ENVIRONMENTAL IMPACT STUDY

RIVERFRONT COMMUNITY PRIVATE OPA

NIAGARA FALLS, ON

SEPTEMBER 2017

SAVANTA

Environmental Impact Study

Riverfront Community Private OPA

Niagara Falls, ON

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1.0 INTRODUCTION

1.1 Study Location

GR (CAN) Investment Co. Ltd is proposing to develop a 49 ha, block (Subject Lands) within a larger 195 ha (484 acre) area of lands they own (Study Area), within the urban limits of the City of Niagara Falls. This Environmental Impact Study responds to the proposed development of the Riverfront Community (Subject Lands). The Study Area and Subject Lands occur centrally within the City of Niagara Falls (City), north of the Welland River/Chippawa Parkway, east of the Ontario Power Generation Inc. (OPG)/Chippawa Power Canal, south of Oldfield Road and west of Stanley Avenue (**Figure 1**, **Appendix A**). The Study Area is bisected by the Conrail Drainage Ditch (Conrail Drain) and a railway line.

1.2 Summary of Previous Studies

Portions of the Study Area have been referred to in Subwatershed Studies completed by the Niagara Peninsula Conservation Authority (NPCA). Pertinent background reference lands include the Lower Welland River Characterization report (NPCA 2011a) and the South Niagara Falls Watershed Report (NPCA 2008). The NPCA Natural Areas Inventory reports also include useful technical summary reporting (2010) and the Study Area is part of a larger area described and assessed in the Niagara River Corridor Conservation Action Plan (Jalava et al. 2010).

The Study Area was evaluated through a series of baseline ecological surveys from March through November 2015. Those investigations were summarized in preliminary reporting in late 2015 and finalized in a Characterization and Environmental Impact Study Report (Dougan & Associates 2015, 2016a). Additional field investigations were completed in the Study Area in 2017. This Environmental Impact Study is considered to be an update of the 2016 EIS and should be viewed in association with earlier reporting. It should also be viewed in association with other reports developed by the GR (CAN) Investment Co. Ltd. consulting team (i.e., Niagara Planning Group, Amec Foster Wheeler, Paradigm Transportation Solutions Limited).

1.3 Purpose of the Current Study

This Environmental Impact Study (EIS) builds upon and supplements the Characterization and Environmental Impact Study Report (Dougan & Associates 2016a). It includes information related to additional technical surveys requested by review agencies to address any outstanding technical questions identified by those parties. Dougan & Associates completed the 2015 ecological surveys and collaborated with Savanta during some early 2017 surveys. This report has considered peer review comments (North-South Environmental Inc. 2016) and responses (Dougan & Associates 2016b), as well as discussions with the Regional Municipality of Niagara (Region), the City of Niagara Falls (City), the Ministry of Natural Resources and Forestry (MNRF), NPCA and Ministry of Municipal Affairs (MMA).

This report summarizes and integrates environmental data collected to-date, and updates and expands upon the impact assessment analyses with specific reference to the Waterfront Community development. This EIS also discusses a conceptual local Natural Heritage System (NHS) that will contribute to a connected, linked system of natural areas features and their associated functions. More detailed assessments have been completed for the Subject Lands

and the adjacent lands. Some comments are provided regarding potential subsequent development phases within other portions of the Study Area.

1.4 Natural Heritage Policy Considerations

The natural heritage features and functions associated with the Subject Lands, are affected by legislation and environmental policies. Planning Act related discussions are addressed directly by Niagara Planning Group (2017). This report addresses Natural Heritage policies and associated guidelines.

In terms of municipal policies, the City of Niagara Falls and Region of Niagara Official Plans are the relevant plans for application to the Subject Lands. Along with other relevant and current agency legislation and policies (e.g., Conservation Authorities Act, Ontario Regulation 155/06 and Endangered Species Act, 2007).

This EIS addresses the proposed Riverfront Community and it serves as the baseline from which the EIS can be updated as the planning and engineering details are further developed (e.g., stormwater management planning). While the Subject Lands are located outside of any provincial plan areas e.g., Greenbelt), the Provincial Policy Statement (PPS) (MMAH 2014) applies. The PPS provides direction on matters of provincial interest related to land use planning and development. This EIS addresses those policies that are specific to Natural Heritage (section 2.1) with reference to other policies with relevance to Natural Heritage and impact assessment considerations and areas of overlap (e.g., those related to Efficient and Resilient Development and Land Use Patterns, section 1.1; Sewage, Water and Stormwater, section 1.6.6; Water, section 2.2; Natural Hazards, section 3.1).

Eight types of significant natural heritage features are defined in the PPS, as follows:

- Significant wetlands;
- Significant coastal wetlands;
- Significant woodlands;
- Significant valleylands;
- Significant wildlife habitat;
- Fish habitat;
- Habitat of endangered and threatened species; and,
- Significant areas of natural and scientific interest (ANSIs).

Development and site alteration shall not be permitted in significant wetlands, or in significant coastal wetlands. Development and site alteration shall not be permitted in: significant woodlands, significant valleylands, significant wildlife habitat or significant ANSIs, unless it is demonstrated that there will be no negative impacts on the natural features or their ecological functions.

Development and site alteration shall not be permitted in the habitat of endangered and threatened species or in fish habitat, except in accordance with provincial and federal requirements. Development and site alteration may be permitted on lands adjacent to fish habitat provided it has been demonstrated that there will be no negative impacts on the natural feature or their ecological functions.

Municipalities are required to identify Natural Heritage Systems recognizing that these systems will vary in size and form in settlement areas, rural areas and prime agricultural areas.

A Wetland Conservation Strategy for Ontario (MNRF 2017) was released by the Province on July 20, 2017. That Strategy identifies three high priority actions to be accomplished by the Province to ensure wetlands remain an enduring part of Ontario's landscape. Those Actions are:

Action 1 – Improving Ontario's Wetland Inventory and Mapping;
Action 2 – Creating No Net Loss Policy for Ontario's Wetlands; and
Action 3 – Improving for the Evaluation of Significant Wetlands.

That Strategy and its relationship with wetlands on the Subject Lands are discussed further in Appendix D.

2.0 TECHNICAL INVESTIGATIONS

2.1 Background References

Pertinent technical information has been drawn from the following sources:

- MNRF wetlands and fisheries information;
- Published scientific research;
- Natural Heritage Information Centre (NHIC) rare species and communities;
- NPCA natural areas, species of concern and hazard land mapping;
- Regional Official Plans, ESA studies, and tree-cutting bylaw;
- City Official Plan, Urban Wooded and Treed Inventory and Assessment study; and,
- Various provincial wildlife atlases (i.e., butterflies, amphibians, reptiles, breeding birds, mammals).

This EIS, which incorporates the results of detailed ecological surveys conducted in 2015 and 2017, has also drawn from supporting background information, agencies and resources including:

- Federal and Provincial Species at Risk (SAR) websites;
- Ontario Ministry of Natural Resources and Forestry (MNRF), Guelph District (Vineland Area);
- Natural Heritage Information Centre (NHIC) rare species and communities; and,
- Natural Heritage Information Centre (NHIC 2016).

2.2 Agency Discussions

2.2.1 Ministry of Natural Resources and Forestry (MNRF)

Dougan & Associates has maintained a technical dialogue with the MNRF (Guelph District, Vineland Field office) during their data collection and interpretation stages, through 2015 to 2017. On-line searches of the Natural Heritage Information Centre (NHIC) database and requests for data regarding Species at Risk (SAR) occurrences were provided by the MNRF in 2015. Savanta has been in dialogue with the MNRF in recent months as the 2017 field program has been developed and implemented.

2.2.2 Niagara Peninsula Conservation Authority (NPCA)

The NPCA provided comments to a draft Terms of Reference for the Environmental Impact Assessment (Dougan report, Appendix A). Dougan & Associates has maintained a technical dialogue with the NPCA throughout data collection and interpretation through 2015 to 2017. Internet searches of the NPCA on-line mapping tool were completed in April 2015, as input to the design of the technical program completed. Savanta has been in dialogue with the NPCA in recent months as the 2017 field program has been developed and implemented.

2.3 Field Investigation Methodologies

2.3.1 Field Survey Summary 2015

Tables 1 through 4 in the 2016 Secondary Plan Characterization and Environmental Impact Study (Dougan & Associates 2016a) (section 8, tables) summarize the fieldwork completed as input to the June 2016 reporting. That fieldwork was completed by several technical experts during the period from: April 1, 2015 to November 11, 2015. Technical work included:

- Plant inventories and Ecological Land Classification mapping;
- Wetland delineation;
- Cavity and mast tree surveys;
- Nocturnal amphibian call surveys;
- Salamander breeding surveys;
- Breeding bird surveys; and
- Fisheries/Aquatic Surveys

2.3.2 Field Survey Summary 2017

During a multi-agency/municipal meeting on March 10, 2017 the MNRF and NPCA identified technical gaps in existing reporting, based upon their review of the 2016 Secondary Plan Characterization and Environmental Impact Study (Dougan & Associates 2016a). In that meeting and in subsequent correspondence dated May 8, 2017 (included in **Appendix C**), the MNRF specifically requested the following surveys be completed to satisfy their requirements for the collection of data regarding the environmental conditions on the Subject Lands.

- Reptile Emergence, Hibernacula and Turtle Nesting Surveys;
- Bat Acoustic Monitoring and Habitat Assessment Surveys;
- Winter Raptor and Stick Nest Surveys;
- Other Candidate Significant Wildlife Habitat (amphibian movement corridors); and
- Other Species at Risk Surveys (Acadian Flycatcher).

The NPCA requested additional surveys be completed to confirm Woodland Canopy Cover characteristics (email correspondence from NPCA to Savanta dated April 18, 2017; included in **Appendix C**).

Savanta has completed the majority of technical surveys recommended by the MNRF and NPCA; supplemental data collection tasks continue to fully document seasonal variations in natural features and associated functions (e.g., reptile hibernacula use). The MNRF have requested a more fulsome assessment of bat habitat under leaf-off conditions prior to more focused acoustic surveys. Dates and personnel for 2017 field surveys are provided in **Table 1** (**Appendix B**) and those surveys are summarized in the following. Technical data and field sheets from 2017 are maintained on file, should agency reviewers require access to supplemental information.

a) Reptile Emergence Hibernacula and Turtle Nesting Surveys

Under this comment heading in the MNRF May 8, 2017 correspondence, turtle overwintering surveys were recommended for completion in the fall or spring (i.e., Sept to Oct; March to May, respectively). Data collected from these surveys is required to provide an indication of turtle wintering areas.

The MNRF recommended that fall and spring surveys be completed to locate congregations of snakes in areas with suitable habitat characteristics (e.g., upland, foundation, rocky slope, etc.). The MNRF indicated that the presence of a minimum of 5 individuals or two or more snake species would indicate the presence of a hibernaculum.

Savanta completed these surveys in association with Dougan & Associates. Five Reptile Emergence Surveys were conducted in 2017: April 28, May 10, May 15, May 19 and May 23, 2017. Two Turtle Basking Surveys were conducted on June 13 and June 15, 2017. Additional surveys are being completed in the Fall 2017.

The site visits conducted included surveys for snake hibernacula, road mortality, turtle overwintering habitat, and turtle nesting habitat. The weather was appropriate for completion of these reptile surveys and was as follows: air temperature above 8°C, full/partial sun, and wind 1 km/hr to 5 km/hr. Specific survey methods are described below.

Reptile Emergence Survey – Turtle Basking

Potentially suitable aquatic habitat for turtles was identified using aerial photography (ponds, open wetlands, and riparian/lacustrine areas). During the June 13 and June 15, 2017 investigations, binoculars were used to scan, from a distance, for 10 minutes, the edges and surface of each water body for basking turtles. Data recorded includes: water and air temperatures (basking prevalent when air is warmer than water), vegetation composition around the water body, and presence of basking features (logs, floating vegetation mats, floating/emergent debris, such as tires). These surveys will be supplemented with Fall, 2017 observations.

This survey methodology focused on Snapping Turtle and Midland Painted Turtle, which are two species that are known to occur in the vicinity of the Subject Lands. Species-specific habitat preferences were considered in the formulation of this survey protocol (COSEWIC 2008; Caverhill et al. 2011; and MNRF 2015).

Turtle Nesting Survey

Turtle nesting surveys were completed on June 13 and June 15, 2017. Candidate turtle nesting areas include shores/beaches of wetlands, lakes or rivers; gravel trails and driveways; and farm field margins with suitable substrate and aspect in relatively close proximity to core habitat (i.e., areas where turtles are observed basking). Potentially suitable nesting areas were searched for evidence including the following: test nest dig sites, claw marks, turtle trails or predated nests. Where potential habitat was noted, soil type mapping was reviewed for the presence of potentially suitable substrate (potentially suitable sites were located within an active golf course where soil auger samples were not permitted). Data recorded included nesting area size, %

slope of the nesting area, % canopy cover over the nesting area, direction of orientation (i.e., east facing), location (UTM coordinates), soil substrate, and distance from roadways (Caverhill et al. 2011).

Reptile Emergence Survey – Snake Hibernacula

Preliminary aerial photography analyses were performed to identify suitable snake habitat (cultural meadow, disturbed meadow, wetland edges, cultural woodland, cultural savannah, rural residence and farm buildings). Surveys focused on searching natural cover objects, such as logs, and debris (discarded carpeting, tarps). All objects were replaced as they were found in order to reduce disturbance. Old barns, foundations and houses were also searched, where access was granted. This survey methodology focused on snake hibernacula features, to determine if these features occur on the Subject Lands. Survey methods are based on OMNR (2016e) and Toronto Zoo (Caverhill et al. 2011) snake survey protocols and were also informed by species-specific habitat preferences.

Searches for potential snake hibernacula were completed during each of the five reptile emergence surveys (April and May 2017). Transects were walked within the Subject Lands as well as along roads for basking snakes or snake mortalities. Data recorded during snake surveys included species observed and its location (UTM coordinates), air temperature, start and end time, and weather conditions.

Salamander Habitat Suitability Assessment and Movement Surveys

Vernal pools are temporarily wet features that are located within wooded upland or swamp areas (deciduous, mixed or coniferous). They are filled by snowmelt and/or high spring water tables and are dry by mid to late summer. The seasonal drying cycle deters the establishment of permanent fish populations and some predatory insects (e.g., odonates) and provides habitat for organisms that thrive in the absence of these predators. Vernal pool species may include breeding amphibians, fingernail clams, fairy shrimp, and a diversity of invertebrates. Salamanders depend on these temporary wetlands for large portions of their life cycle such as breeding and egg laying/hatching (Baldwin et al 2006).

The suitability of breeding pools for salamanders and many amphibians is associated with the pool hydroperiod (i.e., the seasonal duration of ponding) (Anderson et al.2015; Babbitt et al 2003). Pooling from spring through until summer (e.g., early to mid-July) is typically required to allow the full cycle of development from eggs, through larvae to juvenile life stages. Hydroperiods can vary substantially from year to year. In dry years, vernal pools may appear as depressions of compacted leaf litter containing woody debris; or they may be vegetated with sedges, rushes or grasses (i.e., appear to be a small wet meadow or marsh). Both isolated and clustered pools can provide important habitat (Van Dyke et al.2017). Wooded areas that contain a variety of vernal pools (i.e., clusters or complexes) with different hydroperiods can be more important as they provide a more diverse habitat array for adults and juveniles to adjust to environmental variation and predation risk.

Habitat suitability surveys were conducted during daylight hours on February 24 and March 1, 2017 in the Study Area. Characteristics of the potential breeding habitats included: pool shape, water depth, canopy cover, in-feature vegetation, presence of suitable egg attachment sites and observations of predatory fish. Throughout the 2017 field investigations, observations continued

to be made of pool size and depth and when features dried completely. In adjacent terrestrial habitat, observations were made regarding the availability of other important habitat features (e.g., downed woody material).

Salamanders move from their underground burrows to the breeding or vernal pools described above, during the first spring rains or in periods of high humidity. Surveys were completed at night during such conditions in the early and peak times for migration. The timing of salamander movement reported by others (e.g., MNRF, conservation authorities and private sector ecologists) was closely monitored in southern Ontario to optimize opportunities for identification on the Subject Lands.

Within the Study Area, transects were located in areas that would bisect assumed movement patterns from overwintering habitats to potential breeding ponds. Targeted salamander movement surveys were conducted on the evenings of February 24 and February 28, 2017. Transects were walked to survey for amphibians and specifically for salamanders migrating from overwintering sites to breeding ponds during the late evening.

b) Bat Acoustic Monitoring and Habitat Assessment

Four bat species are listed as Endangered on the Species at Risk in Ontario list: Eastern Small-footed Myotis (*Myotis leibii*), Little Brown Myotis (*Myotis lucifugus*), Tri-coloured Bat (*Perimyotis subflavus*) and Northern Myotis (*Myotis septentrionalis*). Bats are known to establish maternity roosts in trees, both within woodlands and hedgerows.

Significant Wildlife Habitat is defined in part based upon the presence of Big Brown Bat and Silver-haired Bat species as being representative of SWH for Bat Maternity Colonies (per SWH Criteria Schedules for Ecoregion 7E).

The MNRF observed that in addition to the December 2015 snag density surveys completed by Dougan & Associates, the remainder of the Subject Lands (whether proposed for development or not) would require additional snag density surveys prior to the completion of acoustic surveys. Dialogue with the MNRF determined that acoustic surveys during 2017 would not be effective or desirable without the more fulsome leaf-off snag density surveys.

The MNRF advises that any coniferous, deciduous or mixed wooded eco-site, including treed swamps, that include trees at least 10 cm diameter-at-breast height (DBH), should be considered candidate (potential) maternity roost habitat. For purposes of this report, a precautionary approach has been taken that assumes that high quality bat habitat likely occurs throughout the forested eco-sites and may be supporting SAR bat species (e.g., ELC communities identified as Deciduous Forests (FOD), and Deciduous Swamp (SWD). These conditions will be refined and confirmed through the permitting process as required by the MNRF under the *Endangered Species Act, 2007* and associated regulations, policies, guidelines.

c) Winter Raptor/Stick Nest Survey

The MNRF requested data related to raptor nesting and dependence on winter foraging areas. This data is required to define significant wildlife habitat for raptors (i.e., woodland raptor nesting

habitat, and Osprey/Bald Eagle habitat). All incidental bird species observations on adjacent lands also were recorded.

Survey methods, summarized below, are adapted from the British Colombia Ministry of Sustainable Resource Management Inventory Methods for Raptors (2001). Daytime and dusk surveys are conducted on days of no rain or heavy snow, with a Beaufort wind speed of 3 or less (<20 km/h). The raptor surveys were completed on March 30, 2017 (winter raptor survey) and on April 18, 2017 (stick nest survey). Transects for both surveys are depicted on **Figure 5** (**Appendix A**).

During the April nest survey, all woodland ELC communities on the Subject Lands were walked in transects 100 m apart to search for stick nests. Where suitable habitat occurred adjacent to the Subject Lands, a 10-minute point count survey was performed. Calls were broadcasted for the following species in two, 30 second intervals, spaced by 30 seconds of listening; Northern Goshawk, Sharp-shinned Hawk, Cooper's Hawk, Red-tailed Hawk and Red-shouldered Hawk. Nest site location, tree species and nest height were recorded. All incidental species were recorded.

d) Other Candidate Significant Wildlife Habitat (Amphibian Movement Corridors) and Wildlife Road Crossing Surveys

While not requested by the City or agencies, Savanta conducted wildlife road crossing surveys to further understand wildlife movement on and immediately adjacent to the Subject Lands. These surveys were conducted on foot or by bicycle starting at 9:00 AM in early April to May. The key animal movement periods are the early spring (April to May) when turtles mobilize to seek nesting habitat, and autumn (September to October). Road crossing surveys were conducted in conjunction with Reptile Emergence Surveys.

Signs of wildlife/road interactions, including dead specimens, live specimens, other evidence (tracks, scat, feathers, etc.), were recorded along with UTM coordinates. Data recorded included: air temperature, start and end time and weather conditions. This survey protocol is adapted from the Ontario Road Ecology Group (OREG 2010).

During pre-survey dialogue with the MNRF, they commented that the Wildlife Road Crossing Surveys would be recognized as potential additional data but that they would not accept this data alone, as a true representation of the number of species present and/or their quantity on this site.

e) Other Species at Risk Surveys

Acadian Flycatcher

The Acadian Flycatcher (*Empidonax virescens*) is listed as endangered on the SARO List. The species is also listed as endangered under the federal *Species at Risk Act* (SARA). MNRF recommended further targeted surveys for Acadian Flycatcher given that a male was heard calling 3 to 4 times on the site by Dougan & Associates on May 29, 2015.

The survey methodology applied on June 19, 2017 was adapted from the Assessment and Status Report for Acadian Flycatcher (COSEWIC 2010) and from previous experience with the species (Burke pers com).

All mature woodlands (deciduous forest and swamp ELC communities - FOD and SWD) on the Subject Lands were walked in transects 250 m apart to search for presence of Acadian Flycatcher. Where suitable habitat occurred, a 10-minute point count was performed at intervals of 250 m. Calls were broadcasted for two 30 second intervals, spaced by 30 seconds of listening. All incidental species were recorded. The early morning survey was conducted on a day of no rain, with a Beaufort wind speed of 2 or less (<10 km/h).

Woodland Canopy Cover

Cultural Woodland (CUW) communities were assessed in 2017 to determine whether they meet the definition of “woodland”, as defined under the Regional Municipality of Niagara By-Law No. 30-2008.

Regardless of stem density, Environmental Conservation Area (ECA) Significant Woodland under the Region of Niagara’s criteria, includes the application of a standard 35%+ canopy cover, which includes any tree species regardless of size, as the methodology to determine the extent of woodland.

A "tree" is defined as “any living species of woody perennial plant, including its root system, which has reached or can reach a height of at least 4.5 m at physiological maturity”. Of the 62 species, subspecies, varieties, and hybrids of hawthorns (*Crataegus*) in Ontario, few are capable of growing to 4.5 m. For purposes of these evaluations, Hawthorns were treated as tall shrubs.

3.0 TECHNICAL FINDINGS

3.1 Physical Baseline Conditions

The Subject Lands are situated in the Haldimand Clay Plain physiographic region (Chapman and Putnam 1984). Soils are characterized as being poorly drained and the water table is usually located close to the surface until late spring. Surface cracking is common during dry periods. The surface horizon ranges from 15 cm to 20 cm deep and has a texture of clay loam to clay; subsoils are heavy clays.

More specifically, Drawing 3.3. in the Functional Servicing Report (Amec Foster Wheeler 2015) highlights the Subject Lands as a mix of Lincoln, Haldimand and Welland clays and silts. Large areas of recent and historic disturbance and existing development are mapped as unclassified soils. These disturbed areas do not exhibit the typical slough ridge topography of the Haldimand Clay physiographic region. The most southwestern portions of these lands are also depicted as soils with “no texture developed” (NPCA 2011a), which reflects disturbance origins.

In terms of watercourses, the Subject Lands border the Welland River and the Chippawa Power Canal. Three surface water features occur internal to the Subject Lands, including the Conrail Drain, a deep, straight, artificial channel, lined with rip-rap along its entire length. Another highly altered watercourse, (referred to as Watercourse 1 in section 3.2.8.2 of the Dougan and Associates reporting 2016a) is short (212 m), and it originates at an old concrete culvert outfall, which is believed to convey flows from a network of legacy pipes that drain surface water, via inlets and broken sections, from the elevated south-central portion of the Subject Lands. A third, more natural watercourse reportedly has its origins on the adjacent Thundering Waters Golf Club. It flows along the eastern edges of the Subject Lands and outlets to the Welland River.

3.2 Biological Baseline Conditions

The Subject Lands occur in the Carolinian or Deciduous Forest Zone, an area that is characterized by a warmer climate supporting plant species more typical of southern areas. In this broad zone, dominant associations on upland clay and silt areas were maple-beech-elm-basswood and butternut-chestnut-white ash-black cherry. The lowland vegetation communities are dominated by single species such as white cedar, willow, tamarack, alder, red or silver maple or black ash (Rowe 1972; Waldron 2003). A variety of locally rare species are also known to occur in the vicinity of the Subject Lands, including Black Gum (*Nyssa sylvatica*) and Pignut Hickory (*Carya glabra*).

3.2.1 Vegetation Communities

The Subject Lands contain a mix of natural and disturbed features, the former being associated with older woodlands which exhibit the typical slough ridge topography associated with the Haldimand Clay Plain. The more intact forest cover is concentrated in the northeastern parts of the Subject Lands and appears to be relatively older (i.e., 70 years to more than 100 years, based upon aerial photograph review). These more intact forested areas exhibit relatively fewer signs of disturbance outside of minor trails, debris disposal and some evidence of hunting.

The southwestern portions of the Subject Lands exhibit a relatively higher degree of disturbance, with evidence of substantial grading and filling associated with the historic alteration of the original Welland River alignment, the creation of both the Chippawa Power Canal and the Conrail Drain and rail line, and with the associated deforestation of these lands. Broad areas of disturbed lands include an early successional matrix or mosaic of treed areas, thickets and meadows. The altered grades have created low points and areas of compacted soils, some of which exhibit wetland characteristics. This report addressed the vegetation conditions in the Subject Lands (including wetland characteristics) as input to both the definition of significant feature limits and to an assessment of potential impacts and mitigation measures.

The limits of the Subject Lands (development footprint) have been defined to avoid significant natural features and associated functions and to concentrate development in areas of greater disturbance, where vegetation communities are reflective of highly altered soil/topographic conditions. The ELC mapping completed by Dougan & Associates (2015; 2016a) has been reviewed at the site level to consider community type and area definitions. This broad, early successional area makes the definition of discrete community limits, including any wetland areas more challenging. A number of wetlands delineated by the MNRF appear to include non-wetland areas. This complexity is directly related to the areas and degree of disturbance observed. Portions of the Subject Lands have a “savannah-like” appearance, but they are cultural savannahs (i.e., not significant vegetation communities as defined by the Province, or as referred to in relevant literature).

Botanical inventories and Ecological Land Classification assessments were conducted in 2015 with supplementary visits completed in 2017 to validate site conditions. The 2015 mapping and characterization work defined 13 ELC dominant vegetation communities from Anthropogenic, Cultural, Forest, and Swamp ELC Eco-sites. Details regarding the following Study Area ELC communities (and areas) are reported in section 3.2 of the Characterization and Environmental Impact Study Report (Dougan & Associates 2015; 2016a).

Anthropogenic	3.37 ha
Cultural Meadow	9.76 ha
Cultural Plantation	0.33 ha
Cultural Thicket	23.53 ha
Cultural Woodland	44.78 ha
Deciduous Forest	6.62 ha
Deciduous Swamp (non-PSW)	29.90 ha
Deciduous Swamp (PSW)	75.30 ha

Source: Dougan & Associates 2016

Since the time the characterization and impact assessment work was completed by Dougan & Associates (2015; 2016a), some vegetation communities have been subject to significant change related to the presence of Emerald Ash Borer (EAB). This insect has triggered significant tree mortality and canopy decline throughout Niagara and in ash-dominated woodlands in the Subject Lands. Wooded areas formerly characterized as ash-dominated cultural woodland, ash lowland deciduous forest, and Green Ash mineral deciduous swamp exhibited significant forest canopy declines in 2017. Quantitative vegetation surveys completed by Savanta (2017) in some woodland communities indicate that the dominant tree canopy has been completely removed by the EAB. The absence of forest canopy in many of those

communities has left a cultural thicket, generally dominated by European Buckthorn.

3.2.2 Vascular Plants

Botanical inventories completed on the Subject Lands by Dougan & Associates identified a total of 333 species of vascular plants (307 of those were identified to the species level. Of that number, about 75%) are native. Plant inventory results are presented in section 3.2.2 and Table 6 of the Characterization and Environmental Impact Study Report (Dougan & Associates 2016a).

No federally or provincially listed plant SAR were observed on the Subject Lands, during the technical work completed by Dougan & Associates. Schreber's Aster (*Eurybia schreberi*), an Imperiled (S2) species within Ontario; and Honey-Locust (*Gleditsia triacanthus*), an Imperiled to Vulnerable (S2S3) species within Ontario were identified by Dougan & Associates during detailed surveys in 2015. Based on communication with MNRF and NPCA staff, Black Gum (*Nyssa sylvatica*) and Round-leaved Greenbrier (*Smilax rotundifolia*) may also be present in some areas within the Niagara Falls Slough Forest Wetland Complex Provincially Significant Wetland (NFSFWC). While neither species was observed during 2015 and 2017 surveys, Black Gum has the potential to be present on the Subject Lands associated with the older intact woodlands and specifically in the margins of the slough features and surrounding areas. Round-leaved Greenbrier also has the potential to be present on the Subject Lands associated with the older intact woodlands and specifically in areas of sandy loam soils.

Very preliminary discussions with naturalists and other citizens who have been exploring these lands, reported the occurrence of two other plant species with recognized significance levels: Dense Blazing Star (*Liatris spicata*) and Butterfly Milkweed (*Asclepias tuberosa*). Field investigations were completed by Savanta in 2017 to validate and to characterize the populations of these species. Locations remain unmapped in this report to protect these desirable species from potential poaching.

Dense Blazing Star is an S2 Threatened species, listed under the Endangered Species Act, 2007. It does not occur naturally in Niagara, but Oldham (2017) reports populations may be introduced in Niagara (e.g., in adjacent Eco-District 7E4). The Natural Areas Inventory describes the occurrence of this species in Niagara as follows: *Although native elsewhere in southern Ontario, Niagara records are from highly disturbed habitats and not with typical native prairie associates and are likely adventive* (NPCA 2010).

Butterfly Milkweed (S4) is considered to be regionally rare in Niagara Region (Oldham 2017). Rare in open, dry sandy areas. Most records are in the Niagara Falls area (e.g., M.J. Oldham #32892, DAO, from Niagara Glen in 2006). The Subject lands do not provide suitable typical prairie grassland habitat for this species, although it is known to spread along disturbed rail railway line edges.

Dougan & Associates (2016a) reported 25 locally rare plant species (Oldham 2010; 2017) occur in the Study Area, concentrated in the forested slough/ridge wetlands:

- Pin Cherry *Prunus pensylvanica*
- Limestone Bittercress *Cardamine douglassii*

- Leathery Knotweed *Polygonum achoreum*
- Asa Gray Sedge *Carex grayi*
- Pale Sedge *Carex pallescens*
- Schreber's Aster *Eurybia schreberi*
- Blunt-leaved Bedstraw *Galium obtusum*
- Mountain Holly *Ilex mucronata*
- Honey-locust *Gleditsia triacanthos*
- Smooth Gooseberry *Ribes hirtellum*
- Drooping Woodreed *Cinna latifolia*
- Necklace Sedge *Carex projecta*
- Swamp Red Currant *Ribes triste*
- Carolina Spring Beauty *Claytonia caroliniana*
- Creeping Spike-rush *Eleocharis palustris*
- Red-tinge Bulrush *Scirpus microcarpus*
- Finely-nerved Sedge *Carex leptonervia*
- Yellow Sedge *Carex flava*
- Canada Pussytoes *Antennaria howellii* ssp. *canadensis*
- Elk Sedge *Carex garberi*
- Drooping Sedge *Carex prasina*
- Le Conte's Violet *Viola affinis*
- American Plum *Prunus americana*
- Alderleaf Buckthorn *Rhamnus alnifolia*
- Woolly Sedge *Carex pellita*

An additional regionally rare plant species was observed in 2017, Shining Ladies'-tresses (*Spiranthes lucida*).

3.2.3 Wildlife Species

The 2015 Dougan and Associates surveys yielded the following information related to wildlife use in the Study Area. Six anuran species were heard calling including Spring Peeper (*Pseudacris crucifer*), American Toad (*Anaxyrus americanus*), Western Chorus Frog (*Pseudacris triseriata*), Northern Leopard Frog (*Lithobates pipiens*), Gray Treefrog (*Hyla versicolor*), and Wood Frog (*Lithobates sylvaticus*). The western and more disturbed portions of the Subject Lands were reported to have a relatively low amphibian species richness (i.e., three versus 6 species present). Details regarding these surveys are provided in section 3.2.4 and associated appendices in the Characterization and Environmental Impact Study Report (Dougan & Associates 2016a). No provincially listed anuran SAR were observed on the Subject Lands.

The Characterization and Environmental Impact Study Report (Dougan & Associates 2016a) also documents detailed salamander surveys completed in vernal pools with sampling and genetic material collection and testing (University of Guelph, Department of Integrative Biology). From investigations on a series of ponds/sloughs, salamanders present were determined to be Blue-spotted (*Ambystoma laterale*) and Blue-spotted dominant polyploids with no evidence of Jefferson Salamander or Jefferson dominant polyploids. No federally or provincially listed salamander SAR were observed on the Subject Lands.

Breeding bird surveys described in the Characterization and Environmental Impact Study Report (Dougan & Associates 2016a), identify 67 species observed, with 56 determined to be, at minimum, potential nesting species. Four species are identified as Species at Risk (SAR):

- Eastern Wood-Pewee (*Contopus virens*), Special concern
- Acadian Flycatcher (*Empidonax virescens*), Endangered
- Barn Swallow (*Hirundo rustica*), Threatened; and
- Wood Thrush (*Hylocichla mustelina*) Special concern.

Additional details regarding Breeding Bird Surveys and findings are presented in section 3.2.5 of the Characterization and Environmental Impact Study Report (Dougan & Associates 2016a), Of the 56 potential breeding bird species recorded 12 are listed as regionally significant breeding bird species and 20 are listed as locally uncommon or rare (see details in section 3.2.5 in the Characterization and Environmental Impact Study Report (Dougan & Associates 2016a),

Section 3.2.6 and 3.2.7 of the Characterization and Environmental Impact Study Report (Dougan & Associates 2016a) discuss bat surveys and incidental wildlife observations. Potentially suitable Bat Maternity Roost habitat was identified in about half of the areas surveyed.

Additional targeted wildlife surveys were carried out in 2017, in response to municipal/agency requests for additional specialized surveys. Results of those surveys are presented in the following categories:

- Reptile Emergence, Hibernacula and Turtle Nesting Surveys;
- Winter Raptor and Stick Nest Surveys;
- Other Candidate Significant Wildlife Habitat (amphibian movement corridors); and
- Other Species at Risk Surveys (Acadian Flycatcher).

3.2.4 Reptile Emergence, Hibernacula, Road Mortality and Turtle Nesting Surveys

Survey stations, transects and reptile observations are summarized on **Figures 4** and **6**, (**Appendix A**). Five turtle basking stations, five turtle nesting transects, thirteen snake transects, five snake area searches, and two, lengthy road transects were established in the Study Area and on adjacent roadways.

Six reptiles were observed within the Study Area; one (Snapping Turtle, Special Concern) is listed on the Species at Risk in Ontario (SARO) list, Regulation 230/08 under the Endangered Species Act, 2007. Another species, Eastern Milksnake, was recorded in the Study Area. It was recently down-listed from Special Concern, but it is still currently identified as an S3 (Vulnerable) ranked species by the NHIC. Two species are ranked S4 (Uncommon and apparently secure), and three are provincially ranked S5 (common and secure in Ontario; NHIC, 2017). Specific observations follow:

- One or more Midland Painted Turtles (S4) were observed basking at the following stations: RT-1, BS-1, BS-2, and BS-4;
- One or more Eastern Gartersnake (S5) were observed along the following transects and area searches: AS-3, BS-4, T-1, T-7, T-11 and T-13;

- One or more Dekay's Brownsnake (S5) were observed along the following transects and area searches: AS-1, T-1 and T-7, Dekay's Brownsnake were also observed Dead on the Road (DOR) along RT-1 (**Figure 6**, **Appendix A**);
- One or more Red-bellied Snakes (S5) were observed along the following transects and area searches: T-1 and T-9;
- One or more Snapping Turtles (provincially designated SC and S-ranked S3) were observed at the following stations: T7, BS-2 and BS-4;
- One Eastern Milksnake (S3) was observed along NT-1; and
- A number of frogs including Bullfrog, Western Chorus frog, and Grey Tree Frog were observed DOR at and north of RT-1 (**Figure 6**, **Appendix A**).

No evidence of turtle nesting was observed during the survey. The Study Area (especially the Subject Lands which are characterized by disturbance) are dominated by tight clay soils that are not generally suitable for successful turtle nesting (i.e., nest would be drowned during storm events due to lack of suitable substrate). Having said that in Niagara, some turtles may nest on shallow, drier rises where appropriate surface soils exist. These conditions, if present would be more likely to occur in the relatively intact natural areas where soils have been subject to less compaction. Concentrations of snake observations suggest suitable snake hibernacula occur at the following Areas Search (AS) and Transect (T) locations: AS-1, and AS-3, and potentially along T-1.

3.2.5 Woodland Raptor Nesting/Osprey, Bald Eagle Surveys

A winter raptor survey was completed in the Study Area on March 30, 2017 and a woodland raptor/stick nest survey was conducted on April 19, 2017. Transects for both surveys are depicted on **Figure 5** (**Appendix A**).

No raptor species were observed during the winter raptor habitat assessment; vegetation community structure and composition were not suitable for this habitat function (i.e., dominated by shrub thicket with limited open areas). No raptor species were confirmed, probable or possible breeders in the Study Areas during 2015 surveys. No stick nests were observed during the 2017 raptor nesting survey.

One Sharp-shinned Hawk (*Accipiter striatus*) was observed in flight, moving from east to west over the Study Area. It was identified as a first spring bird, a non-breeding individual, most likely migrating along the Niagara Escarpment. The Beamer Conservation Area Hawk Watch counted 63 Sharp-shinned Hawks migrating that same day (Ontbirds post, April 19, 2017). This species is considered a non-breeder, flyover or migrant.

No Great Horned Owl (*Bubo virginianus*) nests were observed as part of this survey. The species was reported by attendees on site, participating in the Save the Thundering Waters initiative. Eastern Screech-Owl (*Megascops asio*) is likely present. It would not be effectively detected during this survey type as it is a nocturnal cavity nesting species.

3.2.6 Other Candidate Significant Wildlife Habitat

Salamander Habitat Assessment Survey

Dougan & Associates (2015; 2016a) implemented a salamander, trapping program in 2015. The 8 ponds selected for survey and the methods applied were defined through discussions amongst their scientists and the MNRF and NPCA. Pond locations within and east of the northeastern portions of the Study Area are depicted on the Wildlife Survey Location Figure, Appendix A, in the Dougan & Associates (2015; 2016a) reporting. Surveys in two of the 8 ponds assessed (ponds 1 and 8) generated the highest number of captured Blue-spotted Salamanders. None of these 8 ponds occur within the Subject Lands.

Of the total of 66 Blue-spotted Salamanders captured, 16, 3 and 19 were captured in Ponds 1, 3 and 8 respectively. Smaller numbers of individuals were captured in other ponds, except Pond 5, with no captures (see Table 7, Dougan & Associates 2015). Dougan & Associates described Pond 5 as having suitable vegetation cover but perhaps being affected by road mortality, water quality or other forms of encroachment given the proximity to Oldfield Road.

Results analyzed by Dr. Bogart (University of Guelph) from tail-tip samples collected by Dougan & Associates during the 2015 salamander trapping field program identified the captured individuals as *Ambystoma laterale* (Blue-spotted Salamanders) and unisexuals (Blue-Spotted Genome dominant). In the 2016 Thundering Water EIS, Dougan & Associates stated the results were consistent with the findings from previous salamander studies conducted at other areas on the site by OMNRF, and by L. Campbell and Associates (MNR 2008).

Dougan & Associates (2015; 2016a) also reported incidental observations of species captured during salamander trapping including Spring Peeper (*Pseudacris crucifer*), Stickleback (*Gasterosteidae sp.*), and Predaceous Diving Beetle (*Dytiscidae sp.*). No endangered Jefferson Salamander (*Ambystoma jeffersonianum*) or Jefferson dominant polyploids were detected.

Savanta completed some supplementary amphibian movement and habitat suitability observations in the Study Area in 2017 to better understand the ecological characteristics of the wetlands including these sloughs or vernal pools. On February 24 and March 1, 2017, salamander habitat suitability assessment surveys were completed in the Study Area. Approximately 40 vernal pools were identified and assessed during the salamander habitat suitability assessment surveys conducted in the Spring (**Figure 3**, **Appendix A**).

Field surveys continue in 2017 with observations of hydroperiods and other seasonal characteristics of these ponds.

Salamander Movement Survey

During the February and March 2017 field investigations, 12 transects were surveyed in the Study Area; the transects and salamander observations are summarized on **Figure 3** (**Appendix A**). Particular attention was paid to characterizing pond habitat characteristics in and around the Subject Lands.

Salamanders (all presumed to be Blue-spotted Salamanders, based upon detailed genetic work completed by Dougan & Associates) were observed during movement surveys, recorded as follows:

- One salamander was visually observed along the following transect: T1;
- Four salamanders were visually observed along the following transect: T3; and
- One salamander was visually observed and identified along the following transect: T9.

3.2.7 Other Species at Risk Surveys

Acadian Flycatcher

Savanta completed a breeding bird survey targeted to determine the presence of Acadian Flycatcher on the Subject Lands (**Figure 5**, **Appendix A)** provides transects and point count survey locations) on June 19, 2017 (7:00 AM to 10:30 AM).

Three transects and 7 point counts were located within mature deciduous forests (suitable habitat for this species). Suitable breeding habitat was observed within the areas surveyed in the Study Area. The structural composition formed by the canopy and understory tree species preferred by Acadian Flycatcher was noted along all three transects. This includes Pin (*Quercus palustris*), and Red Oak (*Q. rubra*) forming the canopy, with Spicebush (*Lindera benzoin*) common in the understory. A sufficient amount of open understory, which the species prefers for both nesting and foraging, was present in much of the interior wooded areas surveyed. This combined with numerous open wooded sloughs in the forest provide habitat that the flycatcher prefers for breeding in Ontario (Heagy 2010).

During transect surveys, flycatchers were listened and watched for. No Acadian Flycatchers were detected during these surveys. Incidental observations made during the June 19, 2017 survey included 40 species of birds. The following bird species observed were of regional interest:

- American Woodcock (*Scolopax minor*); uncommon summer resident (NPCA 2010) suitable breeding habitat; one bird flushed;
- Tufted Titmouse (*Baeolophus bicolor*); rare permanent resident (NPCA 2010) pairs in suitable breeding habitat. Two pairs and a singing male were observed (2015 and 2017); and
- Rusty Blackbird (*Euphagus carolinensis*); Special Concern (COSEWIC) single male was noted. This is an uncommon migrant through the region (NPCA 2010).

While completing the Acadian Flycatcher survey, it was also noted that Western Chorus Frog (*Pseudacris triseriata*) populations occupied many of the ephemeral woodland pools present in the mature deciduous woodlands of the Study Area. Swamp Darner (dragonfly) (*Epiasechna heros*) (S2S3) was also observed, in slough wetlands in the northwestern portion of the Study Area.

4.0 INTERPRETATION OF FINDINGS – SIGNIFICANCE AND SENSITIVITY

This section addresses the relative significance and sensitivity of natural heritage features and associated functions associated with the Study Area. This assessment informed the definition of potential development limits for the Subject Lands and the definition of a conceptual Natural Heritage System (NHS). This analysis requires an understanding of the presence of ecological functions and their relationship with physical systems (e.g., physiography, soils, hydrology, hydrogeology).

Six of the eight types of significant natural heritage features addressed by the PPS were determined to occur, within and/or immediately adjacent to the Subject Lands. These are discussed in detail in the following sections, including reference to whether they have been confirmed within the Riverfront Community limits.

- Significant wetlands;
- Significant woodlands;
- Significant valleylands;
- Significant wildlife habitat;
- Fish habitat; and
- Habitat of endangered and threatened species.

The Provincial Policy Statement (PPS) (MMAH 2014) defines *Natural Features and Areas* as being important "…for their environmental and social values as a legacy of the natural landscapes of an area." This has been considered in the context of features and associated functions in the following analyses.

4.1 Significant Wetlands

The MNRF has mapped the presence of a provincially significant wetland (PSW) complex on and in the vicinity of the Study Area. The Niagara Falls Slough Forest Wetland is generally described in the following extract from that evaluation (MNR 2008).

Niagara Falls Woodlot #1 is a PSW wetland complex comprised of 18 wetland units separated by less than 750 m. The area in between the wetland units is drier land with early successional vegetation communities and previously filled lands with extensive drainage. Important linkages include the slough pattern of permanent to semipermanent pools, a small (N-S) watercourse in the eastern portion which enters the Welland River (Chippawa Channel), a super ditch running SW to NE entering the Power Canal, a RXR corridor extending through the wetland swinging northward through the City to the Whirlpool Area of the Niagara Gorge and the Welland River (Chippawa channel) to the south. Deer movement along the RXR corridor have been documented and wintering concentrations of deer have been identified (MNR files). Several amphibian species are recorded present through the wetland units. These species have complex lifecycles requiring permanent to semi-permanent water areas adjacent to uplands and must be able to move between these habitats to complete their lifecycle. Since they are short-lived and exist throughout the wetland they must be moving effectively in this complex and meeting their life cycle needs.

The 18 wetland units mapped by the MNRF vary in size from 0.00 ha (units 17, 18, 19 are

presumably too small to measure) to 54.64 ha (OWES unit 7). While previously determined not to meet PSW thresholds, the May 22, 2010 updated OWES information upgraded the wetland complex to provincially significant. This was noted to be in response to a desk-top update to the 3rd edition of OWES and some fieldwork near public area and roadsides. The 2010 evaluation presented a total wetland score of 624 out of a possible 1000 points (more than 600, or 60% exceeds the threshold of PSW). The total area of wetland within the complex is identified as 113.84 ha, with a catchment area of 841.57 ha, based upon mapped wetland areas as defined in March 18, 2010 mapping attached to the OWES reporting.

Dougan & Associates (2015; 2016a) delineated the limits of the wetlands within the Subject Lands in August 2015. The MNRF approved the wetland boundary adjustments on May 16, 2016. The MNRF, in response to receipt and review of the Dougan & Associates 2016 reporting determined that additional modifications to wetland limits were required. MNRF attended the Study Area on September 22, 2016 and subsequently updated Niagara Falls Slough Forest Wetland mapping on an updated LIO mapping layer, posted publicly in early January 2017. Ontario's PSW files are considered open files and adjustments to wetland mapping and evaluations can be made in response to new information and/or in response to changing wetland conditions.

The following information provides context at a landscape level for understanding the relative frequency and importance and sensitivity of the wetlands on and immediately adjacent to the Study Area.

The majority of the wetlands in Niagara Region are associated with the Haldimand Clay Plain, a physiographic feature, which encompasses a 320,000 ha area. That clay plain has a relatively high percentage (i.e., 29.2%) of natural cover. The Lower Welland River watershed, which includes about half of the Subject Lands, is characterized by about 29% natural cover, including more than 18% wetland cover (NPCA 2011a). In terms of the City of Niagara Falls, forest cover is about 25.07% with more than half of that total (i.e.,13.4%) being classified as wooded swamp (NPCA 2011a). Both percentages are well above the average woodland and swamp cover across the entire NPCA jurisdiction (i.e., 17.79% and 9.14% respectively).

The Niagara River Corridor Conservation Action Plan addresses a subset of the Niagara Region and includes a large area of Haldimand Clay Plain (noted as Eco-district 7E-5). That report (Jalava et al. 2010) identifies nearly 22% of the Eco-district as natural cover (predominantly forest). The majority of the Eco-district (two thirds, or 238,234 ha) is defined as agriculture with nearly 32,247 ha in pastures and abandoned fields.

The intact areas of the Haldimand Clay Plain exhibit a common and widespread pattern of wetland slough/ridge topography, that is readily evident from aerial photographs. These wetland areas occur within Ecoregion 7E and the Deciduous Forest Region, Niagara Forest Section (Rowe 1972). Settlement and farming on the Haldimand Clay Plain has been hampered by this wetland-rich landscape and its poorly drained soils with deficiencies in lime, phosphorus and organic matter (Chapman and Putnam 1984). A moderate degree of historic agricultural abandonment and natural succession has occurred where farming was apparently determined not to be viable.

While widespread and relatively common in Niagara, wetlands also display a high richness of species at risk (Environment Canada 2014). The southern half of the Subject Lands are

addressed in the Lower Welland River Characterization Report (NPCA 2011a). Additional context is provided in the South Niagara Falls Watershed Report (NPCA 2008).

Approximately 111.6 ha of wetlands (and associated upland woodlands) occur within the Study Area. The majority (about 99.6 ha) occur in areas of typical slough ridge topography and soils characteristic of the Haldimand Clay Plan. These wetlands are characterized as deciduous swamp, more specifically:

- Oak Mineral Deciduous Swamp (majority of wetland area);
- Pin Oak Mineral Deciduous Swamp (minor occurrence);
- Green Ash Mineral Deciduous Swamp; and
- Willow Mineral Deciduous Swamp (Dougan & Associates 2016a).

The 99.6 ha includes both areas of upland and wetland habitat, in a matrix of natural features that are generally defined as slough forest. These relatively intact wetlands are an important component of the Niagara Falls Slough Forest Wetland Complex Provincially Significant Wetland. The Riverfront Community (Subject Lands) does not include wetlands and woodlands characteristic of the slough ridge topography. These occur outside of the Subject Lands in the larger Study Area.

These relatively intact slough forest woodlands and wetlands have remained intact without documented changes to topography and/or soils for long periods (depicted as Areas 1 and 2 on **Figure 4**, **Appendix A**). Other areas, that were actively farmed relatively recently (i.e., after 1960), have succeeded back into natural vegetation cover. Despite the historic agricultural use, large areas of the original slough ridge topography are still evident and; soils have naturally recovered from former agricultural activities (depicted as Area 3, Early to mid-successional on **Figure 4**, **Appendix A**).

A fourth category of wetland is identified as occurring within Area 4 on **Figure 4** (**Appendix A**) – these represent young, recent successional features that display signs of significant and/or recent disturbance (Highly disturbed). These disturbed areas have been affected historically by large-scale activities including: re-alignment of the Welland River, the creation of the Chippawa Power Canal and the Conrail Drain and railway line, and the associated deforestation/filling of these lands. A review of a series of more current aerial photos reveals that portions of the Recent Succession (Highly disturbed, Area 4) area were subject to more recent disturbances up to a period around 2000 (i.e., earth moving, grading and equipment use). Since that time of heavy disturbance, vegetation succession has continued. Ongoing active and passive recreation disturbances continue in some of these areas, associated with uncontrolled access (e.g., recreation vehicles/off-roading, hunting).

The significant topographic and soil changes and the absence of the natural hydrologic regimes typical of undisturbed tracts on the Haldimand Clay Plain (i.e., slough ridge topography) have left these Area 4 lands delayed in terms of ecological succession and with relatively more limited ecological features and functions. In these disturbed areas, a number of wetland features (variable sizes totaling about 12 ha as mapped by the MNRF) exist along with areas that have wetland characteristics but would not appear to merit definition as *Natural Features and Areas* or as significant wetlands. The total of these wetland areas within the Riverfront Community is

4.44 ha (to be removed). These disturbance origin wetland areas and characteristics appear to relate to:

- Localized ponding in areas of past disturbance (e.g., areas with compacted and poorly developed soils, depressions created through equipment use, fill placement);
- Localized inundated areas associated with the Conrail Drain construction and operation; and
- Localized ponding likely established historically by the construction of Chippawa Parkway (i.e., impounded areas of water due to inadequate/undersized and/or damaged/blocked drainage/outlets).

The updated 2017 MNRF PSW mapping for the Subject Lands added a number of these features and areas as part of the Niagara Falls Slough Forest Wetland Provincially Significant Wetland Complex. These recently added wetland areas and disturbed lands with wetland characteristics were reviewed in detail to better understand their degree of functional importance and contributions to the larger wetland complex. A Wetland Functional approach was applied to 10 features (**Figure 8**, **Appendix A**) within and immediately adjacent to the Subject Lands. **Table 3** (**Appendix B**) provides a summary of relative ecological characteristics considered during that assessment.

In addition to an evaluation of significance the sensitivity of the wetlands (i.e., vulnerability to impacts) and the viability of their retention within an urbanizing environment, were considered. The majority of wetlands (i.e., about 100 ha of 112 ha or about 90% of MNRF mapped features) are slough features. These are also referred to as vernal pools within forested areas. Vernal pools have been the subject of much research in northeastern North America in recent years. The Haldimand Clay Plain wetlands do not appear to have been the subject of specific landscape scale or site specific scientific research.

Vernal pools are dependent upon a specific type of hydroperiod, or frequency and/or duration of flooding. These tend to be a mix of intermittent or ephemeral and permanent pools within forested settings that have small catchments around individual isolated pool features. Hydrologic inputs are from snow storage/melt, rainfall and overland runoff from those small catchments. Vernal pools are well known for their potential to contribute to local amphibian productivity and diversity.

Within and adjacent to the Study Area, vernal pools were observed to be habitat to several amphibians, including Spotted salamander, a member of the Burrowing Salamander family. This species depends upon vernal pools for breeding and larval development stages of their life cycle, while adults spend their time underground for the majority of the year. Each spring, usually during the first warms rains, the adults emerge from underground and move across the landscape to these vernal or breeding pools. A number of factors are identified in the technical literature related to Spotted Salamander habitat and behaviours (e.g., forest canopy cover, presence of suitable egg attachments sites, absence of predators, suitable hydro-period, seasonal weather patterns and associated water quality, availability of unimpeded movement corridors, etc.). Each of these components can affect the success of these vernal pools for Spotted Salamander and other species of vertebrates.

A regionally rare dragonfly, Swamp Darner (*Epiaeschna heros*) G5 (S2/S3) was also in 2017, during Acadian Flycatcher surveys (north end of transect T3, **Figure 5**, **Appendix A**). The wetland vernal pools/sloughs in the more mature hickory oak deciduous forests of the Study Area are suitable habitat for this large dragonfly species. Swamp darner inhabits the vernal pools/sloughs for the relatively long duration of the nymph stage of this species' lifecycle.

This report has confirmed the significance and sensitivity of the vernal pools or slough forest wetlands (i.e., about 90% of the wetlands in the Study Area). These features do not occur within the Subject Lands. The Study Area includes important slough forests with a matrix of upland and wetland conditions. All of the vernal pools on the intact Haldimand Clay Plain areas of the Study Area were observed to provide suitable habitat to a range of amphibian species. During surface water chemistry testing, there did appear to be a relationship between elevated conductivity levels and the absence of Spotted Salamanders. It is apparent and well-documented that vernal pools have a high level of sensitivity to changes in habitat parameters (Brooks 2005; Calhoun et al. 2005; Karracker et al. 2008). This relationship is the subject of ongoing monitoring in the Study Area.

Wetland features and functions are considered further and are integrated with findings presented for other natural heritage components addressed in the following sub-sections. Wetlands to be maintained within a proposed Natural Heritage System are depicted on **Figure 8**, **Appendix A**). Limits of some of these features require more careful analysis and may be refined as part of ongoing "open file" wetland investigations. This wetland analysis has defined wetlands on the Subject Lands according to four categories, based upon a detailed functional assessment of features; i.e., those that merit:

1) Inclusion within the Niagara Falls Slough Forest Wetland Complex Provincially Significant Wetland given the intact slough forest wetlands with a high degree of ecological functions;
2) Inclusion within the Niagara Falls Slough Forest Wetland Complex Provincially Significant Wetland given the presence of a relatively high degree of ecological functions (albeit on lands without intact topography/soils);
3) Consideration for inclusion within the Welland River East Complex Provincially Significant Wetland, given the character and functional location of these features; or
4) Removal from MNRF mapping and considered to be other wetlands or areas with wetland characteristics.

These wetlands are discussed further in Appendix D.

4.2 Significant Woodlands

The limits of the woodland areas on the Subject Lands generally coincide with the limits of the broad areas of wetland. Having said that, the slough ridge topography on the Haldimand Clay Plain leads to these wetland and forested areas being a mix of wetland and upland conditions, with sometimes quite subtle topographic differences affecting the definition between woodland and wetland. This degree of habitat complexity is part of the richness associated with these systems. The woodlands on the Subject Lands reflect the same relative degree of disturbance patterns and history as described in the wetland section, above.

The woodlands that have persisted intact on the landscape over the longest period of time are those depicted as Areas 1 and 2 on **Figure 7** (**Appendix A**). While not defined as old growth in the broad assessment of old growth in eastern Niagara (Kershner 2004), parts of these woodlands display characteristics that could meet generally accepted old growth criteria and definitions; they would meet the definition of "Older Forest Growth" in the Regional Official Plan (Region of Niagara 2015). These woodland areas should be considered to meet mature/old growth conditions – they possess the highest degree of intact features and associated ecological functions, and they merit definition of significant woodland.

Area 3 on **Figure 7** (**Appendix A**), includes regenerating forest cover on relatively intact topography and soils. These areas were in agricultural production until well after 1960 (based upon a review of aerial photographs). Field investigations suggest that some of these woodland areas are 30 years to 50 years of age. These treed areas provide important habitat and also merit definition of significant woodland.

Area 4 **Figure 7** (**Appendix A**) includes regenerating forest cover (defined as Cultural Woodland by Dougan & Associates 2016a) that occurs on altered topography and soils. The composition and age of these treed areas reflect relatively recent disturbances. The disturbances have led to the establishment of a mosaic of cultural thicket and cultural woodland with some areas exhibiting wetland characteristics. Treed areas in Area 4 do not possess the degree of functional importance of woodlands in Areas 1 through 3. The canopy in Area 4 is dominated by Green Ash. The Emerald Ash Borer (EAB), *Agrilus planipennis Fairmaire* has caused significant tree mortality and canopy decline throughout Niagara. EAB, is an invasive, wood boring beetle native to Asia that feeds on and eventually kills all species of Ash. The forest Area 4 has been heavily impacted by EAB.

The Region (2015) defines woodland as: … *a treed area that provides environmental and economic benefits to both the private landowner and general public, such as erosion prevention, hydrologic and nutrient cycling, provision of clean air and long term storage of carbon, provision of wildlife habitat outdoor recreational opportunities and the sustainable harvest of woodland products. It does not include a cultivated fruit or nut orchard or a plantation used for the purpose of producing Christmas tree*s."

Treed areas within Areas 1 through 3 (**Figure 7**, **Appendix A**) meet this definition. While pockets of woodland on Area 4 may meet this definition, it is expected those areas will continue to face canopy decline from the EAB infestations. The EAB infestation in portions of the Subject Lands has already shifted some woodland to non-forested, thicket communities.

Significant woodlands are identified by the planning authority using criteria established by the MNRF. In terms of Significant, the Region defines significant."… *in regard to other natural heritage features and areas, ecologically important in terms of features, functions, representation of amount, and contributing to the quality, diversity, ecological health and integrity of the Core Natural Heritage System*."

Schedule C of the Regional Official Plan depicts Core Natural Heritage as including: Environmental Protection Areas, Environmental Conservation Areas, Potential Natural Heritage Corridors). On the Subject Lands, these elements are more closely associated with most of Areas 1 through 3 on **Figure 7** (**Appendix A**).

Natural woodlands within Areas 1, 2, 3 **(Figure 7**, **Appendix A**), defined by Dougan & Associates (2016a) as ELC types FOD, and SWD, should be considered significant, as they meet one or more of the following Regional criteria (Regional Municipality of Niagara, 2015):

- Contain threatened or endangered species or species of concern (Special Concern in Ontario or Canada or provincially ranked S1-S3);
- Within the Urban Area, be 2 hectares or greater in size;
- Contain interior woodland habitat at least 100 m in from the woodland boundaries;
- Contain older growth forest and be 2 hectares or greater in area;
- Overlap or contain one or more of the other significant natural heritage features listed in Region (2015) policies 7.B.1.3 or 7.B.1.4 (i.e., EPA, ECA or fish habitat); and,
- Abut or be crossed by a watercourse or water body and be 2 or more hectares in area.

A few portions of the highly disturbed area (**Area 4**) that are mapped as Cultural Woodland by Dougan & Associates technically meet the definition of woodland (i.e., confirmed by stem density measurements) in pockets not yet affected by EAB. In the unlikely situation that the canopy is able to persist EAB, these treed areas will continue to succeed. The altered topography and soils will, however, delay the successional process and will not permit the re-establishment of natural woodland conditions reflective of the Haldimand Clay Plain landscape. These areas do not merit designation as Significant Woodland, but the local ecological functions need to be considered and addressed in terms of the impact assessment.

4.3 Significant Valleyland

Significant valleylands are defined and designated by the planning authority. General guidelines for determining significance of these features are presented in the NHRM (MNR 2010) for Policy 2.1 of the PPS. Recommended criteria for designating significant valleylands include prominence as a distinctive landform, degree of naturalness, and importance of its ecological functions, restoration potential, and historical and cultural values

Although it has been historically re-aligned and is subject to reverse flows to feed the upstream Chippawa Power Canal, the Welland River and banks were deemed to meet thresholds suggested in the NHRM (MNR 2010) and defined as significant valleyland (e.g., hydrologic functions, landform prominence). The Chippawa Parkway was selected as the upper limit of the feature, except in the eastern limits of the Study Area, where the lower reaches of the easternmost tributary occur within a well-defined valleyland that would meet generally accepted significance thresholds.

4.4 Significant Wildlife Habitat

Significant wildlife habitat is one of the more complex natural heritage features to identify and evaluate. There are several provincial documents that discuss identifying and evaluating SWH including the NHRM (MNR 2010), the Significant Wildlife Habitat Technical Guide (MNR 2000), and the SWH Eco-region Criterion Schedule (MNRF 2015). The Subject Lands are located in Eco-region 7E and were therefore assessed using the 7E Criterion Schedule (MNRF 2015a).

There are four general types of significant wildlife habitat (SWH), each of which is represented on portions of the Subject Lands.

- Seasonal concentration areas of animals;
- Rare vegetation communities or specialized habitat for wildlife;
- Habitat for species of conservation concern (not including endangered and/or threatened); and
- Animal movement corridors.

From a cumulative perspective, Significant Wildlife Habitat is concentrated within the more intact natural areas (i.e., Areas 1, 2, and 3 on **Figure 7**, **Appendix A**). Some components of SWH extend into other woodland, cultural woodland and cultural thicket habitats; however, the degree of significance in these areas is reduced, given the extensive and relatively recent disturbances, and ongoing effects from EAB. SWH present in the Subject Lands is briefly described in the following and is illustrated within the Natural Heritage Feature Summary mapping on **Figure 8** (**Appendix A**).

4.4.1 Seasonal Concentration Areas

Seasonal concentration areas are those sites where large numbers of a species gather together at one time of the year, or where several species congregate. Seasonal concentration areas include: deer yards; wintering sites for snakes, bats, raptors and turtles; waterfowl staging and molting areas, bird nesting colonies, shorebird staging areas, and migratory stopover areas for passerines or butterflies. Only the best examples of these concentration areas are usually designated as significant wildlife habitat.

Bat Maternity Colonies

Results from across the property indicate that most of the intermediate to old forested areas (Areas 1 to 3, **Figure 7**, **Appendix A**) are likely to contain standing dead trees that may provide suitable roosting habitat. MNRF advises that any coniferous, deciduous or mixed wooded ecosites, including treed swamps, that include trees at least 10 cm diameter-at-breast height (DBH), should be considered suitable (potential) maternity roost habitat. The relatively older forested areas (Areas 1 to 3, **Figure 7**, **Appendix A**) have been assumed to include significant wildlife habitat for bat maternity colonies. Forested areas in the disturbed lands (Area 4, **Figure 7**, **Appendix A**) have been treated with a pre-cautionary approach, where potential roosting stems may still remain; these are considered to be candidate significant wildlife habitat. This interpretation will be refined with 2018 acoustic monitoring data and may be affected by ongoing tree decline and collapse in areas dominated by ash.

Turtle Wintering Areas

While a number of features included observations of Snapping Turtles and/or Midland Painted Turtle, numbers of Midland Painted Turtle individuals observed at turtle basking stations BS-2 and BS-4 (>5), together with one or more Snapping Turtle observations, achieves the threshold for confirmed SWH for “Turtle Wintering Areas”.

Reptile Hibernacula

Surveys completed on the Subject Lands identified four species of snakes, (Eastern Gartersnake, Eastern Milksnake, Red-bellied Snake, and Dekay’s Brownsnake). An area search

(AS-1) on the eastern margins of the Subject Lands identified a potential hibernaculum consisting of a large rubble and debris pile located by an old barn. Two snake species, Eastern Gartersnake and Dekay's Brownsnake were observed within AS-1 during the Spring Emergence period. Due to the presence of more than one species of snake this feature is considered confirmed SWH for "Reptile Hibernaculum".

Transect T-1 is located along a highly disturbed clearing consisting of ATV trails and debris. Three species of snake were observed along this transect, Eastern Gartersnake, Dekay's Brownsnake and Red-bellied Snake, during the Spring Emergence Period. Due to the relatively high number of individuals and species observed in this area during the Spring Emergence period, it is likely a hibernaculum exists along this transect. Field observation suggest the hibernaculum may be located along the easternmost segments of Transect T-1.

Deer Winter Congregation Areas

Most woodlands and wetlands in the local landscape (including woodland/wetland portions of the Subject Lands) are mapped as Deer Wintering Areas by the MNRF (**Figure 2**, **Appendix A**). White-tailed Deer are the most common and widely distributed mammal in North America, with an Ontario population of about 400,000 (MNRF 2016f). Ontario's deer herds are managed through a selective harvest system. The Stratum II deer wintering area on the Subject Lands contributes to the general deer population in Niagara. Stratum I habitat is often referred to as Core Deer Habitat – it is the most used portion of a deer winter concentration area. Stratum II deer wintering area, which is identified over much of the Study Area, is the larger yarding area. Stratum III habitat is the range occupied by deer year-round.

Concerns are increasing around the compatibility of human uses (i.e., urban and urbanizing areas) in direct contact with White-tailed Deer, especially in terms of potential vehicle/deer collisions and negative health interactions (Lyme disease spread by the bacterium *Borrela burgdorferi*). Wainfleet Bog, about 15 km southwest of the Subject Lands is one of five federally identified risk areas for Lyme disease in southern Ontario (Health Canada 2017).

The identification of Stratum II deer wintering area on the Subject Lands contributes to the identification of Significant Wildlife Habitat.

4.4.2 Rare Vegetation Communities or Specialized Habitat for Wildlife

Rare and specialized habitat, are two separate components. Rare habitats are those with vegetation communities that are considered rare in the province. SRANKS are rarity rankings applied to species at the 'state', or in Canada at the provincial level, and are part of a system developed under the auspices of the Nature Conservancy (Arlington, VA). Generally, community types with SRANKS of S1 to S3 (extremely rare to rare-uncommon in Ontario), as defined by the Natural Heritage Information Centre (NHIC 2016), could qualify. It is to be assumed that these habitats are at risk and that they are also likely to support additional wildlife species that are considered significant. Specialized habitats are microhabitats that are critical to some wildlife species. The NHRM (MNR 2010) defines specialized habitats as those that provide for species with highly specific habitat requirements; areas with exceptionally high species diversity or community diversity; and areas that provide habitat that greatly enhances species' survival.

Provincially Rare Vegetation Communities

Three provincially rare vegetation community types were observed within the Study Area; they occur principally outside of the Subject Lands.

- Pin Oak Mineral Deciduous Swamp (SWD1-3);
- Buttonbush Mineral Thicket Swamp (SWT2-4); and
- Gray Dogwood Mineral Thicket Swamp (SWT2-9).

The Pin Oak Mineral Deciduous Swamp occurs principally within the forested PSW areas identified for protection in the north and east of the Subject Lands. The majority of Buttonbush Mineral Thicket Swamps occurred as inclusions within the PSW areas identified for protection north and east of Block A11. The Gray Dogwood Mineral Thicket Swamps occurred principally within Area 3, generally in areas of less closed tree canopy cover.

Old growth forest (>140 yrs) and older forests (> 100 years; ROP) are difficult to validate without detailed dendrochronological measurements. Based upon a review of the available historic aerial imagery (e.g., 1934, 1960), it appears that the older woodlands (generally depicted as Areas 1 and 2 on **Figure 7**, **Appendix A**) were on the landscape in the early 1900s, making at least portions of those stands at or older than 100 years.

Dougan & Associates (2016a) reported the presence of larger individual stems (i.e., over 50 cm DBH with some over 100 cm DBH) of Red Oak, Pin Oak, Bur Oak, and Shagbark Hickory. They noted older individual and small stands of trees in Areas 1, 2 and 3 referred to as ELC polygons 12, 13, 29, 30, and 46 (refer to Map 2 in the Characterization and Environmental Impact Study Report; Dougan & Associates 2016). For purposes of this report, Areas 1 and 2 are considered to be/include old growth forests and/or pockets of older forests.

Woodland Raptor Nesting Habitat

No raptor species were confirmed, probable or possible breeders in the Study Area during 2015 surveys. No stick nests were observed during the 2017 raptor nesting survey.

One Sharp-shinned Hawk (*Accipiter striatus*) was observed in flight, moving from east to west over the Subject Lands. It was identified as a first spring bird, a non-breeding individual, most likely migrating along the Niagara Escarpment. The Beamer Conservation Area Hawk Watch counted 63 Sharp-shinned Hawks migrating that same day (Ontbirds post, April 19, 2017). This species is considered a non-breeder, flyover or migrant.

No Great Horned Owl (*Bubo virginianus*) nests were observed as part of this survey. The species was reported by attendees on site, participating in the Save the Thundering Waters Forest initiative. Eastern Screech-Owl (*Megascops asio*) is likely present. It would not be effectively detected during this survey type as it is a nocturnal cavity nesting species.

Turtle Nesting Areas

No suitable turtle nesting habitat was observed in the Study Area. Detailed soil sampling was completed in representative locations throughout the proposed Riverfront Community. The past

and recent history of disturbance in Areas 4 (**Figure 7**, **Appendix A**) has led to a high degree of soil compaction throughout that limits suitable substrate for turtle nesting.

Amphibian Breeding Habitat (Woodland)

Discussed in some detail in section 4.1 of this report, the vernal pool habitats within the slough forest complex provide breeding habitat for woodland amphibians. They support: Spring Peeper, Western Chorus Frog, Northern Leopard Frog, Gray Treefrog, Wood Frog, American Toad and Blue-spotted Salamander breeding. These pools within the mature forested woodlands were observed to support relatively large populations of Western Chorus Frog. Work completed to-date supports the conclusion that natural vernal pools within the forests with intact slough ridge topography have an extensive network of Breeding Amphibian Habitat (woodlands).

Amphibian Breeding Habitat (Wetland)

Amphibian breeding habitat is also present in the other non-slough forest wetlands – some of these smaller wetland areas are more limited in terms of habitat quality and quantity, but they do contribute to the general amphibian breeding populations. In 2017, heavier rainfall amounts and frequency led to an increased level of pooling in features, including highly altered features (e.g., vehicle tire tracks). Amphibians were observed throughout the Subject Lands at times where normal precipitation levels may have led to more restricted distribution and earlier seasonal pool drying.

Bullfrog was heard calling at turtle basking stations BS-2 and BS-4, which triggers the presence of the breeding amphibian open wetland Significant Wildlife Habitat (SWH) type. Bullfrog were also observed dead on the road along Oldfield Road on the north side of the Study Area (**Figure 6**, **Appendix A**). No live Bullfrog observations were made in the northern forested portions of the Study Area where the road-killed specimens were observed and no SWH designation can be confirmed. Bullfrog may be present in ponds along the northern edges of the Study Area, although the deeper pools to the north (I.e., outside the Study Area) that were subject to recent development were likely more suitable habitat for this species. The bullfrogs may have been displaced by construction activities underway to the north at the time of the surveys.

Woodland Area-sensitive Breeding Bird Habitat

Large blocks of intermediate/mature and mature/old forest occur in both the northern and southern portions of the Subject Lands. Habitat suitable for sensitive habitat occurs in contiguous blocks of forest within Areas 1 through 3 (**Figure 7**, **Appendix A**). Bird species that depend upon area-sensitive habitat were observed during 2015 and 2017 surveys (e.g., Tufted Titmouse, White-breasted Nuthatch, Yellow-throated Vireo). Cultural woodland within Area 4 should be considered to be other woodlands. These areas do not merit designation as Significant Woodland, but the local ecological functions need to be considered and addressed in terms of the impact assessment (i.e., for the Subject Lands addressed in this EIS).

4.3.3 Habitat for Species of Conservation Concern (Not Including Endangered and / or Threatened)

Shrub/Early Successional Breeding Bird Habitat

The 15.7 ha patch of Cultural Thicket (CUT) in the Study Area exceeds the 10 ha threshold for this habitat and includes the presence of indicators of shrub and early successional habitat defined as 'Significant Wildlife Habitat' (SWH) in Ecoregion 7E in Ontario (Brown Thrasher, Black-billed Cuckoo, and Field Sparrow).

Successional habitats (including thickets and meadows), comprise about 6.73% of the NPCA jurisdiction. Niagara Falls has 14.26% of the City landscape in successional habitat, almost four times the NPCA wide cover. Similarly, high percentages of successional cover occur in Welland (17.46%), Fort Erie (12.35%) and Port Colborne (10.51%), likely reflecting an extended period of agricultural abandonment on the poorly drained Haldimand Clay Plain soils.

The portions of the highly disturbed area (Area 4; **Figure 7**, **Appendix A**) that are mapped as Cultural Thicket by Dougan & Associates (2016a) will continue to succeed, however, the altered topography and soils will delay the successional process and will facilitate the prevalence of European Buckthorn, an invasive shrub species that changes the soil quality and fauna and affects the ability of native plant species to establish. These areas do not merit designation as Significant Wildlife Habitat, but the local ecological functions need to be considered and addressed in terms of the impact assessment.

The Cultural Thicket referred to above does not meet the definition of savannah in Ontario. Those rare vegetation communities typically develop in sandy soils in the Carolinian forest region. These features occur in southwestern Ontario (e.g., Windsor), along some Lake Huron shores, and along Lake Erie. Savannah and alvar communities do not appear to have historically occupied the Subject Lands, nor are they currently present (NPCA 2010; Oldham 2017).

Habitat for Species of Conservation Concern

Species of conservation concern include those that are provincially rare (S1 to S3), provincially historic records (SH) and Special Concern species. Several specialized wildlife habitats are also included in this SWH category: i.e., terrestrial crayfish habitat and significant breeding bird habitats for marsh, open country and early successional bird species. Habitats of species of conservation concern do not include habitats of endangered or threatened species as identified by the ESA, 2007.

Two provincially rare plant species were identified within the Study Area during field site surveys in 2015; Schreber's Aster (*Eurybia schreberi*) and Honey Locust (*Gleditsia triacanthos*). These species both occur within the Provincially Significant Wetlands (PSW) outside of the Subject Lands, within the larger Study Area. Schreber's Aster occurs within the mature central deciduous swamp and Honey Locust occurs along the floodplain of Watercourse 2 (Map 2, Dougan & Associates 2016a). Two additional rare species are known from nearby similar habitats; Black Gum (*Nyssa sylvatica*) and Round-leaved Greenbrier (*Smilax rotundifolia*), but they were not confirmed during field investigations. Round-leaved Greenbrier (*Smilax rotundifolia*), had been recorded from lands immediately north of the Subject Lands, north of

Oldfield Road.

Two bird species designated as Special Concern in Ontario were identified within the Study Area during 2015: Eastern Wood-Pewee and Wood Thrush. Both of these species occur widely in natural woodlands within Areas 1, 2, 3 (**Figure 7**, **Appendix A**).

Two reptile species of conservation concern were identified within the study area during 2017 surveys: Snapping Turtle and Eastern Milksnake. Snapping Turtle (Special Concern) were observed at BS-2 and BS-4 as well as in a ditch along T7. Eastern Milksnake (S3, not at risk) was observed along NT-1.

4.4.4 Animal Movement Corridors

Animal movement corridors are required to connect wetland amphibian breeding SWH to suitable non-breeding (summer and winter) habitats. Animal movement corridors are areas that are traditionally used by wildlife to move from one habitat to another. This is usually in response to different seasonal habitat requirements, including areas used by amphibians between breeding and summer/over-wintering habitats, called amphibian movement corridors.

Field investigations completed in 2017 have identified the following observations:

- There is a relatively high density of amphibian breeding in the more intact woodland vernal pools in the Study Area (including populations of Blue-spotted Salamander and Western Chorus Frog);
- The mix of sloughs and ridges in those woodlands appear to include habitat for both breeding and non-breeding functions for Blue-spotted Salamanders;
- Scattered salamander movement observations and anecdotal reports of salamander movement across Dorchester Road in the southwest portions of the Study Area, suggest the woodlands west of Dorchester Road may also provide some non-breeding habitat for Blue-spotted Salamander;
- Amphibian movement occurs broadly across the Subject Lands, including across areas of disturbance;
- The relatively wet spring and summer seasons in 2017 seemed to be associated with the widespread amphibian use of temporary pools, including even flooded ditches and ruts in paths;
- Road crossing/mortality observations included substantial numbers of amphibians and a few reptiles (e.g., Grey Tree Frog, Western Chorus Frog, Green Frog, American Toad, Midland Painted Turtle, Dekay's Brownsnake) along Chippawa Parkway and Dorchester Road; and
- Road mortality occurred broadly along those roadways, and was not focused in areas where culverts or water crossings were present.

The Lower Welland River watershed and the City of Niagara Falls are more generally characterized by a high percentage of natural vegetation cover. This broad natural cover in rural areas, in particular, provides a relatively porous landscape for the movement of wildlife and for the flow of genetic diversity, nutrients and energy. The Welland River and its tributaries facilitate the movement of aquatic organisms.

A review of **Figure 2** (**Appendix A**), the Lower Welland Watershed Plan; and the NPCA Natural Areas Inventory, provides the following input to a dialogue about existing landscape linkages on and local to the Subject Lands.

- The Study Area is closely connected to the aquatic and riparian habitats of the Welland River, although that connection is impeded to some degree by the existing road infrastructure;
- The degree of connection and the importance of the functional linkage with the river is also diminished by the artificial fluctuations in water levels and flow direction required to provide input to the Chippawa Power Canal;
- The Study Area is connected via fragmented patches of natural features ('stepping stones') across the landscape to the west (e.g., Heartland Forest) and to the south (e.g., Horse Track Woods, Young Woods, Old Lincoln Street Slough Forest, Willoughby Marsh; NPCA 2011a);
- The Study Area is isolated from direct connections for some species and guilds of species (e.g., amphibians, reptiles) by substantial natural and anthropogenic barriers (i.e., existing residential development, the Conrail Drain Ditch/embankments, a railway line/embankments and industrial development, Stanley Avenue, the Chippawa Power Canal, Welland River); and
- The Conrail Drain does provide some positive local movement opportunities (e.g., medium sized mammals) while the rail line provides an "aerial" link manageable for similar mobile mammal species, connecting the Subject Lands across the Welland River/Chippawa Power Canal to the southwest, under the QEW).

4.5 Fish Habitat

Fish Habitat, as defined in the federal Fisheries Act, c. F-14, means… spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes. Fish, as defined in S.2 of the Fisheries Act, c. F-14, includes parts of fish, shellfish, crustaceans marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals (DFO 2013).

Fish habitat and aquatic habitat more generally, are addressed in section 3.2.8 of the Characterization and Environmental Impact Study Report (Dougan and Associates 2016a), That reporting addresses the Welland River shoreline and three watercourses that provide access for fish from the Welland River and the Chippawa Power Canal into the interior of the Subject Lands. Of those three, two are highly altered. The Conrail Drain is a deep, straight, artificial channel, lined with rip-rap along its entire length. It provides no spawning habitat for off-site fishes, nor can it be accessed by large off-site fishes. It is relatively unproductive and only supports a sparse population of Brook Stickleback.

The second highly altered watercourse, (referred to as Watercourse 1 in section 3.2.8.2 of the Dougan and Associates reporting) is short (212 m) and it originates at an old concrete culvert outfall, which is believed to convey flows from a network of legacy pipes that drain surface water, via inlets and broken sections, from the elevated south-central portion of the Study Area. This drainage ditch was not observed to provide direct fish habitat – northern pike searches (i.e., spawning, young of the year) proved negative.

The third watercourse along the eastern limits of the Study Area (eastern watercourse) is more natural and is believed to have its origins on the adjacent Thundering Waters Golf Club. Low numbers of six species of fish were recorded in this watercourse including young of the year White Sucker.

4.6 Habitat of Endangered and Threatened Species

One individual of a threatened species, Barn Swallow, was seen foraging over the Study Area on May 28, 2015. No suitable breeding habitat (e.g., barns, bridges) and limited foraging habitat exist in the Study Area. Barn Swallow foraging habitat will be addressed under specific assessment by the MNRF through the SAR Information Gathering Form process.

Acadian Flycatcher was observed by Dougan & Associates on May 29, 2015. The observation of this species was noted in the Characterization and Environmental Impact Study Report, as not considered territorial (i.e., not confirmed breeding) (Dougan & Associates 2016). At the request of the MNRF, a targeted 2017 search for Acadian Flycatcher was completed (including detailed observations along transects with 7 point counts). The survey was completed by an ornithologist with extensive experience with this species in Ontario (Burke, Savanta Inc.). No Acadian Flycatchers were detected.

In Canada, Acadian Flycatcher occurs in the Carolinian forest region and it represented by between 35 to 50 pairs each year (Environment Canada 2012). In Ontario, only 30% to 50% of the known breeding sites may be occupied in any given year (COSSARO 2010). This area is at the northern limits of this species' range in North America. Black and Roy (2010) note that Acadian Flycatcher is an occasional spring transient and a very rare summer straggler in Niagara. While there are no Niagara breeding records for this species in the second Breeding Bird Atlas, sightings of this species have been recorded over the past several decades in locations including Marcy's Woods and Abino Woods.

The Recovery Strategy for this species defines critical habitat for Acadian Flycatcher as being based on two criteria: habitat suitability and multi-year occupancy by Acadian Flycatchers. Suitable habitat includes large blocks of relatively undisturbed, contiguous mature, deciduous or mixed forests.

Suitable breeding habitat was observed for this species within the areas surveyed in the Study Area. The structural composition formed by the canopy and understory tree species preferred by Acadian Flycatcher was noted along all three transects. This includes Pin (*Quercus palustris*), and Red Oaks (*Q. rubra*) in the canopy, and Spicebush (*Lindera benzoin*) in the understory. A sufficient amount of open understory, which the species prefers for both nesting and foraging, was present in much of the interior wooded areas surveyed. This combined with numerous open wooded sloughs in the forest to provide habitat that the flycatcher prefers for breeding in Ontario (Heagy 2010).

Should the species occur in the Study Area in future years (requires multiple years of surveys to confirm presence/absence), critical habitat would be defined to include all mature and old forests with slough ridge topography, north of the rail line and Conrail Drainage Ditch (larger intact forest blocks). The suitability of the old slough forests northeast of the Study Area for Acadian Flycatcher is undetermined (outside of the GR CAN Investment Co. Ltd. ownership).

The habitat has likely been negatively affected by the installation of an emergency/fire lane through the slough forest from Oldfield Road to an industrial facility at the rail line.

Dense Blazing Star has not been addressed in this section as the MNRF report that this species is not native to Niagara.

4.7 Summary of Natural Heritages Features and Associated Functions

Based upon a review and interpretation of the 2015 and 2017 ecological data, the following natural heritage features and associated functions are present within and in some cases, immediately adjacent to the Study Area. Results are presented first for the Subject Lands (i.e., Riverfront Community) and then for the larger Study Area (i.e., GR CAN Investment Co. Ltd. ownership):

Subject Lands/Riverfront Community

- Significant wildlife habitat (candidate bat maternity habitat, non-woodland/open wetland amphibian breeding habitat, species of conservation concern and rare species);

Study Area/ GR (CAN) Investment Co. Ltd. Ownership

- Significant wetlands, associated with the characteristic slough ridge topography (within Areas 1 through 3 (**Figure 7**, **Appendix A**);
- Significant woodlands, which generally overlap with significant wetlands but also include contiguous areas of cultural woodlands defined by Dougan & Associates, where they occur on natural topography (i.e., intact slough ridge features and natural soils) and are not dominated by ash;
- Significant wildlife habitat (candidate bat maternity habitat, stratum II Deer Concentration areas, rare vegetation communities, woodland amphibian breeding, non-woodland (open wetland amphibian breeding habitat), species of conservation concern and rare species;
- Significant Valleyland;
- Fish habitat; and
- Habitat (potential) of naturally occurring endangered and threatened species (Barn Swallow, Acadian Flycatcher).

Table 2 (**Appendix B**) identifies these features and characteristics in terms of the Study Area and the Subject Lands. That same table provides the details of the impact assessment completed (discussed further in section 6). **Figure 10** (**Appendix A**) provides a compilation of natural heritage features and functions by area. The largest and oldest blocks of forest and wetland habitat occur in areas labeled 1, 2 and 5. These include the most intact areas with a high degree of functional importance and overlapping natural heritage designations (e.g., significant woodlands, significant wildlife habitat, significant wetlands). Areas 3, 7 and 8 include fish habitat, wetland amphibian breeding habitat and rare species.

Areas 4 and 6 are disturbed/artificial habitats that provide snake hibernacula locations.

5.0 PROPOSED DEVELOPMENT

GR (CAN) Investments Ltd. (GR CAN) began consultation with City staff and others in 2015 on the process of developing a private OPA for the lands referred to as Riverfront Community (Subject Lands). The Planning Justification Report (Niagara Planning Group 2017) provides more information related to this proposed Official Plan Amendment.

The technical information collected and analyzed for this report has helped to inform the development limits of the Riverfront Community – the limits avoid the most important natural heritage features and associated functions. This report also responds to the proposed Riverfront Community development through the completion of an assessment of potential impacts, mitigation and net effects. At about 49 ha the Riverfront Community is proposed to include a mix of residential, commercial, institutional uses and associated road and servicing infrastructure. The footprint of the Subject Lands has been defined to avoid the most important natural heritage features. Potential impacts associated with the Subject Lands are summarized in section 7.

A Functional Servicing Study (Amec Foster Wheeler 2015) and an Implementation report (Amec Foster Wheeler 2017) outline the proposed servicing of the Riverfront Community. Some general servicing commentary is provided from that reporting in the following, as a foundation to the completion of the impact assessment.

The proposed Riverfront Community development will access servicing to the north and to the east of the property (i.e., in association with existing development.). Existing contour mapping indicates that the proposed development is relatively flat, and that there is a separation in grade created by the Conrail Drain. The Conrail Drain receives and conveys runoff from 67.0 ha within the site, as well as runoff from some 298 ha of predominantly urbanized lands upstream of the site. That drain is capable of conveying all events up to and including the 100-year storm event.

The Amec Foster Wheeler Implementation Report (2017) identifies conceptual sanitary, water and stormwater plans for the Riverfront Community. Stormwater is proposed to be addressed through two wet ponds established within the limits of the Subject Lands south of the railway line; these are intended to provide a “Normal” standard of treatment. Oil and grit separators are proposed north of the railway line and east of the main watercourse. The Conrail Drain and the eastern watercourse are proposed, to be enhanced, to serve as conveyance systems. Hydraulic structures crossing the Conrail Drain and Eastern Watercourse are specified to meet current standards for freeboard and clearance. The development proposes to draw water from the Welland River and to discharge it to the headwater of the Conrail Drain to maintain a supply of water to that feature.

Sanitary servicing is proposed to be addressed through the implementation of a new 825 mm sewer on Dorchester Road, a sewage pumping station and forcemain and a collection system within the Riverfront Community. Water supply will be provided via new 300 mm connections to existing servicing on Dorchester Road and Don Murie Street. Mention is made of the potential incorporation of a future 1050 mm trunk watermain being linked with/facilitated by the proposed Riverfront Community development.

A detailed Functional Servicing Report (FSR) will be completed once the Riverfront Community plan has been approved and a detailed development plan is developed. The impact assessment analyses in this report are based upon the available servicing information.

6.0 IMPACT ASSESSMENT, AVOIDANCE AND MITIGATION MEASURES

This section of the EIS assesses the impacts, predicted effects, mitigation and enhancement measures associated with the proposed Riverfront Community and related engineering and servicing information. More detailed analyses are presented for the Subject Lands (i.e., area defined for the private OPA). Additional guidance related to the larger Study Area is also provided where it can inform potential development proposals outside of but linked to the Riverfront Community. This section contains input that can inform more detailed engineering and design work and subsequent impact assessment considerations, as needed.

The range of potential impacts from proposed development can generally be divided under two categories: direct impacts are normally associated with the physical removal or alteration of natural features that could occur based upon a land use application, and indirect impacts may be changes or impacts (these could be minor or major) to less visible functions or avenues that could cause negative impacts to natural heritage features over time.

Impact discussions are summarized in **Table 2** along with recommendations for proposed mitigation. Ecological enhancement and restoration opportunities are outlined in the discussion regarding the proposed Natural Heritage System (NHS) (section 6.8).

The development plan has been refined since the original 2016 submission in response to environmental inputs to minimize potential effects on significant natural heritage features. **Figure 11** (**Appendix A**) highlights general areas of predicted impact that merit additional discussion. Impact Area 1 has been the subject of discussion regarding potential future development areas (i.e., outside the Riverfront Community). Some of these areas include significant wetlands, significant wildlife habitat and significant woodlands. Development in these areas would require additional impact assessment work.

Impact Areas 3 and 4 **Figure 11** (**Appendix A**) are disturbed, artificial habitats (reptile hibernacula) that can be removed and replaced with the creation of artificial reptile habitat. Impact area 5 is a barrier to the connectivity for reptiles and amphibians moving from the Welland River, internally through the Subject Lands.

Opportunity areas are also depicted on **Figure 11** (**Appendix A**). Opportunity area 6 is well-suited for ecological restoration of the more natural tributary and fish habitat on the Subject Lands. Opportunity area 2 is an important area of wildlife movement that can be established and managed to optimize local wildlife movement. Opportunity area 3 is an opportunity to establish an innovative eco-centre focused on potential ecological lodging, research, passive recreation and education.

Opportunity areas are discussed further in section 6.7.

6.1 Significant Wetlands

The Provincially Significant Wetlands which include areas of relatively intact intermediate /mature/old slough forests will be conserved (note: these have been avoided – they occur in the larger Study Area, not in the Subject Lands). These forests also include significant wildlife habitat (e.g., woodland breeding amphibians, rare vegetation communities, species of conservation interest and candidate bat maternity roots). Some other wetlands defined by the

MNRF as Provincially Significant that are not slough forests (i.e., on disturbed landscapes) have also been conserved and avoided by the proposed Riverfront Community because they include relatively important ecological functions. Where these features do not provide important ecological functions, their removal is discussed and addressed through the application of a proposed removal and net gain approach.

The slough forest wetlands in the Study Area are generally characterized by relatively confined catchment areas and they are sustained through snowmelt, precipitation and through localized surface water flows. These features have been avoided by the Riverfront Community, although some occur nearby in the larger Study Area. While preventing direct construction impacts on these features is important, it's also important to maintain hydrologic conditions (both quantity and quality). These features are sensitive to potential changes in water quality associated with the deposition of sediment (e.g., impacts on amphibian egg viability) and changes in oxygen levels and conductivity (Baldwin et al 2006; Branch and Taylor 1977; Brooks 2005; Calhoun et al 2005; Homan et al 2005; McDonald et al. 2016; Osbourn et al. 2014).

The mitigation measures required to avoid/limit direct and indirect impacts on these features include:

- Completion of detailed water balance assessments to ensure the protection of the pre-development hydrologic conditions;
- Establishment of buffer zones from the protected limits of slough wetland features;
- Avoidance of the use of these natural slough features for stormwater discharge;
- Avoidance of discharge and/or runoff of lawn/landscape chemicals and/or salt road runoff into the vernal pools;
- Control and management of human and pet access to these large, intact woodlands;
- Control of litter production, storage and distribution within the Subject Lands to manage potential increases in predators (e.g., skunk, raccoon);
- Completion of an Eco-passage review and assessment for Dorchester Road/Chippawa Parkway to avoid/limit the degree of roadkill currently occurring – this review will consider how servicing installation, stormwater structures and easements and road upgrades can trigger the installation of specialized wildlife fencing and eco-passage structures; and
- Maintenance of local movement linkages across the Subject Lands and Study Area to allow the ongoing local movements of amphibians (i.e., including specialized design input to any natural channel design works proposed for the Conrail Drain).

There are opportunities to improve or cause positive effects on the vernal pools/slough forests. The following examples are noted, in addition to the detailed assessment of eco-passage opportunities associated with Dorchester Road/Chippawa Parkway:

- Installation of access controls in areas of human use immediately adjacent to the Significant Wetlands (e.g., along Oldfield Road adjacent to the Subject Lands);
- Installation of small wildlife (e.g., Spotted Salamander) linkage improvements across the rail line and Conrail Drainage Ditch (these represent degrees of movement barriers to some organisms);
- Assessment of alternate winter road maintenance best practices in areas adjacent to vernal pool/slough portions of the Significant Wetlands (note, while this is a

recommendation specific to the Subject Lands, the City and Region should address this best practice throughout their jurisdictions to improve the viability and sustainability of important amphibian populations);
- Assessment of the potential for the creation of small, natural, localized clean water reservoirs to help mitigate potential/predicted climate change induced drought conditions in vernal pools (to be designed to draw and treat only clean water, not hard surface runoff and to achieve water quality targets); and
- The planning, design and implementation of restoration to improve the features and functions associated with the eastern watercourse.

Other wetlands that have been identified for protection are not slough features, and have developed on the disturbed landscape will also require hydrologic assessments to ensure that pre and post development hydrologic conditions are generally maintained. Opportunities exist for the use of some of these features (or portions thereof) for stormwater management purposes, so long as ecological features and associated functions are conserved and/or enhanced. The detail design of Stormwater management (SWM) facilities will be subject to a refined impact assessment review process as deemed necessary by the City, MNRF and the NPCA.

6.2 Significant Woodlands

Significant woodland will not be impacted by the Riverfront Community. Approximately 15 ha of other, cultural woodland on disturbed topography/soils will be removed within the Subject Lands. While not deemed to meet Significant Woodland definition, these areas do provide area and functions that need to be considered in the impact assessment and mitigation development process (e.g., mitigation through forest enhancement and/or forest establishment).

6.3 Significant Valleylands

There is no development proposed between Dorchester Road/Chippawa Parkway and the Chippawa Power Canal/Welland River (lands not privately owned). The area of Significant Valleyland will be unaffected by the proposed Riverfront Community, although development and site alteration activities were observed on portions of these lands, during field investigations. We understand that a trail is currently being constructed within the Significant Valleyland, portions of which are defined as Significant Wetland. There are opportunities to improve ecological conditions outside of the Study Area, within the valleyland, subject to further review (e.g., removal of invasive species such as *Phragmites*). Lower reaches of the valley containing the easternmost tributary appear to include servicing activities related to the development of the Subject Lands. Once details are available, potential works in the valley should be considered for avoidance and/or mitigation.

6.4 Significant Wildlife Habitat

The following components of significant wildlife habitat occur within the Study Area:

- Turtle wintering areas;
- Provincially rare vegetation communities;
  - Pin Oak Mineral Deciduous Swamp (SWD1-3)
  - Buttonbush Mineral Thicket Swamp (SWT2-4

  - Gray Dogwood Mineral Thicket Swamp (SWT2-9)
- Old growth forest (>140 years) and older growth forest (>100 years; ROP);
- Amphibian breeding habitat (Woodland);
- Amphibian breeding habitat (Wetland);
- Woodland area-sensitive breeding bird habitat;
- Reptile hibernacula (two artificial features associated with dwellings and disturbed areas may be removed);
- Deer winter congregation areas;
- Habitat for species of conservation concern; and
- Animal movement corridors.

These features have largely been avoided by the definition of the development area (i.e., Subject Lands). The following confirmed and/or candidate significant wildlife habitat may be impacted.

Bat maternity roosts, if present in declining cultural woodlands, may be removed within the Subject Lands. While unlikely to occur given the general absence of suitable bat maternity roost trees (especially given the impacts associated with emerald ash borer), mitigation will need to be addressed if they are present.

Any SAR bats observations confirmed during acoustic surveys will need to be addressed through the permitting process under the Endangered Species Act, 2007. SAR bat species are responding well to artificial structure use in Ontario (specifically multi-unit structures versus typical small bat boxes).

The general open nature of the Subject Lands will be replaced with development. This will reduce the ability of some wildlife to move broadly across this portion of the Subject Lands. The broad movement that currently occurs includes significant road mortality for local amphibian and reptile populations. The ability to install suitable eco-passages and fencing (wildlife movement control fencing), will substantially reduce the amphibian and reptile road mortality observed. This will reduce pressure on local populations and will improve the security of connectivity and movement between the Welland River and the Subject Lands. Detailed planning and design efforts are required to ensure any roadworks (including those internal to the development), facilitate safe wildlife passage.

Other mitigation measures can be implemented to address potential impacts on specialized habitats and to supplement and enhance habitats more broadly within the Study Area, to reduce limiting factors for some species. Brief comments follow – these should be addressed more fully in detailed restoration planning.

Eastern Wood-Pewee is known to inhabit low canopy layers in forest clearings or forest edges in the Study Area. Understory management and the removal of invasive plants can increase foraging opportunities. Retention of dead branches on mature tree specimens within the forest community will provide hunting perches. The species tends to prefer intermediate to mature forests (>40 cm DBH) with relatively little understory. These measures should be addressed in management planning for retained natural areas.

One function that occurs within the Study Area, that would benefit from special attention is the enhancement of pollination opportunities. The different vegetation communities that will be affected include a measure of pollinator functions that should be restored and enhanced on the landscape. The Study Area and the local landscape more generally, would benefit from deliberate pollinator habitat creation. The specific areas to be enhanced and/or restored should be subject to detailed planning. Initial guidance is provided in the following summary text.

Pollinator habitat will target two habitat types, pollinator supporting forest and open meadow habitat. Younger, more disturbed areas of forest retained outside the Subject Lands can be under-planted with and managed to favour tree species that are known to flower, with species selected by their range in blooming times. Red Maple blooms in the early spring, Black Cherry blooms mid-spring and Basswood flowers from late May to July. These species can contribute significantly to the pollination function. Basswood is known for having one of the longest bloom times of all native species and is still in bloom when most other species are no longer in flower.

Open meadow habitat (e.g., along the rail and Conrail drain features can provide improved conditions for many pollinator species, but it can also be used to promote species identified as significant (e.g., transplanted/expanded populations of Dense Blazing Star, Butterfly Milkweed) and other species that will support Monarch Butterflies (classified as special concern in Ontario and endangered in Canada). The key herbaceous species for Monarch habitat is Common Milkweed, as they need the plant to complete their lifecycle however there are many other species that are particularly useful when creating pollinator habitat.

Open meadows can be enhanced with plantings of native flowering species such as:

- Common Milkweed (*Asclepias syriaca*);
- Wild Bergamot (*Monarda fistulosa*);
- Brown Eyed Susan (*Rudbeckia triloba*);
- Common Evening Primrose (*Oenothera biennis*);
- New England Aster (*Symphyotrichum novae-angliae*); and
- Early Goldenrod (*Solidago juncea*).

Increasing the availability of flowering plant species will increase the availability of aerial insects including flies, bugs, butterflies, moths, bees, wasps, beetles, grasshoppers, crickets, stoneflies, and mayflies. This will enhance habitat for bat foraging.

Bat boxes installed within the areas to be conserved and at selected locations on adjacent lands (e.g., Welland River shoreline) will enhance the bat habitat on the Subject lands. Multiple unit bat houses, commonly known as “bat condos” are proving to be particularly effective in improving bat population numbers. Exact bat box locations should be determined during detailed mitigation and restoration planning.

Rehabilitation efforts will also incorporate areas that will be suitable for turtle nesting (currently a limiting habitat factor on the Subject Lands). To encourage nesting, artificial turtle nesting beaches, composed of a gravel and sand mixture areas, should be constructed with southern faces.

6.5 Fish Habitat

The Welland River fish habitat is set back and divided from the proposed development by Dorchester Road/Chippawa Parkway. The eastern watercourse (outside the Subject Lands) will be restored and enhanced through a detailed planning and design process that engages both the MNRF and the NPCA. Opportunities exist to remove in stream concrete culverts and to improve habitat quality. This should be the subject of more detailed planning.

Stormwater Management Infrastructure Construction

Typically, the only component of stormwater management infrastructure that would be installed within fish habitat would be the outfall headwall and channel to convey flows to the receiving watercourse. Potential adverse effects on fish and fish habitat could include temporary disturbance and loss of habitat due to in-water work and permanent changes in habitat due to the presence of the structure.

In order to minimize the potential for adverse effects, infrastructure should be installed outside the warmwater timing restriction period (March 15 to July 15). Should work in water be required outside this time period, there could be some potential disturbance of local fish communities and temporary habitat loss, but effects would be anticipated to be minor and localized, with fish avoiding the work area and congregating in residual habitats. To mitigate against potential indirect effects erosion from the proposed work areas need to be controlled.

Erosion and Sedimentation Control

Erosion and sedimentation from the disturbed work area associated with the proposed development could potentially result in adverse effects to water quality (e.g., increased turbidity) or sedimentation and associated effects on fish (e.g., injury or mortality due to suspended sediments or altered habitat use) or fish habitat (e.g., loss of interstitial spaces in rocky areas, smothering of aquatic vegetation and/or incubating eggs). These activities can also affect the water quality in the slough wetlands in the Study Area.

It is recommended that the contractor prepare and implement an Erosion and Sedimentation Control (ESC) Plan to minimize the potential for erosion and sedimentation from the construction site. The ESC Plan should be developed based on the guidance provided in the Erosion and Sediment Control Guideline for Urban Construction (GGHCA 2006). Basic elements of the plan should include consideration of:

- Construction phasing to minimize the amount of time soils are barren and therefore, more susceptible to erosion;
- Requirements and timing for rehabilitation of disturbed areas;
- Stormwater management strategies during construction;
- Grading and removal of headwater drainage features during periods when the features are dry, to minimize potential for adverse effects on downstream water quality;
- Erosion prevention measures (e.g., hydroseeding, sodding, erosion control matting, tarping of stockpiles);
- Sedimentation control measures (e.g., silt fences); and

- Inspection and performance monitoring requirements and adaptive management considerations.

Implementation of an effective ESC Plan, incorporating both erosion and sediment controls, coupled with regular inspection and performance monitoring and implementation of any remedial actions necessary to ensure effective performance, is anticipated to be largely effective in preventing the movement of eroded soil particles off-site towards fish habitat in the eastern watercourse and/or the Welland River or towards wetlands within the slough forests.

However, it is anticipated that some erosion and off-site sedimentation will occur at some point during the construction process. Watercourse and wetland buffers will assist in mitigating potential effects on fish and fish habitat. The vegetated buffer will promote retention and infiltration of surface water and filtration (through settling) of suspended sediment eroded from the construction area.

It is recommended that the contractor consider management of stormwater throughout the construction period as part of the overall ESC Plan, Overall, no negative effects to fish and fish habitat or to slough wetlands are predicted to occur as a result of erosion and sedimentation during construction, provided an effective ESC Plan, including monitoring and adaptive management, is implemented.

Accidental Spills

Accidental spills of potentially hazardous materials (e.g., fuel and oil from heavy equipment), if transported to the eastern watercourse, could cause stress or injury to fish and other aquatic biota (e.g., benthic invertebrates).

In order to mitigate the potential for adverse effects on fish, fish habitat or wetlands due to potential accidental spills during construction, it is recommended that the contractor prepare a spill prevention and response plan to outline the material handling and storage protocols, mitigation measures (e.g., spill kits on-site), monitoring measures and spill response plans (i.e., emergency contact procedures, including MOECC Spills Action Centre, and response measures including containment and clean-up). Implementation of an effective spill prevention and response plan is anticipated to be largely effective in preventing adverse effects on wetlands, fish and fish habitat in the eastern watercourse and the Welland River.

Potential Post-Construction Effects

No direct effects on the aquatic or wetland environments are anticipated to occur during the post-construction period, since there will be no requirement for any activity within fish habitat (i.e., below the average annual high-water mark of any watercourses providing fish habitat). However, potential indirect effects on the aquatic environment may occur during the post-construction period including:

- Changes in flow and water quality due to stormwater management; and
- Effects on water quality associated with runoff from urban areas.

These potential effects and recommended mitigation measures are discussed briefly in the following.

The aquatic environment may be affected by post development changes in flows and water quality within the eastern watercourse (i.e., associated with standard stormwater management practices). Given that the catchment area of the Welland River that will be affected by the proposed development is very small, and that flows in the river are large compared to the other smaller watercourses, no adverse effects of stormwater management are anticipated to occur in the Welland River.

The eastern watercourse could be negatively affected given:

- Increased peak flows resulting in higher rates of bed and bank erosion (with associated effects on fish and fish habitat) and high flow velocities with potential effects on fish movements;
- Higher rates of surface water runoff to watercourses resulting in more rapid increases and decreases in flow and water level downstream (i.e., increased “flashiness”); and
- Altered flows and aquatic habitat availability where stormwater discharges are located at different locations in the catchment than current discharge vectors.

The Stormwater Management Plan (Amec Foster Wheeler 2015) provides some conceptual stormwater management information, based on several objectives, including flood control, erosion prevention and quality control.

Some surface water on the Subject Lands may flow directly overland as runoff from residential areas into the adjacent watercourses. This runoff or shallow subsurface infiltration water could potentially be impaired due to residential use of potential contaminants (e.g., lawn fertilizers) or other residential land use activities (including accidental spills in rear yards). Best management practices will need to be developed and implemented in the vicinity of significant wetlands and other wetlands to mitigate this risk.

Proposed ecological restoration of the eastern watercourse, including the implementation of buffers, will assist in mitigating potential effects on surface water quality and corresponding effects on fish habitat. It is recommended that riparian planting plans be developed as part of the overall Natural Heritage System design for the development in order to enhance those riparian areas that may currently be lacking in natural vegetation.

6.6 Other Predicted Indirect Impacts

The Riverfront Community is proposed principally for disturbed portions of the Study Area. This approach to the definition of the development boundaries will limit the potential for direct and/or indirect effects. Potential impacts not already addressed may include:

- Noise, vibration and lighting and potential effects on wildlife behaviour and/or reproductive success (i.e., during construction and post development);
- Localized micro-drainage changes that could cause localized ponding and inundation of rooting systems;

- Introduction of non-native plant species in the disturbed margins of the developed footprint, displacing some native flora;
- Stress/dieback of retained vegetation along developed edges (root/stem/crown impacts, sediment); and
- Impacts on wildlife and plant populations associated with anticipated increased human and pet impacts on retained natural areas (i.e., due to off-leash pet cats and dogs).

The potential impacts of development on the natural features and associated functions adjacent to the Subject Lands will be limited, given the nature of that interface. The majority of the outer edges of the Subject Lands occur within a semi-open cultural woodland or cultural thicket, communities that are dominated by Green Ash and Eastern Cottonwood. Climbing poison ivy, European Buckthorn, Hawthorn and American Elm. The semi-open and disturbed nature of these communities will largely prevent indirect effects that can be associated with intruding into forest community edges (e.g., windthrow, sunscald). Mitigation measures such as pre-stressing (opening a closed canopy over a period of time to pre-condition forest trees to more open conditions) will be unnecessary. The natural disturbed, semi-open nature of the cultural woodland and thicket already mimic a pre-stressed outcome. The areas of cultural woodland and cultural thicket will not benefit from a linear buffer at development edges.

Where development edges interface with forest and wetland communities, protective buffers will mitigate potential effects (section 6.7).

The following general mitigation measures are recommended to limit indirect effects; these should be subject to more detailed planning and design:

- Locate and flag development limits prior to construction;
- Erect pre-construction erosion and sedimentation control fencing along confirmed protection edges and at the outer limit of the dripline of specific trees defined for protection;
- Conduct pre-construction briefings with site workers to advise regarding the sensitivity of the development edge conditions (i.e., pre-construction searches and mapping of locally rare/uncommon flora, etc.); and
- Match the existing grade of retained areas, adjacent to the Subject Lands (i.e., feathered grades from development edges).

Light can be a concern where it is directed towards a variety of natural features and functions. Primary sources for “new light” will be from road lighting. In particular, the use of larger light standards can be problematic by allowing light penetration into forested blocks, which could inhibit or affect wildlife use. The strategic placement of rear lots or public parks close to natural areas can also introduce unwanted lighting.

To minimize light being directed into the adjacent ecological features, outdoor common area lighting should be located and directed away from the retained wooded areas. Public pathways should be discouraged in proximity to retained natural areas. Finally, to minimize impacts on birds, direct upward light should be eliminated, spill light should be minimized and all lighting sources should illuminate only non-reflective surfaces (as per guidelines developed in other jurisdictions; e.g., City of Toronto Green Development Standard, 2007).

6.7 Buffer Definition and Implementation

Buffers are one of a host of mitigation measures available to reduce potential impacts on natural features and associated functions, during the development process. Table C-1 in the Natural Heritage Reference Manual (MNR 2010) identifies a range of mitigation available to address potential impacts associated with: vegetation removal, grading, utility installation and construction.

The scientific community generally suggests that a variety of site-specific conditions must be considered to delineate effective buffer widths including, but not limited to, the size of the natural feature, the adjacent land use, the desired buffer function, feature sensitivity and the local biophysical conditions (e.g., slope, vegetation, soil texture, infiltration, drainage, groundwater conditions and flow) (CVC 2012; MNRF 2005).

The concept of buffers appears in the literature as early as the 1940s (Girard 1941) and 1950s (Smith 1953, Glover 1956) in relation to the protection of waterfowl and their habitat, prompted by the economic value of waterfowl as a resource in North America. In addition to habitat protection, watercourses in general were also the subject of earlier literature on buffers. Trimble and Sartz (1957) presented an approach to buffer delineation for stream protection adjacent to logging operations. Impacts to watercourses related to agricultural runoff have been the subject of intensive study starting in the 1960s mainly devoted to the determination of optimal buffer areas for water quality enhancement (Hilditch 1992). Notably, none of this early documentation on buffers was done in the context of municipal land use planning.

Specific buffer width determination for municipal land use planning started occurring on a sporadic and inconsistent basis in some Ontario municipalities in the 1990s. The 2014 Provincial Policy Statement (PPS) (MMAH) establishes the concept of buffers as a mitigation measure to conserve significant natural heritage features and associated functions. The Natural Heritage Reference Manual (NHRM) (MNR 2010) provides some supplementary commentary regarding buffers, although that guidance remains more conceptual in nature.

Urbanization can increase access to the protected natural areas, which can result in a variety of impacts. Many of these impacts are expected in an urban context and need to be managed appropriately to ensure the conservation of important natural areas over time. In many cases, buffers can contribute to effective mitigation of effects although there does not appear to be a strong correlation between buffer width and mitigation effectiveness. The capacity of ecological buffers to effectively mitigate impacts caused by adjacent land uses is influenced by a variety of factors that cannot be exclusively accounted for by buffers (MNRF 2005).

As noted in section 6.6, buffers are not recommended for affected areas of cultural woodland and cultural thicket. The following buffer guidance is provided for woodland and wetland areas; Figure 11 identifies locations of these buffer treatments.

Pin Oak Mineral Deciduous Swamp Edges:

This rare vegetation community is located in proximity to the northwestern edges of Riverfront Community. A 30 m buffer is recommended in this area to physically buffer the wetland sloughs

against impact (Impact Area 7 on **Figure 11**, **Appendix A**). In addition to the buffer, the following specific measures are required:

- Completion of detailed water balance assessments to ensure the protection of the hydrologic conditions in this Pin Oak Mineral Deciduous Swamp;
- Prevention of road runoff into the catchment of the Pin Oak Mineral Deciduous Swamp;
- Avoidance of stormwater discharge into this feature;
- Avoidance of discharge and/or runoff of lawn/landscape chemicals and/or salt road runoff into this feature; and
- Installation of access controls/fencing to prevent human use in and adjacent to the wetlands.

Fresh Moist Poplar Deciduous Forest Edges:

This vegetation community, located in proximity to the northeastern edges of Riverfront Community is characterized by a young Eastern Cottonwood forest with American Elm, and an understory of Common Buckthorn, Gray Dogwood, and Highbush Cranberry. Eastern Cottonwood is a relatively short-lived species that can tolerate disturbed soils, but performs better on well-drained sandy soils. The species is shade-intolerant and can lead to hazard tree conditions over time, as the trees age. A limited buffer (i.e., average 10 m) will maintain the character of thus forest (Impact Area 8 on **Figure 11**, **Appendix A**). That buffer may be refined in response to site specific tree retention planning along this edge. In addition to the buffer, the following specific measure is recommended:

- Development and implementation of a forest edge enhancement plan in the buffer to control invasives (e.g., European Buckthorn) and to underplant with more desirable tree species that demonstrate tolerance to prevalent insect/disease damage (i.e., non-ash plantings).

Willow Deciduous Mineral Swamp Edges:

This wetland community, located in proximity to the southeastern edges of Riverfront Community is dominated by White Willow and Eastern Cottonwood with occurrences of Black Walnut and American Elm.

An average 15 m buffer will maintain the character of this wetland community (Impact Areas 9 on **Figure 11**, **Appendix A**). The buffer may be refined in response to site specific tree retention planning along this edge. In addition to the buffer, the following specific measure is recommended:

- Completion of detailed water balance assessments to ensure the protection of the hydrologic conditions in this Willow Swamp;
- Avoidance of discharge and/or runoff of lawn/landscape chemicals and/or salt road runoff into this feature;
- Installation of access controls/fencing to prevent human use in and adjacent to the wetlands; and

- Development and implementation of a forest edge enhancement plan in the buffer to control invasives, including White Willow and to underplant with more desirable, native tree species that demonstrate tolerance to prevalent insect/disease damage (e.g., Black Willow).

6.8 Natural Heritage Enhancement Opportunities

The ability to control and manage human access in the post development landscape will reduce ongoing effects associated with off road vehicle access and hunting. There are important opportunities for managed access that will afford increased passive recreation, education and interpretation activities. **Figure 11** (**Appendix A**) illustrates key enhancement opportunities in the Study Area that can be considered and deigned in response to the proposed development.

Area 6 **Figure 11** (**Appendix A**) represents an opportunity to significantly improve the fish habitat and other aspects of the minor easternmost watercourse. This area includes the naturalized occurrences of Honey Locust. Additional ecological restoration planning is required to advance this concept.

Area 2 **Figure 11** (**Appendix A**) is an area that should be conserved as a connecting link to enhance amphibian and reptile movement. The form and character of this linkage should be designed in response to any potential future development outside of the Subject Lands. Taken together with eco-passages and drift net fencing linkage management will also reduce road mortality. This area needs to be considered in the broader context of roadworks both internal and external to the proposed development.

Area 3 **Figure 11** (**Appendix A**) generally identifies where an opportunity exists to establish an innovative, low impact facility that could include become a hub for wetland education and research. This also offers an opportunity for collective dialogue amongst key stakeholders to define opportunities for and interest in:

- Net Zero Impact lodging;
- Eco-tourism;
- Carolinian Wetland Slough research;
- Community-based wetland education/museum;
- Indigenous perspectives on slough forests;
- Trail head design and trail links with other areas; and
- Rare plant research nursery which could also contribute to naturalized landscaping elsewhere in the Subject Lands.

This opportunity complements the innovative nature of other aspects of the proposed Riverfront Community. This opportunity is well-suited to dialogue and potential collaboration/partnerships with: academic and research institutions, First Nations, the MNRF and NPCA.

6.9 Proposed Natural Heritage System and Natural Area/Function Enhancement

The PPS (MMAH 2014) requires that municipalities identify a Natural Heritage System (NHS).

A Natural Heritage System is an …"*ecologically based delineation of nature and natural function – a system of connected or to be connected green and natural areas that provide ecological functions over a longer period of time and enable movement of species*" (MNR 2010). NHS Planning typically includes the definition of Core Areas, Buffers and Linkages. There have been many approaches developed and implemented by municipalities to accomplish the definition and delineation of an NHS.

Natural Features and Areas are important "…*for their environmental and social values as a legacy of the natural landscapes of an area*." The relatively intact portions of the Haldimand Clay Plain on the Subject Lands where the slough ridge landscape has been maintained, are the key elements that will form the NHS.

The Region of Niagara has identified a Core Natural Heritage System comprised of: Environmental Protection Areas, Environmental Conservation Areas, Potential Natural Heritage Corridors and other designated features. The City of Niagara Falls has inventoried Natural Heritage Features including: Significant Woodlands, Locally Significant Woodlands, Locally Significant Wetlands, Significant Wildlife Habitat, etc., and has developed mapping of Natural Heritage Features and Adjacent Lands (i.e., Appendix III-B; City of Niagara Falls 2015). The Niagara River Corridor Conservation Plan identifies a number of goals and specific actions intended to conserve and enhance the natural heritage resources of the area defined as the Niagara River Corridor area.

The NHS defined during this and subsequent development impact assessment processes affords an opportunity to refine the systems defined at the Regional and City levels. A series of principles were identified to help guide the NHS definition, internal and external to the Subject Lands:

Long Term Core Area Protection – Protection of the important existing natural heritage areas and associated functions for the long term, in-situ;

Linkages and Connections – Enhancement of existing linkages where appropriate and consideration of integration of linkages in the context of existing and future infrastructure;

Restoration and Flexibility – Restoration of relatively intact natural features insitu and replacement/creation and enhancement of less intact or less important features, where these actions can contribute to an overall gain in environment (i.e., a focus on increased ecosystem services where outcomes can be optimized);

Viability and Sustainability – Protection of natural features and their associated functions that are reasonably sustainable in an urbanized setting (i.e., not those that will be unsustainable, such as isolated, small natural features that will be heavily affected by surrounding development);

Compatibility and Integration with Urban Uses – Provision of opportunities for and access to use the NHS for passive and complementary recreational uses and for nature appreciation and establishment;

Supportive and Compatible Green Infrastructure – Creation of an NHS that allows for the installation of some compatible elements of infrastructure within and integrated with some components of an NHS;

Eco-Health – The establishment of an NHS that considers and allows for the management of risks associated with settlement areas and natural areas (e.g., insect and mammal disease vector control), while optimizing the ability to increase the health and well-being of community residents (i.e., through the important psychological/emotional benefits of human-nature interactions);

Resilience – Promotion of natural systems that are resilience to the effects of urbanization (e.g., by creating an NHS relying upon tolerant and sustainable native species and novel vegetation communities);

Biodiversity – Promotion of biodiversity conservation and enhancement; and Healthy, Liveable and Safe Communities – Establishment an NHS that will contribute to the City's achievement of other important PPS policies.

Figure 12 (**Appendix A**) provides a general outline of the NHS for the Riverfront Community. This NHS is designed to provide a diverse and representative system of natural and restored areas that together will provide a viable, functioning and sustainable natural system in an urbanizing area. Four Special Study Areas are noted on that Figure; these are areas where opportunities may exist to improve wildlife linkages (e.g., through innovative eco-passage methods).

There are suitable locations where more, broad ecological restoration activities could lead to enhanced local and regional increases in biodiversity and the development of a more connected natural system. These locations could contribute to any off-site mitigation and/or enhancement that may need to be addressed through multi-agency/municipal discussions. The opportunities are addressed in local subwatershed studies, and in the Niagara River Corridor Conservation Action Plan (CAP). The predicted net effects associated with the proposed Riverfront Community development can be mitigated in part through the implementation of key opportunities, that:

- Increase forest features and functions;
- Restore areas of degraded slough wetlands;
- Improve the cover and quality of riparian habitat; and
- Enhance the degree of landscape connectivity.

Those opportunities that fall within subwatersheds and catchments in the City of Niagara Falls (per the following List) should be used to inform dialogue amongst the applicant and other parties to ensure the actions selected are optimized in terms of positive outcomes for the natural heritage system in the City of Niagara Falls.

Portions of the following subwatersheds and drainage basins where off-site opportunities may occur for restoration and enhancement fall within:

- Hunter's Drain (South Niagara Falls Watershed);

- Lyon's Creek (South Niagara Falls Watershed);
- Ussher's Creek (South Niagara Falls Watershed);
- Baker Creek;
- Miller Creek;
- Tea Creek; and
- Miller Creek.

6.10 Summary of Net Effects and Monitoring

The natural features and functions within the Study Area have been assessed against the NHS principles and against significance standards. The majority of natural heritage features and functions will be retained within the Study Area in a post development landscape. The proposed NHS (**Figure 12**, **Appendix A**) includes about 141 ha or 62 % of the Study Area. The conserved areas encompass large blocks of forest and wetlands. These areas are the relatively intact and old forests and slough wetlands that are characteristic of the Haldimand Clay Plain.

Proposed development will remove predominantly disturbed areas (i.e., cultural woodland - about 25.10 ha; cultural thicket - about 13.37 ha; cultural meadow - about 4.13 ha). These are communities that occur on the historic and more recently disturbed lands. The proposed Riverfront Community includes portions of lands that have been defined as other wetland in this report (in some cases overlapping with candidate significant wildlife habitat; 4.44 ha). These other wetlands are deemed not to reasonably meet definitions of natural features or Significant Wetlands.

Ecological monitoring will be required beyond the inspection activities typically associated with construction. A monitoring program should be discussed and developed amongst the City and other agencies to ensure that:

- Protective, mitigation strategies and actions are effectively implemented;
- Ecological Restoration measures are effectively implemented; and
- Restored features and associated functions are developing along projected trajectories.

Ongoing baseline monitoring being completed on the Study Area will continue to inform an understanding of the wetlands and other natural features and associated functions. Long term monitoring opportunities can be afforded through research linked to this development, especially as it relates to better characterizing and understanding slough forest ecology.

In addition to monitoring, adaptive management planning should be considered and incorporated into mitigation plans. The ability to establish the Riverfront Community ahead of potential development in other portions of the Study Area allows for the adoption of knowledge gained through development and implementation to be incorporated into subsequent mitigation and monitoring designs.

Table 2: Predicted Effects, Mitigation, Enhancement and Net Effects

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY – SUBJECT LANDS	SUBJECT LANDS - IMPACTORS	SUBJECT LANDS - PREDICTED EFFECTS	SUBJECT LANDS - AVOIDANCE, MITIGATION AND/OR RESTORATION	SUBJECT LANDS - NET EFFECTS	SUBJECT LANDS - MONITORING AND MANAGEMENT
PPS NATURAL HERITAGE FEATURES						
1. Significant Wetlands	**Context - Entire Study Area:** • Includes about 104 ha of deciduous swamp within the Niagara Falls Slough Forest Wetland Complex Provincially Significant Wetland • Oak Mineral Deciduous Swamp (76.3 ha); • Pin Oak Mineral Deciduous Swamp (1.3 ha); • Green Ash Mineral Deciduous Swamp (22.7 ha); and • Willow Mineral Deciduous Swamp (4.9 ha). **Subject Lands (Riverfront Community):** Includes _ ha of wetland areas and/or areas with wetland characteristics; Savanta recommends refinements to the PSW designated areas (see Appendix E)	• No significant wetland removal, per Savanta recommendations • Adjacent wetland effects may be caused by increased impervious cover related to the installation of buildings, roads and parking areas proposed adjacent to wetland unit • Altered surface water catchments associated with nearby wetland units	• Potential reduction in surface water flows to the wetland features with subsequent drying and vegetation changes • Potential reduction in habitat for species dependent upon current moisture regime	• A pre and post wetland water balance will be developed to maintain pre development conditions (seasonal and annual considerations to avoid any effects associated with periodicity changes) • Installation of 30 m buffers adjacent to any significant wetland characterized as intermediate to mature (i.e., in Areas 1 through 3 on Figure 8, Appendix A) • Installation of 10 m to 15 m buffers adjacent to any wetland characterized as early successional/disturbed (i.e., in Area 4 on Figure 10, Appendix A) • Development of wetland edge management plans and associated access control planning	• The PSW wetlands will be conserved, assuming the successful matching of pre- and post-development water balances • Wetland features and functions will be better protected with a buffer and with associated random-access control and associated disturbances	Opportunities exist for the implementation of long term research focused on better understanding slough forests on the Haldimand Clay Plain
2. Significant Coastal Wetlands	• Not present/not applicable	N/A	N/A	N/A	N/A	N/A
3. Significant Woodlands	**Context - Entire Study Area:** • The majority of treed areas within the Subject Lands meet the definition of significant woodlands (i.e., in Areas 1 through 3 on Figure 8, Appendix A) • Significant Woodlands are those ELC types defined by Dougan & Associates as FOC, FOD, FOM, SWC, SWD, SWM • Some contiguous areas of Cultural Woodland (CUW) may also meet the definition of Significant Woodlands where insect disease damage has not impacted forest canopy cover **Subject Lands (Riverfront Community):** • Cultural Woodlands in Area 4 (Figure 7, Appendix A) will not succeed to represent natural forest conditions (i.e., altered topography and soils); these are not deemed to be significant woodlands, but	• Proposed Riverfront Community will encroach into non-significant cultural woodlands (25.10 ha) and non-wooded areas (i.e., Cultural Thicket, 13.37 ha; Cultural Meadow, 4.13 ha; Cultural Plantation, 0.33 ha) • Other potential development outside of and adjacent to the Riverfront Community include areas of impact on Significant Woodland (subject to additional study)	• Removal of some habitat for common and generalist species of plants and wildlife • Removal of concentrations of invasive species in cultural woodlands (i.e., European buckthorn)	• Consider the mitigation of cultural woodland functions removed through the development of an NHS • Where cultural woodland is retained within and/or immediately adjacent to the Subject Lands, develop and implement an invasive control program to improve ecological conditions	• No net loss of ecological functions • Potential improvements to the remaining ecological functions within retained cultural woodlands	• Monitoring to ensure the restored woodland functions as per the Ecological Restoration and/or Management Plan

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY – SUBJECT LANDS	SUBJECT LANDS - IMPACTORS	SUBJECT LANDS - PREDICTED EFFECTS	SUBJECT LANDS - AVOIDANCE, MITIGATION AND/OR RESTORATION	SUBJECT LANDS - NET EFFECTS	SUBJECT LANDS - MONITORING AND MANAGEMENT
	they include functions that need to be considered in the impact assessment and Natural Heritage System definition					
4. Significant Valleylands	**Context - Entire Study Area:** • The Welland River valley feature and the associated river/riparian areas (inland to the Chippawa Parkway) merit consideration as Significant Valleyland	• **Note: Adjacent to Riverfront Community Lands:** Amec Foster Wheeler identifies a Wet Pond SWM facility in proximity to the easternmost watercourse • **Note: Adjacent to Riverfront Community Lands:** Amec Foster Wheeler identifies a watermain connection and/or "external works for the Subject Lands "which may affect the easternmost watercourse/significant valleyland	• **Note: Adjacent to Riverfront Community Lands:** Potential for intrusions into the valleyland for servicing connections • Note; some of these valleylands are not owned by GR (Canada)	• **Note: Adjacent to Riverfront Community Lands:** There are opportunities to improve ecological conditions within the candidate Significant Valleyland areas (e.g., invasive management, shallow shoreline marsh optimization for spawning and/or turtles, subject to OPG managed water levels) • Denoted on Figure 11 (Appendix A) as opportunity area 6 • These opportunities should be considered in the context of any proposed works	• To be determined; subject to more detailed assessment when detailed designs are developed	
5. Significant Wildlife Habitat	**Context - Entire Study Area:** • Predicted use of the forested ELC types for bat maternity colonies (FOD, FOM, SWD, SWM) • Possible, more limited use of Cultural Woodlands for bat maternity colonies (CUW) • Stratum II Deer Concentration areas through most of the natural woodlands on the Subject Lands • Rare vegetation communities – SWT2-4 (buttonbush mineral thicket swamp), SWD1-3 (pin oak deciduous swamp) • Woodland amphibian breeding habitat is present in many vernal pools throughout more intact forested areas with natural slough ridge topography • Eastern Wood Pewee breeding habitat within various woodlots within the Subject Lands • Wood Thrush breeding habitat identified within various woodlots within the Subject Lands • Rare Odonates – S1 to S3 species – Swamp Darner • Two provincially rare plant species were identified within the study area during field	• Two small disturbed/created pools associated with the Conrail drain provide amphibian breeding habitat: both would benefit from more precise field delineation – one is an old homestead with questionable functional importance • Isolated impacts on potential bat maternity colonies in the cultural woodland – impacts have been limited by the avoidance of significant woodland communities along with widespread emerald ash borer damage • Potential change in wildlife movement patterns and behavior associated with development	• Two disturbed/created pools associated with the Conrail drain provide amphibian breeding habitat will be removed • Potential reduction of bat maternity colonies in the cultural woodland (to be confirmed through additional study related to any SAR Permitting process required)	• Creation of breeding amphibian habitat in association with restoration planning for the easternmost valley and for SWM facility design and implementation • Installation of artificial habitat structures suitable for bat maternity colonies (multiple versus smaller-scale units) • Maintenance and enhancement of natural linkages to connect habitat on the Subject Lands with adjacent lands • Example denoted on Figure 11 (Appendix A) as opportunity area 2 • Assessment and determination of eco-passages to facilitate wildlife movement, with resultant decreases in road mortality	• No net negative effect on Significant Wildlife Habitat is predicted within the Subject Lands • Expected improved road mortality and reptile/amphibian movement • Increased turtle and snake population sizes and health associated with increase in habitats currently deemed to be limiting (e.g., turtle nesting and snake hibernation habitat) • Positive effects are expected through the creation of a more contiguous and diverse NHS	• Monitoring of restoration areas and artificial structures to ensure success over time

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY – SUBJECT LANDS	SUBJECT LANDS - IMPACTORS	SUBJECT LANDS - PREDICTED EFFECTS	SUBJECT LANDS - AVOIDANCE, MITIGATION AND/OR RESTORATION	SUBJECT LANDS - NET EFFECTS	SUBJECT LANDS - MONITORING AND MANAGEMENT
	site surveys in 2015; Schreber's Aster (*Eurybia schreberi*) and Honey Locust (*Gleditsia triacanthos*). These species both occur within the Provincially Significant Wetlands (PSW); Schreber's Aster within the mature central deciduous swamp and Honey Locust along the floodplain of the eastern, more natural watercourse 2. **Subject Lands (Riverfront Community):** • Non-woodland (open wetland) amphibian breeding habitat is present at four dug ponds and one natural pond • Possible, more limited use of Cultural Woodlands for bat maternity colonies (CUW)					
6. Fish Habitat	**Context - Entire Study Area:** • Welland River shoreline and three watercourses that provide access for fish from the Welland River and the Chippawa Power Canal into the interior of the Subject Lands • The easternmost watercourse is the most natural and the only fish habitat on the Subject Lands with origins on the adjacent Thundering Waters Golf Club. Low numbers of six species of fish were recorded in this watercourse including young of the year White Sucker. • Two other watercourses that do not include fish habitat are the highly altered, the largest being the Conrail Drain. That feature is a deep, straight, artificial channel, lined with rip-rap along its entire length. It provides no spawning habitat for off-site fishes, nor can it be accessed by large off-site fish **Subject Lands (Riverfront Community):** • The Conrail Drain occurs between and partially within the Subject Lands • The smallest, ditched watercourse on the western margins of the Subject Lands occurs within the Subject Lands (i.e., short at 212m, and it originates at an old concrete culvert outfall, which is believed to convey flows from a network of legacy pipes that	• Earthworks (e.g., grading, filling) and vegetation removal on the Subject Lands during construction • Potential for altered runoff locations during post-construction due to stormwater • During construction, spills could occur from equipment and vehicles that could enter into the tributary, impairing water quality and aquatic and riparian vegetation	• No direct effects on fish habitat in any watercourse • Indirect effects on fish habitat could occur due to potential for erosion and sedimentation from the disturbed work area during construction • Increased stormwater flows could result in erosion of the bed and banks of the watercourses within the Subject Lands. Increased erosion from the Subject Lands or within the creek itself could result in negative effects on fish habitat and fish mortality, health effects or altered behaviour of aquatic biota (benthic invertebrates and fish) • During construction, water quality and vegetation could be negatively affected due to spills • Potential for decreased surface water quantity to the tributaries due to diversion of surface runoff due to proposed SWM activities	• Eastern watercourse (only fish habitat on the Subject Lands) will be retained and protected with a 15 m buffer adjacent to the proposed High Tech Office Park • Buffer will mitigate potential effects to fish habitat and water quality • Implementation of erosion and sediment control measures during construction will provide protection to fish habitat • Erosion and sedimentation control measures will be installed prior to construction, or prior to the element of work, which may cause the effect • During construction, the contractor will have spill kits on site, manage spills accordingly, and report spills to the appropriate MOECC Spills Action Centre, if applicable • SWM will be designed to ensure that there will be no changes in base flow and surface water flow to watercourses resulting from an increase in impervious area within the Subject Lands and from the installation of the SWM ponds • Siltation and erosion control procedures should be utilized to reduce the entrance of sediments or other contaminants into the	• No net negative effects on fish habitat • Enhancements to fish habitat may result from improved riparian habitat in the easternmost watercourse and in the Conrail Drain	• Construction monitoring to ensure effectiveness and maintenance of the sediment and erosion control measures throughout construction • Monitoring of any proposed SWM discharge flows into retained watercourses • Monitoring of restoration areas to ensure successful establishment of restored stream systems

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY – SUBJECT LANDS	SUBJECT LANDS - IMPACTORS	SUBJECT LANDS - PREDICTED EFFECTS	SUBJECT LANDS - AVOIDANCE, MITIGATION AND/OR RESTORATION	SUBJECT LANDS - NET EFFECTS	SUBJECT LANDS - MONITORING AND MANAGEMENT
	drain surface water, via inlets and broken sections)			watercourses from SWM Ponds • SWM ponds should be designed to fit into the existing landform as much as possible to minimize grading works • The site plan will to minimize changes in the post-development storm release rates to the watercourses within the Subject Lands • The Conrail Drain is proposed to be subject to natural channel design; details of this work should be reviewed in detail to consider opportunities to improve fish habitat (and other wildlife habitat)		
7. Habitat of Endangered and Threatened Species	**Context - Entire Study Area:** - Barn Swallow - Acadian Flycatcher (unconfirmed) - Dense Blazing Star (confirmed but not native to Niagara)	• Vegetation removal	• Potential removal of foraging habitat	• Completion of an IGF with MNRF to address potential impacts Potential foraging habitat creation within the proposed NHS • Potential to improve habitat for this species (including nesting) with the installation of artificial habitat structures in the proposed NHS (e.g., adjacent to the Welland River) • Develop mitigation measures for the Dense Blazing Star, focused on transplantation/division and propagation to increase the population and to distribute sub-populations through the Study Area (in suitable micro-habitat locations)	• Potential positive effects on Barn Swallow given the addition of replacement foraging habitat and Barn Swallow nesting habitat • Potential increased population size of Dense Blazing Star	• Monitoring of any installed Barn Swallow replacement structures • Ongoing monitoring for Acadian Flycatcher presence • Monitoring the success of the Dense Blazing Star mitigation plan
8. Significant Areas of Natural and Scientific Interest	• Not Present	N/A	N/A	N/A	N/A	N/A
OTHER PROVINCIAL PLANS						
1. Greenbelt Plan	• Not Present/not applicable	N/A	N/A	N/A	N/A	N/A
2. Oak Ridges Moraine	• Not Present/not applicable	N/A	N/A	N/A	N/A	N/A
OTHER FEATURES AND FUNCTIONS						
1. Other Non-PSW Wetlands	**Context - Entire Study Area:**	• Proposed Riverfront Community will remove wetland areas	• Removal of 4.22 ha of deciduous	• Removals will be off-set through the creation of wetland habitat within the	• Requirement for a no net loss of wetland area and degree of	• Monitoring of restoration areas to

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY – SUBJECT LANDS	SUBJECT LANDS - IMPACTORS	SUBJECT LANDS - PREDICTED EFFECTS	SUBJECT LANDS - AVOIDANCE, MITIGATION AND/OR RESTORATION	SUBJECT LANDS - NET EFFECTS	SUBJECT LANDS - MONITORING AND MANAGEMENT
	• MNRF has defined Significant Wetlands as part of the Niagara Falls Slough Forest Wetland Complex • Some wetland areas in the Study Area are recommended to be defined as Other Wetlands (i.e., non-PSW; see **Figure 8**, **Appendix A**) **Subject Lands (Riverfront Community):** Includes 4.45 ha of wetland areas and/or areas with wetland characteristics, created where: • Localized ponding occurs in areas of past disturbance (e.g., depressions created through equipment use, fill placement); • Localized inundated areas area associated with the Conrail Drain construction; and • Localized ponding was likely established historically by the construction of Chippawa Parkway (i.e., impounded areas of water due to inadequate/undersized drainage/outlets). • Small wetland features recommended for removal from the MNRF PSW mapping will be removed	recommended to be deemed non-PSW	swamp • Removal of 0.19 ha of thicket swamp • Removal of 0.04 ha of meadow marsh • These figures are based upon Dougan & Associates ELC community definition and should be considered to be approximate	proposed NHS (within the Study Area and/or outside the Study Area) • Details of off-setting to be discussed and developed amongst the applicant, MNRF, City and NPCA	ecological functions • Potential for increase in area and function	ensure the successful establishment of restored stream systems
2. Regionally and Locally Important Species	• The following locally and regionally rare species were observed and are mostly associated with the more mature and intact wetland communities: - Butterfly Milkweed - Pin Cherry - Limestone Bittercress - Leathery Knotweed - Asa Gray Sedge - Pale Sedge - Schreber's Aster - Blunt-leaved Bedstraw - Mountain Holly - Honey-locust - Smooth Gooseberry - Drooping Woodreed - Necklace Sedge - Swamp Red Currant - Carolina Spring Beauty - Creeping Spike-rush - Red-tinge Bulrush - Finely-nerved Sedge	• Vegetation removal and grading associated with the proposed Riverfront Community	• Removal of some general and specialized habitat areas • Potential removal of species that may occur in more open areas of Phase 1 (e.g., Canada Pussytoes, Pin Cherry)	• The NHS affords opportunities to transplant/propagate and monitor individual stems encountered through pre-construction surveys • The NHS should be subject to a planning and management initiative that will detail how these species will be conserved within the Study Area • An opportunity to establish a native species restoration and research nursery as part of this development could contribute significantly to the conservation and restoration of species • Specialized habitat creation and maintenance should be installed to favour less common wildlife (e.g., American Woodcock)	• It is likely that the diversity of species (including rare species) will be conserved and enhanced through mitigation measures (e.g., nursery, transplantation) and through habitat enhancement (invasive control, NHS planning, design and development)	• Monitoring of restoration areas to ensure the successful establishment of restored systems

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY – SUBJECT LANDS	SUBJECT LANDS - IMPACTORS	SUBJECT LANDS - PREDICTED EFFECTS	SUBJECT LANDS - AVOIDANCE, MITIGATION AND/OR RESTORATION	SUBJECT LANDS - NET EFFECTS	SUBJECT LANDS - MONITORING AND MANAGEMENT
	- Yellow Sedge - Canada Pussytoes - Elk Sedge - Drooping Sedge - Le Conte's Violet - American Plum - Alderleaf Buckthorn - Woolly Sedge • 12 Locally/Regionally Rare and/or Priority Landbird species, including: - American Woodcock - Tufted Titmouse - Rusty Blackbird • Rare Odonates and Lepidoptera - Swamp Darner					
3. Environmentally Significant Areas	• Not Present/ Not Applicable	N/A	N/A	N/A	N/A	N/A
4. Other – Presence of Species under the ESA	• Not Present/ Not Applicable	N/A	N/A	N/A	N/A	N/A
5. Other - Presence of Species Under the *Migratory Birds Convention Act*	• The federal *Migratory Birds Convention Act* (MBCA) prohibits the killing, capturing, injuring, taking or disturbing of migratory birds (including eggs) or the damaging, destroying, removing or disturbing of nests	• During construction; in particular, tree removal, migratory birds, and eggs and nests of these birds could inadvertently be harmed	• Inadvertent harm to migratory birds or their eggs or nests	• Tree or vegetation removal should occur outside of the migratory bird-nesting window of April 1 – August 31 (approximate) • In circumstances where this window cannot be avoided, a nest search is recommended and a buffer will be marked off surrounding any active nests that must be maintained until activity in the nest has ceased	• With the implementation of the mitigation measures, no net effect is anticipated	• None

7.0 CONCLUSIONS AND RECOMMENDATIONS

This EIS report addresses the natural heritage features and associated functions currently found within the Subject Lands, and more broadly within the Study Area. It assesses the potential impacts of the proposed development. Given that specific development plans for the Subject Lands will not be advanced until after the approval of the private OPA, impacts have been assessed on the proposed development limits (**Figure 11**, **Appendix A**). Once development is further refined and a SWM report has been completed for the Subject Lands, an updated impact assessment can be completed.

The Study Area contains PSWs, Habitat of Endangered and Threatened Species, Significant Valleylands, Fish Habitat, areas of Significant Woodland, Significant Wildlife Habitat and the presence of Special Concern species as well as provincially and locally rare flora and fauna. The Subject Lands contain more limited natural heritage features and functions, given the historic and more recent disturbances.

More specifically, the Subject Lands include minor areas of: Significant wildlife habitat (candidate bat maternity habitat, non-woodland open wetland amphibian breeding habitat, species of conservation concern and rare species).

Direct impacts associated with the proposed development will be limited, given that the proposed development provides for the protection of PSW's, significant woodlands, significant wildlife habitat and fish habitat. Development is proposed primarily within disturbed cultural areas with minor intrusions into and/or removal of localized woodlands and wetlands that are recommended for reconsideration in terms of their function in the larger wetland complex. Indirect effects have been addressed in relation to the potential for:

- Construction related impacts on natural features and edge conditions;
- Changes in wetland conditions associated with catchment alterations;
- Potential impacts on aquatic conditions and fish habitat; and
- Potential impacts on listed species and those considered rare at more regional and local scales.

The impacts can be mitigated through measures proposed within the Subject lands and for other areas. Together, a proposed Natural Heritage System for the Subject Lands (**Figure 12**, **Appendix A**) will link with adjacent lands to contribute to the enhancement and restoration of natural areas and associated functions within and adjacent to the Riverfront Community Master Plan Area.

The proposed development of the Riverfront Community will generate limited effects that can be mitigated through a defined program of enhancements and off-sets. The details of that program require further discussions amongst the applicant, City and agencies.

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APPENDICES

A. Figures

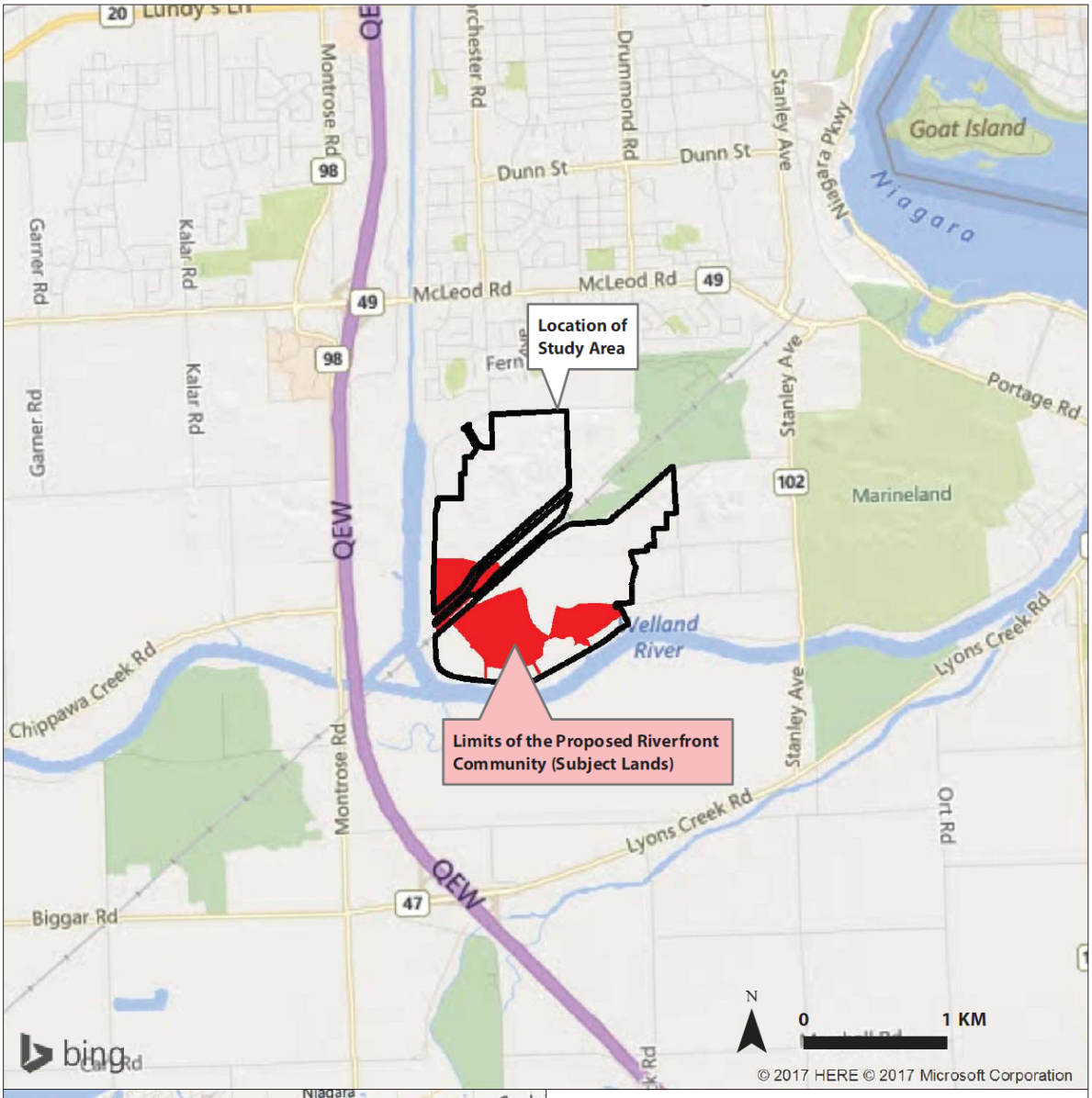
B. Tables

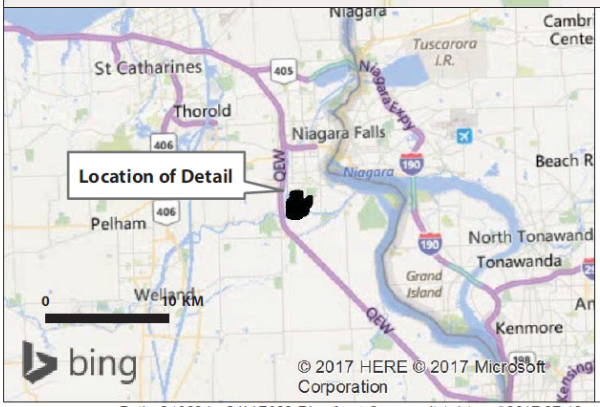
C. Agency Correspondence

D. Supplemental Wetland Commentary

E. Curricula Vitae of Savanta Study Team

Appendix A – Figures





Riverfront Community
Private OPA - Environmental Impact Study

Figure 1
Location of Subject Lands

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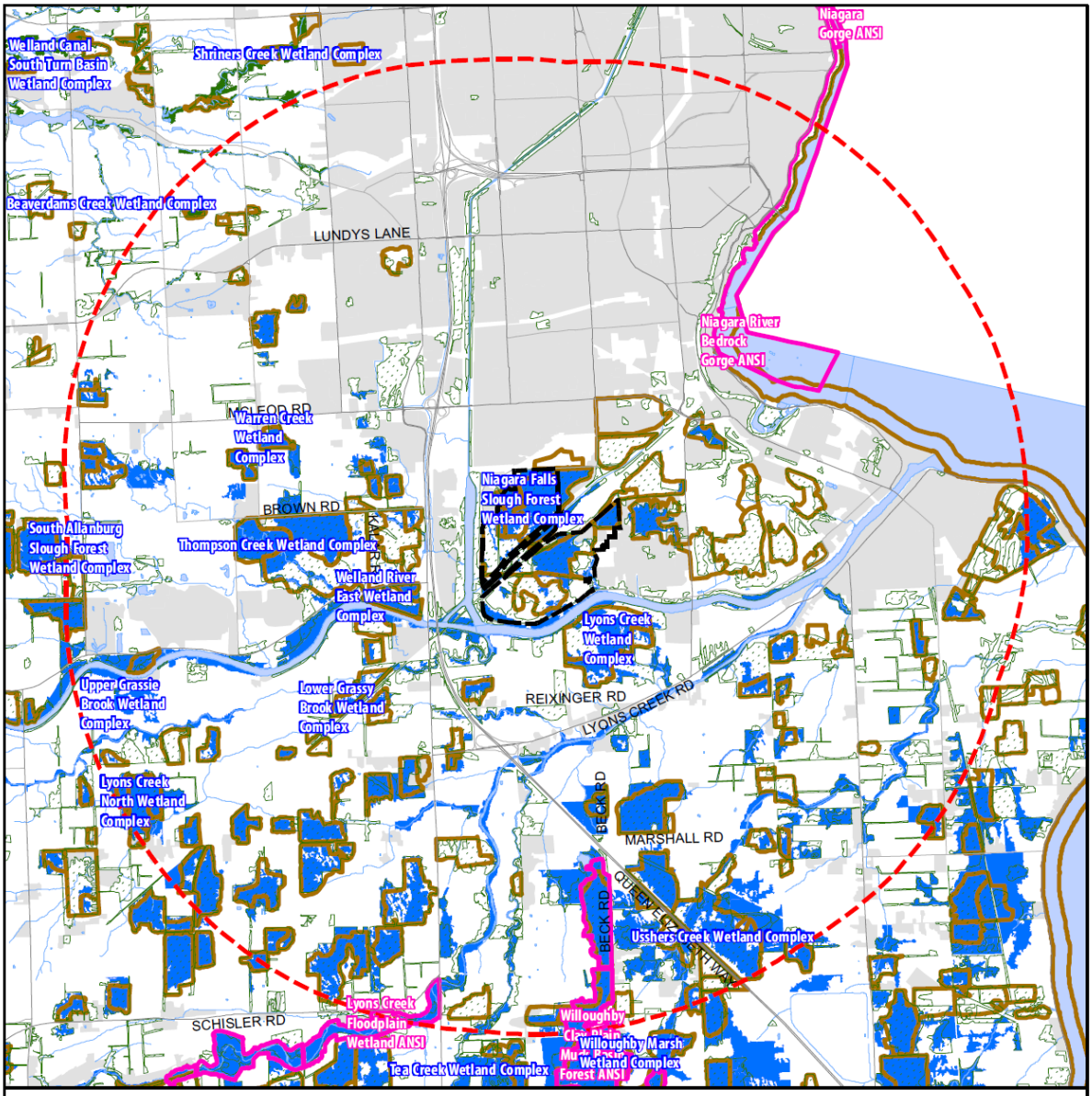

Riverfront Community Private OPA - Environmental Impact Study

Figure 2 Landscape Setting

- Study Area
- 5 km Adjacent Lands
- ANSI (MNRF LIO)
- Waterbody (MNRF LIO)
- Wetland Evaluated-Provincial (MNRF LIO)
- Wetland Evaluated-Other (MNRF LIO)
- Woodland (MNRF LIO)
- Deer Wintering Area (MNRF LIO)

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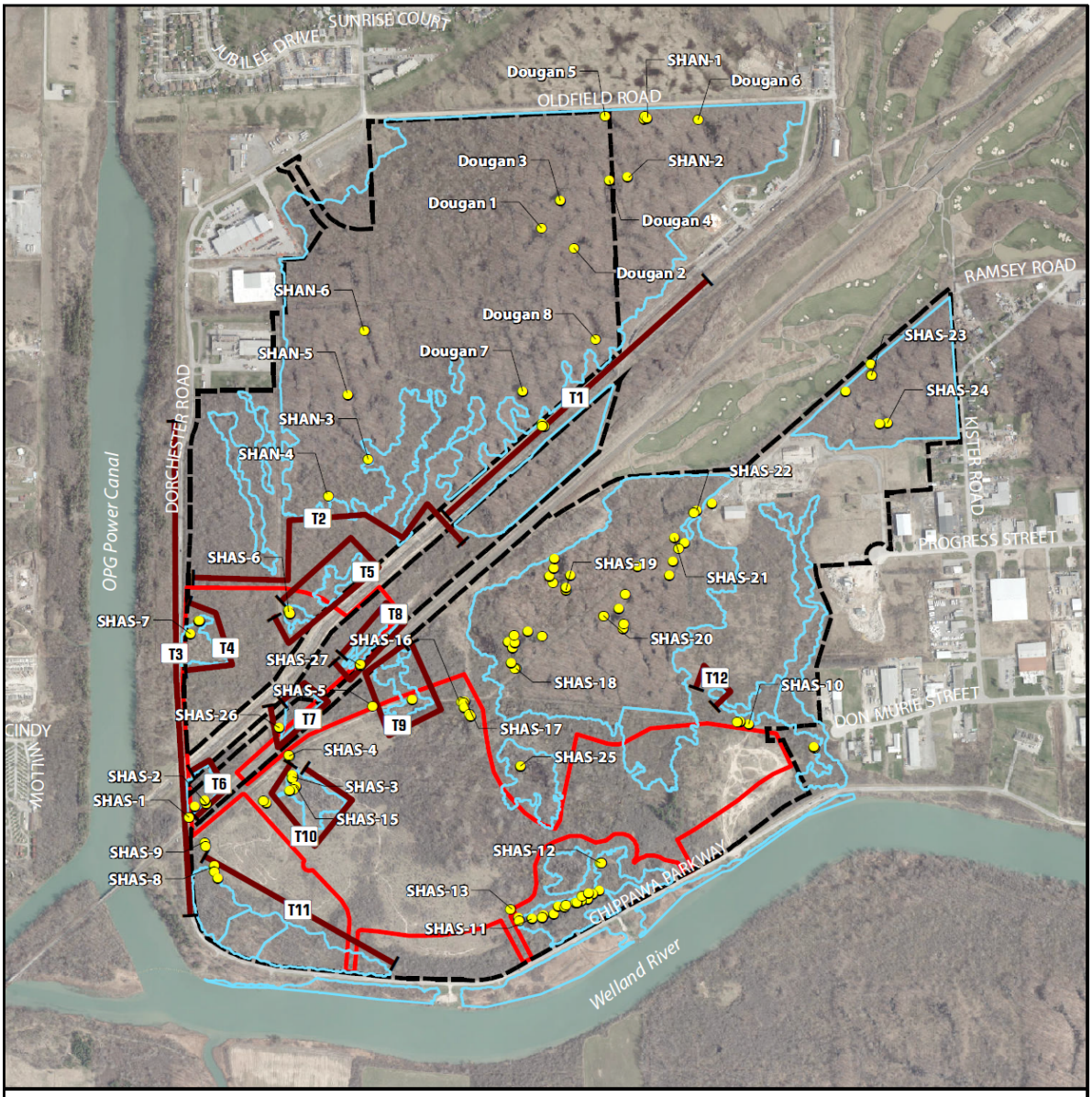

Riverfront Community Private OPA - Environmental Impact Study

Figure 3 Amphibian Field Survey Transects and Observation Points

Study Area
Subject Lands
Transect Location
Wetlands Evaluated Provincial (MNRF-LIO)
Wetland/Vernal Pool Observations

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NOTE:
Pool numbering and labels are related to internal notes.

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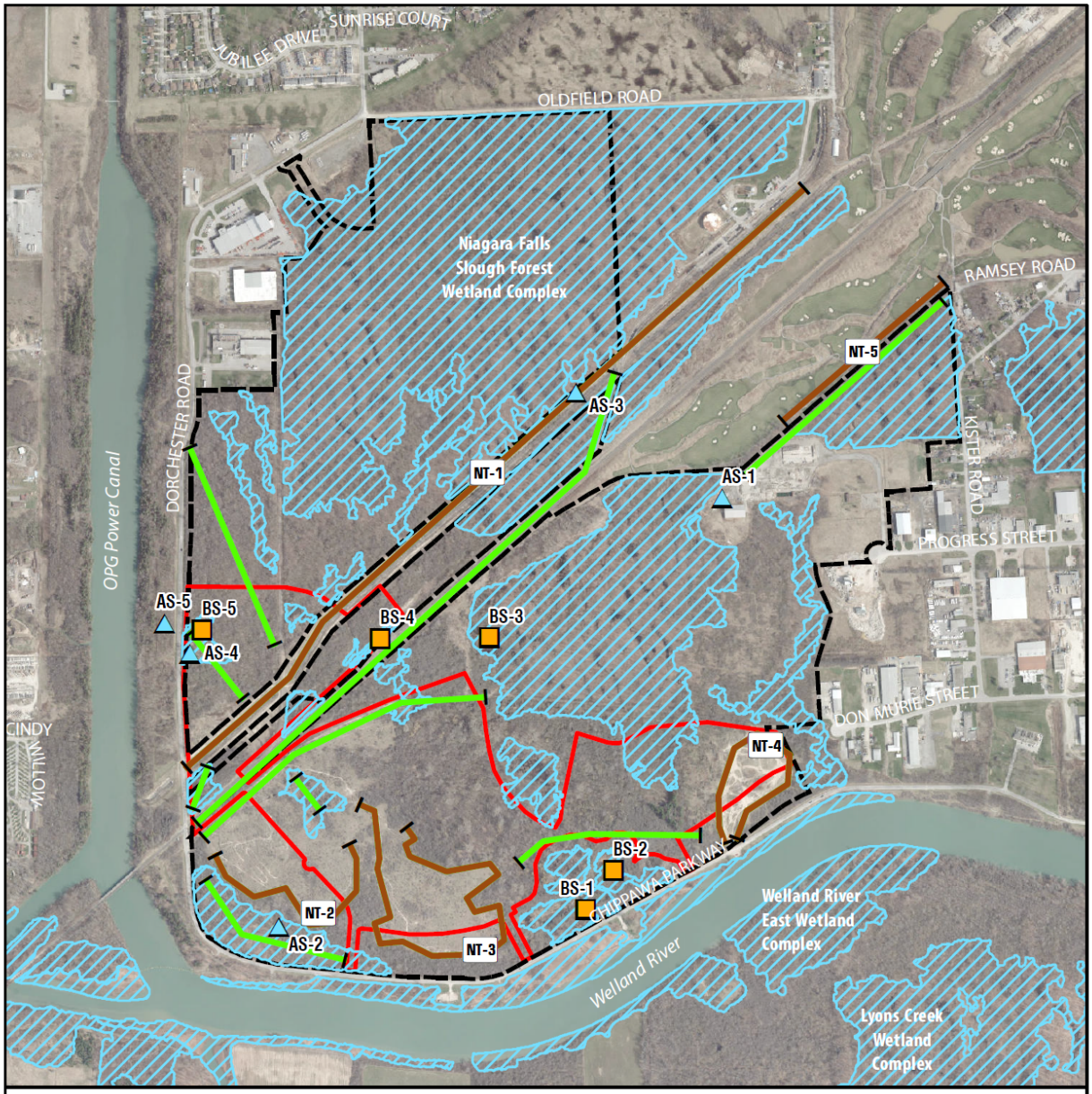

Riverfront Community Private OPA - Environmental Impact Study

Figure 4 2017 Reptile Field Survey Transects and Points

- Study Area
- Subject Lands
- Wetland Evaluated-Provincial (MNRF LIO)
- Point Count Station
- Area Search
- Turtle Nesting Transect Location
- Snake Transect Location

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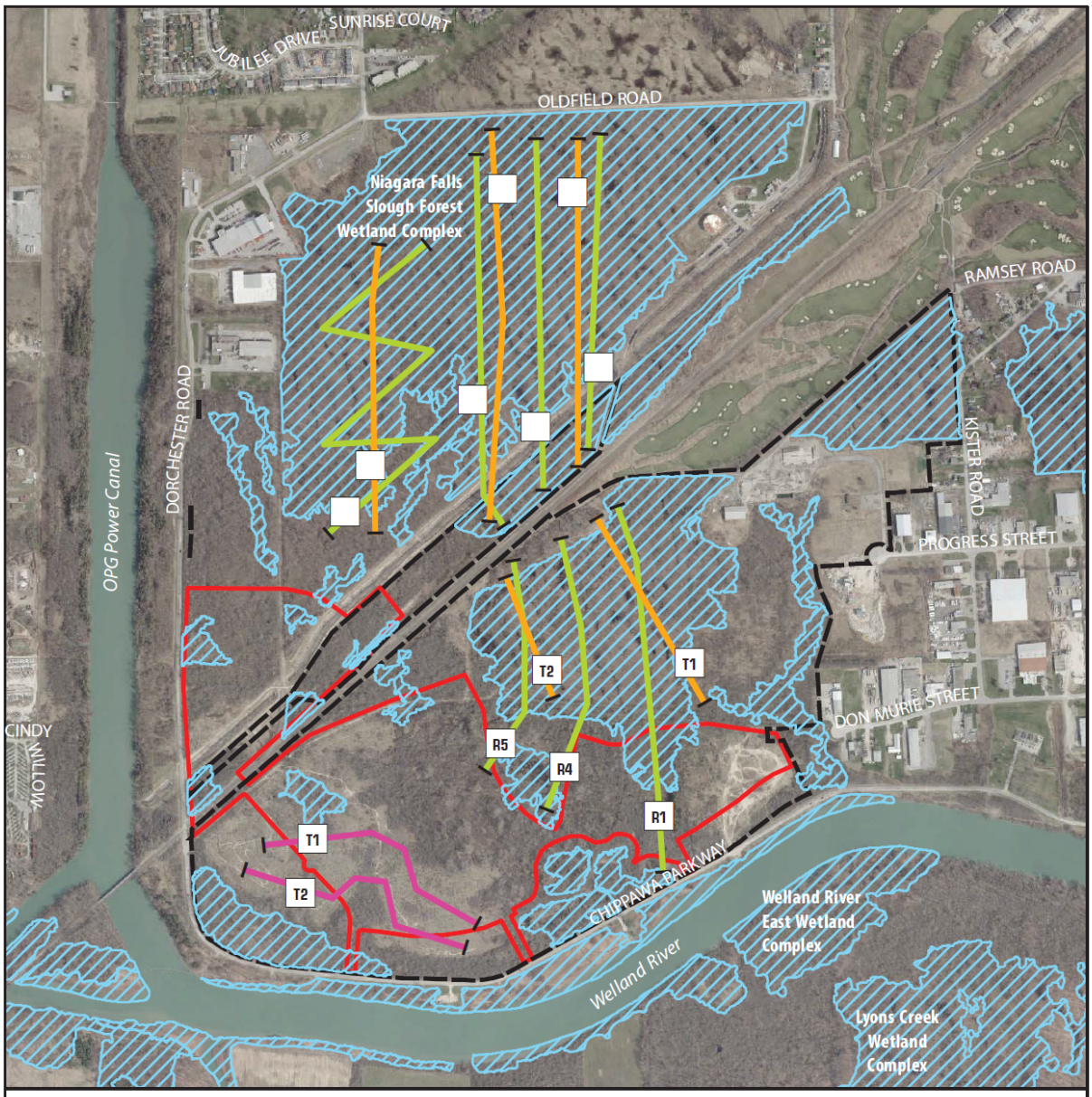

Riverfront Community Private OPA - Environmental Impact Study

Figure 5 2017 Bird Field Survey Transects and Points

Study Area
Subject Lands
Wetland Evaluated-Provincial (MNRF LIO)

Transect Survey Type
Raptor/Stick Nest Survey
Targeted Acadian Flycatcher Survey
Winter Raptor Survey

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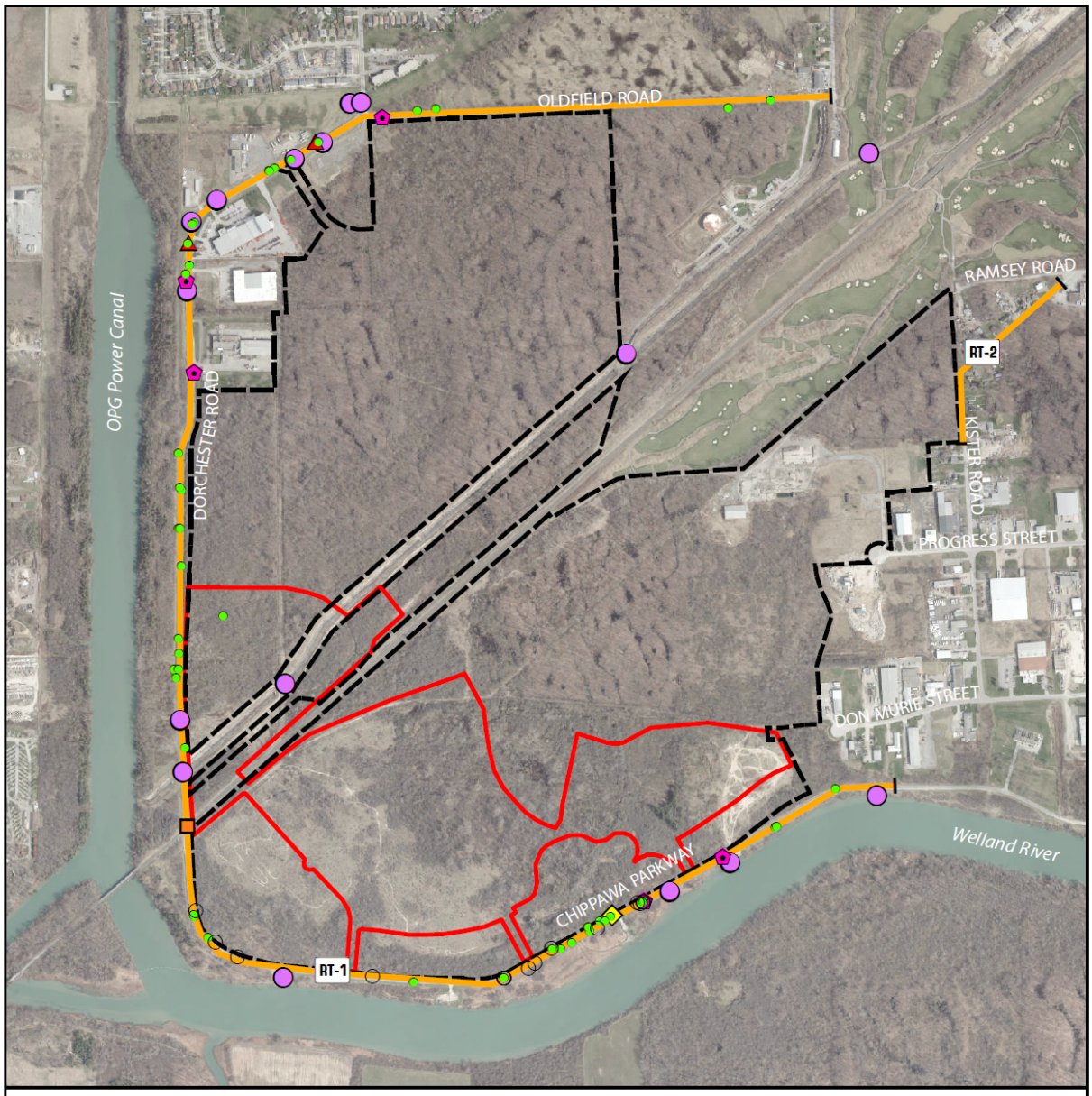

Riverfront Community Private OPA - Environmental Impact Study

Figure 6 2017 Road Mortality Transects and Results

Study Area
Subject Lands
Transect Location
Hydraulic Structures (Amec Foster Wheeler, 2015)

Species

Bird
Frog
Mammal
Snake
Turtle
Unknown

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Riverfront Community Private OPA - Environmental Impact Study

Figure 7 Landscape Ecology - Historical Context Interpreted Areas

Natural Heritage Feature Interpretation - Naturalness and Disturbance

- Study Area
- Subject Lands
- Area 1 - Mature/Older Natural Heritage Features
- Area 2 - Intermediate/Mature Natural Features
- Area 3 - Early Successional Natural Heritage Features - Slough/Ridge Topography Largely Intact
- Area 4 - Recent Succession - Highly Disturbed - Topography/Soils Altered

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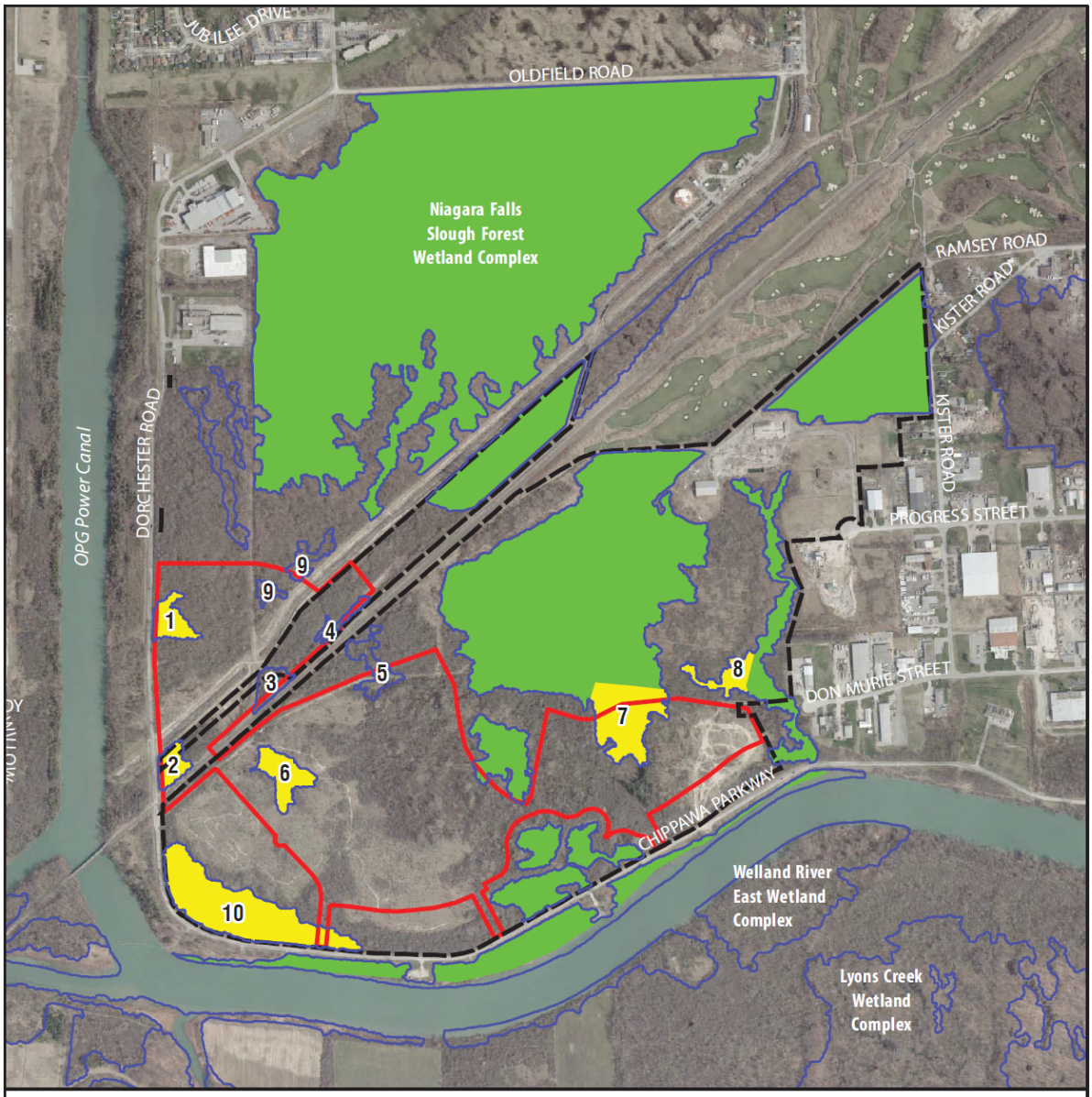

Riverfront Community Private OPA - Environmental Impact Study

Figure 8
Significant Wetlands

Study Area
Subject Lands
Wetland Evaluated-Provincial (MNRF LIO)
Significant Wetlands - per Savanta recommendation
Other Wetlands - per Savanta recommendation
1 - 10 Detailed Wetland Functional Assessment

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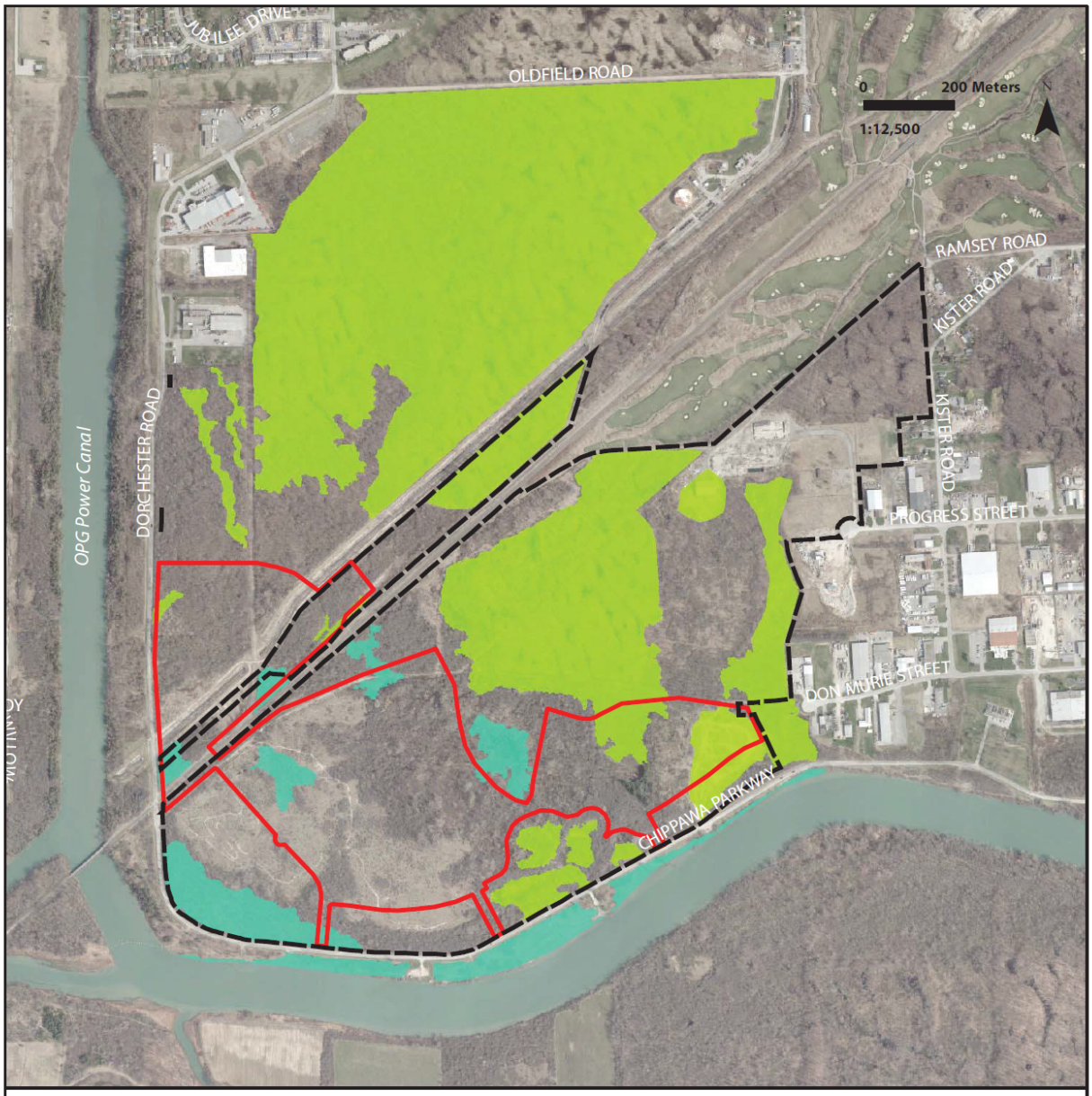

Riverfront Community Private OPA - Environmental Impact Study

Figure 9 Significant Wildlife Habitat

- Study Area
- Subject Lands
- Significant Wildlife Habitat
- Candidate Significant Wildlife Habitat

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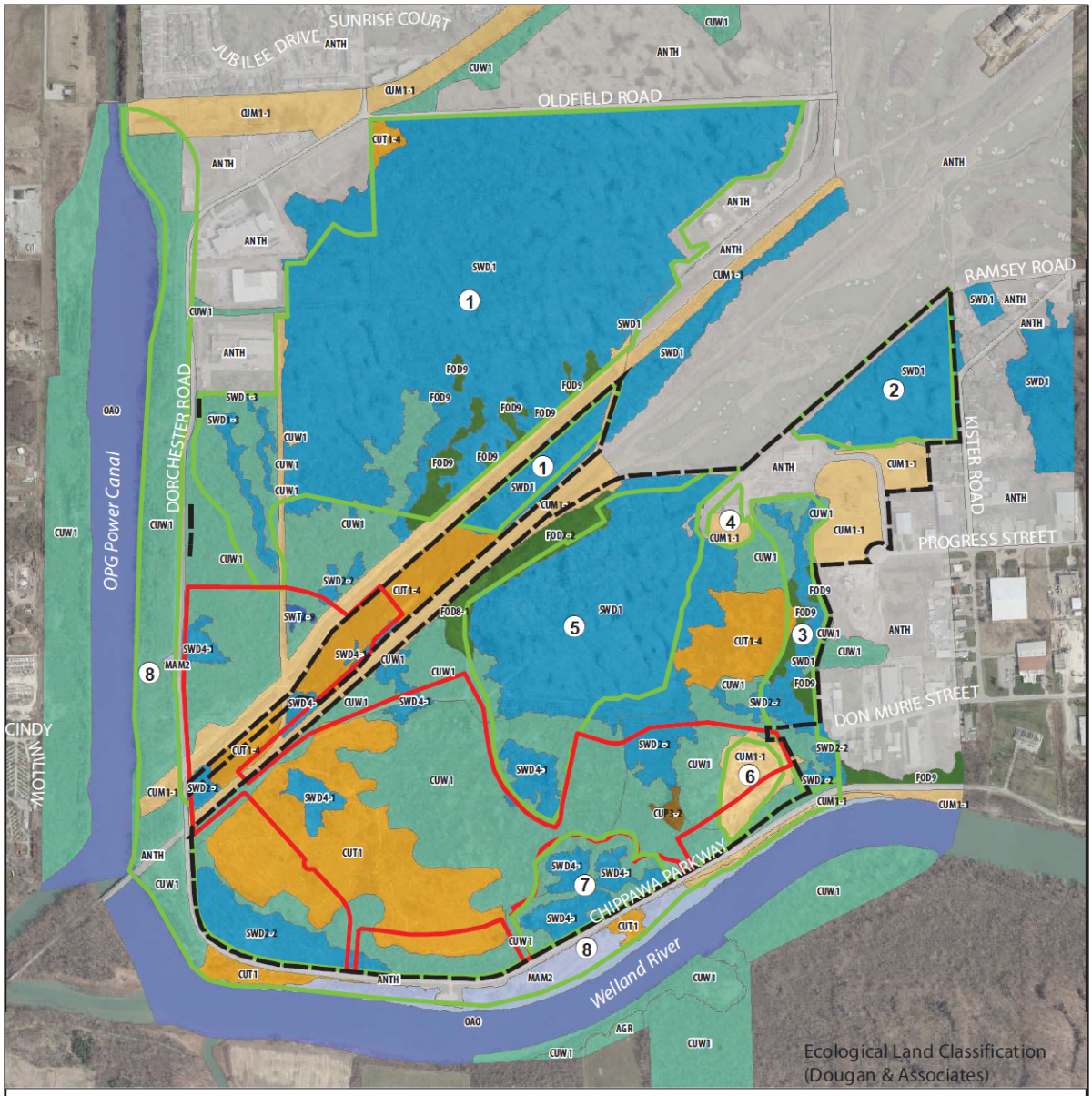

Riverfront Community Private OPA - Environmental Impact Study

Figure 10 Natural Heritage Feature Summary

- Study Area
- Subject Lands
- Compiled Significant Natural Features and Functions
- (1) Areas addressed in text of reporting

- ANTH - Anthropogenic
- CUM - Cultural Meadow
- CUT - Cultural Thicket
- CUP - Plantation
- CUW - Cultural Woodland
- FOD - Deciduous Forest
- MAM - Meadow Marsh
- SWD - Deciduous Swamp
- SWT - Thicket Swamp
- OAO - Open Aquatic

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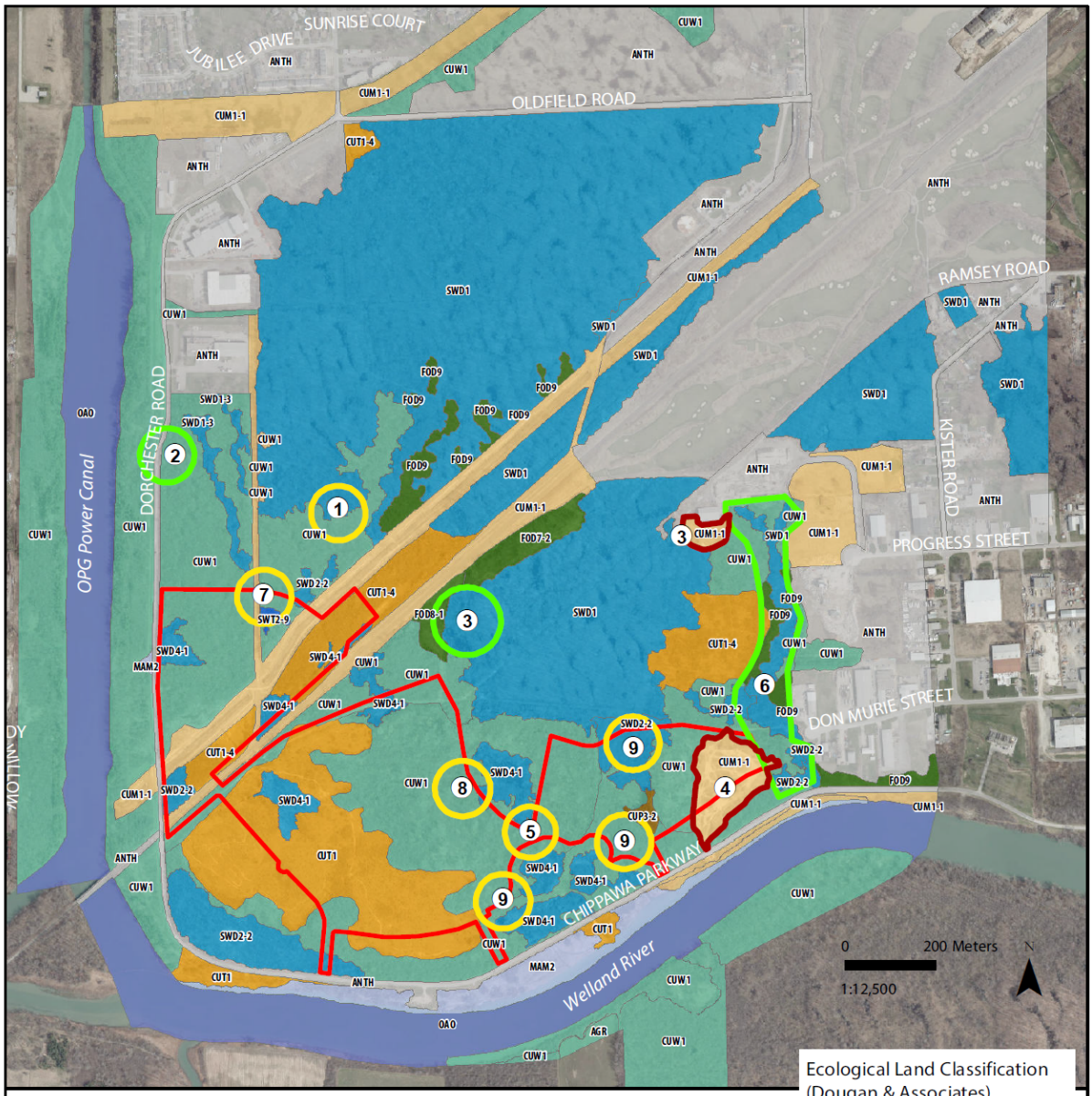

Riverfront Community Private OPA - Environmental Impact Study

Figure 11 Potential Impact Areas and Mitigation

Subject Lands

Impact Areas

Impact Areas - Artificial Habitat Replacement

Opportunity Areas

NOTE: The Dorchester Road and Chippawa Parkway alignment represents a linear opportunity for eco-passage development.

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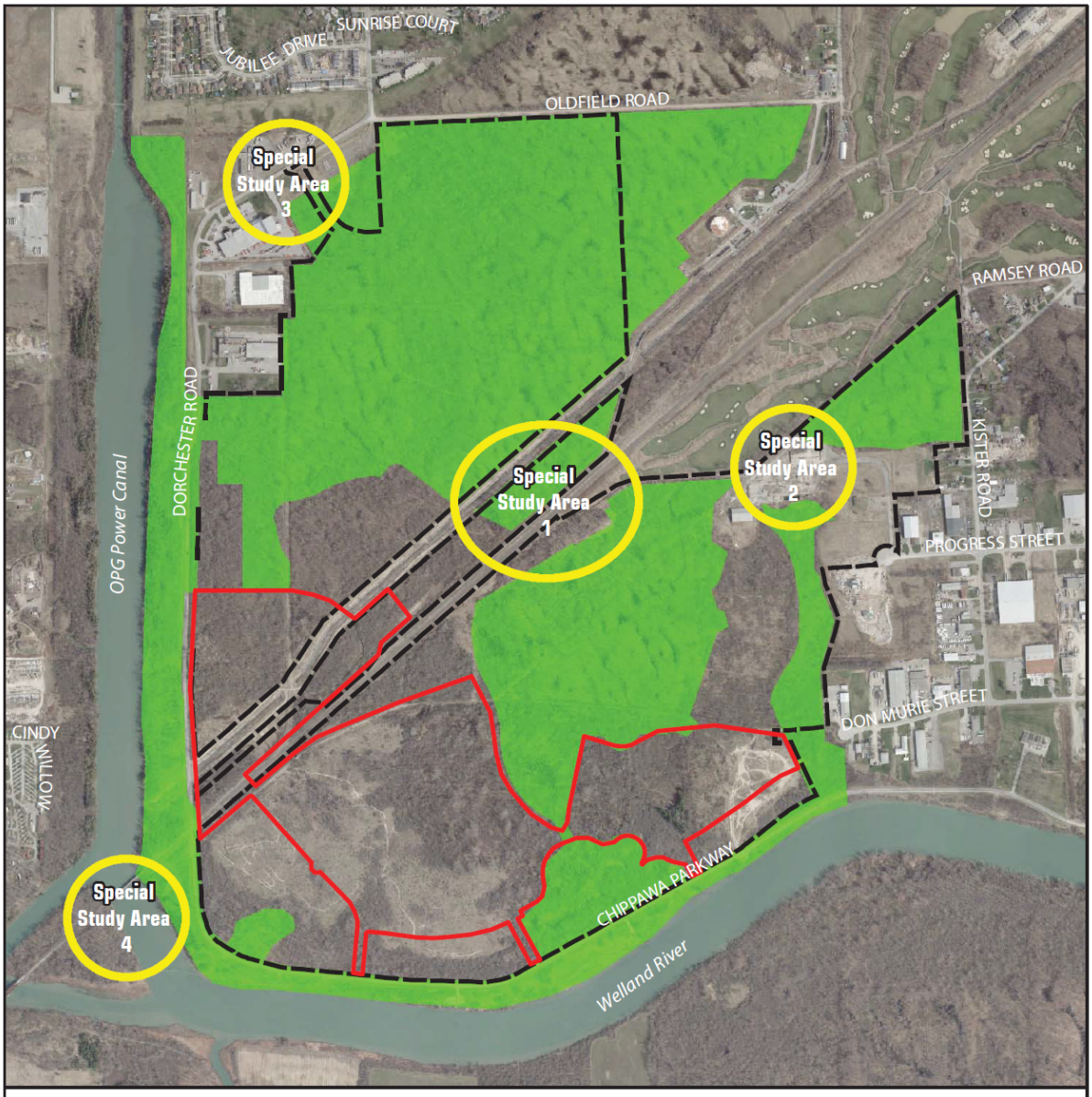
Ecological Land Classification (Dougan & Associates)

- ANTH - Anthropogenic
- CUM - Cultural Meadow
- CUT - Cultural Thicket
- CUP - Plantation
- CUW - Cultural Woodland
- FOD - Deciduous Forest
- MAM - Meadow Marsh
- SWD - Deciduous Swamp
- SWT - Thicket Swamp
- OAO - Open Aquatic

Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2017 07 12 report figures\Figure 11 Potential Impacts and Mitigation Measures.mxd REVISED: September 28, 2017



Riverfront Community Private OPA - Environmental Impact Study

Figure 12 Preliminary Natural Heritage System

Study Area
Subject Lands
Preliminary Natural Heritage System

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Appendix B – Tables

Table 1: Savanta Field Investigations (2017)

FIELD DATE (2017)	NATURE OF INVESTIGATION	SURVEYOR
February 24	• Salamander Movement Survey	E. Lee, L. Williamson, O. Park, J. Leslie
February 28	• Salamander Movement Survey	E. Lee, L. Williamson, O. Park, J. Leslie
March 1	• Vernal Pool Habitat Assessment	E. Lee, L. Williamson
March 30	• Winter Raptor Survey	P. Burke
April 18	• Woodland Raptor/Stick Nest Survey	P. Burke
April 28	• Spring Reptile and Road Mortality Surveys	R. Lee, K. Beauchamp *(Dougan & Associates)*
May 10	• Spring Reptile and Road Mortality Surveys	R. Lee, S. Hill *(Dougan & Associates)*
May 15	• Spring Reptile and Road Mortality Surveys	R. Lee, K. Beauchamp *(Dougan & Associates)*
May 19	• Spring Reptile and Road Mortality Surveys	R. Lee, K. Beauchamp *(Dougan & Associates)*
May 23	• Spring Reptile and Road Mortality Surveys	R. Lee, K. Beauchamp *(Dougan & Associates)*
June 13	• Turtle Nesting Surveys	R. Lee, C. Myrdal *(Dougan & Associates)*
June 15	• Turtle Nesting Surveys	R. Lee, K. Beauchamp *(Dougan & Associates)*
June 19	• Acadian Flycatcher BBS	P. Burke
August 4	• Vernal Pool Habitat Assessment	L. Williamson, M. Green
August 11	• Vernal Pool Habitat Assessment	O. Park, C. Zoladeski
September 2	• First round, Fall Reptile Survey	L. Williamson, M. Green
September 6	• Detailed Wetland Survey	C. Zoladeski, K. Hunt
September 17	• Detailed Wetland Natural Cover Survey	T. Hilditch

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TABLE 2: RIVERFRONT COMMUNITIES WETLAND FUNCTIONAL ASSESSMENT

HYDROGEOMORPHIC LANDSCAPE POSITION	1	2	3	4	5	6	7	8	9	10	Slough
Size											
Ground water functional relationship (i.e., prominent recharge/discharge)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Riparian	✓	n/a	n/a	✓	n/a	n/a	n/a	**n/a**	n/a	n/a	n/a
Isolated Catchment	n/a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
REGULATING SERVICES	1	2	3	4	5	6	7	8	9	10	Slough
Carbon sequestration and storage	Low	Low	Low	Low	Low	Low	Moderate	Low	Low	Low	Moderate
Local climate and air quality	Low	Low	Low	Low	Low	Low	Moderate	Low	Low	Moderate	Moderate
Moderation of risks (i.e., floods, storms)	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Erosion Prevention	Low	Low	Low	Low	Low	Low	Low	Moderate	Low	Low	Low
Pollination	Low	Low	Low	Low	Low	Low	Moderate	Low	Low	Low	Low
WATER	1	2	3	4	5	6	7	8	9	10	Slough
Hydrological											
Conveyance	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Low	n/a	n/a	n/a
Floodwater and flow regulation, storage	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Low	n/a	Low	Moderate
Erosion control/shoreline stabilization/sediment stabilization	n/a	n/a	n/a	n/a	n/a	n/a	Low	n/a	n/a	Low	n/a
Quality and temperature effects	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Low	n/a	n/a	n/a
Sediment/toxicant reduction and retention	n/a	n/a	n/a	n/a	n/a	n/a	n/a	✓	n/a	n/a	Low-Moderate
Organic contributions - invertebrates and debris	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Biogeochemical processes - cycling, removal and/or storage	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low-Moderate
LAND & BIOTA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Slough**
1. Terrestrial Habitat											
Decomposition processes	Low	Low	Low	Low	Low	Low	Moderate	Low	Low	Low	High
Biological diversity	Low	Low	Low	Moderate	Low	Low	Moderate	Moderate	Low	Low	Moderate
Community structural diversity	Low	Low	Low	Low	Low	Low	Moderate	Low	Low	Low	Low
Species richness	Low	Low	Low	Low	Low	Low	Moderate	Low	Low	Low	Low
Productivity	Low	Low	Low	Low	Low	Low	High	Low	Low	Low	Moderate
Soils formation	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	High
2. Aquatic Habitat											
Biological diversity	Low	n/a	n/a	Low	n/a	n/a	n/a	n/a	n/a	n/a	Low

Community structure		Low	n/a	n/a	Low	n/a	n/a	n/a	n/a	n/a	n/a	Low
Species richness		Low	n/a	n/a	Low	n/a	n/a	n/a	n/a	n/a	n/a	Moderate
Productivity		Low	n/a	n/a	Low	n/a	n/a	n/a	n/a	n/a	n/a	Moderate
3. Specialized Habitat												
Seasonal concentration areas: deer, waterfowl, reptiles, bats												
Specialized habitats:												
	Area-dependent	n/a	n/a	n/a	n/a	n/a	n/a	✓	n/a	n/a	n/a	✓
	Colonial nesting	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Winter mammal cover	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Moderate
	Waterfowl nesting	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Amphibian breeding	Low	n/a	n/a	Low	n/a	n/a	Low	n/a	n/a	Low	High
	Turtle nesting	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Low-Moderate
	Seeps and springs	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Mineral licks	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Vegetation communities at risk	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	✓
	Confirmed Provincial SAR	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Riparian	n/a	n/a	n/a	n/a	n/a	n/a	n/a	✓	n/a	n/a	n/a
	Productive	none known	none known	none known	none known	none known	none known	none known	none known	none known	none known	none known
	Consumptive	none known	none known	none known	none known	none known	none known	none known	none known	none known	none known	none known
	Recreation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Indigenous/historical/cultural importance	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
	Long-term landscape presence	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	✓
	Settlement period creation/ alteration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	No
	Recent history/Current Disturbance/Alteration	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	No

NOTES:

This functional assessment tool has been developed from a variety of domestic and international resource materials.
This approach relies upon a comparative analysis (as opposed to quantitative measures) and should be considered halpful as a relative and approximate measure
* Information presented in the Socio-cultural section should be considered to be draft and incomplete. No relevant social research has been completed to inform this assessment
** No iIndigenous engagment has informed this partial assessment

Appendix C – Agency Correspondence

Ministry of Natural Resources and Forestry

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Ontario

Guelph District

8th May 2017

Kyle Hunt
Savanta Inc.
Phone: 647-228-2918
Email: kylehunt@savanta.ca

Dear Mr. Hunt,

RE: Proposed Spring Field Program - Thundering Waters

The Ministry of Natural Resources and Forestry (MNRF) has reviewed Savanta's document "Thundering Water 2017 Spring Field Studies Draft for Discussion with NPCA and MNRF" received on the 3rd of April 2017. MNRF staff has scoped the review of this document to focus on Significant Wildlife Habitat (SWH) and Species at Risk (SAR) surveys. It is understood that the project team has, in part, referenced the provincial guidance document 'SWH Criteria Schedules for Ecoregion 7E' to inform the survey efforts and delineation of SWH on the subject lands. After review of the proposed field work, MNRF has the following advice for SWH and SAR surveys:

Reptile Emergence, Hibernacula and Turtle Nesting Surveys
Turtle wintering areas**:** We recommend fall (Sep-Oct) or spring (Mar-May) surveys to look for congregations of turtles – this will give indication of limited wintering areas and therefore significant wintering areas.

Reptile Hibernacula: It is recommended that SWH for reptiles is delineated by locating a snake hibernaculum used by a minimum of 5 individuals or 2 or more snake species. We recommend fall (Sept/Oct) and spring (Apr/May) surveys looking for congregation(s) (5 or more individuals) should be carried out in areas that show suitable characteristics (e.g. upland, foundation, rocky slope, etc.).

With reference to the "Wildlife Road Crossing Surveys" the MNRF sees this as potential additional data but it does not accept this data alone as a true representation of the number of species present and/or their quantity on this site.

Bat Acoustic Monitoring and Habitat Assessment
The MNRF understands that the purpose of the surveys proposed is to check for any bat species presence on the property and is not intended to confirm SWH and not intended to identify SAR habitat. It is understood that this survey effort is not meant to inform potential implications of the *Endangered Species Act*, 2007 (ESA).

It is recommended that the field work and surveys proposed for bats include the delineation of SWH and SAR bat habitat to inform the planning process. In addition, the proposed spring field study notes that "Once presence of SAR bat species is established, survey effort may be halted and the requirement for further nights of surveys will be re-assessed." It is unclear to MNRF what this approach is intended to accomplish. Given that there is a short window for acoustical monitoring for bats (June 1-30), MNRF staff recommend undertaking all necessary bat surveys to inform potential SWH and ESA implications. It is recommended that all information be collected in June 2017 to avoid the need for further bat surveys in June 2018.

Bat habitat assessment:
The following is advice on two methodologies; one should be applied for identifying SWH and the other for SAR habitat, although MNRF notes carrying out both surveys concurrently would preferable.

In previous work surveys for potential bat habitat (by Dougan and Associates), the Provincially Significant Wetland (PSW) on site was not included as the consultant had stated that the PSW would be avoided and therefore unaffected by any development. Please note that if the PSW is not included as part of this study and MNRF deems any activities that are planned on the site to be impacting the areas that have not been surveyed, additional surveys will be required to identify potential bat habitat.

Significant Wildlife Habitat: SWH Criteria Schedules for Ecoregion 7E recommends that the presence of Big Brown Bat and Silver-haired Bat species as being representative of SWH for Bat Maternity Colonies. It is recommended that the project team review the SWH schedule for Ecoregion 7E for more details. In addition, evaluation methods for maternity colonies under SWH should be conducted following methods outlined in the OMNR document "Bats and Bat Habitats: Guidelines for Wind Power Projects" (2011).

SAR habitat: In previous surveys for potential bat habitat (by Dougan and Associates) only Northern myotis and Little brown myotis were included. When identifying SAR bat habitat, MNRF advises that all SAR bats should be considered when carrying out surveys. In your letter you have listed ELC communities that will be targeted for bat habitat. MNRF advises that any coniferous, deciduous or mixed wooded ecosite, including treed swamps, that include trees at least 10cm diameter-at-breast height (dbh), should be considered suitable (potential) maternity roost habitat. As mentioned in your letter you will identify suitable roost habitat. We recommend following the methodology (part II) outlined in appendix A.

Bat Species acoustic Surveys:
Prior to setting up acoustic monitors, MNRF requests information related to the potential bat habitat on site (from the bat habitat assessment) and the information on the planned acoustic monitoring , to confirm suitable locations. Before carrying out acoustic surveys, please provide us with: Number of monitors to be deployed, a map showing the locations of monitors and locations of mapped snag trees (from part II) overlaid on ELC mapping.

SWH: Under SWH exit surveys and acoustic monitoring is required. The methodology is outlined in "Bats and Bat Habitats: Guidelines for Wind Power Projects" (2011).

SAR habitat: In appendix A (part III) you will find the methodology MNRF recommends for acoustic monitoring. Should you choose a different methodology please submit this to MNRF for review.

Woodland Canopy Cover
This section was reviewed by Niagara Peninsula Conservation Authority (NPCA) and advice was given through email correspondence from Lee-Ann Hamilton dated 19th April 2017.

Winter Raptor and Stick Nest Surveys
Winter Surveys for raptors: Survey methodology can be found in Appendix A of the MNRF document "Bird and bird habitats: Guidelines for wind power projects".

Woodland Raptor Nesting habitat: It is recommended that the location of nests are identified. Surveys in early March to end of May using call broadcasts can help in locating territorial/nesting raptors and facilitate in finding the nests.

Other candidate Significant Wildlife Habitat:
Amphibian breeding habitat has been identified and confirmed as SWH through previous work on this site. However, it is our understanding that amphibian movement corridors have not been identified. Field studies should be conducted at the time of year when species are expected to be migrating or entering breeding sites.

Other Species at Risk surveys:
Acadian Flycatcher:
MNRF is aware that a male was calling 3-4 times on the site on the 29th of May 2015. The presence of this species is rare and as such we recommend further targeted surveys for this species.

Closing
MNRF staff appreciates the opportunity to review the proposed spring field studies for the Thundering Waters site. It would be appreciated if the project team could clarify the concerns noted above and provide the additional information regarding the bat surveys.

Should you have any questions regarding the MNRF's comments, please contact the undersigned.

Kind regards,

Michelle Karam
Management Biologist
michelle.karam@ontario.ca

CC – Staff members involved in the technical committee for this project from the following organizations:
Ministry of Natural Resources and Forestry,
Niagara Peninsula Conservation Authority,
Niagara Region,
City of Niagara Falls.

Appendix A

If project proponents wish to deviate from the technical guidance provided in this email, they should discuss the proposed changes with the MNRF Guelph District staff. MNRF may require a site visit in order to provide additional guidance to assist with study design.

The recommended approach for determining presence/absence of Little Brown Myotis, Northern Myotis and Tri-colored Bat within treed areas, is as follows:

I. SAR Bat Habitat Suitability Assessment

Following the completion of ELC mapping of a study area, any coniferous, deciduous or mixed wooded ecosite, including treed swamps, that includes trees at least 10cm diameter-at-breast height (dbh) should be considered suitable (potential) maternity roost habitat. For cultural treed areas, such as plantations, consultation with the Ministry of Natural Resource and Forestry (MNRF) is recommended to determine if these habitats may be suitable for the species.

If suitable habitat may be impacted by a proposed activity, MNRF recommends that the proponent proceed to Phase II. Upon completion of Phase I, it is strongly encouraged that the proponent consult with the MNRF to discuss the proposed work plan and study design.

II. Identification of Suitable (Potential) Maternity Roost Trees

Within treed habitats, Tri-colored Bat primarily roosts in tree foliage (mainly within oak leaves), while Little Brown Myotis and Northern Myotis often select loose bark, cracks and cavities. Because of these differences, two separate field data sheets should be completed by the proponent to identify and map suitable roost trees for Tri-colored Bat and Little Brown Myotis/Northern Myotis (see attachments). The data collected in Phase II will help inform the positioning of acoustic monitoring stations (detectors) in Phase III.

The timing of field visits is important in order for an observer to be able to clearly identify tree attributes that are suitable for the establishment of maternity roosts:

- **Tri-colored Bat**: It is recommended that field visits take place during the leaf-on season the same year that acoustic monitoring is to be conducted so that foliage characteristic (i.e., dead/dying leaves along a dead branch) can be observed.

- **Little Brown Myotis/Northern Myotis**: It is recommended that field visits occur during the leaf-off period so that the view of tree attributes (hollows, cracks etc.) is not obscured by foliage.

Note: For large ecosites (e.g., >10 ha) where a thorough walk-through to view all potential roost trees may not be possible or practical, the proponent should discuss the potential for a scoped study design for Phase II with the MNRF prior to undertaking field work.

i) Tri-colored Bat

Leaf roosts are shaped like umbrellas with a "roof" and a hollow core where bats rest. Studies have shown that oak leaves are a preferred roost site. Maple leaves are also selected, although less commonly. It is thought that Tri-colored Bat may prefer roost trees in more open woodlands, as opposed to deep woods.

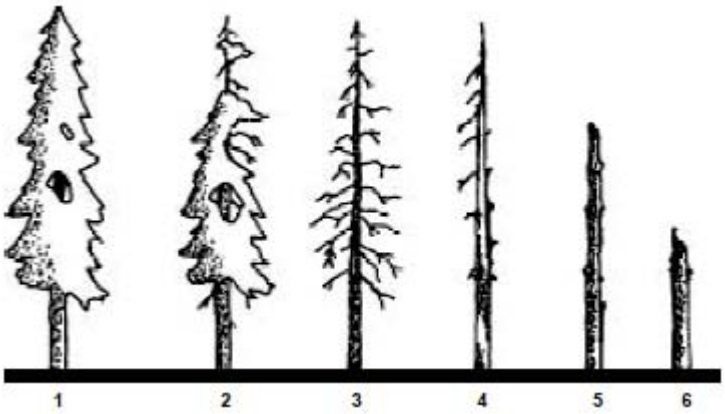
Within each ecosite identified as suitable maternity roost habitat in Phase I, the following trees should be documented on the field data sheet.

- any oak tree ≥10cm dbh
- any maple tree ≥10cm dbh IF the tree includes dead/dying leaf clusters
- any maple tree ≥25cm dbh

ii) Little Brown Myotis and Northern Myotis

For purposes of this exercise, a "snag" is any standing live or dead tree ≥10cm dbh with cracks, crevices, hollows, cavities, and/or loose or naturally exfoliating bark. Within each ecosite identified as suitable maternity roost habitat in Phase I, all "snags" should be identified and relevant information recorded on the appropriate field data sheet. Proponents should be aware that some tree species, such as shagbark hickory, silver maple and yellow birch, have naturally exfoliating bark that may be suitable for establishing maternity roosts.

During the field visit, the Decay Class (Watt and Caceres, 1999) should be noted for each snag. Snags in an early stage of decay (which also includes healthy, live trees) may be preferred by Little Brown Myotis and Northern Myotis if suitable attributes for roost space are present. However, since SAR bats may also roost in snags outside of Class 1-3, any snag >10cm dbh with suitable roost features should be documented. For trees with cavities, the entrance can be high or low ("chimney-like") on the tree.



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 percent of bark lost, few branch stubs, broken top
6. Very old dead tree, advanced decay, no branches, parts of the stem have rotted away

III. Acoustic Surveys

Within each ELC ecosite determined to be suitable maternity roost habitat in Phase I, acoustic surveys are recommended to confirm presence/absence of Little Brown Myotis, Northern Myotis and Tri-colored Bat. As described below, acoustic detectors should be placed in the best possible locations in order to maximize the probability of detecting all three SAR bats species. The data collected in Phase II should be used to select optimal locations for monitoring. The trees to be targeted for acoustic monitoring will typically be a subset of the trees documented in Phase II.

Density and Optimal Location of Acoustic Monitoring Stations:

Multiple stations may be required to cover an ecosite adequately. Based on the microphone range of most broadband acoustic detectors (20-30m), **4 stations/hectare** is needed for full coverage of an ELC ecosite.

Strategic placement of acoustic detectors is critical for the successful isolation of high-quality bat calls. Recommended positioning is to locate acoustic detectors **within 10m of the best potential maternity roost trees**. To increase the probability of detecting all three SAR bat species, detectors should be divided proportionally to target suitable roost trees (if present) for Tri-colored Bat and Little Brown Myotis/Northern Myotis.

Prior to undertaking acoustic surveys, it is recommended that the proponent discuss the proposed location of acoustic monitoring stations with the MNRF.

(i) Tri-colored Bat

Although Tri-colored Bat will roost within both live and dead foliage, reproductive females may prefer clusters of dead leaves, especially if they are situated on a live tree. Using the information

collected on the field data sheet, the best suitable maternity roost trees for Tri-colored Bat should be selected according to the following criteria (in order of importance):

If oaks are present:

- Live oak with dead/dying leaf clusters
- Dead oak with retained dead leaf clusters
- Live oak (no dead leaf clusters) with the largest dbh (≥25cm)
- Oak within a forest gap

If oaks are absent:

- Live maple with dead/dying leaf clusters
- Dead maple with retained dead leaf clusters
- Live maple (no dead leaf clusters) with the largest dbh (≥25cm)
- Maple within a forest gap

Note that if a cluster of tree species with attributes preferred by Tri-colored Bat is present, this may be a good area to target acoustic monitoring.

(ii) Little Brown Myotis and Northern Myotis

Bats that roost under tree bark or within crevices or cavities frequently select the tallest and largest diameter snags, which often extend above the forest canopy. This is because larger snags better retain solar heat, which benefits the pups. Tall trees within a forest gap or along an edge may also have a less obstructed flight approach for bats.

Using the information collected on the field data sheet completed in Phase II, the best suitable maternity roost trees for Little Brown Myotis/Northern Myotis should be selected using the following criteria (in order of importance):

- Tallest snag
- Snag exhibits cavities/crevices often originating as cracks, scars, knot holes or woodpecker cavities
- Snag has the largest dbh (>25 cm)
- Snag is within the highest density of snags (e.g., cluster of snags)
- Snag has a large amount of loose, peeling bark (naturally occurring or due to decay)
- Cavity or crevice is high on the tree (>10 m) or is "chimney like" with a low entrance
- Tree species provides good cavity habitat (e.g., white pine, maple, aspen, ash, oak)
- Snag is located within an area where the canopy is more open
- Snag exhibits early stages of decay (Decay Class 1-3)

Notes: The purpose of the above-listed criteria is to determine the best placement of acoustic monitors in order to maximize the probability of detecting Little Brown Myotis and Northern Myotis. The listed criteria are not intended for any type of snag "ranking". Snags that do not include any of the above characteristics still have potential for

providing maternity roost space. For example, the absence of snags ≥25cm dbh by no means indicates that there is no potential maternity roost habitat present within an ecosite.

In addition, for efficiency, a proponent may also wish to complete snag density surveys at this time (see Phase IV).

Timing and Weather Conditions:

Acoustic surveys should take place on **evenings between June 1st and June 30th, commencing after dusk and continuing for 5 hours**. Surveys should occur on warm/mild nights (i.e., ambient temperature >10°C) with low wind and no precipitation. At least 10 visits on nights that align with the above conditions where no SAR bat activity is detected are required to confirm absence.

Note that project proponents may cease survey work at any point once documentation of all three SAR bats species presence occurs.

Recommended Equipment Guidelines for Best Results:

- Broadband detectors (full spectrum) should be used. These may be automated systems in conjunction with computer software analysis packages or manual devices with condenser microphones.
- Acoustic monitoring systems should allow the observer to determine the signal to noise ratio of the recorded signal (e.g., from oscillograms or time-amplitude displays). These provide information about signal strength and increase quality and accuracy of the data being analysed.
- Microphones should be positioned to maximize bat detection i.e., situated away from nearby obstacles to allow for maximum range of detection and angled slightly away from prevailing wind to minimize wind noise.
- The same brand and/or model acoustic recording system should be used throughout the survey (if multiple devices are required), as the type of system may influence detection range/efficiency. If different systems are used, this variation should be quantified.
- Information on the equipment used should be recorded, including information on all adjustable settings (e.g., gain level), the position of the microphones, and dates and times for each station where recording was conducted.

Analysis:

Analytical software should be used to interpret bat calls and process results. Data should be analysed to the species level (as opposed to the genus level) in order to confirm presence/absence of SAR bats. Note that MNRF may request a copy of the raw acoustic data file when reviewing the results of the work completed in Phase III.

Additional Notes:

Project proponents should be aware that information about the number of bat passes detected in an area does not allow for an estimate of the number of bats present because there is not a 1:1 relationship between the number of passes and the number of bats responsible for those passes. It is not possible to distinguish between several bat passes made by a single bat flying repeatedly through the study area vs. several bats each making a single pass. Therefore, bat passes cannot provide a direct estimate of population densities.

Next Steps:

If Little Brown Myotis and/or Northern Myotis are detected, project proponents should proceed to Phase IV (Snag Density Survey). If only Tri-colored Bat is detected, snag density is not relevant and the proponent can proceed directly to Phase V (Complete an Information Gathering Form).

Suitable Maternity Roost Trees for Little Brown Myotis/Northern Myotis

Include all live and dead standing trees >10cm dbh with loose or naturally exfoliating bark, cavities, hollows or cracks.

Project Name:
Site Name:
ELC Ecosite:

Survey Date(s):
Observers(s):
Snag Density (snags/ha):

Tree #	Tree Species ID	dbh (cm)	Height Class[1]	Snag attributes (check all that apply)	Easting	Northing	Notes
				☐ cavity[2] ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?[3]			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			
				☐ cavity ☐ loose bark ☐ crack ☐ knot hole ☐ other snag within 10m? ☐ Decay Class 1-3?			

[1] **Height Class**: 1 = Dominant (above canopy); 2 = Co-dominant (canopy height); 3 = Intermediate (just below canopy); 4 = suppressed (well below canopy)
[2] The approx. height of the cavity should be noted.
[3] **Decay Class**: 1 = Healthy, live tree; 2 = Declining live tree, part of canopy lost; 3 = Very recently dead, bark intact, branches intact.

Suitable Maternity Roost Trees for Tri-colored Bat

Include all oak trees ≥10cm dbh (if present). If oaks are absent, include maples ≥10cm dbh IF dead/dying leaf clusters are present; and maples >25cm dbh if no dead/dying leaf clusters are present.

Project Name: Survey Date(s):
Site Name: Observer(s):
ELC Ecosite:

Tree#	**Tree Species ID**	**Tree Status (live/dead)**	**Dbh (cm)**	**Tree Structural & Locational Attributes (check all that apply)**	**Easting**	**Northing**	**Notes**
				☐ dead/dying leaf cluster ☐ cavity ☐ open area/forest gap ☐ forest edge ☐ interior ☐ preferred tree species within 10m?			
				☐ dead/dying leaf cluster ☐ cavity ☐ open area/forest gap ☐ forest edge ☐ interior ☐ preferred tree species within 10m?			
				☐ dead/dying leaf cluster ☐ cavity ☐ open area/forest gap ☐ forest edge ☐ interior ☐ preferred tree species within 10m?			
				☐ dead/dying leaf cluster ☐ cavity ☐ open area/forest gap ☐ forest edge ☐ interior ☐ preferred tree species within 10m?			
				☐ dead/dying leaf cluster ☐ cavity ☐ open area/forest gap ☐ forest edge ☐ interior ☐ preferred tree species within 10m?			
				☐ dead/dying leaf cluster ☐ cavity ☐ open area/forest gap ☐ forest edge ☐ interior ☐ preferred tree species within 10m?			
				☐ dead/dying leaf cluster ☐ cavity ☐ open area/forest gap ☐ forest edge ☐ interior ☐ preferred tree species within 10m?			
				☐ dead/dying leaf cluster ☐ cavity ☐ open area/forest gap ☐ forest edge ☐ interior ☐ preferred tree species within 10m?			

Appendix D – Supplemental Wetland Commentary

APPENDIX D – Supplemental Wetland Commentary

The Province released the Wetland Conservation Strategy for Ontario (WCSO) (July 20, 2017). That Strategy, which completes work presented in the draft released in 2016 (MNRF 2016c) provides a framework to improve the conservation of wetlands across the Province. The WCSO provides a comprehensive review of recent and current legislation, policies, guidelines, international agreements and the importance of collaboration as ingredients to the conservation of wetlands in Ontario. The Strategy is defined as a "roadmap" to ensure that the Ontario government and its partners continue to reach higher and further to ensure that wetlands remain an enduring part of Ontario's landscape. The WCSO includes initial steps towards improving OWES and to providing some measure of removal and replacement, subject to a future no net loss policy.

The success of the Strategy is defined by the Province as:

> By 2025, the net loss of wetland area and function is halted where wetland loss has been the greatest.
>
> By 2030, a net gain in wetland area and function is achieved where wetland loss has been the greatest.

The Strategy provides a vision, goals and outcomes for conserving Ontario's wetlands as well as a list of actions the Ontario government will undertake to ensure progress. Examples of Principles defines in the Strategy include:

- Wetlands should be conserved based on three hierarchical priorities:
  - Protect – retain area and functions of existing wetlands,
  - Mitigate – minimize any further damage to wetlands, and
  - Restore – improve and re-establish wetland area and function on the landscape.
- Wetlands should be conserved based on a precautionary approach and using the best available science, information and traditional ecological knowledge.
- Conservation of all wetlands and their functions is important, including provincially significant, coastal wetlands and other locally and regionally important wetlands.
- Wetlands should be conserved in a manner that recognizes and is informed by the Aboriginal and treaty rights, as well as the interests of First Nation and Métis communities.

The strategy identifies four strategic directions and identifies some examples of actions that will be implemented. These are listed in the following and are summarized below:

- Awareness;
- Knowledge;
- Partnership; and
- Conservation.

From these four Strategic Directions, the Province has defined three Actions, which will be advanced as the highest priority activities coming from the Strategy:

Action 1: Improving Ontario's Wetland Inventory and Mapping;
Action 2: Creating No Net Loss Policy for Ontario's Wetlands; and
Action 3. Improving the Evaluation of Significant Wetlands.

The Province has appropriately raised questions about the need to improve guidance for evaluating the significance of wetlands in Ontario (e.g., correcting the OWES to reflect recent advances in science and knowledge; assessing whether some values that are not currently considered should be added; whether other values could be removed and whether some values should be re-assessed in light of new knowledge). Improvements are also identified related to the need for increased clarity where current guidance is limited (Action 3).

Problems exist throughout the OWES and its application. Perhaps most apparent are the inadequacies associated with the rating and ranking of socio-economic and Aboriginal components, which misrepresent their value and are not aligned with practices suggested in the literature. Other components of the OWES have similar technical weaknesses and gaps.

The development and implementation of an effective No Net Loss policy for wetlands is presented in the WCSO (Action 2). This proposed tool once developed, presents an opportunity to improve planning and community building outcomes where low functioning wetland units are involved. There is currently no guidance regarding how a no net loss approach will be defined.

In considering the potential removal of wetland areas in the Riverfront Community lands, the following principles have been identified:

- Wetland avoidance should be the primary approach to planning for development;
- Wetlands in Areas 1, 2, 3 (**Figure 7**, **Appendix A**) are the most important on this local landscape, although all wetlands present have a degree of function that needs to be fully considered;
- Wetland removal should be considered as a last resort and should be restricted to Area 4 (**Figure 7**, **Appendix A**);
- Any wetland removal, approved by the MNRF and NPCA will need to be fully offset in terms of wetland area and function; and
- The approach should consider achieving a net gain wherever possible (e.g., versus no net loss).

This proposed Riverfront Community development presents an opportunity to apply goals presented within the WCSO in a manner that can inform and enhance community and policy development outcomes. Rather than a no net loss, there are opportunities in this instance for the establishment of net gains, associated with potential:

- Ownership or easement opportunities to prevent ongoing uncontrolled access and to protect wetlands over the long term;
- Opportunities to create significant social and economic benefits associated with wise stewardship, controlled and limited access, scientific research, education and outreach;
- Opportunities to consider and improve the local Natural Heritage System through defined benefits and offsets both within and adjacent to the Subject Lands.

Given the relatively new WCSO, dialogue amongst various parties is required to fully understand and address the Province's interests and intentions.

The following specific information is provided to inform those discussions. It relates to wetland mapping presented on **Figure 8** (**Appendix A**). That Figure identifies wetlands assessed as "significant", with a more detailed understanding of the degree of function present. This designation includes all PSW units associated with Areas 1, 2, 3 (**Figure 7**, **Appendix A**) and wetlands that do not occur on intact topography, but which have a relatively higher degree of function for disturbance origin features. Those latter units are likely more appropriately included within the Welland River East Wetland Complex, rather than the Niagara Falls Slough Forest Wetland Complex (i.e., given topographic and geographic conditions).

The remaining 10 wetland areas, or areas with wetland characteristics do not merit designation as significant. The majority, occur within the Riverfront Community, or Subject Lands. Brief comments follow regarding these units – Table 3 (Appendix B) provides a relative comparison of functions present in each area, as contrasted with a typical slough forest wetland on intact soils (Last column, Table 3).

These findings should be discussed in detail with the MNRF. Concurrence will be sought for refinements to the OWES mapping to portray the degree of functional assessment more precisely and to review steps required to implement a no net loss approach to these small wetland features.

Appendix E – Curricula Vitae of Savanta Study Team

Noel Boucher B.Sc. (Env.)

Senior Fisheries Biologist

Curriculum Vitae

Noel brings over 17 years of experience, primarily in environmental consulting, to his role at Savanta. He has completed numerous baseline, construction and post-construction fisheries monitoring studies, impact assessments and permitting and approval acquisitions for a wide range of project types in the energy, infrastructure and land development sectors.

FISHERIES EXPERIENCE

Noel has extensive experience in the design and implementation of fisheries studies to support environmental assessments, permitting and approvals, constraints and fatal flaw assessments and post-construction studies. Noel has broad knowledge of fisheries assessment protocols and techniques, as well as agency expectations regarding fisheries studies in various development sectors.

Noel's fisheries and related experience includes fish community assessment (electrofishing, gill netting, trap netting, seine netting), fish passage studies (PIT tagging, radio telemetry), spawning studies (visual assessment, egg collections), aquatic habitat assessments, including Ontario Stream Assessment Protocols, and Headwater Drainage Feature Assessments. In addition to fish and fish habitat studies, Noel has also completed high-water mark delineations and setback assessments, benthic invertebrate studies, surface water quality assessments and fish tissue mercury studies. Noel is experienced with aquatic species at risk in Ontario, including Redside Dace, American Eel and Lake Sturgeon, and has completed studies in environments ranging from small creeks to large lakes.

Noel has successfully obtained Fisheries Act Authorizations and Letters of Advice for waterpower facilities, dams, road water crossings and shoreline development projects. Noel has in-depth knowledge of fisheries impact assessment requirements and avoidance, mitigation and fish habitat offsetting and compensation measures and has designed fish habitat features including spawning beds, wetland spawning and nursery areas and complex shoreline habitats.

ENVIRONMENTAL ASSESSMENT EXPERIENCE

Noel is very familiar with a wide range of federal and provincial Environmental Assessment (EA) protocols. Federally, he is experienced with EAs and Section 67 assessments under the Canadian Environmental Assessment Act. Provincially, his experience includes the Municipal Class EA, Conservation Ontario Class EA, Waterpower Class EA, Class EA for Minor Transmission Facilities, MNR Class EA, and Environmental Screening Process Requirements for Electricity Projects and Waste Management Projects.

Noel's EA experience has included roles associated with overall project management, environmental coordination and technical fisheries input. In his roles as project manager or environmental coordinator on various types of EAs, Noel has been responsible for the management and implementation of a wide range of environmental services for EAs including Aboriginal, public and agency consultation, impact assessment, identification of avoidance and mitigation measures, net effects assessment, significance determinations, cumulative effects assessment, reporting and agency follow-up.

Noel's consultation experience in support of EAs includes stakeholder mapping, consultation planning, attendance and presentations at public meetings and open houses, facilitation of agency meetings and Aboriginal community meetings. Noel has completed consultations on complex and contentious projects with varying levels of community support and opposition and he utilizes his strong listening skills to build trust and foster good working relationships with stakeholders to ensure meaningful consultation occurs.

PROJECT MANAGEMENT EXPERIENCE

Noel has managed projects ranging from small studies to large, multi-disciplinary assessments for complex development projects. He has applied his strong project management skills to maintain team productivity and effectiveness and ensure that projects are delivered in accordance with high quality standards, on schedule and on budget.

Most recently, Noel managed a team of environmental specialists to complete an Environmental Impact Study for a proposed residential development in the GTA. Noel was responsible for ensuring all fieldwork was completed and all deliverables were propared on budget and schedule and in accordance with Savanta's high quality standards.

Noel has also managed a team of environmental and various engineering discipline specialists to complete the detailed engineering design, technical specifications and environmental permit applications for a shoreline development project in northern Ontario. In this role, Noel had primary responsibility for client engagement, subconsultant management, quality control and scheduling while ensuring cohesiveness of the engineering and environmental inputs to the overall project design.

SELECT PROJECT EXPERIENCE

- EIS for proposed residential development, Oshawa, Ontario
- Preparation of an opinion letter supporting a proposed watercourse realignment, Milton, Ontario
- Block 51-1 post-construction aquatic monitoring and reporting, Brampton, Ontario
- Hilton Falls Diversion Dyke Upgrade Project: Conservation Ontario Class EA, Milton, Ontario
- Shickluna Small Hydro Project: Environmental Screening Report, environmental permitting and baseline fisheries studies
- 20 Solar Projects in Southern Ontario: Renewable Energy Approvals and amendments, environmental permitting and environmental monitoring during construction
- Chaudière Hydro Project: Environmental Effects Determination and Fisheries Act Authorization
- Timiskaming Ontario Dam Replacement Project: Environmental Effects Determination and Fisheries Act Authorization
- Gull Bay Shoreline Stabilization Project: Environmental Permitting (Fisheries Act, Endangered Species Act, Navigation Protection Act, Aggregate Resources Act, Public Lands Act) and environmental specifications
- Assistance with Large Renewable Procurement application process for 7 Solar Projects: Consultation and Site Considerations Reports
- Kabinakagami River Project: Ontario Waterpower Association Class EA and baseline fisheries studies
- Umbata Falls Hydroelectric Project: Environmental Screening Report, baseline fisheries studies, permitting and approvals, post-construction environmental monitoring
- Shikwamkwa Dam Replacement Project: MNR Class EA, baseline fisheries studies and post-construction environmental monitoring.

EDUCATION

B.Sc., Environmental Science, University of Guelph

CERTIFICATION AND TRAINING

- MTO/DFO/OMNRF Fisheries Protocol Training
- Ontario Class 2 Backpack Electrofishing Certification
- Ontario Wetland Evaluation System Certification

EMPLOYMENT HISTORY

- Savanta: April 2016 - present
- Hatch Ltd.: 2001 – 2015: Lead, Environmental Services Group, Niagara Falls Operations (2014 – 2016); Aquatic Biologist (2001 – 2016)
- Royal Botanical Gardens: 2000 – 2001, Fisheries Technician
- Hamilton Conservation Authority: 1999, Fisheries Technician

Peter Burke B.Sc.

Ornithologist, Senior Ecologist

Curriculum Vitae

Peter has accumulated 28 years of extensive natural history knowledge that includes wildlife, insect and vegetation communities within Southern Ontario and beyond. He possesses an expert knowledge of birds across North, Central and South America, which includes breeding bird surveys, bird banding, bird field guide illustration and bird tour leading. Peter also possesses expert knowledge of butterfly, dragonfly and damselfly communities in Eastern Canada, including identification of species, both adults and larvae, and field guide illustration. He is experienced in the writing of Management Plans and preparing extensive annotated bibliographies for Species at Risk.

Peter is knowledgeable with regard to Peregrine Falcons, including their biological requirements, reintroduction programs throughout southern Ontario and hacking sites in large cities, including London. He has also been involved with addressing improvements to Barn Swallow replacement nest structures on several recent Savanta projects, working with Savanta team members to design the most effective ways to maximize usage. His familiarity with the scientific literature and field experience have combined to produce meaningful improvements such as nesting cup placement in relation to proximity of cover and audio and visual attractants, that have increased structure usage by Barn Swallows in 2015.

Peter has searched for and documented potential habitat of the Endangered Kirtland's Warbler in Ontario for the Canadian Wildlife Service. He is a professional tour leader for Field Guides Inc., and is a world-renowned professional illustrator for various bird field identification guides, including National Geographic.

EXPERIENCE

With Savanta, Peter has conducted field surveys for breeding birds, including SAR species and other wildlife including herptiles, mammals, odonates and lepidoptera. He is responsible for documenting specific breeding information on SAR species and following MNRF protocols while conducting searches for these species. He also reported all species in datasets and provided written summaries of important areas for wildlife found on the subject lands, completed specific reporting on SAR species found on the subject lands, and mapped polygons to delimit specific inhabited areas.

Earlier in his career Peter performed reconnaissance work to detect the endangered and extremely rare Kirtland's Warbler in potential breeding locations in Southern Ontario. This work included site determination via FRI mapping and GIS. This work has involved initiating communications with individuals in the Forestry industry, performing site searches, deploying songmeters, documenting breeding evidence, reporting habitat characteristics, as well as reporting presence /absence, and working to determine what future efforts should take place to secure breeding habitats for this species in Southern Ontario.

During his time with the MNRF and Trent University, Peter conducted yearly breeding bird productivity monitoring studies. He found and monitored the nesting success of forest birds in hardwood communities across several logging practices in Algonquin Park, as well as public and private woodlots in Southwest Ontario. This included banding endangered species such as the Acadian Flycatcher. He also conducted vegetation surveys, which quantified the territory and site level structural characteristics. During that time Peter also participated in salamander monitoring surveys using mark-recapture techniques and cover boards. He also assisted with Southern Flying Squirrel trapping using mark-recapture techniques and live traps.

Peter has constructed an annotated bibliography for 25 bird Species at Risk. This included the collection of scientific papers, PhD. dissertations, relevant internet sources, books, and consultations with over 20 experts in Canada and the United States. Covering all SAR in Ontario, information was categorized for various topics ranging from relationship to vegetation management, forestry and agricultural practices, wind turbine energy, aggregates, transportation, pesticides/herbicides, fisheries, mining, etc.

Peter Burke B.Sc.

EDUCATION

- B.Sc. Biology, Guelph University (1991)

PROFESSIONAL AND OTHER AFFILIATIONS

- Created Listserve for public use of natural history in Middlesex, Oxford & Elgin Counties: 2009
- Served as Chair of the Ontario Bird Records Committee: 2001
- World renowned illustrator for bird identification guides.

CERTIFICATION AND TRAINING

- Wilderness First Aid Training
- Wilderness Bear Safety Courses

EMPLOYMENT HISTORY

- Savanta Incorporated: Biologist June – August 2010-2013 (contract), April 2014 – Present (Full-Time)
- Canadian Wildlife Service: Contract Biologist January 2013 – Present
- Ontario Ministry of Natural Resources and Forestry (OMNRF): Contract Biologist, October 2012 - Present
- Golder & Associates: Contract Biologist April – November 2010
- Natural Heritage Information Centre, MNRF: Contract Biologist June – September 2010, May – September 2003
- MNRF & Trent University: Contract Biologist July 2001 – 2011
- Bird Studies Canada: Field Biologist May 1991 – November 2003
- Various Organizations: Biology Consultant 1987 – 1991 Organizations include: Canadian Forest Service, Canadian Wildlife Service, Environment Canada, Trent University
- Ministry of Natural Resources and Forestry: Interpretive Naturalist June – September (summers) 1987 – 1990

Shannon Catton M.Sc.

Manager, Environmental Consulting

Curriculum Vitae

Shannon brings a decade of experience working on environmental approvals, impact assessment studies, natural heritage reviews, ecological restoration and Species at Risk assignments for various private interests. Shannon has provided environmental expertise to major oil and gas pipeline expansion projects, limestone quarry expansions, power transmission and electricity infrastructure renewal projects, wind and solar power project approvals and various residential developments. She brings positive energy, insight and mindfulness to the resolution of complex environmental approval challenges.

Shannon's project management experience has included preparing, coordinating and implementing of annual field program and annual work programs, as well as budget requirements, technical reporting and Species at Risk permit applications, as well as on-going collaboration with various government agencies and other stakeholders. Terrestrial surveys included salamander migration and egg mass surveys, tissue sampling (in conjunction with the Ministry of Natural Resources and Forestry) and amphibian call count surveys.

Shannon has also performed terrestrial surveys including tree inventories, vegetation community assessments (Ecological Land Classification and Ontario Wetland Evaluation Systems), habitat assessments, winter wildlife surveys, and reptile hibernacula surveys. She has also performed Natural Heritage Reviews for various residential development projects in the Oak Ridges Moraine and Niagara Escarpment Plan areas.

Shannon provided on-going provincial guidance for a cross-country pipeline regarding terrestrial policies such as the Species at Risk field programs, Endangered Species Act and Migratory Bird Convention Act and municipal permitting. Shannon also provided senior review for technical reports and the Environmental Assessment Report for the NEB application.

SELECT PROJECT EXPERIENCE

- Dufferin Aggregates Action Quarry Extension, Action, Ontario
- Terrestrial Surveys for various pit and quarry implementation and extension projects, Ontario
- Timberland Homes Subdivision, LaSalle, Ontario
- Natural Heritage Evaluations for various residential development projects, Ontario
- Environmental Impact Studies for various residential development projects, Ontario
- TransCanada Pipelines Energy East Expansion Project, Alberta to New Brunswick
- TransCanada Pipelines Parkway Loop, Greater Toronto Area, Ontario
- NOVA Chemicals Pipeline Extension Project, Sarnia, Ontario
- Union Gas Bluewater River Crossing Replacement Project, Sarnia, Ontario
- Hydro One Networks Inc. Midtown Electricity Infrastructure Renewal Project, Toronto, Ontario
- Hydro One Networks Inc. Darlington Power Plant, Pickering Ontario
- St. Columban Wind Projects, St. Columban, Ontario
- Almonte Solar Project, Almonte, Ontario

SELECT PUBLICATIONS AND PRESENTATIONS

- Catton, S. The Ontario Endangered Species Act: Project Implications and Proactive Management. Presentation for various clients and Stantec offices in Ontario, 2012.
- Matthew, U., P.J. Richardson, S. Catton, C.D. Stabler, D.W. Larson. The quarry-to-alvar initiative: Creating new alvar habitat from abandoned limestone quarries. Canadian Reclamation, 2:10-15, 2009.
- Tomlinson, S., U. Matthes, P.J. Richardson, D.W. Larson. The ecological equivalence of quarry floors to alvars. Applied Vegetation Science, 11:73-82, 2008.
- A comparative analysis of the seed bank, vegetation and environmental conditions of abandoned limestone quarry floors of southern Ontario and alvars on the Bruce Peninsula, Canada. Presentation to the World Conference on Ecological Restoration by the Society of Ecological Restoration (SER), Spain, 2005.
- Biological and physical comparisons of quarry floors and alvars. Presentation to the Aggregate Producers' Association of Ontario Pit and Quarry Restoration Workshop, Hamilton, Ontario, 2005.
- Using alvars as a reference ecosystem to restore abandoned limestone quarries. Poster Presentation at the A.D. Latornell Conservation Symposium, Alliston, Ontario, 2004.
- A comparative analysis of the seed bank, vegetation and environmental characteristics of abandoned limestone quarry floors of southern Ontario and alvars on the Bruce Peninsula. Presentation to the Ontario Ecology and Ethology Colloquium (OEEC), Mississauga, Ontario, 2004.
- The quarry-to-alvar initiative: progress report. The Ontario Aggregate Resources Corporation (TOARC) Annual Report, Burlington, Ontario, 2003.
- The quarry-to-alvar initiative: restoring value to abandoned quarries. The Ontario Aggregate Resources Corporation (TOARC) Annual Report, Burlington, Ontario, 2002.

Shannon Catton M.Sc.

EDUCATION

M.Sc., Botany, University of Guelph, 2006

B.A., B.Sc., Sociology and Biology (Hons), University of Guelph, 2003

CERTIFICATES AND TRAINING

Ontario Ministry of Natural Resources Ontario Wetland Evaluation

Systems (OWES) Certification, North Bay, Ontario, 2008

Ontario Ministry of Natural Resources Ecological Land Classification for southern Ontario (ELC) Certification, Turkey Point, Ontario, 2006

EMPLOYMENT HISTORY

Savanta Inc., 2014 – 2015: Manager, Environmental Consulting

Savanta Inc., 2013 – 2014: Terrestrial Ecologist, Project Manager

Stantec Consulting, 2012 – 2013: Terrestrial Team Lead

Stantec Consulting, 2010 – 2012: Senior Terrestrial Ecologist and Project Manager

Stantec Consulting, 2007 – 2010: Project Manager

Stantec Consulting, 2006 – 2007: Terrestrial Ecologist

Hamilton Conservation Authority, April – October 2006: Natural Heritage Technical Lead

Tom Hilditch B.Sc.

President & CEO

Curriculum Vitae

PUBLIC AND PRIVATE SECTOR WORK

Tom is an environmental professional with a deep knowledge and understanding of Environmental Impact Assessment (IA) and Sustainability. Early on in Tom's 35-year environmental career, he completed ecological inventories of natural areas in support of conservation authority Environmentally Significant Areas studies and as input to a range of consulting projects. The bulk of his career has been invested in the environmental consulting industry where he has completed hundreds of projects for both public and private sector clients in a range of settings (e.g., Canada, Venezuela, Barbados, China, Japan, Equatorial Guinea). Tom has developed a reputation for his work on complex files, where innovation and collaboration are core aspects to the development of practical and meaningful outcomes.

Tom has contributed to watershed and subwatershed planning, and has led integrated coastal zone management and regional scale projects, where key aspects have included the completion of rapid assessments, comprehensive stakeholder engagement and expert testimony. His projects, completed for local, regional, state and national levels of government have most recently included responsibility for the Natural Heritage and Drainage sector components of the new Barbados Physical Development Plan. In Barbados he has led the creation of a Natural Heritage System (NHS) as a foundation for green economic and innovative land use planning.

In terms of private sector projects, Tom is currently leading detailed ecological assessments across about 25,000 ha of land slated for the creation of new healthy communities. His work includes the planning, implementation and monitoring of innovative and practical Natural Heritage Systems. He has completed extensive work with species at risk, including contributions to policy and guideline development, impact assessment and permitting, as well as innovative overall benefit projects.

Tom has completed detailed studies for the land development, mineral aggregate and energy industries. He recently completed a detailed peer review of potential impacts of

a large renewable energy project on species at risk. That work, addressed the proposed 300 MW wind energy centre on the Henvey Inlet First Nation lands in central Ontario and its relationship with about 20 reptile and bird species at risk. While working with the First Nation community, Tom provided input to an Environmental Permit for the management of all aspects of pre-construction, construction, operations and decommissioning stages of the wind farm.

Tom has had the honour of speaking before national and international audiences, including: Wetlands International, INTECOL, International Association for Impact Assessment, Society of Wetland Scientists and the Canadian Society of Landscape Architects. He has developed and delivered EIA training sessions with several hundred EIA practitioners, regulators and NGOs. Most recently, he initiated and organized the Ontario Endangered Species Act Conference, which brought together over 230 individuals from all backgrounds intensely involved with the Act across Ontario.

SCIENTIFIC AND INDUSTRY ASSOCIATION WORK

In 2015, Tom was appointed by the Province of Ontario to serve as the Chair of the Committee on the Status of Species at Risk in Ontario (COSSARO). This builds upon his earlier provincial appointment as the Chair of the Species at Risk Program Advisory Committee (SARPAC), a body that reports to Ontario's Ministry of Natural Resources and Forests, regarding the implementation of the Ontario Endangered Species Act, 2007. Tom also served as Director on the Ontario Board for Nature Conservancy Canada, and served as the Special Advisor to the Board of Directors of the Ontario Stone, Sand and Gravel Association (OSSGA) for all matters related to the environment and Natural Heritage. He remains an active participant in the Building and Land Development Industry of Ontario (BILD).

Tom has served as the President of the Canadian Chapter of the Society of Wetland Scientists and for the Canadian Land Reclamation Association in Ontario.

SELECT PUBLICATIONS AND PRESENTATIONS

Provincial Policy Statement 2014: A Comparison of Recent Changes to the PPS with a Focus on Natural Heritage System Policies. Presented at: Ontario Bar Association; 2015 February 5; Toronto, Canada.

Provincial Planning Statement and Environmental Protection. Presented at: Land Development & Planning Forum; 2014 June 17-18; Toronto, Canada.

Founder and Chair of The Ontario Endangered Species Act Conference; 2013 April 8-9; Royal Ontario Museum, Toronto, Canada.

Innovations in Endangered Species Legislation. Presented at: 2nd World Biodiversity Congress: 2011 September 8-12; Kuching, Malaysia.

Endangered Species Legislation as a Stimulus for Habitat Restoration. Presented at: Society for Ecological Restoration 4th World Conference on Ecological Restoration; 2011 August 21-25; Merida, Mexico.

The Presqu'ile Bay Species at Risk Outreach Project Case Study. Presented at: The International Association for Great Lakes Research 53rd Annual Conference on Great Lakes Research; 2010 May 17-21; Toronto, Canada.

Endangered Species Act, 2007: Implications and Opportunities. Presented at: Ontario Stone, Sand and Gravel Rehabilitation Tour: 2008 September 11 and September 25; Bowmanville, Canada.

Endangered Species Act, 2007: Consequences and Opportunities. Presented at: Ontario East Municipal Conference; 2008 September 10-12; Kingston, Canada.

Endangered Species Act, 2007: A Private Sector Perspective. Presented at: Ontario Bar Association; 2008 September 11; Toronto, Canada.

A Private Sector Species at Risk Initiative: St. Mary's Cement & Great Lakes Wetland Stewardship. Presented at: A.D. Latornell Conservation Symposium; 2007 November 14-16; Alliston, Canada.

An Overview of Canadian Environmental Technologies. Presented at: Environment 2001 Conference; 2001 4-8 February; Abu Dhabi, United Arab Emirates.

Achieving Excellence in Natural Heritage Planning. Presented with D. Charlton and R. Hubbard at: Ontario Provincial Planners Conference; 2000 Niagara Falls, Canada.

Biodiversity Planning; Multi-layered Stakeholder Consensus Building, A Model for Success. Presented at: International Association for Impact Assessment Annual Meeting; 1998; Christchurch, New Zealand.

Provincial Wetlands Policy, Environmental Impact Study Requirements. Presented at: Society of Wetland Scientists; 1994; Washington, United States.

Brick Wetlands Complex, An EIS Case Study. Presented at: Wetlands Boundaries, Buffers and Gradients Conference; 1994; Waterloo, Canada.

Wetland Impact Mitigation Techniques, A Case Study. Presented at: Ontario Ministry of Natural Resources and Transportation; 1994; Ontario, Canada.

Wetland Policy Statement Implementation Issues and Experiences, Long Range Planning Directions; 1993; Ontario, Canada.

Woodland Evaluation Systems – Their Use and Application in Municipal Planning. Presented at: The Significant Woodlands Workshop, Ontario Ministry of Natural Resources; 1993; Dorset, Canada.

Buffers for the Protection of Wetland Ecological Integrity – A Model for Buffer Determination. Presented at: International Association of Ecology 4th International Wetlands Conference; 1992 September; Ohio, United States.

GIS – A Tool for Ecological Mapping and Impact Assessment of an Environmentally Sensitive Area. Presented at: The International Association for Impact Assessment Annual Meeting; 1992 August; Washington, D.C., United States.

SELECT PROJECT EXPERIENCE

Henvey Inlet Wind Species at Risk EA Peer Review and Environmental Permit Input, Henvey Inlet First Nation, Pickerel

Natural Heritage and Drainage Sector Planning and Input to the Barbados Physical Development Plan, Barbados

Milton Urban Expansion Lands Ecological Investigations and Environmental Approvals (Boyne District, Milton Phase 4, Derry Green)

North Markham Urban Expansion Lands Ecological Investigations and Environmental Approvals

Grandview Resort Golf Course Development EIA, Huntsville

Environmental Baseline, Impact Assessment and Natural Heritage System Design Study, Heritage Heights, Brampton

Nelson Burlington Quarry License Expansion and Rehabilitation Design

Environmental Inventory Reporting, North Oakville Secondary Plan Implementation

EIAs for Clublink Corporation: Kings Riding, Cherry Downs, Rolling Hills

EIAs for Kaneff Group Golf Course developments: Royal Ontario Lionhead

EIA for golf course, resort and condo development, Grand Niagara, Niagara Falls

Eagle Heights Environmental Impact Assessment, Environmental Monitoring and Expert Testimony

St. Mary's Cement Greenfield Quarry EIA and ARA Application, Flamborough

Brighton, Presqu'ile Species at Risk Conservation and Restoration Planning, St. Mary's Cement

American Badger Strategic Assessment of Range and Soils/Habitat; Creation of Innovative Recovery Tools

Airport Expansion, Screening Level Environmental Assessment, Equatorial Guinea, Africa

Mai Po Wetland EIS and Conservation Planning Investigation, Hong Kong, PRC

Niagara Waterfront Planning Study; Master Planning for Economic Rejuvenation

Municipal Class Environmental Assessment, Scarborough Golf Club Road, Rail Separation

Municipal Class Environmental Assessment Jackson District Sanitary and Storm Sewer

Horseshoe Valley Resort Corporation, Sewage Treatment Class Environmental Assessment

Kingston Area Waste Management Master Plan

GO Transit Class EA, Rail Line Upgrade, Toronto

Swan Lake Wetland Management Concept Plan, Wehai Province, PRC

Downsview National Urban Park Design and Green Infrastructure Plan

Greening of the Official Plan, Regional Municipality of York

Elephant Conservation ENGO Observations & Opportunities, Confidential Exploratory Document

Tom Hilditch B.Sc.

EDUCATION

- B.Sc., Agr., Resources Management, University of Guelph

PROFESSIONAL AND OTHER AFFILIATIONS

- Society for Conservation Biology
- International Association for Impact Assessment
- Ontario Field Ornithologists
- Canadian Society of Environmental Biologists
- International Association for Environmental Philosophy
- The International Society for Ecological Economics
- Ontario Stone, Sand and Gravel Association
- Society for Ecological Restoration
- Canadian Land Reclamation Association

EMPLOYMENT HISTORY

- Savanta Inc. 2006 – Current: Founder, President & CEO
- Stantec Consulting 2005 – 2006: Vice President
- Stantec Consulting 2005: Senior Principal
- Stantec Consulting 2003 – 2005: Principal
- ESG International Inc. 2001 – 2003: President
- ESG International Inc. 1997 – 2001: Vice President
- ESG International Inc. 1994 – 1997: Senior Ecologist, Principal
- Gartner Lee Ltd. 1989 – 1994: Senior Ecologist, Associate
- Gartner Lee Ltd. 1983 – 1989: Ecologist
- Lake Simcoe Region Conservation Authority 1981 – 1983: Forest and Wetland Technician
- Ecologistics Ltd. 1981: Manager, Field Biology Team
- Toronto and Region Conservation Authority 1979 – 1981: Field Biologist, Environmentally Significant Areas of Study

Kyle Hunt M.E.Des

Senior Environmental Assessment and Indigenous Engagement Specialist

Curriculum Vitae

Kyle brings over fourteen years of environmental impact assessment (EIA), Indigenous engagement and environmental permitting experience to the Savanta team. Kyle has managed numerous high profile and controversial EIA's for renewable energy, electrical transmission, power generation, oil and gas and waterfront development projects. Kyle is a member of the International Association for Impact Assessment and the Ontario Association for Impact Assessment.

Throughout his career, Kyle has worked with private, public and Indigenous clients to conduct EIA related biophysical and socio-economic technical studies, prepare and peer review EIA documents and engage with Indigenous and non-Indigenous communities to incorporate local knowledge and concerns into the EIA process. Kyle has expert knowledge of all phases of the EIA process including project scoping, routing and siting studies, environmental baseline studies, mitigation planning, cumulative effects assessment, Indigenous and public engagement, follow-up monitoring and land reclamation.

Kyle is a skilled and effective EIA practitioner who develops strategic and innovative solutions to complex environmental problems that achieve meaningful project outcomes while balancing environmental, social and economic objectives.

SELECT PROJECT EXPERIENCE

- Canol Pipeline Remediation Access Assessment, Public Works and Government Services Canada, Norman Wells Northwest Territories
- Great Bear Lake Remediation Project, Public Works and Government Services Canada, Yellowknife Northwest Territories
- Henvey Inlet First Nation Wind Project EIA, Pattern Energy and Nigig Power Corporation, Pickerel Ontario
- Wataynikeneyap Power Transmission Line, on behalf of various First Nation communities in Northwestern Ontario
- Lakeview Waterfront Connection Environmental Assessment, Credit Valley Conservation Authority, Mississauga Ontario
- Balsam Lake Solar Farm Renewable Energy Approval, Panasonic, Coboconk Ontario
- Don Mouth Naturalization Project Environmental Assessment, Toronto and Region Conservation Authority, Toronto Ontario
- Habitat Banking in Canada, a white paper on behalf of Fisheries and Oceans Canada, Ottawa Ontario
- East-West Tie Transmission Routing Constraints Analysis, TransCanada Energy, Toronto, Ontario.
- Oakville Generating Station Environmental Assessment, TransCanada Energy, Oakville Ontario
- Northwest Transmission Expansion Project Environmental Assessment, Hydro One Networks Inc., Thunder Bay Ontario

SELECT PRESENTATIONS, CONFERENCES AND PUBLICATIONS

- "Species at Risk Permitting in Canada: Challenges and Opportunities", Canadian Bar Association Energy and Environment Conference, 2017
- "Developing Indigenous Led Regulatory Processes on First Nation Reserve Land", Ontario Association of Impact Assessment, 2016
- "Developing Indigenous Led Regulatory Processes on First Nation Reserve Land", delivered to Dr. Jennifer Taylor's Undergraduate Course in Environmental Impact Assessment, 2016
- "Developing a Fish Habitat Banking Program in Canada", Environmental Science and Engineering, January 2011
- "Effects of Manmade Snow on Native Plant Communities", Parks Canada, 2008

EDUCATION

- M.E.Des., Environmental Science, University of Calgary
- BES Honours, Forest and Natural Resources, Lakehead University

EMPLOYMENT HISTORY

- Savanta Inc, 2016 - Present: Senior Project Manager
- AECOM, 2014 - 2016: Senior Planner
- SENES Consultants, 2009-20014: Environmental Scientist
- Resorts of the Canadian Rockies, 2004-2009: Environmental Manager

Eva Lee B.Sc.

Ecologist

Curriculum Vitae

Eva Lee has a diverse background which includes the roles of Junior Reclamation Specialist in Alberta, Upper Air Technician in Nunavut with Environment Canada, Botanist Technician in Manitoba, and Curatorial Research Assistant with the Toronto Zoo.

Eva has highly developed flora, fauna and soil identification skills, and she is experienced in wildlife sweeps, small mammal surveys, benthic sampling, vegetation monitoring, and many others. She is also experienced in conducting pre and post construction monitoring surveys. Eva's ability to adapt to various working environments, operational strategies and demanding workloads is well developed. She is certified in various safety courses, including but not limited to: Possession and Acquisition License, Winter Survival Training, Wilderness Awareness, First Aid, Argo and ATV Operator and Pleasure Craft Operator.

BACKGROUND & EXPERIENCE

Until joining Savanta in June 2014, Eva held a Junior Ecologist consulting position in Markham, Ontario, where she was responsible for assisting with field assessments of terrestrial and aquatic ecosystems, biological inventory and monitoring, GIS mapping, AutoCAD drafting and data analysis. As a junior reclamation specialist in Calgary, Alberta, Eva was responsible for conducting and assisting with field assessments related to remediation, reclamation and restoration. This work included Ecological Land Classifications (ELC), wetland classifications, weed surveys, Phase I & II Environmental Site Assessments, pre-and-post-construction monitoring as well as wildlife surveys. In this role, Eva also wrote reports, coordinated projects, interpreted aerial photographs and maintained excellent communication with project managers.

While working for Parks Canada (PC) in Churchill, Manitoba, Eva completed plant inventory lists for various PC properties. She also created several communications and interpretative products to be used for educational and research purposes by park staff and visitors. Eva

assisted Park Canada Ecosystem Scientists with various projects, including radio-collar tracking of Polar Bears, assisting with wildlife population distribution surveys, setting up permafrost loggers and remote wildlife sensing cameras.

Eva has also held positions as a Bird of Prey Handler, a Curatorial Research, and as an Upper Air Technician in Nunavut Ontario. She has experience writing Environmental Protection Plans, Contaminated Site Inventories, and conducting Environmental Site Assessments (Phase I and II). Eva is also experienced with Ecological Land Classifications (ELC), wetland classifications, soil classifications as well as the identification of flora and fauna in Ontario, Alberta, Manitoba and Nunavut. She has been a Crew Lead on various large budget field projects, responsible for client contact and resolving conflicts. She has led nature and interpretive walks, as well as lectures and has experience travelling and living in remote locations and is familiar working alongside military personnel.

In a volunteer capacity, Eva has also assisted researchers in Manitoba with mark-recapture studies of small animals and walked roadsides in Ontario documenting all signs of wildlife/road interactions, collecting data that would inform decisions around wildlife road mortality in Rouge Park. In Nunavut, Canada, Eva also volunteered to survey and assist with data collection for migratory shorebirds, which included completing point counts, as well as netting, banding and releasing various shorebirds. This work also included surveying behavioural activities of small mammals in the area. Eva also assisted with an Ellesmere Island Wolf project at the Eureka Weather Station, including radio-tracking the local Arctic Wolf population.

SELECT PROJECT EXPERIENCE

Amphibian Survey Lead for Milton Phase 4 Proposed Developments

Conducted and assisted with terrestrial surveys for Norton Park Place Scoped Environmental Impact Study, Brampton, Ontario

Assisted with Natural Heritage System restoration for Block 51-2, Brampton, Ontario

Assisted with Natural Heritage Impact Study for Easton's Group of Hotels 4050 Yonge St., Toronto

Reptile Lead for Elgin Mills Greenway SWM Pond, Richmond Hill, Ontario

Eva Lee B.Sc.

EDUCATION

- B.Sc., Natural Resource Management, University of Guelph
- Environmental Technician Diploma, Seneca College

CERTIFICATION AND TRAINING

- Currently pursuing C.Tech (OACETT) and EPt (ECO Canada) designations
- WHMIS & TDG
- Ground Disturbance Level II
- First Aid
- H2S Alive
- ATV and ARGO Operator
- Pipeline Construction and Safety Training
- Wildlife Awareness
- Infrastructure Health and Safety Association (HAS) Basic
- Pleasure Craft Operator Card (PCOC)
- Possession and Acquisition License (PAL)
- Petroleum Safety Training (PST 2.0)
- Other skills include: basic wilderness survival, kayaking and canoeing, hiking and wildlife tracking. Fluent in Chinese (Mandarin) and French (basic).

VOLUNTEER EXPERIENCE

- Churchill Northern Studies Centre (2012)
- Ontario Road Ecology Group (2011)
- National Wildlife Research Centre under the direction of Dr. Guy Morrison (2009, 2010)
- U.S. Fish & Wildlife Service under the direction of Dean Mech and David Cluff (2010)

EMPLOYMENT HISTORY

- Savanta Inc. June 2014 - Current: Ecologist
- Beacon Environmental, Nov – June 2013 – 2014: Junior Ecologist
- TERA Environmental Consultants, May – Aug 2013: Junior Reclamation Specialist
- Parks Canada, May – Aug 2012: Botanist Technician
- African Lion Safari, Mar – May 2012: Bird of Prey Handler and Trainer
- Toronto Zoo, June – Sept 2011: Curatorial Research Assistant
- Environment Canada, Apr – Aug 2009, Apr – Sept 2010: Upper Air Technician

Curriculum Vitae

SAVANTA

www.savanta.ca

Lead Reptile Biologist for Rouge Park Blandings Turtle Headstart Initiative, Scarborough, Ontario

Lead Reptile Biologist for the Rouge Park Blandings Turtle Population Viability Analysis

Salamander surveyor for the East Boundary Road proposal, Cambridge, Ontario

Reptile Biologist for Milton Phase 4 proposed residential developments

OWES wetland co evaluator for North Markham Berczy and Bruce tableland wetlands, Markham, Ontario.

Christopher Zoladeski Ph.D.

Botanist, Senior Ecologist

Curriculum Vitae

Chris has 25 years of environmental consulting experience on projects ranging from biological surveys to comprehensive natural heritage strategies and sustainable forestry audits. He has an extensive knowledge of forest, wetland and applied plant ecology and Ecological Land Classification and flora of southern and central Ontario.

Chris implemented conservation biology principles in the development of biodiversity, watershed and natural heritage policy planning. He conducted numerous Environmental Impact Assessments including habitat restoration, species at risk management and wetland delineation for projects ranging from housing and golf course developments to comprehensive assessments of aggregate sites.

HABITAT RESTORATION

Chris had a lead role in several projects involving major habitat restoration initiatives, in particular those carried out by aggregate resources operators and major land developers. For example, he provided a template for a tallgrass prairie restoration and rehabilitation strategy at sites in southern Ontario. In northwest Brampton, he was a member of a multidisciplinary team devising a natural heritage system along re-aligned watercourse and valley channel.

IMPACT ASSESSMENT

Participating in various roles, Chris has completed field investigations and data analysis as well as project management duties in hundreds of site-specific environmental impact studies for housing, industrial and pipeline developments. These assignments included proposals for mitigation measures to lessen the impacts on the natural habitats and species, while supporting a balanced approach to land use.

WETLAND DELINEATION AND SIGNIFICANT WOODLANDS

Based on his knowledge of wetland vegetation, flora, soils and habitat features and functions, Chris has completed numerous wetland delineations and analyses. The results contributed to a better understanding of these ecosystems and better decisions regarding development limits. Similarly, using the criteria established by municipalities and the province, he delineated and analyzed many sites containing Significant Woodland areas.

SELECT PUBLICATIONS

Books

Zoladeski, C.A., Delorme, R.J., Wickware, G.M., Corns, I.G.W. and Allan, D.T. 1998. Forest ecosystem toposequences in Manitoba. Special Report 12, Canadian Forest Service, Northern Forestry Centre, Edmonton, Alberta, 63p.

Zoladeski, C.A., Cowell, D.W. and Ecosystem Classification Advisory Committee. 1996. Ecosystem classification for the southeast Yukon: field guide, first approximation; Yukon Renewable Resources, Canadian Forest Service, Department of Indian and Northern Affairs and Northern Development, Whitehorse, Yukon, 409p.

Zoladeski, C.A., Wickware, G.M., Delorme, R.J., Sims, R.A. and Corns, I.G.W. 1995. Forest ecosystem classification for Manitoba: field guide, special report 2; UBC Press, Vancouver, B.C., 205p.

Articles in Periodicals

Zoladeski, C.A. 1991. Vegetation zonation in dune slacks on the Leba Bar, Polish Baltic Sea coast; Journal of Vegetation Science, v.2, p.255-258.

Zoladeski, C.A. and Maycock, P.F. 1990. Dynamics of the boreal forest in northwestern Ontario; American Midland Naturalist, v.124, p.289-300.

Zoladeski, C.A. 1989. Current status of rare vascular plants on Cape Enragé (Bic), Quebec; Le Naturaliste canadien, v.116, p.113-116.

Zoladeski, C.A. 1988. New station for Malaxis paludosa, bog adder's-mouth orchid, in northwestern Ontario; The Canadian Field-Naturalist, v.102, p.548-549.

Zoladeski, C.A. 1988. Classification and gradient analysis of forest vegetation of Cape Enragé, Bic Park, Quebec; Le Naturaliste canadien, v.115, p.9-11.

SELECT PROJECT EXPERIENCE

Lead Botanist, Churchill Phase IV (Lands to the north) Environmental Impact Study, Orlando Corporation, Brampton

Lead Botanist, Block 47-1 & 47-2 Environmental Impact Study for Block Plan, Brampton

Lead Botanist, West Gormley Wetlands Construction Phase Monitoring as part of the Adaptive Management Plan, Richmond Hill

Lead Botanist, Heritage Heights Secondary Plan Area, Northwest Brampton, Natural Heritage System Planning, Subwatershed Study and Impact Assessment

Lead Botanist, Block 51-1 Mount Pleasant Community, Northwest Brampton, Environmental Implementation Report and Associated Vegetation Surveys, Multidisciplinary and Multi-Agency Analysis, Monitoring Natural Heritage System Implementation

Lead Botanist, Boyne Secondary Plan Area, South Milton, Natural Heritage System Planning, Environmental Baseline and Species at Risk Studies, Subwatershed Impact Studies and Natural Heritage Feature Staking

Environmental Impact Studies for golf course, aggregate and residential developments, Greater Toronto Area and Southern Ontario

Pilot Grassland Restoration Project, The Ontario Aggregate Resources Corporation and Ontario Ministry of Natural Resources

Lake Erie Sand Spit Savannas and Species at Risk: Invasive Species Inventory and Vegetation Restoration Strategy, Ontario Ministry of Natural Resources, Canadian Wildlife Service, Walker Industries, and LESSS Recovery Team

Cherry Birch Recovery Strategy, Ontario Ministry of Natural Resources

State of Aggregate Resources in Ontario Study: Paper 6 – Rehabilitation, Field Assessments, Ontario Ministry of Natural Resources

Sustainable Forest Licence Audits, Ontario Ministry of Natural Resources

Christopher Zoladeski Ph.D.

EDUCATION

- Ph.D., Botany, University of Toronto
- M.Sc., Forest Ecology and Soil Science, Laval University

CERTIFICATION AND TRAINING

- Butternut Health Assessment Certificate
- Environmental Impact Study Training Session, Ontario Ministry of Natural Resources
- Ecological Land Classification Training Course
- Ontario Wetland Evaluation System Training Course

EMPLOYMENT HISTORY

- Savanta Inc. 2009 – Current: Botanist, Senior Ecologist
- Stantec Consulting 2002 – 2009: Senior Scientist
- Toronto and Region Conservation Authority1999 - 2000: Co-ordinator, Natural Heritage Systems
- Geomatics International Inc. 1992 – 1999: Senior Ecologist
- Acres International Limited (1990-1992): Ecologist