigation proposed below, it is not anticipated that a permit under the ESA (2008) will be required to remove the woodland.

The details of this assessment are described in the attached Bat Acoustic Monitoring Report (Appendix II), which should be circulated to the MECP and MNRF for review and comment.

6.0 Recommended Buffers

Buffers are recommended for retained natural heritage features to protect their form and function from impacts during and post-development. The outer limit of the buffers establishes the outer boundary of the protected natural features and the constraints to guide development activities within the subject property. A 10m buffer is recommended from the dripline edge of the two adjacent off-site woodlands (Woodland C and Woodland D) in order to protect the trees and their root zones (Map 4). All development, including any form of construction or grading, is to remain outside of the recommended buffer limits.

Woodland E is separated from the subject property by an existing rail line, therefore no buffers are required to protect the root zones of these trees. Woodland A will be removed as part of an adjacent development pursuit by the City of Stratford.

7.0 Impact Analysis and Recommendations

Details of the proposed development are included in the following supporting documents: Functional Servicing and Stormwater Management Report (Draft) (WalterFedy 2019), and Geotechnical Investigation – Proposed Industrial Development (Revised Draft) (Pinchin 2019). Refer to Map 4 for the proposed site plan.

7.1 Description of the Proposed Undertaking

The proponent is proposing construction of an industrial float glass manufacturing facility with associated warehousing, auxiliary buildings for materials storage and handling, water circulation, energy recovery, offices, and an Emergency Preparedness Centre. The development will consist of numerous slab-on-grade buildings with an approximate area of 2,000,000 square feet. Part of the construction involves a deep underground furnace extending 15m below finished floor elevation. The majority of the facility will be paved asphalt to facilitate truck traffic and for employee parking. Railway spur lines along the western property limits will be constructed adjacent to the CN Rail right-of-way to support the operations. A large (approximately 8ha) stormwater management facility will also be constructed in the northwest portion of the property.

The stormwater management (SWM) strategy involves collection of runoff from minor storm events into a storm sewer system directing into the stormwater management pond; flows from major storm events will also be directed to the west and north towards the stormwater management pond. The SWM facility is intended to provide peak flow attenuation, quality and erosion control, and water balance mitigation, according to provincial, municipal and UTRCA standards. Refer to the Functional Servicing and Stormwater Management Report (WalterFedy 2019) for a more fulsome description, modelling, and analysis of the stormwater management design and associated grading plan.

Compensation for the removal of Woodland B has been agreed to in principle subject to compensation by the UTRCA during an agency/team meeting held on August 21, 2019 and is further detailed in Section 8. Aside from the removal of Woodland B, the proposed development will not encroach into adjacent natural features or their recommended buffers.

7.2 Impact Analysis, Mitigation and Net Effects

Potential impacts arising from the proposed development are determined by comparing the details of the proposed development with the characteristics of the existing natural features and their functions. Where the development proposal overlaps with the natural features or their buffers, impacts may arise. The following is a description of the types of impacts which will be discussed.

- Direct impacts to the natural features within the study area associated with disruption or displacement caused by the actual proposed 'footprint' of the undertaking.
- Indirect impacts associated with changes in site conditions such as drainage and water quantity/quality.
- Induced and cumulative impacts associated with impacts after the development is constructed such as subsequent demand on the resources created by increased habitation/use of the area and vicinity over time.

Impacts, mitigation measures and net effects are detailed in Table 5. The table details the impact of all components of the proposed development.

Table 5. Impact Assessment, Mitigation Measures, and Net Effects

Source of Potential Impact	Impact Type	Ecological Feature or Function Effected	Potential Impact	Mitigation Measures	Net Impact
Land Use Impacts					
Development of glass plant and associated infrastructure Interruption of wildlife corridors	Direct Cumulative	Woodland B (Proposed removal of Woodland A on adjacent site)	- direct loss of SAR and non-SAR bats - loss of Candidate Foraging and Movement/Travel Corridor for Little Brown Myotis	<ul style="list-style-type: none"> • Install tree protection fencing prior to construction activities and maintain 10m buffers to off-site woodland features. • Compensate for the removal of Woodland B in the form of tree planting. <ul style="list-style-type: none"> • 1ha on-site and 2ha off site will be planted with trees (See Section 8). • In addition to the compensation plan identified for the property, the SWM facility should be naturalized to attract a diversity of aerial insects and increase foraging opportunities for bats and birds. • Mitigation measures are listed below for bats and are based on the most recent guidance from MECP, MNRF, and Bat Conservation International: <ul style="list-style-type: none"> • Vegetation and tree removal required must occur outside of the bat active period between April 1st and October 31st to avoid direct impacts to SAR and non-SAR bats. • The woodland area will be compensated appropriately through a compensation plan with specific focus on increasing foraging habitat through native plantings which are known to support bat species (See Section 8). • The MNRF, MECP, and UTRCA should be provided the opportunity to review and comment on the compensation plan. 	Medium-High

Source of Potential Impact	Impact Type	Ecological Feature or Function Effected	Potential Impact	Mitigation Measures	Net Impact
				<ul style="list-style-type: none"> • Two modular bat condos will be installed on the property. One in full sun by the SWM pond and one in the partial shade in the buffer area of Woodland D. • One Standard Universal 4 Chamber Bat House will be installed by the SWM Pond. • Two rocket bat roosting structures will be installed. One in full sun by the SWM pond and one in the partial shade in the buffer area of Woodland D. • Monitoring for a minimum of five years following installation is recommended to assess the use and continued use of the structure(s). Survey methodology should follow those outlined in the MNRF Guelph District protocol for the Use of Buildings and Isolated Trees by Species at Risk Bats (MNRF 2014). • Newly compensated forests and artificial roosting structures should consider; avoiding areas with artificial lighting that would cause light wash effects on the compensation area to the greatest extent possible; strive to create diversified edges that will provide sheltered areas to promote higher insect concentrations; promote vegetation structural diversity; consider a variety of vegetation types from trees to shrubs to herbaceous 	

Source of Potential Impact	Impact Type	Ecological Feature or Function Effected	Potential Impact	Mitigation Measures	Net Impact
				vegetation promotes greater insect diversity and cover for bats; consider planting tree species that bats are known to prefer for roosting habitat (see above); and avoid the use of pesticides during regular maintenance operations on the site (JNCC 2001).	
<p>Interruption or change of surface water and groundwater flows (water balance) and quality (temperature)</p> <p>Increased hard surface/decrease in infiltration</p>	Indirect	Groundwater resources; local watercourses	-Changes to water balance and on-site drainage patterns, increased runoff	<ul style="list-style-type: none"> • Appropriately designed SWM and drainage on-site to meet municipal, provincial, and UTRCA standards. • Maintenance of a permanent pool at approximately the same elevation of existing groundwater level, in combination with a small earthen berm in the downstream receiving channel (Hislop Municipal Drain), will assist in maintaining baseflow supply for water balance mitigation (WalterFedy 2019). • Outlet structure of SWM facility will be constructed with cooling trenches to mitigate temperature loading of discharge flows to Hislop Municipal Drain (WalterFedy2019). 	Low
Construction Impacts					
Site grading, during construction activities (erosion from runoff and sedimentation)	Indirect	Local watercourses, natural features on-site and adjacent	<p>-Potential for soil erosion and sedimentation of local watercourses and natural features</p> <p>-Potential impact to tree root zones</p>	<ul style="list-style-type: none"> • Sediment and erosion controls to be implemented during construction will include stabilized construction entrances, a perimeter silt fence, installation of coir log check dams, construction of sediment basins, and diversion swales (WalterFedy 2019). • An Erosion and Sediment Control (ESC) plan is required to be prepared to help 	Low

Source of Potential Impact	Impact Type	Ecological Feature or Function Effected	Potential Impact	Mitigation Measures	Net Impact
				<p>control and reduce the sediment load of runoff which may flow towards nearby surface water features or vegetated areas.</p> <ul style="list-style-type: none"> • Prior to the start of any construction, all erosion and sediment control (ESC) measures installed will be inspected to ensure adequate functionality (WalterFedy 2019). • Regular monitoring of sediment fences and other ESC measures, particularly following large rain events, according to ESC management recommendations by WalterFedy (2019). • Heavy-duty silt fencing is to be installed along sections of the site adjacent to the Hislop Municipal Drain; light-duty silt fencing is appropriate in all other locations and around the perimeter of all stockpiles (WalterFedy 2019). • Inspection of buffer areas to ensure no unauthorized construction encroachments, vegetation damage, or other disturbances. • Re-establishing vegetative cover in disturbed areas following the completion of the construction work is recommended. Hydroseeding of stockpiles is recommended if stockpiles remain undisturbed for extended periods (WalterFedy 2019). • Implement sediment control measures at the discharge point of any dewatering systems for servicing trenches/excavations (Pinchin 2019). 	

Source of Potential Impact	Impact Type	Ecological Feature or Function Effected	Potential Impact	Mitigation Measures	Net Impact
				<ul style="list-style-type: none"> All grading activities will adhere to the ESC mitigation measures for temporary sediment control ponds as recommended by WalterFedy (2019). All ESC measures will be removed and appropriately disposed of following construction (WalterFedy 2019). Maintain 10m buffers to off-site woodland features. 	
Site clearing and vegetation removal	Direct and Indirect	Natural features on-site	<ul style="list-style-type: none"> -Disruption to migratory birds and their nests -Soil instability, resulting in erosion and sedimentation -Tree removal -Disruption to local wildlife 	<ul style="list-style-type: none"> All vegetation and tree removal required as part of the proposed development must occur outside of the bat active period between April 1st and October 31st to avoid direct impacts to SAR and non-SAR bats Vegetation removal is recommended to occur outside of the breeding and nesting season for migratory birds, approximately April 1 to August 31 for bird species in forested habitats (CWS 2018a,b). Should vegetation removal be required during the nesting season for migratory birds, surveys for nesting birds must be undertaken. Stabilize soils following vegetation removal and grading, by seeding the area with appropriate cover crop (i.e. Annual Rye, <i>Lolium multiflorum</i>) to reduce the potential for sedimentation and erosion, where appropriate. Maintain vegetation wherever possible. Maintain 10m buffers to off-site woodland features. 	Low

Source of Potential Impact	Impact Type	Ecological Feature or Function Effected	Potential Impact	Mitigation Measures	Net Impact
Scarring and damage to vegetation by machinery Decreased health of vegetation from dust and sedimentation Introduction of non-native species	Direct and Indirect	Natural features adjacent	-Damage to vegetation from construction activities	<ul style="list-style-type: none"> Maintain 10m buffers to off-site woodland features. Install silt fencing at grading limits to demarcate construction zone and establish separation to adjacent natural features. Develop and implement an ESC plan. Implement Best Management Practices to minimize risk of spreading invasive species to adjacent natural features through construction equipment. 	Low
Machinery maintenance	Direct and Indirect	Natural features adjacent, groundwater resources, local watercourses	-Potential contamination of soil, vegetation, water	<ul style="list-style-type: none"> All machinery maintenance to be done in a designated area at a high elevation point on-site, where possible. Implement Best Management Practices, spill action response plan, and spill contingency plan for fuel handling, storage, and on-site equipment maintenance activities. Contractors on-site should ensure construction equipment is in good working order. Equipment operators should have spill prevention kits available. 	None
Land Use Management Impacts					
Property maintenance Road salt use Non-native species planting Lighting	Indirect	Natural features adjacent, groundwater resources, local watercourses	-Potential impact to adjacent woodland features, Wellhead Protection Area	<ul style="list-style-type: none"> Maintain 10m buffers to off-site woodland features. Implement snow and salt management recommendations and Best Management Practices (WalterFedy 2019). Implement Best Management Practices for lighting infrastructure to effectively direct 	Low to Medium

Source of Potential Impact	Impact Type	Ecological Feature or Function Effected	Potential Impact	Mitigation Measures	Net Impact
				<p>light and minimize disruption to local wildlife.</p> <ul style="list-style-type: none"> • Limit use of commercial fertilizers and herbicides in landscaped areas. • Only native species should be used for on-site landscaping. 	

8.0 Woodland Compensation Plan

To compensate for the loss of the 0.96 ha woodland on the subject property, a compensation plan has been developed following with consultation with UTRCA, MECP, MNRF, and the County of Perth. Slightly more than a 3:1 woodland compensation plan has been developed, with compensation areas totaling 3 ha. A portion of the compensation will occur in undeveloped areas of the subject property and a portion will occur off-site on lands owned by the County of Perth. Table 6 describes recommendations and requirements communicated by agencies consulted with regard to compensation and how, and to what extent, these were incorporated into the plans developed. Maps 5a and 5b provide detailed planting plans for the subject property and Map 6, prepared by the UTRCA, provides a general planting plan for the additional compensation lands identified by the County (Kirkton Arboretum).

Table 6. Agency Recommendations and Requirements for the Woodland Compensation Plan

Agency	Recommendations and/or requirements ²	Compensation Details
County of Perth (Rebecca Clothier)	<ul style="list-style-type: none"> • Woodland area compensation at a replacement ratio of 3:1 must be implemented. • A ratio of 1:1 of the tree planting must occur on the subject property. • The property to be used for the off-site 2:1 tree replacement planting is the Kirkton-Woodham Arboretum (legally described as Concession West Boundary Part Lot 11). • County Council must approve the compensation on County lands. 	<ul style="list-style-type: none"> • Woodland compensation is proposed at slightly more than 3:1 (3ha total). <ul style="list-style-type: none"> • 1 ha of land will be planted along the southern property boundary. This planting plan will enhance buffer areas from off-site woodlands and will provide a vegetated connection between woodlands. • 2ha of land will be planted within the Kirkton-Woodham Arboretum. This was approved by County Council during the October 3, 2019 Council meeting. • Plantings will consist of a mix native tree species (depending on availability): <ul style="list-style-type: none"> • Shagbark Hickory • Bitternut Hickory • Sugar Maple • Red Maple • Northern Red Oak • White Oak American Elm
UTRCA (Brenda Gallagher and Spencer McDonald)	<ul style="list-style-type: none"> • Compensation planning must achieve a net benefit (i.e. more than 1:1). • The compensation plan should consider the area of woodland being lost (not the number of individual trees). • Plantings may be phased in over time. • Compensation areas should be designated as Open Space to 	

² Recommendations and requirements are reiterated here from correspondence with agency representatives to Jessica Linton (NRSI) and are not necessarily verbatim.

Agency	Recommendations and/or requirements ²	Compensation Details
	<p>ensure they will not be developed in the future.</p> <ul style="list-style-type: none"> Plant material should be native and appropriate for the soil conditions at the compensation site. For small area plantings larger caliper trees are desirable, for larger area plantings whips may be used. 600 trees per acre (2.5 hectares) is recommended for whip plantings while 100-200 trees per acre is recommended for larger trees. 	<ul style="list-style-type: none"> White Cedar Black Cherry Sycamore, and/or Hackberry With regard to bat habitat improvements: <ul style="list-style-type: none"> The majority of trees listed above are desirable species for attracting bats and their insect prey. In addition to the tree plantings in the on-site compensation area, the SWM pond area (8ha of open water) will be landscaped and planted with a variety of trees and shrubs. To improve bat habitat, a total of 5 bat roosting structures will be erected on the subject property and strategically placed to receive different amounts of daylight exposure and adjacent to existing vs. created habitat to monitor differences in habitat use (Map 5a). This approach is based on Bat Conservation International's most recent recommendations. All structures will be within 500m of existing (un-impacted) woodlands off site and within the proposed tree planting areas. A 5 year monitoring program will examine structure use to inform future compensation planning for reviewing agencies.
MECP (Michelle Karam)	<ul style="list-style-type: none"> With regard to Species at Risk bats, woodland removal will not contravene <i>the Endangered Species Act</i>, if 1) there are no maternity roosts for SAR bats, and 2) if the area is foraging habitat: that it will not be limiting the species if it is removed i.e. there are other foraging opportunities close and accessible enough to their roosts. If there is confidence in 1 and 2 above, then proposed timing windows and other proposed mitigation may help to increase the use of the site. 	
MNRF (Graham Buck)	<ul style="list-style-type: none"> With regard to non-SAR bats, if the feature is identified as SWH management approaches should be applied to demonstrate that the bats, if present, will not be adversely impacted. This includes timing the work to avoid direct impacts to roosting bats and providing artificial roosts. The home range of a female big brown bat is 2500 to 3000 ha, therefore a new roost placed within 500 meters from the forest could be used by the female big brown bats. 	

9.0 Monitoring

During, and post-construction monitoring are recommended as a means to ensure the adjacent natural features are adequately protected, and that the construction mitigation and habitat compensation measures are functioning as intended. The recommended monitoring components are described below. A fulsome Monitoring Plan will be prepared during the detailed design phase in collaboration with the study team and provided as a consolidated standalone document, to the satisfaction of the City and UTRCA, and MNRF.

9.1 During Construction

- Prior to the start of any construction, all erosion and sediment control (ESC) measures installed will be inspected to ensure adequate functionality (WalterFedy 2019).
- Regular monitoring of sediment fences and other ESC measures, particularly following large rain events, according to ESC management recommendations by WalterFedy (2019)
- Inspection of buffer areas to ensure no unauthorized construction encroachments, vegetation damage, or other disturbances.
- Fueling of machinery to be undertaken at designated location away from wetlands and watercourses (i.e. at least 30m).
- Storage of machinery and material, fill, etc. in designated areas.

9.2 Post-Construction

The proposed mitigation includes vegetation and wildlife habitat compensation for the removal of Woodland B. This will involve tree planting in addition to the installation of two artificial bat roost structures. Monitoring related to the compensation plan will include:

- Monitoring of artificial roost structures for a minimum of five years following installation to is recommended to assess the use and continued use of the structure(s). Survey methodology should follow those outlined in the MNRF Guelph District protocol for the Use of Buildings and Isolated Trees by Species at Risk Bats (MNRF 2014).
- In addition to the annual health inspections of plantings surrounding the stormwater management facility, a two year warranty is recommended for all

proposed planting material included in the compensation plan (shrubs, trees, herbaceous and grasses). All plants shall be inspected by an appropriate inspector at the end of the guarantee period. Plants which, at that time, are not in healthy vigorous growing condition, to the inspector's approval, shall be replaced at no extra charge. All tree staking is to be removed just prior to final inspection.

An approved Maintenance and Monitoring plan for SWM facility by MECP and UTRCA is required as part of the detailed design for Site Plan Approval. The monitoring program will be completed post-construction for 3 years from date of operation to ensure the facility is functioning as intended. Expected components include:

- Identifying the frequency of oil-grit separator and pond forebay clean outs, and
- water sampling to ensure water quality objectives being met (WalterFedy 2019)

The monitoring program will incorporate an adaptive management process in which monitoring results will be used to identify and focus requirements for improved or revised impact mitigation measures. For example, wherever the monitoring program identifies residual impacts to adjacent natural features or their buffers, the existing mitigation strategy will be reviewed to identify means to improve their effectiveness. The monitoring program will detail potential measures that may be implemented to alleviate observed residual impacts.

10.0 Conclusions

NRSI was retained by Xinyi Canada Glass Limited to complete an EIS for a proposed glass manufacturing facility near Stratford, Ontario. Natural features identified within and adjacent to the property include regulated wetlands, a drainage channel, and woodlands. Although the majority of the subject property is currently under agricultural production, the layout and design of the site also requires the removal of a small wooded wetland feature. This EIS has been prepared in accordance with relevant guidelines for identifying and delineating natural heritage features and the City of Stratford and UTRCA's (2006) EIS guidelines. Specifically, the EIS:

- 1) Confirms the extent of the natural heritage feature and the relationship of the specific feature to other features in the area. This was achieved through delineating and surveying woodland and wetland boundaries in the field with staff of UTRCA and carrying out a comprehensive field program to identify the ecological function of natural heritage features in the study area.
- 2) Confirms the significance of natural heritage features. The results of our surveys indicate that the small wooded area in the subject property provides habitat for foraging bats. Woodlands adjacent to the subject property also provide breeding habitat for Eastern Wood Pewee, a species of conservation concern.
- 3) Identifies potential impacts of the development on the natural heritage features and functions. This was achieved by identifying the significance and sensitivity of features within and adjacent to the subject property and comparing them to the activities and infrastructure associated with the proposed development.
- 4) Identifies avoidance and mitigation strategies, specifically what mitigation measures should be implemented to minimize impacts to natural features such as timing windows, buffers, and sediment and erosion control measures. A detailed compensation plan for Woodland B was also developed to ensure the function of this feature is maintained within the landscape. The proposed stormwater management strategy addresses quantity, quality, water balance, and erosion and sediment control by providing capture and infiltration of all runoff generated on the property. Erosion and sediment control will be provided by means of silt fences, check dams, diversion swales and sediment basins.

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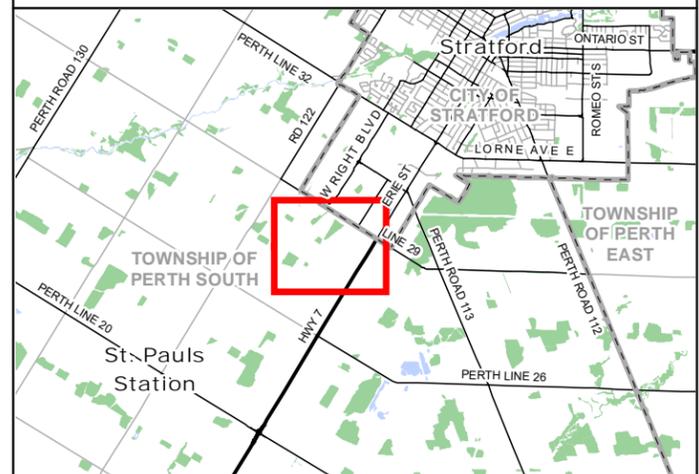
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<https://doi.org/10.2173/bna.eawpew.02>

Maps



Xinyi Glass Plant Vegetation Communities and Biological Survey Locations



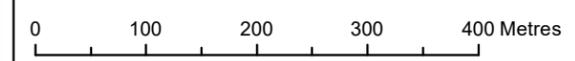
Legend

- Subject Property
 - Study Area
 - Anuran Survey Station
 - Survey Direction
 - Railway
 - Intermittent Watercourse
 - Surveyed Wetland Boundary, UTRCA Approved (October 31, 2018)
 - Wetlands (UTRCA)
 - Ecological Land Classification (ELC)
- (FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
 (FOD6-5) Fresh - Moist Sugar Maple - Hardwood Deciduous Forest Type
 (FOD7) Fresh - Moist Lowland Deciduous Forest Ecosite
 (SWD3-3) Swamp Maple Mineral Deciduous Swamp Type



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Project: 2192A Date: September 4, 2019	NAD83 - UTM Zone 17 Size: 11x17" 1:6,500
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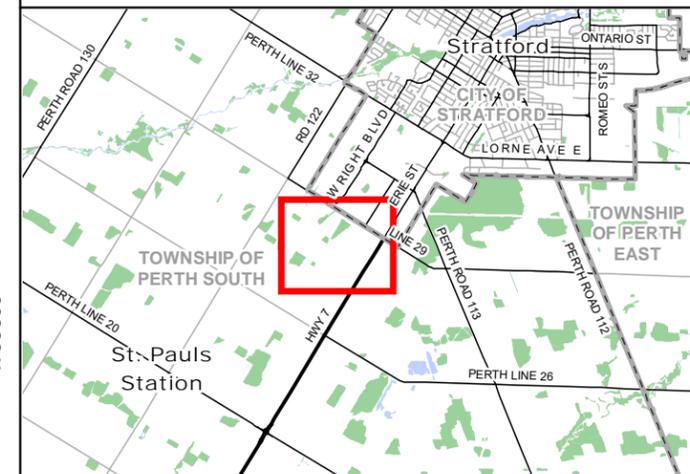
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Xinyi Glass Plant Significant Natural Features



- Legend**
- Subject Property
 - Railway
 - Intermittent Watercourse
 - Surveyed Wetland Boundary, UTRCA Approved (October 31, 2018)
 - Ecological Land Classification (ELC)
 - (FOD5) Dry - Fresh Sugar Maple Deciduous Forest Ecosite
 - (FOD6-5) Fresh - Moist Sugar Maple - Hardwood Deciduous Forest Type
 - (FOD7) Fresh - Moist Lowland Deciduous Forest Ecosite
 - (SWD3-3) Swamp Maple Mineral Deciduous Swamp Type
 - Significant Wildlife Habitat**
 - Special Concern and Rare Wildlife Species (Eastern Wood-pewee)



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Project: 2192A Date: September 9, 2019	NAD83 - UTM Zone 17 Size: 11x17" 1:6,500
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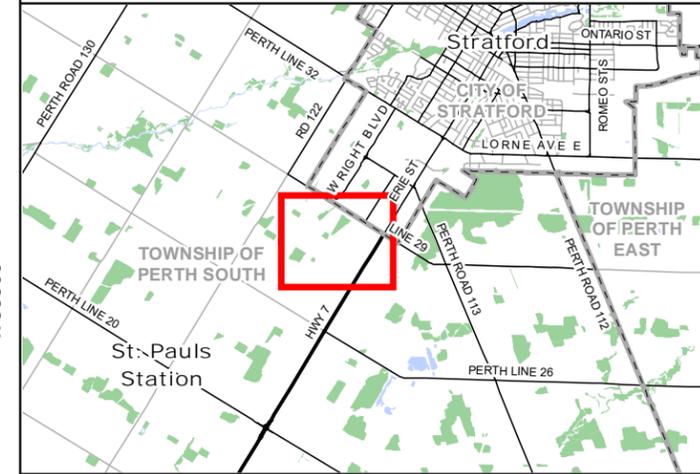
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Map 4

Xinyi Glass Plant Proposed Development and Buffers



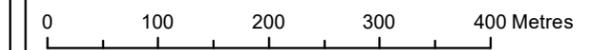
Legend

- Subject Property
- Site Plan
- Dripline (surveyed by WalterFedy on December 20th, 2018)
- Woodland Buffer (10m)
- Railway
- Intermittent Watercourse



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Project: 2192A Date: September 5, 2019	NAD83 - UTM Zone 17 Size: 11x17" 1:6,500
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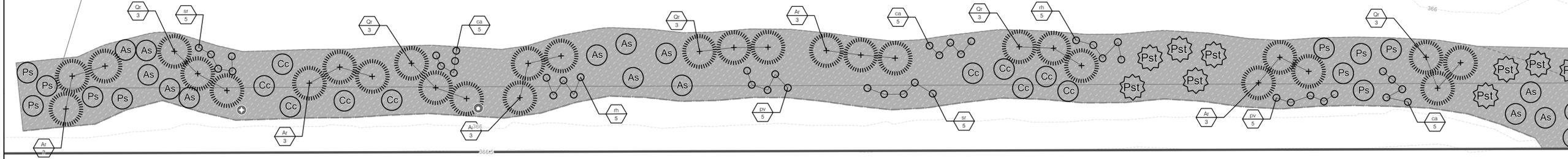
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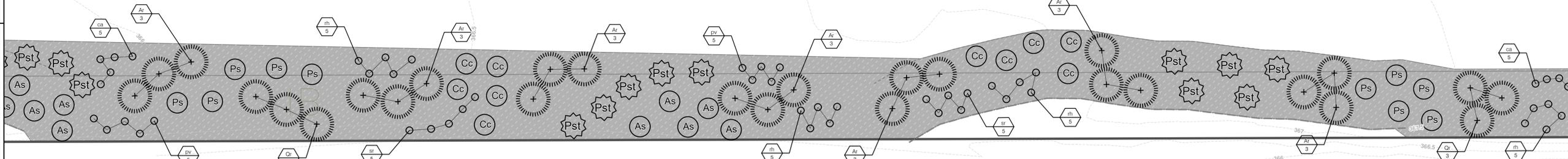
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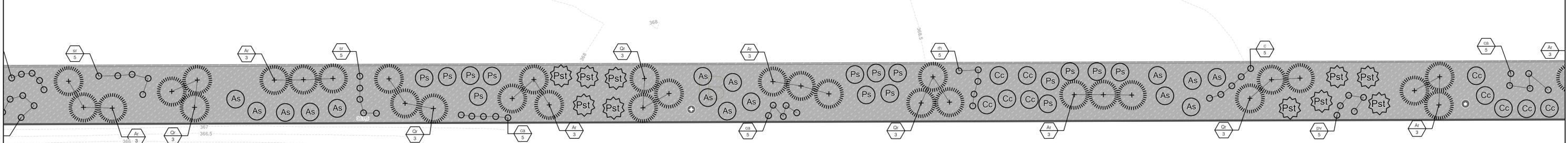
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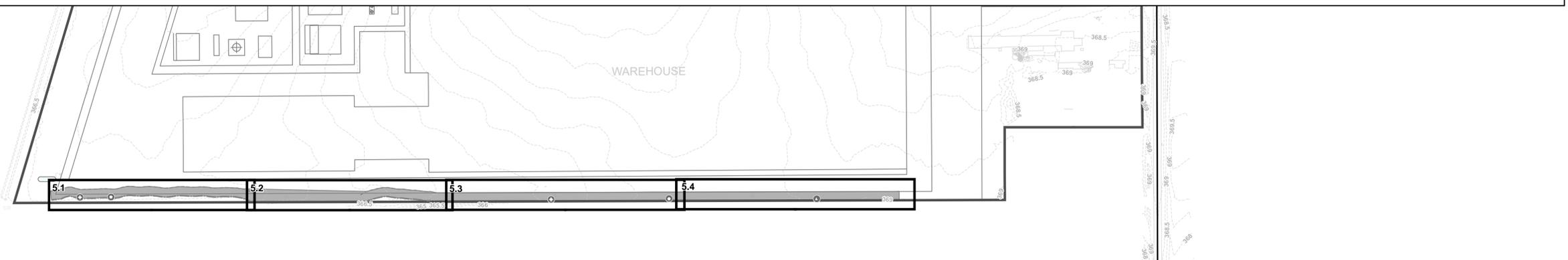
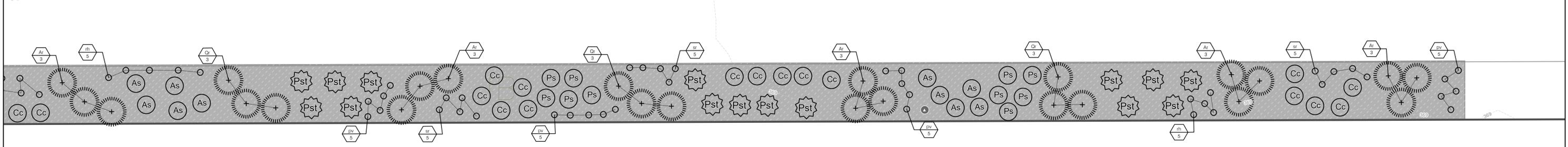
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5.3



5.4



Map 5A
Xinyi Glass Plant
 Compensation Tree Planting Plan

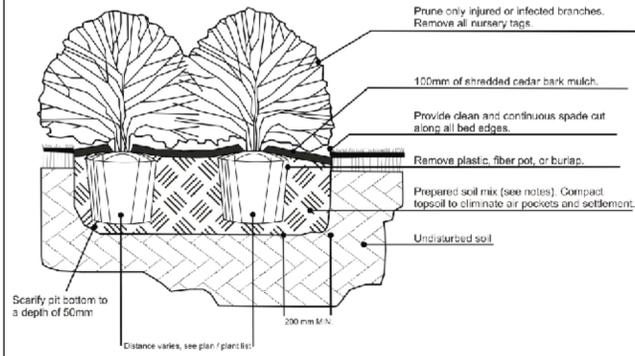
- Legend**
- Subject Property
 - Highway
 - Primary Road
 - Secondary Road
 - Dripline (surveyed by WalterFedy on December 20th, 2018)
 - Woodland Buffer (10m)
 - Site Plan
 - Existing Conditions
 - Existing Contour
 - 'Modular Condo' Bat Roosting Structure
 - 'Rocket' Bat Roosting Structure
 - 'Standard Universal 4 Chamber' Bat Roosting Structure
 - Planting Area
 - Native Seed Mixture
 - Deciduous Wire Basket Planting (50mm caliper)
 - Deciduous Tree Planting (1 gallon pot)
 - Coniferous Tree Planting (1 gallon pot)
 - Shrub Planting (1 gallon pot)

NATURAL RESOURCE SOLUTIONS INC.
 Aquatic, Terrestrial and Wetland Biologists

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Project: 2192A	NAD83 - UTM Zone 17
Date: October 23, 2019	Size: 24x36"
	Scale: 1:300

**BALLED & BURLAPPED
POTTED SHRUBS**

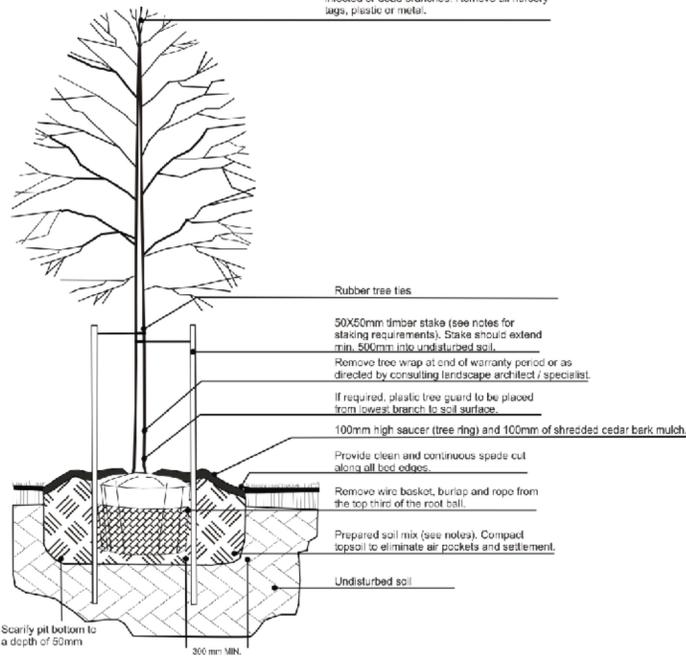


Notes:

1. Saucer shall be soaked with water and mulched immediately following planting.
2. All dimensions are in mm.
3. In poorly drained soils plant shrubs slightly higher than adjacent grade.
4. All plants to be straight and planted vertically regardless of slope.
5. Lightly tamp topsoil when backfilling to remove air pockets.
6. Remove all nursery tags, metal or plastic.

**BALLED & BURLAPPED / WIRE BASKET
DECIDUOUS TREE**

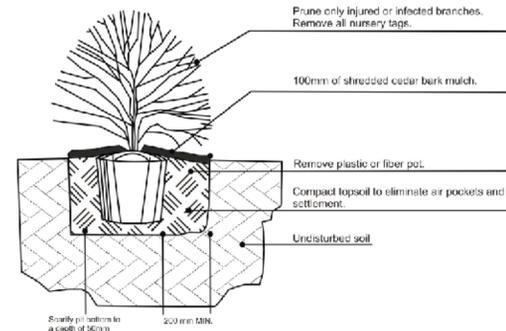
Do not cut or damage leader. Prune only injured, infested or dead branches. Remove all nursery tags, plastic or metal.



Notes:

1. Saucer shall be soaked with water and mulched immediately following planting.
2. All dimensions are in mm.
3. Staking Schedule:
 - < 30mm caliper size / 2500 HL - one stake
 - > 30mm caliper size / 2500 HL - two stakes
 - > 70mm caliper size - three stakes
 All support systems must be removed at end of warranty period (2 yrs.).
4. All trees to be straight and planted vertically regardless of slope.
5. Top of root flare shall be positioned 50mm above grade.
6. Lightly tamp topsoil when backfilling to remove air pockets.
7. Remove all nursery tags, metal or plastic.
8. No weak graft union accepted.

POTTED SHRUBS and TREE SEEDLINGS

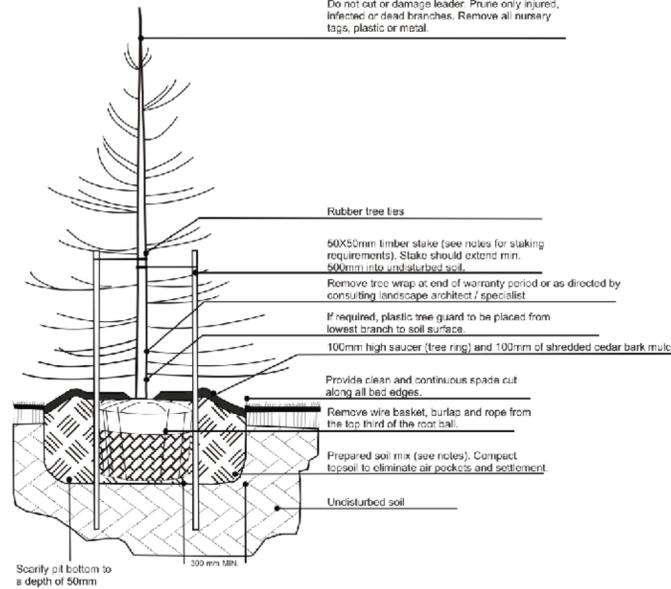


Notes:

1. Saucer shall be soaked with water and mulched immediately following planting.
2. All dimensions are in mm.
3. In poorly drained soils plant shrubs slightly higher than adjacent grade.
4. All plants to be straight and planted vertically regardless of slope.
5. Lightly tamp topsoil when backfilling to remove air pockets.
6. Remove all nursery tags, metal or plastic.

**BALLED & BURLAPPED / WIRE BASKET
CONIFEROUS TREE**

Do not cut or damage leader. Prune only injured, infested or dead branches. Remove all nursery tags, plastic or metal.



Notes:

1. Saucer shall be soaked with water and mulched immediately following planting.
2. All dimensions are in mm.
3. Staking Schedule:
 - < 2500 Ht. - one stake
 - > 2500 Ht. - two stakes
 Spaded trees - three stakes or guy wires
 All support systems must be removed at end of warranty period (2 yrs.).
4. All trees to be straight and planted vertically regardless of slope.
5. Top of root flare shall be positioned 50mm above grade.
6. Lightly tamp topsoil when backfilling to remove air pockets.
7. Remove all nursery tags, metal or plastic.

Map 5B

**Xinyi Glass Plant
Compensation Tree Planting Plan - Planting Tables**

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Project 2102A
Date: October 23, 2019
Rev: 2443P

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Planting Tables

Type	Common Name	Scientific Name	Code	Quantity	Size
Trees	Red Maple	<i>Acer rubrum</i>	Ar	66	50mm caliper
	Sugar Maple	<i>Acer saccharum</i>	As	45	1 gallon pot, 75cm
	Bitternut Hickory	<i>Carya cordiformis</i>	Cc	45	1 gallon pot, 30-50cm
	White Pine	<i>Pinus strobus</i>	Pst	45	1 gallon pot, 30-50cm
	Trembling Aspen	<i>Populus tremuloides</i>	Pt	108	Plug whip*
	Black Cherry	<i>Prunus serotina</i>	Ps	45	1 gallon pot, 75cm
	Red Oak	<i>Quercus rubra</i>	Qr	48	50mm caliper
Shrubs	Alternate-leaved Dogwood	<i>Cornus alternifolia</i>	ca	45	1 gallon pot, 60cm
	Chokecherry	<i>Prunus virginiana</i>	pv	45	
	Staghorn Sumac	<i>Rhus hirta</i>	rh	45	
	Red Elderberry	<i>Sambucus racemosa</i>	sr	45	
Herbaceous	Common Milkweed	<i>Asclepias syriaca</i>	n/a	115g	460g total weight
	Wild Bergamot	<i>Monarda fistulosa</i>		115g	
	Black-eyed Susan	<i>Rudbeckia hirta</i>		115g	
	New England Aster	<i>Symphyotrichum novae-angliae</i>		115g	

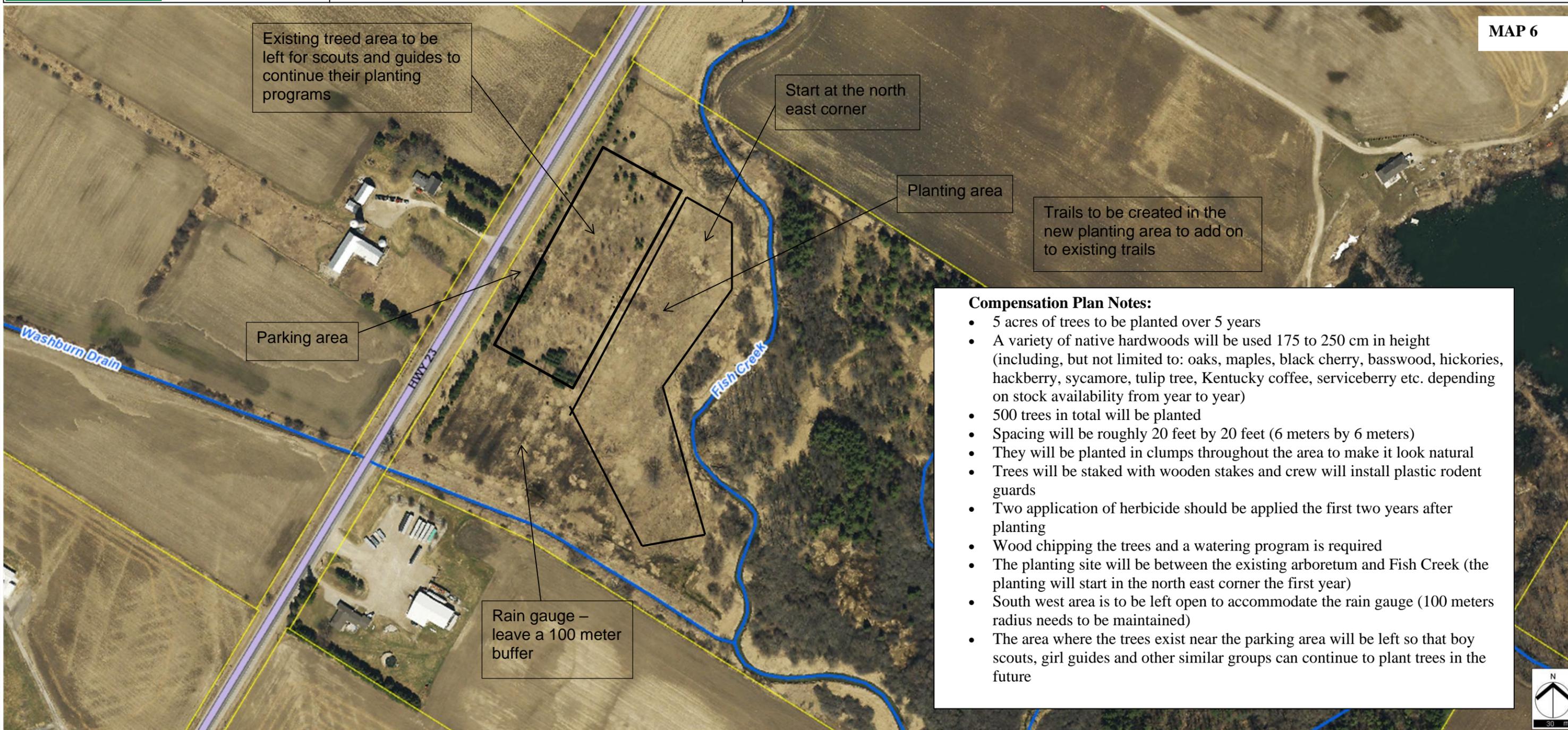
*Whips to be planted throughout the restoration zone (location not indicated on the drawing)

Total Trees	402
Total Shrubs	180
Total Stems	582

Nurse Crop	Application Rate	Area
White Clover Seed (OSC #6735)	10kg/ha	1ha

Notes

1. All tree and shrub sizes are indicated as minimum dimensions.
2. Bare root material is acceptable, where available.
3. All seed (cover crop and native seed mixture) may be hand-broadcast.
4. Planting should occur in early spring or late fall.
5. All tree and shrub stems should be treated with Skoot or an equivalent product to discourage browse.
6. All caliper trees should be staked using wooden stakes and biodegradable "strap" ties.
7. All plants will be true to species; cultivars are not acceptable.
8. Should revisions to stock be required, this will be discussed with NRSI prior to installation.
9. Plantings will be backfilled using the native soil, soil amendments are not required.
10. It is advised that the plantings be watered between June and September during drought conditions in the first year.



Compensation Plan Notes:

- 5 acres of trees to be planted over 5 years
- A variety of native hardwoods will be used 175 to 250 cm in height (including, but not limited to: oaks, maples, black cherry, basswood, hickories, hackberry, sycamore, tulip tree, Kentucky coffee, serviceberry etc. depending on stock availability from year to year)
- 500 trees in total will be planted
- Spacing will be roughly 20 feet by 20 feet (6 meters by 6 meters)
- They will be planted in clumps throughout the area to make it look natural
- Trees will be staked with wooden stakes and crew will install plastic rodent guards
- Two application of herbicide should be applied the first two years after planting
- Wood chipping the trees and a watering program is required
- The planting site will be between the existing arboretum and Fish Creek (the planting will start in the north east corner the first year)
- South west area is to be left open to accommodate the rain gauge (100 meters radius needs to be maintained)
- The area where the trees exist near the parking area will be left so that boy scouts, girl guides and other similar groups can continue to plant trees in the future

Planting Prescription: Plant 5 acres of native hardwood trees over 5 years.

Allow:

Site Preparation: Establish a walking trail in the new planting area to add on to existing trails. Contact volunteers who are maintaining site. Leave area to the south west open to accommodate the rain gauge. Leave area near parking lot for scouts and girls guides etc. to continue with their planting programs.

Maintenance: After planting, the trees will be spray with a herbicide. Wood chipping and a watering program would be mandatory.

April 23, 2019

Project No. 2192

Rob Horne
Chief Administrative Officer
City of Stratford
1 Wellington St.,
Stratford, Ontario
N5A 2L3

Tracey Annett
Manager
Environmental Planner and Regulations
Upper Thames River Conservation Authority
1424 Clarke Road
London, Ontario
N5V 5B9

**Re: Xinyi Glass Plant Development, Perth South Township, Perth County
Proposed Terms of Reference for an Environmental Impact Study**

Dear Mr. Horne and Ms. Annett,

On behalf of Natural Resource Solutions Inc. (NRSI), I am pleased to provide the enclosed proposed Terms of Reference (TOR) to undertake an Environmental Impact Study (EIS) for a proposed glass manufacturing facility near Stratford, Ontario. The legal description of the lands that encompass the proposed development area is Lots 1 and 2, Part Lots 3 and 4, Concession 5 Downie, Township of Perth South, Perth County, Ontario. The subject property is approximately 78.9 ha in size and is bound by an existing rail line to the northwest, Gibb Road to the north, Highway 7 to the east, and active agricultural lands with two small boundary woodlands to the south. The subject property is shown on Map 1.

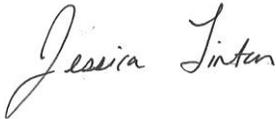
The proponent is proposing to construct a large glass manufacturing facility, in an area almost entirely characterized by agricultural lands currently. However, the development will require the removal of a small treed feature (Woodland B, Map 1). Designated natural heritage features exist within, and adjacent to, the subject property according to the Perth County Official Plan (2018) Land Use Plan mapping (Schedule 'A'). Additionally, the subject property falls within the Upper Thames River Conservation Authority (UTRCA) regulation limit due to the presence of unevaluated wetland features and a watercourse (Hislop Drain).

An initial reconnaissance site visit was completed by NRSI staff on October 23, 2018. During this site visit it was observed that the two treed features within the subject property, including the small treed feature proposed for removal, supported vegetation typically associated with wetland communities. A site visit with UTRCA staff was held on October 31, 2018 with NRSI (Jessica Linton, Andrew Dean) and UTRCA (Spencer McDonald, Brenda Gallagher) to review the on-site natural features, including flagging of

the wetland boundaries and to discuss habitat compensation approaches. The UTRCA-approved wetland boundaries were subsequently surveyed as shown on Map 1.

Approval for the proposed development is subject to the natural heritage policies of the Perth County Official Plan (2018) and the UTRCA Regulations (O. Reg 157/06). The following TOR has been prepared to outline NRSI's proposed work plan to complete the EIS. This work plan has been prepared in accordance with the guidelines described in the UTRCA's Environmental Planning Policy Manual (2006), and is consistent with the general direction provided by the UTRCA during the October 31 site visit.

Sincerely,

A handwritten signature in cursive script that reads "Jessica Linton".

Jessica Linton, M.E.S
Senior Manager, Natural Resource Solutions Inc.

Environmental Impact Study – Xinyi Glass Plant, Perth South Township, Perth County

Terms of Reference (Draft)

Introduction

The subject property (Map 1) is approximately 78.9ha in size. The property is generally characterized as active agriculture (i.e. row crops) with two isolated mature treed features separated by approximately 20m. A drainage feature (Hislop Drain) originates at the southwest corner of Woodland A, and appears to be a tile drain that conveys flows in a northeasterly direction off-site under Gibb Road through a relatively large-sized corrugated steel pipe. Additional drainage infrastructure was documented by NRSI on the northwest edge of Woodland B; a catch basin was observed in this location with an outlet pipe draining towards the northwest to an undetermined receiver. These drainage features appear to be lowering the water table of both treed features to some extent. The treed features are predominantly swamp wetland; small areas of the outer peripheries are lowland forest (i.e. not wetland). Both treed features are mapped as 'Natural Resources/Environment' according to the County's Official Plan (2018).

Collection and Review of Background Information

Background information pertaining to the biological resources on, and within up to 10km, of the subject property has been collected and compiled. This includes a review of the following sources:

- Natural Heritage Information Centre (NHIC), Land Information Ontario (MNRF 2019a);
- Perth Natural Heritage Systems Study (Perth County 2018b)
- Ontario Breeding Bird Atlas (BSC et al. 2008);
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2019);
- Mammal Atlas of Ontario (Dobbyn 1994);
- Ontario Butterfly Atlas (McNaughton et al. 2019);
- Ontario Odonata Atlas (MNRF 2019b);
- Correspondence with UTRCA and MNRF staff;
- Perth County OP (2018); and

Based on the review of background information, a preliminary Species at Risk (SAR) and Species of Conservation Concern (SCC) screening exercise has been conducted to identify any SAR or SCC that have the potential to occur within or adjacent to (i.e. within 120m) the subject property to inform the field program. It is anticipated that the MNRF will be provided this proposed Terms of Reference, including the SAR/SCC screening, by the municipal reviewing agencies to determine if any additional SAR-specific surveys are required.

A Significant Wildlife Habitat (SWH) screening exercise has also been completed based on available background information to identify a preliminary list of candidate SWH types which may be present in the study area. This screening will be used to help inform NRSI biologists about features or species of potential significance requiring focus during site investigations.

The SAR/SCC and SWH screening exercises will be updated following completion of all field studies to provide an accurate assessment of available habitats on-site. The finalized tables will be appended to the EIS. The preliminary tables are appended to this document.

Field Studies

The following is a summary of the field survey methodology that will be used to characterize the existing natural features within the subject property and study area, where appropriate. The study area is defined as within 120m of the subject property. The need for any SAR-specific surveys will be determined in consultation with the MNRF, following their review.

Vegetation Community Description and Mapping

Vegetation communities within the subject property will be mapped and classified following the Ecological Land Classification (ELC) system for southern Ontario (Lee et al. 1998). Details on the vegetation communities will be recorded including species composition, dominance, uncommon species or features, surficial soil types, and evidence of human impact.

Vascular Flora Inventory

A two-season (spring, summer) vegetation inventory will be conducted to record all species of vascular flora within the subject property. The natural features on-site will be systematically searched for plant species and any rare species and their location(s) will be recorded with a handheld GPS unit. Vascular flora species will be recorded by ELC polygon.

Breeding Bird Surveys

Two early morning breeding bird surveys will be completed between late May and early July in accordance with Ontario Breeding Bird Atlas (OBBA) protocol (BSC 2001). Surveys will be completed between a half-hour before sunrise and 10:00am. Surveys will be timed to occur at least 10 days apart. Surveys will be completed through a comprehensive area search of each vegetation community within the subject property and immediately adjacent lands. Standard breeding evidence codes will be recorded based on OBBA. Any observations of significant species will be recorded in detail, including their specific observation location(s), observed behaviour and highest level of breeding evidence. Note that the agricultural fields are actively row-cropped and do not provide habitat for meadow/grassland bird SAR such as Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*).

Amphibian Call Surveys

Three amphibian call surveys will be completed in accordance with the Marsh Monitoring Program amphibian call survey protocol (BSC 2009). This will involve 3-minute point counts during peak breeding periods to record species calling and their abundance. Point counts will be located adjacent to suitable amphibian breeding habitats within wetland areas on-site.

Habitat Assessments and Documentation of Other Wildlife

Any features that may be indicative of SWH or habitat for SAR will be documented in detail, photographed, and georeferenced using a hand-held GPS unit. Included in this will be an assessment of potential mole salamander breeding habitat, and multi-season

(i.e. leaf-on and leaf-off) bat habitat assessments. A leaf-off bat habitat assessment was completed by NRSI on March 19, 2019.

NRSI biologists will assess wildlife habitats within the subject property during all site visits, including documentation of all incidental wildlife observations. In addition to direct observations, any evidence such as dens, tracks, and scat will also be documented.

Bat Monitoring

As a result of the leaf-off bat habitat assessment, bat monitoring surveys are required to further inform habitat use and species presence within Woodland B that is proposed for removal. It is anticipated that acoustic and exit surveys will be required consistent with Guelph District MNRF standardized protocol, however the monitoring approach will be confirmed with the MNRF.

Reporting

Opportunities and Constraints Analysis

The results of the background information review and on-site field investigations will be compiled to characterize the natural features present within and adjacent to the subject property. All significant natural heritage features will be individually delineated, mapped and assessed. Natural feature significance and sensitivity will be assessed according to provincial and local guidance documents and relevant policies as well as biologist expertise, and appropriate buffers from these features will be recommended for their protection. The constraints analysis will be completed to guide the location and layout of the proposed development on the subject property.

Impact Assessment

Details of the proposed development (i.e. site plan, grading, servicing, stormwater) will be reviewed and compared to the existing natural features on the subject property. NRSI will rely on supporting studies from other disciplines (i.e. geotechnical, hydrogeological) to supplement the analysis. Any areas of conflict between significant features, species, setbacks, etc. and the development will be discussed with the client and options for avoiding or minimizing impacts will be recommended. Potential impacts will be described in detail, with corresponding recommended mitigation measures where impacts cannot be avoided.

The impact of the development will be determined based on the following:

- **Direct impacts** associated with disruption or displacement caused by the actual proposed 'footprint' of the proposed development area. The approach to identifying and delineating constraint areas, discussed above, will be used to avoid direct impacts (where possible) from the development on significant natural features.
- **Indirect impacts** associated with changes in site conditions such as drainage and water quantity/quality or temporary construction-related impacts. Preliminary sources of indirect impacts may include the following:
 - control of sediment and erosion,
 - changes to groundwater and surface water flow patterns,
 - changes to surface and ground water quality
 - indirect impacts or disturbances to wildlife

- **Cumulative impacts** associated with the proposed development will be determined as can be reasonably expected in the context of the landscape.

Mitigation, Enhancement, and Restoration

Recommendations with respect to mitigation of residual impacts will be made and opportunities for ecological enhancement, restoration, and/or compensation within the subject property will be highlighted as appropriate based on the site plan. Details will be based on the results of site the characterization and may include specific areas of restoration or enhancement, native species buffer plantings, invasive species management, etc.

Based on consultation with the UTRCA, it is anticipated that any proposed wetland removal within the property will require adequate compensation to ensure the function of this feature within the area is not lost. Based on the data collected during the field program and based on input from the project hydrogeologist, the form and function of the wetlands on the property will be characterized in detail. This information, combined with the proposed development layout, will be used to identify an appropriately scaled and designed compensation plan.

Monitoring

Recommendations for the development of a pre-, during and post-construction monitoring program will be developed appropriately based on the site plan. Details will be based on the results of the site characterization. This will include recommendations for monitoring the effectiveness of recommended mitigation measures, restoration/enhancement/compensation measures and other stewardship initiatives if applicable.

Report

The findings of the natural feature characterization, constraints analysis and the impact assessment with associated mitigation, enhancement, compensation, and monitoring recommendations (if applicable) will be summarized in an EIS report. The report will include the approved TOR, records of agency correspondence, the findings of the EIS, and a fulsome description of the proposed undertaking. Species lists will be appended and natural features will be shown on a series of maps including existing conditions, constraints and buffers and the development concept.

Cc: Chris Pidgeon, GSP Group
Jeff Leunissen, City of Stratford
Will Yang, Xinyi Canada Glass Limited
Tommy Wong, Xinyi Canada Glass Limited
Ben Feng, Xinyi Canada Glass Limited
Brenda Gallagher, UTRCA
Spencer McDonald, UTRCA

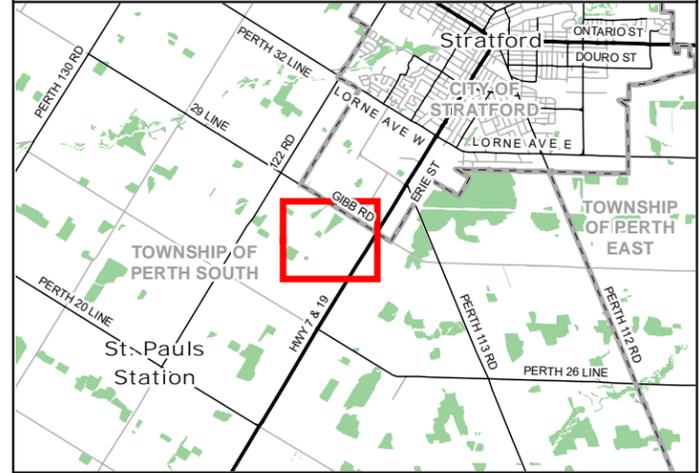
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Xinyi Glass Plant EIS Study Area and Natural Features

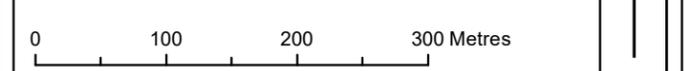


- Legend**
- Subject Property
 - Railway
 - Intermittent Watercourse
 - Surveyed Wetland Boundary, UTRCA Approved (October 31, 2018)
 - Wetlands (UTRCA)



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Project: 2192 Date: April 24, 2019	NAD83 - UTM Zone 17 Size: 11x17" 1:5,500
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SAR/SCC Habitat Screening Results

Xinyi Glass Plant EIS, Perth County - SAR/SCC Screening

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ⁴	Habitat Preference ^{5,6,7,8}	Background Source	Suitable Habitats within Subject Property
Plants/Mosses								
<i>Juglans cinerea</i>	Butternut	S3?	END	E	Schedule 1	Stream banks and swamps, as well as upland beech-maple, oak-hickory, and mixed hardwood stands.	MNRF 2018b	Yes
<i>Solidago speciosa</i>	Showy Goldenrod	S1	END	E	Schedule 1	Dry open sandy ground, including oak and jack pine savannas, prairies, fields, rarely dunes, and associated roadsides and railroads.	MNRF 2018b	No
<i>Symphotrichum praealtum</i> var. <i>praealtum</i>	Willow-leaf Aster	S2	THR	T	Schedule 1	Moist fields (including recent clearings) and prairies.	MNRF 2018b	No
Birds								
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	S4B	SC	SC	--	Well-drained grassland or prairie with low cover of grasses, taller weeds on sandy soil; hayfields or weedy fallow fields; uplands with ground vegetation of various densities; perches for singing; requires tracts of grassland > 10ha.	BSC et al. 2008	No. Agricultural fields are actively cropped.
<i>Cardellina canadensis</i>	Canada Warbler	S4B	SC	T	Schedule 1	Generally prefers wet coniferous, deciduous and mixed forest types, with a dense shrub layer. Nests on the ground, on logs or hummocks, and uses dense shrub layer to conceal the nest.	MNRF 2018b	Yes
<i>Chaetura pelagica</i>	Chimney Swift	S4B, S4N	THR	THR	Schedule 1	Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water.	MNRF 2018b; BSC et al. 2008	No. Suitable nesting and roosting structures not present.
<i>Chordeiles minor</i>	Common Nighthawk	S4B	SC	T	Schedule 1	Open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs.	MNRF 2018b	No. Ploughed fields exist, however the agricultural fields are actively cropped and are unsuitable for nesting.
<i>Contopus virens</i>	Eastern Wood-Pewee	S4B	SC	SC	--	Open, deciduous, mixed or coniferous forest; predominated by oak with little understory; forest clearings, edges; farm woodlots, parks.	MNRF 2018b; BSC et al. 2008	Yes
<i>Dolichonyx oryzivorus</i>	Bobolink	S4B	THR	T	No Schedule	Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50ha.	MNRF 2018b; BSC et al. 2008	No. Agricultural fields are actively cropped.

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ⁴	Habitat Preference ^{5,6,7,8}	Background Source	Suitable Habitats within Subject Property
<i>Haliaeetus leucocephalus</i>	Bald Eagle	S2N, S4B	SC	NAR	--	Require large continuous area of deciduous or mixed woods around large lakes, rivers; require area of 255ha for nesting, shelter, feeding, roosting; prefer open woods with 30 to 50% canopy cover; nest in tall trees 50 to 200m from shore; require tall, dead, partially dead trees within 400m of nest for perching.	MNRF 2018b	No
<i>Hirundo rustica</i>	Barn Swallow	S4B	THR	THR	--	Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water.	MNRF 2018b; BSC et al. 2008	Possible. The Hislop Drain culvert at Gibb Rd. may provide suitable nesting habitat. No other suitable structures are present.
<i>Hylocichla mustelina</i>	Wood Thrush	S4B	SC	THR	--	Carolinian and Great Lakes-St. Lawrence forest zones; undisturbed moist mature deciduous or mixed forest with deciduous sapling growth; near pond or swamp; hardwood forest edges; must have some trees higher than 12m.	MNRF 2018b; MNRF 2019a; BSC et al. 2008	Yes
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	S4B	SC	T	Schedule 1	Open, deciduous forest with little understory; fields or pasture lands with scattered large trees; wooded swamps; orchards, small woodlots or forest edges; groves of dead or dying trees; feeds on insects and stores nuts or acorns for winter; loss of habitat is limiting factor; requires cavity trees with at least 40 cm dbh; require about 4ha for a territory.	MNRF 2018b	Yes
<i>Riparia riparia</i>	Bank Swallow	S4B	THR	THR	--	Sand, clay or gravel river banks or steep riverbank cliffs; lakeshore bluffs of easily crumbled sand or gravel; gravel pits, road-cuts, grassland or cultivated fields that are close to water; nesting sites are limiting factor for species presence.	MNRF 2018b; BSC et al. 2008	No. Suitable nesting habitat is not present.
<i>Sturnella magna</i>	Eastern Meadowlark	S4B	THR	T	No Schedule	Open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees; old orchards with adjacent, open grassy areas >10ha in size.	MNRF 2018b; MNRF 2019a; BSC et al. 2008	No. Agricultural fields are actively cropped; meadow areas unsuitably sized.

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ⁴	Habitat Preference ^{5,6,7,8}	Background Source	Suitable Habitats within Subject Property
<i>Vermivora chrysoptera</i>	Golden-winged Warbler	S4B	SC	T	Schedule 1	Early successional habitat; shrubby, grassy abandoned fields with small deciduous trees bordered by low woodland and wooded swamps; alder bogs; deciduous, damp woods; shrubby clearings in deciduous woods with saplings and grasses; brier-woodland edges; requires >10ha of habitat.	MNRF 2018b	No
Herpetofauna								
<i>Chelydra serpentina serpentina</i>	Snapping Turtle	S3	SC	SC	Schedule 1	Permanent, semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddy banks or bottoms; often uses soft soil or clean dry sand on south-facing slopes for nest sites; may nest at some distance from water; often hibernate together in groups in mud under water; home range size ~28 ha.	MNRF 2018b; Ontario Nature 2019	No. Treed habitats and watercourse on-site do not provide suitable habitat conditions.
<i>Pseudacris triseriata</i> pop. 2	Western Chorus Frog (Great Lakes/St. Lawrence - Canadian Shield Population)	S3	NAR	T	Schedule 1	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools.	Ontario Nature 2019	Yes
<i>Thamnophis sauritus septentrionalis</i>	Eastern Ribbonsnake	S3	SC	SC	Schedule 1	Sunny grassy areas with low dense vegetation near bodies of shallow permanent quiet water; wet meadows, grassy marshes or sphagnum bogs; borders of ponds, lakes or streams; hibernates in groups.	MNRF 2018b	No
Mammals								
<i>Myotis leibii</i>	Eastern Small-footed Myotis	S2S3B	END	--	--	Roosts in caves, mine shafts, crevices or buildings that are in or near woodland; hibernates in cold dry caves or mines; maternity colonies in caves or buildings; hunts in forests.	MNRF 2018b	No
<i>Myotis lucifugus</i>	Little Brown Myotis	S4	END	E	Schedule 1	Uses caves, quarries, tunnels, hollow trees or buildings for roosting; winters in humid caves; maternity sites in dark warm areas such as attics and barns; feeds primarily in wetlands, forest edges.	MNRF 2018b; Dobbyn 1994	Yes. Trees are present.
<i>Myotis septentrionalis</i>	Northern Myotis	S3	END	E	Schedule 1	Hibernates during winter in mines or caves; during summer males roost alone and females form maternity colonies of up to 60 adults; roosts in houses, manmade structures but prefers hollow trees or under loose bark; hunts within forests, below canopy.	MNRF 2018b; Dobbyn 1994	Yes. Trees are present.
<i>Perimyotis subflavus</i>	Tri-colored Bat	S3?	END	E	Schedule 1	Open woods near water; roosts in trees, cliff crevices, buildings or caves; hibernates in damp, draft-free, warm caves, mines or rock crevices.	MNRF 2018b	Yes. Trees are present.

Scientific Name	Common Name	SRANK ¹	COSSARO ²	COSEWIC ³	SARA Schedule ⁴	Habitat Preference ^{5,6,7,8}	Background Source	Suitable Habitats within Subject Property
Insects								
<i>Danaus plexippus</i>	Monarch	S2N, S4B	SC	END	Schedule 1	Open areas with Milkweed spp. (<i>Asclepias</i> spp.)	MNRF 2018b; MacNaughton et al. 2019	Yes
<i>Pieris virginiensis</i>	West Virginia White	S3	--	SC	--	Generally prefer moist, rich, deciduous woodlands. The larvae feed only on the leaves of toothworts (<i>Cardamine</i> spp.).	MNRF 2018b	No
Aquatic Species								
<i>Rainbow Mussel</i>	Villosa iris	S2S3	SC	SC	Schedule 1	Most abundant in shallow, well oxygenated reaches of small- to medium-sized rivers and sometimes lakes, on substrates of cobble, gravel, sand and occasionally mud.	MNRF 2018b	No

^{1,2}MNRF 2018a, ^{3,4}Government of Canada 2018, ⁵OMNR 2000, ⁶Reznicek et al. 2011, ⁷Layberry et al. 1998

LEGEND
SRANK
S1 Critically Imperiled
S2 Imperiled
S3 Vulnerable
S4 Apparently Secure
S#? Rank Uncertain
B Breeding
N Non-breeding
COSSARO/COSEWIC
NAR Not at Risk
SC Special Concern
END/E Endangered
THR/T Threatened
SARA Schedule
Schedule 1 Officially Protected under SARA

SWH Screening Results

Significant Wildlife Habitat Assessment Tables

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Waterfowl Stopover and Staging Areas (Terrestrial)					
<p><u>Rationale:</u> Habitat important to migrating waterfowl.</p>	<p>American Black Duck Wood Duck Green-winged Teal Blue-winged Teal Mallard Northern Pintail Northern Shoveler American Wigeon Gadwall</p>	<p>CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these Ecosites.</p>	<p>Fields with sheet water during Spring (mid March to May).</p> <ul style="list-style-type: none"> • 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^{cod/viii}. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Anecdotal information from the landowner, adjacent landowners or local naturalist clubs may be good information in determining occurrence. • Reports and other information available from Conservation Authorities (CAs) • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Field Naturalist Clubs • Ducks Unlimited Canada • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area 	<p>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"^{ccxi}</p> <ul style="list-style-type: none"> • Any mixed species aggregations of 100 or more individuals required. • The area of the flooded field ecosite habitat plus a 100-300m radius buffer dependent on local site conditions and adjacent land use is the significant wildlife habitat^{cv/viii}. • 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). • SWHMiST^{cxix} Index #7 provides development effects and mitigation measures. 	<p>Fields with sheet water are not present, all fields are tiled and well-drained for agriculture.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: 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 identified are usually only one of a few in the eco-district.	Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal 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	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	<ul style="list-style-type: none"> • 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 abundant food supply (mostly aquatic invertebrates and vegetation in shallow water). <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Environment Canada • Naturalist clubs often are aware of staging/stopover areas. • OMNRF Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging. • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Ducks Unlimited projects • Element occurrence specification by Nature Serve: http://www.natureserve.org • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area 	<p>Studies carried out and verified presence of:</p> <ul style="list-style-type: none"> • Aggregations of 100¹ or more of listed species for 7 days¹, results in > 700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH^{cxix}. • The combined area of the ELC ecosites and a 100m radius area is the SWH^{cxviii} • Wetland area and shorelines associated with sites identified within the SWHTG^{cxlviii} Appendix K^{cxlix} are significant wildlife habitat. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"^{ncxix} • 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). • SWHMiST^{cxlix} Index #7 provides development effects and mitigation measures. 	<p>Aquatic habitat is not present within the study area.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Shorebird Migratory Stopover Area					
Rationale: 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 Dunlin Whimbrel	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. <u>Information Sources</u> <ul style="list-style-type: none"> • Western hemisphere shorebird reserve network. • Canadian Wildlife Service (CWS) Ontario Shorebird Survey. • Bird Studies Canada • Ontario Nature • Local birders and naturalist clubs • Natural Heritage Information Center (NHIC) Shorebird Migratory Concentration Area 	Studies confirming: <ul style="list-style-type: none"> • 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 (<24hrs) 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 100m radius area^{cxviii} • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"^{ccxi} • SWHMIST^{cxlix} Index #8 provides development effects and mitigation measures. 	Shorebird stopover habitats are typically associated with large bodies of water such as the Great Lakes and associated wetlands. Not SWH

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Raptor Wintering Area					
<p><u>Rational:</u> Sites used by multiple species, a high number of individuals and used annually are most significant</p>	<p>Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl</p> <p><u>Special Concern:</u> Short-eared Owl Bald Eagle</p>	<p>Hawks/Owls: Combination of ELC Community Series; need to have present one Community Series from each land class: Forest: FOD, FOM, FOC</p> <p>Upland: CUM, CUT, CUS, CUW</p>	<p>The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors.</p> <p>Raptor wintering sites need to be > 20 ha^{cxlviii, cxlix} with a combination of forest and upland^{xxi, xvii, xviii, xix, xx, xxi}. Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15ha) with adjacent woodlands^{cxix}</p> <p>Field area of the habitat is to be wind swept with limited snow depth or accumulation.</p> <p>Eagle sites have open water, large trees and snags available for roosting</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • OMNRF Ecologist or Biologist • Field Natural Clubs • Natural Heritage Information Center (NHIC) Raptor Winter Concentration Area • Data from Bird Studies Canada • Reports and other information available from Conservation Authorities CAs. 	<p>Studies confirm the use of these habitats by:</p> <ul style="list-style-type: none"> • One or more Short-eared Owls or; One or more Bald Eagles or; At least 10 individuals and two listed hawk/owl species • To be significant a site must be used regularly (3 in 5 years)^{cxlix} 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"^{ncxi} • SWHMIST^{cxlix} Index #10 and #11 provides development effects and mitigation measures. 	<p>Field/meadow habitat is not present in the study area.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Bat Hibernacula					
<p><u>Rationale</u> Bat hibernacula are rare habitats in Ontario landscapes.</p>	<p>Big Brown Bat Tri-coloured Bat</p>	<p>Bat Hibernacula may be found in these ecosites: CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)</p>	<ul style="list-style-type: none"> 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. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> OMNRF for possible locations and contact for local experts Natural Heritage Information Center (NHIC) Bat Hibernaculum Ministry of Northern Development and Mines for location of mine shafts. Clubs that explore caves (eg. Sierra Club) University Biology Departments with bat experts. 	<ul style="list-style-type: none"> All sites with confirmed hibernating bats are SWH. The habitat area includes a 200m radius around the entrance of the hibernaculum^{ccviii, ccvii} for most. 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"^{ccv} SWHMIST^{cdix} Index #1 provides development effects and mitigation measures. 	<p>This habitat was not identified during the background review process.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Bat Maternity Colonies					
<p><u>Rationale:</u> Known locations of forested bat maternity colonies is extremely rare in all Ontario landscapes.</p>	<p>Big Brown Bat Silver-haired Bat</p>	<p>Maternity colonies considered SWH are found in forested Ecosites.</p> <p>All ELC Ecosites in ELC Community Series: FOD FOM SWD SWM</p>	<p>Maternity colonies can be found in tree cavities, vegetation and often in buildings^{xxii, xxv, xxvi, xxvii, xxxi} (buildings are not considered to be SWH).</p> <ul style="list-style-type: none"> • Maternity roosts are not found in caves and mines in Ontario^{xxii} • Maternity colonies located in Mature deciduous or mixed forest stands^{ccix, ccx} with >10/ha large diameter (>25cm dbh) wildlife trees^{ccvii} • Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3^{ccxiv} or class 1 or 2^{ccxii} • 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^{ccx} <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • OMNRF for possible locations and contact for local experts • University Biology Departments with bat experts. 	<ul style="list-style-type: none"> • Maternity Colonies with confirmed use by: <ul style="list-style-type: none"> • >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^{ccv} • SWHMIS T^{cxix} Index #12 provides development effects and mitigation measures. 	<p>A leaf-off bat habitat assessment was completed by NRSI on March 19, 2019 for the smaller treed area to the southwest (Woodland B, approximately 1ha in size). Two (2) candidate bat habitat trees were identified in this feature and therefore it does not qualify as Candidate SWH.</p> <p>Suitable bat maternity colony habitat may exist elsewhere within the subject property and study area.</p> <p>Candidate SWH for the larger treed area to the northeast (Woodland A); Not SWH for the smaller treed area to the southwest (Woodland B).</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Bat Migratory Stopover Area					
	Hoary Bat Eastern Red Bat Silver-haired Bat	No specified ELC types.	<p>Long distance migratory bats typically migrate during late summer and early fall from summer breeding habitats throughout Ontario to southern wintering areas. Their annual fall migrations concentrate these species of bats at stopover areas. The location and characteristics of stopover habitats are generally unknown.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • OMNR for possible locations and contact for local experts • University of Waterloo, Biology Department 	<p>Long Point has been identified as a significant stopover habitat for fall migrating Silver-haired Bats, due to significant increases in abundance, activity and feeding that was documented during fall migration^{ccxv}</p> <ul style="list-style-type: none"> • The confirmation criteria and habitat areas for this SWH are still being determined. • SWHDSS^{cclix} Index #38 provides development effects and mitigation measures 	Criteria unavailable to assess significance of habitat within the study area.

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Turtle Wintering Area					
<p><u>Rationale:</u> Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant</p>	<p>Midland Painted Turtle</p> <p><u>Special Concern:</u> Northern Map Turtle Snapping Turtle</p>	<p>Snapping and Midland Painted Turtles - ELC Community Classes: SW, MA, OA and SA; ELC Community Series: FEO and BOO</p> <p>Northern Map Turtle - Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.</p>	<p>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.</p> <ul style="list-style-type: none"> Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen^{cx, cx, cxi, cxviii}. Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> EIS studies carried out by Conservation Authorities. Local field naturalists and experts, as well as university herpetologists may also know where to find some of these sites. OMNRF ecologist or biologist Natural Heritage Information Center (NHIC) 	<ul style="list-style-type: none"> 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)^{cvii} Congregation of turtles is more common where wintering areas are limited and therefore significant^{cx, cx, cxi, cxii}. SWHMiST^{cxix} Index #28 provides development effects and mitigation measures for turtle wintering habitat. 	<p>Permanent water bodies that would support turtle overwintering are not present within the study area.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Snake Hibernaculum					
<p><u>Rationale:</u> Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant</p>	<p><u>Snakes:</u> Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake</p> <p><u>Special Concern:</u> Milksnake Eastern Ribbonsnake</p> <p><u>Lizard:</u> <u>Special Concern</u> (Southern Shield population): Five-lined Skink</p>	<p>For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may be directly related to these habitats.</p> <p>Observations of congregations of snakes on sunny warm days in the spring or fall is a good indicator.</p> <p>For Five-lined Skink, ELC Community Series of FOD and FOM and Ecosites: FOC1 FOC3</p>	<ul style="list-style-type: none"> For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural locations. The existence of features that go below the 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^{xiv, i, ii, iii, cxii}. 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 ground cover. Five-lined skink prefer mixed forests with rock outcrop openings providing cover rock overlaying granite bedrock with fissures cciii. <p>Information Sources</p> <ul style="list-style-type: none"> In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells). Reports and other information from CAs. Local Field naturalists and experts, as well as university herpetologists may also know where to find some of these sites. clubs Natural Heritage Information Center (NHIC) OMNRF ecologist or biologist may be aware of locations of wintering skinks 	<p>Studies confirming:</p> <ul style="list-style-type: none"> Presence of snake hibernacula used by a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. Congregations of a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct). <u>Note:</u> If there are Special Concern Species present, then site is SWH <u>Note:</u> 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 30m buffer is the SWH¹ SWHMIST^{cdix} Index #13 provides development effects and mitigation measures for snake hibernacula. Presence of any active hibernaculum for skink is significant. SWHMIST^{cdix} Index #37 provides development effects and mitigation measures for five-lined skink wintering habitat. 	<p>Suitable hibernacula features may be present within the study area.</p> <p>Candidate SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Bank and Cliff)					
<p><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 populations are declining in Ontario.</p>	<p>Cliff Swallow Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)</p>	<p>Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles Cliff faces, bridge abutments, silos, barns</p> <p>Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1</p>	<ul style="list-style-type: none"> Any site or areas with exposed soil banks, undisturbed or naturally 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. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> Reports and other information available from CAs Ontario Breeding Bird Atlas^{ccv} Bird Studies Canada; <i>NatureCounts</i> http://www.birdscanada.org/birdmon/ Field Naturalist clubs 	<p>Studies confirming:</p> <ul style="list-style-type: none"> Presence of 1 or more nesting sites with 8^{ccvix} or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. A colony identified as SWH will include a 50m radius habitat area from the peripheral nests^{ccvii} 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"^{ccxi} SWHMiST^{ccxix} Index #4 provides development effects and mitigation measures 	<p>Banks and cliffs are not present within the study area.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Coloniality - Nesting Bird Breeding Habitat (Tree/Shrubs)					
<p><u>Rationale:</u> Large Colonies are important to local bird population, typically sites are only known colony in area and are used annually.</p>	<p>Great Blue Heron Black-crowned Night-heron Great Egret Green Heron</p>	<p>SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1</p>	<p>• 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 15m from ground, near the top of the tree.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Ontario Breeding Bird Atlas^{ccv}, colonial nest records. • Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNR). • NHIC Mixed Wader Nesting Colony • Aerial photographs can help identify large heronries • Reports and other information available from CAs • MNRF District Offices • Local naturalist clubs 	<p>Studies confirming:</p> <ul style="list-style-type: none"> • Presence of 5¹ or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300m radius or extent of the Forest Ecosite containing the colony or any island <15.0ha with a colony is the SWH^{cc, ccvii} • 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 • SWHMiST^{cdix} Index #5 provides development effects and mitigation measures. 	<p>No stick nests or other evidence of heron nesting was observed by NRSI during field investigations completed to-date.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Colonially - Nesting Bird Breeding Habitat (Ground)					
<p><u>Rationale:</u> Colonies are important to local bird populations, typically sites are only known colony in area and are used annually.</p>	<p>Herring Gull Great Black-backed Gull Little Gull Ring-billed Gull Common Tern Caspian Tern Brewer's Blackbird</p>	<p>Any rocky island or peninsula (natural or artificial) within a lake or large river (two-lined on a 1:50,000 NTS map).</p> <p>Close proximity to watercourses in open fields or pastures with scattered trees or shrubs (Brewer's Blackbird)</p> <p>MAM1 – 6 MAS1 – 3 CUM CUT CUS</p>	<p>• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas.</p> <p>• Brewer's Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands.</p> <p><u>Information Sources</u></p> <p>• Ontario Breeding Bird Atlas^{ccv}, rare/colonial species records.</p> <p>• Canadian Wildlife Service</p> <p>• Reports and other information available from CAs</p> <p>• Natural Heritage Information Center (NHIC) Colonial Waterbird Nesting Area</p> <p>• MNRF District Offices</p> <p>• Field naturalist clubs</p>	<p>Studies confirming:</p> <ul style="list-style-type: none"> • Presence of >25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern¹. • Presence of 5 or more pairs for Brewer's Blackbird. • 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 150m area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0ha with a colony is the SWH^{cc, ccvii} • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"^{ccxi} • SWHMIST^{ccix} Index #6 provides development effects and mitigation measures. 	<p>Suitable nesting habitat for gulls/terns and Brewer's Blackbird is not present.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Migratory Butterfly Stopover Areas					
<p><u>Rationale:</u> Butterfly stopovers areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.</p>	<p>Painted Lady Red Admiral</p> <p><u>Special Concern:</u> Monarch</p>	<p>Combination of ELC Community Series: Need to have present one Community Series from each landclass:</p> <p><u>Field:</u> CUM CUS CUT</p> <p><u>Forest:</u> FOC FOM FOD CUP</p> <p>Anecdotally, a candidate sight for butterfly stopover will have a history of butterflies being observed.</p>	<p>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^{cxlix}.</p> <ul style="list-style-type: none"> • 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^{xxxii, xxxiii, xxxiv, xxxv, xxxvi}. • 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 cxlviii, cxlix. • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes^{xxxvii, xxxviii, xxxix, xl, xli}. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • OMNRF (NHIC) • Agriculture Canada in Ottawa may have list of butterfly experts. • Field Naturalist Clubs • Toronto Entomologists Association • Conservation Authorities 	<p>Studies confirm:</p> <ul style="list-style-type: none"> • The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct)^{xlii}. 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^{xxxvii}, significant variation can occur between years and multiple years of sampling should occur^{xl, xli}. • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD • MUD of >5000 or >3000 with the presence of Painted Ladies or Red Admiral's is to be considered significant. • SWHMIST^{cxlix} Index #16 provides development effects and mitigation measures. 	<p>Study area not located within 5 km of Lake Ontario.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Landbird Migratory Stopover Areas					
<p><u>Rationale:</u> Sites with a high diversity of species as well as high number are most significant</p>	<p>All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.on.ec.gc.ca/wildlife_e.html All migrant raptors species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)</p>	<p>All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD</p>	<p>Woodlots need to be >10 ha¹ in size and within 5km^{iv, v, vi, vii, viii, ix, x, xi, xii, xiii, xiv, xv} of Lake Ontario.</p> <ul style="list-style-type: none"> • If multiple woodlands are located along the shoreline, those woodlands <2km from Lake Ontario are more significant^{cxlix} • Sites have a variety of habitats; forest, grassland and wetland complexes^{cxlix}. • The largest sites are more significant^{cxlix} • Woodlots and forest fragments are important habitats to migrating birds^{ccviii}, these features located along the shore and located within 5km of Lake Ontario are Candidate SWH^{cxlviii}. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Bird Studies Canada • Ontario Nature • Local birders and naturalist club • Ontario Important Bird Areas (IBA) Program 	<p>Studies confirm:</p> <ul style="list-style-type: none"> • Use of the woodlot by >200 birds/day and with >35 spp. with at least 10 bird spp. 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 (Apr/May) and fall (Aug/Oct) migration using standardized assessment techniques. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"^{ccxi} • SWHMiST^{cxlix} Index #9 provides development effects and mitigation measures. 	<p>Study area not located within 5 km of Lake Ontario.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Deer Yarding Areas					
<p><u>Rationale:</u> Winter habitat for deer is considered to be the main factor for northern deer populations. In winter, deer congregate in "yards" to survive severe winter conditions. Deer yards typically have a long history of annual use by deer, yards typically represent 10-15% of an areas summer range.</p>	White-tailed Deer	<p>Note: OMNRF to determine this habitat.</p> <p>ELC Community Series providing a thermal cover component for a deer yard would include: FOM, FOC, SWM and SWC.</p> <p>Or these ELC Ecosites: CUP2 CUP3 FOD3 CUT</p>	<ul style="list-style-type: none"> Deer yarding areas or winter concentration areas (yards) are areas deer move to in response to the onset of winter snow and cold. This is a behavioural response and deer will establish traditional use areas. The yard is composed of two areas referred to as Stratum I and Stratum II. Stratum II covers the entire winter yard area and is usually a mixed or deciduous forest with plenty of browse available for food. Agricultural lands can also be included in this area. Deer move to these areas in early winter and generally, when snow depths reach 20cm, most of the deer will have moved here. If the snow is light and fluffy, deer may continue to use this area until 30cm snow depth. In mild winters, deer may remain in the Stratum II area the entire winter. The Core of a deer yard (Stratum I) is located within the Stratum II area and is critical for deer survival in areas where winters become severe. It is primarily composed of coniferous trees (pine, hemlock, cedar, spruce) with a canopy cover of more than 60%^{cxciv}. OMNRF determines deer yards following methods outlined in "Selected Wildlife and Habitat Features: Inventory Manual"^{hxcv} Woodlots with high densities of deer due to artificial feeding are not significant. 	<p>No Studies Required:</p> <ul style="list-style-type: none"> Snow depth and temperature are the greatest influence on deer use of winter yards. Snow depths > 40cm for more than 60 days in a typically winter are minimum criteria for a deer yard to be considered as SWH^{hvi, lvii, lviii, lxx, lxi, l}. Deer Yards are mapped by OMNRF District offices. Locations of Core or Stratum 1 and Stratum 2 Deer yards considered significant by OMNRF will be available at local MNRD offices or via Land Information Ontario (LIO). Field investigations that record deer tracks in winter are done to confirm use (best done from an aircraft). Preferably, this is done over a series of winters to establish the boundary of the Stratum I and Stratum II yard in an "average" winter. MNRD will complete these field investigations^{cxcv}. If a SWH is determined for Deer Wintering Area or if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. SWHMIST^{cxix} Index #2 provides development effects and mitigation measures. 	<p>Deer overwintering habitat not identified within or adjacent to the study area by MNRD.</p> <p>Not SWH</p>

Table 1. Characteristics of Seasonal Concentration Areas for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Deer Winter Congregation Areas					
<p><u>Rationale:</u> Deer movement during winter in the southern areas of Ecoregion 6E 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^{cxviii}</p>	White-tailed Deer	<p>All Forested Ecosites with these ELC Community Series: FOC FOM FOD SWC SWM SWD</p> <p>Conifer plantations much smaller than 50ha may also be used.</p>	<ul style="list-style-type: none"> Woodlots will typically be >100 ha in size. Woodlots <100ha may be considered as significant based on MNRF studies or assessment. Deer movement during winter in the southern areas of Eco-region 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands^{cxviii}. If deer are constrained by snow depth refer to the Deer Yarding Area habitat within Table 1.1 of this Schedule. Large woodlots > 100ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha^{ccxxiv}. Woodlots with high densities of deer due to artificial feeding are not significant. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> MNRF District Offices LIO/NRVIS 	<p>Studies confirm:</p> <ul style="list-style-type: none"> Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF^{cxviii}. 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 MNRF¹. Studies should be completed during winter (Jan/Feb) when >20cm of snow is on the ground using aerial survey techniques^{ccxxiv}, ground or road surveys, or a pellet count deer density survey^{ccxxv}. If a SWH is determined for Deer Wintering Area of if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. SWHMiST^{cxlix} Index #2 provides development effects and mitigation measures. 	<p>Deer overwintering habitat not identified within or adjacent to the study area by MNRF.</p> <p>Not SWH</p>

Significant Wildlife Habitat Assessment Tables

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community ¹	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes ¹	Habitat Description ¹	Detailed Information and Sources ¹	Defining Criteria ¹	Assessment Details
Cliff and Talus Slopes					
<p><u>Rationale:</u> Cliffs and Talus Slopes are extremely rare habitats in Ontario.</p>	<p>Any ELC Ecosite within Community Series:</p> <p>TAO CLO TAS CLS TAT CLT</p>	<p>A Cliff is vertical to near vertical bedrock >3m in height.</p> <p>A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris.</p>	<p>Most cliff and talus slopes occur along the Niagara Escarpment.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • The Niagara Escarpment Commission has detailed information on location of these habitats. • OMNRF District • Natural Heritage Information Center (NHIC) has location information on their website • Local naturalist clubs • Conservation Authorities 	<ul style="list-style-type: none"> • Confirm any ELC Vegetation Type for Cliffs or Talus Slopes^{lxviii} • SWHMiST^{cxlix} Index #21 provides development effects and mitigation measures. 	<p>Vegetation type not present within the study area.</p> <p>Not SWH</p>

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community ¹	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes ¹	Habitat Description ¹	Detailed Information and Sources ¹	Defining Criteria ¹	Assessment Details
Sand Barrens					
<p><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.</p>	<p>ELC Ecosites: SBO1 SBS1 SBT1</p> <p>Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always <60%.</p>	<p>Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. They have little or no soil and the underlying rock protrudes through the surface. 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%.</p>	<p>Any sand barren area, >0.5ha in size.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • OMNRF Districts. • Natural Heritage Information Center (NHIC) has location information on their website • Field naturalist clubs • Conservation Authorities 	<ul style="list-style-type: none"> • Confirm any ELC Vegetation Type for Sand Barrens^{boxviii} • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics)ⁱ. • SWHMiST^{cxlix} Index #20 provides development effects and mitigation measures. 	<p>Vegetation type not present within the study area.</p> <p>Not SWH</p>

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community ¹	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes ¹	Habitat Description ¹	Detailed Information and Sources ¹	Defining Criteria ¹	Assessment Details
Alvar					
<p><u>Rationale:</u> Alvars are extremely rare habitats in Ecoregion 6E. Most alvars in Ontario are in Ecoregion 6E and 7E. Alvars in 6E are small and highly localized just north of the Palaeozoic-Precambrian contact.</p>	<p>ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2</p> <p>Five Alvar</p> <p>Indicator Species: 1) Carex crawei 2) Panicum philadelphicum 3) Eleocharis compressa 4) Scutellaria parvula 5) Trichostema brachiatum</p> <p>These indicator species are very specific to Alvars within Ecoregion 6E</p>	<p>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 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 plant. Undisturbed alvars can be phyto- and zoo geographically 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.^{lxviii}</p>	<p>An Alvar site > 0.5 ha in size.^{lxv}</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> Alvars of Ontario (2000), Federation of Ontario Naturalists^{lxvi} Ontario Nature – Conserving Great Lakes Alvars^{ccviii} Natural Heritage Information Center (NHIC) has location information on their website Field Naturalist clubs Conservation Authorities 	<p>Field studies identify four of the five Alvar indicator species^{lxv},^{cxliix} at a Candidate Alvar site is Significant.</p> <ul style="list-style-type: none"> Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotics sp.). The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses^{lxv}. SWHMiST^{cxliix} Index #17 provides development effects and mitigation measures. 	<p>Vegetation type not present within the study area.</p> <p>Not SWH</p>

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community ¹	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes ¹	Habitat Description ¹	Detailed Information and Sources ¹	Defining Criteria ¹	Assessment Details
Old Growth Forest					
<p><u>Rationale:</u> Due to historic logging practices, extensive old growth forest is rare in the Ecoregion. Interior habitat provided by old growth forests is required by many wildlife species.</p>	<p>Forest Community Series: FOD FOC FOM SWD SWC SWM</p>	<p>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.</p>	<p>Woodland Stands areas 30ha or greater in size or with at least 10 ha interior habitat assuming 100m buffer at edge of forest í.</p> <p>Information Sources</p> <ul style="list-style-type: none"> • OMNRF Forest Resource Inventory mapping • OMNRF Forester, Ecologist or Biologist • Field Local naturalist clubs • Conservation Authorities • Sustainable Forestry License (SFL) companies will possibly know locations through field operations. • Municipal forestry departments 	<p>Field Studies will determine:</p> <ul style="list-style-type: none"> • If dominant trees species of the ecosite are >140 years old, then stand is Significant Wildlife Habitat^{cxviii} • The stand will have experienced no recognizable forestry activities^{cxviii} • The area of Forest Ecosites combined to make up the stand is the SWH. • Determine ELC Vegetation Type for forest stand^{lboxviii} • SWHDSS^{cxlix} Index #23 provides development effects and mitigation measures. 	<p>Vegetation type not present within the study area.</p> <p>Not SWH</p>

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community ¹	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes ¹	Habitat Description ¹	Detailed Information and Sources ¹	Defining Criteria ¹	Assessment Details
Savannah					
<p><u>Rationale:</u> Savannahs are extremely rare habitats in Ontario.</p>	<p>TPS1 TPS2 TPW1 TPW2 CUS2</p>	<p>A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%.</p>	<ul style="list-style-type: none"> • 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. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Natural Heritage Information Center (NHIC) has location information on their website • OMNRF Ecologists • Field naturalists clubs • Conservation Authorities 	<p>Field studies confirm one or more of the Savannah indicator species listed in^{lxv} Appendix N should be present. Note: Savannah plant spp. list from Ecoregion 6E should be used^{cxviii}.</p> <ul style="list-style-type: none"> • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics sp.). • SWHMiST^{cxlix} Index #18 provides development effects and mitigation measures. 	<p>Vegetation type not present within the study area.</p> <p>Not SWH</p>

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community ¹	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes ¹	Habitat Description ¹	Detailed Information and Sources ¹	Defining Criteria ¹	Assessment Details
Tallgrass Prairie					
<p><u>Rationale:</u> Tallgrass Prairies are extremely rare habitats in Ontario.</p>	<p>TPO1 TPO2</p>	<p>A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover.</p>	<ul style="list-style-type: none"> • 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. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • OMNR Districts • Natural Heritage Information Center (NHIC) has location information available on their website • Field naturalists clubs • Conservation Authorities 	<p>Field studies confirm one or more of the Prairie indicator species listed in ^{lxv} Appendix N should be present. Note: Prairie plant spp. list from Ecoregion 6E should be used ^{cxlviii}.</p> <ul style="list-style-type: none"> • Area of the ELC Ecosite is the SWH • Site must not be dominated by exotic or introduced species (<50% vegetative cover exotics). • SWHMiST ^{cxlix} Index #19 provides development effects and mitigation measures. 	<p>Vegetation type not present within the study area.</p> <p>Not SWH</p>

Table 2. Characteristics of Rare Vegetation Communities for Ecoregion 6E.

Rare Vegetation Community ¹	Candidate SWH			Confirmed SWH	Study Area
	ELC Ecosite Codes ¹	Habitat Description ¹	Detailed Information and Sources ¹	Defining Criteria ¹	Assessment Details
Other Rare Vegetation Communities					
<p><u>Rationale:</u> Plant communities that often contain rare species which depend on the habitat for survival.</p>	<p>Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG^{cxlviii}. Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.</p>	<p>Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.</p>	<p>ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in appendix M^{cxlviii}</p> <p>The OMNR/NHIC will have up to date listing for rare vegetation communities.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Natural Heritage Information Center (NHIC) has location information available on their website • OMNRF Districts • Field naturalists clubs • Conservation Authorities 	<p>Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG^{cxlviii}.</p> <ul style="list-style-type: none"> • Area of the ELC Vegetation Type polygon is the SWH. • SWHMIST^{cxlix} Index #37 provides development effects and mitigation measures. 	<p>Other rare vegetation types not present within the study area.</p> <p>Not SWH</p>

Significant Wildlife Habitat Assessment Tables

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Waterfowl Nesting Area					
<p><u>Rationale:</u> Important to local waterfowl populations, sites with greatest number of species and highest number of individuals are significant.</p>	<p>American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard</p>	<p>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</p> <p>Note: includes adjacency to Provincially Significant Wetlands</p>	<p>A waterfowl nesting area extends 120m^{cxlix} from a wetland (> 0.5 ha) or a wetland (>0.5ha) and any small wetlands (0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120m of each individual wetland where waterfowl nesting is known to occur^{cxlix}.</p> <ul style="list-style-type: none"> • Upland areas should be at least 120m wide so that predators such as raccoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40cm dbh) in woodlands for cavity nest sites. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Ducks Unlimited staff may know the locations of particularly productive nesting sites. • OMNRF Wetland Evaluations for indication of significant waterfowl nesting habitat. • Reports and other information available from CAs 	<p>Studies confirmed:</p> <ul style="list-style-type: none"> • 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"^{ccxi} • 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 120m^{cxlviii} from the wetland and will provide enough habitat for waterfowl to successfully nest. • SWHMiST^{cxlix} Index #25 provides development effects and mitigation measures. 	<p>Aquatic habitat is not present within the study area.</p> <p>Not SWH</p>

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Bald Eagle and Osprey Nesting, Foraging and Perching Habitat					
<p><u>Rationale:</u> Nest sites are fairly uncommon in Eco-region 6E are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.</p>	<p>Osprey</p> <p><u>Special Concern:</u> Bald Eagle</p>	<p>ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands</p>	<ul style="list-style-type: none"> Nests are associated with lakes, ponds, rivers or wetlands along 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). <p><u>Information Sources</u></p> <ul style="list-style-type: none"> Natural Heritage Information Center (NHIC) compiles all known nesting sites for Bald Eagles in Ontario. MNRF values information (LIO/NRVIS) will list known nesting locations. Note: data from NRVIS is provided as a point and does not represent all the habitat. Nature Counts, Ontario Nest Records Scheme data. OMNRF Districts Sustainable Forestry License (SFL) companies will identify additional nesting locations through field operations. Check the Ontario Breeding Bird Atlas^{ccv} or Rare Breeding Birds in Ontario for species documented Reports and other information available from CAs. Field naturalists clubs 	<p>Studies confirm the use of these nests by:</p> <ul style="list-style-type: none"> One or more active Osprey or Bald Eagle nests in an area^{cxviii}. 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 300m radius around the nest or the contiguous woodland stand is the SWH^{ccvii}, maintaining undisturbed shorelines with large trees within this area is important^{cxlviii}. For a Bald Eagle the active nest and a 400-800m radius around the nest is the SWH^{cv}, ^{ccvii}. Area of the habitat from 400-800m is dependent on site lines from the nest to the development and inclusion of perching and foraging habitat^{cv}. 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^{ccvii} 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"^{ccxi} SWHMiST^{cxlix} Index #26 provides development effects and mitigation measures 	<p>Suitable habitat for Bald Eagle and Osprey is not present within the study area.</p> <p>Not SWH</p>

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Woodland Raptor Nesting Habitat					
<p><u>Rationale:</u> Nests sites for these species are rarely identified; these area sensitive habitats and are often used annually by these species.</p>	<p>Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk</p>	<p>May be found in all forested ELC Ecosites.</p> <p>May also be found in SWC, SWM, SWD and CUP3.</p>	<p>All natural or conifer plantation woodland/forest stands >30ha with >10ha of interior habitat^(bxxxviii, bxxxix, xc, xci, xciii, xciv, xcvi, cxxxiii). Interior habitat determined with a 200m buffer^{cxdviii}.</p> <ul style="list-style-type: none"> • 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 Cooper's 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. <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • OMNRF • Check the Ontario Breeding Bird Atlas^{ccv} or Rare Breeding Birds in Ontario for species documented. • Check data from Bird Studies Canada • Reports and other information available from CAs 	<p>Studies confirm:</p> <ul style="list-style-type: none"> • Presence of 1 or more active nests from species list is considered significant^{cxdviii}. • Red-shouldered Hawk and Northern Goshawk – a 400m radius around the nest or 28ha area of habitat is the SWH^{ccvii}. • Barred Owl – a 200m radius around the nest is the SWH^{ccvii}. • Broad-winged Hawk and Coopers Hawk – a 100m radius around the nest is the SWH^{ccvii}. • Sharp-shinned Hawk – a 50m radius around the nest is the SWH^{ccvii}. • 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. • SWHMiST^{cdlix} Index #27 provides development effects and mitigation measures. 	<p>Deciduous forest and swamp is present within the study area, although the extent of contiguous forest cover is too small (<30 ha) to support significant habitat.</p> <p>Not SWH</p>

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Turtle Nesting Area					
<p><u>Rationale:</u> These habitats are rare and when identified will often be the only breeding site for local populations of turtles</p>	<p>Midland Painted Turtle</p> <p><u>Special Concern:</u> Northern Map Turtle Snapping Turtle</p>	<p>Exposed mineral soil (sand or gravel) areas adjacent (<100m)^{cxviii} or within the following ELC Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1</p>	<p>• 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.</p> <p>• 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 and shoulders are not SWH.</p> <p>• Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used.</p> <p><u>Information Sources</u></p> <p>• Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels).</p> <p>• Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may help to find potential nesting habitat for them.</p> <p>• Natural Heritage Information Center (NHIC)</p> <p>• Field Naturalist clubs and landowners</p>	<p>Studies confirm:</p> <ul style="list-style-type: none"> • Presence of 5 or more nesting Midland Painted Turtles • One or more Northern Map Turtle or Snapping Turtle nesting is a SWHⁱ • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH^{cxviii}. • Travel routes from wetland to nesting area are to be considered within the SWH^{cxlix}. • 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. • SWHMiST^{cxlix} Index #28 provides development effects and mitigation measures for turtle nesting habitat. 	<p>Candidate vegetation community types not identified within the study area.</p> <p>Not SWH</p>

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Seeps and Springs					
<p><u>Rationale:</u> Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.</p>	<p>Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.</p>	<p>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.</p>	<p>Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system^{cxvii, cxlix}.</p> <ul style="list-style-type: none"> • Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species^{cxix, cxx, cxxi, cxxii, cxiii, cxiv} <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Topographical Map • Thermography • Hydrological surveys conducted by CAs and MOE • Field naturalists clubs and landowners • Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped. 	<p>Field Studies confirm:</p> <ul style="list-style-type: none"> • Presence of a site with 2 or more seeps/springs should be considered SWH. • The area of a ELC forest 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^{cxlviii} • SWHMIST^{cxlix} Index #30 provides development effects and mitigation measures 	<p>Seeps and springs are possible within the study area.</p> <p>Candidate SWH</p>

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Amphibian Breeding Habitat (Woodland)					
<p><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.</p>	<p>Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog</p>	<p>All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD</p> <p>Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians.</p>	<ul style="list-style-type: none"> • Presence of a wetland, pond or woodland pool (including vernal pools) >500m² (about 25m diameter)^{ccvii} within or adjacent (within 120m) to a woodland (no minimum size)^{clxxxii, lxiii, lxxv, lxxvi, lxxvii, lxxviii, lxxix, lxxx} 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-July are more likely to be used as breeding habitat^{cdviii} <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records • Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. • OMNRF District • OMNRF wetland evaluations • Field naturalist clubs • Canadian Wildlife Service Amphibian Road Call Survey • Ontario Vernal Pool Association: http://www.ontariovernalpools.org 	<p>Studies confirm:</p> <ul style="list-style-type: none"> • 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)^{lxxi} or 2 or more of the listed frog species with Call Level Codes of 3. • A combination of observational study and call count surveys^{cviii} will be required during the spring March-June when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. • The habitat is the woodland area plus a 230m radius of woodland area^{lxiii, lxxv, lxxvi, lxxvii, lxxviii, lxxx, lxx, lxxi} if a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is the be included in the habitat. • SWHMiST^{cdlix} Index #14 provides development effects and mitigation measures. 	<p>Suitable amphibian breeding habitat may be present within the subject property and study area.</p> <p>Candidate SWH</p>

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Amphibian Breeding Habitat (Wetland)					
<p><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</p>	<p>Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Tree frog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog</p>	<p>ELC Community Classes SW, MA, FE, BO, OA and SA.</p> <p>Typically these wetland ecosites will be isolated (>120m) from woodland ecosites, however larger wetlands containing predominantly aquatic species (e.g. Bull Frog) may be adjacent to woodlands.</p>	<p>• Wetlands >500m² (about 25m diameter)^{cvii} 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^{cbxxiv}.</p> <p>• 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.</p> <p>• Bullfrogs require permanent water bodies with abundant emergent vegetation.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Ontario Herpetofaunal Summary Atlas (or other similar atlases) • Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count. • OMNRF Districts and wetland evaluations • Reports and other information available from CAs. 	<p>Studies confirm:</p> <ul style="list-style-type: none"> • Presence of breeding population of 1 or more of the listed newt/salamander species or 2 or more of the listed frog/toad species and with at least 20 individuals (adults or eggs masses)^{lxxi, lxxiii}, 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^{cvii} will be required during spring (March to 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. • SWHMiST^{cxlix} Index #15 provides development effects and mitigation measures. 	<p>Isolated wetland features not present within the study area.</p> <p>Not SWH</p>

Table 3. Characteristics of Specialized Wildlife Habitat for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Woodland Area-Sensitive Bird Breeding Habitat					
<p><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.</p>	<p>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</p> <p>Special Concern: Cerulean Warbler Canada Warbler</p>	<p>All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD</p>	<ul style="list-style-type: none"> Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha. ^{cv, cxxxi, cxxxii, cxxxiii, cxxxiv, cxxxv, cxxxvi, cxxxvii, cxxxviii, cxxxix, cxi, cxli, cxlii, cxliii, cxliv, cxlv, cxlvi, cl, cli, clii, cliii, cxliv, clv, clvii, clviii, clix} Interior forest habitats are at least 200m from forest edge habitat. <p>Information Sources</p> <ul style="list-style-type: none"> Local bird clubs Canadian Wildlife Service (CWS) for the location of forest bird monitoring. Bird studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to greatest value to interior species Reports and other information available from CAs. 	<ul style="list-style-type: none"> 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"^{ccxi} SWHMiST^{cxlix} Index #34 provides development effects and mitigation measures. 	<p>Contiguous forest habitat of suitable size (>30 ha) not present within the study area.</p> <p>Not SWH</p>

Significant Wildlife Habitat Assessment Tables

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Marsh Bird Breeding Habitat					
<p><u>Rationale:</u> Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.</p> <p><u>Special Concern:</u> Black Tern Yellow Rail</p>	<p>American Bittern Virginia Rail Sora Common Gallinule American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Sandhill Crane Green Heron Trumpeter Swan</p>	<p>MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1</p> <p>For Green Heron: All SW, MA and CUM1 sites.</p>	<p>• Nesting occurs in wetlands</p> <p>• All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present^{ccov}.</p> <p>• 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.</p> <p><u>Information Sources</u></p> <p>• Contact OMNRF, wetland evaluations are a good source of information.</p> <p>• Field naturalist clubs</p> <p>• Natural Heritage Information Center (NHIC) Records</p> <p>• Reports and other information available from CAs.</p> <p>• Ontario Breeding Bird Atlas^{ccv}</p>	<p>Studies confirm:</p> <p>• Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or 1 pair of Sandhill Cranes; or breeding by any combination of 5 or more of the listed species¹.</p> <p>• Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH¹.</p> <p>• Area of the ELC ecosite is the SWH</p> <p>• Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats.</p> <p>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"^{ccxi}.</p> <p>• SWHMiST^{ccix} Index #35 provides development effects and mitigation measures</p>	<p>Marsh bird breeding habitat is not present within the study area; however, candidate swamp (SW) habitat is present for Green Heron.</p> <p>Candidate SWH</p>

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Open Country Bird Breeding Habitat					
<p><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.</p>	<p>Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow</p> <p><u>Special Concern:</u> Short-eared Owl</p>	<p>CUM1 CUM2</p>	<p>Large grassland areas (includes natural and cultural fields and meadows) >30 ha^{ckx, cbx, cbxi, cbxii, cbxiii, cbxiv, cbxv, cbxvi, cbxvii, cbxviii, cbxix}. 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)^l.</p> <p>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.</p> <p>The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Agricultural land classification maps, Ministry of Agriculture. • Ask local birders • Ontario Breeding Bird Atlas^{ccv} • Reports and other information available from CAs. 	<p>Field Studies confirm:</p> <ul style="list-style-type: none"> • Presence of nesting or breeding of 2 or more of the listed species. • A field with 1 or more breeding Short-eared Owl 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"^{ccxi}. • SWHMiST^{ckix} Index #32 provides development effects and mitigation measures. 	<p>Large fields are not present within the study area.</p> <p>Not SWH</p>

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Shrub/Early Successional Bird Breeding Habitat					
<p><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 cxcix.</p>	<p><u>Indicator spp.:</u> Brown Thrasher Clay-coloured Sparrow</p> <p><u>Common spp.:</u> Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher</p> <p><u>Special Concern:</u> Yellow-breasted Chat Golden-winged Warbler</p>	<p>CUT1 CUT2 CUS1 CUS2 CUW1 CUW2</p> <p>Patches of shrub ecosites can be complexed into a larger habitat for some bird species.</p>	<p>Large field areas succeeding to shrub and thicket habitats >10ha^{cxiv} in size.</p> <ul style="list-style-type: none"> • 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)ⁱ. <p>Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species^{cbxiii}.</p> <p>Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Agricultural land classification maps Ministry of Agriculture Local bird clubs • Ontario Breeding Bird Atlas^{ccv} • Reports and other information available from CAs 	<p>Field Studies confirm:</p> <ul style="list-style-type: none"> • Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common speciesⁱ. • A field 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 • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"^{ccxi} • SWHMiST^{cxix} Index #33 provides development effects and mitigation measures. 	<p>Large early successional habitats are not present within the study area.</p> <p>Not SWH</p>

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Terrestrial Crayfish					
<u>Rationale:</u> Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare. ^{ccii}	Chimney or Digger Crayfish: (<i>Fallicambarus fodiens</i>) Devil Crawfish or Meadow Crayfish: (<i>Cambarus diogenes</i>)	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM	Wet meadow and edges of shallow marshes (no minimum size) identified 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. Information Sources • Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998	Studies Confirm: • Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable marsh meadow or terrestrial sites ^{ccci} • 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 during in temporary or permanent water Note the presence of burrows or chemistry are often the only indicator of presence, observance or collection of individuals is very difficult ^{ccci} • SWHMiST ^{ccix} Index #36 provides development effects and mitigation measures.	Terrestrial Crayfish habitat may be present within the study area. Candidate SWH

Table 4. Characteristics of Habitat for Species of Conservation Concern for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Special Concern and Rare Wildlife Species					
<p><u>Rationale:</u> These species are quite rare or have experienced significant population declines in Ontario.</p>	<p>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.</p>	<p>All plant and animal element occurrences (EO) within a 1 or 10km grid.</p> <p>Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy.</p>	<p>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^{boxiii}.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • Natural Heritage Information Centre (NHIC) will have the Special Concern and Provincially Rare (S1-S3, SH) species lists with element occurrences data. • NHIC Website: "Get Information": http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas^{ccv} • Expert advice should be sought as many of the rare spp. have little information available about their requirements. 	<p>Studies Confirm:</p> <ul style="list-style-type: none"> • 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 to be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat. • SWHMiST^{cxix} Index #37 provides development effects and mitigation measures. 	<p>Special Concern and Rare Wildlife Species may be present in the study area.</p> <p>Candidate SWH</p>

Significant Wildlife Habitat Assessment Tables

Table 5. Characteristics of Animal Movement Corridors for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Amphibian Movement Corridors					
<p>Rationale: Movement corridors for amphibians moving from their terrestrial habitat to breeding habitat can be extremely important for local populations.</p>	Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper 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 ^{cxlviv, cxlxxv, cxlxvi, cxlxvii, cxlxviii, cxlxix, cxlxx, cxlxxi} 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 ¹ . <u>Information Sources</u> • MNRF District Office • Natural Heritage Information Center NHIC • Reports and other information available from CAs • Field Naturalist Clubs	• 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 ^{cxlix} . • Corridors should have at least 15m of vegetation on both sides of waterway ^{cxlix} or be up to 200m wide ^{cxlix} of woodland habitat and with gaps <20m ^{cxlix} . • Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat ^{cxlix} . • SWHMIST ^{cxlix} Index #40 provides development effects and mitigation measures.	Amphibian Breeding Habitat - Wetland is not applicable for the study area. Therefore, amphibian movement corridors are not applicable. Not SWH

Table 5. Characteristics of Animal Movement Corridors for Ecoregion 6E.

	Wildlife Species ¹	Candidate SWH		Confirmed SWH	Study Area
		ELC Ecosite Codes ¹	Habitat Criteria and Information Sources ¹	Defining Criteria ¹	Assessment Details
Wildlife Habitat: Deer Movement Corridors					
<p><u>Rationale:</u> Corridors important for all species to be able to access seasonally important life-cycle habitats or to access new habitat for dispersing individuals by minimizing their vulnerability while travelling.</p>	White-tailed Deer	<p>Corridors may be found in all forested ecosites.</p> <p>A Project Proposal in Stratum II Deer Wintering Area has potential to contain corridors.</p>	<p>Movement corridor must be determined when Deer Wintering Habitat is confirmed as SWH from Table 1.1 of this schedule¹.</p> <ul style="list-style-type: none"> • A deer wintering habitat identified by the OMNRF as SWH in Table 1.1 of this Schedule will have corridors that the deer use during fall migration and spring dispersion^{clxxxii, clxxxiii, cxlix, cxcliv}. • Corridors typically follow riparian areas, woodlots, areas of physical geography (ravines, or ridges). <p><u>Information Sources</u></p> <ul style="list-style-type: none"> • MNRF District Office • Natural Heritage Information Center (NHIC) • Reports and other information available from CAs • Field Naturalist Clubs 	<ul style="list-style-type: none"> • Studies must be conducted at the time of year when deer are migrating or moving to and from winter concentration areas. • Corridors that lead to a deer wintering yard should be unbroken by roads and residential areas. • Corridors should be at least 200m wide^{cxlix} with gaps <20m^{cxlix} and if following riparian area with at least 15m of vegetation on both sides of waterway^{cxlix}. Shorter corridors are more significant than longer corridors^{cxlix}. • SWHMiST^{cxlix} Index #39 provides development effects and mitigation measures. 	<p>Deer Wintering Habitat is not applicable for the study area. Therefore, deer movement corridors are not applicable.</p> <p>Not SWH</p>

Appendix II
Bat Acoustic Monitoring Report



Project No. 2192B

To: Michelle Karam, Ministry of Environment, Conservation and Parks
Graham Buck, Ministry of Natural Resource and Forestry

CC: Will Yang, Xinyi Canada Glass Ltd.
Chris Pidgeon, GSP Group

From: Jessica Linton, Project Manager
Heather Fotherby, Terrestrial Biologist (Bat Data Analysis)

Date: February 11, 2020

**Re: Xinyi Glass Plant Development, Environmental Impact Study
Bat Acoustic Monitoring Results**

Natural Resource Solutions Inc. (NRSI) was retained by Xinyi Canada Glass Ltd. to complete and Environmental Impact Study (EIS) for a proposed glass manufacturing facility in Stratford, ON. The lands that encompass the proposed development area is Lots 2 and 3, Concession 5 Downie, Township of Perth South, Perth County, Ontario. The subject property is approximately 71 ha in size and is bound by an existing rail line to the northwest, Gibb Road and farmland to the north, Highway 7 to the east, and active agricultural lands with two small boundary woodlands to the south.

The development will require the removal of a small (0.96 ha) treed feature which was identified as potential habitat for bats. As part of the EIS, NRSI conducted acoustic surveys to assess the potential presence of bat habitat and species composition, with specific focus on bat Species at Risk (SAR).

This memo provides a summary of the methods and results of the bat acoustic monitoring. It is anticipated that Mr. Buck will provide guidance with regards to Significant Wildlife Habitat on behalf of the Ontario Ministry of Natural Resources and Forestry (MNRF) and Ms. Karam will provide guidance with regard to SAR and *Endangered Species Act* compliance on behalf of the Ontario Ministry of Environment, Conservation and Parks (MECP).

Methods

Acoustic monitoring for bats was completed in the (FOD7) Fresh – Moist Lowland Deciduous Forest and (SWD3-3) Swamp Maple Mineral Deciduous Swamp vegetation community within Woodland B on the subject property (Map 1). Bat acoustic monitoring methodology followed the guidelines outlined within the MNRF Survey Protocol for Species at Risk Bats within Treed Habitats for Little Brown Myotis, Northern Myotis and Tri-Colored Bats (MNRF 2017) and are described in detail below.

Acoustic Monitoring Station Locations

Following a comprehensive of all trees in the woodland, NRSI identified three candidate bat roost trees within the subject property to be monitored (Map 1). The woodland edge was also monitored for bat activity as the edge was identified as a candidate foraging area and travel corridor. Details of each candidate bat habitat feature including location, tree species, height, decay class and Diameter-at-Breast Height (DBH), if applicable, is provided in Appendix I.

NRSI placed an acoustic monitoring station within 10 m of each of the three candidate bat roost trees to assess the potential presence of SAR bats within the subject property (Map 1). For the candidate foraging area and travel corridor, two acoustic monitoring stations were placed along the edge of the habitat to conceal the microphones from any foraging or travelling bats to avoid recording inspection calls.

A total of five acoustic recorders were utilized. 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	On
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	43.34017 N
Longitude	-81.02131 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 1 and June 20, 2019 for a total of 20 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.

Upon review of weather conditions during the monitoring period, bat echolocation calls recorded on the 10 evenings with the most ideal weather conditions for bat activity (ambient temperature >10°C, low wind and no precipitation) were selected for further analyses (Appendix III). As per MNR (2017), at least 10 monitoring nights that align with the above weather conditions where no SAR bat activity is detected are required to confirm their absence from a given habitat. Note, due to an equipment error, data was only recorded from June 1 to June 14, 2019 for a total of 14 nights at BAT-005. Five of these 14 nights aligned with suitable weather conditions and were included in the following analysis. Monitoring station BAT-005 was installed to monitor a potential foraging area and/or travel corridor. Due to the presence of BAT-004 along the same woodland edge as BAT-005, it is assumed that data collected at BAT-004 could be used in place of data that would have been collected at BAT-005 to assess the potential presence of a foraging area/travel corridor.

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 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.

All bat call sequences with one or more of the following auto-classification results were manually vetted by NRSI biologists to bat species or species grouping (Table 2):

- Classified as a high frequency call sequence (potential SAR) and not confidently classified to species level;

- Classified as a SAR;
- A SAR was identified as one of the second or third suggested species identifications; and/or
- Not assigned a classification by the auto-classifier or classified as “No ID”.

Table 2. Call classifications for Ontario bat species.

Species Groupings		Species	Typical Characteristic Frequency (kHz)	Call Sequence Classification				
20 kHz		Hoary Bat <i>(Lasiurus cinereus)</i>	20 (~to 30)	Low Frequency	30 kHz		Hoary Bat	
		Big Brown Bat <i>(Eptesicus fuscus)</i>	~30				Big Brown Bat	
		Silver-haired Bat <i>(Lasionycteris noctivagans)</i>	~30				Silver-haired Bat	
30 kHz		Eastern Red Bat <i>(Lasiurus borealis)</i>	~40	High Frequency	40 kHz		Eastern Red Bat	
		Tricolored Bat <i>(Perimyotis subflavus)</i>	~40				Tri-colored Bat	
	Species at Risk	Eastern Small-footed Myotis <i>(Myotis leibii)</i>	~40				Eastern Small-footed Myotis	
		Little Brown Myotis <i>(Myotis lucifugus)</i>	~40				Little Brown Myotis	
		Myotis	Northern Myotis <i>(Myotis septentrionalis)</i>				~40	Northern Myotis
			Myotis spp.					

Once the required files were manually vetted, the auto-classification program provided an estimated likelihood of presence for each species, also known as a maximum likelihood estimate (MLE). An MLE value provides an indication of the strength of evidence for the presence of a species. An 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. These values are discussed in the results below at the site-level and presented in Appendix IV at the station-level. It is important to note that the likelihood estimate provides a probabilistic estimate and does not convey certainty.

Results

Five bat species were documented as present during passive acoustic monitoring conducted within the subject property. One of these species, Little Brown Myotis (*Myotis lucifugus*), is listed as SAR in Ontario. A summary of the acoustic monitoring results is provided in Appendix IV and Figure 1.

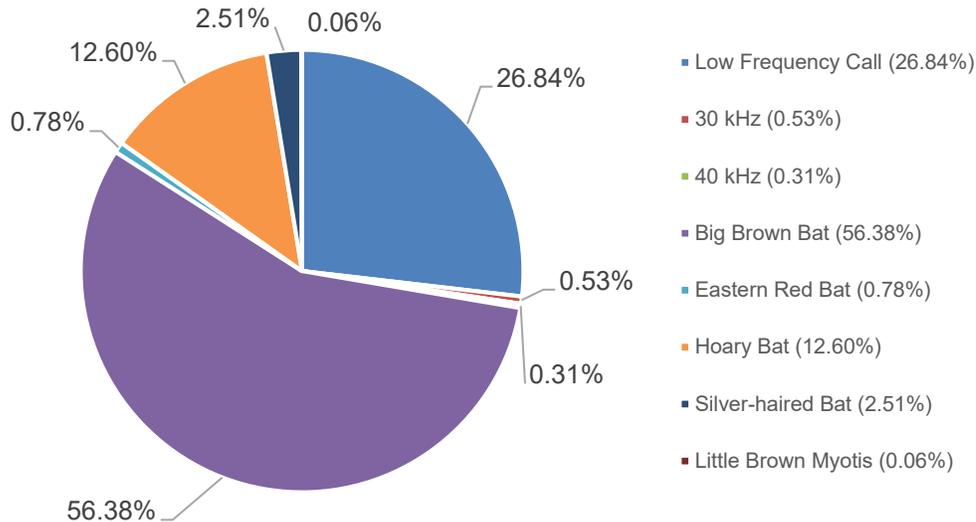


Figure 1. Bat species and species grouping classification results (all stations).

A total of 3,223 bat pass sequences were recorded throughout the acoustic monitoring period that were of high enough quality that they could be classified to either the species level or a species grouping. The majority of these bat pass sequences that were classified to the species level were identified as Big Brown Bat (*Eptesicus fuscus*) (56.38%). Several sequences were classified to Hoary Bat (*Lasiurus cinereus*) (12.60%) and Silver-haired Bat (*Lasionycteris noctivagans*) (2.51%). A small proportion of calls were classified to Eastern Red Bat (*Lasiurus borealis*) (0.78%) and Little Brown Myotis (0.06%).

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 Eastern Red Bat (MLE=0) within the subject property. The data suggests that there is weaker evidence for the presence of Little Brown Myotis (MLE=0.91) and no evidence for the presence of Silver-haired Bat (MLE = 1). Station-level MLE values (per monitoring station) for each species is provided in Appendix IV.

Of those bat pass sequences that were classified to species groupings, 865 (26.84%) was identified to the Low Frequency species grouping, 17 (0.53%) to the 30 kHz species grouping and 10 (0.31%) to the 40 kHz species grouping. While SAR bats are included in the 40 kHz species grouping, this species grouping also includes non-SAR bats (Eastern Red Bat) and should not be considered probable evidence of the presence of SAR.

In addition to the 3,223 bat pass sequences discussed above, 33 sequences were identified as low-quality sequences, which do not allow for a confident classification to species or species grouping. These bat pass sequences were not included in the analysis. Low quality calls collected from this study site are likely a result of high clutter within the vicinity of some of the microphones, due to the requirement to place acoustic recorders in forested habitats as outlined in MNRF (2017). High clutter areas have dense vegetation that interferes with the passage of ultrasound from the bat to the microphone, resulting in fewer high-quality sequences being recorded.

Bat pass sequences were detected on all monitoring nights. Bat activity peaked on the evening of June 19, 2019, when the highest number of bat pass sequences were recorded (757). The evenings of June 15 and June 16 had the lowest number of recorded bat pass sequences (101 and 103, respectively). Figure 2 provides a summary of the number of recorded bat pass sequences per monitoring night.

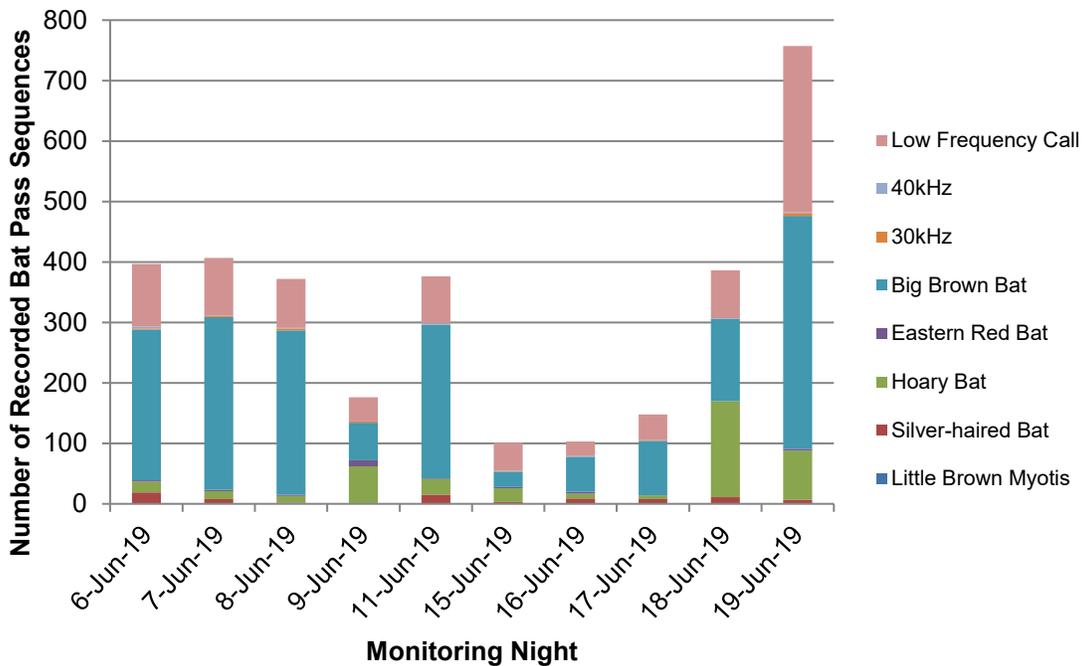


Figure 2. Bat species and relative abundance per monitoring night.

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 or mild nights (i.e., ambient temperature > 10°C) with low wind speed and no precipitation (MNRF 2017). Figure 3 presents the number of bat pass sequences recorded each monitoring 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 III summarizes the weather conditions for each recording interval throughout the monitoring period.

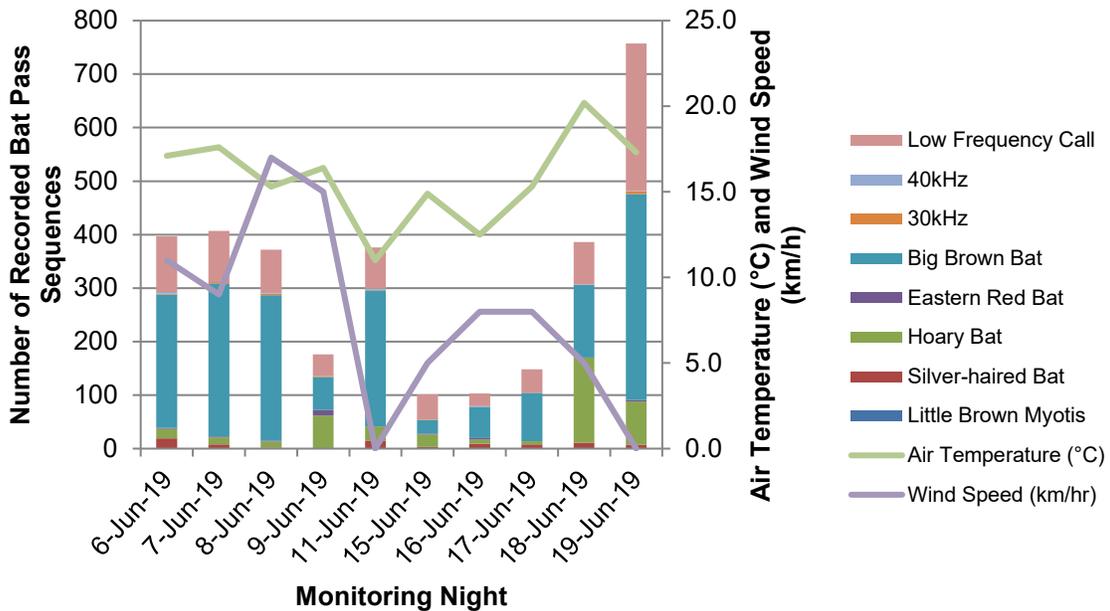


Figure 3. Relationship between number of recorded bat pass sequences per monitoring night (21:00 and 22:00 hrs) and weather conditions at sunset (21:00 hrs).

Acoustic monitoring station BAT-001 had the highest total number of bat pass sequences recorded with 936 records, while station BAT-005 had the lowest, with a total of 425 recorded bat pass sequences. However, note that only five days of data recorded at BAT-005 are included in this analysis due to equipment error. 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 monitoring stations, as illustrated in Figure 4.

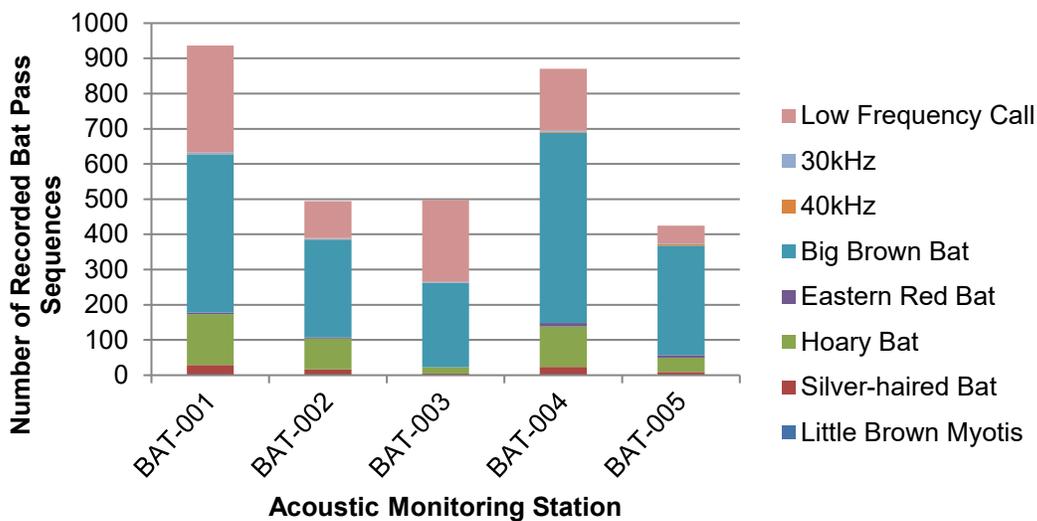


Figure 4. Bat species detected and relative abundance per acoustic monitoring station.

Bat pass sequences classified to the 40 kHz species grouping were recorded at all monitoring stations except BAT-001. One bat pass sequence recorded at BAT-002 and one at BAT-004 were classified to Little Brown Myotis.

Bat activity also varied throughout each monitoring night. At the site-level (across all monitoring stations throughout the entire monitoring period) bat activity was high starting at 21:00 hrs and gradually declined throughout the evening until it peaked again at 1:00 hrs. Figure 5 provides a summary of bat species and relative species abundances per hour during the recording period each evening.

The timing of bat pass sequence recordings can provide information on how bats are using available habitats within the subject property. Bat pass sequences recorded early in the evening can indicate the presence of roosting and maternity colony habitat (Figure 5). Sequences recorded later in the evening can indicate the presence of foraging habitat and movement or travel corridors (flyways) (Figure 5).

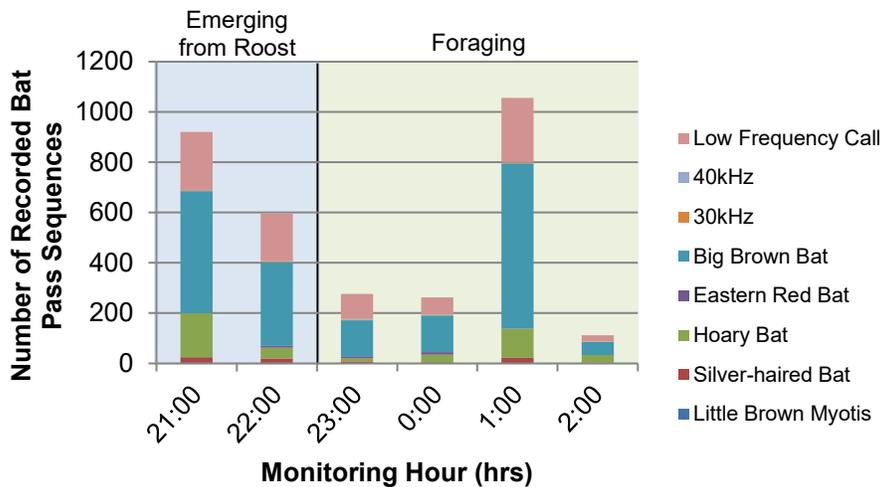


Figure 5. Bat species detected and relative abundance per monitoring hour.

Figure 6 further illustrates the timing of bat pass sequence recordings specific to SAR or potential SAR. While SAR bats are included in the 40 kHz species grouping, this species grouping also includes non-SAR bats (Eastern Red Bat) and should not be considered probable evidence of the presence of SAR. SAR and potential SAR activity peaked between the hours of 23:00 and 01:00 during the monitoring period.

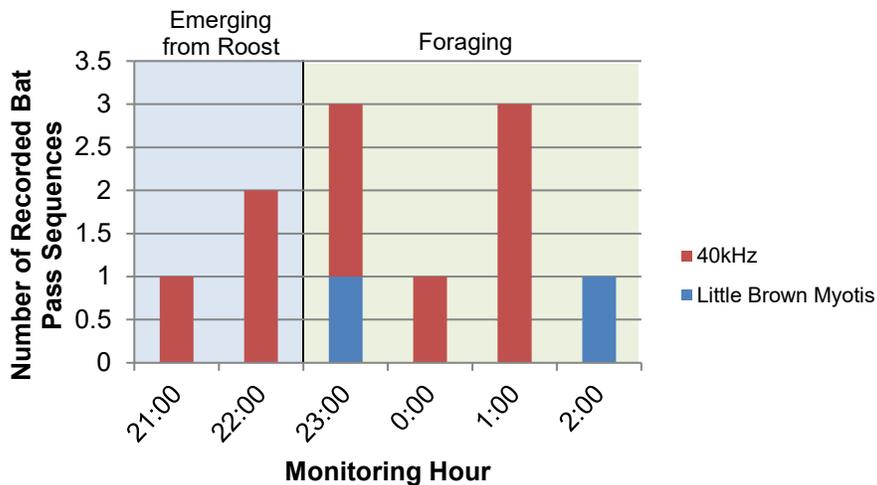


Figure 6. Bat Species at Risk and potential bat Species at Risk detected and relative abundance per monitoring hour.

Summary and Discussion

Passive bat acoustic monitoring completed within the subject property identified the presence of five species, Big Brown Bat, Eastern Red Bat, Hoary Bat, Silver-haired Bat and Little Brown Myotis. Little Brown Myotis is listed as SAR in Ontario.

Species at Risk

Little Brown Myotis was detected at monitoring stations BAT-002 and BAT-004 during the monitoring period (Appendix IV). Bat pass sequences identified to the 40 kHz species groupings were also documented at all acoustic monitoring stations with the exception of station BAT-001. While Little Brown Myotis is included in the 40 kHz species grouping, this species grouping also includes Eastern Red Bat, and should therefore not be considered probable evidence of the presence of Little Brown Myotis. Due to the timing and low number of recorded sequences at BAT-002 and BAT-004, it is not likely that bat SAR are using habitats within the vicinity of these monitoring stations as maternity colony or roosting habitat. The location of these two stations not only captured identified potential roost trees, but also woodland edge habitat and it is therefore assumed that bat SAR may be using the woodland edges for foraging or as a movement or travel corridor between key habitats.

The edge of the FOD7 vegetation community within the subject property is therefore considered candidate foraging and movement/travel corridor habitat for the SAR, Little Brown Myotis. Foraging, movement or travel corridor habitats are considered the least sensitive to alteration (MNR 2012).

The proposed development will require the removal of the entire 0.96 ha woodland. The MECP has indicated that to proceed with woodland removal there needs to be a confidence that 1) the woodland is not maternity roost for SAR bats, and 2) that if the woodland provides foraging habitat that it will not be limiting the species if removed. Based on the small number of SAR (2) and potential SAR (10) bat pass sequences recorded and the timing of these recordings, the data does not suggest that the woodland provide maternal roosting habitat. There is evidence that a small number of bats use the woodland as foraging and/or as a travel corridor, however, alternate

foraging areas and movement or travel corridors are available within close proximity of the subject property. Furthermore, the development will result in a large, landscaped stormwater management area which is likely to provide an increased area of foraging habitat within the subject property. Based on this analysis, in combination with the mitigation proposed below, it is not anticipated that a permit under the *Endangered Species Act*, 2007 (ESA) will be required to remove the woodland.

Significant Wildlife Habitat

To be considered candidate SWH for Bat Maternity Colonies a habitat must be a mature deciduous or mixed forest stand with greater than 10 large diameter (>25cm DBH) wildlife trees per hectare. Bat habitat assessment results indicate that the woodland proposed for removal contains 3.12 large diameter wildlife trees per hectare and therefore does not meet the criteria for providing SWH for Bat Maternity Colonies. Based on this analysis, there are no implications with regards to SWH under the Provincial Policy Statement. Big Brown Bats primarily form maternity colonies in buildings and other man-made structures but will also roost in tree cavities, although less frequently (Agosta 2002, Gerson 1984). Therefore, given the presence of farm houses and barns in the area, this species is anticipated to be using these structures for roosting.

Recommendations

No bat SAR or SWH for bats have been identified within the woodland, however there were a high number of non-SAR bats using the woodland area, likely as a travel corridor or for foraging. The following provides guidance on how to avoid and minimize direct impacts to bats as a result of the removal of the woodland feature.

- The methods, results and recommendations below should be included in the required EIS document to ensure they are considered as part of all planning applications.
- All vegetation and tree removal required as part of the proposed development must occur outside of the bat active period between April 1st and October 31st to avoid direct impacts to SAR and non-SAR bats.
- The woodland area should be compensated for appropriately through an approved compensation plan developed in consultation with MNR and UTRCA.
- The landscaping design of the large (8ha) stormwater management area should consider a variety of native trees and shrubs that will diversify insects (bat food sources) and improve the quality of foraging habitat around the pond. A landscaping plan should be developed in consultation with NRSI and reviewed by UTRCA.
- The compensation plan should have consideration for tree species that bats are known to prefer for roosting habitat, which may include:
 - Shagbark Hickory (*Carya ovata*), Bitternut Hickory (*Carya cordiformis*), Silver Maple (*Acer saccharinum*), Sugar Maple (*Acer saccharum*), Red Maple (*Acer rubrum*), Northern Red Oak (*Quercus rubra*), Black Oak (*Quercus velutina*), White Oak (*Quercus alba*) and American Elm (*Ulmus Americana*) (US Fish and Wildlife Service).
- To increase roosting habitat for Big Brown Bat and Silver-haired Bat, it is recommended that artificial roosting structures be installed within suitable habitat (e.g., near a drinking source and/or foraging habitat) as part of the compensation plan. Big Brown Bats tend to prefer cooler roosts in comparison with Little Brown

Myotis, for example. It is therefore recommended to install a minimum of two artificial roost structures, both in full sun, one with a sun shade roof, one without. Starting with a number of smaller roost structures is recommended in areas where a roost is unknown or has not yet been established by the species. Following confirmation of the use of the artificial roost structure by bats, it is then recommended to add additional artificial roost structures or expand existing structures. Based on the maximum number of recorded bat pass sequences in one evening across all monitoring stations (757), appropriate compensation should involve the installation of artificial roost structures that support at least 760 individuals. It is recommended that installed artificial roost structures be monitored for a minimum of five years following installation to assess the use of the structure by bats and to ensure that it continues to provide suitable bat maternity colony habitat. Monitoring is recommended to include two exit surveys per year conducted during the maternity period between June 1st and July 7th. It is recommended to collect acoustic data during surveys to allow for species identification of any bats confirmed to be using the structures. Survey methodology should follow those outlined in the MNRF Guelph District protocol for the Use of Buildings and Isolated Trees by Species at Risk Bats (MNRF 2014). Please note that Bat Conservation and Management Inc. (BCM) has been consulted to confirm appropriate artificial roost structure compensation. Should the advice provided by BCM be any different, the above compensation habitat recommendations may be updated in the future.

- To promote the use of any newly created or enhanced woodlands by bats for maternity colonies, roosting, foraging, and travel corridors, the following is recommended to be considered when selecting a location and developing the planting plan (JNCC 2001):
 - Avoid areas with artificial lighting that would cause light wash effects on the compensation area to the greatest extent possible;
 - Strive to create a diversified edges that will provide sheltered areas to promote higher insect concentrations;
 - Promote vegetation structural diversity. Consider a variety of vegetation types from trees to shrubs to herbaceous vegetation promotes greater insect diversity and cover for bats;
 - Consider planting tree species that bats are known to prefer for roosting habitat (see above);
 - Avoid the use of pesticides during regular maintenance operations on the site.

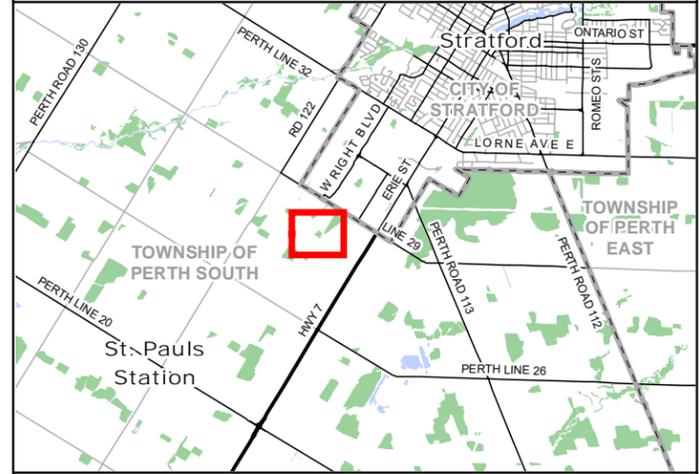
The exact location of the compensation area will be selected in consultation with the Upper Thames Region Conservation Authority and City of Stratford. Foraging habitat immediately adjacent to the proposed development lands will still be present in the form of woodlands, drainage channels, and a large (8ha) landscaped stormwater management pond which is being constructed as part of the Xinyi Glass Manufacturing Facility. It is anticipated that artificial roost structures will be proposed as part of a compensation plan focused on the stormwater management pond which will maintain foraging habitat onsite.

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MAP

Xinyi Glass Plant EIS Candidate Bat Habitat and Acoustic Monitoring Stations



- Legend**
- Subject Property
 - Bat Acoustic Monitoring Station (BAT)
 - Candidate Bat Roost Tree (RST)
 - Bat Species at Risk Foraging and Travel Corridor Habitat
 - Railway
 - Intermittent Watercourse
 - Ecological Land Classification (ELC)
 - (FOD6-5) Fresh - Moist Sugar Maple - Hardwood Deciduous Forest Type
 - (FOD7) Fresh - Moist Lowland Deciduous Forest Ecosite
 - (SWD3-3) Swamp Maple Mineral Deciduous Swamp Type



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Project: 2192B Date: February 12, 2020	NAD83 - UTM Zone 17 Size: 11x17" 1:3,000
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0 40 80 120 160 200 Metres



APPENDIX I

Location and Description of Monitored Candidate Bat Habitat

Type of Candidate Habitat	Candidate Roost Tree ID	Location (UTM Coordinates)		Species (Common Name)	Species (Scientific Name)	DBH (cm)	Height Class ¹ (m)	Decay Class ²	Habitat Features	Corresponding Acoustic Monitoring Station
		Zone: 17T								
		Easting	Northing							
Roost	RST-001	498197	4798535	Freeman's Maple	<i>Acer freemanii</i>	35	1	2	Cavity, Crack/Crevice	BAT-003
Roost	RST-002	498129	4798579	Freeman's Maple	<i>Acer freemanii</i>	35	2	2	Cavity	BAT-004
Roost	RST-003	498233	4798542	Ash sp.	<i>Fraxinus sp.</i>	38	1	4	Loose Bark	BAT-002
Travel Corridor	-	-	-	-	-	-	-	-	Forest Edge	BAT-001
Travel Corridor	-	-	-	-	-	-	-	-	Forest Edge	BAT-005

¹Height Class: 1-Dominant (above canopy), 2-Co-dominant (canopy height), 3-Intermediate (just below canopy), 4-surpressed (well below canopy)

²Decay Class (Watt and Caceres 1999): 1-Healthy, Live Tree, 2-Declining Live Tree, Part of Canopy Lost, 3-Very Recently Dead, No Canopy, Bark Intact, Branches Intact, 4-Recently Dead, Bark Peeling, Only Large Branches Intact, 5-Older Dead Tree, 90% of Bark Lost, Few Branch Stubs, Broken Top, 6-Very Old Dead Tree, Advanced Decay, No Branches, Parts of the Stem Have Rotted Away

APPENDIX II

Location and Set-up Details of Bat Acoustic Monitoring Stations

Acoustic Monitoring Station	Location (UTM Coordinates)		Microphone Height (m)	Microphone Direction (degrees)	Habitat Type	Clutter ¹
	Zone: 17T					
	Easting	Northing				
BAT-001	498253	4798572	5.2	355	Forest Edge	EDGE
BAT-002	498228	4798537	5.2	38	Potential Roost Tree (RST-003) Along Forest Edge	EDGE
BAT-003	498194	4798542	5.2	185	Potential Roost Tree (RST-001) in Forest	HIGH
BAT-004	498126	4798574	5.2	127	Potential Roost Tree (RST-002) Along Forest Edge	HIGH
BAT-005	498170	4798609	5.2	255	Forest Edge	EDGE

¹NO = 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
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	
June 1, 2019	21:00	2:00	14.7	15	15.0	5	4.0
June 2, 2019	21:00	2:00	7.3	13	14.5	9	1.2
June 3, 2019	21:00	2:00	9.3	8	4.9	17	0.0
June 4, 2019	21:00	2:00	17.8	15	3.8	4	0.0
June 5, 2019	21:00	2:00	16.1	5	17.3	17	11.5
June 6, 2019 ²	21:00	2:00	17.1	11	14.5	8	0.0
June 7, 2019 ²	21:00	2:00	17.6	9	11.1	0	0.0
June 8, 2019 ²	21:00	2:00	15.3	17	14.2	8	0.0
June 9, 2019 ²	21:00	2:00	16.4	15	14.5	13	0.0
June 10, 2019	21:00	2:00	12.4	34	19.2	17	6.0
June 11, 2019 ²	21:00	2:00	11.0	0	11.6	22	0.0
June 12, 2019	21:00	2:00	13.8	15	7.3	4	0.0
June 13, 2019	21:00	2:00	12.1	24	13.6	13	9.3
June 14, 2019	21:00	2:00	17.0	22	9.9	26	0.0
June 15, 2019 ^{2,3}	21:00	2:00	14.9	5	16.9	28	0.7
June 16, 2019 ^{2,3}	21:00	2:00	12.5	8	13.4	4	0.0
June 17, 2019 ^{2,3}	21:00	2:00	15.3	8	11.3	5	0.0
June 18, 2019 ^{2,3}	21:00	2:00	20.2	5	13.5	4	0.0
June 19, 2019 ^{2,3}	21:00	2:00	17.3	0	13.0	4	0.0
June 20, 2019 ^{2,3}	21:00	2:00	15.5	13	16.3	5	3.4

¹Government of Canada 2019

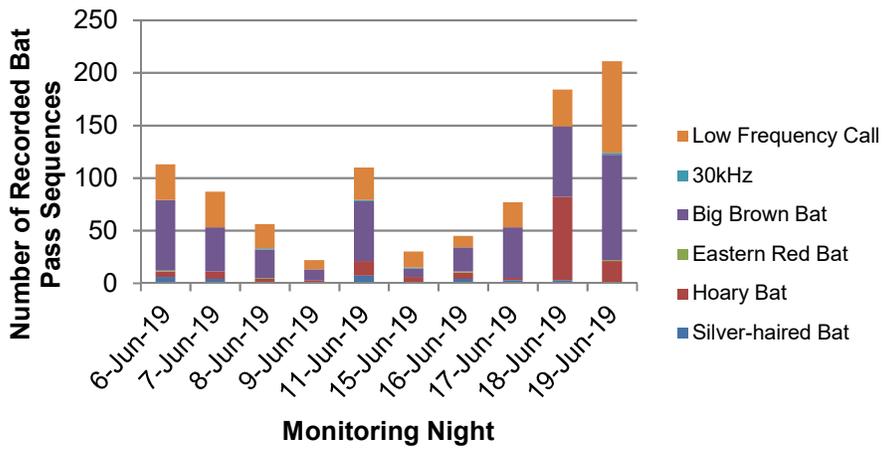
²Dates included in bat acoustic data analysis for monitoring stations BAT-001 - BAT-004

³Dates included in bat acoustic data analysis for monitoring station BAT-005

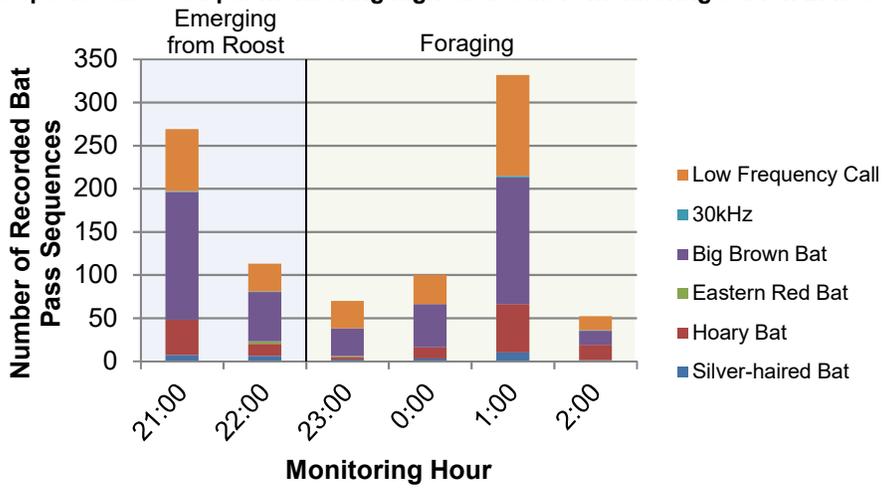
APPENDIX IV
Acoustic Monitoring Results

Bat ID Software Program Used	Software Version	Type of Data Analyzed (FS or ZC)	Acoustic Monitoring Station	Species or Species Grouping Classification	No. of Bat Pass Sequences	Maximum Likelihood Estimate (p-value) ¹
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-001	Silver-haired Bat	29	0.98
				Hoary Bat	145	0
				Eastern Red Bat	4	0.09
				Big Brown Bat	449	0
				30kHz	5	-
				Low Frequency Call	303	-
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-002	Little Brown Myotis	1	0.83
				Silver-haired Bat	15	1
				Hoary Bat	88	0
				Eastern Red Bat	4	0.1
				Big Brown Bat	277	0
				40kHz	2	-
				30kHz	3	-
				Low Frequency Call	104	-
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-003	Silver-haired Bat	5	1
				Hoary Bat	18	0.05
				Big Brown Bat	239	0.05
				40kHz	1	-
				30kHz	2	-
				Low Frequency Call	233	-
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-004	Little Brown Myotis	1	0.93
				Silver-haired Bat	23	1
				Hoary Bat	114	0
				Eastern Red Bat	10	0
				Big Brown Bat	541	0
				40kHz	3	-
				30kHz	4	-
				Low Frequency Call	174	-
SonoBat	4.2.2 North Northeast	Full Spectrum	BAT-005	Silver-haired Bat	9	1
				Hoary Bat	41	0
				Eastern Red Bat	7	0.02
				Big Brown Bat	311	0
				40kHz	4	-
				30kHz	2	-
Low Frequency Call	51	-				

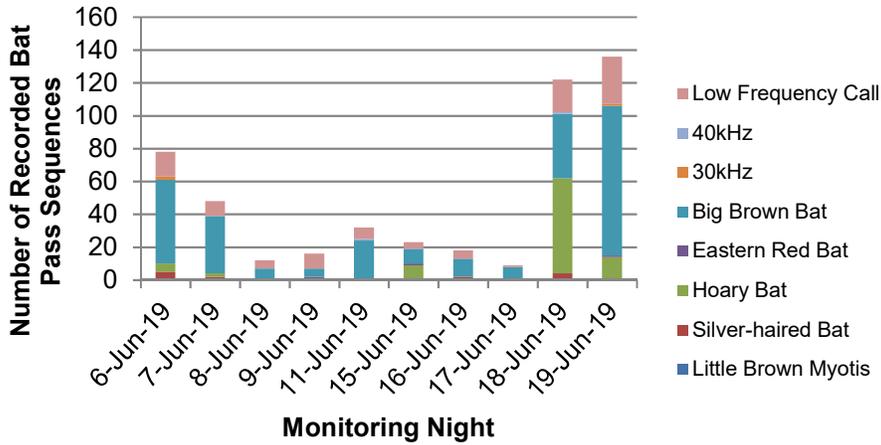
¹Calculated by SonoBat 4.2.2 Auto-classifier



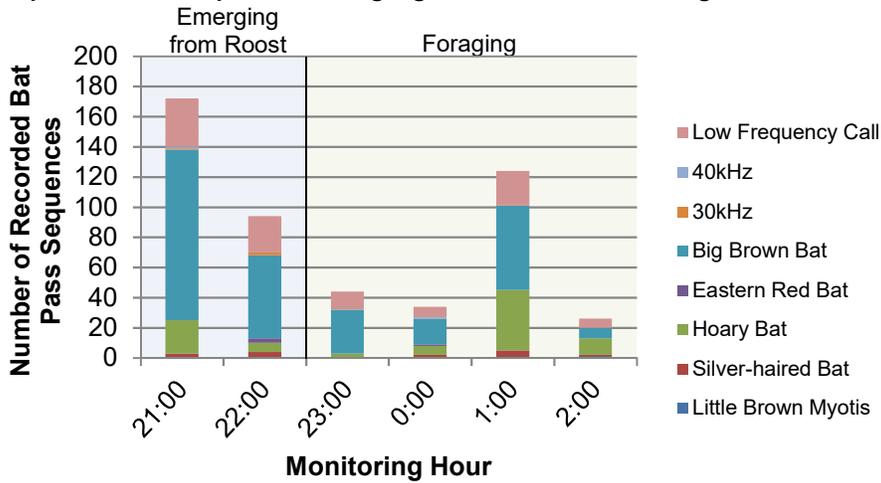
Bat species detected per monitoring night at acoustic monitoring station BAT-001.



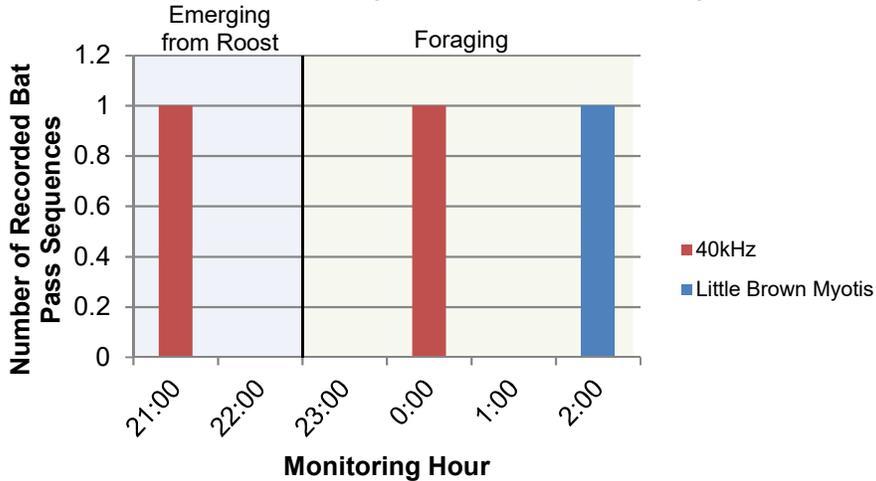
Bat species detected per monitoring hour at acoustic monitoring station BAT-001.



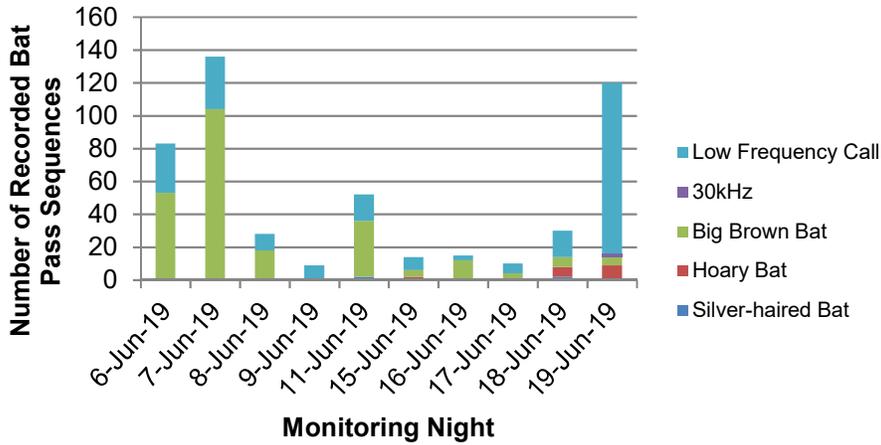
Bat species detected per monitoring night at acoustic monitoring station BAT-002.



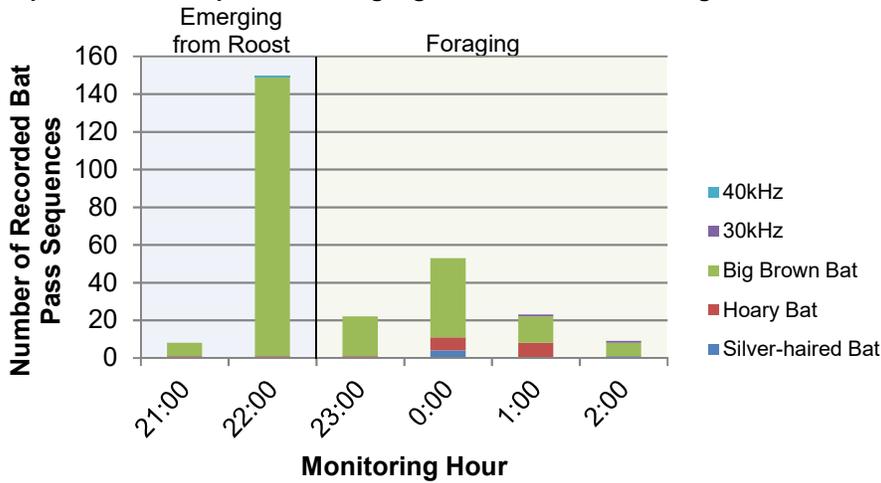
Bat species detected per monitoring hour at acoustic monitoring station BAT-002.



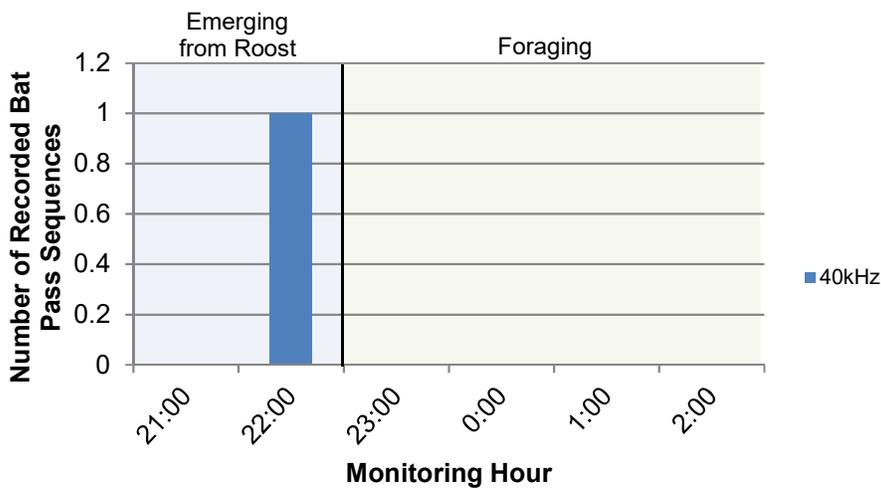
Bat Species at Risk detected per monitoring hour at acoustic monitoring station BAT-002.



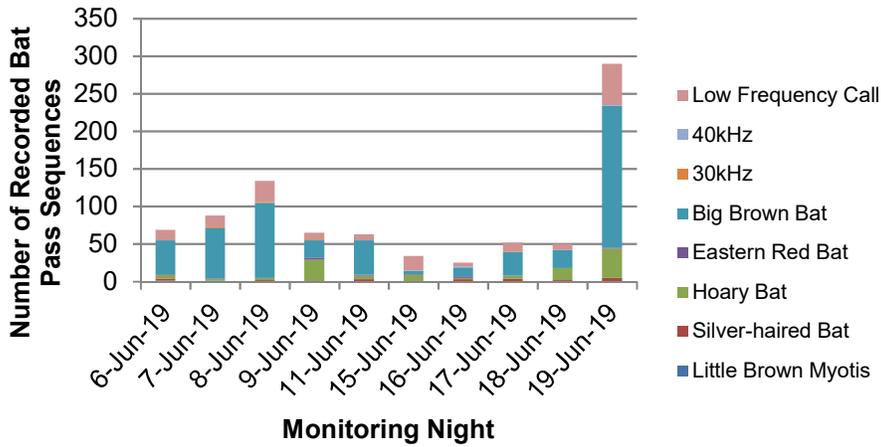
Bat species detected per monitoring night at acoustic monitoring station BAT-003.



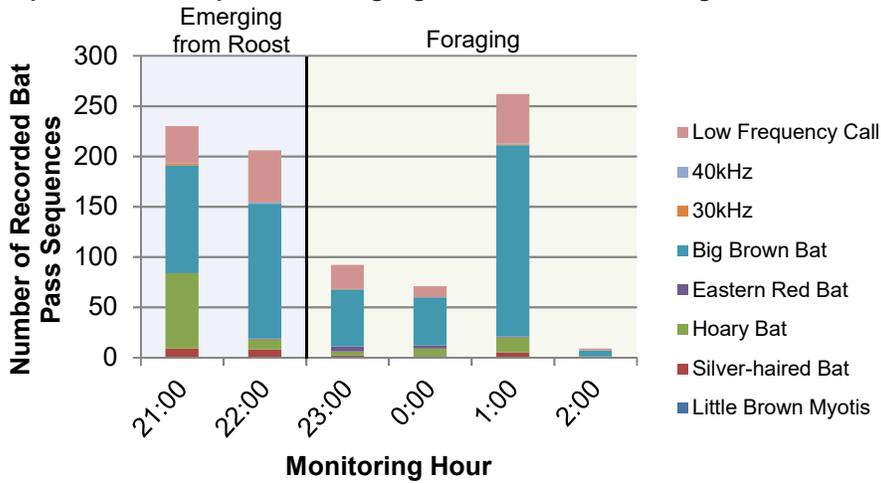
Bat species detected per monitoring hour at acoustic monitoring station BAT-003.



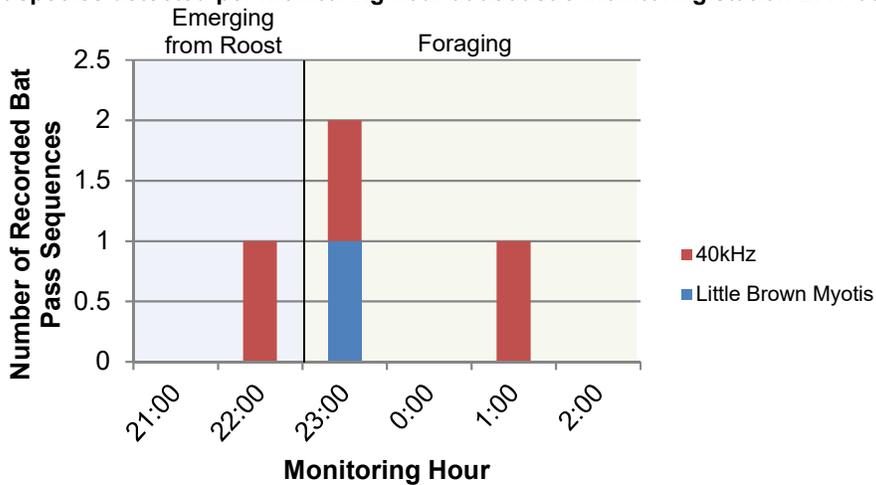
Bat Species at Risk detected per monitoring hour at acoustic monitoring station BAT-002.



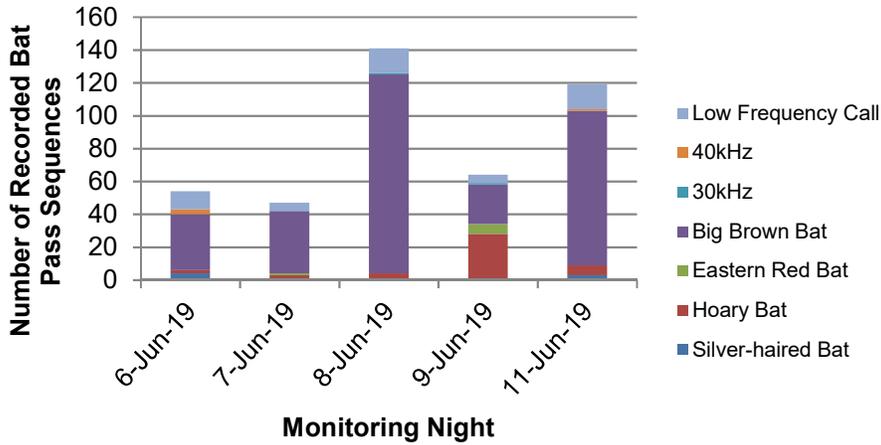
Bat species detected per monitoring night at acoustic monitoring station BAT-004.



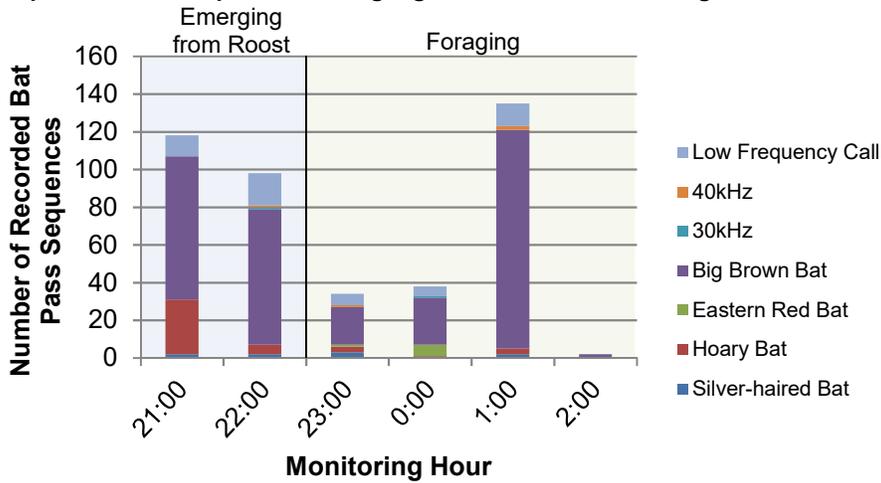
Bat species detected per monitoring hour at acoustic monitoring station BAT-004.



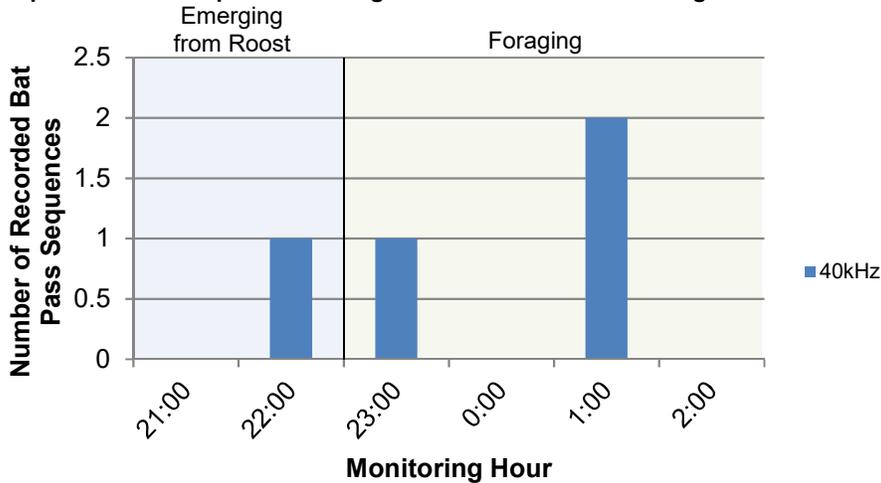
Bat Species at Risk detected per monitoring hour at acoustic monitoring station BAT-004.



Bat species detected per monitoring night at acoustic monitoring station BAT-005.



Bat species detected per monitoring hour at acoustic monitoring station BAT-005.



Bat Species at Risk detected per monitoring hour at acoustic monitoring station BAT-005.

Appendix III
Vascular Flora Species Observed within the Study Area

Appendix III
Vascular Plant Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	SARO ²	COSEWIC ³	SARA Schedule ⁴	Perth County ⁵	NRSI Observed	
							Woodland B SWD3-3 / FOD7	Study Area SWD3-3 / FOD5 / FOD6-5 / FOD7
Pteridophytes	Ferns & Allies							
Dryopteridaceae	Wood Fern Family							
<i>Athyrium filix-femina</i> var. <i>angustum</i>	Northern Lady Fern	S5				X	X	X
<i>Dryopteris clintoniana</i>	Clinton's Wood Fern	S4				X	X	X
<i>Dryopteris cristata</i>	Crested Wood Fern	S5				X	X	X
<i>Matteuccia struthiopteris</i> var. <i>pensylvanica</i>	Ostrich Fern	S5				X		X
<i>Onoclea sensibilis</i>	Sensitive Fern	S5				X	X	X
<i>Polystichum acrostichoides</i>	Christmas Fern	S5				X		X
Equisetaceae	Horsetail Family							
<i>Equisetum arvense</i>	Field Horsetail	S5				X	X	X
Dicotyledons	Dicots							
Aceraceae	Maple Family							
<i>Acer saccharum</i> ssp. <i>saccharum</i>	Sugar Maple	S5				X		X
<i>Acer X freemanii</i>	Freeman's Maple						X	X
Anacardiaceae	Sumac or Cashew Family							
<i>Toxicodendron rydbergii</i>	Poison-ivy	S5					X	X
Asteraceae	Composite or Aster Family							
<i>Arctium minus</i> ssp. <i>minus</i>	Common Burdock	SE5				I	X	X
<i>Bidens frondosa</i>	Devil's Beggar-ticks	S5				X	X	X
<i>Erigeron annuus</i>	Daisy Fleabane	S5					X	X
<i>Erigeron philadelphicus</i> ssp. <i>philadelphicus</i>	Philadelphia Fleabane	S5				X	X	X
<i>Lapsana communis</i>	Nipplewort	SE5				I	X	X
<i>Solidago canadensis</i>	Canada Goldenrod	S5				X	X	X
<i>Solidago flexicaulis</i>	Zig-zag Goldenrod	S5				X		X
<i>Sonchus arvensis</i> ssp. <i>arvensis</i>	Field Sow-thistle	SE5				I	X	X
<i>Symphyotrichum lanceolatum</i> var. <i>lanceolatum</i>	Tall White Aster	S5				X	X	X
Berberidaceae	Barberry Family							
<i>Caulophyllum giganteum</i>	Blue Cohosh	S5						X
Betulaceae	Birch Family							
<i>Ostrya virginiana</i>	Hop Hornbeam	S5				X		X
Brassicaceae	Mustard Family							
<i>Alliaria petiolata</i>	Garlic Mustard	SE5				I	X	X
<i>Capsella bursa-pastoris</i>	Shepherd's Purse	SE5				I	X	X
<i>Cardamine bulbosa</i>	Bulbous Cress	S4				X	X	X
<i>Cardamine diphylla</i>	Two-leaved Toothwort	S5				X		X
Caprifoliaceae	Honeysuckle Family							
<i>Lonicera tatarica</i>	Tartarian Honeysuckle	SE5				I	X	X
<i>Sambucus canadensis</i>	Common Elderberry	S5				X	X	X
<i>Sambucus racemosa</i> ssp. <i>pubens</i>	Red-berried Elderberry	S5				X		X
<i>Viburnum lentago</i>	Nannyberry	S5				X	X	X
Celastraceae	Staff-tree Family							
<i>Euonymus obovata</i>	Running Strawberry-bush	S5				X		X

Appendix III
Vascular Plant Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	SARO ²	COSEWIC ³	SARA Schedule ⁴	Perth County ⁵	NRSI Observed	
							Woodland B SWD3-3 / FOD7	Study Area SWD3-3 / FOD5 / FOD6-5 / FOD7
Cornaceae	Dogwood Family							
<i>Cornus alternifolia</i>	Alternate-leaved Dogwood	S5				X		X
<i>Cornus foemina</i> ssp. <i>racemosa</i>	Red Panicked Dogwood	S5				X		X
<i>Cornus stolonifera</i>	Red-osier Dogwood	S5				X	X	X
Cucurbitaceae	Gourd Family							
<i>Echinocystis lobata</i>	Prickly Cucumber	S5				X	X	X
Fagaceae	Beech Family							
<i>Fagus grandifolia</i>	American Beech	S5				X		X
Geraniaceae	Geranium Family							
<i>Geranium robertianum</i>	Herb Robert	SE5				I	X	X
Grossulariaceae	Currant Family							
<i>Ribes americanum</i>	Wild Black Currant	S5				X	X	X
<i>Ribes cynosbati</i>	Prickly Gooseberry	S5				X		X
<i>Ribes rubrum</i>	Red Currant	SE5				I	X	X
<i>Ribes triste</i>	Wild Red Currant	S5				X	X	X
Hydrophyllaceae	Water-leaf Family							
<i>Hydrophyllum virginianum</i>	Virginia Water-leaf	S5				X		X
Juglandaceae	Walnut Family							
<i>Carya cordiformis</i>	Bitternut Hickory	S5				X		X
Lauraceae	Laurel Family							
<i>Lindera benzoin</i>	Spicebush	S5				X	X	X
Oleaceae	Olive Family							
<i>Fraxinus americana</i>	White Ash	S5				X		X
<i>Fraxinus nigra</i>	Black Ash	S5		T		X	X	X
<i>Fraxinus pennsylvanica</i>	Green Ash	S5				X	X	X
Onagraceae	Evening-primrose Family							
<i>Circaea lutetiana</i> ssp. <i>canadensis</i>	Yellowish Enchanter's Nightshade	S5				X	X	X
<i>Epilobium coloratum</i>	Purple-veined Willow-herb	S5				X	X	X
<i>Oenothera biennis</i>	Common Evening-primrose	S5				X	X	X
Oxalidaceae	Wood Sorrel Family							
<i>Oxalis stricta</i>	Upright Yellow Wood-sorrel	S5				X	X	X
Primulaceae	Primrose Family							
<i>Lysimachia thyrsiflora</i>	Tufted Loosestrife	S5				X	X	X
Ranunculaceae	Buttercup Family							
<i>Caltha palustris</i>	Marsh-marigold	S5				X	X	X
<i>Ranunculus acris</i>	Tall Buttercup	SE5				I	X	X
<i>Thalictrum dioicum</i>	Early Meadow-rue	S5				X		X

Appendix III
Vascular Plant Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	SARO ²	COSEWIC ³	SARA Schedule ⁴	Perth County ⁵	NRSI Observed	
							Woodland B SWD3-3 / FOD7	Study Area SWD3-3 / FOD5 / FOD6-5 / FOD7
Rhamnaceae	Buckthorn Family							
<i>Rhamnus cathartica</i>	European Buckthorn	SE5				I	X	X
Rosaceae	Rose Family							
<i>Agrimonia striata</i>	Grooved Agrimony	S4?					X	X
<i>Geum aleppicum</i>	Yellow Avens	S5				X	X	X
<i>Geum canadense</i>	White Avens	S5				X	X	X
<i>Malus domestica</i>	Apple							X
<i>Prunus serotina</i>	Black Cherry	S5				X	X	X
<i>Prunus virginiana</i> ssp. <i>virginiana</i>	Choke Cherry	S5				X		X
<i>Rubus idaeus</i> ssp. <i>melanolasius</i>	Wild Red Raspberry	S5				X	X	X
<i>Rubus pubescens</i>	Dwarf Raspberry	S5				X	X	X
Rubiaceae	Madder Family							
<i>Galium aparine</i>	Cleavers	S5				X	X	X
<i>Galium mollugo</i>	White Bedstraw	SE5				I	X	X
<i>Galium palustre</i>	Marsh Bedstraw	S5				X	X	X
Salicaceae	Willow Family							
<i>Populus tremuloides</i>	Trembling Aspen	S5				X	X	X
<i>Salix eriocephala</i>	Heart-leaved Willow	S5				X	X	X
Scrophulariaceae	Figwort Family							
<i>Chelone glabra</i>	Turtlehead	S5				X	X	X
Solanaceae	Nightshade Family							
<i>Solanum dulcamara</i>	Bitter Nightshade	SE5				I	X	X
Tiliaceae	Linden Family							
<i>Tilia americana</i>	American Basswood	S5				X		X
Ulmaceae	Elm Family							
<i>Ulmus americana</i>	White Elm	S5				X	X	X
Urticaceae	Nettle Family							
<i>Boehmeria cylindrica</i>	False Nettle	S5				X	X	X
<i>Urtica dioica</i> ssp. <i>gracilis</i>	American Stinging Nettle	S5				X	X	X
Violaceae	Violet Family							
<i>Viola pubescens</i>	Downy Yellow Violet	S5				X	X	X
<i>Viola sororia</i>	Woolly Blue Violet	S5				X	X	X
Vitaceae	Grape Family							
<i>Parthenocissus vitacea</i>	Woodbine	S5				X	X	X
Monocotyledons	Monocots							
Araceae	Arum Family							
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	S5				X	X	X

Appendix IV
Bird Species Reported and Observed from the Study Area

Appendix IV
Bird Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	SARO ²	COSEWIC ³	SARA Schedule ⁴	OBBA ⁵	NRSI Observed	NRSI Observed
						17MH90, 17MH99, 17NH09	Subject Property	Study Area
Anatidae	Ducks, Geese & Swans							
<i>Branta canadensis</i>	Canada Goose	S5				CO	X	X
<i>Aix sponsa</i>	Wood Duck	S5				PR		
<i>Anas platyrhynchos</i>	Mallard	S5				CO	X	X
Phasianidae	Partridges, Grouse & Turkeys							
<i>Phasianus colchicus</i>	Ring-necked Pheasant	SNA				PR		
<i>Bonasa umbellus</i>	Ruffed Grouse	S4				PR		
<i>Meleagris gallopavo</i>	Wild Turkey	S5				PR		
Columbidae	Pigeons & Doves							
<i>Columba livia</i>	Rock Pigeon	SNA				CO		
<i>Zenaidura macroura</i>	Mourning Dove	S5				CO		PO
Cuculiformes	Cuckoos & Anis							
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	S4B				PO		
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	S5B				PR		
Apodidae	Swifts							
<i>Chaetura pelagica</i>	Chimney Swift	S4B, S4N	THR	T	Schedule 1	PR		
Trochilidae	Hummingbirds							
<i>Archilochus colubris</i>	Ruby-throated Hummingbird	S5B				PR		
Charadriidae	Plovers							
<i>Charadrius vociferus</i>	Killdeer	S5B, S5N				CO	X	X
Scolopacidae	Waders							
<i>Actitis macularia</i>	Spotted Sandpiper	S5				PR		
Ardeidae	Hérons & Bitterns							
<i>Ardea herodias</i>	Great Blue Heron	S4B				PO	X	X
<i>Butorides virescens</i>	Green Heron	S4B				PR		
Cathartidae	Vultures							
<i>Cathartes aura</i>	Turkey Vulture	S5B				PO	X	X

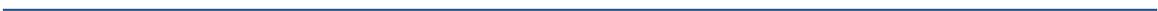
Appendix IV
Bird Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	SARO ²	COSEWIC ³	SARA Schedule ⁴	OBBA ⁵	NRSI Observed	NRSI Observed
						17MH90, 17MH99, 17NH09	Subject Property	Study Area
Accipitridae	Hawks, Kites, Eagles & Allies							
<i>Pandion haliaetus</i>	Osprey	S5B				PO		
<i>Circus cyaneus</i>	Northern Harrier	S4B	NAR	NAR		PO		
<i>Accipiter striatus</i>	Sharp-shinned Hawk	S5	NAR			PO		
<i>Accipiter cooperii</i>	Cooper's Hawk	S4	NAR	NAR		PO		
<i>Accipiter gentilis</i>	Northern Goshawk	S4	NAR	NAR		PO		
<i>Buteo platypterus</i>	Broad-winged Hawk	S5B				PR		
<i>Buteo jamaicensis</i>	Red-tailed Hawk	S5	NAR	NAR		CO		
Strigidae	Typical Owls							
<i>Megascops asio</i>	Eastern Screech-Owl	S4	NAR	NAR		PR		
<i>Bubo virginianus</i>	Great Horned Owl	S4				PO		
Alcedinidae	Kingfishers							
<i>Megaceryle alcyon</i>	Belted Kingfisher	S4B				PR		
Picidae	Woodpeckers							
<i>Melanerpes carolinus</i>	Red-bellied Woodpecker	S4				PR	X	X
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	S5B				CO		
<i>Dryobates pubescens</i>	Downy Woodpecker	S5				PR	PO	PO
<i>Dryobates villosus</i>	Hairy Woodpecker	S5				PO		
<i>Colaptes auratus</i>	Northern Flicker	S4B				CO	PO	PO
<i>Dryocopus pileatus</i>	Pileated Woodpecker	S5				PR		
Falconidae	Caracaras & Falcons							
<i>Falco sparverius</i>	American Kestrel	S4				PR		
Tyrannidae	Tyrant Flycatchers							
<i>Contopus virens</i>	Eastern Wood-Pewee	S4B	SC	SC		PR	PR	PR
<i>Empidonax alnorum</i>	Alder Flycatcher	S5B				PR		
<i>Empidonax traillii</i>	Willow Flycatcher	S5B				PR		PO
<i>Empidonax minimus</i>	Least Flycatcher	S4B				PR		
<i>Sayornis phoebe</i>	Eastern Phoebe	S5B				CO		
<i>Myiarchus crinitus</i>	Great Crested Flycatcher	S4B				PR	X	X
<i>Tyrannus tyrannus</i>	Eastern Kingbird	S4B				PR		

Appendix IV
Bird Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	SARO ²	COSEWIC ³	SARA Schedule ⁴	OBBA ⁵	NRSI Observed	NRSI Observed
						17MH90, 17MH99, 17NH09	Subject Property	Study Area
Regulidae	Kinglets							
<i>Regulus satrapa</i>	Golden-crowned Kinglet	S5B				PR		
Muscicapidae	Old world Flycatchers							
Turdidae	Thrushes							
<i>Sialia sialis</i>	Eastern Bluebird	S5B	NAR	NAR		PR		
<i>Catharus fuscescens</i>	Veery	S4B				PO		
<i>Hylocichla mustelina</i>	Wood Thrush	S4B	SC	T		PR		
<i>Turdus migratorius</i>	American Robin	S5B				CO	CO	CO
Mimidae	Mockingbirds, Thrashers & Allies							
<i>Dumetella carolinensis</i>	Gray Catbird	S4B				CO	PO	PO
<i>Toxostoma rufum</i>	Brown Thrasher	S4B				PO		
Sturnidae	Starlings							
<i>Sturnus vulgaris</i>	European Starling	SNA				CO	CO	CO
Bombycillidae	Waxwings							
<i>Bombycilla cedrorum</i>	Cedar Waxwing	S5B				CO		
Passeridae	Old World Sparrows							
<i>Passer domesticus</i>	House Sparrow	SNA				CO		
Fringillidae	Finches & Allies							
<i>Carpodacus mexicanus</i>	House Finch	SNA				PR		
<i>Loxia leucoptera</i>	White-winged Crossbill	S5B				PR		
<i>Spinus tristis</i>	American Goldfinch	S5B				CO	PR	PR
Parulidae	Wood Warblers							
<i>Seiurus aurocapillus</i>	Ovenbird	S4B				PO		
<i>Mniotilta varia</i>	Black-and-white Warbler	S5B				PO		
<i>Geothlypis philadelphia</i>	Mourning Warbler	S4B				PR		
<i>Geothlypis trichas</i>	Common Yellowthroat	S5B				PO		
<i>Setophaga ruticilla</i>	American Redstart	S5B				PR		
<i>Setophaga fusca</i>	Blackburnian Warbler	S5B				PO		
<i>Setophaga petechia</i>	Yellow Warbler	S5B				PR		

Appendix V
Herpetofauna Species Reported and Observed from the Study Area



Appendix V

Reptile and Amphibian Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	SARO ²	COSEWIC ³	SARA Schedule ⁴	Ontario Reptile and Amphibian Atlas ⁵ (17MJ90, 17MH99, 17NH09)	NRSI Observed	
							Subject Property	Study Area
Turtles								
<i>Chelydra serpentina serpentina</i>	Snapping Turtle	S3	SC	SC	Schedule 1	X		
<i>Chrysemys picta marginata</i>	Midland Painted Turtle	S5		SC		X		
<i>Trachemys scripta elegans</i>	Red-eared Slider	SNA				X		
Snakes								
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake	S5				X		
<i>Thamnophis sirtalis sirtalis</i>	Eastern Gartersnake	S5				X		
Toads and Frogs								
<i>Anaxyrus americanus</i>	American Toad	S5				X		X
<i>Hyla versicolor</i>	Tetraploid Gray Treefrog	S5				X		
<i>Pseudacris triseriata</i> pop. 2	Western Chorus Frog (<i>Great Lakes/St. Lawrence - Canadian Shield Population</i>)	S3	NAR	T	Schedule 1	X		
<i>Pseudacris crucifer</i>	Spring Peeper	S5				X		
<i>Lithobates clamitans melanota</i>	Northern Green Frog	S5				X		
<i>Lithobates palustris</i>	Pickerel Frog	S4	NAR	NAR		X		
<i>Lithobates pipiens</i>	Northern Leopard Frog	S5	NAR	NAR		X		
<i>Lithobates sylvaticus</i>	Wood Frog	S5				X		
Total						13	0	1

¹MNRF 2019; ²MNRF 2019; ³COSEWIC 2018; ⁴Government of Canada 2016; ⁵Ontario Nature 2019

Legend
SRANK
S3 Vulnerable
S4 Apparently Secure
S5 Secure
SNA Unranked
COSSARO
SC Special Concern
NAR Not at Risk
COSEWIC
T Threatened
SC Special Concern
NAR Not at Risk
SARA Schedule
Schedule 1 Officially Protected under SARA

Appendix VI
Mammal Species Reported from the Study Area

Appendix VI
Mammal Species Reported From the Study Area

Scientific Name	Common Name	SRANK ¹	SARO ²	COSEWIC ³	SARA Schedule ⁴	Ontario Mammal Atlas ⁵	NRSI Observed	
							Subject Property	Study Area
Didelphimorphia	Opossums							
<i>Didelphis virginiana</i>	Virginia Opossum	S4				X		
Insectivora	Shrews and Moles							
<i>Blarina brevicauda</i>	Northern Short-tailed Shrew	S5				X		
<i>Condylura cristata</i>	Star-nosed Mole	S5				X		
<i>Parascalops breweri</i>	Hairy-tailed Mole	S4				X		
<i>Sorex cinereus</i>	Masked Shrew	S5				X		
<i>Sorex fumeus</i>	Smoky Shrew	S5				X		
Chiroptera	Bats							
<i>Eptesicus fuscus</i>	Big Brown Bat	S4				X	X	X
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	S4					X	X
<i>Lasiurus borealis</i>	Eastern Red Bat	S4				X	X	X
<i>Lasiurus cinereus</i>	Hoary Bat	S4					X	X
<i>Myotis lucifugus</i>	Little Brown Myotis	S4	END	E	Schedule 1	X	X	X
<i>Myotis septentrionalis</i>	Northern Myotis	S3	END	E	Schedule 1	X		
Lagomorpha	Rabbits and Hares							
<i>Lepus europaeus</i>	European Hare	SNA				X		
<i>Sylvilagus floridanus</i>	Eastern Cottontail	S5				X		
Rodentia	Rodents							
<i>Castor canadensis</i>	Beaver	S5				X		
<i>Erethizon dorsatum</i>	Porcupine	S5				X		
<i>Glaucomys sabrinus</i>	Northern Flying Squirrel	S5				X		
<i>Marmota monax</i>	Woodchuck	S5				X		
<i>Microtus pennsylvanicus</i>	Meadow Vole	S5				X		
<i>Microtus pinetorum</i>	Woodland Vole	S3?	SC	SC	Schedule 1			
<i>Mus musculus</i>	House Mouse	SNA				X		
<i>Ondatra zibethicus</i>	Muskrat	S5				X		
<i>Peromyscus leucopus</i>	White-footed Mouse	S5				X		
<i>Peromyscus maniculatus</i>	Deer Mouse	S5				X		
<i>Rattus norvegicus</i>	Norway Rat	SNA				X		
<i>Sciurus carolinensis</i>	Eastern Gray Squirrel	S5				X	X	X
<i>Synaptomys cooperi</i>	Southern Bog Lemming	S4				X		
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	S5				X		
<i>Tamias striatus</i>	Eastern Chipmunk	S5				X		
<i>Zapus hudsonius</i>	Meadow Jumping Mouse	S5				X		

