

GUIDING SOLUTIONS IN THE NATURAL ENVIRONMENT

Natural Environment Report/ Environmental Impact Study

in support of a Master Environmental Servicing Plan 4134 16th Avenue

Prepared For:

Sixteenth Land Holdings Inc.

Prepared By:

Beacon Environmental Limited

Date: Project:

September 2016 215200

MARKHAM 144 Main St. North, Suite 206 Markham, ON L3P 5T3 T)905.201.7622 F)905.201.0639 BRACEBRIDGE 126 Kimberley Avenue Bracebridge, ON P1L 1Z9 T)705.645.1050 + F)705.645.6639 GUELPH 373 Woolwich Street Guelph, ON N1H 3W4 T)519.826.0419 & F)519.826.9306 PETERBOROUGH 305 Reid Street Peterborough, ON K9J 3R2 T) 705.243.7251 OTTAWA 470 Somerset Street West Ottawa, ON K1R 5J8 T) 613.627.2376



Table of Contents

1.	Introduction1					
2.	Policy	/ Context2				
	2.1	Provincial Policy Statement				
	2.2	Greenbelt Plan 2				
	2.3	Rouge North Management Plan2				
	2.4	Region of York Official Plan				
	2.5	Town of Markham Official Plan 4				
		2.5.1 Greenway System				
	2.6	Toronto and Region Conservation Authority5				
	2.7	Endangered Species Act 6				
	2.8	Federal Fisheries Act				
	2.9	Transport Canada7				
3.	Existi	ng Conditions8				
	3.1	Field Investigations				
	3.2	Natural Heritage System8				
		3.2.1 Terrestrial Resources				
		3.2.1.1 ELC Communities				
		3.2.1.2 Semi-Natural and Cultural Communities				
		3.2.1.3 Polest Communities				
		3.2.1.5 Flora				
		3.2.1.6 Natural Heritage Features				
		3.2.2 Wildlife				
		3.2.2.1 Breeding Birds				
		3.2.2.2 Breeding Amphibians				
		3.2.2.3 Significant Wildlife Habitat				
		3.2.3 Aqualic Resources				
		3.2.3.2 Bruce Creek				
		3.2.3.3 Surface Drainage Features and Ponds				
	3.3	Landscape Connectivity				
4.	Const	traint Mapping29				
	4.1	Additional Studies				
		4.1.1 Fluvial Geomorphology Study				
		4.1.2 Slope Stability Assessment				
5.	Officia	al Plan Amendment31				
6.	Propo	osed Development32				
	6.1	Block Plan				
	6.2	Servicing				
		6.2.1 Stormwater Management				



		6.2.2 Water Supply	33
		6.2.3 Wastewater and Sanitary Servicing	
		6.2.4 Grading	34
		6.2.5 Roads	35
		6.2.6 Amenities – Trails and Parks	36
7.	Poten	itial Impacts and Mitigation	
	7.1	Development Limits	
	7.2	Water Balance	
		7.2.1 Feature Based Water Balance	37
	7.3	Stormwater Management Plan	
	7.4	Water Supply Servicing	
	7.5	Wastewater and Sanitary Servicing	
	7.6	Grading	
		7.6.1 Proposed Cut and Fill	41
	7.7	Road Crossings	
		7.7.1 Street 'A' crossing of Bruce Creek	
		7.7.1.1 Street D (west of woodlot)	
		7.7.1.2 Road Easement Connection to Warden Avenue	
	70	7.7.2 Removal of Existing Golf Course Driveway	
	7.0	Diskoring Airport	
	7.9	Vegetation Demoval	
	7.10	Vegetation Removal	
	7.11	Surface Drainage Feature Removal	
	7.12	Ceneral Miligation Measures	
	1.13	5 Species at Risk Miligation Measures	
		7.13.1 Butternut Impacts and Mitigation	
_	_		
8.	Resto	oration and Enhancement Opportunities	
	8.1	Summary of Vegetation Removals and Additions	
9.	Monit	oring	49
10.	Policy	/ Conformity	50
11.	Sumn	nary and Recommendations	
12.	Literature Cited		



Figures

Figure 1. Site Location	after page 2
Figure 2. Existing Conditions Terrestrial	after page 8
Figure 3. Existing Conditions Wildlife	. after page 20
Figure 4. Existing Conditions Aquatic	. after page 24
Figure 5. Constraints	. after page 30
Figure 6a. Official Plan Amendment 2014	. after page 32
Figure 6b. Official Plan Amendment 1987	. after page 32
Figure 7. Conceptual Development Plan	. after page 32
Figure 8. Development Plan	. after page 32
Figure 9. Potential Impacts, Mitigation and Enhancements	. after page 46

Tables

Table 1.	Summary of Field Investigations	. 8
Table 2.	Regionally Rare and Uncommon Plants	16
Table 3.	Breeding Amphibian Survey Results	21
Table 4.	Policy Compliance Assessment	50

Appendices

- A. Terms of Reference
- B. Species at Risk Screening Letter MNRF
- C. Plant List
- D. Breeding Bird Survey



1. Introduction

This Environmental Study Report by Beacon Environmental Limited (Beacon) has been prepared for the property located at 4134 16th Avenue. This study is part of the overall Master Environmental and Servicing Plan (MESP) in support of an Official Plan Amendment ("OPA") application to permit the development of a residential community on the subject property.

The property size is a total of 168.64 hectares (416.72 acres), and it is located on the north side of 16th. Avenue, on the west side of Kennedy Road. It has a small amount of frontage onto the east side of Warden Avenue in the City of Markham Region of York (**Figure 1**). Existing residential development surrounds the property on all sides.

The following Environmental Study follows the Terms of Reference (ToR) for the MESP that were prepared by the landowner consulting team and was approved by the City of Markham in July 2016. The ToR are provided in **Appendix A**. It demonstrates conformity with all policies from the Greenbelt Plan, the Region of York Official Plan, the existing City of Markham Official Plan (1987) and all regulations and policies from the Toronto Region Conservation Authority.

Bruce Creek traverses the property in a roughly north / south direction, bisecting the property into west and east tableland areas. Berczy Creek crosses the southwest corner of the property.

The current golf course use has been ongoing since York Downs Golf & Country Club opened on site in the early 1970's. The current Official Plan designation of 'Private Open Space' for the areas outside of the valleylands reflects this historic golf course use.

Sixteenth Land Holdings Inc. proposes to develop the property for a residential community and is submitting an OPA to re-designate the developable portion of the property from 'Private Open Space' to appropriate urban residential designations to permit the development of residential uses.

This report has been prepared in conjunction with the OPA application in support of the re-designation as proposed in the draft OPA and in the Planning Report (Gatzios Planning, August 2016). Please refer to the draft OPA and to the Planning Report for a description of the proposed Official Plan land use designations for the property.

The proposed residential development is detailed in the two draft plan of subdivision applications that accompany this MESP. There is one draft plan of subdivision for the east portion of the property and one for the west portion of the property. The west draft plan of subdivision also contains the valleylands associated with both Berczy Creek and Bruce Creek. References in this report to the two draft plans or to specific lots / blocks will include 'East' or 'West' to denote the appropriate area.



2. Policy Context

2.1 **Provincial Policy Statement**

Policy 2.1 of the Provincial Policy Statement (PPS) (MMAH 2014) provides direction to regional and local municipalities regarding planning policies for the protection and management of natural heritage features and resources. The PPS defines seven natural heritage features and provides planning policies for each. The *Natural Heritage Reference Manual* (OMNR 2010), which is currently under review, is a technical document used to help assess the natural heritage features listed below:

- a) significant wetlands;
- b) coastal wetlands;
- c) significant habitat of endangered and threatened species;
- d) fish habitat;
- e) significant woodlands;
- f) significant valleylands;
- g) significant Areas of Natural and Scientific Interest (ANSIs); and
- h) significant wildlife habitat.

Each of these features is afforded varying levels of protection subject to guidelines, and in some cases, regulations.

2.2 Greenbelt Plan

The subject property is located in the Settlement Area outside of the Greenbelt Plan Area. Bruce Creek and Berczy Creek are identified as River Valley Connections (outside the Greenbelt).

Section 3.2.5 of the Plan speaks to External Connections of the Greenbelt Plan Area. The Natural Heritage System is connected to local, regional and provincial scale natural heritage, water resource and agricultural systems beyond the boundaries of the Greenbelt Plan Area. The river valleys that run through existing or approved urban areas and connect the Greenbelt Plan Area to inland *lakes* and the Great Lakes are a key component of the long-term health of the Natural System. Municipalities should consider planning, design and construction practices that maintain or where possible enhance the size, diversity and *connectivity* of *key natural heritage features* and *key hydrologic features* and functions. These external connections are generally depicted in the Greenbelt Plan, but are not within the regulated boundary of the Greenbelt Plan.

2.3 Rouge North Management Plan

The subject property is located within the Rouge North Management Plan Area. A guideline document that seeks to protect the Rouge River and its tributaries from the Oak Ridges Moraine to Lake Ontario was created in 2001. Also, OPA 140 in the City's Official Plan (1987) incorporates the Rouge North Management Plan.





The Rouge River Tributaries within the Subject Property are located in the Middle Reaches Study Area. The Rouge Park North Management Plan's goal for this area is:

To sustain and enhance aquatic habitat resources to achieve targets set out in the Rouge River Fisheries Management Plan through the protection and enhancement of vegetation communities, baseflow, water quality and hydrological function, while accommodating additional Rouge Park objectives and recognizing the influences of future growth and existing urban development within the watershed.

The Middle Reaches Study Area encompasses 130 m from the stable top of bank or, in the absence of a defined valley, 100 m from edge of vegetation. Additional Study Area includes a 100 m extension to natural features including but not limited to wetlands and wetland complexes, seepage areas, woodlands and vegetation communities and watercourses as defined in TRCA's Valley and Stream Corridor Management Plan. The park boundary within this Study Area is then delineated using bankfull channel width, meander belt width and a vegetation community maintenance area. The vegetation community maintenance area is set a certain distance from the meander belt limit. The width is related to the tree species typically found within the Study Area. Once the limits of the Park have been defined, the objective of the Rouge North Management Plan is to bring the lands into public ownership. In order to achieve this objective, all levels of government, TRCA, Rouge Park Alliance and NGOs have been charged with the implementation.

2.4 Region of York Official Plan

The Region of York Official Plan was adopted in 2009 and approved by the Ministry of Municipal Affairs and Housing in September 2010 incorporating several modifications. The OP identifies a Regional Greenlands System. The policies detailed in the plan are intended to identify, protect and restore the Greenlands System as a permanent resource for the Region. Lands designated Greenlands in the Region of York Official Plan are subject to development constraints.

The boundaries and extent of the Greenlands System identified on Map 2 of the Official Plan are approximate. Specific delineation or clarification of Greenland boundaries may be undertaken when applications for development are received. Refinements to the boundaries may occur through environmental evaluation, and do not require an amendment to the plan.

Development applications within or on lands close to the Greenlands System must be accompanied by an environmental evaluation of impacts the development will have or is expected to have on the environmental functions, attributes, or linkages of the Greenlands System. The evaluation must also provide the details of any mitigation measures that will ensure that the Greenlands features will not be adversely impacted.

Permanent and intermittent streams and Significant Woodlands are also identified on Map 5 in the York OP. The policies in the plan that address these features are intended to protect woodlands and their biodiversity and encourage reforestation to provide environmental, social and economic benefits for the residents of York Region. Section 2.2.45 of the OP states that woodlands are significant if they meet one of the following criteria:



- a. is 0.5 hectares or larger and:
 - *i.* directly supports globally or provincially rare plants, animals or communities as assigned by the Natural Heritage Information Centre; or,
 - *ii.* directly supports threatened or endangered species, with the exception of specimens deemed not requiring protection by the Province (e.g. as is sometimes the case with Butternut); or,
 - *iii. is within 30 metres of a provincially significant wetland or wetland as identified on Map 4, waterbody, permanent stream or intermittent stream;*
- b. is 2 hectares or larger and:
 - i. is located outside of the Urban Area and is within 100 metres of a Life Science Area of Natural and Scientific Interest, a provincially significant wetland or wetland as identified on Map 4, significant valleyland, Environmentally Significant Area, or fish habitat; or,
 - ii. occurs within the Regional Greenlands System;
- c. is south of the Oak Ridges Moraine and is 4 hectares or larger in size;
- d. is north of the Oak Ridges Moraine and is 10 hectares or larger in size;
- e. on the Oak Ridges Moraine the woodland will be evaluated for significance based on the requirements of the Oak Ridges Moraine Conservation Plan and associated technical papers; or,
- f. on lands in the Greenbelt Natural Heritage System, the woodland will be evaluated for significance based on the requirements of the Greenbelt Plan and associated technical papers; or,
- g. on lands in the Lake Simcoe watershed, outside of the Greenbelt, the Oak Ridges Moraine Conservation Plan, and existing settlement areas, the woodland will be evaluated for significance based on the requirements of the Lake Simcoe Protection Plan and associated technical papers.

Section 2.2.48 states that woodlands are NOT considered significant notwithstanding Section 2.2.45 if they are within the Urban Area if all of the following criteria are met:

- a. the woodland is located outside of the Regional Greenlands System as shown on Map 2 of this Plan;
- b. the woodland is located in an area strategic to the achievement of the community objectives of Section 5.2 and 5.6 of this Plan or is identified within an intensification area detailed in a local municipal intensification strategy, and is evaluated through an official plan amendment process, or other appropriate study;
- c. the woodland does not meet the criteria in policy 2.2.45.a of this Plan; and,
- d. the woodland is a cultural and regenerating woodland to the satisfaction of York Region, in consultation with the conservation authority and local municipality.

2.5 Town of Markham Official Plan

Markham's new Official Plan was adopted by Council on December 10, 2013, and approved by York Region on June 12, 2014. The new Official Plan has been appealed to the Ontario Municipal Board and is not yet in force. Until an Ontario Municipal Board decision to approve all or part of the new Official Plan has been made, the current Official Plan (Revised 1987), as amended, continues to remain in force and hence has been reviewed and applied to the subject property.



Schedule A (Land Use) identifies the subject property as Open Space, Hazard Land and the north east corner as Future Urban Area. Schedule I (Environmental Protection Areas) of the Markham Official Plan identifies Valleylands on the subject property which includes the Hazard Lands depicted on Schedule A. As outlined in the Markham OP:

⁶Environmental Protection Area identifies lands and water bodies containing natural features and/or ecological functions of such significance to the Town or sensitivity to disturbance as to warrant long term protection. Corresponding objectives for their preservation will be implemented through detailed policies which address specific subcategories as follows:

- Locally Significant Area Complexes;
- Valleylands including HAZARD LANDS designated on Schedule 'A' LAND USE; and
- Woodlots and other Significant Vegetation Communities.'

Section 2.2.2.9 c) and f) of the Official Plan speaks to Environmental Buffers, which calls for the minimum width of an environmental buffer to be 10 m from the stable top of bank or predicted stable top of bank or the Regulatory Flood Line, drip line of the trees at the edge of the woodlot, or as defined by an Environmental Impact Study.

2.5.1 Greenway System

Appendix Map 1 of the Town of Markham OP identifies Bruce Creek, Berczy Creek, the eastern woodlot and a Bruce Creek tributary as part of the Greenway System.

The purpose of the Greenway System is to:

- support ecological functions;
- provide access to natural areas; and
- provide continuous trails linking the Town's Greenway System with the Rouge Park, the Oak Ridges Moraine and the Don River Valley south of Steeles Avenue.

The Greenway System as shown on Map 4 in the City of Markham OP (2014) incorporates the same areas/features as the 1987 Greenway System for the subject property, with one exception. The 2014 Greenway System does not include Feature A which is described in Section 3.2.3.3.

2.6 Toronto and Region Conservation Authority

The Toronto and Region Conservation Authority (TRCA) regulates land use activities in and adjacent to wetlands, watercourses and valleylands under Ontario Regulation 166/06 (*Regulation for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*) made under the Conservation Authorities Act.

The TRCA may grant permission to development within regulated areas "if, in its opinion, the control of flooding, erosion...or pollution of the conservation of land will not be affected by the development". As part of its permitting process, the TRCA typically requires the proponent to prepare an Environmental



Impact Statement (EIS), which must demonstrate that the development can proceed without resulting in any alteration to a watercourse or interference to the hydrologic function of a wetland.

With respect to wetlands (which were a key change in the May 2006 revision to the Conservation Authority regulations) the regulated area extends to within 30 m of an unevaluated wetland and within 120 m of a Provincially Significant Wetland. The regulation requires the issuance of a permit from the Conservation Authority to allow "interference" with a wetland or for infringement within the flood and fill areas associated with a watercourse as was the case prior to the new regulation.

Generally, development within the flood limit of a watercourse is not allowed. However, subject to conformity with the Official Plan and completion of appropriate studies and Conservation Authority permits, some development *may* be permitted within the constraint area. The TRCA will generally require that all watercourses stay in their natural state with respect to development proposals.

The TRCA's Living City Policy was approved in November 2014 and replaces the Valley and Stream Corridor Management Program (1994). The Living City Policy document, among other matters, implements current federal, provincial and municipal legislation, policies and agreements affecting conservation authorities; and implements the policies for TRCA's updated section 28 of Ontario Regulation 166/06. According to the Living City Policy, the boundaries of a stream corridor generally require a minimum 10 m setback from the greater of:

- Physical top of the valley feature;
- Stable top of bank, where geotechnical concerns exist (which must be confirmed through an appropriate geotechnical analysis);
- Limits of flooding on the property in a Regional Storm Event; and
- Limits of significant vegetation which is contiguous with the valley corridor.

Section 7.3.1.4 of the Living City Policy outlines buffers adjacent to natural features. The boundaries of a wetland that is not identified as a Provincially Significant Wetland is 10 m.

2.7 Endangered Species Act

Ontario's *Endangered Species Act, 2007 (ESA)* came into effect on June 30, 2008 and replaced the former 1971 Act. Under the *ESA*, species in Ontario are identified as extirpated, endangered, threatened, or of special concern and each species is afforded different levels of protection.

A Species at Risk Screening (SAR) request was submitted to MNRF in August 2016. A response from M. Eplett a Management Biologist with MNRF was provided on August 23, 2016 and is provided in **Appendix B**. The SAR screening identifies the following species recorded in the Subject Property:

- Redside Dace (*Clinostomus elongatus*) Endangered
- Butternut (Juglans cinerea) Endangered
- Barn Swallow (*Hirundo rustica*) Threatened
- Eastern Wood-peewee Special Concern

Both Bruce Creek and Berczy Creek provide direct habitat for the Endangered Redside Dace and in this regard are regulated as occupied Redside Dace streams. MNRF also indicates that the property



contains features that may be considered contributing habitat for Redside Dace. Contributing habitat includes streams, permanent or intermittent headwater drainage features, groundwater discharge areas or wetlands that augment or maintain the baseflow, coarse sediment supply or surface water quality of areas currently known to be occupied by Redside Dace or areas which provide an opportunity for Redside Dace recovery / recolonization.

MNRF also identifies Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*) both listed as Threatened under the *ESA*.

2.8 Federal *Fisheries Act*

As direct fish habitat is present within the subject property, which has potential to be impacted, the *Fisheries Act* (1985) is a key piece of legislation relevant to the proposed development.

Fish habitat is protected under the federal *Fisheries Act* (1985). In Ontario, the federal Department of Fisheries and Oceans Canada (DFO) manages fish habitat and the Ontario Ministry of Natural Resources and Forestry (OMNRF) manages fisheries.

The *Fisheries Act* has recently been updated through Bill C-38 which came into effect November 25th, 2013. Key changes include the combination of former Sections 32 and 35 into a new Section 35 addressing the removal of Harmful Alteration, Disruption or Destruction (HADD) of fish habitat. The prohibitions on killing fish and causing harmful alteration, disruption or destruction of fish habitat (HADD) have been replaced with a single prohibition in Section 35 against causing '*serious harm to fish*' that are part of a commercial, recreational or aboriginal fishery, or to fish that support such a fishery.

"Serious harm to fish" is defined as "the death of fish or any permanent alteration to, or destruction of, fish habitat".

2.9 Transport Canada

The subject property is located within the Secondary Bird Hazard Zone. A report prepared for Transport Canada (LGL, 2002) identifies the Secondary Bird Hazard Zone is a "bird behaviour buffer zone" of 4 km placed around the Primary Bird Hazard Zone. This buffer accounts for variations in bird movements around specific land-uses.

Paragraph 6 of the Pickering Airport Site Zoning Regulations states:

6. No owner or lessee of any land which is situated within the Bird Hazard Zone, which is more particularly described in Part VII of the schedule, shall use the land or allow the land to be used for activities or uses that attract birds that create a hazard to aircraft safety and, therefore, are incompatible with the safe operation of the airport or aircraft.

Appendix C of the document indicates that Stormwater Management Ponds are permitted in the Secondary Bird Hazard Zone but are classified as Potentially Risky.



3. Existing Conditions

3.1 Field Investigations

Beacon conducted field investigations in 2015 and 2016. Previous field investigations, including characterization of Bruce and Berczy Creeks, vegetation assessments and natural features staking were completed in 2010 by Beacon Environmental as part of an Environmental Analysis Study completed for the York Downs Golf and Country Club. The results of all of these studies have been compiled below in Section 3.3 of this MESP report. **Table 1** provides a list of the field investigations conducted by Beacon.

Field Investigation	Dates	
ELC and Floral Inventory	June 18 th and 21 st , 2010, June 21 st , June 30 th	
	and August 15 th 2016	
Butternut Health Assessment	August 2, 2016	
Tree Inventory	April to August 2016	
Aquatic Assessment	June 19 th , 2010 and August 3 rd 2016	
Surface Drainage Feature Assessment	May 10 and November 10, 2011, July 19th,	
	August 3 rd and August 17 th , 2016	
Amphibian Surveys	April 14 th and May 15 th , 2011, April 19 th , May 30 th	
	and June 29 th , 2016	
Breeding Bird Surveys	June 2 nd , June 11 th and June 19 th , 2015	
Vegetation/Top of Bank Staking/Wetland Staking	July 28 th , September 10 th and September 23 rd ,	
	2010, March 4 th , 2016	

Table 1. Summary of Field Investigations

Also completed as part of MESP were hydrogeological, geotechnical, hydrologic and fluvial geomorphology investigations. The results of these investigations are presented in the MESP (2016) and a summary of each in respect to natural environment is provided below in Section 3.5.

3.2 Natural Heritage System

3.2.1 Terrestrial Resources

3.2.1.1 ELC Communities

A total of 31 vegetation community types were identified on the subject property. The communities can be broadly categorized as forest, wetland, and semi-natural/cultural. Semi-natural/cultural communities include old field meadows, plantations, successional thickets and woodlands, and managed areas (e.g. golf course greens, agriculture). Large areas of the subject property fall into the semi-natural/cultural category. Natural forests and wetlands on the property tend to be rather small and are generally associated with the valleylands of Berczy Creek and Bruce Creek. The vegetation communities on the subject property are illustrated on **Figure 2** and described in detail below.





Legend

- Subject Property
- Butternut
- Watercourse Surface Drainage Features
- ELC Communities
- ELC Community Type
- **Cultural Communities**
- Forest Communities
- Wetland Communities

First Base Solutions, 2015. First Base Solutions Web Mapping Service, York Region 2015 Air Photo. Beacon Environmental, 2016. ELC, Watercourse, Ephemeral Watercourse, Subject Property. LIO, 2016 MNRF Wetlands.

	THE PER		a polyter and
	PAUL	1.5	TE ANY OUT OTHER
		THE W	NA INI MA
	- 1110 F	M	JIHIJA BE
	A DECKARD		A A A A A A A A A A A A A A A A A A A
	Hard and a state of the	33	o participation Comment 3
Feature 1	land	and and	an anna genus
i outuro i	ALALE AND	a catto	Windinging and Bush &
34	A. MININA (SIS	and the second	PUTTO IN IS IS AND A
	Alen and and	AF B (1)	nun an the Landy
47	ine	AP	Constantial of Taxa
41	BYE	and a	Winner and anis
52 -	toa	A DOWN	Summer Burger
2	a	- 19	STADAT IN
Woodla	and	Tal	
Featur	e 2		
-	The star		us - mutanitans
	ALL ARDS	TO DE	E maintenant
	UNIT #	ELC CODE	COMMUNITY DESCRIPTION
) 47	Semi-natural and Cultural	Communities	
	1	CUP/CUW1	Cultural Plantation/Cultural Woodland
	1 2a-2e 15 20	CUP/CUW1 CUM1-1 CUP3-3 CUP1-3	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Scotch Pine Plantation Black Walnut Plantation
	1 2a-2e 15 20 24 24 26 29	CUP/CUW1 CUM1-1 CUP3-3 CUP1-3 CUW1 CUT1	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soctch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket
26	1 2a-2e 15 20 20 24 26, 29 32, 36	CUP/CUW1 CUM1-1 CUP3-3 CUP1-3 CUW1 CUT1 CUW1	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Socth Pine Plantation Black Walnut Plantation Cultural Nicotland Cultural Nicket Cultural Nicket Cultural Nicket
26	1 2a-2e 15 20 24 26,29 32,36 33,36 34 39	CUP/CUW1 CUM1-1 CUP3-3 CUP1-3 CUW1 CUT1 CUW1 CUT1 CUS1	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soctch Pine Plantation Black Walnut Plantation Cultural Nicket Cultural Nicket Cultural Nicket/Shrub Hedgerow Cultural Thicket/Shrub Hedgerow Cultural Shannah
26	1 2a-2e 15 20 20 26, 29 32, 36 34 39 40 40	CUP/CUW1 CUM1-1 CUP3-3 CUP1-3 CUW1 CUT1 CUW1 CUT1 CUT1 CUS1 CUP3 CUW4	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Socht Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savanah Conferous Plantation Conferous Plantation
26	1 2a-2e 20 20 24 26, 29 32, 36 34 39 40 44	CUP/CUW1 CUM1-1 CUP3-3 CUP1-3 CUV1-CUT1 CUT1 CUT1 CUT1 CUT1 CUS1 CUP3 CUW1	Cultural Plantation/Cultural Woodland Dry-Moist Cid FieldMeadow Socth Pine Plantation Black Wolnut Plantation Cultural Woodland Cultural Nicket Cultural Voodland Cultural Savannah Coniferous Plantation Cultural Savannah Coniferous Plantation Cultural Woodland Cultural Savannah Coniferous Plantation Cultural Savannah Cultural Sav
26	1 2a-2e 20 20 26,29 32,36 34 39 40 44 47 47	CUP/CUM1 CUM1-1 CUP3-3 CUP1-3 CUP1-3 CUV1 CUV1 CUV1 CUV1 CUV1 CUV1 CUS1 CUP3 CUP3 CUP3	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Socth Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket Cultural Savannah Coniferous Plantation Cultural Savannah Coniferous Plantation Cultural Savannah Agriculture Manicured
26	1 2a-2e 20 26,29 32,36 34 39 40 44 47 Forest Communities 3	CUP2CUV1 CUP3-3 CUP3-3 CUP1-3 CUV1 CUV1 CUV1 CUV1 CUV1 CUV1 CUV1 CUV1	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Socth Pine Plantation Black Walnut Plantation Cultural Voodland Cultural Thicket Cultural Woodland Cultural Thicket Cultural Savannah Coniferous Plantation Cultural Savannah Coniferous Plantation Cultural Savannah Fresh-Moist Willow Lowland Deciduous Forest
26	1 22-2e 25 20 26,29 26,29 32,36 324 39 40 44 47 Forest Communities 3 6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	CUP2CUV1 CUM1-1 CUP3-3 CUP1-3 CUV1 CUV1 CUV1 CUV1 CUV1 CUV1 CUV1 CUV1	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Socth Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket Cultural Savannah Coniferous Plantation Cultural Savannah Coniferous Plantation Cultural Savannah Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Maple-Hardwood Deciduous Fresh-Moist Sugar Maple-Hardwood Deciduous Fresh-Maple-Hardwood Deciduous Fresh-Maple-Hardwood Deciduous Fresh-Maple-Hardwood Deciduous Fresh-Maple-Hardwood Deciduous
26	1 2a-2e 25 20 26,29 26,29 26,29 26,29 26,34 39 40 40 40 47 Forest Communities 6 8,9,12 1 13	CUP2CUV1 CUM1-1 CUP3-3 CUP3-3 CUP1-3 CUV1 CUT1 CUT1 CUT1 CUT1 CUS1 CUF3 CUV1 CUF3 CUW1 CUF3 CUW1 CUF3 CUW1 CUF3 CUW1 CUF4 CUF4 FOD7-3 FOD5-1 FOD5-1	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Socth Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Woodland Cultural Voodland Cultural Netty Plantation Cultural Savannah Coniferous Plantation Cultural Savannah Coniferous Plantation Cultural Moodland Extreme Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Woist Willow Lowla
26	1 2a-2e 2a 2a 2b	CUP/CUM1 CUP3-3 CUP3-3 CUP3-3 CUM1 CUM1 CUM1 CUM1 CUM1 CUS1 CUP3 CUM1 CUP3 CUM1 CUP3 CUM1 CUP3 CUM1 CUP3 CUM1 CUP3 CUM1 CUP3 CUP3 CUP3 CUP3 CUP3 CUP3 CUP3 CUP3	Cultural Plantation/Cultural Woodland Dry-Moist OId FieldNeadow Socich Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Modeland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Woodland Agriculture Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist White Cedar Conferous Forest Fresh-Moist White Cedar Hardwood Mexed Forest Fresh-Moist White Gear-Hardwood Mexed Forest Fresh-Moist White Fresh-Mox
26	1 2a-2e 2a-2e 2a-2e 2a-2a	CUP/CUM1 CUP3-3 CUP3-3 CUP1-3 CUM1 CUM1 CUM1 CUM1 CUM1 CUM1 CUM1 CUM1	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldNeadow Soch? Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Savannah Cultural Woodland Agriculture Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Dry-Fresh Sugar Maple Deciduous Forest Dry-Fresh Sugar Maple Back Sorest Dry-Fresh Sugar Maple Backdow Strest Dry-Fresh Sugar Maple Backdow Strest Dry-Fresh Sugar Maple Backdow Strest Dry-Fresh Sugar Maple Backdow Strest
26	1 2a-2e 2a-2e 2a-2e 2a-2a-3 2a-3 2a-3a-3 2a-3a-3 2a-3a-3 2a-3a-3 2a-3a-3 2a-3a-3 2a-3a-3 2a-3a-3 2a-3a-3a-3 2a-3a-3a-3 2a-2a-3a-3a-3a-3a-3a-3a-3a-3a-3a-3a-3a-3a-3a	CUP/CUM1 CUP3 3 CUP3 3 CUP4 3 CUM1 CUT1 CUM1 CUT1 CUM1 CUT1 CUF3 CUM1 CUF3 CUM1 CUF3 CUF3 CUM1 CUF3 CUF3 CUF3 CUF3 CUF3 CUF3 CUF3 CUF3	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch? Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Savannah Cultural Woodland Agriculture Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist White Cedar-Ardiwood Deciduous Forest Dry-Fresh Sugar Maple-Basswood Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Pry-Fresh Sugar Maple-Hardwood Deciduous Forest Pry-Fresh Witte Cedar-Conferous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Witte Cedar-Conferous Forest Pry-Fresh Witte Cedar-Conferous Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest
26	1 2a-2e 2a-2e 2a-2e 2a-2e 2a-2a	CUP/CUW1 CUP3-3 CUP1-3 CUP1-3 CUW1 CUM1 CUM1 CUT1 CUS1 CUP3 CUW1 CUP3 CUW1 CUP3 CUW1 CUP3 CUW1 FOD7-3 FOD6-5 FOC4-1 FOD7-1 FOM7-2 FOM7-2 FOM7-2 FOM7-2 FOM7-5 FOC2-2 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-3 FOM7-4 FOM7-3 FOM7-4 FOM7-	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Savannah Cultural Savannah Cultural Woodland Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Lowland Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Miced Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Dry-Fresh Mat-Hardwood Deciduous Forest
26	1 2a-2e	CUP/CUW1 CUM1-1 CUP3-3 CUP1-3 CUW1 CUM1 CUM1 CUM1 CUM1 CUM1 CUM1 CUF3 CUW1 CUF3 CUW1 CUF3 CUW1 FOD7-3 FOD6-5 FOC4-1 FOD5-6 FOC5-1 FOM7-2 FOD5-6 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-5 FOD7-3 FOD5-6 FOD7-3 FOD5-6 FOD7-3 FOD5-6 FOD7-3 FOD5-6 FOD7-3 FOD5-7 FOD5-6 FOD7-3 FOD5-7 FOD5-	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Thicket Cultural Thicket/Shrub Hedgerow Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Woodland Agriculture Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Lowland Deciduous Forest Dry-Fresh Sugar Maple-Barswood Deciduous Forest Dry-Fresh Sugar Maple-Barswood Deciduous Forest Dry-Fresh Sugar Maple-Barswood Deciduous Forest Dry-Fresh Sugar Maple-Barswood Deciduous Forest Dry-Fresh Wilte Cedar-Charlerous Forest Dry-Fresh Wilte Cedar-Coniferous Forest Dry-Fresh Wilte Cedar-Coniferous Forest Dry-Fresh Wilte Cedar-Coniferous Forest Dry-Fresh Mayar Maple-Hardwood Deciduous Forest Dry-Fresh Sugar Maple-Barswood Deciduous Forest Dry-Fresh Wilte Cedar-Hardwood Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest
26	1 2a-2e 2a-2e 2a-2e 2a-2e 2a-2a-2 2a-2e 2a-2a-2a-2a-2a-2a-2a-2a-2a-2a-2a-2a-2a-2	CUP/CUW1 CUP3-3 CUP1-3 CUW1 CUM1 CUM1 CUM1 CUM1 CUM1 CUM1 CUM1 CUM	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Woodland Cultural Woodland Agriculture Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Ecelar-David Deciduous Forest Fresh-Moist Willow Ecelar-Davided Forest Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Cedar-Hardwood Mixed Forest Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Calar-Hardwood Mixed Forest Fresh-Moist Willow Calar-Hardwood Mixed Forest Fresh-Moist Kalar Kalant Lowdood Mixed Forest Fresh-Moist Kalar Kalant Lowdood Mixed Forest Fresh-Moist Kalar Kalant Agent Age
26	1 22-2e 23 24 26,29 24 26,29 24 26,29 24 26,29 24 39 39 40 40 40 40 47 47 48 Forest Communities 6 8,9,12 13 14,158,16b 176,17b 22 27 27 33 3 44 42 42 42 42 44 44 44 44 45 45 45 45 45 45 45 45 45	CUP/CUM1 CUP3 3 CUP3 3 CUP3 3 CUP4 3 CUM1 CUM1 CUM1 CUM1 CUM1 CUS1 CUP3 CUW1 CUF3 CUP3 CUW1 CUP3 CUW1 CUP3 CUW1 CUP3 CUW1 CUP3 CUP3 CUP3 CUP3 CUP3 CUP3 CUP3 CUP3	Cultural Plantation/Cultural Woodland Dry-Moist OId FieldNeadow Socich Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Woodland Agriculture Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist White Cedar-Hardwood Deciduous Forest Dry-Fresh Sugar Maple-Badwood Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Dry-Fresh Neist White Cedar-Sugar Maple Marked Forest Fresh-Moist White Cedar-Sugar Maple Mixed Forest Fresh-Moist White Cedar-Sugar Maple Mixed Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Sugar Maple-Markwood Mixed Forest Fresh-Moist Sugar Maple-Andrewood Mecidous Forest Fresh-Moist Sugar Maple-Andrewood Meciduous Forest Fresh-Moist Sugar Maple-Andrewood Meciduous Forest Fresh-Moist Sugar Maple-Andrewood Meciduous Forest Fresh-Moist Sugar Maple-Balexed Deciduous Forest Fresh-Moist Sugar Maple-Balexed Deciduous Forest Fresh-Moist Sugar Maple-Andrewood Meciduous Forest Fresh-Moist Sugar Maple-Balexed Deciduous Forest Fresh-Moist Sugar Maple-Andrewood Meciduous Forest Fresh-Moist Sugar Maple-Balexed Deciduous Forest Fresh-Moist Sugar Maple-Andrewood Meciduous Forest Fresh-Moist Sugar Maple-
26	1 22-2e 23 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 26 27 27 27 27 27 27 27 27 27 27 27 27 27	CUP/CUM1 CUP3 3 CUP3 3 CUP1 3 CUP1 3 CUM1 CUT1 CUM1 CUT1 CUS1 CUM1 CUT1 CUS1 CUP3 CUW1 CUT1 CUP3 CUW1 CUT1 CUP3 CUW1 CUT1 CUP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 CUP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 CUW1 CUT1 COP3 COP3 COP3 COP3 COP3 COP3 CUW1 CUT1 COP3 COP3 COP3 COP3 COP3 COP3 COP3 COP3	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Woodland Agriculture Manicured Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Dry-Fresh Sugar Maple Hardwood Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Dry-Fresh-Moist White Cedar-Cunferous Forest Dry-Fresh-Moist White Cedar-Aradwood Mixed Forest Dry-Fresh-Moist White Cedar-Aradwood Mixed Forest Dry-Fresh-Moist White Cedar-Aradwood Deciduous Forest Dry-Fresh-Moist White Cedar-Aradwood Deciduous Forest Dry-Fresh-Moist White Cedar-Aradwood Deciduous Forest Dry-Fresh-Moist Black Walnut Lowland Deciduous Forest Fresh-Moist White Cedar-Sugar Maple Mixed Forest Fresh-Moist Black Walnut Lowland Deciduous Forest Fresh-Moist White Cedar-Sugar Maple Mixed Forest Fresh-Moist Black Walnut Lowland Deciduous Forest Fresh-Moist White Cedar-Sugar Maple Mixed Forest Fresh-
26	1 22-2e 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 26 27 27 27 31 14,169,16b 272,17b 222 27 31 31 44 42 43 44 45 28	CUP/CUM1 CUP3 3 CUP3 3 CUP1-3 CUM1 CUT1 CUM1 CUT1 CUS1 CUM1 CUT1 CUS1 CUF3 CUW1 CUT1 CUS1 CUF3 CUW1 FOD7-3 FOD7-3 FOD5-1 FOD5-1 FOD5-1 FOM7-2 FOM7-2 FOM7-4 FOM7-1 FOD6-1 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-2 FOD7-2 FOD7-2 FOD7-3 FOD7-2 FOD7-3 FOD7-3 FOD7-2 FOD7-3 FOD7-2 FOD7-3 FOD7-4 FOD7-4 FOD7-4 FOD7-4 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD6-1 FOD7-3 FOD7-4 FOD6-1 FOD6-1 FOD7-3 FOD7-4 FOD7-4 FOD6-1 FOD6-1 FOD7-3 FOD7-4 FOD7-4 FOD6-1 FOD6-1 FOD7-1 FOD7-3 FOD7-4 FOD7-1 FOD7-4 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-4 FOD7-1	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Woodland Cultural Woodland Agriculture Manicured Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Hardwood Meed Forest Fresh-Moist White Cedar-Hardwood Deciduous Forest Fresh-Moist White Cedar-Hardwood Deciduous Forest Fresh-Moist White Cedar-Hardwood Deciduous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Atardwood Meed Forest Fresh-Moist White Cedar-Hardwood Deciduous Forest Fresh-Moist White Cedar-Hardwood Deciduous Forest Fresh-Moist White Cedar-Hardwood Meed Forest Fresh-Moist Back Walnut Lowland Deciduous Forest Fresh-Moist Sugar Maple-Ash Deciduous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist Sugar Maple-Ash Deciduous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist Maple Forest Fresh-Moist White Cedar-Conferous Forest
26	1 22-2e 23 24 26,29 24 26,29 24 26,29 24,26,29 24,26,29 24,26,29 24,26,29 24,26,29 24,26,29 24,27 25 25 27 31 14,169,160 172,170 22 22 27 31 37 41 42 43 43 43 44 45 28 Wetland Communities	CUP/CUW1 CUP3 3 CUP3 3 CUP1-3 CUW1 CUT1 CUT1 CUT1 CUS1 CUW1 CUT1 CUF3 CUW1 CUT3 CUW1 CUF3 CUW1 CUF3 CUW1 CUF3 CUW1 CUF3 CUW1 CUF3 CUF3 CUF3 CUF3 CUF3 CUF3 CUF3 CUF3	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Woodland Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist White Cedar Conferous Forest Fresh-Moist Sugar Maple-Hardwood Mixed Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Nardwood Deciduous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Nardwood Mixed Forest Fresh-Moist White Cedar-Nardwood Deciduous Forest Fresh-Moist White Cedar-Nardwood Mixed Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar Conferous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar Conferous Forest Fresh-Moist White Cedar Confe
26	1 2a-2e 2 2a-2e 2a-2e 2a-2e 2a-2e 2a-2e 2a-2a 2a	CUP/CUW1 CUP3 3 CUP1-3 CUP1-3 CUW1 CUM1 CUM1 CUT1 CUM1 CUT1 CUS1 CUW1 CUP3 CUW1 CUP3 CUW1 FOD7-3 FOD6-5 FOC4-1 FOD6-5 FOC4-1 FOD7-3 FOD6-5 FOC4-1 FOD7-3 FOD6-5 FOC7-3 FOD6-5 FOD7-3 FOD7-1 FOD7-1 FOD7-1 FOD7-2 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-1 FOD7-1 FOD7-3 FOD7-1 FOD7-1 FOD7-3 FOD7-3 FOD7-1 FOD7-1 FOD7-3 FOD7-1 FOD7-1 FOD7-1 FOD7-3 FOD7-1 FOD7-1 FOD7-1 FOD7-3 FOD7-1 FOD7-1 FOD7-1 FOD7-3 FOD7-1 FOD7-3 FOD7-3 FOD7-1 FOD7-1 FOD7-3 FOD7-3 FOD7-1 FOD7-3 FOD7-3 FOD7-1 FOD7-2 FOD7-1 FOD7-2 FOD7-1 FOD7-2 FOD7-1 FOD7-2 FOD7-1 FOD7-2 FOD7-2 FOD7-2 FOD7-1 FOD7-2 FOD7-1 FOD7-2 FOD7-2 FOD7-2 FOD7-1 FOD7-2 FOD	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Conferous Plantation Cultural Woodland Cultural Modeland Cultural Woodland Cultural Woodland Cultural Modeland Cultural Woodland Cultural Woodland Cultural Woodland Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Wille Cedar Arafwood Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Sugar Maple-Androud Deciduous Forest Fresh-Moist Black Walnut Lowland Deciduous Forest Fresh-Moist White Cedar Conferous Forest Fresh-Woist White Cedar Conferous Forest Fresh-
26	1 2a-2e 2a-2e 2a-2a-2a 2a-2a-2a-2a 2a-2a-2a-2a-2a 2a-2a-2a-2a-2a-2a-2a-2a-2a-2a-2a-2a-2a-2	CUP/CUW1 CUP3 3 CUP1-3 CUP1-3 CUW1 CUT1 CUW1 CUT1 CUS1 CUW1 CUT1 CUS1 CUW1 CUF3 CUW1 CUF3 CUW1 CUF3 CUW1 FOD7-3 FOD6-5 FOD6-5 FOD7-1 FOD7-1 FOD7-5 FOD7-2 FOD7-2 FOD7-2 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-1 FOD7-3 FOD7-3 FOD7-3 FOD7-3 FOD7-1 FO	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Woodland Agriculture Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willo Cedar-Coniferous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Dry-Fresh Sugar Maple-Basswood Deciduous Forest Dry-Fresh Sugar Maple-Basswood Deciduous Forest Dry-Fresh-Mist Sugar Maple-Basswood Deciduous Forest Dry-Fresh-Mist Sugar Maple-Basswood Deciduous Forest Fresh-Moist Sugar Maple-Basswood Deciduous Forest Fresh-Moist Sugar Maple-Androwood Mixed Forest
26	1 22-2c 23 24 26,29 24 26,29 23,2,36 34 39 40 40 40 40 47 47 48 Forest Communities 6 8,9,12 14,165,166 17a,17b,17b,17b,17b,17b,17b,17b,17b,17b,17b	CUP/CUM1 CUP3 3 CUP3 3 CUP3 3 CUP3 3 CUP1 3 CUM1 CUT1 CUM1 CUT1 CUS1 CUP3 CUM1 CUF3 CUP3	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldNeadow Socich Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Woodland Cultural Woodland Agriculture Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist White Cedar Conferous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Fresh-Moist White Cedar-Hardwood Mixed Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Sugar Maple-Hardwood Mixed Forest Fresh-Moist Sugar Maple-Alexed Deciduous Forest Fresh-Moist White Cedar-Sugar Maple Mixed Forest Fresh-Moist Sugar Maple-Alexed Marsh Dondweed Submerged Shallow Awash Pondweed Submerged Shallow Awash Common Reed Shallow Awash Pondweed Submerged Shallow Awash Common Reed Shallow Awash Common Reed Shallow Awash Pondweed Submerged Shallow Awash Common Reed Shallow Awash Pondweed Submerged Shallow Awash Common Reed Shallow Awash Common Reed Shallow Awash Common Reed Shallow Awash Common Reed Shall
26	1 2a-2e 2a 2a 2b	CUP/CUM1 CUP3.3 CUM1.1 CUP3.3 CUP1.3 CUM1 CUT1 CUM1 CUT1 CUS1 CUM1 CUT1 CUS1 CUM1 CUT1 CUS1 CUM1 CUT1 FOD7-3 FOD6-5 FOC4-1 FOM7-2 FOD5-6 FOC4-1 FOM7-2 FOD7-3 FOD6-5 FOM7-2 FOM7-1 FOM7-2 FOM7-1 FOM7-2 FOM7-1 FOM7-2 SWD4.1 MAM2-5 MAM2 SASI-1 OA01 MAM2-2 MAM2 SASI-1 OA01 FOM7-2	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldNeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Conferous Plantation Cultural Woodland Agriculture Manicured Agriculture Manicured Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Wahle Cedar Conferous Prest Fresh-Moist White Cedar Conferous Forest Dry-Fresh Sugar Maple Plantavood Deciduous Forest Fresh-Moist White Cedar Conferous Forest Dry-Fresh Sugar Maple Asswood Deciduous Forest Fresh-Moist White Cedar Conferous Forest Dry-Fresh Sugar Maple Hardwood Deciduous Forest Dry-Fresh Sugar Maple Plantavood Deciduous Forest Fresh-Moist White Cedar-Conferous Forest Dry-Fresh Sugar Maple Hardwood Deciduous Forest Fresh-Moist White Cedar-Conferous Forest Dry-Fresh Sugar Maple Hardwood Mixed Forest Fresh-Moist White Cedar-Conferous Forest Dry-Fresh Walsz White Cedar-Conferous Forest Fresh-Moist White Cedar-Mardwood Mixeh Formon Reed Mineral Meadow Mars
26	1 2-2-2e 2-2-2e 2-2-2e 2-2-2e 2-2-2e 2-2-2e 2-2-2e 2-2-2e 3-3 3 4-4 4 4 4 4 4 5 5 7 7 10e-100 118, 23a, 24b, 22 5 7 7 10e-100 128, 23a, 24b, 22 7 7 7 10e-100 1 18, 23a, 24b, 22 7 7 7 10e-100 1 18, 23a, 24b, 22 7 7 7 10e-100 1 18, 23a, 24b, 22 7 7 7 10e-100 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	CUP/CUM1 CUP3.3 CUM1.1 CUP3.3 CUP1.3 CUM1 CUT1 CUM1 CUT1 CUS1 CUM1 CUT1 CUS1 CUM1 CUT1 CUS1 CUM1 FOD7.3 FOD6-5 FOC6-1 FOD5-1 FOM7-2 FOD5-6 FOC2-2 FOD6-5 FOC2-2 FOD6-5 FOO7-3 FOD2-4 FOD7-3 FOD2-4 FOD7-4 FOD7-4 FOD7-4 FOD7-4 FOD7-4 FOD7-4 FOD7-4 FOD7-4 FOD7-4 FOD7-1 FOD8-1 FOM7-1 FOM7-2 FOM7-1 FOM7-1 FOM7-2 FOM7-2 FOM7-1 FOM7-2 FOM7-2 FOM7-2 FOM7-1 FOM7-2 FOM	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Prier Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Woodland Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Willow Lowland Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Wille Cedar-Nardwood Mixed Forest Fresh-Moist Wille Cedar-Conferous Forest Fresh-Moist Wille Cedar-Nardwood Mixed Forest Fresh-Moist Mile Cedar-Nardwood Mixed Forest Fres
	1 22-2e 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 24 26,29 26 26,28 26 26,29 27 27 31 3 14,169,160 179,17b 22 27 27 31 31 42 28 28 28 Wetland Communities	CUP/CUW1 CUP3.3 CUP3.3 CUP4.3 CUP4.3 CUV1 CUT1 CUS1 CUV1 CUT1 CUS1 CUV1 CUT1 CUS1 CUV1 FOD7.3 FOD7.3 FOD6-5 FOC4-1 FOD5-1 FOD5-1 FOD7-3	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Savannah Cultural Woodland Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist White Cedar-Lardwood Mixed Forest Presh-Moist White Cedar-Hardwood Deciduous Forest Fresh-Moist White Cedar-Lardwood Deciduous Forest Fresh-Moist Sugar Maple-Hardwood Deciduous Forest Fresh-Moist White Cedar-Lardwood Deciduous Forest Fresh-Moist White Cedar-Lardwood Deciduous Forest Fresh-Moist White Cedar-Lardwood Deciduous Forest Fresh-Moist Sugar Maple-Ash Deciduous Forest Fresh-Moist Sugar Maple-Ash Deciduous Forest Fresh-Moist White Cedar-Differous Forest Fresh-Moist White Cedar-Differous Forest Fresh-Moist White Cedar-Differous Forest Fresh-Moist White Cedar-Coniferous Forest Fresh-Moist White Cedar-Coniferous Forest Fresh-Moist White Cedar-Coniferous Forest Fresh-Moist White Cedar-Differous Forest Fresh-Moist White Cedar-Coniferous Forest Fresh-Moist White Cedar-Differous Forest Fresh-Moist White Cedar-Differous Forest Fresh-Moist White Cedar Coniferous Forest Fresh-Moist
	1 22-22 24 26,29 24 26,29 24,26,29 24,26,29 24,26,29 24,26,29 24,26,29 24,26,29 24,26,26 24,27 25 25 27 31 14,169,160 173,170 21 22 22 27 31 31 32 37 41 42 42 43 43 43 44 5 5 7 10-102 14 18,230,230 4 25 28 28 28 28 28 28 28 28 28 28 28 28 28	CUP/CUW1 CUM1.1 CUP3.3 CUM1.1 CUP3.3 CUP1.3 CUW1 CUT1 CUT1 CUS1 CUV1 CUT1 CUS1 CUP3 CUW1 FOD7.3 FOD6-5 FOC4.1 FOD7.4 FOD7.4 FOD7.4 FOD7.3 FOD7.4 FOD7	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Savannah Cultural Woodland Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist White Cedar Conferous Prest Fresh-Moist White Cedar Conferous Forest Fresh-Moist White Cedar-Wardwood Mixed Forest Fresh-Moist White Cedar-Hardwood Deciduous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Wardwood Forest Fresh-Moist White Cedar-Wardwood Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar Conferous
26	1 2a-2e 3a-3a-2e 3a-2e 3a-3a-2e 3a-2e 3a-3a-2e 3a-2e 3a-3a-2e 3a-2e 3	CUP/CUW1 CUM1.1 CUP3.3 CUP1.3 CUP1.3 CUV1 CUT1 CUT1 CUT1 CUT1 CUT1 CUT1 CUT1 CUT	Cultural Plantation/Cultural Woodland Dry-Moist Old FieldMeadow Soch Pine Plantation Black Walnut Plantation Cultural Woodland Cultural Thicket Cultural Woodland Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Thicket/Shrub Hedgerow Cultural Savannah Cultural Woodland Cultural Modeland Cultural Woodland Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist Willow Lowland Deciduous Forest Fresh-Moist White Cedar Conferous Prest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Dry-Fresh Sugar Maple-Hardwood Deciduous Forest Fresh-Moist Sugar Maple-Ash Deciduous Forest Fresh-Moist Black Walnut Lowland Deciduous Forest Fresh-Moist White Cedar-Conferous Forest Fresh-Moist White Cedar-Hardwood Mixed Forest Fresh-Moist White Cedar Conferous Forest Fresh-Moist White Cedar Conferous Forest Fresh-Moist White Cedar-Hardwood Mixed Forest Fresh-Moist White Cedar Conferous

MASTER ENVIRONMENTAL SERVICING PLAN FOR 4134 16TH AVE

FIGURE 2: Existing Conditions Terrestrial

UTM Zone 17 N, NAD 83

Project 215200 September 2016



3.2.1.2 Semi-Natural and Cultural Communities

Cultural Plantation/Cultural Woodland (CUP/CUW1)

<u>Unit1 (multiple units)</u>: This community occurs throughout the golf course between fairways and manicured areas. It is characterized by a mix of predominantly mid-aged planted deciduous and coniferous trees, including Silver Maple (*Acer saccharinum*), Norway Maple (*Acer platanoides*), Little Leaf Linden (*Tilia cordata*), Weeping Willow (*Salix x sepulcralis*), White Pine (*Pinus strobes*), Scots Pine (*Pinus sylvestris*), Austrian Pine (*Pinus nigra*), Red Pine (*Pinus resinosa*), White Spruce (*Picea glauca*), Norway Spruce (*Picea abies*), and Colorado Blue Spruce (*Picea pungens*). In addition to the planted trees, there are occasional remnant natural trees including Sugar Maple (*Acer saccharum*), Bur Oak (*Quercus macrocarpa*), basswood (*Tilia americana*), and white cedar (*Thuja occidentalis*). Canopy cover ranges from 25% to 60%. The understory is sparse, with occasional regenerating shrubs such as Buckthorn (*Rhamnus cathartica*) and Raspberry (*Rubus spp.*). The ground layer is comprised of old field meadow species such as Smooth Brome Grass (*Bromus inermis*), Bluegrass (*Poa spp.*), Reed Canary Grass (*Phalaris arundinacea*), Tall Goldenrod (*Solidago altissima*), Cow Vetch (*Vicia cracca*), Creeping Thistle (*Cirsium arvensis*), Panicled Aster (*Aster lanceolatus*), Bird's Foot Trefoil (*Lotus corniculata*), and Common Milkweed (*Asclepias incarnate*). Narrow bands of wet meadow vegetation occur along the edges of streams and ponds.

Dry-Moist Old Field Meadow (CUM1-1)

<u>Unit 2 (multiple units)</u>: Old field meadow communities are present throughout the property. These communities have a ground layer comprised of varying mixtures of common grasses and forbs, including Smooth Brome Grass, Bluegrasses, Reed Canary Grass, Tall Goldenrod, Cow Vetch, Creeping Thistle, Panicled Aster, Bird's Foot Trefoil and Common Milkweed. Woody regeneration in these communities is generally sporadic (<25% woody cover) and includes Buckthorn, Hawthorn (*Crataegus spp.*), Poplar (*Populus spp.*), Raspberry, Manitoba Maple (*Acer negundo*), and Red Osier Dogwood (*Cornus sericea*). Occasional planted trees include young maples, pines, spruce and cedar. Narrow bands of wet meadow vegetation occur along the edges of streams and ponds.

Scotch Pine Coniferous Plantation (CUP3-3)

<u>Unit 15:</u> This unit, located at the southwest corner of the site, consists of planted Scots Pine with a dense understory of Buckthorn

Black Walnut Deciduous Plantation (CUP1-3)

<u>Unit 20:</u> This is a small mid-aged Black Walnut (*Juglans nigra*) plantation mixed in with several Scots Pines.

Mineral Cultural Thickets (CUT1)

<u>Unit 26:</u> This disturbed thicket community occurs on a stretch of valley slope associated with Bruce Creek at the southeast corner of the property. It is a tall shrub dominated community of predominantly



Common Buckthorn, Hawthorn and Lilac (*Syringa vulgaris*). Riverbank Grape (*Vitis riparia*) and Chokecherry (*Prunus virginiana*) occur occasionally in the understory. The ground layer is sparse and consists of little more than Riverbank Grape, Virginia Creeper (*Parthenocissus inserta*), Enchanter's Nightshade (*Circaea lutetiana*), and Buckthorn seedlings. The community has a sparse canopy of Black Walnut, Ash and Silver Maple (*Acer saccharinum*).

<u>Unit 29:</u> This unit is a small patch of buckthorn and hawthorn.

Cultural Woodlands (CUW1)

<u>Unit 24:</u> This woodland has an open canopy of Black Walnut with some willow, Trembling Aspen, and Bur Oak. The understory is sparse, consisting of Black Walnut and Common Buckthorn. The ground layer is dominated by grasses, Garlic Mustard, and Tall Goldenrod.

<u>Unit 32:</u> This unit is one of the larger wooded areas on the property. The structure and species composition of this woodland suggest past disturbances, such as clearing or grazing. It is a dense, scrubby site with a generally open canopy of young to mid-aged White Elm, Bur Oak, Basswood, Green Ash, Manitoba Maple, and Trembling Aspen. Tall shrubs including Buckthorn, apples, and hawthorns are abundant. The ground layer consists of species common to moist soils including Virginia Creeper, Poison Ivy, Enchanter's Nightshade, Garlic Mustard, Herb Robert, Red Baneberry, and Sensitive Fern.

<u>Unit 36:</u> This semi-natural/successional community occurs toward the southwest corner of the property. The canopy consists of planted Red Pine and Scots Pine and regenerating Manitoba Maple, Norway Maple and Poplar. The understory is dense and comprised of Buckthorn, Riverbank Grape, Manitoba Maple and Raspberry. Virginia Creeper, Enchanter's Nightshade, Garlic Mustard (*Alliaria petilota*), Urban Avens (*Geum urbanum*) and Dame's Rocket (*Hesperis matronalis*) are common in the ground layer.

<u>Unit 44:</u> This woodland community is located along the northwest edge of Unit 35. The area appears to have been logged/cleared as the canopy is very open and consists mainly of Black Cherry (*Prunus serotina*) and White Cedar (*Thuja occidentalis*). The understory is sparse and composed of White Ash (*Fraxinus americana*), Buckthorn and Raspberry. Tall Goldenrod is abundant in the ground layer.

Cultural Thicket/Shrub Hedgerow (CUT1)

<u>Unit 34:</u> This hedgerow community has an open canopy comprised of predominantly Hawthorns (*Crateaegus punctata*) and a remnant Bur Oak. The sparse understory is made up of Buckthorn and Raspberry. Old field meadow species such as Creeping Thistle and cool season grasses make up the ground layer.

Cultural Savannah (CUS1)

<u>Unit 39:</u> This community is located along the northern edge of the property. It has a sparse canopy of Black Walnut, Green Ash (*Fraxinus pennsylvanica*), Manitoba Maple and White Cedar. The understory consists of Riverbank Grape, Elderberry and a dense patch of Red Raspberry. Dominant ground covers include Jewelweed (*Impatiens capensis*), Tall Goldenrod, Dame's Rocket, and Virginia Creeper.



Coniferous Plantation (CUP3)

<u>Unit 40:</u> This community is located at the far western edge of the property. It consists of planted Red Pine, White Pine and Scots Pine, along with occasional naturally occurring Black Walnut, Sugar Maple, and White Ash. White Ash, Alternate-Leaved Dogwood (*Cornus alternifolia*), Buckthorn and Chokecherry make up the understory. Ground covers include Virginia Creeper, Enchanter's Nightshade, Jack-In-The-Pulpit (*Arisaema triphyllum*) and Red Baneberry (*Actaea rubra*).

<u>Agriculture</u>

<u>Unit 47:</u> These areas are managed agriculture fields planted with corn.

<u>Manicured</u>

<u>Unit 48:</u> Much of the property is characterized by manicured lawns with planted deciduous and coniferous trees, including Silver Maple, Norway Maple, Green Ash, pines, and spruce

3.2.1.3 Forest Communities

Fresh-Moist Willow Lowland Deciduous Forest (FOD7-3)

<u>Unit 3:</u> This mid-aged forest patch occurs toward the southwest end of the property within the Berczy creek floodplain. The canopy consists of Crack Willow, along with Black Walnut, Manitoba Maple, Poplar and Butternut (*Juglans cinerea*). The understory consists of Buckthorn and Manitoba Maple. Garlic Mustard, Enchanter's Nightshade, Field Horsetail (*Equisetum arvensis*), and Jewelweed are common in the ground layer.

<u>Unit 27:</u> This lowland willow forest occurs in the floodplain of Bruce Creek toward the southeast end of the property. The canopy consists of Crack Willow (*Salix fragilis*), Black Walnut, and Manitoba Maple. The shrub layer is sparse, consisting of a few Elderberry (*Sambucus canadensis*) and Riverbank Grape. The ground layer is dense and comprised mainly of Jewelweed, Dame's Rocket and Ostrich Fern (*Matteuccia struthiopteris*).

Fresh-Moist Sugar Maple – Hardwood Deciduous Forest (FOD6-5)

<u>Unit 6:</u> This forest community occurs along the western boundary of the property. The canopy consists of Sugar Maple, Black Walnut, White Ash, and Basswood, with a subcanopy of ash, Basswood (*Tilia americana*), Black Cherry, Manitoba Maple and Butternut. Manitoba Maple, Ash, and Alternate-Leaved Dogwood occur in the understory. The ground layer consists of Virginia Creeper, White Avens (*Geum canadensis*), Spinulose Wood Fern (Dryopertis carthusiana), Riverbank Grape, and Red Baneberry.

<u>Unit 41:</u> This mid-aged forest community is located at the far western edge of the property on gentle valley slope adjacent to Berczy Creek. The canopy is dominated by Black Walnut in association with White Ash and Sugar Maple. Alternate-Leaved Dogwood, White Ash, Buckthorn and Chokecherry



make up the understory. The ground layer consists of Jack-In-The-Pulpit, Virginia Creeper and Enchanter's Nightshade.

Fresh White Cedar Coniferous Forest Type (FOC2-2)

Unit 21: This unit is a small patch of young White Cedar located in the northeast area of the property.

Fresh-Moist White Cedar Coniferous Forest (FOC4-1)

<u>Unit 8:</u> This mid-aged coniferous forest community is located at the northern edge of the property along Bruce Creek. The canopy is predominantly White Cedar along with several Manitoba Maple and Black Walnut. The subcanopy/understory consists of Hawthorn, Buckthorn, Ash, Basswood aAnd Chokecherry. Ground flora includes ferns (*Matteuccia struthiopteris*, *Onoclea sensibilis*, *Athyrium felix-femina*), Enchanter's Nightshade, and Virginia Creeper. A small meadow marsh community occurs along the creek with Canada Anemone (*Anemone canadensis*), Reed Canary Grass, Joe-Pye Weed (Eupatorium macultatum) and Dame's Rocket.

<u>Unit 9:</u> This forest community has a dense canopy of large White Cedar trees. The shrub and ground layers are sparse due to heavy shade. Occasional shrubs include Buckthorn, Elderberry, White Ash and Alternate-Leaved Dogwood. The ground layer is predominantly Herb Robert (*Geranium robertianum*), Enchanter's Nightshade, Garlic Mustard and Celandine (*Cheledonim majus*).

<u>Unit 12:</u> This moist coniferous forest community is dominated by White Cedar, with several Yellow Birch (*Betula alleghaniensis*), Basswood and Sugar Maple. The understory is generally sparse and comprised of Hawthorn, Buckthorn and Green Ash. Jewelweed and Ostrich Fern dominate the ground layer.

<u>Unit 45:</u> This forest community is part of the large woodland situated on the tableland and upper valley slope of Bruce Creek. It has a dense canopy of mid-aged to mature White Cedar, with occasional White Ash. The understory is generally open and consists of Buckthorn and White Ash. Enchanter's Night Shade, Virginia Creeper, Ostrich Fern, Lady Fern and Celandine make up the ground layer.

Dry-Fresh Sugar Maple Deciduous Forest (FOD5-1)

<u>Unit 13</u>: This community has a canopy comprised primarily of Sugar Maple with Basswood associates. The sub-canopy consists mainly of Sugar Maple, along with Buckthorn, White Cedar and Elm. The understory is fairly sparse and composed of Buckthorn, Chokecherry and Ash. Virginia Creeper, Enchanter's Nightshade and Garlic Mustard are common ground species.

Fresh- Moist White Cedar-Hardwood Mixed Forest (FOM7-2)

<u>Unit 14:</u> This moist mixed forest is associated with a small intermittent drainage feature draining toward Bruce Creek. The canopy is comprised of primarily White Cedar and Black Maple (*Acer nigrum*), with Basswood, Black Walnut and Hawthorn associates. Buckthorn, Chokecherry, Young Black Maple and



Basswood make up the understory. Jewelweed, Virginia Creeper, Tall Goldenrod, and Field Horsetail are dominant in the ground layer.

<u>Unit 16:</u> These two small forest patches occur on a slope bordering a reed canary grass meadow marsh and stream. The canopy is composed of White Cedar in association with Basswood, Sugar Maple, Elm and Ash. The subcanopy consists of Ash, Buckthorn and Hawthorn. The understory is fairly open, and consists of primarily Buckthorn, Ash and Chokecherry. The ground layer is generally sparse and consists of Virginia Creeper, Jewelweed and Wild Strawberry (*Fragaria virginiana*).

<u>Unit 35:</u> This unit is one of the larger wooded areas on the property, much of which is situated within the floodplain of Bruce Creek. The area is generally characterized by a mix of mid-aged to mature White Cedar and hardwoods, including Yellow Birch, Black Ash (*Fraxinus nigra*), Green Ash and Basswood. Ostrich Fern, Jewelweed and Enchanter's Nightshade are abundant in the ground layer. Several small drainages run through the woodlot toward Bruce Creek. Bruce Creek runs along the south end of the unit. The creek is bordered by meadow marsh vegetation (Reed Canary Grass, Joe-Pye Weed), Manitoba Maple, Black Walnut, Willow and Cedar.

<u>Unit 46:</u> Two mid-aged mixed forest communities occur within Unit 32. The canopy consists of White Cedar in association with Trembling Aspen, Yellow Birch, Green Ash and White Elm. Ground covers include Enchanter's Nightshade, Wood Ferns, Virginia Creeper, Field Horsetail, Jack-In-The-Pulpit and Wild Sarsaparilla (*Aralia nudicaulis*).

Dry-Fresh Sugar Maple-Basswood Deciduous Forest (FOD5-6)

<u>Unit 17:</u> This community occurs on a slope adjacent to a reed canary grass meadow marsh and stream. It is characterized by a canopy of predominantly Sugar Maple and Basswood, with a subcanopy of Sugar Maple and Crab Apple (*Malus pumila*). Shrubs include Buckthorn, Chokecherry and Young White Ash. Enchanter's Night Shade, Wild Strawberry and Buckthorn Seedlings, and Jewelweed make up the ground layer.

Dry-Fresh Oak-Hardwood Deciduous Forest (FOD2-4)

<u>Unit 31</u>: This mid-aged forest community has a canopy of Bur Oak, Black Maple, and White Ash. Ironwood, Black Cherry, Bur Oak, and Basswood occur in the subcanopy. The understory is fairly sparse, consisting of Buckthorn and Chokecherry. The ground layer is composed of primarily Zigzag Goldenrod, Virginia Creeper, May-Apple (*Podophyllum peltatum*), and Virginia Waterleaf (*Hydrophyllum virginiana*).

Fresh-Moist White Cedar-Sugar Maple Mixed Forest (FOM7-1)

<u>Unit 37:</u> This forest community occurs along the western edge of the property along the slope to Berczy Creek. It is a small piece of a larger forest corridor that extends off the property to the west. The canopy is a mix of White Cedar, Sugar Maple, Black Walnut, and Norway Maple. The subcanopy and understory is comprised of Manitoba Maple, Buckthorn, White Ash, Chokecherry, Alternate-Leaved Dogwood, and Elderberry. Zig-Zag Goldenrod, Enchanter's Nightshade, and Virginia Creeper are common in the ground layer.



Fresh-Moist Sugar Maple-Ash Lowland Forest (FOD6-1)

<u>Unit 42</u>: This small forest community is situated along Berczy Creek, adjacent to Warden Ave. The canopy is comprised of Sugar Maple, Ash, Basswood, and Willow. The understory consists of ash, alternate leaved dogwood, and chokecherry. Zig-zag Goldenrod and Virginia creeper are abundant in the ground layer.

Fresh-Moist Poplar Deciduous Forest (FOD8-1)

<u>Unit 43</u>: Young trembling aspen dominate the canopy of this small forest community. The understory is generally sparse and consists of red-osier dogwood and buckthorn. The ground layer is dense and consists mainly of jewelweed, as well as tall goldenrod and Virginia creeper.

Fresh-Moist Sugar Maple-Hardwood Deciduous Forest (FOD6-5)

<u>Unit 22</u>: This mid-aged forest community occurs along a stretch of valley slope associated with Bruce Creek. The canopy is composed of sugar maple along with black walnut, bur oak, and basswood. Buckthorn, chokecherry, and young ash are dominant in the understory. The ground layer includes Virginia creeper, goldenrod, Canada anemone, and avens. A small inclusion of white cedar (FOC4-1) occurs at the south end of the unit.

3.2.1.4 Wetland Communities

Willow Mineral Deciduous Swamp Type (SWD4-1)

<u>Unit 4:</u> This small mid-aged swamp community occurs at the south end of the property along 16th Avenue. The canopy is comprised of crack willow. Ground vegetation includes cattails (*Typha spp*.), Panicled Aster, Marsh Bedstraw (*Galium palustre*), Reed Canary Grass, Field Horsetail, and bulrush (*Scirpus spp*).

Narrow-leaved Sedge Graminoid Mineral Meadow Marsh (MAM2-5)

<u>Unit 5</u>: This small meadow marsh community occurs at the southwest corner of the property within a cultural meadow in the Berczy Creek floodplain. It is comprised of a mix of wetland forbs and graminoides including sedges (*Carex pellita, Carex vulpinoidea*), rushes (*Junus sp.*), Panicled Aster, Marsh Bedstraw, bulrush (*Scirpus atrovirens*), and Spotted Water Hemlock (*Cicuta maculate*).

Mineral Meadow Marsh (MAM2)

<u>Unit 7</u>: This community occurs in a low-lying area in an old field on the west side of the property. It is dominated by Common Reed (*Phragmites australis*), an exotic invasive species. Additional species include Reed Canary Grass, cattails, Panicled Bulrush, sedges, Tall Goldenrod, and Spikerush (*Eleocharis sp.*).



Pondweed Submerged Shallow Aquatic (SAS1-1)

<u>Unit 10:</u> These communities occur in several ponds on the property which were dug for irrigation and water hazards. They contain waterweeds (*Elodeoa canadensis*) and pondweeds (*Potomogeton zosteriformis*).

Open Aquatic (OAO1)

<u>Units 11</u>: These are open water features (ponds), dug for irrigation purposes, that contain little to no aquatic vegetation.

Reed-canary Grass Mineral Meadow Marsh (MAM2-2)

<u>Unit 18:</u> This meadow marsh community is located along a surface drainage feature (SDF-B) that eventually drains toward Bruce Creek. It is dominated by Reed Canary Grass, with Jewelweed and Red-osier Dogwood associates. Individual Green Ash, White Cedar, Willow, and Basswood make up a very sparse canopy (<10%).

<u>Unit 23:</u> This community was identified in several areas of the property. It is comprised of predominantly Reed Canary Grass, with occasional occurrences of common meadow marsh species such as Joe-pye Weed and Panicled Aster.

Cattail Mineral Shallow Marsh (MAS2-1)

<u>Unit 19</u>: This community is located along the edges of the large dug pond located toward the northeast end of the property. It predominantly consists of narrow-leaved cattail, in association with Broad-leaved Cattail (*Typha latifolia*) and Reed Canary Grass.

Open Aquatic/Cattail Mineral Shallow Marsh (OAO1/MAS2-1)

<u>Units 28a and 28b</u>: are two golf course ponds with a fringe of cattail, bulrushes, and spikerush. Unit 28a supports a small amount of duckweed (*Spirodela polyrhiza, Lemna minor*).

Both features were dug for irrigation purposes or as water hazards.

Forb Mineral Meadow Marsh (MAM2-10)

<u>Unit 25:</u> This wet meadow community is located in the floodplain of Bruce Creek at the southeast corner of the property. It is a diverse community of forbs and graminoids typical of moist soils and marshes, including Field Horsetail, Marsh Bedstraw, Panicled Aster, Reed Canary Grass, sedges (*Carex granularis, Carex bebbii*), Canada anemone, Tall Goldenrod, Bulrush (*Scirpus spp.*), rushes (*Juncus sp.*), Joe-pye Weed, cattail, Red-osier Dogwood, and Michigan Iily (*Lilium michiganense*).



<u>Unit 30:</u> This small meadow marsh community of predominantly Panicled Aster is located within a large old field meadow community.

Birch-Poplar Organic Deciduous Swamp (SWD7-3)

<u>Unit 33.</u> This poplar swamp community has an open canopy of Trembling aspen and Balsam poplar, and a shrub layer comprised of Red-osier Dogwood, Common Buckthorn, and Red Raspberry. The ground layer consists of Jewelweed, Field Horsetail, grasses, sedges, and Fringed Loosestrife (*Lysimachia ciliata*).

3.2.1.5 Flora

A total of 163 plant species were identified on the subject property. A checklist of plant species is presented in **Appendix C**. Approximately 71% of the plant species recorded on the subject property are native to the region. Forty-eight species (29%) are non-native to the region and reflect higher levels of disturbance and a lower floristic quality. The relatively high proportion of native species for natural areas within an urbanized context is one indicator that, overall, the remaining natural areas on the subject property are of good quality.

A number of regionally and locally rare species were observed on the subject property. These species are listed in **Table 2**.

Scientific Name	Common Name	S-RANK ¹	YORK ²	L-Rank ³
Acer nigrum	Black Maple	S4?	R4	L4
Bromus ciliatus	Fringed Brome	S5	U	L3
Calystegia sepium	Hedge Bindweed	S5	U	L5
Elodea canadensis	Broad Waterweed	S5	U	L4
Galium asprellum	Rough Bedstraw	S5	U	L4
Heracleum maximum	Cow-parsnip	S5	R9	L5
Juglans nigra	Black Walnut	S4	R	L5
Lilium michiganense	Michigan Lily	S5	U	L4
Oenothera biennis	Common Evening-primrose	S5	U	L5
Potamogeton zosteriformis	Flatstem Pondweed	S5	U	L3
Salix exigua	Sandbar Willow	S5	U	L5
Sanicula marilandica	Black Snakeroot	S5	U	L4
Scirpus microcarpus	Small-fruit Bulrush	S5	U	L4
Solidago patula	Rough-leaved Goldenrod	S5	R5	L3
Spirodela polyrhiza	Common Water-flaxseed	S5	U	L4

Table 2. Regionally Rare and Uncommon Plants

Key to Table

¹Provincial S-Rank: S4 = Apparently Secure; S5 = Secure; S4? = inexact or uncertain rank

²York (regional statuses from Varga et al., 2005): **R** = rare (no. of records indicated when <20), **U** = uncommon.



³**TRCA Ranks:** L5 = Able to withstand high levels of disturbance; generally secure throughout the jurisdiction, including the urban matrix. May be of very localized concern in highly degraded areas; L4 = Able to withstand some disturbance; generally secure in rural matrix; of concern in urban matrix; L3 = Able to withstand minor disturbance; generally secure in natural matrix; considered to be of regional concern; L2 = Unable to withstand disturbance; some criteria are very limiting factors; generally occur in high-quality natural areas, in natural matrix; probably rare in the TRCA jurisdiction; of concern regionally

In addition to the regionally rare and uncommon species, two vascular plant Species at Risk were identified on to the subject property: Butternut (Endangered) and Kentucky Coffee-tree (*Gymnocladius dioicus*) (Threatened). Both species are protected under the Ontario *Endangered Species Act*.

Butternut

The Butternut tree is designated Endangered in Ontario due to a fungal disease known as Butternut Canker, which kills most trees once they are infected. Twenty-three butternut (*Juglans cinerea*) trees were identified on the subject property, with an additional two found just west of the property. Most of these trees occur in the southwestern portion of the property (**Figure 2**). A Butternut Health Assessment was conducted on all of the Butternuts, with the exception of three that were far from proposed development.

Under the *ESA*, if proposed development or site alteration may affect a Butternut tree or its habitat, the tree must be assessed to determine its health and confirm its status under the EAS. Under the assessment process, there are three categories of Butternut trees:

- Category 1 (Non-retainable): the Butternut tree is affected by butternut canker to such an advanced degree that retaining the tree would not support the protection or recovery of butternut trees in the area in which the tree is located;
- Category 2 (Retainable): the Butternut tree is not affected by butternut canker or the butternut tree is affected by butternut canker but the degree to which it is affected is not too advanced and retaining the tree could support the protection or recovery of Butternut trees in the area in which the tree is located; and
- Category 3 (Archivable): the Butternut tree may be useful in determining sources of resistance to butternut canker. Archivable trees are Category 2 trees that are over 20 cm DBH and within 40 m of a badly cankered Butternut.

Retainable and Archivable trees (Categories 2 and 3) are protected under the ESA; however; non-retainable (Category 1) trees are not protected.

Kentucky Coffee-tree

Several planted Kentucky Coffee-trees were identified on the golf course. The species is designated as Threatened in Ontario, but is not native to York Region. Extant populations of Kentucky Coffee-tree are limited to extreme southwestern Ontario (Counties of Lambton, Kent, and Essex) (Environment Canada 2014); however, Kentucky Coffee-tree is frequently planted as an ornamental tree (often from questionable genetic stock) and, as a result, it is located well beyond the species known native range on Ontario (Environment Canada 2014). In this regard, the incidences of the Kentucky Coffee-tree on the property are not subject to the ESA.



3.2.1.6 Natural Heritage Features

Generally natural / naturalized habitat is confined to two larger features on the subject property, identified on **Figure 2**, that are located in the east block plan area. These are identified as Feature 1 Woodlot/Wetland and Feature 2 Woodlot. A description of each is provided below.

Feature 1 – Woodlot / Wetland

This feature is approximately 4.3 ha in size and is comprised of cultural woodland, mixed forest, deciduous swamp, and meadow marsh. This area has been disturbed as a result of past agricultural land uses, including tree thinning and grazing as evidenced by sparse mature tree cover, relatively low native species diversity, and an abundance of successional shrubs, notably Buckthorn, apples, and hawthorns. The interior of the feature is less disturbed and supports mixed cedar hardwood forest community. The wetland in the south end of this feature is of relatively higher quality, although Buckthorn is invading. The wetland supports several regionally rare plants including Rough-leaved Goldenrod and Water Horsetail. No breeding amphibians were detected in the area.

As part of the Hydrogeological Assessment completed by Burnside (2016) two piezometers were installed in Feature 1 – PZ5s/d is in the wetland feature and PZ8s/d is located in the woodlot. Groundwater levels in this feature have been below ground surface throughout the monitoring period to date. Preliminary data for the woodlot shows a strong downward gradient. Burnside has interpreted this data to mean that the woodlot/wetland feature is supported by precipitation and surface water runoff and provides a groundwater recharge function.

Feature 2 – Bruce Creek Valley Woodlot

This feature is approximately 3.8 ha in size and encompasses portions of the valley slope and floodplain along Bruce Creek. It is comprised predominantly of mature mixed cedar-hardwood forest, as well as oak-hardwood forest, poplar forest, cultural meadow, and meadow marsh along Bruce Creek. The condition of the vegetation communities is generally good with a relatively high proportion of native species. Disturbances include a golf course path, and a clearing near the southeast corner has recently been used a dumping area. The vegetation in this patch contributes to erosion control, flood attenuation, and buffering to watercourses including Bruce Creek and a smaller drainage (Feature B).

3.2.2 Wildlife

3.2.2.1 Breeding Birds

Breeding bird surveys were undertaken at a time of year when most breeding birds are singing (i.e., between late May and early July on the dates noted above). Surveys were undertaken in the early morning, between dawn and 10:00 am, on days with typical temperatures, light or no wind, and no precipitation. All birds that were either heard or seen using the site were recorded by means of walking surveys that would record all singing birds in the surveyed area. All birds observed or heard singing in suitable habitat, were assumed to be breeding on-site, and were recorded by location on an orthophotograph. The maximum number of each species in any one survey day was tabulated.



A total of 47 bird species were observed on the site (**Appendix D**). This a moderate diversity that is reflective of the variety of habitats, albeit fragmented on the property. Of the species identified, three were foraging but not breeding on the property. These were: Great Blue Heron (*Ardea herodias*), Rock Dove (*Columba livia*) and Cliff Swallow (*Petrochelidon pyrrhonota*). Numerous species recorded on the property were common, disturbance-tolerant species found in rural and edge environments. The six most abundant species, in decreasing order of abundance were: American Robin (*Turdus migratorius*), Red-winged Blackbird (*Agelaius phoeniceus*), Song Sparrow (*Melospiza melodia*), Tree Swallow (*Tachycineta bicolor*), Baltimore Oriole (*Icterus galbula*), and Northern Cardinal (*Cardinalis cardinalis*). An estimated 11 pairs of Tree Swallows were nesting in nest boxes which had been supplied by the landowners.

Small numbers of species in low abundance were associated with both woodland and wetland habitat. Forest species included common species that breed in the small fragmented woodlands located throughout the property. Species in this group include: Black-capped Chickadee (*Poecile atricapillus*), Eastern Wood-Pewee (*Contopus virens*), Great-crested Flycatcher (*Myiarchus crinitus*) and Rose-breasted Grosbeak (*Pheucticus ludovicianus*). More breeding birds were identified on the eastern half of the property in Feature 2 woodlot than in Feature 1 woodlot/wetland.

Mainly single individuals of a few wetland species were observed. Most of these species, such as foraging Great Blue Heron, and breeding Mallard (*Anas platyrhynchos*), Spotted Sandpiper (*Actitis macularia*) and Common Yellowthroat (*Geothlyphis trichas*) were using the swm Pond H. The golf course ponds are too small and without sufficient wetland habitat to provide habitat for wetland birds. At most, the ponds may provide foraging habitat for swallows.

Red-breasted Nuthatch (*Sitta canadensis*) and Savannah Sparrow (*Passerculus sandwichensis*) were the only two area-sensitive species recorded. Area-sensitive species require either larger blocks of suitable habitat in which to breed, or higher productivity in larger habitat blocks. Red-breasted Nuthatch is frequently present in mixed and coniferous forests in southern Ontario. Savannah Sparrow is frequently present in agricultural fields and old fields in southern Ontario. Although it requires large areas of open land, it will breed in many types of large field habitats is a very common species in southern Ontario. That only two individual area-sensitive species were recorded indicates that the property provides negligible habitat for area-sensitive species.

Two species at risk were recorded on the subject lands by Beacon Environmental: Eastern Wood-Pewee and Barn Swallow (*Hirundo rustica*). Eastern Wood-Pewee is listed as Special Concern nationally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and provincially by the Committee on the Status of Species at Risk in Ontario (COSSARO). Barn Swallow is listed as Threatened by both COSEWIC and COSSAR). Both species have been listed due to declines in populations, however both are still quite common and widespread throughout southern Ontario.

Eastern Wood-Pewee is present in a variety of deciduous and mixed woodlands. Three Eastern Wood-Pewee territories were recorded on the subject property in wooded patches across the golf course. The two central observations on **Figure 3** are assumed to be the same pair.

Barn Swallow usually nests in built structures and forages in surrounding fields, meadows and wetland areas. Single nests were observed in two of the maintenance buildings in the central part of the site (**Figure 3**).



Provincial 'S' Ranks

None of the species observed are 'provincially rare' (i.e. ranked S1 to S3 by MNR's Natural Heritage Information Centre). Most of the species have an S5 (secure) rank, while about one-third have been given an S4 ("apparently secure") rank.

TRCA 'L' Ranks

Three species are listed as TRCA Species of Concern (L1-L3, most to least concern). All are ranked L3: Great Blue Heron, Black–billed Cuckoo (*Coccyzus erythropthalmus*) and Mourning Warbler (*Geothlypis philadelphia*). The Great Blue Heron was foraging over the site and is not a breeding species on the property. Black-billed Cuckoo is uncommonly observed in southern Ontario. It is usually found in large shrubland habitats, but may also be observed in forests with gaps in vegetation. The golf course may provide a somewhat similar habitat structure. Mourning Warbler is usually present in dense vegetation in early successional forests, as well as densely vegetated gaps in forests. Single individuals of both species were recorded on the property and were probably breeding species. The Mourning Warbler was observed near the south end of Feature 1 woodlot.

MNRF identified Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*) both listed as Threatened under the *ESA*. Breeding bird surveys did not identify these species or their habitat on the subject property.

3.2.2.2 Breeding Amphibians

Breeding amphibian surveys were completed on April 19th, May 30th and June 29th 2016, after dusk and during suitable temperature conditions. Amphibian breeding surveys were conducted according to Environment Canada's Marsh Monitoring Program protocol (Gartshore *et al.* 2004). The survey dates are spaced so as to record amphibian species that call during different times in the spring. These surveys are conducted to record the presence or absence of breeding amphibians in potentially suitable habitat. Species, calling locations and approximate numbers of calling individuals were recorded and mapped. The survey method provides an indication of amphibian abundance during the breeding season using the following scale:

- 0 no calls;
- 1 individuals of one species can be counted, calls not simultaneous;
- 2 some calls of one species simultaneous, numbers can be reliably estimated; and
- 3 full chorus, calls continuous and overlapping (not countable).

All areas that contained potential breeding amphibian habitat (ponds, wetlands, etc.) were surveyed from a distance that would enable calling amphibians to be heard.

Survey Date	Weather
April 19, 2016	Temp.:9°C, Wind: 2, Precip.: None
May 30, 2016	Temp.:21°C, Wind: 0, Precip.: None
June 29, 2016	Temp.:21°C, Wind: 0, Precip.: None





Legend

- Subject Property
- Watercourse
- Amphibian Survey Location and Site Number Special Concern

Threatened

Barn Swallow Nest Location

Eastern Wood Pewee Observation

Area-Sensitive Species RBNU –Red-breasted Nuthatch SASP – Savannah Sparrow

First Base Solutions, 2015. First Base Solutions Web Mapping Service, York Region 2015 Air Photo. Beacon Environmental, 2016. Amphibian Survey Location, Barn Swallow Nest Location, Eastern Wood Peewee Observation, Watercourse, Subject Property.

MASTER ENVIRONMENTAL SERVICING PLAN FOR 4134 16TH AVE

FIGURE 3: Existing Conditions Wildlife

UTM Zone 17 N, NAD 83

Project 215200 September 2016



Natural Environment Report & Environmental Impact Study – 4134 16th Avenue

A total of three species were identified through the surveys of which all are widespread and common in Ontario (**Table 3** and **Figure 3** for survey locations). Green Frogs (*Rana clamitans*) are mostly aquatic, rely on permanent water and may be present in relatively poor quality water. American Toads (*Bufo americanus*) are habitat generalists and will use a variety of wetland or pond types for both breeding and summering. They require 'burrowable' soil for hibernation. American Bullfrog (*Lithobates catesbeianus*) is the largest North American frog. They require larger bodies of water to breed but can be found in smaller ponds and along well-vegetated shorelines. Another bullfrog was heard on June 19 in the southeastern most pond.

Location	Date			
Location	April 19, 2016	May 30, 2016	June 29, 2016	
7	-	-	-	
100	-	GRFR 2(4)	GRFR 2(7)	
TUa			BULL 1 (1)	
10b	-	-	GRFR 1(2)	
10c	-	GRFR 1(1)	-	
11	-	-	BUFR 1(1)	
11a	-	GRFR 1(1)	GRFR 1(1)	
11b	-	GRFR 1(2)	GRFR 1(2)	
110	-	AMTO 1(1)	GRFR 1(3)	
TIC		GRFR 2(6)		
11d	-	GRFR 1(3)	-	
18	-	-	-	
23	-	-	-	
23b	-	-	-	
23c	-	-	-	
24	-	GRFR 2(9)	-	

Table 3. Breeding Amphibian Survey Results

Notes: Species Call Code(#of individuals) GRFR – Green Frog BUFR – American Bullfrog AMTO – American Toad

Several survey locations had no frog calls during all three survey dates. No SAR amphibian species were detected during the 2016 surveys.

3.2.2.3 Significant Wildlife Habitat

Section 2.1 of the PPS affords protection to certain natural heritage features, including Significant Wildlife Habitat (SWH). It is typically the responsibility of the municipality to identify Significant Wildlife Habitat for areas within its jurisdiction; however neither York Region nor the City of Markham have undertaken this assessment. Therefore any areas that may be identified as SWH would be considered 'candidate' SWH.



To determine if the subject property supports candidate Significant Wildlife Habitat, the Significant Wildlife Habitat Technical Guide (SWHTG) (MNR 2000), and the MNRF Significant Wildlife Habitat (SWH) Ecoregion 6E Criterion Schedule (January 2015) were consulted. Both are guidance documents and provide guidance on possible criteria and thresholds that could be used by municipalities to identify candidate Significant Wildlife Habitats in their respective planning areas.

The list of criteria and thresholds is quite extensive, but all SWH falls under one of four categories:

- Seasonal Concentration Areas
- Rare Vegetation Communities or Specialized Habitats for Wildlife
- Habitats for Species of Conservation Concern
- Animal Movement Corridors

Seasonal concentration areas include areas such as heron colonies, waterfowl or shorebird stopover or staging areas and reptile hibernacula. There are none of these types of features on the subject property.

The presence of American Bullfrog can lead to a Candidate SWH recommendation if sufficient individuals are present. The presence of the three single individuals on the property in different ponds is insufficient evidence for a Candidate SWH recommendation.

Rare vegetation communities or specialized habitats for wildlife include areas such as: cliffs, alvars, other rare vegetation types as well as other habitats such as raptor nesting habitat, old growth habitat and habitat for area-sensitive species. There are none of these types of features on the subject property.

Regarding Habitat for Species of Conservation Concern, species have been considered conservation concern if they are: listed as Special Concern, or S1- S3 under the provincial Natural Heritage Information Centre rankings, Note however, that the presence of a Conservation Concern species per se does not necessarily lead to Candidate Significant Wildlife Habitat status, since according to the SWHTG (MNR 2000) "Habitats that support large populations of a species of concern should be considered significant", and therefore probably not habitats that support few or one individuals.

The Eastern Wood-Pewee is a provincial Special Concern species. Each of the three territories of Eastern Wood-Pewee that were observed were in different wooded areas across the property (**Figure 3**). Despite its status, the Eastern Wood-Pewee is very common across southern Ontario in various types of woodlands. The presence of one pewee in a wooded area is not sufficient evidence to constitute SWH.

The SWH Ecoregion 6E Criterion Schedule notes that Animal Movement Corridors are difficult to identify and can be detrimental for some species. The guidance given is that animal movement corridors should be identified only when they have been recognized by the MNRF or a planning authority. These identified corridors are often for either amphibians or deer. Thus, no animal movement corridors are identified on the subject property as none are known.



3.2.3 Aquatic Resources

The subject property lies within the Berczy Creek and Bruce Creeks subwatersheds, which are part of the greater Rouge River watershed. Berczy Creek traverses the property at the south west corner of the property and Bruce Creek flows through the central portion (**Figure 4**).

Fish habitat assessments were completed to identify and assess water body characteristics that provide habitat for the critical life processes as outlined in the federal *Fisheries Act*. The habitat assessments detail the characteristics and major physical attributes of the water body. Eleven transects were completed at existing crossings along the main branch of Bruce Creek and three along Berczy Creek (**Figure 4**). Stream physical conditions were inspected and documented with photographs.

Since both the Berczy and Bruce Creek systems provide direct habitat for the Provincially Endangered Redside Dace (*Clinostomus elongatus*), fish sampling was not completed. MNRF's preference is not to sample such a watercourse. Also, sufficient fisheries records for the system are available to characterize the fish community.

3.2.3.1 Berczy Creek

The Rouge River State of the Watershed Report, (TRCA 2007) classifies Berczy Creek as a riverine cool water system. This classification is based on the known groundwater discharge areas upstream of the property. Occurrences of migratory salmonids have been recently documented and much of Berczy Creek is also known habitat for Redside Dace. Records as recent have 2005 have been documented for reaches just downstream of the golf course lands and existing populations are known in other nearby reaches. Redside Dace is addressed in further detail in Section 3.2.5. The overall species profile for Berczy Creek is a diverse warmwater/coolwater complement with at least 19 species identified in recent years.

Field investigations were conducted by Beacon staff on Berczy Creek as it flows through the property. The stream morphology consists of mixed pools, runs and riffles throughout the Subject Property. This diversity signifies a healthy condition that provides spawning, feeding and refuge habitat for the species present in the system. The substrate includes a mix of sand, gravel and cobble which provides aeration, spawning substrate and habitat for benthic invertebrates which are a food source for the fish community. Undercut banks and tree cover are present in several locations creating suitable cover. In other areas, grasses overhang the banks, which provide ideal cover for certain cyprinids including Redside Dace. In other areas, mowing is occurring within 1-2 metres of the bank resulting in some bank erosion. Overall, the watercourse is in good condition as it flows through the property.

Fish Community

Fish sampling records were obtained from the Rouge River Fisheries Management Plan (TRCA and OMNR, 2011). TRCA has designated each of the major subwatersheds in the Rouge River watershed as a unique Fisheries Management Zone (FMZ). Berczy Creek is identified as FMZ 2 and managed for Redside Dace, Brassy Minnow (*Hybognathus hankinsoni*), Rainbow Darter (*Etheostoma caeruleum*) and American Brook Lamprey (*Lethenteron appendix*). The report classifies Berczy Creek as a riverine cool water system based on the known groundwater discharge areas upstream of the subject property. Based on the fish community information from the Fisheries Management Report, the majority of the



fish species located within Berczy Creek are a mix of warmwater, coolwater and coldwater species. All of the species can be found in riverine systems with varying depths and substrates. There are also several fish barriers in Berczy Creek, which prevent fish passage and may limit their occurrence compared to historical records. None of these barriers are present on the subject property,

Berczy Creek as it flows through the subject property is identified by MNRF as a Redside Dace occupied reach with records as recent as 2009. Redside Dace habitat includes the active channel, as well as the meander belt + 30 m on either side of the meander belt. Redside Dace is discussed further below in Section 3.2.5.

3.2.3.2 Bruce Creek

The Rouge River State of the Watershed Report (TRCA 2007) classifies Bruce Creek as a riverine warm water system. Groundwater discharge areas are present just upstream of the property but the influence of several golf courses and urbanization cause a warming effect, which results in the warm water designation. Bruce Creek provides very high quality fish habitat that supports Brook Trout (*Salvelinus fontinalis*) in the upper reaches upstream of the subject property and an abundant Redside Dace population through the mid-lower reaches including through the subject property. Similar to Berczy Creek, records as recent as 2005 have been documented at a sampling site immediately downstream of 16th Avenue. The reaches that flow through the subject property also have documented occurrences of migratory salmonids. The overall species profile for Bruce Creek is primarily warmwater with at least 26 species identified in recent years. Water quality is considered 'very good' in the mid to lower reaches of the subwatershed. Bruce Creek is the only watercourse with such a rating in the entire Rouge River watershed. The thermal rating is unstable and likely the result of on-line ponds on the tributaries.

Field investigations were conducted by Beacon staff on Bruce Creek as it flows through the property. The stream morphology is a mix of pools, runs and riffles, which signifies a stable system with good quality habitat for the various life stages of the fish community. The morphology of the downstream reaches is not as diverse. These reaches are characterized by long and uniform pool areas and consequently are lower quality habitat. The substrate was comprised of a mix of sand, gravel and cobble, which provides aeration and suitable habitat for benthic invertebrates. Undercut banks and tree cover are present in several locations. The undercut banks provide good quality cover and the trees provide overhead cover, allochthonous food sources and bank stabilization. Eroding banks were identified at several locations throughout the property indicating some measure of instability, likely the result of mowing to within two metres of the banks. A stormwater outlet is located approximately 300 m north of 16th Avenue.

3.2.3.3 Surface Drainage Features and Ponds

There are a total of eight (8) ponds on the subject property, five of which are located within the Bruce Creek floodplain (Ponds C to F and Pond A). The remaining ponds are located in the northeast corner of the property (Pond H – existing SWM Pond), one near the clubhouse (Pond B) and a smaller pond within the golf course (Pond G).





Legend

- Subject Property
- Watercourse
- -
- Aquatic Habitat Assessment Locations
- Tile Drainage Flow Path
- -- Surface Drainage Feature Inlet
 - Existing Storm Sewer Outlet
 - Auxiliary Water
 - Overland/Stone Trench

First Base Solutions, 2015. First Base Solutions Web Mapping Service, York Region 2015 Air Photo. Beacon Environmental, 2016. Aquatic Habitat Assessment Locations, Inlet, Outlet, Auxiliary Water, Overland, Piped Drainage, Watercourse, Ephemeral Watercourse, Subject Property. LIO, 2016 MNRF Wetlands. Stantec, 2016 Existing Storm Sewer.

MASTER ENVIRONMENTAL SERVICING PLAN FOR 4134 16TH AVE

FIGURE 4: Existing Conditions Aquatic

UTM Zone 17 N, NAD 83

Project 215200 September 2016



Several small surface drainage features were identified through aerial photo interpretation and were investigated as part of the field program. Assessments of the features were completed on several occasions including May 10 and November 10, 2011, July 19th, August 3rd and August 17th, 2016.

These features are identified on **Figure 4**. The configuration of ponds and surface drainage features is highly altered because of the golf course use. The descriptions herein provide functions and flow assessment based on the field investigations and discussions with golf course staff.

<u>Ponds</u>

Pond A is located at the southern extent of the property adjacent to Bruce Creek. The water level in this pond is controlled with a spillway. Overflow from the pond spills into Bruce Creek.

Pond B is used for irrigation purposes and was constructed after 2009. This pond is contained within a large berm and does not discharge to Bruce Creek.

Ponds C, D, and E function in series and are used for golf course hazards and irrigation purposes. Pond E discharges to Bruce Creek at its southern end. The outlet was not flowing at the time of field investigations. Through discussions with golf course staff, these ponds have not overtopped their banks in this history of the golf course. The ponds provide habitat for warmwater tolerant fish species.

Pond H is a SWM pond that receives drainage from the east side of Kennedy Road and possible surface water run-off from the adjacent old field meadow through Surface Drainage Feature A (SDF-A). Pond H discharges in three different ways to three different locations escribed below:

- To Bruce Creek via a storm sewer.
- Auxiliary pipe connection to Pond E to augment water for irrigation. Pond H was retrofitted in the early 2000's with a pipe and valve system and water was conveyed through a pipe under Bruce Creek and discharged in to Pond E as a backup.
- A buried stone trench connects Pond H to a Reed Canary Grass Meadow Mineral Marsh (ELC unit 18) but the control valve is not functional. In the event of a large precipitation event flow is conveyed overland.

Pond G is an isolated golf course hazard pond with no connection to Bruce Creek.

Surface Drainage Feature A

Surface Drainage Feature A (SDF-A) is small undefined drainage feature that appears to originate near Kennedy Road and drains into Pond H in the northeast corner of the property. Pond H currently services Upper Unionville but only temporarily. A valve at the outlet to Pond H controlled discharge historically but it no longer functions. Consequently, SDF-A terminates in Pond H.

Surface Drainage Feature B

Surface Drainage Feature B (SDF-B) originates from a pipe that conveys flow from irrigation and rain events across the driving range and discharges at the top of Unit 18. Both Unit 18 and SDF-B were



completely dry during most of the field investigations. But water was observed flowing from this pipe during some of the site visits. Unit 18 likely contributes some flow to SDF-B. The results from the hydrogeology assessment completed by Burnside (2016) show a downward hydraulic gradient and a recharge function during runoff events for Unit 18. Consequently, the flow contribution is limited to surface water. Flow from SDF-B is then conveyed through a pipe under the golf course fairway where it davlights in the Fresh Moist White Cedar Hardwood Mixed Forest (FOM7-2)(ELC Community 14), A small, defined meandering channel traverses this feature. During the July 19th and August 3rd 2016 site visit, very minimal flow was observed from the culvert and water temperature recorded was 15°C at 14:00 (July 19th, 2016). Air temperature was 23°C. The coolness of this water indicates a source other than surface water. Also, at the time of these observations no flow was present at the upstream end of the pipe. The water discharging from the culvert conceivably originates from a piping system that drains the fairway. SDF-B flow is then conveyed under another fairway before it reappears in the Fresh Moist White Cedar Hardwood Mixed Forest (FOM7-2)(ELC Community 35) where it converges with flow from SDF-C, splits into two channels and finally discharges into Bruce Creek. Majority of flow was observed in the eastern channel to Bruce Creek. Based on field investigations, SDF-B flows in response to precipitation events and spring runoff. No floodline or top of bank is associated with this feature.

Surface Drainage Feature C

Surface Drainage Feature C (SDF-C) originates in the isolated eastern woodlot/wetland (Feature 1). Its flow is captured in a small culvert that crosses a laneway. The channel is narrow and is choked with vegetation. Standing water with very minimal flow was observed within the upper reach of SDF-B during field investigations conducted in 2016. SDF-B is then piped under the golf course fairway for approximately 80 m where it flows into an open channel in the Fresh-Moist White Cedar-Hardwood Mixed Forest (ELC unit #35). The surface water is conveyed through the open channel for a distance of approximately 50 m before flowing through a culvert under a second golf course fairway. The intermittent feature discharges through a CSP culvert into a defined channel that converges with SDF-B and meanders, splitting into two channels through Woodlot Feature 2 where it enters Bruce Creek.

Surface Drainage Feature D

SDF-D is a small gully feature that outlets from a culvert at the edge of the Fresh Moist White Cedar Deciduous Forest near the northwest boundary of the subject property. This feature flows out of the bank into a defined channel cut into the Bruce Creek valley.

Surface Drainage Feature E

SDF-D originates on the west side of a golf cart trail and connects to Berczy Creek on the east bank. Flow is conveyed under the trail through a small CSP culvert. The culvert discharges into a defined channel through a Cultural Woodland (CUW-1)(ELC Community 1). The channel is approximately 20 m long and consists of poorly vegetated banks with signs of scouring. The substrates consist of cobbles, silt/sand with small boulders. The feature was dry during the August 3rd 2016 field investigation. Flow in this feature is ephemeral meaning that it flows in response to precipitation events and spring runoff. The source of flow is from drainage collected from the western part of the golf course. No floodline or top of bank is associated with this feature. At most, it contributes sporadic flow to Bruce Creek.



Fish Community

Fish sampling records were obtained from the Rouge River Fisheries Management Plan (TRCA and OMNR, 2011). TRCA has designated each of the major subwatersheds in the Rouge River watershed as a unique Fisheries Management Zone (FMZ). Bruce Creek is identified as FMZ 3. The report classifies Bruce Creek as a riverine warm water system. Groundwater discharge areas are present just upstream of the subject property but the influence of several golf courses and urbanization cause a warming effect, which results in the warm water designation. FMZ 3 is managed for the following key target species:

- Redside Dace (*Clinostomus elongatus*);
- Brook Trout (Salvelinus fontinalis);
- Rainbow Darter (*Etheostoma caeruleum*);
- Mottled Sculpin (Cottus bairdi); and
- American Brook Lamprey (Lethenteron appendix).

A total of 37 species have been captured in Bruce Creek and are a mix of coolwater and coldwater species. All of the species can be found in riverine systems with varying depths and substrates. There are also several fish barriers in Bruce Creek which prevent fish passage and may limit the occurrence of various species compared to historical records.

Redside Dace

Redside Dace is a small colourful minnow that reaches a maximum length of about 12 cm. In Canada, this species is present only in southern Ontario where it occurs most frequently in streams between Oshawa and Hamilton including the Rouge River watershed, in the Holland River drainage, one tributary of the Grand River and three tributaries of Lake Huron.

Redside Dace require cool, clear flowing water with riffle-pool morphology and overhanging streamside vegetation. Stream sections flowing through open terrestrial habitats with overhanging vegetation, undercut banks and submerged branches and logs are most suitable. Channel depths are typically less than 1 m and substrate can vary from fine sediment to cobbles and boulders; however they are most often present in gravel/cobble bed habitat and often with a shallow surface covering of silt or detritus (RDRT, 2010). Redside Dace are a coolwater species and are usually associated with water temperatures of less than 24°C and dissolved oxygen concentration are at least seven milligrams per litre (McKee and Parker ,1982).

Spawning occurs when water temperature reaches 16°C to 18°C on gravelly riffles. It occurs with common tolerant coolwater fishes such as Creek Chub (*Semotilus atromaculatus*) and Common Shiner (*Luxilus cornutus*), and lays its eggs in the gravel nests of these ubiquitous species. This strategy improves egg survival through the guarding behaviour of these species as they provide protection and keep the eggs free of silt. The Redside Dace is a surface feeder and relies on a visual search of prey. It often leaps several centimetres out of the water to capture aerial insects (COSEWIC, 2012) and uses the overhanging vegetation as cover and insects are often concentrated in these areas.

These specialized spawning and feeding strategies make Redside Dace more susceptible to habitat disturbance. They are most often associated with small, cool headwater streams, are sensitive to siltation, and tend not to be widely dispersed because of this habitat preference. Destruction and



degradation of habitat have been the major factors in the reduction of Redside Dace distribution. Siltation, removal of riparian vegetation, channelization, agricultural run-off, and pollution of streams in urban areas all reduce suitable habitat and food sources for this species. For this reason, Redside Dace can be a useful indicator of the health of the aquatic ecosystem because when habitat quality starts to decline, Redside Dace are immediately affected (OMNR and OSCIA, 2002).

Redside Dace is listed as Endangered by COSSARO and is therefore protected under the Ontario *Endangered Species Act* (2007). It has an S-rank of S2 indicating that it is imperilled and vulnerable to extirpation (NHIC, 2012). COSEWIC also lists it as endangered, but it has not yet been listed on the federal *Species at Risk Act*.

Redside Dace Recovery Strategy (RSRT, 2010) provides direction for the protection, enhancement and restoration of habitat for creek and stream systems where the species occurs at present or historically. The strategy indicates that the "*significant portions of the habitat*" of Redside Dace (in relation to the treatment of "Threatened" species by the *Provincial Policy Statement*) should be determined by consideration of the Strategy's definition of an "occupied reach".

Bruce Creek is identified by MNRF as a Redside Dace occupied reach with records as recent as 2009. In this regard, discussions will need to be undertaken with MNRF to determine impacts to Redside Dace habitat as a result of the proposed development.

3.3 Landscape Connectivity

Landscape connectivity and natural linkages have become common parlance when discussing environmental planning. The idea is that variously sized habitat patches, so-called 'core' natural areas, and supporting features are linked by natural corridors in an often fragmented landscape of land uses. Current planning policy typically includes provisions for the maintenance of such corridors.

For example as in section 2.1.2 of the Provincial Policy Statement (MMAH 2014):

"The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features."

Corridors can be major river valleys, or can be smaller in scale such as those associated with creeks. Corridors serve various ecological functions depending on their size and quality. These functions can include providing shelter from predators and the elements, providing breeding habitat, connecting core natural areas, and facilitating seed dispersal and exchange of genetic material. Wildlife use of corridors likely varies. In the fragmented landscapes of southern Ontario, corridors are usually discontinuous stepping-stones acting as corridors in concert to provide elements of connectivity.

Fish migrate along watercourses and this aspect of corridor ecology is important in the Subject Property as fish are present in both Bruce Creek and Berczy Creek. Riparian corridors also provide shade over watercourses which maintains cooler temperatures for temperature sensitive fish species.


On the other hand, some studies have shown that corridors can have some undesirable effects, for example on the breeding success of certain bird species through increased nest predation facilitated by edge effects and ease of movement for predators (Weldon 2006). The role of corridors or linkages for maintaining plant populations or dispersal of a species at the larger landscape level is still not well-documented, although it has been identified as a factor for the spread of some invasive species such as Garlic Mustard. There remains considerable scientific debate surrounding the role of corridors and the importance of connectivity.

As the subject property is situated within the built up area of the City of Markham, there are only a few large core natural areas in the vicinity of the subject lands, generally associated with the stream corridor. There is likely some local level of connectivity occurring along Bruce Creek and Berczy Creek.

4. Constraint Mapping

Section 4 of the York Downs MESP Terms of Reference (**Appendix A**) requires the establishment of opportunities and constraints mapping to determine developable areas and undevelopable areas. The findings of the biophysical inventories, assessments and evaluations presented in Section 3 of this report provide the technical basis for the identification of constraints and opportunities for the proposed development within the subject property.

Field staking took place as part of the Environmental Analysis Study (Beacon, 2010). Top of bank and dripline were staked in the presence of city staff and TRCA staff. The wetland adjacent to the isolated woodlot was also staked but TRCA was not party to this exercise. The top of bank and drip line were re-staked on March 4th, 2016. Bruce Creek and Berczy Creek are the primary constraints on the subject property. Feature 1 Woodlot/Wetland and Feature 2 Woodlot adjacent to Bruce Creek are also constraints. Appropriate buffers between the constraint areas and the proposed development are provided in Section 6.2.

Development constraint lines were driven by:

- Staked physical top of slope;
- Long-term stable top of slope;
- Regional floodline;
- Staked drip line;
- Staked wetland; and,
- Limit of Redside Dace habitat (Meander belt + 30 m).

The Feature 1 dripline was staked in 2010 and again in 2016. A 10 m buffer applied as outlined in Section 2.2.2.9 of the City of Markham OP. A small wetland (ELC unit 23) is located on the western side of the woodlot feature. A 10 m buffer has been applied to this wetland and defines the development limits around this feature.

A meander belt assessment was completed by Beacon Environmental (2016) to delineate Redside Dace habitat, and is presented on **Figure 5**. The floodplain illustrated on **Figure 5** was derived from a floodplain analysis completed by Stantec in 2016. A stable slope analysis was required at the upper reach of Bruce Creek on the west side, immediately south of the northern property boundary and the



eastern bank of the northernmost reach of Berczy Creek within the subject property. These analyses were completed by Golder Associates (2016a and 2016b), and results are presented on **Figure 5**.

Therefore, development limits adjacent to Bruce Creek and Berczy Creek were defined by the following:

- Regional Floodline + 10 m buffer,
- Meander belt + 30 m (Redside Dace habitat),
- Physical top of slope and/or dripline + 10 m buffer, whichever constraint governs; and
- Long-term stable top of slope + 10 m setback.

Wetland staking has not yet been conducted but will be undertaken in the near future. Nearly all wetlands are being retained on the landscape with the exception of Units 7 and 18, both of which are mineral meadow marsh units (MAM2) and are less than 0.5 ha in size.

4.1 Additional Studies

4.1.1 Fluvial Geomorphology Study

A geomorphic assessment was also completed by Beacon for the subject property. The purpose of this assessment was to characterize existing fluvial geomorphic conditions, contribute to the determination of development constraints, and provide input to stormwater servicing plans for the subject property. A historic assessment was undertaken to determine changes in land use and channel planform over time. Results of this assessment identified extensive channelization of both Berczy and Bruce Creek within the subject property between 1961-present. Many of the ponds currently being used by the golf course for irrigation are located in former channel meander bends. This information was referenced in the delineation of meander belt limits for stream corridors (unconfined watercourses) to aid in the determination of erosion hazard limits, and the delineation of occupied Redside Dace regulated habitat (referencing meander belt plus 30 m) for stream and valley corridors to aid in the determination of development limits for the subject property.

In order to understand the potential impacts of the proposed development plan on channel morphology, an impact assessment was undertaken with respect to stormwater erosion control, as well as road and servicing stream corridor crossings. For the erosion control analysis, a comparison pre- and post-development (controlled) flow conditions for the 25 mm, 30 mm and 35 mm storm events under 24 hour, 48 hour and 72 hour detention scenarios was undertaken for nodes located at the downstream limit of the subject property to evaluate how closely post-development conditions can replicate existing condition hydrograph (peak, volume and form), focusing on those portions of the hydrograph above the critical discharge. Results of the analysis indicated, that for both Berczy Creek and Bruce Creek, the 48-hour detention scenario was able to most closely replicate modelled existing conditions (i.e., difference in pre to post cumulative time of exceedance within 5%) without resulting in an over-control of flows. Overcontrol of stormwater within the system is undesirable as the transport of sand-sized material and washload within both Berczy and Bruce Creeks is critical to the maintenance of channel form and function. As such, the 48-hour detention scenario was identified as the preferred erosion control approach for Berczy Creek and Bruce Creek, through which existing rates of channel erosion are not anticipated under the post-development condition.





- Subject Property
- Ultimate Constraint
- Watercourse
- Long Term Stable Top of Slope + 10 m setback (Golder, 2016)
- Long Term Stable Top of Slope (Golder, 2016)

- Meander Belt Width
- - Limit of Redside Dace Habitat - Staked Wetland +10m
- - Regional Floodline + 10 m
- 100 Year Floodline (Stantec)
- Regional Floodline (Stantec)
- Staked Wetland Limits (Beacon Only)
- Staked Top of Slope/Dripline (TRCA, March 2016)
- Staked Top of Slope/Dripline 10 m Buffer
- Staked Dripline (City of Markham, TRCA March 2016)
- Staked Dripline 10 m Buffer

MASTER ENVIRONMENTAL SERVICING PLAN FOR 4134 16TH AVE

FIGURE 5: Constraints

UTM Zone 17 N, NAD 83



Only one road crossing of the Natural Heritage System (NHS) is proposed through the development plan. A 40 m clear span bridge is proposed to cross Bruce Creek. In accordance with the TRCA Crossings Guideline for Valley and Stream Corridors, an evaluation of channel planform (both current and historic) was undertaken at the proposed crossing location. Based on this evaluation, the 40 m span was deemed sufficient to accommodate the governing meander amplitude in vicinity of the crossing, in addition to a factor of safety which would accommodate for long-term adjustments in channel form. Further, a review of the HEC-RAS model output for more frequent storm events in vicinity of the proposed crossing indicated a minimal impact on instream hydraulics.

A sanitary sewer crossing of Bruce Creek is also proposed. The crossing will be installed using directional drilling and will achieve a depth of cover of 2 m under the existing channel bed. Based on the results of the rapid assessments, which indicated widening as the dominant process along Bruce Creek, the 2 m depth of cover was deemed sufficient to mitigate long-term risk to this infrastructure due to active erosion (i.e., channel incision).

4.1.2 Slope Stability Assessment

A Slope Stability and Natural Hazard Setback Assessment was completed by Golder Associates Ltd (Golder). The slope stability analysis was completed along the west bank of Bruce Creek in June 2015. This study involved the use of boreholes to identify the soils. The sub-surface conditions consist of topsoil underlain by a surficial sandy silty clay deposit with trace organics. Visual observations of the slope indicate toe erosion in the form of undercutting which has likely led to slope failures at the toe and on the face of the slope. No signs of deep-seated slope instability were noted during the visual reconnaissance visit. Golder recommends a setback that varies from 27.2 m to 33.0 m along the assessment area of Bruce Creek (**Figure 5**). Further recommendations include, directing surface water run-off from the slope, no fill placement within the geotechnical setback and preserve all existing vegetation.

An Estimated Long Term Stable Top of Slope was developed for two areas of concern identified along Berczy Creek during the staking exercise with TRCA in March 2016. Area 1 is located along Berczy Creek near the western property boundary and Area 2 is located approximately 150 m downstream. Boreholes drilled in the general area identify soil conditions to be soft to hard Silty Clay with zones of Till-like Silty Clay. Based on the assessment the setback requirement for Area 1 will be approximately 36 m from the creek and approximately 40 m from the creek in Area 2.

5. Official Plan Amendment

The City of Markham 2014 Official Plan – Map 5 Natural Heritage Features and Landforms and May 6 Hydrologic Features identifies woodlands, wetlands and watercourses within the City boundary, including the subject property. The results of the field investigations that were completed in support of the MESP/EIS, confirmed the boundary delineation of the woodlots and three areas identified as wetlands on Schedule 5. The associated ELC communities are described below:



- Unevaluated Wetland 1 was confirmed to be a mix of Fresh Moist Sugar Maple-Basswood Deciduous Forest (FOD6-5), Dry Moist Old Field Meadow (CUM1-1), Manicured and Cultural Thicket (CUT1).
- Unevaluated Wetland 2 was confirmed to be Fresh Moist White Cedar Coniferous Forest (FOC4-1), Dry Fresh Oak Hardwood Deciduous Forest (FOD2-4), Fresh Moist White Cedar Hardwood Mixed Forest (FOM7-2) and Cultural Woodland (CUW1).
- Delineation of Unevaluated Wetland 3 was incorrect and the boundaries have been refined based on the wetland staking exercise.

In addition, a watercourse portrayed in the east central area of the property was confirmed to be absent on the landscape.

Figure 6a presents a portrayal of Maps 5 and 6 as shown in the OP with a corresponding map that portrays the field verified features. As part of the OPA amendment, Maps 5 and 6 should be adjusted accordingly.

As part of this process Schedule I of the Town of Markham Official Plan (1987) was also reviewed. Schedule I presents the location of Woodlots and Other Significant Vegetation Communities. The limits of these features have also been adjusted based on the staking completed by Beacon (**Figure 6b**).

6. Proposed Development

6.1 Block Plan

The conceptual Development Plan (**Figure 7**) proposes to develop the subject property as mixed residential and commercial uses. The proposed residential development is provided in the two draft plan of subdivision figures that accompany this MESP. The draft plans have been divided in half. One covers the east portion of the property and one covers the west portion of the property. The west draft plan of subdivision includes all of the valleylands associated with both Berczy Creek and Bruce Creek. **Figure 8** illustrates the development plan for the subject property.

Both the East and West draft plans of subdivision are comprised of a mix of residential, open space blocks, elementary school block, parks, and SWM ponds.

6.2 Servicing

A summary of the servicing plan is provided in this section as it relates to natural environment features. Full servicing details are provided in the Master Environmental Servicing Plan and Functional Servicing Plan prepared by Stantec and included in this submission.





- Subject Property
- Permanent and Intermittent Streams (Map 6 Markham OP, 2014)
- Unevaluated Wetlands (Map 6 Markham OP, 2014)
- Woodlands (Map 5 Markham OP, 2014)

- Wetlands (MNRF, 2016)
- Watercourse (Beacon) _
- Wetlands (Beacon 2016)
- Woodland (Beacon 2016)
- Hedgerow (Beacon 2016)

First Base Solutions, 2015. First Base Solutions Web Mapping Service, York Region 2015 Air Photo. Beacon Environmental,

MASTER ENVIRONMENTAL SERVICING PLAN FOR 4134 16TH AVE

FIGURE 6A: Official Plan Amendment

UTM Zone 17 N, NAD 83

2016





- Subject Property
- Watercourse (Schedule 1 Markham OP, 1987)
- Woodlots and other Significant Vegetation Communities (Schedule 1 Markham OP, 1987) Hedgerow (Beacon 2016)
- Hedgerow (Schedule 1 Markham OP, 1987)

- Forest (Beacon 2016)

First Base Solutions, 2015. First Base Solutions Web Mapping Service, York Region 2015 Air Photo. Beacon Environmental,

MASTER ENVIRONMENTAL SERVICING PLAN FOR 4134 16TH AVE

FIGURE 6B: Official Plan Amendment

UTM Zone 17 N, NAD 83

2016







- Subject Property
- Watercourse
- Development Plan (August 22, 2016)
- Development Constraint
- Long Term Stable Top of Slope + 10 m setback (Golder, 2016)
- Long Term Stable Top of Slope (Golder, 2016)

- ---- Meander Belt Width
- - Limit of Redside Dace Habitat
- 100 Year Floodline (Stantec)
- Regional Floodline + 10 m ----- Staked Wetland Limits (Beacon Only)
- - Staked Wetland +10m

- Staked Top of Slope/Dripline (TRCA, March 2016)
- Staked Top of Slope/Dripline 10 m Buffer
- Staked Dripline (City of Markham, TRCA March 2016)
- Staked Dripline 10 m Buffer

MASTER ENVIRONMENTAL SERVICING PLAN FOR 4134 16TH AVE

FIGURE 8: Development Plan

UTM Zone 17 N, NAD 83

First Base Solutions, 2015. First Base Solutions Web Mapping Service, York Region 2015 Air Photo. Beacon Environmental, 2016. Watercourse.



6.2.1 Stormwater Management

Four Stormwater Management facilities (wet ponds) and one end-of-pipe infiltration facility are proposed for the subject property. Ponds 1 and 2 will be located in the 'East' development. Both will drain to Bruce Creek. Ponds 3 and 4 will be located in the 'West' development. Pond 3 will discharge to Bruce Creek and Pond 4 will discharge to Berczy Creek (**Figure 8**).

Based on the preliminary grading plan, SWM Pond 1 and SWM Pond 3 will require fill within the shallow fringe of the Regional Floodplain. The pond grading matches the existing grades along the Redside Dace habitat limit (meander belt + 30 m) and/or the 100 year floodline.

All four SWM Ponds will discharge into Redside Dace habitat in both Bruce and Berczy Creeks. Therefore, the ponds have been designed in accordance with the Ministry of Natural Resources *Draft Guidance for Development Activities in Redside Dace Protected Habitat* (OMNR, 2011). Only Pond 1 will require the construction of the outfall in Redside Dace habitat.

An infiltration facility will be constructed in Block 9 within the Berczy Creek subcatchment. This facility is proposed in an area with a small drainage area and will provide extended detention storage, prior to discharge into a storm sewer and ultimately SWM Pond 4.

Storm sewers will also be constructed along municipal and private roads and will closely follow typical road cross-section configurations. The storm sewers within the subject property will be sized to capture and convey runoff for storm events up to and including the five year storm event and will discharge to SWM facilities. Flows greater than the five year storm event will be conveyed overland within the right-of-way (ROW). Locations of these facilities are provided on **Figure 8**.

A foundation drain collection (FDC) system is needed in areas where the storm sewer is not low enough for basement connections (Stantec, 2016). The FDC will collect cool, clean water which will be released directly in the valley system through stone trenches. In addition, roof drainage will be collected and conveyed to the ROW below the road surface. There is one location where a perforated roof leader collector (RLC) pipe will discharge to an FDC pipe which will then discharge to a wetland stone reservoir within the old golf course irrigation pond. This system would be located south of the proposed crossing (**Figure 8**).

As part of the Development Phasing process a temporary SWM pond is required to service the same drainage area as SWM Pond 2. This pond will be removed once SWM Pond 2 is constructed.

6.2.2 Water Supply

The southwestern portion of the development will be serviced through a 300 mm diameter watermain which will connect to an existing 450 mm diameter watermain at each of the proposed intersections at16th Avenue. The southeastern portion of the development will be serviced with a 300 mm diameter watermain that will connect with an existing 300 mm diameter watermain at Yorkton Boulevard. The northern portion of the development with be serviced with the following:

• A 300 mm diameter watermain connection to the existing 300 mm diameter watermain at Angus Glen Boulevard;



- A 150 mm diameter watermain connection to the existing 150 mm diameter watermain at Saddleworth Road (east side of the ROW), and at Dancers Drive;
- A 300 mm diameter watermain connection to the existing 300 mm diameter watermain at Prospectors Drive (east side of the ROW);
- A 300 mm diameter watermain connection to the existing 300 mm diameter watermain at the east side of the existing PRV chamber on Bur Oak Avenue on the east side of Kennedy Road.

The pipes will generally follow the right-of-ways but one crossing of the Greenway System and Bruce Creek is required along Street 'A' (**Figure 8**). The watermain will consist of an insulated pipe suspended from the crossing structure, or below Bruce Creek via trenchless construction method.

6.2.3 Wastewater and Sanitary Servicing

The sanitary sewers will be constructed along the municipal and private road right-of-ways and will closely follow typical road cross-section configurations. The proposed sanitary system will be designed based on gravity flow and will not require pumping stations or syphons and forcemains (Stantec, 2016). The proposed sanitary sewer design will utilize existing infrastructure as capacity allows.

The sanitary sewer will be extended under Bruce Creek using trenchless installation in order to avoid impacts to the creek. The trenchless construction will occur from lands adjacent to SWM Pond 1 to SWM Pond 3 located south of Bruce Creek. Stantec reviewed two options and locations for the sanitary crossing of Bruce Creek during the preliminary design process. These included:

- 1) Crossing Bruce Creek near the proposed road crossing; and
- 2) Extending from a low point on the east side to a low point on the west side.

Option 1 would require a deep sanitary sewer ranging from 6 m to 11 m due to grading and the distance travelled within the subject property, which is considered too deep for local servicing, is not an efficient and would require impacts to the road allowance for maintenance.

Option 2 is preferred as the need for deep sewers is minimized (Stantec, 2016). For this option, the sanitary sewer will be 1.5 m below creek bed.

6.2.4 Grading

The site will be graded in accordance with the City of Markham criteria. The proposed grading plan will satisfy the criteria as follows:

- Provisions will be made to minimize grading disturbances in the vicinity of the existing vegetation and natural heritage features identified for retention;
- Road grades have been designed to match existing roads and adjacent lot grades at the periphery of the subject property;
- Existing grades will be matched to minimize grading and cut/fill quantities and to minimize changes to the surface hydrology and hydrogeology, where possible;



Natural Environment Report & Environmental Impact Study – 4134 16th Avenue

- Provide major overland flow routes for flows in excess of storm sewer capacity;
- Accommodate external flows from adjacent properties based on current land use;
- Maintain adequate cover over storm and sanitary sewers and watermains, where possible;
- Minimize the need for rear lot catch basins;
- Minimize the need for retaining walls;
- Achieve the SWM objectives for the subject property.

The proposed grading plan will match existing grades along Berczy Creek with all grading occurring within the lots or within open space blocks that will be dedicated as part of the valley system. The proposed grading plan will generally match the existing grades along Bruce Creek. All grading in this vicinity will also occur in the lots or within open space blocks that will be dedicated as or the valley system. A few locations adjacent to the Bruce Creek valley will require retaining walls and/or grading into the buffer.

- 1. Grading may encroach into the buffer of Feature 2 Woodlot adjacent to Bruce Creek.
- 2. Limited grading encroachments are required for the proposed road crossing of Bruce Creek.
- 3. Two of the proposed SWM pond blocks (Pond 1 and Pond 3) will encroach into the Regional Floodline portion of the Valley feature, but will match the existing grades along the Redside Dace Habitat limit (meander belt limit + 30 m) and/or 100 year floodline, whichever constraint governs. A floodplain cut grading design could be implemented as described in the Stantec (2016) report. The cut grading would occur along the western valley bank south of the existing golf course driveway crossing that will also be removed. Should the cut grading design not be implemented then minor grading within the Redside Dace Habitat limit (meander belt limit + 30m) behind some of the proposed walkout lots south of Bruce Creek Valley is required to ensure positive drainage into the valley.
- 4. The existing golf course irrigation ponds within the Bruce Creek Valley will be dewatered and filled with top soil to the match the existing waterline levels with the exception of Pond E which will be filled to existing waterline and retained as a wetland feature.
- 5. Feature 1 woodlot/wetland located east of Bruce Creek is surrounded by lots and roads. The proposed grading around this feature will tie into existing ground at the buffer limit of the feature. A small portion of the road along the south limit of this feature will require minor grading within the buffer.

6.2.5 Roads

One road crossing of Bruce Creek is required for connectivity, traffic flow and neighborhood structure. The crossing location has been selected in area that is relatively narrow and perpendicular to the valley corridor and where the watermain crossing is proposed. The road crossing is proposed to be a clear span bridge.

The development plan also proposes a road crossing of SDF-B adjacent to the eastern woodlot/wetland feature.



A narrow property corridor is located at the western limits of the subject property and was set aside as a connection to Warden Avenue. The need for this connection and associated environmental impacts were assessed and based on the conclusions, the Draft Block Plan does not include a connection to Warden Avenue. Additional discussion is provided in Section 7.7.1.2.

6.2.6 Amenities – Trails and Parks

A trail system is proposed that will extend along the north side of Bruce Creek along SWM Pond 1 and a second trail system along Berczy Creek. Two pedestrian crossings will be required one on Bruce Creek and the other on Berczy Creek. The proposed trail system is presented in the MBTW Community Design Plan 2016.

Various open space areas have been included adjacent to Bruce Creek and Berczy Creek.

7. Potential Impacts and Mitigation

7.1 **Development Limits**

The Town of Markham OP defines the limits of the Environmental Protection Areas as features (including woodlands, valleylands, wetlands and other significant vegetation communities) plus a minimum of 10 m from any of these features. The TRCA Living City Policies are consistent with these criteria. In this regard, the development limits adjacent to Bruce Creek and Berczy Creek were defined by:

- Regional Floodline + 10 m buffer;
- Meander belt + 30 m (Redside Dace habitat);
- Staked top of slope and/or dripline + 10 m buffer; and
- Long-term stable top of slope.

7.2 Water Balance

The elements of the water balance are dependent on climate, topography, soil texture and hydraulic conductivity and land cover conditions. Precipitation, interception, evapotranspiration, change in groundwater storage, surface runoff and infiltration are the individual elements that are used to estimate the balance. Because the impervious surfaces increase through the development process, infiltration is reduced and surface runoff is increased. Also, the removal of vegetation decreases the amount of evapotranspiration. These changes need to be mitigated to maintain the hydrologic regime of the watercourses as well as the hydrogeological regime of the subject property.

The Subject Property is located within a Low Groundwater Recharge Area (LGRA) as described in the 2012 TRCA Stormwater Management Guidelines. This guideline requires a "best effort made" approach to the maintenance of groundwater recharge (Stantec, 2016).



An overall water balance was completed for the subject property as part of the Hydrogeology Assessment and Water Balance Report prepared by R.J. Burnside Associates (2016). The water balance calculations estimate that, following development, the potential infiltration, without mitigation could decrease by approximately 39% for the overall site from 183,300 m³/yr to 111, 600 m³/yr. Analysis shows that runoff could increase by approximately 140% for the overall site.

Mitigation methods to improve post development infiltration include: designing grades to direct roof runoff towards lawns, side and rear yard swales. Amended soils are also proposed for select areas in East and West draft plan

Additionally, certain natural features within the site require individual feature based water balance assessments to ensure ecological form and hydrologic function are maintained.

7.2.1 Feature Based Water Balance

Stantec identified the external drainage area for the Feature 1 woodlot/wetland near Kennedy Road. As detailed in the Stantec (2016) report, the drainage area (2.97 ha) for the woodlot is located around the eastern limits of the feature. Development is proposed within the existing drainage area to this feature. At present, Feature 1 receives 9, 250 m³/yr in Total Estimated Annual Runoff while in the post-development scenario, this area will slightly decrease to 9,200 m³/yr. Potential impacts to Feature 1 include:

- Slightly reduced runoff from surrounding area;
- Change in vegetation in post-development drainage area.

To ensure that this feature continues to receive runoff and maintain its form and function, a feature based water balance assessment has been completed. Stantec (2016) proposed a new drainage boundary for Feature 1, which is presented in Figure 2.14 in their report. Mitigation measures have been proposed and include, backyard drainage from lots adjacent to Feature 1 will sheet flow to the feature. Roof drainage from selected lots will also be directed to Feature 1, as well, two separate RLC pipes are proposed to collect clean water from 8 roofs and release to Feature 1. A flow dispersal mechanism will be installed at the RLC outfall prior to release of flow into the open space area.

A feature based water balance was completed as part of the Hydrogeology Assessment and Water Balance Report prepared by R.J. Burnside Associates (2016). The feature based water balance calculations estimate that developing in the external drainage area to the feature, essentially eliminates surface water contributions from the upland area and creates a runoff deficit of approximately $4,150 \text{ m}^3/a$ (~45% of pre-development runoff). The wetland and woodlot areas will remain the same in post-development. The volume of precipitation that will runoff and be directed as sheet flow to the woodlot/wetland feature as a result of runoff from rear yard lawns and downspout disconnection from approximately $6,900 \text{ m}^2$ of roof area is approximately $4,100 \text{ m}^3/a$ (~99% of target).

The results of the Feature Based Water Balance for Feature 1 indicate that the proposed mitigation plan is unable to match the existing conditions. However the results indicate that best efforts approach to matching the targets has been applied. For further detail regarding the Feature Based Water Balance, please refer to Burnside (2016) and Stantec (2016).



7.3 Stormwater Management Plan

Without the implementation of a Stormwater Management Plan and with the increase in impervious surfaces, there are several potential impacts to the natural environment including:

- Increased risk of flooding to downstream areas;
- Erosion of watercourses from un-controlled surface water runoff and flows;
- Impaired water quality and increased turbidity leading to impacts to fisheries, macroinvertebrates and aquatic vegetation.

Also, with the presence of habitat occupied by Redside Dace, additional impacts to this Endangered species may result. With this in mind, the ponds have been designed, where feasible according to MNRF recommendations that SWM ponds discharging to Redside Dace streams provide a 3.0 m permanent pool with a bottom draw outlet to mitigate temperature impacts (Stantec, 2016). If this type of design is not feasible, cooling trenches and low flow augmentation systems will be implemented within the proposed development.

The design must include best efforts to maintain the following conditions:

- Discharge temperature below 24°C;
- Dissolved oxygen concentration at discharge of at least seven milligrams per litre; and
- TSS of <25 mg/L above stream background (MNRF 2016).

A complete stormwater management (SWM) plan has been developed by Stantec (2016). The analysis determined that four end-of-pipe wet pond facilities are required for quality control and quantity attenuation and one end-of-pipe infiltration facility providing quantity control. The locations of these facilities are provided on **Figure 8**.

SWM Pond 1 will require grading and filling within the shallow fringe of the Regional Floodplain. The pond grading matches the existing grades along the Redside Dace habitat limit. Based on the groundwater table, the normal water level of the pond will be below the groundwater, therefore a pond liner will be required as well as perimeter subdrains. As SWM Pond 1 will be within the groundwater table, the full 3 m permanent pool will be provided to satisfy MNRF. Temporary dewatering will be required for the construction of the pond. The SWM Pond will discharge to Bruce Creek and the outfall will be located in Redside habitat.

The proposed location of SWM Pond 2 and required grading will all occur outside of the constraint limits. Based on the groundwater table, the normal water level of Pond 2 will also be below the groundwater, therefore a pond liner will be required as well as perimeter subdrains. As SWM Pond 2 will also be within the groundwater table, the full 3 m permanent pool will be provided to satisfy MNRF. Temporary dewatering will be required for the construction of the pond. The pond will outlet to Bruce Creek through the existing outlet constructed for Pond H within the valley. No modifications to the existing headwall are proposed.

SWM Pond 3 will require grading and filling within the shallow fringe of the Regional Floodplain. The toe of the pond berm will be located within the Regional Floodplain and will require erosion preventative measures. Based on groundwater data the normal water level will be above the groundwater table. Stantec proposes a 1.5 m permanent pool to avoid interception with the groundwater table along with



a cooling trench and low flow augmentation to satisfy MNRF guidelines. However, if a 3 m pond is preferred, which would intercept the groundwater table, a liner and perimeter subdrains would be required. Temporary dewatering will be required for the construction of the pond. The outlet is proposed to drain to Bruce Creek and will be located outside Redside Dace habitat.

The proposed location of SWM Pond 4 and required grading will all occur outside of the constraint limits. Based on the groundwater table, the normal water level will be below the groundwater, therefore a pond liner will be required as well as perimeter subdrains. SWM Pond 4 will be within the groundwater table, therefore the full 3 m permanent pool will be provided to satisfy MNRF. Temporary dewatering will be required for the construction of the pond. The pond will discharge to Berczy Creek and will be located outside Redside Dace habitat. According to the 2012 TRCA Stormwater Management Guidelines, Berczy Creek downstream of Warden Ave does not require quantity flood controls. This determination is made by TRCA through hydrologic studies and subwatershed level stormwater management studies...

SWM Facilities will maintain water quality and quantity for the proposed development conditions and minimize impacts to the watercourse related to sediment and temperature. The ponds will include a bottom draw outlet for thermal mitigation, and both ponds and outfall structures have been designed to provide 48-hour detention of the 25 mm storm, and peak flow reduction to pre-development levels. This design will be sufficient for minimizing erosive flows.

The infiltration facility will treat roof, lot and road drainage. The drainage will enter the facility at curb cut locations and will be filtered by landscaping, engineered sand, soil and organic filter medium prior to release into the underdrain and ultimately the storm sewer.

Low Impact Development techniques will be implemented where appropriate throughout the development, and where possible to lessen the impacts associated with stormwater. These are discussed in detail in Section 2 of the MESP Servicing Plan (Stantec, 2016) and include extra depth topsoil, direction of residential roof downspouts to ground surface, grassed swales in sideyards and backyards, enclave biorentention facilities, infiltration facilities, infiltration galleries and perforated roof leader collection (RLC) pipes within the right of way.

The interim SWM pond will be located in an easement north of SWM Pond 2. Impacts associated with the construction of this temporary pond may include vegetation removal. This area will be restored as outlined in Section 8.

7.4 Water Supply Servicing

To facilitate the installation of the watermain along 'Street A', it will be necessary to cross Bruce Creek. The crossing of the watermain will be co-located with the road crossing. The watermain will either be suspended from the bridge structure, or a trenchless construction method to install the infrastructure below the creek invert will be undertaken.

Environmental impacts associated with suspending the watermain from the bridge structure would be limited to works associated with the road crossing construction.

If the watermain is installed with trenchless techniques under Bruce Creek it will avoid impacting Redside Dace habitat to the extent possible. All efforts will be made to ensure construction activities



remain outside Redside Dace habitat (i.e. entry and exit pits). The preferred methodology will be determined as the development process advances.

7.5 Wastewater and Sanitary Servicing

The proposed sanitary sewer will cross under Bruce Creek via trenchless method at a depth of 1.5 m below creek bed. A gravity sewer is proposed as the primary option for this crossing. This option will be feasible provided that sufficient cover is available over the pipe to meet the design criteria for TRCA. All efforts will be made to ensure construction activities remain outside Redside Dace habitat (i.e. entry and exit pits).

Potential impacts associated with the proposed sanitary sewer crossing of Bruce Creek include potential cave-ins, release of drilling fluids, and dewatering. Various environmental and design mitigation measures will be implemented to ensure the protection of Bruce Creek habitat and aquatic life. This will include developing detailed plans for ESC, construction and post-construction monitoring, and contingency plans.

The Guidance for Development Activities in Redside Dace Habitat (MNRF, 2016) recommends an installation depth of 2.5 m where feasible. Discussion with the appropriate agencies will be ongoing to ensure no impacts will result from the installation of the proposed sanitary sewer.

7.6 Grading

The proposed grading plan has been designed to mimic the existing drainage divide to Bruce and Berczy Creek to the extent possible. A drainage diversion is proposed from Bruce Creek to Berczy Creek which is approximately 0.5 ha and approximately 0.3% of the Berczy Creek subcatchment (Stantec, 2016).

Grading for the site has generally been driven by existing infrastructure, pond elevations, natural heritage features, matching existing grades, road and lot grading criteria and pipe cover. There is a considerable grade differential of 20 m across the subject property which will require earth cuts and fills of up to 4.0 m in depth. This will provide positive drainage for local services and will address topographic and environmental constraints. The grading design for roads is dictated by the depth of cover required over top of sanitary and storm sewers.

The preliminary grading design and road profile for the subject property maintain the major storm water drainage flows within the subdivision with conveyance over the local road network and through dedicated overland flow routes to the SWM facilities. In addition, road grades at connections to existing roads are designed to ensure that offsite drainage is generally maintained external to the subject property, and to maintain internal site drainage within the subject property (Stantec, 2016). Lands have generally been graded to direct overland flow to the ponds. The Master Servicing Plan and Grading Report (Stantec 2016; Chapter 5) details all grading requirements for the site. Significant grading changes are illustrated on Drawing 5.4, which also shows the areas of cut and fill.

The grading design recognizes the existing boundary conditions including valley systems and natural heritage features. The site grading has been completed to retain these features while minimizing cut



and fill operations and will replicate the existing subwatershed drainage boundary divide to the best extent possible. Minor grading encroachments into the Natural Heritage System are proposed in order to minimize disturbance and prevent the use of unnecessary retaining walls, while tying in proposed grades to existing grades. Further, the impact of these encroachments on the final NHS are reversible as all disturbed areas will be tilled or loosened and topped with sufficient topsoil in order to support the establishment and long-term growth of proposed plantings.

7.6.1 Proposed Cut and Fill

As per the Master Servicing Plan (Stantec 2016; Chapter 5), fill within the Regional Floodplain will be necessary to construct SWM Ponds 1 and 3. In order to mitigate this encroachment, a floodplain cut grading design could be implemented to satisfy the TRCA Living City Policy 8.12.2. The results of an incremental cut and fill assessment completed by Stantec identified that the proposed compensating cut within the valley would need to occur within the meander belt + 30 m (Redside Dace habitat). However, further hydraulic modelling showed that Regional storm flood elevations with and without the compensating cut are minor and no increases to flood elevations upstream would result. Refer to MESP Servicing and Grading Report for further details.

As outlined in the TRCA Living City Policies, cut and fill operations should not encroach into the meander belt width and should avoid natural features. In this respect, the proposed compensating cut is not required given the minor changes to the flood elevations as demonstrated by Stantec (2016). Impacts associated with this will include disturbance to Redside Dace habitat through removal of riparian vegetation and cut operations within the meander belt. In this regard, additional discussion may be required to ensure compliance with both the LCP and the ESA.

Pond Features

As detailed above the existing golf course irrigation ponds within the Bruce Creek Valley will be dewatered and filled with top soil to match the existing waterline levels. These areas will be stabilized with native vegetation. The storage capacity of these ponds has not been included in the hydraulic modelling completed by Stantec.

In addition, Ponds B, G, and H will be removed from the landscape.

7.7 Road Crossings

7.7.1 Street 'A' crossing of Bruce Creek

Potential impacts associated with the road crossing of Bruce Creek without mitigation include:

- Potential for restricted flows and impact to fish passage based on the type and size of structure;
- Reduced light penetration;
- Exacerbated erosion through poor site selection;



- Water quality impairment from construction and surface water runoff from crossing structure; and,
- Removal of riparian vegetation and Redside Dace habitat.

One crossing of Bruce Creek is proposed for connectivity, neighborhood structure and traffic flow. The Crossings Guideline for Valley and Stream Corridors prepared by TRCA (2015) was reviewed in relation to the proposed crossing. TRCA outlines objectives for the road crossings in relation to natural hazards and natural heritage functions. These objectives are consistent with TRCA's Living City Policies (2014). Also, the presence of Redside Dace was considered.

For new crossings, many aspects of natural hazards and natural heritage objectives can be accomplished through proper siting of the infrastructure.

For Natural Hazards, the objectives pertain to avoidance and mitigation of flood risk, geotechnical risk from slope stability and geomorphic risk from channel migration over time:

- Proposed crossing must not increase flood risk for design storm events up to and including the Regulatory storm event (Regional storm).
- Span the zone of potential future channel migration as defined by the meander belt. Alternative design supported by geomorphic studies may be supportable.

For Natural Heritage function, the objectives relate to terrestrial and aquatic habitat and connectivity functions.

Terrestrial Objectives

- Avoid siting infrastructure in locations of existing forests, wetlands, seepage areas, and other sensitive habitats;
- Minimize footprint impacts of crossings on important terrestrial features and their ecological functions through site selection and design;
- Maintain terrestrial habitat and wildlife connectivity functions by avoiding the priority areas for habitat and wildlife connectivity or by siting and designing crossings to structurally connect habitat patches and to permit wildlife movement.

.Aquatic Objectives

- Avoid sensitive aquatic habitat features (e.g. critical spawning areas, important feeding or refuge areas for sensitive/locally rare/indicator species);
- Avoid channel realignment, hardening, or other modifications;
- Minimize footprint impacts of crossings on important aquatic features and their ecological functions (e.g. groundwater upwellings and discharge areas, maintaining natural sediment transport) through site selection and design;
- Maintain aquatic habitat and fish passage functions by avoiding the priority areas or by siting and designing crossings to permit fish passage.



A single road crossing has been selected to minimize the number of stream crossings and still meet the traffic requirements of the proposed development. The proposed crossing location was selected in an area that is relatively narrow and is perpendicular to the valley corridor. This crossing location will not impact any woodlots or wetlands as it is a currently manicured golf course area. There are no observed/known seepage areas in the vicinity of the bridge or unstable slope areas.

Bruce Creek at the proposed road crossing is fairly consistent with the habitat described above. The substrates consist of cobble, silt and gravel with woody debris and aquatic vegetation providing cover. Stream morphology within this reach is mostly riffle/run with some areas of pools associated with the meanders. Canopy cover was low, however there was abundant overhanging vegetation. Pockets of Watercress (*Nasturtium officinale*) were observed through this reach. Watercress is often an indicator of groundwater discharge. Groundwater seepage contributes to stream base flow and cools water temperatures during the summer resulting in more favourable conditions for cold water fish species.

The proposed bridge will be a 40 m clear span bridge which avoid any obstructions to fish passage and will permit the movement of wildlife under the bridge. The wide meander belt width in this reach of the valley corridor precludes construction of a complete span of the meander belt. Refer to the Beacon *Geomorphic Assessment* for additional studies to support the proposed design. Therefore, there will be disturbance to Redside Dace habitat; however construction of a 40 m span crossing of Bruce Creek within the Angus Glen Village Gate Development just north of York Downs was recently completed and approved by the Ministry of Natural Resources (MNR) with a Section 17(2)(c) permit under the ESA (Beacon 2014).

Additional mitigation measures will be implemented to ensure no impact to fish or fish habitat in Bruce Creek, including Redside Dace. These mitigation measures will include but not limited to the following:

- Limit vegetation removal where possible, and stabilize cleared areas to prevent surface water runoff and sedimentation into watercourse;
- Develop and implement an Erosion and Sediment control plan to minimize risk of sedimentation into watercourse, complete regulator inspections of control measures and repair when required;
- Develop a Spill Prevention plan and ensure spill kits are kept on site;
- Restore disturbed areas with native plants; and,
- Adhere to the appropriate timing works if in water works are required.

Refer to the MESP Servicing and Grading Report prepared by Stantec 2016 for further detail.

7.7.1.1 Street D (west of woodlot)

An existing concrete culvert will be replaced under Street 'D' East with two 600 mm diameter culverts. This will facilitate flow from the eastern woodlot through SDF-C to Bruce Creek.

7.7.1.2 Road Easement Connection to Warden Avenue

An assessment of the road connecting the proposed development to Warden Avenue was completed by Poulos & Chung (2016). The study determined that:



- The easement road must be located on an elevated structure in order to match the grade of Warden Avenue;
- The elevated structure would be located directly over a meandering stream;
- The elevated structure would have to traverse through significant land contour changes, and;
- Through sensitive wooden and topographical areas.

A connection to Warden Avenue at the location of the existing easement would result in substantial environmental impacts that may not be mitigatable. These include:

- The road would require a crossing of Berczy Creek which is designated as occupied Redside Dace habitat by MNRF;
- The alignment would require the removal of a mature woodlot feature east of Warden Avenue;
- The crossing location would be close to several existing crossings of Berczy Creek and Carlton Creek, including two crossings of Warden Avenue, two crossings located at Berczy Creek Way, Glenburn Forest Way and Old Farm Lane Way, increasing the number of crossings on Berczy Creek;
- The proposed road crossing would be located at a large meander in Berczy Creek.

7.7.2 Removal of Existing Golf Course Driveway

The development plan will require the removal of the existing golf course driveway which crosses Bruce Creek. For the purposes of construction, the crossing will remain in place during earthworks operations. Removal of this structure will allow for re-naturalization of Bruce Creek through this reach. All appropriate mitigation measures will be implemented during the removal of the existing driveway crossing.

7.8 Trails

The proposed development requires a pedestrian crossing of the creeks other than at the road locations. Several golf course crossings are located throughout the golf course. The trail plan will make efforts to incorporate these existing crossings wherever a trail crossing of the creek is proposed in order to minimize disturbance and impacts to the natural environment (Stantec, 2016). These existing crossings are preferred in order to minimize potential impacts to Redside Dace habitat associated with new crossings. Existing crossings that are not incorporated into the trail plan will be removed and the area will be re-naturalized.

7.9 Pickering Airport

A Wildlife Hazard Assessment report will be provided by Beacon to comply with the Airport Wildlife Planning and Management regulation under the Canadian Aviation Regulations (CARs) which came into force on December 30, 2006.



Furthermore, the Pickering Airport Site Zoning Regulations apply to the land adjacent to and in the vicinity of the Pickering Airport Site. The purpose of the proposed Regulations is to prevent lands adjacent to or in the vicinity from being used or developed in a manner that is incompatible with the safe operation of an airport or aircraft.

Bird Hazard Zones are identified - No owner or lessee of land within the limits of the bird hazard zone shall permit any part of that land to be used for activities or uses attracting birds that create a hazard to aviation safety and are therefore incompatible with the safe operation of the airport or aircraft.

7.10 Vegetation Removal

Most of the Subject Property is utilized as golf course and consists of landscaped areas. The remainder of the property is disturbed. It is anticipated that all trees situated within the areas to be developed will be removed with the exception of trees that can be integrated within park or buffer blocks, or in some cases rear lots of larger residences. The naturally vegetated areas on the block are mainly contained within the valley corridors and hence will be protected as part of the natural heritage system.

Wetland Communities

Three wetland communities will be removed to accommodate the proposed development. This includes the following communities:

- Common Reed Mineral Meadow Marsh (MAM2, ELC unit 7);
- Forb Mineral Meadow Marsh (MAM2-10, ELC unit 30); and
- Reed Canary Grass Mineral Meadow Marsh (MAM2-2, ELC unit 18).

The Common Reed Mineral Meadow Marsh (ELC unit 7) will converted into the Infiltration Facility and used as a Park.

The Forb Mineral Meadow Marsh (Unit 30) is a small wetland feature that will be removed to accommodate the proposed Street D.

The Reed Canary Grass Mineral Meadow Marsh (ELC unit 18) is associated with Surface Drainage Feature B and receives its flow from the golf course drainage collection under the driving range and precipitation events. Results from Burnside's hydrogeological assessment show not groundwater discharge to this feature.

Several features associated with the golf course ponds will be removed as the ponds are filled in. This includes the following communities:

- Pondweed Submerged Shallow Aquatic (SAS1-1, ELC unit 10a-10c);
- Cattail Mineral Shallow Marsh (MAS2-1, ELC unit 19); and
- Open Aquatic/Cattail Mineral Shallow Marsh (OAO1/MAS2-1, ELC unit 28a, 28b).

The total area of wetland that will be removed is 2.17 ha. Approximately 39 ha will be replaced through wetland and upland compensation areas and plantings identified on **Figure 9**.



Upland Communities

All of the natural upland communities are located within the two major valley systems that traverse the block as well as the eastern woodlot/wetland feature in the East Block. These communities will be undisturbed through the development process except for potential changes to the water balance and minor encroachment into the buffer to accommodate grading. Without mitigation, less drainage may reach these features which could cause long-term impacts. However, using the results of the water balance and through the use of Low Impact Development (LID) measures, these impacts can be avoided. Section 6.2 addresses mitigation measures and the water balance.

Several cultural communities will be removed from the tableland portions of the site. Most of these areas are anthropogenic and have limited function on the landscape. None of these areas contribute to habitat of significant species, nor were any Species at Risk flora or fauna identified in any of these units. This removal will be compensated by upland planting along the Bruce Creek and Berczy Creek corridors.

7.11 Surface Drainage Feature Removal

SDF- A will be removed in its entirety and the minor flow from SDF-B from Unit 18 to where it daylights in Feature 2 - Bruce Creek Valley woodlot will be enclosed while maintaining its function as flow conveyance to Bruce Creek.

7.12 General Mitigation Measures

Erosion and Sediment Control

Prior to any construction, a detailed Erosion and Sediment Control Plan will be developed using the Greater Golden Horseshoe Area Conservation Authorities' Erosion and Sediment Control Guidelines for Urban Construction (2006). It will detail all necessary measures. Regional approval will be secured for the location of the temporary construction entrance.

Proposed erosion controls include the phasing of earthworks, seeding or hydro seeding, using erosion control blankets or the implementing of scarification, to limit the amount of exposed soils during construction.

Sediment controls will include mud mats at construction entrances, sediment control fencing and tree protection fencing, temporary sediment control ponds, temporary sediment traps and diversion swales with rock check dams. These measures will allow sediment to settle, and prevent sediment laden water from entering watercourses and other natural features. It will also keep public roadways free of debris during the construction period.

Tree Removal and Preservation

Tree Inventory and Preservation Plans are currently being developed by Beacon Environmental for the subject property. These plans detail single trees and groups of trees, including hedgerows that are





MASTER ENVIRONMENTAL SERVICING PLAN FOR 4134 16TH AVE

FIGURE 9: Potential Impacts, Mitigation and Enchancements

UTM Zone 17 N, NAD 83



outside the proposed Natural Heritage System. The Plan includes recommendations for retention or removal of each of these trees. The reports also include general guidelines including nest surveys during the breeding bird season prior to removal of any specimens.

Timing Windows

The federal *Migratory Birds Convention Act* (1994) and provincial *Fish and Wildlife Conservation Act* protect the nests, eggs and young of most bird species from harm or destruction. As the breeding bird season in southern Ontario is generally from mid-April to mid-July, the clearing of vegetation should occur outside of these periods. For any proposed clearing of vegetation within these dates, or where birds may be suspected of nesting outside of typical dates, an ecologist should undertake detailed nest searches immediately prior to site alteration to ensure that no active nests are present.

As both Berczy Creek and Bruce Creek are designated Redside Dace habitat, works within the regulated habitat (meander belt + 30 m for occupied and in water works for contributing features) must be conducted from July 1 to September 15, unless otherwise directed by MNRF.

Construction Dewatering

For any dewatering activities that may affect the creeks, the Redside Dace timing window (July 1 to September 15) would apply. Any water discharged to the tributaries should meet the criteria set in the Guidance for Development Activities in Redside Dace Protected Habitat (MNRF, 2016).

7.13 Species at Risk Mitigation Measures

7.13.1 Butternut Impacts and Mitigation

Twenty-three Endangered Butternuts were recorded during surveys on the property. Some of these will not be affected by the development and others are non-retainable. Non-retainable trees are not protected under the Endangered Species Act (ESA) due to the presence of large amounts of butternut canker. The remaining trees that will be affected, can be either directly removed or harmed under the ESA as long as the appropriate Registry (Section 23.7 of O. Reg. 242/08) or ESA permit process is followed. Beacon will first submit the Butternut Health Assessments for auditing to the Ministry of Natural Resources, in order that the ministry can agree with the health assessments. After this, the Registry or permit process can begin.

7.13.2 Barn Swallow Impacts and Mitigation

Two nests of the Threatened Barn Swallow were recorded in two buildings on the central part of the property. These buildings can be removed, however, prior to removal, the MNRF Registry process must be followed and compensation structures built. Section 23.5 of Ontario Regulation 242/08 provides direction on this process. A Mitigation and Restoration Record is created and the structures are monitored for two years.



8. Restoration and Enhancement Opportunities

8.1 Summary of Vegetation Removals and Additions

Very few natural communities are present on this block other than the valley corridors, all of which are being retained in their present form. Vegetation losses and gains have been categorized in upland, wetland and drainage feature categories. The upland communities to be removed consist of disturbed cultural communities on the tableland including hedgerows, old field meadow, cultural plantation, and cultural thicket. These features provide minimal ecological function and do not make substantial contributions to the natural heritage system. Given the design of the current golf course land use, several pockets of forest communities will also be removed. Tree Inventory and Preservation Plans are currently being developed by Beacon Environmental for the subject property. These plans detail single trees and groups of trees, including hedgerows that are outside the proposed Natural Heritage System.

Pockets of wetland communities are also proposed for removal. These features consist of Common Reed Mineral Meadow Marsh and Reed Canary Grass Mineral Meadow Marsh.

Several restoration and enhancement areas have been identified across the site with the objective of:

- buffering and protecting existing habitats;
- providing connectivity between natural areas;
- creating new habitat; and
- enhancing and restoring existing habitats.

Enhancement areas have been proposed for five locations within the subject property. These are identified on **Figure 9**.

- Area A represents riparian and upland plantings along the Bruce Creek corridor;
- Area B represents riparian and upland plantings along the Berczy Creek corridor;
- Area C will be the creation of a wetland feature in Pond E;
- Area D consists of the infiltration gallery located in the Block 9 Park; and
- Area E is located in the Open Space area next to the Bruce Creek valley woodlot.

Further restoration will be proposed as part of the MNRF permitting for Redside Dace that will likely be required. Discussions will be undertaken with that agency as the development process advances.

All restoration and enhancement areas will be planted with a mix of native woody plant materials that are complementary to the existing vegetation and site conditions. A mixture of species is generally proposed for each type of buffer, including a variety of sizes to provide diversity. A higher proportion of smaller sizes is recommended since they establish more easily. Seed mixes to create groundcover and assist in soil stabilization are recommended between woody planting beds. Areas within regulated Redside Dace habitat will be planted with the appropriate grasses and shrubs as approved by MNRF.

Restoration areas, buffers and all disturbed areas will be prepared by tilling or loosening and topped with sufficient topsoil to a minimum depth of 300 mm as to support the establishment and long-term growth of the proposed plantings. During site preparation of these areas, any invasive species will be



removed prior to planting. The recommendations for the restoration and enhancement areas and the locations are preliminary and conceptual. The precise locations and extent of treatment and locations will be the subject of further discussion as the process unfolds and will only be confirmed at a later detailed design stage.

9. Monitoring

The following section outlines, in general terms, the rationale for and type, duration, and frequency of the various elements of a monitoring program that could be considered appropriate for 4134 16th Avenue. Monitoring will focus on the performance of the stormwater management facilities, the effectiveness of the natural feature boundaries and the detection of any changes in the terrestrial and aquatic environments that might be attributable to the proposed development. The results of the monitoring plan will be analyzed and appropriate measures to resolve observed issues will be identified and implemented.

Construction Monitoring

Erosion and Sediment Control Measures

All ESC measures will be installed prior to construction and inspected regularly throughout construction phasing. Any damaged ESC measures should be repaired or replaced within 48 hours of the inspection.

Long-term Natural Heritage Monitoring

<u>Wetlands</u>

Wetlands lying adjacent to the areas that are developed will be monitored during and post-construction. Wetland monitoring will examine any changes to the physical extent of the feature (boundary changes), integrity of its physical and biological attributes, invasive species, encroachments (e.g., debris, dumping of fill or garbage, cutting), etc. The wetlands shall also be examined to determine if existing hydrology is having detrimental effects on its quality and function. This will include identification and documentation of areas where:

- Silt accumulation is evident;
- Erosion is occurring on a regular basis;
- Canopy species are declining;
- Native wetland species are being displaced by aggressive species (e.g., cattail, reed canary grass, tall reed grass, purple loosestrife) which are indicative of impaired water quantity/quality.

<u>Woodlots</u>

The edges of woodland units adjacent to development blocks will be periodically inspected and any observed impacts documented with photographic records. At least one monitoring cycle must be undertaken prior to the commencement of construction to establish baseline reference conditions. Monitoring should document the following:



- Encroachments (e.g., informal trails, yard waste disposal, vegetation removal/conversion, gates in fences or illegal structures);
- Tree canopy health and condition;
- Presence of problem plant species where they represent a significant portion of cover

Buffer Integrity

The condition of the buffer areas will be inspected and evaluated through field reconnaissance. Buffers will be inspected post development to ensure that any area where encroachments (including but not limited to illegal dumping, fence removal, or presence of illegal structures) are documented, and subsequently reported to the City or TRCA.

Stormwater Management

The SWM system components (including the LID measures and SWM ponds) will be inspected regularly to evaluate their operation. Specific monitoring parameters of SWM ponds that discharge to Redside Dace Habitat will be determined in consultation with MNRF under the ESA (2007).

10. Policy Conformity

A summary of federal, provincial and municipal environmental protection and planning policies and regulations applicable to the subject property discussed in **Section 2**. An evaluation of how the preferred land use option for the Subject Property complies with the applicable environmental policies and legislation is summarized below in **Table 4**.

APPLICABLE POLICY / LEGISLATION	RELEVANT EIS FINDINGS AND RECOMMENDATIONS	Compliance
Federal Fisheries Act (1985)	The watercourses within the subject property provide fish habitat. All watercourses and associated fish habitats within the subject property will be protected through appropriate setbacks and through implementation of appropriate mitigation measures that ensure fish habitat is not impacted.	Yes
Endangered Species Act (2007)	Habitat for Redside Dace (endangered), Butternut (endangered) and Barn Swallow (threatened) has been confirmed within the Subject Property. The habitat of Redside Dace has been confirmed with MNRF and the limit of future development has been established outside the habitat for this species. Some elements of the development such as a proposed road crossing of Bruce Creek in Redside Dace contributing habitat and a stormwater outfall will need to be constructed within the habitat for this species. Appropriate mitigation measures have been identified and will be implemented to reduce potential impacts to the fishery.	Yes (Subject to MNRF Permitting and Approval)

Table 4. Policy Compliance Assessment



APPLICABLE	RELEVANT EIS FINDINGS AND RECOMMENDATIONS	Compliance
POLICY /		-
LEGISLATION		
	Several Butternut have been identified. An audit will be undertaken	
	by MNRF and the requisite treatment of these trees as it relates to	
	permitting will be completed	
	Barn Swallow habitat will be removed from the Subject Property to	
	accommodate the proposed development. Compensation for the	
	Endangered Species Act regulations to the satisfaction of OMNR	
Provincial Policy Sta	tement (2014) Section 2.1 – Natural Heritage	
Provincial Policy Statement (2014) Section 2.1 – Natural Heritage		
Threatened	on the Subject Property and is being addressed in conformity with	163
and	the Endangered Species Act (see above)	
Endangered		
Species		
2. Significant	No Significant Valleylands are present on the Subject Property	Yes
Valleylands		
3. Significant	There are no Provincially Significant Wetlands identified on the	Yes
Wetlands	Subject Property or environs.	
	Several unevaluated wetlands are located on the tableland. These	
	wetlands are associated with anthropogenic surface drainage	
	realures.	
	Some elements of the development, such as the construction of road	
	'D' will encroach into the wetland buffer. One small wetland will be	
	removed from the landscape. Appropriate mitigation measures such	
	as compensation for wetland loss due to roadways, buffers and	
	sediment and erosion controls will be recommended in the EIS to	
	reduce potential impacts to these non-provincially significant wetland	
	features as a result of accommodating essential infrastructure and	
	servicing needs.	
4. Significant	Woodland features on the subject property are not significant.	Yes
5 Significant	None is present on the property	Voo
Wildlife Habitat	None is present on the property	165
6. Significant	The subject property does not overlap with any earth or life science	N/A
Areas of	ANSIs	
Natural and		
Scientific		
Interest		
7. Fish Habitat	See text above re: Federal Fisheries Act	Yes
		(Subject to
City of Markham	Section 2.2.2.9 f) of the Official Plan calls for the minimum width on	Voc
Official Plan (1987)	an environmental huffer to be 10m from the drin line of the trees at	1 62
	the edge of a woodlot or as defined by an Environmental Impact	
	Study. The Greenway System on Map 4 has been respected. An	
	OPA will be required for refinement.	



APPLICABLE POLICY / LEGISLATION	RELEVANT EIS FINDINGS AND RECOMMENDATIONS	Compliance
York Region Official Plan (2010)	Sections 2.2.45 and 2.2.48 of the OP address woodland significance. Map 2 identifies the Greenland System. All woodlands are being protected and the Greenland System has been respected.	Yes
Toronto Region Conservation Area (TRCA) Regulations	The subject property includes watercourses and valley hazard lands (i.e., floodplains, slopes), all subject to TRCA regulation. The MESP has identified all features that would be subject to regulation, and the proposed development plan protects all regulated features.	Yes (subject to TRCA permits)
	Some elements of the development, such as a proposed road crossing, watermain and sanitary sewer crossing of Bruce Creek and four stormwater outfalls, will need to be constructed within regulated areas and require TRCA permits. Appropriate mitigation measures have been identified and will need to be implemented to reduce potential impacts to the regulated features.	

11. Summary and Recommendations

This Environmental Study identifies the existing features and development impacts 4134 16th Avenue in the City of Markham. The site presents a variety of constraints that include: Greenbelt Plan Area, Species at Risk and high quality environmental features. The proposed development plan has incorporated all of the natural environment policies set out in the Town of Markham Official Plan.

Residual impacts will be minimal provided the proposed mitigation measures are implemented. These include:

- Completion of feature-based water balance to determine water supply to natural features;
- Monitoring quality and quantity of discharge of dewatering water to tributaries;
- Meeting MNRF criteria for SWM outlets and discharge;
- Implementation of monitoring plan and using adaptive management to address issues.

This document fulfills the criteria for the Natural Environment Report component of the MESP and provides sufficient detail to fulfill the requirements for an EIS as well.

Report prepared by: Beacon Environmental

Sarah Aitken, B.Sc. Aquatic Ecologist

Report reviewed by: Beacon Environmental

Jo-Anne Lane, M.Sc. Principal



12. Literature Cited

Stantec. 2016.

Functional Servicing and Stormwater Management Report – 4134 16th Avenue Residential Development.

Stantec. 2016.

Master Environmental Servicing Plan – 4134 16th Avenue Master Servicing and Grading Plan.

R.J. Burnside. 2016.

Master Environmental Servicing Plan - 4134 16th Avenue Hydrogeological Report.

Beacon Environmental. 2016.

Ministry of Natural Resources (MNR). 2016.

Guidance for Development Activities in Redside Dace Protected Habitat. Ontario Ministry of Natural Resources, Peterborough, Ontario. ii+42 pp.

Rouge Park Alliance. 2001.

Rouge Park North Management Plan.



Appendix A

Terms of Reference



Terms of Reference for a Master Environmental Servicing Plan (MESP) For York Downs July 2016

Preamble

The following provides an overview of the City of Markham's Submission Requirements for Master Environmental Servicing Plans (MESP's). The MESP is to be prepared in support of Secondary Plans for specific development areas, and is to be completed in conformance with the requirements outlined in the City's Official Plan. These submission requirements are intended to be generic and summarize the information requirements for an MESP completed anywhere within the City of Markham. Nevertheless, it is recognized that the submission requirements may be tailored to be specific to the available information and/or guidance from higher level studies (such as the Subwatershed Study for the City's Future Urban Area).

In circumstances where a Subwatershed Study (for instance) precedes a Secondary Plan and MESP process, some of the data/analyses listed herein may not require new work or it may be appropriate to build upon the technical analyses and assessments conducted in the primary or parent studies, subject to scope concurrence with the City and its partners. References in the table below to the need to refine SWS recommendations are intended to apply to circumstances where refinement may be needed if there are substantive differences in land use assumptions between the MESP and the SWS and/or legislative requirements, policies or engineering standards that have arisen since the completion of the SWS (e.g. Species At Risk [SAR], Climate Change, etc.).

These Terms of Reference summarize only the information and content which is required for an MESP. Further details of the scope of work required for MESP's (i.e. analytical tools and methodology, monitoring, field investigations, mapping and reporting formats and requirements, etc.) are to be defined in the Terms of Reference for each specific MESP. Development proponents are required to consult with the City of Markham and the City's Study Partners (e.g., Toronto and Region Conservation Authority (TRCA), Ministry of Natural Resources and Forestry (MNRF), Regional Municipality of York (Region), adjacent municipalities, as appropriate) to establish and prepare the Terms of Reference for each MESP, prior to initiation.

Task	Required Components				
	Executive Summary				
1.	The Executive Summary shall include the following:				
	• Integrated summary of the work completed and conclusions of the individual sections				
	• Identification of inter-relationship between the various sections				
	• Concise summary of the significance and implications of the findings of the MESP				
	Summary of conclusions and recommendations				
	Introduction				
	The MESP shall include the following, subject to consultation with City and Study Partners:				
	• Purpose of the MESP including its relationship to higher level documents and/or other relevant Studies, and its relationship to neighbouring lands in terms of servicing, transportation etc.; Terms of Reference for the MESP should also include a section clearly outlining the study requirements				
	• Study area location, attributes, descriptions, figures and boundaries, including rationale for determination of study extent				
	• Setting (existing land use, natural features, etc.)				
	• Study objectives; the MESP is to:				
2.	 be completed in support of proposed land development within the corresponding Secondary Planning Area 				
	 be completed to advance detail and be consistent with the recommendations from higher level and/or relevant studies, as applicable 				
	 describe and evaluate opportunities and constraints and conceptual mitigation related to the hierarchy of protection, enhancement, or if required, compensation, for the natural heritage and hydrologic features potentially impacted within the study area; to evaluate these features and their functions in terms of opportunities and constraints for the management of Greenway System in the context of the development, specifically to determine the potential implications to the natural heritage and hydrologic features and valley lands in compliance with the approved policies in the OP (existing 1987 and the partially approved 2014) 				
	 outline site design or management techniques that may be required to mitigate, enhance or compensate for the potential adverse effects to the natural heritage and hydrologic features and functions 				
	 provide sufficient level of site investigation, servicing investigation and conceptual design, in recognition of potential access restrictions to some locations, to ensure that significant natural heritage and hydrologic features and their functions are protected and managed in the governing studies, where applicable, as part of the completion of the MESP 				
	 identify opportunities to reduce servicing and transportation crossings of the Greenway System 				
	[Note: more detailed investigations will be required in support of individual				

	development applications; however, those study requirements will be appropriately scoped as a result of this investigation.]	
	Scope Outline	
	• Study team that include an inter-disciplinary team with expertise including but not limited to environmental, hydrogeological/geotechnical, engineering, planning, landscape architects and public consultation and transportation.	
	• Maps depicting land ownership and participation in the study	
	Report structure outline	
	 Summary of pre-consultation activities with City, TRCA, MNRF, Region, and others as required 	
	• Background review of existing relevant studies (e.g. transportation studies, approved watershed, subwatershed, drainage studies, fisheries management plans, best management practices guides, natural heritage systems planning guides, flood and stormwater management studies, etc.)	
Planning and Environmental Policy Context		
3.	• Identify and define applicable Federal, Provincial, Regional, TRCA and Municipal planning and environmental policies including existing 1987 City of Markham Official Plan and the applicable sections of the partially approved City of Markham 2014 Official Plan which supersede it . This includes policy review of the applicable Official Plan policies	
	• Reference existing relevant studies (e.g. approved watershed, subwatershed, drainage studies, fisheries management plans, best management practices guides, natural heritage systems planning guides, flood and stormwater management studies, urban design studies, transportation studies, trail studies, etc.) which represent the parent studies and governing documents for the MESP. Identify, list and summarize applicable sections of each document as they relate to the MESP	
	• Define requirements for compliance with any relevant Subwatershed and other applicable studies	
	• Identify Greenway System including natural heritage and hydrologic features identified for protection in the applicable Official Plan policies.	
	Characterization of <u>Existing</u> Conditions: Constraints and Opportunities	
	The MESP will include assessment/identification (as applicable) of constraints and opportunities to the Greenway System related to:	
	Monitoring	
4.	 Pre-development monitoring of adequate duration established consultatively with City and TRCA staff 	
	Physical Setting	
	• Physiography - – characterization of physiographic setting and landform;	
	• Topography – topographic survey of the study area and boundary, including all on- site structures, watercourses, drainage routes, culverts and general location of treed	

	areas, etc.; and
0	Geology – surficial geology description and mapping, bedrock geology and stratigraphic interpretation of the subsurface sediments
• ;	Surface Water Resources
0	Surface water hydrology and hydraulics including:
	 Existing land use drainage conditions (boundaries and patterns)
	 Existing land use hydrologic modeling
0	The Regional Storm assessment for existing and post development will be conducted using the watershed model prepared by TRCA. The consultant will conduct the modeling using the current VO2 model, but with the understanding that further assessment of the Regional impacts using the updated PCSWMM model will be required to confirm or adjust previous findings. Updates will be submitted to the City and the TRCA as amendments to the MESP
0	Water budget for existing conditions, based upon water balance for surface water with input from the groundwater component
0	In consultation with the city and TRCA, identify headwater drainage features and establish management scenarios as per the TRCA Evaluation Classification and Management of Headwater Drainage Features Guidelines (2014)
0	Update existing TRCA's floodline mapping based on current site topographic survey.
0	Surface water quality including:
	 Documentation of water quality monitoring findings for area watercourses
	 Outline of recommendations from Stormwater Management Retrofit Study/Plan including specifically any retrofit and restoration opportunities
•	Water Budget/ Water Balance
0	Establish water budget for existing conditions, based upon water balance for groundwater with input from the surface water component. This would include (but not limited to):
	 calculation of annual infiltration with input from field tests related to soil's hydraulic conductivity and infiltration rates
	 establish targets for overall water balance including local groundwater recharge as necessary based on the extent of guidance provided by this MESP and any other relevant higher level studies (to ensure the sustainability of wetlands, woodlands, etc. and to manage runoff)
0	Feature based water balance - identify natural features within the study area and based on monitoring results provide information how each feature is sustained within their catchment areas (groundwater/surface water), hydroperiod, and expected timing to return to "normal" conditions
0	Prepare stage/storage/discharge information for storage based features using survey and monitoring data
• Prepare and calibrate hydrologic/hydrogeologic modeling or calculations using monitoring data

• Groundwater Resources

A hydrogeological assessment to assess the existing soil and groundwater conditions at York Downs will characterize the physiography, topography and drainage, surface water flow conditions and describe the surficial and bedrock geology, hydrostratigraphy, local aquifers, groundwater use and water quality, and the interpreted groundwater flow systems. Water balance calculations for pre-development, post-development and post-development with mitigation will also be provided.

An extensive groundwater and surface water monitoring network has been established on the property including 28 monitoring wells, 16 drive point piezometers and 6 staff gauges. Monthly monitoring began in March 2016 and is on-going. In addition to this data, historical groundwater and surface water monitoring data previously subject to PTTW monitoring requirements are also considered.

- Hydrogeological investigations including:
 - Existing groundwater levels, flow direction and gradients
 - Aquifer locations and vul**n**erability
 - Groundwater recharge and discharge zones
 - Baseflow contribution to wetlands and watercourses
- Major groundwater resources and groundwater users in the area from MOECC water well and water taking permits and other relevant information
- Refine/define targets for overall water balance as necessary based upon scale of assessment and extent of guidance provided by higher level studies
- Source Water Protection Plan including:
 - Wellhead Protection Area Quantity
 - Wellhead Protection Areas A, B, C, and D
 - Groundwater Vulnerability 8 and 10
 - Significant Groundwater Recharge Areas
 - Ecologically Significant Groundwater Recharge Areas
 - Surface Water Intake Protection Zones
- Fluvial Geomorphology
 - Existing land use fluvial geomorphologic conditions including:
 - Reach delineation
 - Rapid assessments

 Detailed geomorphic field assessment
 Meander belt width assessments for major tributaries throughout the study area, using MNRF and TRCA approved assessment protocols in support of erosion hazard delineation
•
 Meander belt width delineation in support of Redside Dace habitat limits, where present in consultation with MNRF
• Erosion threshold assessment including consideration of downstream areas
Aquatic Resources
• Aquatic community description including:
 Physical conditions including channel form, in-stream cover, spawning habitat, refuge habitat, riparian cover, etc.
 Fisheries community composition and significant/sensitive species including aquatic species or communities that have designations under the Endangered Species Act or the Species At Risk Act
• Hydrologically sensitive features and key hydrologic features
 Natural features' dependencies on surface water and/or groundwater based upon hydrogeological investigations.
 Identification and delineate (including staking) of all wetland features (provincially and locally significant wetlands and unevaluated wetlands) in consultation with the Ministry of Natural Resources and Forestry (as required), TRCA and the City.
 Identification and delineation of valleyland features and buffers
Terrestrial Resources
• Vegetation community description and floral inventories including:
 Ecosystem context
 Community description using MNRF ELC standards
 Identification of Areas of Natural and Scientific Interest (ANSI)
-
 Identification of vegetative communities and significant/sensitive species including species or communities that have designations under the Endangered Species Act or the Species At Risk Act
 Identification and delineation (including staking) of woodlands. Any proposals for removal of woodlands will require completion of woodland assessment using the City's established Terms of Reference for Woodland Evaluation. This work can be completed separately (prior to impact assessment) or as part of this MESP.
 Habitat conditions and species. Acceptable methods should be clarified for birds, amphibians/reptiles and mammals and approved by City and TRCA staff.

	 Significant wildlife species and habitat conditions
	 Conduct breeding bird and amphibian surveys, as requested by TRCA and/or MNRF as required
	 Significant species including local, Regional, Provincial significant species, communities of conservation concern as per TRCA rankings, and species or communities that have designations under the Endangered Species Act or the Species At Risk Act
	 Identification of wildlife linkage passages and connectivity opportunities
	 Confirmation of the Greenway System
	- Integrated characterization (Task 4) of how the existing Greenway System is interconnected, including natural heritage and hydrologic features and their functions. This would include:
	- Identify natural linkages and ecological corridor functions
	- Identification of vegetation protection zones (i.e. buffers)
	- Identification of complementary land uses and potential enhancement lands
	 Establish opportunities and constraints mapping and define developable areas, undevelopable areas and any areas requiring further stud
	 Clearly define the circumstances in which infrastructure is permitted within vegetation protection zones. LID, trails, etc
	Proposed Development Plan and Municipal Servicing
	Note: The timing of this section of the MESP coincides with the timing of the Community Design Plan and Sustainability Framework development.
	The MESP will include:
	• Summary description of development, including proposed development areas, types of development, and maps
	Study area ownership
	Stormwater Management (SWM) servicing including:
5.	 Functional stormwater and environmental management plan and associated hydrologic modelling (pre and post development) complete with boundaries as required
	 Updated hydrologic analysis and verification that stormwater management plan addresses criteria and requirements of Subwatershed Study and other parent documents as appropriate
	• Post development water budget to inform stormwater management plan for water quality, quantity, infiltration, groundwater and erosion control
	 Refine infiltration targets (for each landowner to meet) based on post development infiltration deficit (particularly in potentially significant recharge areas) based upon refined land uses and other technical information
	• Refine stormwater runoff control rates and/or design targets based upon refined

	land uses and other technical information
0	Hydraulic analysis – major infrastructure (floodplain, culverts, other crossings etc.)
0	If applicable, apply fluvial geomorphology recommendations for the design of open watercourses including: meander belt, erosion thresholds etc.
0	Outline best management practices/stormwater management recommendations/alternatives
0	Size and site general footpint of proposed stormwater management facilities and outfalls; where required, complete site visits with relevant agencies to review stormwater management facility/outfall locations
0	Delineate future land use catchment area boundaries
0	Delineate major and minor drainage systems
0	Preliminary grading plans/facility design elements, including preliminary storage- discharge relationships for stormwater management facilities
0	Screening and assessment of long list of low impact development (LID) techniques to be considered at detailed design stage including assessment of function and feasibility based upon proposed conditions. LID targets (infiltration, evapotranspiration, runoff) shall be established at the MESP stage based on the pre/post water balance assessment. The MESP should clearly state that LID measures will be implemented at the site specific stage consistent with the recommendations of the MESP, applicable City's OP policies and the City and TRCA LID guidelines and directions
0	Complete review of alternatives for Regulatory Event management and recommend preferred management strategy
0	Compare pre to post development stormwater conditions up to the Regional flows and water levels within downstream receiving watercourses including SPAs.
0	Integrate stormwater management plan requirements with future specific water budget analysis to identify appropriate mitigation measures to manage runoff volumes to specific features
0	Analysis and comparison of pre-development and post-development (controlled) flow conditions for modelled storm events relative to the erosion threshold (variation within +/- 5% will be allowed)
0	Consultation summary with MNRF to address implications on aquatic SAR (i.g. Redside Dace)
• W	ater supply servicing including:
0	Existing infrastructure
0	Availability of external services
0	Expected population and demands
0	Future Population (Ultimate Scenario) within the catchment area in accordance with the current Official Plan (OP)
0	Identification of proposed/permitted connection points to existing water supply systems

• Pressure districts
• Design criteria (average, daily, hourly, fire demand, pressure, and pipe roughness)
• Proposed infrastructure and servicing plan
• Water distribution modelling and pressures during maximum day, peak hour, minimum hour and maximum day plus fire conditions
 Servicing constraints (Regional and Municipal scale), expansion, and upgrade requirements to support the proposed development Internal servicing constraints
Wastewater/sanitary servicing including:
• Existing infrastructure
 Identification of proposed/permitted connection points to existing wastewater servicing systems
• Existing service areas and flows
• Design criteria (generation rates and infiltration contribution) for growth
• Proposed infrastructure and servicing plan
• Expected population and wastewater generation
• Future Population (Ultimate Scenario) within the catchment area in accordance with the current OP
• Expected sanitary flow from the proposed and future developments within the area
• Prepare and implement monitoring plan at key locations as required
• Wastewater servicing model inclusive of existing and proposed service areas
 Servicing constraints (Regional and Municipal scale), expansion, and upgrade requirements to support the proposed development
Preliminary site grading including:
 Existing grading including existing topography and general grading/sloping direction(s) of site, location of high and low areas
 Grading criteria including consideration of positive drainage of sewers and overland flow by gravity to receiving systems; ensure acceptable grading of site and roads
 Proposed grading including proposed preliminary grading concept plan, location of future high and low areas, grading constraints in relation to existing and proposed servicing infrastructure and environmental/ecological features, potential requirements for cut/fill, consideration of existing and future grades of surrounding areas outside of TRCA buffers, interface with natural heritage and hydrological features
• High level recommendations and principles to be applied for site management and phasing, related to minimizing erosion and sediment discharge to receiving watercourses during construction, consistent with City Engineering Standards

• Considerations of reduction in cut/fill and integration of the natural topography in post development landscaping and road design						
• Conceptual natural channel design (if required) for relocated watercourses including:						
• Base mapping						
 Design criteria (hydrology, hydraulics, channel dimensions, terrestrial and aquatic habitat) 						
• Geomorphic field assessment						
• Design constraints						
 Corridor requirements (flood conveyance, erosion hazard limits, aquatic habitat, terrestrial habitat, existing City/Region trail systems) 						
• Fish habitat impacts and mitigation, enhancement or if appropriate, compensation opportunities						
• Design concepts (plan view, profile, typical sections, etc.)						
• Barrier removal opportunities						
• Consultation summary with MNRF where Redside Dace (and/or other species at risk) habitats may be affected						
 Road crossing, cycling and pedestrian bridge crossing, and trail system conceptual designs Based on recommendations from relevant studies (where available), complete conceptual design of road crossings, cycling and pedestrian bridge crossing, and trail system including consideration of requirements related to hydraulics, fluvial geomorphology and wildlife passage 						
Transportation						
The MESP at minimum will include:						
 Introduction Study assumptions Rationale and location of crossings as related to the Greenway System Intersection operation methodology Verification of crossing role and function Transportation Association of Canada crossing vehicle capacity 						
 Existing Conditions Site and area description Study area road network (including transit, bike and pedestrian) Transit service Existing traffic volumes Existing traffic intersection operations 						
 Future background traffic conditions Planned network improvements Traffic growth Other area developments 						

	 Background traffic volumes 						
	 Background traffic intersection operations 						
	Proposed development Development statistics						
	• Development statistics						
	• Non-auto trin generation						
	• Trin distribution and assignment						
	• The distribution and assignment						
	 Total traffic conditions Total traffic volumes 						
	• Assessment, comparison and evaluation of alternative road networks						
	• Mobility connectivity – internal and external						
	• Total traffic intersection operations						
	 Transportation demand management 						
	 Recommended transportation network 						
	 Road classification 						
	 Non-auto facilities (Including transit, bike and pedestrian) 						
	 Future transit service 						
	 Right of way 						
	 Cross sections 						
	Phasing						
	The MESP will include:						
	• Development and construction phasing and staging (Phase 1 has been identified as per						
	Figure 1 . Remaining phases will be identified at a later stage and will be included in						
7	the MESP as updates or amendments)						
	• Mobility connectivity internal and external						
	• Mobility connectivity - Internal and external						
	• Requirements for interim stormwater and environmental management and servicing,						
	and associated recommendations						
	Potential Development Impacts and Proposed Mitigation/Enhancements						
	An impact assessment shall be conducted after the characterization of the Environment and						
	once a Conceptual Plan has been developed.						
	The impact assessment should include the application of the Mitigation Hierarchy. The						
	Mitigation Hierarchy will be established in consultation with the City and IRCA staff and						
	will prioritize the determination of avoidance, minimization and mitigation to alleviate						
8	consideration of natural heritage compensation are always treated as a last resort outcome						
	consideration of natural nertrage compensation are always treated as a last resolt outcome.						
	The MESP will include:						
	Assessment of impacts on surface and groundwater resources						
	• Development footprint and site grading						
	• Assessment of the impacts of the development on the surface water and						
	groundwater systems and any mitigation measures required prior to construction						

• Define impacts of buried services and roads
• List mitigation and enhancement techniques to achieve subwatershed study recommendations (as available)
• Recommend list of acceptable LID techniques to maintain water budget, based upon long list of general mitigation techniques previously advanced (see Section 5); final LID and Best Management Practices (BMPs) to be established at the detailed design stage. Provide target information values for landowners.
• Apply and advance the recommendations from the Subwatershed Study (as available) related to headwater drainage features completed as part of the subwatershed studies or related studies as available. The MESP shall recommend management scenarios for each feature based on established protocols and management scenarios in the subwatershed studies (as available)
• Characterization of groundwater quality where potential exists for development to alter conditions (e.g., individual septic systems)
• Assess impacts on aquatic and aquatic habitats and recommend suitable mitigation, enhancement, and compensation measures where applicable including consultation summary with MNRF to address implications on aquatic SAR (e.g. Redside Dace)
• Assess impacts on vegetation and vegetative communities and recommend suitable mitigation measures, enhancements and compensation where applicable
• Assess impacts on woodlands and recommend suitable mitigation measures, enhancements and compensation where applicable
• Assess impacts on wildlife and wildlife habitat and recommend suitable mitigation, enhancement, and compensation measures where applicable
• Update the PCSWMM model established by AMEC for the upstream Future Urban Area (FUA) with the post development hydrologic conditions for the site for the Regional Storm event. Modeling to be completed once PCSWMM is available.
• Use the FUA PCSWMM model to complete a Regional Storm event impact assessment for the downstream receiving system including SPAs. Provide mitigation measures (if required) to address any increases in water levels in the SPAs that result from the proposed development of the York Downs lands.
• Apply and advance the recommendations from the subwatershed study (as available) related to channel protection, buffers and/or setback delineation in accordance with criteria established in the applicable Official Plan and related Official Plan Amendments (OPAs)
• Identify enhancement and compensation requirements based on recommendations from higher level studies
• Effects on connectivity, and fragmentation and isolation of habitat
• Complete a feature specific water budget analysis and identify mitigation, enhancement and potential compensation measures as applicable
• Assess impacts to, and identify protection, enhancement and potential compensation approaches as applicable for the management of species at risk based on the federal Species At Risk Act (SARA) and/or the Provincial Endangered Species Act (ESA)

	 Description of how the recommended watercourse and stormwater management strategy and Greenway System address requirements of higher level studies
	• Integrated assessment of impacts to interconnection between the existing Greenway System with groundwater, surface water, wetlands, woodlands, and other natural heritage features
	• Summarize impacts on the natural environment and natural processes to protect, enhance or if appropriate, compensate, the natural environment and natural processes from the impacts of development
	General and Public Consultation
	The MESP will:
10	• Outline how all consultation requirements have been met for the Planning Act and the Municipal Class EA for the first two phases in the Planning and Design Process of the Class EA for all major road, water and wastewater projects at a minimum, where applicable
	• Include appropriate consultation within the context of the Planning Process
	Monitoring
	Monitoring requirements must be included in the MESP in accordance with findings of the MESP and any relevant environmental studies or other higher level documentations where applicable. The following requirements must be satisfied in this MESP for all phases (see Figure 1) in this study:
	• Phase 1 – minimum two (2) years monitoring
	• Remaining Phases - minimum three (3) years monitoring
11	Terrestrial and aquatic system
	Valleylands and Creek system
	Surface and Groundwater systems
	• Water balance/ water budget for all feature based natural systems
	During construction and post-construction monitoring activities
	• Other monitoring requirements (e.g. MNRF, Region)
	Future Study Requirements (Draft plan stage, detailed design stage, etc.)
12	Native soil preservation
13	Conclusions/Recommendations



Appendix B

Species at Risk Screening Letter - MNRF

Ministry of Natural Resources and Forestry Aurora District Office 50 Bloomington Road Aurora, Ontario L4G 0L8 Ministère des Richesses naturelles et des Forets

Telephone: (905) 713-7400 Facsimile: (905) 713-7361



August 23, 2016

Sarah Aitken, B.Sc. Aquatic Ecologist BEACON ENVIRONMENTAL 373 Woolwich Street Guelph, ON N1H 3W4 T) 519.826.0419 ext. 31 Email: saitken@beaconenviro.com

Re: Request for Information for an Master Environmental Servicing Plan for 4134 16th Avenue, City of Markham

Dear Ms. Aitken,

In your email dated August 4, 2016 you requested information on natural heritage features and element occurrences occurring on or adjacent to the above mentioned location. There are Species at Risk recorded for your study area. As of the date of this letter, we have records of:

Redside Dace	END
Butternut	END
Barn Swallow	THR
Eastern Wood-pewee	SC

Please be advised Berczy Creek and Bruce Creek located on the subject property are considered occupied habitat for Redside Dace.

The property contains features that may be considered contributing habitat for Redside Dace. As defined under Ontario Regulation 242/08 (Section 29.1), the regulated habitat of Redside Dace includes contributing features which are streams, permanent or intermittent headwater drainage features, groundwater discharge areas or wetlands that augment or maintain the baseflow, coarse sediment supply or surface water quality of areas currently known to be occupied by Redside Dace or areas which provide an opportunity for Redside Dace recovery / recolonization.

As part of the consultation with MNRF regarding your study, potential contributing habitat features may need to be assessed in order to determine the extent of the habitat regulation applying to your subject area.

Additionally, the species listed below have the potential to occur in your study and may require further assessment or field studies to determine presence. We have records of the following species within the vicinity of your study area:

Bobolink	THR
Eastern Meadowlark	THR

Natural heritage features recorded in the vicinity of your area include identified wetlands.

These species may receive protection under the *Endangered Species Act 2007* and thus, an approval from MNRF may be required if the work you are proposing could cause harm to these species or their habitats. If the Species at Risk in Ontario List is amended, additional species may be listed and protected under the *ESA 2007* or the status and protection levels of currently listed species may change.

Absence of information provided by MNRF for a given geographic area, or lack of current information for a given area or element, does not categorically mean the absence of sensitive species or features. Many areas in Ontario have never been surveyed and new plant and animal species records are still being discovered for many localities. For these reasons, the MNRF cannot provide a definitive statement on the presence, absence or condition of biological elements in any part of Ontario.

This species at risk information is highly sensitive and is not intended for any person or project unrelated to this undertaking. Please do not include any specific information in reports that will be available for public record. As you complete your fieldwork in these areas, please report all information related to any species at risk to our office. This will assist with updating our database and facilitate early consultation regarding your project.

If you have any questions or comments, please do not hesitate to contact ESA.aurora@ontario.ca.

Sincerely,

Megan Eplett Management Biologist Ontario Ministry of Natural Resources and Forestry, Aurora District



Plant List



Plant List

Family Name	Scientific Name	Common Name	COSEWIC	COSARO	S-RANK	YORK	L-Rank
ACERACEAE	Acer negundo	Manitoba Maple			S5		L+?
ACERACEAE	Acer nigrum	Black Maple			S4?	R4	L4
ACERACEAE	Acer platanoides	Norway Maple			SE5		L+
ACERACEAE	Acer rubrum	Red Maple			S5		L4
ACERACEAE	Acer saccharinum	Silver Maple			S5		L4
ACERACEAE	Acer saccharum var. saccharum	Sugar Maple			S5		L5
ALISMATACEAE	Sagittaria latifolia	Broadleaf Arrowhead			S5		L4
ANACARDIACEAE	Toxicodendron rydbergii	Western Poison Ivy			S5		L5
APIACEAE	Daucus carota	Queen Anne's Lace			SE5		L+
APIACEAE	Heracleum maximum	Cow-parsnip			S5	R9	L5
APIACEAE	Sanicula marilandica	Black Snakeroot			S5	U	L4
ARACEAE	Arisaema triphyllum ssp. triphyllum	Jack-in-the-pulpit			S5		L5
ASCLEPIADACEAE	Asclepias syriaca	Common Milkweed			S5		L5
ASCLEPIADACEAE	Cynanchum rossicum	European Swallow-wort			SE5		L+
ASTERACEAE	Achillea millefolium var. occidentalis	Wooly Yarrow			S5		L5
ASTERACEAE	Ageratina altissima var. altissima	White Snakeroot			S5		L5
ASTERACEAE	Arctium sp	Burdock Species					
ASTERACEAE	Aster lanceolatus ssp. lanceolatus	Panicled Aster			S5		L5
ASTERACEAE	Aster lateriflorus var. lateriflorus	Calico Aster			S5		L5
ASTERACEAE	Aster puniceus var. puniceus	Purple-stemmed Aster			S5		L5
ASTERACEAE	Cirsium arvense	Crepping Thistle			SE5		L+
ASTERACEAE	Cirsium vulgare	Bull Thistle			SE5		L+
ASTERACEAE	Erigeron annuus	White-top Fleabane			S5		L5
ASTERACEAE	Eupatorium maculatum var. maculatum	Spotted Joe-pye Weed			S5		L5
ASTERACEAE	Inula helenium	Elecampane			SE5		L+
ASTERACEAE	Leucanthemum vulgare	Oxeye Daisy			SE5		L+
ASTERACEAE	Solidago canadensis var. scabra	Tall Goldenrod			S5		L5

	BEACON	
10 C	ENVIRONMENTAL	

Family Name	Scientific Name	Common Name COSEWIC COSARO			S-RANK	YORK	L-Rank
ASTERACEAE	Solidago flexicaulis	Broad-leaved Goldenrod			S5		L5
ASTERACEAE	Solidago patula	Rough-leaved Goldenrod			S5	R5	L3
ASTERACEAE	Sonchus arvensis ssp. arvensis	Field Sowthistle			SE5		L+
ASTERACEAE	Taraxacum officinale	Common Dandelion			SE5		L+
ASTERACEAE	Tussilago farfara	Colt's Foot			SE5		L+
ASTERACEAE	Xanthium strumarium	Rough Cockle-bur			S5		L5
BALSAMINACEAE	Impatiens capensis	Spotted Jewel-weed			S5		L5
BERBERIDACEAE	Caulophyllum giganteum	Blue Cohosh			S5		L4
BERBERIDACEAE	Podophyllum peltatum	May Apple			S5		L5
BETULACEAE	Betula alleghaniensis	Yellow Birch			S5		L4
BETULACEAE	Carpinus caroliniana ssp. virginiana	American Hornbeam			S5		L4
BETULACEAE	Ostrya virginiana	Eastern Hop-hornbeam			S5		L5
BORAGINACEAE	Cynoglossum officinale	Hound's-tongue			SE5		L+
BORAGINACEAE	Myosotis laxa	Small Forget-me-not			S5		L4
BRASSICACEAE	Alliaria petiolata	Garlic Mustard			SE5		L+
BRASSICACEAE	Barbarea vulgaris	Yellow Rocket			SE5		L+
BRASSICACEAE	Hesperis matronalis	Dame's Rocket			SE5		L+
CAPRIFOLIACEAE	Sambucus nigra ssp. canadensis	Common Elderberry			S5		L5
CAPRIFOLIACEAE	Sambucus racemosa var. racemosa	Red-berried Elder			S5		L5
CAPRIFOLIACEAE	Viburnum lentago	Nannyberry			S5		L5
CAPRIFOLIACEAE	Viburnum opulus	Guelder-rose Viburnum			SE4		L+
CLUSIACEAE	Hypericum perforatum	St. John's-wort			SE5		L+
CONVOLVULACEAE	Calystegia sepium ssp. angulata	Hedge Bindweed			S5	U	L5
CORNACEAE	Cornus alternifolia	Alternate-leaf Dogwood			S5		L5
CORNACEAE	Cornus sericea ssp. sericea	Red-osier Dogwood			S5		L5
CUCURBITACEAE	Echinocystis lobata	Wild Mock-cucumber			S5		L5
CUPRESSACEAE	Thuja occidentalis	Northern White Cedar			S5		L4
CYPERACEAE	Carex granularis	Meadow Sedge			S5		L5
CYPERACEAE	Carex radiata	Stellate Sedge			S5		L5
CYPERACEAE	Carex vulpinoidea	Fox Sedge			S5		L5
CYPERACEAE	Eleocharis sp	Spikerush Species					
CYPERACEAE	Schoenoplectus tabernaemontani	Soft-stemmed Bulrush			S5		L4
CYPERACEAE	Scirpus atrovirens	Woolgrass Bulrush			S5		L5
CYPERACEAE	Scirpus microcarpus	Small-fruit Bulrush			S5	U	L4
DIPSACACEAE	Dipsacus fullonum ssp. sylvestris	Common Teasel			SE5		L+

é	BEACON	
	ENVIRONMENTAL	

Family Name	Scientific Name	Common Name	COSEWIC	COSARO	S-RANK	YORK	L-Rank
DRYOPTERIDACEAE	Athyrium filix-femina var. angustum	Lady-fern			S5		L5
DRYOPTERIDACEAE	Dryopteris carthusiana	Spinulose Wood Fern			S5		L5
DRYOPTERIDACEAE	Matteuccia struthiopteris var. pensylvanica	Ostrich Fern			S5		L5
DRYOPTERIDACEAE	Onoclea sensibilis	Sensitive Fern			S5		L5
EQUISETACEAE	Equisetum arvense	Field Horsetail			S5		L5
EQUISETACEAE	Equisetum fluviatile	Water Horsetail			S5		L3
FABACEAE	Amphicarpaea bracteata	Hog-peanut			S5		L5
FABACEAE	Gymnocladus dioicus	Kentucky Coffee-tree	THR	THR	S2		
FABACEAE	Lotus corniculatus	Bird's-foot Trefoil			SE5		L+
FABACEAE	Melilotus officinalis	Yellow Sweet Clover			SE5		L+
FABACEAE	Vicia cracca	Tufted Vetch			SE5		L+
FAGACEAE	Quercus macrocarpa	Bur Oak			S5		L4
FAGACEAE	Quercus rubra	Northern Red Oak			S5		L4
GERANIACEAE	Geranium robertianum	Herb-robert			SE5		L+?
GROSSULARIACEAE	Ribes americanum	Wild Black Currant			S5		L5
HYDROCHARITACEAE	Elodea canadensis	Broad Waterweed			S5	U	L4
HYDROPHYLLACEAE	Hydrophyllum virginianum	Virginia Waterleaf			S5		L5
IRIDACEAE	Iris pseudacorus	Yellow Iris			SE3		L+
JUGLANDACEAE	Juglans cinerea	Butternut	END	END	S4		L3
JUGLANDACEAE	Juglans nigra	Black Walnut			S4	R	L5
JUNCACEAE	Juncus dudleyi	Dudley's Rush			S5		L5
LAMIACEAE	Leonurus cardiaca ssp. cardiaca	Common Motherwort			SE5		L+
LEMNACEAE	Lemna minor	Lesser Duckweed			S5		L5
LEMNACEAE	Spirodela polyrhiza	Common Water-flaxseed			S5	U	L3
LILIACEAE	Allium tricoccum	Wild Leek			S5		L4
LILIACEAE	Lilium michiganense	Michigan Lily			S5	U	L3
LILIACEAE	Maianthemum canadense	Wild-lily-of-the-valley			S5		L4
LILIACEAE	Trillium erectum	Red Trillium			S5		L4
LINACEAE	Linum perenne	Blue Flax			SE3		L+
LYTHRACEAE	Lythrum salicaria	Slender-spike Loosestrife			SE5		L+
OLEACEAE	Fraxinus americana	White Ash			S5		L5
OLEACEAE	Fraxinus nigra	Black Ash			S5		L4
OLEACEAE	Fraxinus pennsylvanica	Green Ash			S5		L5
OLEACEAE	Syringa vulgaris	Common Lilac			SE5		L+
ONAGRACEAE	Circaea lutetiana ssp. canadensis	Enchanter's Nightshade			S5		L5

	BEACON	
1 To 1	ENVIRONMENTAL	

Family Name	Scientific Name	Common Name	COSEWIC	COSARO	S-RANK	YORK	L-Rank
ONAGRACEAE	Oenothera biennis	Common Evening-primrose			S5	U	L5
PAPAVERACEAE	Chelidonium majus	Greater Celadine			SE5		L+
PAPAVERACEAE	Sanguinaria canadensis	Bloodroot			S5		L5
PINACEAE	Larix laricina	American Larch			S5		L3
PINACEAE	Picea abies	Norway Spruce			SE3		L+
PINACEAE	Picea glauca	White Spruce			S5		L3
PINACEAE	Picea pungens	Colorado Spruce			SE1		L+
PINACEAE	Pinus nigra	Black Pine			SE2		L+
PINACEAE	Pinus resinosa	Red Pine			S5		L2
PINACEAE	Pinus strobus	Eastern White Pine			S5		L4
PINACEAE	Pinus sylvestris	Scotch Pine			SE5		L+
PINACEAE	Tsuga canadensis	Eastern Hemlock			S5		L4
PLANTAGINACEAE	Plantago major	Nipple-seed Plantain			SE5		L+
POACEAE	Bromus ciliatus	Fringed Brome			S5	U	L3
POACEAE	Bromus inermis ssp. inermis	Smooth Brome			SE5		L+
POACEAE	Dactylis glomerata	Orchard Grass			SE5		L+
POACEAE	Glyceria grandis	American Manna Grass	Grass		S4S5		L4
POACEAE	Glyceria striata	Fowl Manna Grass			S5		L5
POACEAE	Leersia oryzoides	Rice Cutgrass			S5		L5
POACEAE	Lolium pratense	Meadow Fescue			SE5		L+
POACEAE	Phalaris arundinacea	Reed Canary Grass			S5		L+?
POACEAE	Phragmites australis	Common Reed			S5		L+?
POACEAE	Poa compressa	Canada Bluegrass			S5		L+
POACEAE	Poa palustris	Fowl Bluegrass			S5		L5
POACEAE	Poa pratensis ssp. pratensis	Kentucky Bluegrass			S5		L+
POTAMOGETONACEAE	Potamogeton zosteriformis	Flatstem Pondweed			S5	U	L2
PRIMULACEAE	Lysimachia ciliata	Fringed Loosestrife			S5		L5
RANUNCULACEAE	Actaea pachypoda	White Baneberry			S5		L4
RANUNCULACEAE	Actaea rubra	Red Baneberry			S5		L5
RANUNCULACEAE	Anemone canadensis	Canada Anemone			S5		L5
RANUNCULACEAE	Caltha palustris	Marsh Marigold			S5		L4
RANUNCULACEAE	Thalictrum dioicum	Early Meadowrue			S5		L5
RANUNCULACEAE	Thalictrum pubescens	Tall Meadowrue			S5		L5
RHAMNACEAE	Rhamnus cathartica	Buckthorn			SE5		L+
ROSACEAE	Agrimonia gryposepala	Tall Hairy Agrimony			S5		L5

BEACON	
ENVIRONMENTAL	

Family Name	Scientific Name	Common Name COSEWIC C			S-RANK	YORK	L-Rank
ROSACEAE	Crataegus punctata	Dotted Hawthorn			S5		L5
ROSACEAE	Crataegus sp	Hawthorn Species					
ROSACEAE	Fragaria virginiana ssp. virginiana	Virginia Strawberry			SU		LU
ROSACEAE	Geum aleppicum	Yellow Avens			S5		L5
ROSACEAE	Geum canadense	White Avens			S5		L5
ROSACEAE	Geum urbanum	Clover-root			SE2		L+
ROSACEAE	Malus pumila	Common Apple			SE5		L+
ROSACEAE	Prunus serotina	Wild Black Cherry			S5		L5
ROSACEAE	Prunus virginiana var. virginiana	Choke Cherry			S5		L5
ROSACEAE	Rubus idaeus ssp. strigosus	Wild Red Raspberry			S5		L5
ROSACEAE	Rubus pubescens	Dwarf Raspberry			S5		L4
RUBIACEAE	Galium asprellum	Rough Bedstraw			S5	U	L4
RUBIACEAE	Galium palustre	Marsh Bedstraw			S5		L5
SALICACEAE	Populus balsamifera ssp. balsamifera	Balsam Poplar			S5		L5
SALICACEAE	Populus tremuloides	Quaking Aspen			S5		L5
SALICACEAE	Salix eriocephala	Heart-leaved Willow			S5		L5
SALICACEAE	Salix exigua	Sandbar Willow			S5	U	L5
SALICACEAE	Salix X rubens	Reddish Willow			SE4		L+
SALICACEAE	Salix X sepulcralis	Weeping Willow			SE2		L+
SOLANACEAE	Solanum dulcamara	Climbing Nightshade			SE5		L+
TILIACEAE	Tilia americana	American Basswood			S5		L5
TILIACEAE	Tilia cordata	Small leaf Linden			SE1		L+
TYPHACEAE	Typha angustifolia	Narrow-leaved Cattail			S5		L+
TYPHACEAE	Typha latifolia	Broad-leaf Cattail			S5		L4
ULMACEAE	Ulmus americana	American Elm			S5		L5
URTICACEAE	Laportea canadensis	Wood Nettle			S5		L5
URTICACEAE	Urtica dioica ssp. gracilis	Slender Stinging Nettle			S5		L5
VERBENACEAE	Verbena hastata	Blue Vervain			S5		L5
VERBENACEAE	Verbena urticifolia	White Vervain			S5		L5
VITACEAE	Parthenocissus vitacea	Thicket Creeper			S5		L5
VITACEAE	Vitis riparia	Riverbank Grape			S5		L5



Appendix D

Breeding Bird Survey



Appendix D

Breeding Bird Survey

		Status					
Common Name	Scientific Name	National Species at Risk COSEWICa	Species at Risk in Ontario Listing a	Provincial breeding season SRANK ^b	TRCA Status d	Area- sensitive (OMNR)c	Number of Presumed Territories or Pairs
Great Blue Heron	Ardea herodias			S4	L3		F
Canada Goose	Branta canadensis			S5	L5		1
Mallard	Anas platyrhynchos			S5	L5		2
Red-tailed Hawk	Buteo jamaicensis			S5	L5		1
Killdeer	Charadrius vociferus			S5	L5		2
Spotted Sandpiper	Actitis macularia			S5	L4		1
Rock Pigeon	Columba livia			SNA	L+		F
Mourning Dove	Zenaida macroura			S5	L5		2
Black-billed Cuckoo	Coccyzus erythropthalmus			S5	L3		1
Belted Kingfisher	Ceryle alcyon			S4	L4		1
Downy Woodpecker	Picoides pubescens			S5	L5		1
Eastern Wood-Pewee	Contopus virens	SC	SC	S4	L4		3
Willow Flycatcher	Empidonax traillii			S5	L4		1
Great Crested Flycatcher	Myiarchus crinitus			S4	L4		3
Eastern Kingbird	Tyrannus tyrannus			S4	L4		3
Tree Swallow	Tachycineta bicolor			S4	L4		11
Cliff Swallow	Petrochelidon pyrrhonota			S4	L4		F
Barn Swallow	Hirundo rustica	THR	THR	S4	L4		2
Blue Jay	Cyanocitta cristata			S5	L5		3
American Crow	Corvus brachyrhynchos			S5	L5		1
Black-capped Chickadee	Poecile atricapillus			S5	L5		4
Red-breasted Nuthatch	Sitta canadensis			S5	L4	A	1
House Wren	Troglodytes aedon			S5	L5		2



		Status					
Common Name	Scientific Name	National Species at Risk COSEWICa	Species at Risk in Ontario Listing a	Provincial breeding season SRANK ^b	TRCA Status d	Area- sensitive (OMNR)c	Number of Presumed Territories or Pairs
American Robin	Turdus migratorius			S5	L5		37
Gray Catbird	Dumetella carolinensis			S4	L4		3
Cedar Waxwing	Bombycilla cedrorum			S5	L5		3
European Starling	Sturnus vulgaris			SE	L+		2
Warbling Vireo	Vireo gilvus			S5	L5		3
Red-eyed Vireo	Vireo olivaceus			S5	L4		1
Yellow Warbler	Setophaga petechia			S5	L5		2
Mourning Warbler	Geothlypis philadelphia			S4	L3		1
Common Yellowthroat	Geothlyphis trichas			S5	L4		4
Northern Cardinal	Cardinalis cardinalis			S5	L5		6
Rose-breasted Grosbeak	Pheucticus Iudovicianus			S4	L4		2
Indigo Bunting	Passerina cyanea			S4	L4		1
Chipping Sparrow	Spizella passerina			S5	L5		5
Savannah Sparrow	Passerculus sandwichensis			S4	L4	А	1
Song Sparrow	Melospiza melodia			S5	L5		12
Swamp Sparrow	Melospiza georgiana			S5	L4		1
Red-winged Blackbird	Agelaius phoeniceus			S4	L5		22
Common Grackle	Quiscalus quiscula			S5	L5		7
Brown-headed Cowbird	Molothrus ater			S4	L5		2
Orchard Oriole	Icterus spurius			S4	L5		1
Baltimore Oriole	lcterus galbula			S4	L5		8
House Finch	Haemorhous mexicanus			SNA	L+		1
American Goldfinch	Spinus tristis			S5	L5		5
House Sparrow	Passer domesticus			SNA	L+		1



Field Work Conducted On: June 2, 11 and 19, 2015

Number of Species:

Breeding: 44

Foraging: 3 Total: 47

Number of (provincial and national) Species at Risk: 2 (Barn Swallow and Eastern Wood-Pewee) Number of S1 to S3 Species: 0 Number of TRCA L1, L2 and L3 Species (Species of Concern): 3 (Great Blue Heron (feeding only), Black-billed Cuckoo, Mourning Warbler) Number of Forest-sensitive Species: 1 (Red-breasted Nuthatch) Number of Grassland-sensitive Species: 1 (Savannah Sparrow)

KEY

F = foraging but not breeding

a COSEWIC = Committee on the Status of Endangered Wildlife in Canada a Species at Risk in Ontario List (as applies to ESA) as designated by COSSARO (Committee on the Status of Species at Risk in Ontario) END = Endangered, THR = Threatened, SC = Special Concern

^b SRANK (from Natural Heritage Information Centre) for breeding status if:

S1 (Critically Imperiled), S2 (Imperiled), S3 (Vulnerable), S4 (Apparently Secure), S5 (Secure)

SNA (Not applicable...'because the species is not a suitable target for conservation activities'; includes non-native species)

c Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide (Appendix G). 151 p plus appendices.

d Toronto and Region Conservation Authority L rank (Dec 2010): remove if not a TRCA site L1 to L3 Regional species of concern from highest to lowest; L4 Urban concern; L5 Secure through region; L+ Non-native