ENVIRONMENTAL IMPLEMENTATION REPORT (EIR)
&
FUNCTIONAL SERVICING STUDY (FSS)

EVERGREEN PROPERTY

JULY 2015

TABLE OF CONTENTS

OVERVIEW xi
1. Introduction 1-1

1.1 Study Area 1-2
1.2 Planning Context 1-3

1.2.1 Tremaine Dundas Secondary Plan Subwatershed Study (TDSPSS) (2009) 1-5

1.3 Study Purpose 1-6
1.4 Study Objectives 1-7
1.5 Study Requirements 1-8
1.6 Study Team 1-9
1.7 Report Contents 1-10

1.7.1 Report Outline 1-10
1.7.2 Key Report Deliverables 1-11

2. Land Use Planning and Environmental Policy Framework 2-14

2.1 Federal Fisheries Act 2-14
2.2 Federal Species at Risk Act 2-16
2.3 Migratory Birds Convention Act 2-17
2.4 Ontario Endangered Species Act 2-17
2.5 Provincial Policy Statement 2-19

2.5.1 Efficient and Resilient Land Use PAtterns 2-20
2.5.2 Natural Heritage 2-21
2.5.3 Water 2-24
2.5.4 Natural and Human-made Hazards 2-25
2.5.5 Sewage, Water and Stormwater 2-25

2.6 Greenbelt Plan 2-25
2.7 Halton Region Official Plan 2-26

2.7.1 Regional Natural Heritage System (NHS) Policies 2-27
2.7.2 Environmental Quality Policies 2-31
2.7.3 Trails Policies 2-32
2.7.4 Urban (Water Supply and Wastewater Treatment) Services 2-33

2.8 City of Burlington Official Plan 2-33

2.8.1 Natural Heritage Policies 2-33
2.8.2 Environmental Evaluation Policies 2-35
2.8.3 Sustainable Design and Compatibility 2-35
2.8.4 Contaminated and Potentially Contaminated Sites 2-36
2.8.5 Watershed Planning Policies 2-36
2.8.6 Storm Water Management Policies 2-36

2.9 Tremaine Dundas Secondary Plan 2-37
2.10 Conservation Halton Regulation and Policies 2-38

3. Characterization of the Biophysical Environment 3-1

3.1 Background Studies 3-1
3.2 Summary of Formal Site Visits and Feature Staking 3-2
3.3 Physical Environment 3-3

3.3.1 Bedrock Geology 3-3
3.3.2 Surficial Geology 3-4
3.3.3 Physiography 3-5
3.3.4 Topography 3-6
3.3.5 Slopes 3-6
3.3.6 Soils 3-6
3.3.7 Groundwater 3-7
3.3.8 Site Water Balance 3-20
3.3.9 Surface Water and Drainage 3-24
3.3.10 Fluvial Geomorphology 3-28

3.4 Biological Environment 3-40

3.4.1 Terrestrial Resources 3-41
3.4.2 Aquatic Resources 3-79

4. Preliminary Natural Heritage System (NHS) 4-91

4.1 Identification of Key Features 4-93

4.1.1 Significant Habitat of Endangered and Threatened Species 4-93
4.1.2 Significant Wetlands 4-96
4.1.3 Significant Woodlands 4-100
4.1.4 Significant Valleylands 4-104
4.1.5 Significant Areas of Natural and Scientific Interest (ANSI) 4-104
4.1.6 Significant Wildlife Habitat (SWH) 4-105

4.1.7 Fish Habitat 4-5

4.2 Evaluation of Other Natural Heritage Components 4-6

4.2.1 Watercourses (S. 115.3(5)) 4-6
4.2.2 Other Wetlands (S. 115.3(6)) 4-7
4.2.3 Regulated Flood Plains (S. 115.4(2)) 4-8

4.3 Linkages 4-8

4.3.1 Location of Linkages 4-9
4.3.2 Extent of Linkages 4-10

4.4 Buffers 4-12

4.4.1 Current Understanding of Ecological Buffers and Policy Guidance 4-13
4.4.2 Determination of Buffers to Key Features in the Study Area 4-14
4.4.3 Discussion of Buffers Recommended in the TDSPSS 4-19

4.5 Enhancements 4-19
4.6 Summary of Components in the Preliminary NHS 4-20

5. Summary of Constraints to Development 5-23

5.1 Physical Constraints to Development 5-23
5.2 Natural Heritage Constraints to Development 5-25

6. Proposed Development, NHS and Functional Servicing System 6-1

6.1 Overview of the Secondary Plan 6-2
6.2 Sustainability Objectives 6-3
6.3 Proposed Draft Plan 6-4
6.4 Proposed Natural Heritage System (NHS) 6-5

6.4.1 Relocation of 14W-17Cb 6-6

6.5 Conceptual Trails Plan 6-6
6.6 Stormwater Management (SWM) Strategy 6-8

6.6.1 SWM Design Objectives and Criteria From the TDSPSS 6-9
6.6.2 Discussion of a Conventional SWM Approach for the Subject Property 6-12
6.6.3 Enhanced Stormwater Managment Approach (LID) 6-13
6.6.4 Enhanced SWM Approach Ownership and Maintenance Options 6-16
6.6.5 Integrating LID Options into the Proposed Draft Plan 6-19

6.6.6 Testing the Enhanced SWM Approach 6-20
6.6.7 Proposed Enhanced Stormwater Management System 6-32
6.6.8 Site Water Balance 6-34

6.7 Road Network 6-38

6.7.1 Ecopassage 6-38

6.8 Grading 6-40
6.9 Servicing 6-41

6.9.1 Wastewater 6-41
6.9.2 Water Servicing 6-42

7. Impact Assessment and Recommended Mitigation 7-44
8. Implementation Plans 8-1

8.1 Conceptual Restoration and Enhancement Plan 8-1

8.1.1 Goals and Themes of the Restoration and Enhancement Plan 8-2
8.1.2 Biomass Recycling 8-3
8.1.3 Habitat Creation and Restoration 8-4
8.1.4 Habitat Enhancement 8-6
8.1.5 Linkage Enhancement 8-8

8.2 Tree Preservation Plan 8-8
8.3 Erosion and Sediment Control Plan 8-9
8.4 Dewatering and Well Decommissioning Plan 8-10

8.4.1 Well Decommissioning 8-10
8.4.2 Dewatering 8-10

8.5 Environmental Monitoring Plan (EMP) 8-11

9. Policy Conformity 9-1
10. Conclusions 10-1
11. References 11-1

TABLES

Table 1.6-1 - Overview of EIR/FSS Study Team Members 1-9
Table 3.2-1 - Summary of Site Visits with Municipal and Agency Staff 3-2
Table 3.3-1 - Hydraulic Conductivities from Slug Testing 3-5
Table 3.3-2 - Observed Groundwater Elevations (May 2007 – December 2014) 3-9
Table 3.3-3 – Observed Groundwater (depth from surface) (May 2007 – December 2014).... 3-10
Table 3.3-8 - EIR Subcatchment Area Culverts and Capacities 3-25
Table 3.3-9 - Existing Peak Flow Rates (from TDSPSS Table 3.3-6)..... 3-26
Table 3.3-10 - Unit Area Flow Rates (from TDSPSS Table 3.3-7) 3-26
Table 3.3-11 - Summary of Fluvial Geomorphologic Analyses from TDSPSS 3-30
Table 3.3-12 - Meander belt widths for 14W-17 and 14W-17Cb 3-34
Table 3.3-13 – Erosion Thresholds Identified for Watercourses 14W-17Cb and 14W-17 3-37
Table 3.4-1 - Summary of Ecological Surveys in the Study Area from 2007 to 2015 3-40
Table 3.4-2 - Description of the ELC Communities within Study Area 3-43
Table 3.4-3 - Description of Hedgerows on the Subject Property..... 3-50
Table 3.4-4 - Refinements to Vegetation Community Mapping from the Tremaine Dundas Secondary Plan Subwatershed Study (TSDPSS) 3-51
Table 3.4-5 – Provincially and Regionally Rare and Uncommon Plant Species in Study Area .. 3-53
Table 3.4-6 - Summary of species, diameters and condition of trees within Study Area 3-56
Table 3.4-7 - Breeding Bird Survey Details 3-58
Table 3.4-8 - 2013 Reptile Survey Details 3-67
Table 3.4-9 - Turtle Observations in ELC unit 18 (Pond) over 2012 and 2013 3-68
Table 3.4-10 - Results of 2013 Snake Surveys 3-71
Table 3.4-11 - Amphibian Call Survey Details for field studies done in 2012, 2013 and 2014.. 3-73
Table 3.4-12 - Breeding Amphibians Activity during Nocturnal Call Surveys (2012-2014) 3-74
Table 3.4-13 - Incidental Amphibian Observations Recorded in 2012 and 2013 3-74
Table 3.4-14 - Weather conditions on dates of Odonate and Lepidopteran Surveys..... 3-76
Table 3.4-15 - Summary of 2013 Odonate and Lepidoptera Observations..... 3-76
Table 3.4-16 - Aquatic Habitat Categorization System* 3-87
Table 3.4-17 - Aquatic Habitat Classification Assessment (Reaches within Study Area) 3-88
Table 5.1-1 - Summary of Physical Constraints to Development 5-24
Table 5.2-1 - Summary of Natural Heritage Constraints 5-25
Table 6.6-1 - Pre-Development Target Flows 6-12
Table 6.6-2 - Potential LID Techniques (Residential) 6-18
Table 6.6-3 - Potential LID Techniques (Employment & Open Space) 6-18
Table 6.6-4 - Feature Based Water Balance Analysis Summary 6-26
Table 6.6-5 - Results of D/S Erosion Threshold Assessment (14W-17Cb, 14W-17 & BCT-R1) .. 6-28

Table 6.6-6 - Erosion Threshold Exceedance Analysis Results 6-30
Table 6.6-7 - Number of Hours Exceeding the Calculated Erosion Threshold of 0.04 m3/s 6-31
Table 6.6-8 - Post-Development Water Balance for Subject Property (prior to mitigation)..... 6-37
Table 8.5-1 – Proposed Environmental Monitoring Plan (EMP)..... 8-1

FIGURES AND DRAWINGS

Figure 1.1 – Subject Property Location
Figure 1.2 - TDSPSS Study Area and Greenbelt Boundary
Figure 1.3 – Provincially and Regionally Significant Natural Areas

Figure 2.1 – Key Features and Linkages Agreed to by the Region and Evergreen

Figure 3.1 - Borehole and Well Locations
Figures 3.2 to 3.6 - Stratigraphic Cross Section Locations
Figure 3.7 - Surficial Soil Distribution
Figure 3.8 - Variation in Groundwater Elevations (2007-2014)
Figure 3.9 - Watercourses and Hydrologic Connections
Figure 3.10 - Hydrograph of Groundwater and Surface Water Elevations (2014)
Figure 3.11 - Groundwater Gradient
Figure 3.12 - Temperature Nomogram for Aquatic Habitat in Tributary 14W-17
Figure 3.13 – 14W-17 Meander Belt Width
Figure 3.14 – 14W-17Cb Meander Belt Width
Figure 3.15 – Erosion Threshold Assessment Reaches
Figure 3.16 - Ecological Survey Locations
Figure 3.17 - Ecological Land Classification (ELC)
Figure 3.18 – Significant Species and Significant Wildlife Habitat

Figure 4.1 – Preliminary Natural Heritage System (NHS)

Figure 5.1 – Specific Constraints to Development

Figure 6.1 – Community Structure (Secondary Plan Schedule A)
Figure 6.2 – Natural Heritage System and Open Space (Secondary Plan Schedule B)
Figure 6.3 – Land Use (Secondary Plan Schedule C)
Figure 6.4 – Transportation Network (Secondary Plan Schedule D)
Figure 6.5 – Conceptual Trails Network and Parks (Secondary Plan Schedule E)
Figure 6.6 - Proposed Natural Heritage System (NHS)
Figure 6.7 – Conceptual Trails Plan
Figure 6.8 – Conceptual Trail Cross-Section
Figure 6.9 - Potential LID Options: Employment, Commercial and Institutional Sites
Figure 6.10 - Potential LID Options: Parks and Streetscapes
Figure 6.11 - Potential LID Options: Low and Medium Density Residential Properties

Figure 6.12 - LID Options: Employment / Commercial Development adjacent to Greenway
Figure 6.13 - LID Options: Employment scenario north of Dundas Street
Figure 6.14 - LID Options: Mixed use scenario adjacent to Tremaine Road
Figure 6.15 - LID Options: 'Greenway' along Tremaine Road frontage of the site
Figure 6.16A-G – Natural Feature Water Balance Results
Figure 8.1 - Conceptual Restoration and Enhancement Plan

Proposed Draft Plan of Subdivision

Drawing 3.9 - Existing Subcatchments
Drawing 3.10 - Existing Regional Floodlines
Drawing 8.4 - Preliminary Site Grading
Drawing 8.5A-D – Grading Cross-Sections
Drawing 8.5E – ROW Cross-Sections
Drawing 8.7 - Storm Servicing
Drawing 8.8 – Conceptual (Conventional) Pond locations
Drawing 8.9 - Major System Drainage
Drawing 8.10 - Sanitary Drainage
Drawing 8.11 - Water Distribution

APPENDICES

Appendix A1: TDSPSS TOR
Appendix A2: EIR/FSS Beacon Field Staff CVs
Appendix B1: Species at Risk Correspondence with MNRF
Appendix B2: Pre-consultation Meeting
Appendix C1: Borehole / Monitoring Well Results
Appendix C2: Hydraulic Conductivity
Appendix D1: AMEC Slope Stability Report 2007
Appendix D2: AMEC Slope Stability Report 2015
Appendix E: Temperature Monitoring Results
Appendix F: Existing and Proposed HEC-RAS Model Results
Appendix G1: Photographs of Surface Water Features
Appendix G2: Detailed Geomorphological Assessments
Appendix G3: Outlet from Infrastructure Ontario Pond Critical Discharge
Appendix I: TDSPSS NHS Components – Figure 3.3.1
Appendix J1: ELC Data Cards
Appendix J2: Plant List
Appendix J3: Butternut Health Assessments (2012)
Appendix J4: Tree Inventory and Preservation Plan
Appendix J5: Breeding Bird List
Appendix J6: Redside Dace Correspondence
Appendix J7: Tree Density Assessment
Appendix K: Representative Low Impact Development (LID) Projects in the GTA
Appendix L1: Storm Sewer / SWM Calculations & LID Modelling
Appendix L2: Sanitary Design Sheets

OVERVIEW

This Environmental Implementation Report (EIR) and Functional Servicing Study (FSS) (herein referred to as the "EIR/FSS") for the Evergreen property (the "Subject Property") is being submitted on behalf of Evergreen Community Ltd. ("Evergreen") in support of development applications to the City of Burlington for a mixed use development based on environmentally sustainable design principles and approaches.

This EIR/FSS is being submitted to:

- address the study requirements identified in the Tremaine and Dundas Secondary Plan Subwatershed Study (TDSPSS) for an EIR/FSS;
- address the requirements of the Region's Official Plan (2014)[1] for an Environmental Impact Assessment (EIA) for proposed development within or adjacent to the Region's Natural Heritage System (NHS);
- address the City's requirement for an Environmental Evaluation Report (EER);
- provide the studies and assessments necessary to support an Official Amendment (and Secondary Plan), a Draft Plan of Subdivision, and a Zoning By-Law Amendment;
- provide the technical information and policy analysis required to support a NHS boundary for the Subject Property that is consistent with Regional Official Plan (2014) policies; and
- provide the various implementation plans required to:
- meet the EIR/FSS requirements set out in the TDSPSS
- address protection of the NHS (as per the Regional Official Plan (2014)policies), and
- identify and describe the servicing needed to support the proposed Draft Plan of Subdivision and Zoning By-Law Amendment.

STUDY AREA AND SUBJECT PROPERTY

The EIR/FSS Study Area (established in the TDSPSS) is approximately 122 hectares (ha) and is bounded by Highway 407 to the north, Tremaine Road to the east, Dundas Street to the south, Bronte Creek to the west, and the CNR line to the northwest. About one half of the Study Area is comprised of Greenbelt Plan Area, and the remaining half is comprised of a combination of agricultural fields and natural areas.

[1] The Region updated its Official Plan in 2009 through Regional Official Plan Amendment 38 (herein referred to as "ROPA 38"). This Official Plan was subsequently appealed by multiple parties and has been modified as a result of a series of negotiated settlements. The most recent consolidation of the Official Plan incorporating all in effect policies to date is November 28, 2014. This is the version of the Official Plan used as the basis for this submission.

The Subject Property occupies the eastern half of the Study Area on the largely agricultural lands between Bronte Creek and Fourteen Mile Creek. The Subject Property is 67 ha in size and is bound by Highway 407 to the north, Dundas Street to the south, Tremaine Road to the east, and the Bronte Creek valleylands to the west. The majority of the Subject Property (approximately 52 ha) is farmed with row crops. In addition, there is a relatively large woodland (approximately 8 ha) located centrally on the Subject Property (referred to herein as the "Central Woodland"), and a smaller woodland (approximately 2 ha) on the southern portion of the Subject Property (referred to herein as the "Southern Woodland"). The balance of the Subject Property is comprised of hedgerows, landscaped areas around existing and former farm houses, idle fields, small isolated wetlands, and marsh wetlands associated with drainage areas (approximately 5 ha).

PLANNING CONTEXT

Before laying out the purpose and content of this EIR/FSS, it is important to understand the planning context for this site, which is somewhat complex and has framed our approach to this EIR/FSS. The key aspects of this context, in order of occurrence, are as follows:

- December 2007/January 2008: Evergreen made development applications for the Subject Property with the City of Burlington and the Region of Halton supported by technical studies. This original application was subject to the land use planning policies in effect at the time, including the Halton Region Official Plan (2006).
- Spring 2008: Halton Region, the City of Burlington and the Town of Oakville embarked on a Secondary Plan study process of this area called for under the Burlington Official Plan which included the TDSPSS.
- September 2009: the TDSPSS was published. Key products that emerged from the TDSPSS were:
    - a Natural Heritage System (NHS), inclusive of an NHS boundary;
    - an overall management strategy for the TDSPSS Study Area as well as implementation guidance: and,
    - a detailed Terms of Reference for an EIR/FSS to support future Draft Plans of Subdivision that identified various study, monitoring and reporting requirements.
- December 16, 2009: Region of Halton Council adopted Regional Official Plan Amendment No. 38 ("ROPA 38") which: introduced a substantive policy change to the Region's approach to natural heritage matters, introduced new mapping which replaced the former Greenlands mapping with NHS mapping, and used the TDSPSS NHS as the basis for the ROPA 38 NHS mapping on the Subject Property (referred to as the "TDSPSS NHS"). This mapping was appealed by Evergreen, and modifications to the mapping were recently agreed to by the Region's environmental consultant , as discussed below.
- September 26, 2011: City of Burlington Council passed a resolution supporting a mixed use development on the Subject Property.
- November 25, 2011: the Ministry of Municipal Affairs and Housing (MMAH) approved ROPA 38, with modifications proposed by the Minister, and soon after ROPA 38, as modified, was appealed in its entirety by multiple appellants.

- November 26, 2012: City of Burlington Council passed a further resolution in support of a mixed use development on the Subject Property, directing the Director of Planning and Building to prepare a secondary plan based on mixed use development concepts, provided that the land use policies can achieve between 816 and 980 jobs.
- Spring 2012: Evergreen responded to the Burlington resolution and reconstituted a multi-disciplinary Study Team comprised of professionals with technical expertise in the areas of planning, hydrogeology, hydrology, fluvial geomorphology, aquatic and terrestrial biology, landscape architecture and engineering to undertake, amongst other things, the necessary technical studies in regard to an EIR/FSS for the Subject Property, as required by the TDSPSS. This study also includes the technical work, analyses and recommendations to address the requirements of an Environmental Impact Assessment (EIA), as required by the Regional Official Plan, and an Environmental Evaluation Report (EER) for the City.
- Between November 2012 and November 2014: ROPA 38, including the NHS policies, underwent a number of modifications as a result of negotiations between the Region and various other parties who had appealed the amendment. The Regional Official Plan (2009), incorporating ROPA 38 and these various modifications last consolidated in November 2014, is referred to herein as the "Regional Official Plan (2014)".
- Between spring 2012 and spring 2015: The Evergreen Study Team worked collaboratively and iteratively to develop this comprehensive EIR/FSS.

The TDSPSS was undertaken to be consistent with the 2006 Regional Official Plan policies in effect at the time with a view to identifying a NHS in the context of Secondary Plan land use policies. However, the TDSPSS was published in September 2009 prior to the completion of the Secondary Plan process, with the NHS boundaries being identified without regard for Secondary Plan land uses. Furthermore the TDSPSS NHS was not approved through a Local Official Plan amendment as contemplated by the 2006 Regional Official Plan. Instead, the TDSPSS NHS mapping was incorporated into the ROPA 38 NHS mapping for the Subject Property in December 2009. Notably, the TDSPSS NHS boundaries include 30 m buffers which were applied to Key Features regardless of the nature of the features and without regard for the type of land use which might be proposed adjacent to the feature.

As part of the comprehensive work undertaken in support of this EIR/FSS, the Evergreen Study Team has recommended a number of refinements and modifications to the TDSPSS NHS (described in detail in this report) based on more detailed, site-specific information collected through this work, as well as the need to be consistent with the Regional Official Plan (2014) policies.

The refined NHS components and overall boundary were presented to the Ontario Municipal Board as part of Evergreen's site-specific appeal in June of 2015. Both of the environmental consultants for the Region and Evergreen agreed that it is appropriate to include Key Features, linkages, buffers and enhancements to Key Features as components of the Regional NHS. However, there was disagreement as to whether it was appropriate to include 30 m buffers in the initial Regional NHS. Specifically, both of the consultants for Region and Evergreen agreed that:

- the Key Features, watercourses and wetlands (as per Regional Official Plan (2014) s. 115 3(6)) as identified through the work done in support of this EIR/FSS are mapped appropriately (subject to minor refinements that may occur as a result of staking with the Region and Conservation Halton (Conservation Halton));
- the local scale linkages as identified through the work done in support of this EIR/FSS are mapped appropriately (subject to minor refinements that may be required in relation to feature boundary refinements confirmed through staking with the Region and Conservation Halton (Conservation Halton)); and
- some enhancements to Key Features can be identified prior to the approval of an EIR/FSS, while others can be identified through the EIR/FSS process.

With respect to buffers, Evergreen's position (as enunciated by its environmental consultant) was that they could be determined based on the conceptual land use plan, and a well documented understanding of the Key Features (pursuant to any refinements identified in this EIR/FSS and the subsequent agency review process at the Draft Plan of Subdivision stage, and pursuant to s.116.1 and s.118 of the Regional Official Plan (2014)). On the other hand, the Region's position was that it was appropriate to maintain the 30 m buffers in the Regional NHS and address any refinements pursuant to s. 116.1 of the Regional Official Plan through an EIA or similar document.

The information contained within this EIR/FSS should allow for the final determination of buffer widths on the Subject Property.

PURPOSE AND CONTENT OF THIS EIR/FSS

The Terms of Reference for an EIR/FSS (provided in Appendix D of the TDSPSS and in **Appendix A1** of this study) state that the general purpose of the EIR/FSS, is as follows:

a) the purpose of the EIR is to characterize and analyse the natural heritage features and functions and to determine and address the potential impacts of a proposed development application, including servicing requirements, on the NHS;

b) the purpose of the FSS is to identify servicing requirements related to sanitary, water, stormwater, roads and site grading;

c) the purpose of both the EIR and FSS is to provide a link between the TDSPSS Management Report ("Management Strategy"), the TDSPSS Implementation Report ("Implementation of a Watershed Plan"), the Secondary Plan, and the Draft Plan submissions for future development applications.

Notably, since the TDSPSS was completed prior to the completion of the Secondary Plan process, this EIR/FSS has been prepared in an iterative manner with the preparation of a proposed Secondary Plan, and is also intended fulfill the requirements of an EIA for the Region and an EER for the City. This is important, as the TDSPSS assumes that a Secondary Plan is in place as a pre-requisite to the preparation of an EIR/FSS and the EIR/FSS is the bridge between the Secondary Plan and the implementing land use documentation such as a draft plan of subdivision and zoning by-law.

This EIR/FSS achieves its intended purpose by:

- building on the biophysical inventories, assessments and evaluations completed as part of the TDSPSS by conducting more detailed and up to date investigations and assessments at the EIR subcatchment and site levels;
- providing the necessary information and analysis to inform the preparation of the Secondary Plan, which was developed iteratively with the identification of an NHS for the Study Area;
- providing the studies and investigations identified in the TDSPSS EIR/FSS Terms of Reference, as well as additional site-specific studies and investigations necessary to support the Draft Plan of Subdivision and Zoning By-Law Amendment;
- conforming with the policies (but not the Regional NHS mapping[2]) of the Regional Official Plan (2014), the City of Burlington's Official Plan, as well as Conservation Halton's policies and regulations, and other applicable Provincial and Federal policies and regulations and being consistent with the Provincial Policy Statement (2014);
- collecting all of the information and conducting the analyses that would be required for an EIA in accordance with the Region of Halton's EIA Guidelines (2014) and for an EER in accordance witht he City of Burlington's Official Plan;
- providing a comprehensive assessment of the biophysical conditions, including natural heritage features and areas and their ecological functions, which has been used (in conjunction with consideration of the Regional Official Plan (2014) policies) as the basis for identifying an NHS for the Subject Property; and
- taking into consideration the goals, objectives and targets of the various environmental management and implementation strategies developed through the TDSPSS in developing an NHS and a series of implementation plans that support the protection and enhancement of the identified NHS for the long-term.

[2] The Regional NHS mapping is not in full force and effect on the Subject Property as it is being challenged by Evergreen, with the Regional environmental consultant agreeing to Evergreen's proposed changes to the boundaries of Key Features and linkages.

The EIR/FSS is structured according to the following study outline and is supplemented with supporting tables, graphics and appendices:

- **Section 1 – Introduction:** outlines the purpose, objectives and scope of work, and presents the study organization.
- **Section 2 – Land Use and Environmental Policy Framework:** summarizes the applicable environmental planning policies, legislation and regulations that are directly relevant to the Study Area and proposed development.
- **Section 3 – Existing Conditions:** describes the methodologies used to characterize the biophysical environment, summarizes the findings of the background reviews and field investigations, and characterizes the biophysical environment.
- **Section 4 – Preliminary Natural Heritage System (NHS):** describes the two-stage process adopted for identifying the NHS for the Subject Property (i.e., the Preliminary NHS identified in conjunction with the land uses contemplated in the Secondary Plan, and the Proposed NHS identified in conjunction with the proposed Draft Plan), and provides technical and policy-based rationale for inclusion of the various components in the Preliminary NHS on the Subject Property (such as Key Features, linkages, buffers, and enhancements to Key Features).
- **Section 5 – Summary of Constraints to Development:** summarizes the physical and natural heritage constraints to future development in relation to the site-specific features and areas, including identification of appropriate setbacks and buffers to protected features and areas in relation to the proposed land uses identified in the Secondary Plan, and with consideration for the applicable environmental policies and regulations.
- **Section 6 - Proposed Development, NHS and Functional Servicing System:** presents an overview of the Secondary Plan for context, describes the sustainable community design principles which were the basis for the proposed Draft Plan, presents the Proposed NHS and Conceptual Trails Plan (which were developed with consideration for the proposed Draft Plan), and describes the functional servicing components of the proposed Draft Plan (including stormwater management, grading, water / wastewater servicing and roads) and how they support a sustainable community design.
- **Section 7 - Impact Assessment and Recommended Mitigation:** includes (a) a detailed matrix of the anticipated impacts of the proposed Draft Plan on the Proposed NHS and its functions, and (b) specific and appropriate mitigation measures to address these potential impacts (including opportunities for a range of environmental enhancements within and outside the Proposed NHS).
- **Section 8 – Implementation Plans:** includes a Conceptual Restoration and Enhancement Plan, a Tree Preservation Plan, Erosion Control Plan, De-Watering and Well-Decommissioning Plan, and Monitoring Plan. The Monitoring Plan provides a detailed Terms of Reference for pre- and post-development monitoring of key environmental parameters to evaluate the effectiveness of recommended mitigation measures and environmental enhancements to be implemented.
- **Section 9 – Policy Compliance:** includes a summary of how the recommendations of the EIR/FSS ensure policy compliance with all the applicable policies and legislation.
- **Section 10 – Conclusions:** summarizes key study findings and provides a concluding statement.

PRELIMINARY AND PROPOSED NHS

As indicated above, this EIR/FSS identifies a recommended NHS that was prepared in two stages.

First, a Preliminary NHS is identified based on careful consideration for the applicable policies and legislation – including the current Regional Official Plan (2014) policies and definitions (**Section 2**), existing conditions as determined from both background information and site-specific field assessments (**Section 3**), and consideration for the types of land uses as envisioned through the Secondary Plan Community Structure (on an iterative basis).

The development of the Preliminary NHS involved a systems based approach by first confirming the identification of Key Features based on the detailed technical work undertaken, then identifying appropriate linkages in relation to these Key Features, and then identifying appropriate buffers based on both consideration of the sensitivities of the Key Features and the nature of the anticipated land uses in the adjacent lands (as identified in the Secondary Plan). Some enhancements to Key Features (primarily within but also a few outside of Key Features) were also identified as part of the Preliminary NHS. The Preliminary NHS conforms to all the policies and definitions of the Regional Official Plan (2014).

The second stage of this exercise was to identify the Proposed NHS in the context of the more detailed land use information provided in the Draft Plan. The Proposed NHS is comprised of the same Key Features, buffers, linkages and enhancements to Key Features as the Preliminary NHS, but also includes additional enhancements to Key Features which were identified as opportunities by the Study Team in relation to the more detailed proposed Draft Plan. The Proposed NHS maximizes opportunities for building NHS integrity and function in an urbanized context.

SECONDARY PLAN

The Secondary Plan, which is being submitted concurrently with this EIR/FSS, was developed iteratively with this document. It is also unusual in that the Secondary Planning Area is relatively small scale and is more or less equivalent to the Study Area for the EIR/FSS. Consequently, this Secondary Plan benefitted from a more detailed knowledge of the natural heritage conditions and proposed functional servicing for the area than would normally be the case. This allowed for the development of a Conceptual Draft Plan and some specific policies that are reflective of the sustainable community approach that has been developed for the Evergreen site.

PROPOSED DEVELOPMENT

Key elements of the sustainable approach to community design adopted for the Evergreen site include:

- taking an “environment first” approach by designing the community on an iterative basis with detailed knowledge of the nature and sensitivity of the NHS components, including integrating

opportunities for additional Enhancements (including a suite of proposed naturalization and restoration both within and outside of Key Features);

- incorporating a suite of Low Impact Development (LID) measures that will: (a) provide enhanced stormwater management to improve water quality and erosion control with the need for minimal conventional stormwater management infrastructure, and (b) compliment the ecological functions of the NHS by providing on-site infiltration and additional naturalized areas outside the NHS; and
- ensuring that the road proposed through one of the local linkages is designed to mitigate any potential impacts related to its function (including narrowing the road, applying speed calming measures, naturalizing the lands on the east and west side of the road, and integrating an ecopassage under the road for amphibians, reptiles and small mammals).

The proposed Draft Plan has been developed through consultations with the Study Team with consideration for:

- direction from the City of Burlington regarding the desire for a sustainable mixed use development
- the Subject Property's natural heritage constraints and opportunities
- ensuring transit connections (including considerations for cycling and trails) both within and outside the community, and
- integration of a LID-based stormwater management approach.

The proposed Draft Plan for the Subject Property includes lots for townhouses and single detached dwellings, as well as a business corridor and mixed-use corridor (general and employment). The proposal preserves 19.6 ha of natural heritage features and associated buffers, linkages and enhancements, and includes approximately 2 ha of proposed parkland and 3 ha open space.

A Trails Plan, Preliminary Site and Features-Based Water Balances, Grading and Drainage Plans, an Enhanced Stormwater Management Strategy (integrating extensive LID measures), and Servicing Plans have all been developed in relation to the proposed Draft Plan. These plans have all been developed with consideration for the Proposed NHS and demonstrate how the Subject Property can be designed, serviced and developed in a sustainable manner that can avoid negatively impacting the Proposed NHS, and in some cases contribute to enhancing it.

IMPACT ASSESSMENT AND RECOMMENDED MITIGATION

One of the primary goals of the EIR/FSS is to assess the potential impacts of the proposed development on the Proposed NHS in the Study Area. The impact assessment presented in this study examines the potential effects of proposed development at the site level, as well as the broader EIR/FSS Study Area level as recommended in the TDSPSS EIR/FSS Terms of Reference. The impact assessment is also intended to fulfill the requirements of a Regional Environmental Impact Assessment (EIA) and City of

Burlington Environmental Evaluation Report (EER) in support of the proposed Draft Plan application, and has been prepared to be in general accordance with the Halton Region EIA Guidelines (2014).

Application of a systems based approach, as outlined in s. 118(2), includes prohibiting development where required by the PPS (2014), not permitting alteration to any components of the NHS "*unless it has been demonstrated that there will be no negative impacts on the natural features and areas or their ecological functions*", and refining the boundaries of the Regional NHS (as per s. 116.1) at a stage in the process where it still allows for flexibility in enhancing the ecological functions of the system components. This study includes a comprehensive matrix that addresses the "no negative impacts" policy test and includes: a description of how the various development activities might affect the Proposed NHS and its functions, recommends various mitigation measures to be implemented to avoid or reduce potential impacts (and any associated monitoring or management actions required), and predicts the net impact. Net impacts have been classified as positive, negative or neutral based on their anticipated impact on the NHS.

The detailed analyses provided in this EIR/FSS confirm that while the boundaries of the Preliminary and Proposed NHS differ from those of the TDSPSS NHS, these differences do not compromise the overall ecological integrity or important ecological functions of the NHS, particularly with the implementation of the recommended mitigation measures.

IMPLEMENTATION PLANS

Above and beyond the various recommended mitigation measures considered appropriate to protect the NHS from negative impacts associated with the proposed development, additional enhancements to Key Features have been identified that are expected to contribute to improving the long-term ecological integrity and functions of the NHS. These enhancements include proposed restoration and management activities on the Subject Property (both within and outside of Key Features), as well as potential restoration and management activities on some of the adjacent lands that could be pursued in consultation with those landowners.

In addition, the EIR/FSS includes a Tree Preservation Plan, Erosion and Sediment Control Plan and De-watering/Well De-commissioning Plan to ensure protection of the NHS and its functions during construction. The Monitoring Plan framework identifies tasks needed to help ensure that the recommended measures are (a) being implemented and (b) performing as anticipated both during and following construction.

1. INTRODUCTION

This Environmental Implementation Report (EIR) and Functional Servicing Study (FSS) (herein referred to as the "EIR/FSS") for the Evergreen property (the "Subject Property") is being submitted on behalf of Evergreen Community Ltd. ("Evergreen") in support of development applications to the City of Burlington for a mixed use development based on environmentally sustainable design principles and approaches.

The Subject Property is located in the northeastern corner of the City of Burlington, in Halton Region, and is bounded to the north by Highway 407, to the east by Tremaine Road, to the south by Dundas Street, and to the west by the Bronte Creek Valley. The location of the Subject Property is shown in **Figure 1.1**. The site is also surrounded by the Provincial Greenbelt Plan Area to the north, west and south, with the entire Bronte Creek Valley contained within the Greenbelt.

This EIR/FSS is being submitted to:

- address the study requirements identified in the Tremaine and Dundas Secondary Plan Subwatershed Study (TDSPSS) for an EIR/FSS;
- address the requirements of the Region's Official Plan (2014)[3] for an Environmental Impact Assessment (EIA) for proposed development within or adjacent to the Region's Natural Heritage System (NHS);
- address the requirements of an Environmental Evaluation Report (EER) for the City of Burlington;
- provide the studies and assessments necessary to support an Official Amendment (and Secondary Plan), a Draft Plan of Subdivision, and a Zoning By-Law Amendment;
- provide the technical information and policy analysis required to support a NHS boundary for the Subject Property that is consistent with Regional Official Plan (2014) policies; and
- provide the various implementation plans required to:
    - meet the EIR/FSS requirements set out in the TDSPSS
    - address protection of the NHS (as per the Regional Official Plan (2014)policies), and
    - identify and describe the servicing needed to support the proposed Draft Plan of Subdivision and Zoning By-Law Amendment.

This introductory section outlines the study area, context, purpose, objectives and requirements for the EIR/FSS, identifies the Study Team, and provides an overview of the study contents.

[3] The Region updated its Official Plan in 2009 through Regional Official Plan Amendment 38 (herein referred to as "ROPA 38"). This Official Plan was subsequently appealed by multiple parties and has been modified as a result of a series of negotiated settlements. The most recent consolidation of the Official Plan incorporating all in effect policies to date is November 28, 2014. This is the version of the Official Plan used as the basis for this submission.

1.1 STUDY AREA

The TDSPSS EIR Terms of Reference (**Appendix A1**) recommended that the Study Area for the EIR/FSS be established on a subcatchment basis, and that an EIR/FSS be prepared for each individual subcatchment. However, given that the area identified for future development is under singular ownership and will be developed through one Draft Plan, the Study Team has prepared one comprehensive EIR/FSS for the entire Study Area. The EIR/FSS Study Area includes all of the same subcatchment areas as the TDSPSS, with the exception of a single isolated subcatchment area to the west of the CNR line which is far removed from the Subject Property, and the lands to the west of Bronte Creek. The EIR/FSS Study Area and the TDSPSS Study Area are both illustrated in **Figure 1.2**, along with the Greenbelt Plan Area.

The resultant EIR/FSS Study Area is approximately 122 hectares (ha) (as compared to the TDSPSS Study area which was closer to 133 ha) and is bounded by Highway 407 to the north, Tremaine Road to the east, Dundas Street to the south, Bronte Creek to the west, and the CNR line to the northwest. Notably, the FSS component of this study focuses on the Subject Property, although it considers connections to services in the adjacent lands.

About one half of the Study Area for this EIR/FSS is comprised of Greenbelt Plan Area (to the west), and the remaining half is comprised of a combination of agricultural fields and natural areas, as illustrated in **Figure 1.2**. Most of these natural areas, and some of the adjacent agricultural fields, form part of the Regional NHS, as described in detail in this study.

The Study Area is on the edge of an existing urban-rural interface at the northeastern corner of the City of Burlington, with several provincially and regionally significant natural areas within the Study Area or in the surrounding lands, as illustrated in **Figure 1.3**. The Study Area contains one Environmentally Sensitive Area (ESA) within its boundaries (i.e., Bronte Creek ESA) as well as several Areas of Natural and Scientific Interest (ANSIs) and provincially significant wetland (PSW) complexes just outside its boundaries. The Bronte Creek ESA falls entirely within the Green belt Plan Area.

The Subject Property occupies the eastern half of the Study Area on the largely agricultural lands between Bronte Creek and Fourteen Mile Creek (as shown in **Figure 1.2**). The Subject Property is 67 ha in size and is bound by Highway 407 to the north, Dundas Street to the south, Tremaine Road to the east, and the Bronte Creek valleylands to the west. The majority of the Subject Property (approximately 52 ha) is farmed with row crops. In addition, there is a relatively large woodland (approximately 8 ha) located centrally on the Subject Property (referred to herein as the “Central Woodland”), and a smaller woodland (approximately 2 ha) on the southern portion of the Subject Property (referred to herein as the “Southern Woodland”). The balance of the Subject Property is comprised of hedgerows, landscaped areas around existing and former farm houses, idle fields, small isolated wetlands, and marsh wetlands associated with drainage areas (approximately 5 ha).

1.2 PLANNING CONTEXT

Before laying out the purpose and content of this EIR/FSS, it is important to understand the planning context for this site, which is somewhat complex and has framed our approach to this EIR/FSS. The key aspects of this context, in order of occurrence, are as follows:

- December 2007/January 2008: Evergreen made development applications for the Subject Property with the City of Burlington and the Region of Halton supported by technical studies. This original application was subject to the land use planning policies in effect at the time, including the Halton Region Official Plan (2006).
- Spring 2008: Halton Region, the City of Burlington and the Town of Oakville embarked on a Secondary Plan study process of this area called for under the Burlington Official Plan which included the TDSPSS.
- September 2009: the TDSPSS was published. Key products that emerged from the TDSPSS were:
    - a Natural Heritage System (NHS), inclusive of an NHS boundary;
    - an overall management strategy for the TDSPSS Study Area as well as implementation guidance: and,
    - a detailed Terms of Reference for an EIR/FSS to support future Draft Plans of Subdivision that identified various study, monitoring and reporting requirements.
- December 16, 2009: Region of Halton Council adopted Regional Official Plan Amendment No. 38 ("ROPA 38") which: introduced a substantive policy change to the Region's approach to natural heritage matters, introduced new mapping which replaced the former Greenlands mapping with NHS mapping, and used the TDSPSS NHS as the basis for the ROPA 38 NHS mapping on the Subject Property (referred to as the "TDSPSS NHS"). This mapping was appealed by Evergreen, and modifications to the mapping were recently agreed to by the Region's environmental consultant , as discussed below.
- September 26, 2011: City of Burlington Council passed a resolution supporting a mixed use development on the Subject Property.
- November 25, 2011: the Ministry of Municipal Affairs and Housing (MMAH) approved ROPA 38, with modifications proposed by the Minister, and soon after ROPA 38, as modified, was appealed in its entirety by multiple appellants.
- November 26, 2012: City of Burlington Council passed a further resolution in support of a mixed use development on the Subject Property, directing the Director of Planning and Building to prepare a secondary plan based on mixed use development concepts, provided that the land use policies can achieve between 816 and 980 jobs.
- Spring 2012: Evergreen responded to the Burlington resolution and reconstituted a multi-disciplinary Study Team comprised of professionals with technical expertise in the areas of planning, hydrogeology, hydrology, fluvial geomorphology, aquatic and terrestrial biology, landscape architecture and engineering to undertake, amongst other things, the necessary technical studies in regard to an EIR/FSS for the Subject Property, as required by the TDSPSS. This study also includes the technical work, analyses and recommendations to address the

requirements of an Environmental Impact Assessment (EIA), as required by the Regional Official Plan, and an Environmental Evaluation Report (EER) for the City.

- Between November 2012 and November 2014: ROPA 38, including the NHS policies, underwent a number of modifications as a result of negotiations between the Region and various other parties who had appealed the amendment. The Regional Official Plan (2009), incorporating ROPA 38 and these various modifications last consolidated in November 2014, is referred to herein as the "Regional Official Plan (2014)".
- Between spring 2012 and spring 2015: The Evergreen Study Team worked collaboratively and iteratively to develop this comprehensive EIR/FSS.

The TDSPSS was undertaken to be consistent with the 2006 Regional Official Plan policies in effect at the time with a view to identifying a NHS in the context of Secondary Plan land use policies. However, the TDSPSS was published in September 2009 prior to the completion of the Secondary Plan process, with the NHS boundaries being identified without regard for Secondary Plan land uses. Furthermore the TDSPSS NHS was not approved through a Local Official Plan amendment as contemplated by the 2006 Regional Official Plan. Instead, the TDSPSS NHS mapping was incorporated into the ROPA 38 NHS mapping for the Subject Property in December 2009. Notably, the TDSPSS NHS boundaries include 30 m buffers which were applied to Key Features regardless of the nature of the features and without regard for the type of land use which might be proposed adjacent to the feature.

As part of the comprehensive work undertaken in support of this EIR/FSS, the Evergreen Study Team has recommended a number of refinements and modifications to the TDSPSS NHS (described in detail in this study) based on more detailed, site-specific information collected through this work, as well as the need to be consistent with the Regional Official Plan (2014) policies.

The refined NHS components and overall boundary were presented to the Ontario Municipal Board as part of Evergreen's site-specific appeal in June of 2015. Both of the environmental consultants for the Region and Evergreen agreed that it is appropriate to include Key Features, linkages, buffers and enhancements to Key Features as components of the Regional NHS. However, there was disagreement as to whether it was appropriate to include 30 m buffers in the initial Regional NHS. Specifically, both of the consultants for Region and Evergreen agreed that:

- the Key Features, watercourses and wetlands (as per Regional Official Plan (2014) s. 115 3(6)) as identified through the work done in support of this EIR/FSS are mapped appropriately (subject to minor refinements that may occur as a result of staking with the Region and Conservation Halton (Conservation Halton));
- the local scale linkages as identified through the work done in support of this EIR/FSS are mapped appropriately (subject to minor refinements that may be required in relation to feature boundary refinements confirmed through staking with the Region and Conservation Halton (Conservation Halton)); and
- some enhancements to Key Features can be identified prior to the approval of an EIR/FSS, while others can be identified through the EIR/FSS process.

With respect to buffers, Evergreen's position (as enunciated by its environmental consultant) was that they could be determined based on the conceptual land use plan, and a well documented understanding of the Key Features (pursuant to any refinements identified in this EIR/FSS and the subsequent agency review process at the Draft Plan of Subdivision stage, and pursuant to s.116.1 and s.118 of the Regional Official Plan (2014)). On the other hand, the Region's position was that it was appropriate to maintain the 30 m buffers in the Regional NHS and address any refinements pursuant to s. 116.1 of the Regional Official Plan through an EIA or similar document.

The information contained within this EIR/FSS should allow for the final determination of buffer widths on the Subject Property.

1.2.1 TREMAINE DUNDAS SECONDARY PLAN SUBWATERSHED STUDY (TDSPSS) (2009)

The TDSPSS provides important technical information as well as guidance that has informed the development of this EIR/FSS.

The TDSPSS goal was:

> *To develop a management plan for the TDSPSA which considers the natural resource features and provides for future uses in the subwatershed that recognize these features and will protect and enhance environmental conditions.*

The TDSPSS identified a NHS based on background reviews and field work completed during 2008 comprised of Core Areas (equivalent to Key Features), buffers, and Enhanced linkage Areas. Stream corridors were also indentified as high or medium constraint and assigned buffers and setbacks accordingly. The TDSPSS NHS served as a reference point for the natural heritage studies undertaken as part of this EIR/FSS. Although the NHS identified through this EIR/FSS is in many respects comparable to the TDSPSS NHS, a number of refinements and modifications to the TDSPSS NHS have been recommended based on the more detailed natural heritage studies undertaken as part of this EIR/FSS, considered in conjunction with the land uses contained in the proposed Secondary Plan, and the greater land use detail contained in the proposed Draft Plan.

The differences between the TDSPSS NHS and the NHS identified in the EIR/FSS are highlighted a in a few locations in this study because the Region originally adopted the TDSPSS NHS boundaries into the ROPA 38 NHS on Map 1 and Map 1G. Although the Region's environmental consultant has recently agreed that the refined Key Features and linkages as identified in this EIR/FSS are appropriate for Map 1 and Map 1G of ROPA 38 (subject to minor refinements that may result from feature staking with the region and Conservation Halton), agreement has yet to be reached on what buffers are appropriate for these Key Features. Notably, a rationale for the buffers recommended for the Preliminary and Proposed NHS on the Subject Property is provided in **Section 4**.

1.3 STUDY PURPOSE

The Terms of Reference for an EIR/FSS from the TDSPSS (**Appendix A1**) state that the general purpose of the EIR/FSS is as follows:

(a) the purpose of the EIR is to characterize and analyse the natural heritage features and functions and to determine and address the potential impacts of a proposed development application, including servicing requirements, on the NHS;

(b) the purpose of the FSS is to identify servicing requirements related to sanitary, water, stormwater, roads and site grading;

(c) the purpose of both the EIR and FSS is to provide a link between the TDSPSS Management Report ("Management Strategy"), the TDSPSS Implementation Report ("Implementation of a Watershed Plan"), the Secondary Plan, and the Draft Plan submissions for future development applications.

Notably, since the TDSPSS was completed prior to the completion of the Secondary Plan process, this EIR/FSS has been prepared in an iterative manner with the preparation of a proposed Secondary Plan, and is also intended fulfill the requirements of an EIA (as specified by the Region's Official Plan) and an EER (as required by the City's Official Plan). This is important, as the TDSPSS assumes that a Secondary Plan is in place as a pre-requisite to the preparation of an EIR/FSS and the EIR/FSS is the bridge between the Secondary Plan and the implementing land use documentation such as a draft plan of subdivision and zoning by-law.

This EIR/FSS achieves its intended purpose by:

- building on the biophysical inventories, assessments and evaluations completed as part of the TDSPSS by conducting more detailed and up to date investigations and assessments at the EIR subcatchment and site levels;
- providing the necessary information and analysis to inform the preparation of the Secondary Plan, which was developed iteratively with the identification of an NHS for the Study Area;
- providing the studies and investigations identified in the TDSPSS EIR/FSS Terms of Reference, as well as additional site-specific studies and investigations necessary to support the Draft Plan of Subdivision and Zoning By-Law Amendment;
- conforming with the policies (but not the Regional NHS mapping[4]) of the Regional Official Plan (2014), the City of Burlington's Official Plan, as well as Conservation Halton's policies and regulations, and other applicable Provincial and Federal policies and regulations and being consistent with the Provincial Policy Statement (2014);

[4] The Regional NHS mapping is not in full force and effect on the Subject Property as it is being challenged by Evergreen, with the Regional environmental consultant agreeing to Evergreen's proposed changes to the boundaries of Key Features and linkages.

- collecting all of the information and conducting the analyses that would be required for an EIA in a manner that is in accordance with the Region of Halton's EIA Guidelines (2014) and an EER;
- providing a comprehensive assessment of the biophysical conditions, including natural heritage features and areas and their ecological functions, which has been used (in conjunction with consideration of the Regional Official Plan (2014) policies) as the basis for identifying an NHS for the Subject Property; and
- taking into consideration the goals, objectives and targets of the various environmental management and implementation strategies developed through the TDSPSS in developing an NHS and a series of implementation plans that support the protection and enhancement of the identified NHS for the long-term.

In summary, the purpose of this EIR/FSS is to:

(a) present a science based analysis that supports the identification of an appropriate NHS for the Subject Property, and

(b) demonstrate how the proposed land uses and the design and servicing of the proposed Draft Plan will have no negative impacts on the Proposed NHS, while meeting the stormwater management, servicing and other environmental requirements of the TDSPSS.

1.4 STUDY OBJECTIVES

The Terms of Reference for this EIR/FSS (**Appendix A1**) require that the following objectives be fulfilled:

- *Demonstrate how the subwatershed requirements set out in the TDSPSS Management Report (including targets), the Implementation Report, and Secondary Plan[5] are being fulfilled in all proposed Draft Plans;*
- *Provide sufficient level of conceptual design to ensure that the various components of NHS and infrastructure can be implemented as envisaged in the TDSPSS and Secondary Plan and to ensure that the Draft Plans are consistent with this conceptual design;*
- *Ensure servicing requirements as determined in the FSS for the areas external to the Draft Plan are adequate;*
- *Identify details regarding any potential development constraints or conflicts and how they are to be resolved;*
- *Provide any further implementation details as needed;*
- *Streamline the Draft Plan approval process; and*
- *Facilitate the development of Draft Plan conditions.*

[5] This EIR/FSS has been developed to be fully consistent with the Secondary Plan being submitted concurrently with this application. This approach is atypical, but allowed for the Secondary Plan to benefit from a more detailed knowledge of the natural heritage conditions and proposed functional servicing for the area than would normally be the case, allowing for a high degree of consistency. Both the Secondary Plan and the EIR/FSS are intended to be consistent with the land use direction provided by the Council of the City of Burlington.

The Region also requires an EIA for any proposed development within 120 m of the Regional NHS. As per s. 118(3), the purpose of an EIA is to demonstrate that the proposed development "*will result in no negative impacts to that portion of the Regional Natural Heritage System*" by "*assessing the potential environmental impacts, requirements for impact avoidance and mitigation measures, and opportunities for enhancement*."

This EIR/FSS has been prepared to fulfill both the objectives identified in the TDSPSS Terms of Reference for this study, and the requirements for an EIA under current Regional policies and guidelines.

Furthermore, since the TDSPSS was completed prior to the completion of the Secondary Plan process, this EIR/FSS has been prepared in an iterative manner with the preparation of a proposed Secondary Plan for the Subject Lands.

1.5 STUDY REQUIREMENTS

The EIR/FSS Terms of Reference presented in the TDSPSS (**Appendix A1**) require that the study include discussion and analyses of the following:

- *Land Use;*
- *Cores and Linkages;*
- *Stream Systems;*
- *Fish, and Fish Habitat;*
- *Grading, Drainage and SWM;*
- *Hydrogeology;*
- *Sanitary, Water and Roads; and*
- *Trails.*

The Region's EIA Guidelines (2014) also specify that an EIA include: a biophysical inventory and analysis, a description of the development proposal, an impact assessment and mitigation strategies, and a monitoring plan. The City's EER requirements, as stated in their Official Plan, also include identification of buffers and setbacks.

This EIR/FSS meets all these requirements by providing:

- a comprehensive assessment of the biophysical conditions - including Key Features (equivalent to "Cores" in the TDSPSS), linkages, watercourses (equivalent to "stream systems" as described in the TDSPSS), and fish habitat / communities in the Study Area with more emphasis on the Subject Property;
- a hydrogeological assessment;
- an identification of recommended buffers and setbacks to protected natural heritage features;
- a description of the proposed land uses and transportation network envisioned through the Secondary Plan and implemented, in more detail, through the proposed Draft Plan;

- a description of the proposed development including associated grading, drainage, stormwater management, sanitary/water servicing and roads;
- a Conceptual Trails Plan;
- a comprehensive impact assessment and recommended mitigation matrix; and
- a series of implementation plans that support the protection and enhancement of the identified NHS for the short and long-term including plans for tree preservation, erosion and sediment control, de-watering and well de-commissioning, and monitoring .

1.6 STUDY TEAM

The following table identifies the Study Team involved in the Evergreen EIR/FSS and their roles.

Table 1.6-1 - Overview of EIR/FSS Study Team Members

Consultant		Title - Qualifications	Role
Urbantech Consulting	David Leighton	President - Project Manager, C.E.T.	Project Management
	Andrew Fata	Associate - P.Eng.	FSS – Primary Author
	Sean McKoy	Project Manager - P.Eng.	Preliminary Design
Beacon Environmental Ltd. (Beacon)	Ken Ursic	Project Manager - Sr. Ecologist - M.Sc. Ecol.	Project Management EIR Report – Primary Author
	Daniel Westerhof	Int. Ecologist – B.Sc., MES	Vegetation Surveys, Incidental Wildlife, EIR Report Input
	Rosalind Chaundy	Sr. Ecologist – M.Sc. F.	Wildlife Surveys, EIR Report Input
	Yves Scholten (no longer with Beacon)	Wildlife Ecologist – B.Sc.	Wildlife Surveys
	Sarah Aitken	Aquatic Ecologist – B.Sc.	Aquatic Habitat Assessments, EIR Report Input
	Erik Daly	GIS Specialist – B.Sc.	GIS Mapping for Natural Heritage
	Stephan Crispin	Landscape Architect – B.L.A., OALA	Restoration and Enhancement Concept, Trails Concept
	Margot Ursic	Planning Ecologist - B.A., M.Sc.	Policy Input, EIR Report Review and Editing
Urban Strategies Inc.	Cyndi Rottenberg Walker	Partner - MScPl, MCIP, RPP	Planning and Policy Review, Community design concept development
	Leigh McGrath	Planner - MScPl, MCIP, RPP	Policy review / development to support proposal; community design concept development and description
GeoProcess Research Associates	Ken Glasbergen, M.Sc	Fluvial Geomorphologist	Fluvial Geomorphological Study – Primary Author
	Dr. John Beebe, PhD	Fluvial Geomorphologist	Fluvial Geomorphological Study Input
	Jeff Hirvonen	Fluvial Geomorphologist	Fluvial Geomorphological Study Input
AMEC	Simon Gautrey	Associate Hydrogeologist -	Hydrogeological Study – Primary

Consultant		Title - Qualifications	Role
		M.Sc. P.Geo	Author Review and Input
	Michael Anderson	Hydrogeologist - M.Sc. P.Geo	Hydrogeological Study – Primary Author
Gerrard Design Associates Inc.	David Gerrard	Principal - OALA, CSLA, LEED AP	Mapping and Graphics Support
Schollen & Company Inc.	Mark Schollen	Principal, Landscape Architect - OALA, CSLA	Low Impact Development (LID) and Sustainable Design Strategies
Urban Forest Innovations Inc.	Philip van Wassenaer	Principal – Consulting Arborist, B.SC., MFC	Tree Inventory and Preservation Study – Primary Author
Jennifer Lawrence and Associates Inc.	Jennifer Lawrence	Environmental Planner, MCIP, RPP	EIR/FSS Report Input and Review

Appendix A2 includes the CVs for the Study Team members from Beacon involved in collecting the field data.

1.7 REPORT CONTENTS

This section includes an overview of the organization of the EIR/FSS followed by an overview of the key EIR/FSS deliverables.

1.7.1 REPORT OUTLINE

The EIR/FSS is structured according to the following study outline and is supplemented with supporting tables, graphics and appendices:

- **Overview**
- **Section 1 – Introduction:** outlines the purpose, objectives and scope of work, and presents the study organization.
- **Section 2 – Land Use and Environmental Policy Framework:** summarizes the applicable environmental planning policies, legislation and regulations that are directly relevant to the Study Area and proposed development.
- **Overview**
- **Section 1 – Introduction:** outlines the purpose, objectives and scope of work, and presents the study organization.
- **Section 2 – Land Use and Environmental Policy Framework:** summarizes the applicable environmental planning policies, legislation and regulations that are directly relevant to the Study Area and proposed development.
- **Section 3 – Existing Conditions:** describes the methodologies used to characterize the biophysical environment, summarizes the findings of the background reviews and field investigations, and characterizes the biophysical environment.
- **Section 4 – Preliminary Natural Heritage System (NHS):** describes the two-stage process adopted for identifying the NHS for the Subject Property (i.e., the Preliminary NHS identified in

conjunction with the land uses contemplated in the Secondary Plan, and the Proposed NHS identified in conjunction with the proposed Draft Plan), and provides technical and policy-based rationale for inclusion of the various components in the Preliminary NHS on the Subject Property (such as Key Features, linkages, buffers, and enhancements to Key Features).

- **Section 5 – Summary of Constraints to Development:** summarizes the physical and natural heritage constraints to future development in relation to the site-specific features and areas, including identification of appropriate setbacks and buffers to protected features and areas in relation to the proposed land uses identified in the Secondary Plan, and with consideration for the applicable environmental policies and regulations.
- **Section 6 - Proposed Development, NHS and Functional Servicing System:** presents an overview of the Secondary Plan for context, describes the sustainable community design principles which were the basis for the proposed Draft Plan, presents the Proposed NHS and Conceptual Trails Plan (which were developed with consideration for the proposed Draft Plan), and describes the functional servicing components of the proposed Draft Plan (including stormwater management, grading, water / wastewater servicing and roads) and how they support a sustainable community design.
- **Section 7 - Impact Assessment and Recommended Mitigation:** includes (a) a detailed matrix of the anticipated impacts of the proposed Draft Plan on the Proposed NHS and its functions, and (b) specific and appropriate mitigation measures to address these potential impacts (including opportunities for a range of environmental enhancements within and outside the Proposed NHS).
- **Section 8 – Implementation Plans:** includes a Conceptual Restoration and Enhancement Plan, a Tree Preservation Plan, Erosion Control Plan, De-Watering and Well-Decommissioning Plan, and Monitoring Plan. The Monitoring Plan provides a detailed Terms of Reference for pre- and post-development monitoring of key environmental parameters to evaluate the effectiveness of recommended mitigation measures and environmental enhancements to be implemented.
- **Section 9 – Policy Compliance:** includes a summary of how the recommendations of the EIR/FSS ensure policy compliance with all the applicable policies and legislation.
- **Section 10 – Conclusions:** summarizes key study findings and provides a concluding statement.

1.7.2 KEY REPORT DELIVERABLES

Between 2012 and 2015 the Evergreen Study Team has undertaken a number of comprehensive studies in the respective disciplines represented (i.e., planning, hydrogeology, ecology, fluvial geomorphology, arboriculture, engineering, landscape architecture and design) and worked together to develop a technically sound and integrated document that:

- meets the requirements of both the Terms of Reference of the TDSPSS and the Region's EIA Guidelines (2014)
- appropriately addresses the policies and definitions of the Region's Official Plan (2014)
- addresses all other applicable policies / regulations / guidelines, and

- supports a progressive and creative Draft Plan for the Subject Property that appropriately balances natural heritage protection within sustainable community planning in the northeastern corner of Burlington's urban area.

The first key deliverable provided in this EIR/FSS is an NHS for the Subject Property (and the Study Area), which was developed through s two-stage process, as follows:

1. First, a Preliminary NHS is identified based on careful consideration for the applicable policies and legislation – including the current REGIONAL OFFICIAL PLAN (2014) policies and definitions (**Section 2**), existing conditions as determined from both background information and site-specific field assessments (**Section 3**), and consideration for the types of land uses as envisioned through the Secondary Plan Community Structure (on an iterative basis).

   The development of the Preliminary NHS involved a systems based approach by first confirming the identification of Key Features based on the detailed technical work undertaken, then identifying appropriate linkages in relation to these Key Features, and then identifying appropriate buffers based on both consideration of the sensitivities of the Key Features and the nature of the anticipated land uses in the adjacent lands (as identified in the Secondary Plan). Some enhancements to Key Features (primarily within but also a few outside of Key Features) were also identified as part of the Preliminary NHS. The Preliminary NHS conforms to all the policies and definitions of the Regional Official Plan (2014).

2. The second stage of this exercise was to identify the Proposed NHS in the context of the more detailed land use information provided in the Draft Plan. The Proposed NHS is comprised of the same Key Features, buffers, linkages and enhancements to Key Features as the Preliminary NHS, but also includes additional enhancements to Key Features which were identified as opportunities by the Study Team in relation to the more detailed proposed Draft Plan. The Proposed NHS maximizes opportunities for building NHS integrity and function in an urbanized context.

Further key deliverables provided in the EIR/FSS include: a Conceptual Restoration and Enhancement Plan, a Conceptual Trails Plan, Preliminary Site and Features-Based Water Balances, Grading and Drainage Plans, Stormwater Management/Low Impact Development Plans, and Servicing Plans. These implementation plans have all been developed with consideration for the Proposed NHS and demonstrate how the Subject Property can be designed, serviced and developed in a sustainable manner that can avoid negatively impacting the Proposed NHS, and in some cases, can contribute to its enhancement.

The EIR/FSS includes a suite of LID measures that will: (i) provide enhanced stormwater management to improve water quality and erosion control without the need for conventional stormwater management infrastructure, and (ii) compliment the ecological functions of the NHS by providing on-site infiltration and additional naturalized areas outside the NHS.

This EIR/FSS has also taken a progressive approach to land use planning by ensuring that the “Special Road”, proposed through one of the local scale linkages, incorporates a number of design elements that will minimize conflicts between vehicles and wildlife (e.g., reduced road width with traffic calming measures, inclusion of an ecopassage for wildlife and measures to funnel small wildlife to that ecopassage) and enhanced habitat conditions in the linkage (e.g., naturalization of areas outside the road but within the right-of-way).

2. LAND USE PLANNING AND ENVIRONMENTAL POLICY FRAMEWORK

The following sections describe environmental legislation, regulations and policies at the Federal, Provincial, Regional and local levels that are directly applicable to this study. An evaluation of how the proposed Draft Plan, and the related mitigation and environmental enhancement measures, address these various policies and regulations is provided in **Section 9**.

The environmental legislation, regulations and policies considered in preparing this EIR/FSS include:

- *Federal Fisheries Act* (1985)
- *Ontario Endangered Species Act* (2007)
- Provincial Policy Statement (2014)
- Provincial Greenbelt Plan (2005)
- The former Halton Region Official Plan (2006) and the current Regional Official Plan (which incorporates Amendment 38 - ROPA 38, and subsequent policy modifications agreed to through mediation / settlements up to November 2014) (herein referred to as "Regional Official Plan (2014)")
- City of Burlington Official Plan (2006)
- *Conservation Authorities Act* and Ontario Regulation 162/06 (2006)

2.1 FEDERAL FISHERIES ACT

The EIR/FSS Study Area includes several watercourses that support fish habitat. As such, the *Fisheries Act* (1985) is a 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 (MNRF – formerly known as MNR or OMNR) manages fisheries.

The *Fisheries Act* was updated through Bill C-38 which came into effect November 25th, 2013. Former prohibitions on killing fish and causing Harmful Alteration, Disruption or Destruction (HADD) of fish habitat are now combined within a single prohibition in s. 35 (1) which precludes "*any work, undertaking or activity that results in serious harm to fish"* that are part of a commercial, recreational or aboriginal fishery, or to fish that support such a fishery. S. 35(2) provides that s. 35(1) does not apply where the work, undertaking or activity has been authorized by the Minister and is carried on in accordance with conditions established by the Minister.

The *Fisheries Act* defines "serious harm" to fish as "serious harm to fish is the death of fish or any permanent alteration to, or destruction of, fish habitat". The *Fisheries Protection Policy Statement* (2013) was prepared by DFO to provide guidance on compliance with the *Fisheries Act*. This policy statement provides an elaborated definition of "serious harm to fish" as follows:

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

Compliance with the provisions of s. 35 of the *Fisheries Act* in regard to particular water bodies is now made on a case-by-case basis through a self-assessment process to determine impacts to fish and fish habitat and to identify appropriate responses. Where development activities taking place in or near water may affect fisheries by adversely affecting fish or fish habitat, the Policy Statement (DFO 2013) recommends that proponents of these activities should:

- understand the types of impacts their projects are likely to cause;
- take measures to avoid and mitigate impacts to the extent possible; and,
- request authorization from the Minister and abide by the conditions of any such authorization, when it is not possible to avoid and mitigate impacts of projects that are likely to cause serious harm to fish.

The following explanation of the concepts of avoidance, mitigation and, the additional measure of offsetting is taken from the Policy Statement (DFO 2013):

Avoidance

- *Avoidance is the undertaking of measures to completely prevent serious harm to fish. Avoidance measures may include locating infrastructure or designing a project or one or more of its components to avoid serious harm to fish. Careful timing of certain activities may also avoid harm to fish and fish habitat.*
- *For some projects, serious harm to fish may be fully avoided while for others, serious harm to fish may only be partially avoided. When serious harm to fish cannot be fully avoided, mitigation measures should be undertaken.*

Mitigation

- *Mitigation is a measure to reduce the spatial scale, duration, or intensity of serious harm to fish that cannot be completely avoided. The best available mitigation measures or standards should be implemented by proponents as much as is practically feasible.*
- *Mitigation measures include the implementation of best management practices during the construction, maintenance, operation and decommissioning of a project.*

Offsetting

- *If all efforts have been made to avoid and mitigate impacts, any residual serious harm to fish should be addressed by offsetting. An offset measure is one that counterbalances unavoidable serious harm to fish resulting from a project with the goal of maintaining or improving the productivity of the commercial, recreational or Aboriginal fishery. Offset measures should support available fisheries management objectives and local restoration priorities.*

As per the Policy Statement (2013), efforts should be made to avoid impacts first. When avoidance is not possible, then efforts should be made to mitigate impacts caused by the project in question . After these actions, any residual impacts should then be addressed by offsetting . An offset measure is one that "*counterbalances unavoidable serious harm to fish resulting from a project with the goal of maintaining or improving the productivity of the commercial, recreational or Aboriginal fishery*". Offset measures should support available fisheries management objectives and local restoration priorities, and can take a variety of forms. Proponents are required to submit an offsetting plan to demonstrate that the measures and standards above are adhered to, and will also be required to demonstrate that the offsetting measures will maintain or improve the productivity of fisheries.

2.2 FEDERAL SPECIES AT RISK ACT

The Federal *Species at Risk Act* – SARA (2002) is intended to prevent federally Endangered or Threatened wildlife (including plants) from becoming extinct from the wild, and to help in the recovery of these species. The Act is also intended to help prevent species listed as Special Concern federally from becoming Endangered or Threatened. To ensure the protection of Species at Risk (SAR), SARA contains prohibitions that make it an offence to kill, harm, harass, capture, take, possess, collect, buy, sell or trade an individual of a species listed in Schedule 1 of SARA as Endangered, Threatened or Extirpated.

However, this legislation applies primarily to lands under Federal jurisdiction, and relies on Provincial laws to protect Federal SAR habitat. On private land, SARA prohibitions apply only to aquatic species and migratory birds that are also listed in the *Migratory Birds Convention Act* (1994). The intent of SARA is to protect critical habitat as much as possible through voluntary actions and stewardship measures.

Neither of the aquatic species whose habitat is confirmed in the Study Area and are listed provincially as Threatened or Endangered (i.e., Silver Shiner (*Notropis photogenis*) and Redside Dace (*Clinostomus elongates*) respectively) are listed as federally Threatened or Endangered. Therefore, the regulations of SARA (2002) only apply to the Study area in relation to the *Migratory Birds Convention Act* (1994) discussed below.

2.3 MIGRATORY BIRDS CONVENTION ACT

The Federal *Migratory Birds Convention Act* – MBCA (1994) protects the nests, eggs and young of most bird species from harassment, harm or destruction. On the Subject Property, this legislation applies in relation to any proposed vegetation clearing as part of the implementation of the proposed Draft Plan, once approved.

In southern Ontario, most birds nest between April 15 and July 31 and so, as a precautionary measure to ensure compliance witht he MBCA, vegetation clearing during this period is typically discouraged. This is because although screening for active nests can be conducted, it is typically very difficult to detect all active nests during the breeding season (e.g., hole nesting birds, birds nesting in conifers, high in tree canopies or in dense grassy habitat). Notably, Environment Canada currently considers the "high risk" period for encountering nesting birds to be from mid-March to late August (e.g., in some old field communities some species nest as late as mid-August).

Regardless of the date, any nest and the habitat to support the nesting birds is protected under the MBCA, and therefore even for proposed vegetation clearing outside of the "high risk" window, surveys should be conducted by a qualified environmental inspector to screen for active nests prior to works being undertaken.

2.4 ONTARIO ENDANGERED SPECIES ACT

Species at Risk (SAR) in Ontario are species that are listed as Endangered, Threatened or Special Concern at the Provincial level. The Ontario *Endangered Species Act* (2007) regulates the habitat of Endangered or Threatened species. Due to the potential and confirmed presence of some SAR within the Study Area, it is important to consider the *Endangered Species Act*.

Correspondence with the MNRF (M. Thompson, Aurora District, April 23, 2012) (see **Appendix B1**), confirmed that current records (i.e., from the past 20 years) exist for at least six provincially listed (6) SAR in the vicinity of the Study Area, three of which are listed as Endangered or Threatened, as follows:

- Eastern Flowering Dogwood (*Cornus florida*) – provincially Endangered plant
- Redside Dace (*Clinostomus elongatus*) – provincially Endangered fish
- Butternut (*Juglans cinerea*) – provincially Endangered plant
- Bobolink (*Dolichonyx oryzivorus*) – provincially Threatened bird
- Snapping Turtle (*Chelydra serpentine*) – provincially Special Concern reptile
- Milksnake (*Lampropeltis triangulum*) – provincially Special Concern reptile

Through the background review and field surveys undertaken as part of the EIR/FSS, several additional Provincial SAR were noted in the Study Area: Yellow-breasted Chat (provincially Endangered bird), Bank Swallow (provincially Threatened bird), Meadowlark (provincially Threatened bird), Barn swallow (provincially Threatened bird), Chimney Swift (provincially Threatened bird) and Silver Shiner

(provincially Threatened fish). There is also a historical record from 1941 for a reptile SAR species which is now considered extirpated from the Study Area. These species are all considered and discussed in this study.

The *Endangered Species Act* provides legal protection to Endangered and Threatened species confirmed on a site, although under subsection 17(1) of the Act, the Minster may issue a permit that authorizes a person to engage in an activity that would otherwise be prohibited (under subsection 9(1) or 10(1) of the Act) provided the applicable legislative requirements of subsection 17(2) are satisfied. For context, relevant excerpts from this Act are included in the following sections.

Subsection 9(1) of the *Endangered Species Act* states that:

No person shall,

(a) *kill, harm, harass, capture or take a living member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species;*

(b) possess, transport, collect, buy, sell, lease, trade or offer to buy, sell, lease or trade,

(i) a living or dead member of a species that is listed on the Species at Risk in Ontario List as an extirpated, endangered or threatened species,

(ii) any part of a living or dead member of a species referred to in subclause (i),

(iii) anything derived from a living or dead member of a species referred to in subclause (i); or

(c) *sell, lease, trade or offer to sell, lease or trade anything that the person represents to be a thing described in subclause (b) (i), (ii) or (iii).*

Subsection 10(1) (a) of the *Endangered Species Act* states that:

No person shall damage or destroy the habitat of a species that is listed on the Species at Risk in Ontario list as an endangered or threatened species.

The *Endangered Species Act Submission Standards for Activity Review and 17(2)(c) Overall Benefit Permits* (OMNR 2012a) is a document that provides guidance regarding permitting requirements under the Act. Relevant excerpts are provided below:

There are four types of permits that may be issued for authorizing otherwise prohibited activities. These are where the activity:

(i) is necessary for the protection of human health or safety - clause 17(2)(a);

(ii) has the main purpose to assist, and would assist, in the protection or recovery of the species - clause 17(2)(b);

(iii) *has the main purpose not to assist in the protection or recovery of the species, but through specific and mandatory conditions outlined in the permit will result in an overall benefit to the species within a reasonable time - clause 17(2)(c); and,*

(iv) will result in significant social or economic benefit to Ontario, but will not jeopardize the survival or recovery of species at risk - clause 17(2)(d).

Such permits may be issued where, in the MNRF's opinion that:

(i) the permitted activity will result in an overall benefit to the species within a reasonable time through requirements imposed by conditions of the permit,

(ii) reasonable alternatives have been considered, including alternatives that would not adversely affect the species, and the best alternative has been adopted, and

(iii) reasonable steps to minimize adverse effects on individual members of the species are required by conditions of the permit.

In July 2013, Ontario Regulation 176/13 (to amend O. Reg. 242/08) came into effect to simplify the process for addressing activities that can potentially damage or destroy the habitats of certain SAR. As a result of this regulation, an Overall Benefit Permit is not needed if the Registry process as described in the regulation is followed, although habitat replacement and monitoring are still required. This applies to Butternut, an Endangered tree species, whose habitat was confirmed as occurring on the Subject Property as part of this EIR/FSS, as well as previous studies (LGL 2008a, AECOM 2009).

The recently updated Provincial Policy Statement (discussed below) now clarifies that the confirmation of habitat of provincially Endangered and Threatened species is ultimately under MNRF's jurisdiction, and that any proposed development or site alteration within such habitat may only be permitted in accordance with Provincial regulations and supporting documents.

2.5 PROVINCIAL POLICY STATEMENT

The Provincial Policy Statement (MMAH 2014) provides policy direction to municipalities and other planning authorities on matters of Provincial interest as they relate to land use planning and development. The Provincial Policy Statement (PPS) provides for appropriate land use planning and development while protecting Ontario's natural heritage. Development governed by the *Planning Act* must be consistent with the PPS.

For this EIR/FSS policies of particular interest are those outlined in: Section 1.1 – Managing and Directing Land Use to Achieve Efficient and Resilient Development and Land Use Patterns, Section 2.1 - Natural Heritage, Section 2.2 – Water, Section 3.1 - Natural Hazards, and Section 1.6 – Infrastructure and Public Service Facilities although, it is recognized that the PPS must be read in its entirety. Key excerpts from these policies are presented below.

2.5.1 EFFICIENT AND RESILIENT LAND USE PATTERNS

The PPS sets out Ontario's overall land use planning vision in a statement that encompasses the many factors at play in creating balanced, healthy communities. As set out in Part IV: Vision for Ontario's Land Use Planning System: "*Efficient development patterns optimize the use of land, resources and public investment in infrastructure and public service facilities. These land use patterns promote a mix of housing, including affordable housing, employment, recreation, parks and open spaces, and transportation choices that increase the use of active transportation and transit before other modes of travel*."

The objectives around efficient development and biodiversity are repeated in policy, notably in Section 1.1.1 which states that:

> *"Healthy, liveable and safe communities are sustained by:*
> *a) promoting efficient development and land use patterns which sustain the financial well-being of the Province and municipalities over the long term;…*
> *c) avoiding development and land use patterns which may cause environmental or public health and safety concerns; …*
> *e) promoting cost-effective development patterns and standards to minimize land consumption and servicing costs; …*
> *h) promoting development and land use patterns that conserve biodiversity and consider the impacts of a changing climate."*

Section 1.1.3 provides that the vitality of settlement areas is critical to the long-term economic prosperity of Ontario's communities, and goes on to provide that:

> *Development pressures and land use change will vary across Ontario. It is in the interest of all communities to use land and resources wisely, to promote efficient development patterns, protect resources, promote green spaces, ensure effective use of infrastructure and public service facilities and minimize unnecessary public expenditures.*

Section 1.1.3.2 also provides that land use patterns within settlement areas shall be based on:
"*a) densities and a mix of uses which: 1. efficiently use land and resources; …*"

These policies demonstrate that attention is given both to the objectives of efficient land development and environmental protection, and that there is a need for balance in regard to these important matters.

2.5.2 NATURAL HERITAGE

The PPS includes policies that speak to the identification and protection of natural heritage systems, as well as levels of protection for the various components that comprise such systems. A number of these feature components, as well as a connected NHS, have been identified in the Study Area, and must be assessed in the context of these policies, as well as the applicable policies under the Provincial Greenbelt Plan (**Section 2.4**), Regional Official Plan (**Section 2.5**), and the City of Burlington's Official Plan (**Section 2.6**).

The policies specific to natural heritage are found in Section 2.1 of the PPS and are provided in their entirety below:

> *Natural features and areas shall be protected for the long term.*
>
> *2.1.2 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.*
>
> *2.1.3 Natural heritage systems shall be identified in Ecoregions 6E & 7E, recognizing that natural heritage systems will vary in size and form in settlement areas, rural areas, and prime agricultural areas.*
>
> *2.1.4. Development and site alteration shall not be permitted in:*
>
> *a) significant wetlands in Ecoregions 5E, 6E and 7E; and*
>
> *b) significant coastal wetlands.*
>
> *2.1.5 Development and site alteration shall not be permitted in:*
>
> *a) significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E;*
>
> *b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);*
>
> *c) significant valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);*
>
> *d) significant wildlife habitat;*
>
> *e) significant areas of natural and scientific interest; and*
>
> *f) coastal wetlands in Ecoregions 5E, 6E and 7E that are not subject to policy 2.1.4(b)*
>
> *unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.*
>
> *2.1.6 Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.*
>
> *2.1.7 Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.*
>
> *2.1.8 Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5 and 2.1.6 unless the ecological*

function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

2.1.9 Nothing in policy 2.1 is intended to limit the ability of agricultural uses to continue.

To simplify the approach of the PPS (2014), as it applies to the Study Area, there is a requirement that a NHS be identified within the Study Area (s. 2.1.3) and that this system be maintained, restored, or, where possible, improved (s. 2.1.2). The definition of NHS makes clear that it is composed of natural features, linkages and enhancement areas, as well as possible other areas.

The PPS (2014) defines the habitat of Endangered and Threatened species as follows:

a) *with respect to a species listed on the Species at Risk in Ontario List as an endangered or threatened species for which a regulation made under clause 55(1)(a) of the Endangered Species Act, 2007 is in force, the area prescribed by that regulation as the habitat of the species; or*
b) *with respect to any other species listed on the Species at Risk in Ontario List as an endangered or threatened species, an area on which the species depends, directly or indirectly, to carry on its life processes, including life processes such as reproduction, rearing, hibernation, migration or feeding, as approved by the Ontario Ministry of Natural Resources; and*
c) *places in the areas described in clause (a) or (b), whichever is applicable, that are used by members of the species as dens, nests, hibernacula or other residences*

The PPS (2014) defines valleylands as: "*…a natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of the year*" and "significant" in regards to valleys is the same as the Region's Official Plan (2014) definition quoted above.

With respect to significance, the PPS (2014) addresses the features listed above as follows:

a) *in regard to wetlands, coastal wetlands and areas of natural and scientific interest, an area identified as provincially significant by the Ontario Ministry of Natural Resources using evaluation procedures established by the Province, as amended from time to time;*
b) *in regard to woodlands, an area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history. These are to be identified using criteria established by the Ontario Ministry of Natural Resources;*
c) *in regard to other features and areas in policy 2.1, ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system;*

…

Criteria for determining significance for the resources identified in sections (c)-(e) are recommended by the Province, but municipal approaches that achieve or exceed the same objective may also be used. While some significant resources may already be identified and

inventoried by official sources, the significance of others can only be determined after evaluation.

S. 2.1.4, 2.1.5, 2.1.6 and 2.1.7 establish when development may occur within the identified natural features. Within the Study Area, the following natural features mentioned in these sections are found: significant wetlands, significant woodlands, significant valleylands, significant wildlife habitat, habitat of Endangered and Threatened species, and fish habitat.

No development or site alteration is permitted on lands "adjacent" to the "natural features and areas" identified in s. 2.1.4, 2.1.5 and 2.1.6, unless the evaluation and the demonstration required by s. 2.1.8 has been carried out. Under the PPS (2014), buffers are not part of a NHS, however an outcome of this evaluation would usually be the identification of methods of mitigating negative impacts, inclusive of buffers.

The confirmation of the natural heritage features and areas noted above is a responsibility shared by the MNRF and the municipal planning authority:

- The MNRF is responsible for the confirmation of habitat of Endangered and Threatened species, and for its regulation (as described in **Section 2.4**), as well as for the identification of provincially significant wetlands (PSWs) and Areas of Natural and Scientific Interest (ANSIs).
- Local and Regional planning authorities are responsible for the confirmation of significant woodlands, significant valleylands, and significant wildlife habitat, with support from applicable guidance documents (e.g., Natural Heritage Reference Manual, OMNR 2010; Significant Wildlife Habitat Technical Guidelines, OMNR 2000; Draft Significant Wildlife Habitat Criteria for Ecoregion 7E, OMNR 2012).
- Local and Regional planning authorities in southern Ontario also typically work with their local conservation authority to identify and confirm non-provincially significant wetlands that may have significance at the local or Regional level.
- As described in **Section 2.1** above, iIdentification and verification of fish habitat is now self-regulated although enforcement of the related policies, but regulation is still managed by MNRF and regulated by DFO.

In areas where significant natural heritage features have been previously identified by the appropriate agency or planning authority, the boundaries of such features can typically be refined through site-specific studies undertaken as part of a planning process, with input from the responsible agency and/or planning authority.

Guidance related to the implementation of the natural heritage policies of the PPS (2014) is found in the *Natural Heritage Reference Manual* (OMNR 2010), which must be read making adjustments for the fact that it was written with the 2005 PPS in mind.

2.5.3 WATER

Water resources in the Study Area and on the Subject Property are a key consideration within this EIR/FSS. Section 2.2 of the PPS directs planning authorities to protect, improve or restore the quality and quantity of surface and groundwater water resources through watershed and land use planning, as per the policies below cited in their entirety:

2.2.1 Planning authorities shall protect, improve or restore the quality and quantity of water by:

a. using the watershed as the ecologically meaningful scale for integrated and long-term planning, which can be a foundation for considering cumulative impacts of development;

b. minimizing potential negative impacts, including cross-jurisdictional and cross-watershed impacts;

c. identifying water resource systems consisting of ground water features, hydrologic functions, natural heritage features and areas , and surface water features including shoreline areas, which are necessary for the ecological and hydrological integrity of the watershed;

d. maintaining linkages and related functions among ground water features, hydrologic functions, natural heritage features and areas, and surface water features including shoreline areas;

e. implementing necessary restrictions on development and site alteration to:

1. protect all municipal drinking water supplies and designated vulnerable areas; and

2. protect, improve or restore vulnerable surface and ground water, sensitive surface water features and sensitive ground water features, and their hydrologic functions;

f. planning for efficient and sustainable use of water resources, through practices for water conservation and sustaining water quality;

g. ensuring consideration of environmental lake capacity, where applicable; and

h. ensuring stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.

2.2.2 Development and site alteration shall be restricted in or near sensitive surface water features and sensitive ground water features such that these features and their related hydrologic functions will be protected, improved or restored.

Mitigative measures and/or alternative development approaches may be required in order to protect, improve or restore sensitive surface water features, sensitive ground water features, and their hydrologic functions.

Achieving consistency with these policies requires a multi-disciplinary and integrated approach to land use planning, as put forward through this EIR/FSS.

2.5.4 NATURAL AND HUMAN-MADE HAZARDS

The PPS also includes policy direction regarding "*reducing the potential for public cost or risk to Ontario's residents from natural or human-made hazards".*

Section 3.1 of the PPS generally discourages development within identified natural hazards (i.e., areas that are at risk of flooding and / or erosion).

Natural hazards that need to be considered within the Study Area include the flooding and erosion hazards associated with Bronte Creek and its associated tributary (outside the Subject Property), and the tributaries of Fourteen Mile Creek.

There are no human-made hazards of concern in the Study Area.

2.5.5 SEWAGE, WATER AND STORMWATER

Section 1.6 of the PPS provides policy guidance related to infrastructure, and Section 1.6.6 specifically relating to sewage, water and stormwater. These policies speak to using existing municipal services to the greatest extent possible, integrating servicing and land use considerations at all stages of the planning process (clause 1.6.6.1(d)), and addressing stormwater management, as follows:

1.6.6.7 Planning for stormwater management shall:

a) minimize, or, where possible, prevent increases in contaminant loads;

b) minimize changes in water balance and erosion;

c) not increase risks to human health and safety and property damage;

d) maximize the extent and function of vegetative and pervious surfaces; and

e) promote stormwater management best practices, including stormwater attenuation and re-use, and low impact development.

The proposed Draft Plan and the supporting servicing plans have been developed with careful consideration for these policies, and for the TDSPSS objectives of minimizing impacts to watercourses.

2.6 GREENBELT PLAN

The Greenbelt Plan (2005) for Ontario's Greater Golden Horseshoe area was established under Section 3 of the *Greenbelt Act* (2005) and took effect on December 16, 2004. In order to provide clarity and certainty about urban structure, and where and how future growth should be accommodated, the Greenbelt Plan builds on the ecological protections provided by the Niagara Escarpment Plan (NEP) and the Oak Ridges Moraine Conservation Plan (ORMCP) to provide an umbrella plan that provides permanent protection to both the agricultural land base and the ecological features and functions

within the plan areas. It also builds upon the existing policy framework established in the PPS and its implementation through municipal official plan policies and maps.

The lands to the north, west and south of the Subject Property are designated as Greenbelt Plan Area (see **Figure 1.2**). Although the Subject Property is surrounded on three sides by Greenbelt Plan Area, only a small portion of the property itself along its western boundary (i.e., along the Bronte Creek valleylands) actually overlaps with the Greenbelt Plan Area.

The Greenbelt Plan's overarching policy category is "Protected Countryside". The western portion of the EIR/FSS Study Area, corresponding with the Bronte Creek valley system, is identified as "Natural Heritage System" within the "Protected Countryside" of the Greenbelt Plan. The Greenbelt Plan also provides protection for "Key Natural Heritage Features" and "Key Hydrologic Features" within and outside the Greenbelt Natural Heritage System, but within the Protected Countryside.

Within the Greenbelt Natural Heritage System, development potential is very limited, and certain Key Natural Heritage Features and Key Hydrologic Features (e.g., wetlands, fish habitat, permanent and intermittent streams, and significant woodlands), once identified, require naturalized vegetation protection zones of at least 30 m. Other Key Natural Heritage Features and Key Hydrologic Features may have vegetation protection zone requirements determined on a case by case basis.

Greenbelt Plan policies apply only to lands contained within the Greenbelt Plan boundary. As stated in Section 1.1 of the Greenbelt Plan: *"[t]his Plan does not apply to lands beyond the Greenbelt Plan Area as shown on Schedule 1*". Furthermore, Greenbelt Plan policies are not intended to apply within areas identified as urban (i.e., "settlement"). Therefore, where Key Features requiring vegetation protection zones are on, or close to, the Greenbelt Plan Area boundary, the boundaries of such zones is restricted to lands within the Greenbelt Plan Area. It is recognized that the Greenbelt Plan recommends that watershed planning and management approaches should be integrated for lands both within and beyond the Greenbelt (Section 3.2.5 Greenbelt Plan).

2.7 HALTON REGION OFFICIAL PLAN

Halton Region released an updated Official Plan through Regional Official Plan Amendment 38 (ROPA 38), which was adopted by Council on December 16th, 2009. ROPA 38 was subsequently appealed to the Ontario Municipal Board (OMB). Ongoing negotiated and mediated settlements of these appeals have resulted in the partial approval of portions of ROPA 38, which were last incorporated into a consolidation released November 2014.

Although there is an outstanding site-specific appeal related to the Subject Property, the Study Team has elected to apply the environmental goals, objectives and policies of ROPA 38 (as per the November 2014 version) in preparation of this EIR/FSS. As noted previously, agreement between Halton Region's and Evergreen's environmental consultants has been reached with respect to the mapping of Key

Features and linkages (as illustrated in **Figure 2.1**) but the extent of buffers and enhancements to Key Features on the Subject Property remains to be resolved. This EIR/FSS addresses this matter by (a) describing the technical basis for the agreed to Key Features and linkages in detail, and (b) describing the technical basis for the recommended buffers and enhancements to Key Features.

The current Regional Official Plan includes policies that speak to the Region's NHS (comprised of the Regional NHS and the Greenbelt NHS), water management, servicing, soil erosion / contamination, and trees. These policies, which are relevant to this EIR/FSS, are discussed in the subsections below.

2.7.1 REGIONAL NATURAL HERITAGE SYSTEM (NHS) POLICIES

One of the key deliverables within this EIR/FSS is the identification of a NHS for the Subject Property, therefore consideration of the Region's NHS policies was central to this work. Sections 113 to 118 of the Regional Official Plan contain policies that provide direction to development and site alteration within and adjacent to the Regional NHS. Policies related to the Greenbelt NHS are addressed separately in s. 110(7.2) and s. 139.3.

Objectives of the NHS relevant to this Study Area include:

114.1 (1)	*To maintain the most natural Escarpment features, stream valleys, wetlands and related significant natural areas and associated cultural Heritage Features.*
114.1(4)	*To direct developments to locations outside hazard lands.*
114.1(5)	*To protect or enhance the diversity of fauna and flora, ecosystems, plant communities, and significant landforms of Halton.*
114.1(6)	*To protect or enhance Key Features, without limiting the ability of existing agricultural uses to continue.*
114.1(7)	*To protect or enhance fish habitats.*
114.1(8)	*To preserve and enhance the quality and quantity of ground and surface water.*
114.1(9)	*To contribute to a continuous natural open space system to provide visual separation of communities and to provide continuous corridors and inter-connections between the Key Features and their ecological functions.*
114.1(12)	*To preserve native species and communities that are rare, threatened or endangered based on regional, provincial or national scales of assessment.*
114.1(18)	*To provide opportunities, where appropriate, for passive outdoor recreational activities.*

S. 115.2 indicates that the Regional NHS consists of:

115.2(1) areas so designated on Map 1…

115.2(3) significant habitats of endangered species and threatenened species not included in the designation on Map 1.

S. 115.3 identifies the REGIONAL NHS as a systems approach to protecting and enhancing natural features and functions that is scientifically structured on the basis of the following components:

115.3(1) Key Features, which include:
a) significant habitat of endangered and threatened species,
b) significant wetlands,
c) significant coastal wetlands,
d) significant woodlands,
e) significant valleylands,
f) significant wildlife habitat,
g) significant areas of natural and scientific interest,
h) fish habitat,
Key Features that have been identified are shown on Map 1G.

115.3(2) enhancements to the Key Features including Centres for Biodiversity,

115.3(3) linkages,

115.3(4) buffers,

115.3(5) watercourses that are within a Conservation Authority Regulation Limit or that provide a linkage to a wetland or a significant woodland, and

115.3(6) wetlands other than those considered significant under Section 115.3(1)b).

Significant habitat of Endangered and Threatened species is defined in the Region's Official Plan (2014) as follows (s. 276.4 (3)):

> *…the habitat, as approved by the Ontario Ministry of Natural Resources, that is necessary for the maintenance, survival, and/or the recovery of naturally occurring or reintroduced populations of endangered species or threatened species, and where those areas of occurrence are occupied or habitually occupied by the species during all or any part(s) of its life cycle.*

S. 293 defines "wetlands" in a manner generally consistent with the *Conservation Authorities Act as*:

> *Means lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case, the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic or water tolerant plants. The four major types of wetlands are swamps, marshes, bogs and fens. Periodically soaked or wet lands being used for agricultural purposes which no longer exhibit wetland characteristics are not considered to be wetlands for the purposes of this definition. Within the Greenbelt Plan Area, wetlands include only those that have been identified by the Ministry of Natural Resources or by any other person, according to evaluation procedures established by the Ministry of Natural Resources, as amended from time to time.*

S. 295 defines a "woodland" using a density based definition consistent with the *Forestry Act* (1998) as:

> *Land with at least: 1000 trees of any size per ha, or 750 trees over 5 cm in diameter per ha, or 500 trees over 12 cm in diameter per ha, or 250 trees over 20 cm in diameter per ha but does not include an active cultivated fruit or nut orchard, a Christmas tree*

plantation, a plantation certified by the Region, a tree nursery, or a narrow linear strip of trees that defines a laneway or a boundary between fields.

S. 255 defines "linkage" in relation to Key Features and the proposed land uses as:

area intended to provide connectivity supporting a range of community and ecosystem processes enabling plants and animals to move between Key Features over multiple generations. Linkages are preferably associated with the presence of existing natural areas and functions and they are to be established where they will provide an important contribution to the long term sustainability of the Regional Natural Heritage System. They are not meant to interfere with normal farm practice. The extent and location of the linkages can be assessed in the context of both the scale of the proposed development or site alteration, and the ecological functions they contribute to the Regional Natural Heritage System.

S. 229.1 defines "enhancements to Key Features" strictly in relation to Key Features as:

ecologically supporting areas adjacent to Key Features and/or measures internal to the Key Features that increase the ecological resilience and function of individual Key Features or groups of Key Features.

S. 220.1.1 defines "buffer" in relation to Key Features and adjacent land uses as:

means an area of land located adjacent to Key Features or watercourses and usually bordering lands that are subject to development or site alteration. The purpose of the buffer is to protect the features and ecological functions of the Regional Natural Heritage System by mitigating impacts of the proposed development or site alteration. The extent of the buffer and activities that may be permitted within it shall be based on the sensitivity and significance of the Key Features and watercourses and their contribution to the long term ecological functions of the Regional Natural Heritage System as determined through a Sub-watershed Study, an Environmental Impact Assessment or similar studies that examine a sufficiently large area.

Notably, the Regional NHS as identified in Map 1 and the Key Features as identified in Map 1G of the current Regional Official Plan for the Subject Property have been challenged by Evergreen. Corrected Key Features and Linkages, as agreed to by the Region and Evergreen environmental consultants, are identified in **Figure 2.1**. Recommended buffers and enhancements to Key Features are also presented in this study.

Policies 118(1) and 118 (1.1) require protection of all Key Features listed above identified through the local municipal planning process. S. 118(2) requires implementation of the Regional NHS through a systems based approach as follows:

a) Prohibiting development and site alteration within significant wetlands, significant coastal wetlands, significant habitat of endangered and threatened species and fish habitat except in accordance with Provincial and Federal legislation or regulations;

b) *Not permitting the alteration of any components of the Regional Natural Heritage System unless it has been demonstrated that there will be no negative impacts on the natural features and areas or their ecological functions; …*
c) *Refining the boundaries of the Regional Natural Heritage System in accordance with Section 116.1; and*
d) *Introducing such refinements at an early stage of the development or site alteration application process and in the broadest available context so that there is greater flexibility to enhance the ecological functions of all components of the system and hence improve the long-term sustainability of the system as a whole.*

As indicated in s. 118(2)(b), s. 116.1 allows for the boundaries of the Regional NHS to be "*refined, with additions, deletions and/or boundary adjustments, through:*

a) *a Sub-watershed Study accepted by the Region and undertaken in the context of an Area-Specific Plan;*
b) *an individual Environmental Impact Assessment accepted by the Region, as required by this Plan; or*
c) *similar studies based on terms of reference accepted by the Region.*

S. 118(1)and 118 (1.1) require protection of all Key Features listed above identified through the local municipal planning process.

S. 118 (3.1(c)) also requires an EIA for proposed development "*located wholly or partially inside or within 120 m of the Regional Natural heritage System*". With respect to an EIA, s. 118(3) states:

> *The purpose of an EIA is to demonstrate that the proposed development or site alteration will result in no negative impacts to that portion of the Regional Natural Heritage System or unmapped Key Features affected by the development or site alteration by identifying components of the Regional Natural Heritage System as listed in Section 115.3 and their associated ecological functions and assessing the potential environmental impacts, requirements for impact avoidance and mitigation measures, and opportunities for enhancement.*

This EIR/FSS builds on the data and analyses provided through the TDSPSS and identifies appropriate Key Features, buffers, linkages and enhancement areas based on more detailed site-specific findings and analyses, and compliance with the Region's current Official Plan (2014) policies.

2.7.2 ENVIRONMENTAL QUALITY POLICIES

Part IV of the Region's Official Plan (2014) includes a section on Environmental Quality, with a number of general policies that speak to the need for an EIA as well as support for use of alternative engineering standards to promote more sustainable development, as proposed in this EIR/FSS. In addition, there are a number of policies that speak to the protection of air, water and land in sections 142 through 147.

Two general policies under this section are relevant to this EIR/FSS:

141(2) Require the proponent of any development in certain areas or under certain conditions as specified in this Plan, to carry out an Environmental Impact Assessment (EIA).

141(8) Encourage opportunities for the consideration and use of alternative engineering standards to promote sustainability and more efficient use of resources.

S. 141(2) is related to s. 118(3) discussed in 2.5.1 of this EIR/FSS.

S. 141 (8) encourages the use of LID on the Subject Property.

Specific objectives and policies related to the protection water (Sections 144 and 145) and land (Sections 146 and 147) particularly relevant to this EIR/FSS include:

144. The objectives of the Region are:

144(3) To maintain, protect and enhance the quality and quantity of groundwater and surface water.

144(5) To support the protection of water quality and quantity in accordance with the objectives of Watershed Plans and Sub-watershed Studies.

144(6) To maintain and enhance fish habitat in Halton.

145. It is the policy of the Region to:

145(10) Encourage the protection and enhancement of watercourses and headwaters areas as an integral component for maintaining natural hydrological processes within a watershed.

145(12) Promote the regeneration of natural areas near watercourses.

145(17) Consider the impact of development on fish habitat and ensure compliance with the Federal Fisheries Act.

145(23) Restrict development and site alteration in or near sensitive surface and groundwater features and require the proponent to carry out an Environmental Impact Assessment in accordance with policies of this Plan and, undertake where appropriate, hydrogeological and hydrological studies to protect, improve or restore such features.

146. The objectives of the Region are:

(6) To protect significant tree-covered areas as a natural resource and promote the enhancement of woodland coverage in Halton.

(8) To promote a linked system of woodlands in Halton where appropriate.

(10) To promote soil conservation and minimize soil erosion.

(11) To ensure that development takes place on sites that are safe from soil contamination.

147. It is the policy of the Region to:

(5) Recognize and protect trees as a renewable natural resource essential to the health and welfare of Halton residents, wildlife and rural environment, and to this end:

(e) Support the Local Municipalities in requiring that all development proposals, to the maximum degree possible, preserve existing trees and plant additional trees in accordance with good forestry management practice.

(f) Require all development proposals to submit, at the time of initial application, an inventory of trees on site and a tree saving and planting plan unless the development will not result in the removal of any trees.

(6)(d) Promote the development of treescapes along streams and valleys so as to reduce flooding and excessive soil erosion, maintain stream banks and slope stability, and provide suitable fish habitat.

(7) Discourage recreational activity within woodlands where such activities will adversely affect forest health.

(17) Require that, prior to the Region or Local Municipality considering any development proposals, the proponent … undertake a process … to determine whether there is any potential contamination on the site and the steps necessary to bring the site to a condition suitable for its intended use.

2.7.3 TRAILS POLICIES

S. 118(6) of the Regional Official Plan (2014) states that the development of trails within the NHS will be encouraged provided that:

a) the trails are located on publicly owned lands or are part of the Bruce Trail;

b) the trails and associated activities do not impact negatively on ecologically sensitive areas or resource uses such as agricultural operations;

c) *proper regard is given to the issues of trespassing on private properties and liability in the event of property damages or personal injuries; and*

d) adjacent landowners potentially affected by the trails are consulted.

The conceptual Trails Plan included in this EIR/FSS (see **Section 6.7**) proposes both formalization of some existing trails and creation of some new trails within the NHS.

2.7.4 URBAN (WATER SUPPLY AND WASTEWATER TREATMENT) SERVICES

The City of Burlington requires a Functional Servicing Report to be prepared in accordance with the provisions of Sections 87 to 89 of the Region's Official Plan (2014).

S. 87 identifies the goal for urban services while s. 88 identifies the objectives for urban services and s. 89 identifies a policy structure for urban services.

S. 89(6) permits the placement of urban service infrastructure on private lands only in accordance with the Region's Urban Service Guidelines (2014).

S. 89(23) directs that the number of disturbances to the Region's NHS related to the provision of urban services to be minimized by integrating construction plans for water and wastewater treatment services, and by accounting for any possible future expansion to these services.

2.8 CITY OF BURLINGTON OFFICIAL PLAN

The City of Burlington Official Plan (approved in 2008, December 2013 Consolidation) will need to be updated to be consistent with the Region's updated Official Plan once the ROPA 38 appeal process is complete. Specifically, s. 118(1) and 118(2) require this updating in regard the Regional NHS. In the meantime, there are a number of policies in the City's current Official Plan that relate to this EIR/FSS.

2.8.1 NATURAL HERITAGE POLICIES

Under the City's Functional Policies (Part II) there is a section on sustainability and the environment that includes the following principles (s. 2.1), objectives (s. 2.2) and policies (s. 2.3) relevant to this EIR/FSS:

- *2.1 (b) Natural heritage features, and the interrelationships between them, that provide for vital resources such as clean water, clean air, wildlife habitat, forest resources and recreational opportunities, will be protected for future generations.*
- *2.1(f) All development should provide a high level of environmental protection and maintenance of compatibility.*
- *2.2(a) To identify and protect a Natural Heritage System and to maintain ecological integrity and function for the future area of a Natural Heritage System.*
- *2.2(b) To preserve air/water quality and maintain biodiversity in the long term.*
- *2.3 (a) Development … should avoid negative effects on the natural and social environment. New development … shall generally be prohibited within natural heritage features unless it can be deemed suitable…[and] is not permitted in areas of (i) significant habitat of endangered species and threatened species; (ii) significant wetlands,*

significant woodlands or significant valleylands; (iii) fish habitat except in accordance with provincial and federal requirements

The City's Official Plan currently identifies significant natural features using three separate land use designations (which are consistent with the former 2006 Regional Official Plan), discussed in more detail below:

1. The Greenlands designation includes lands that form a permanent natural resource base consisting of natural features and open space areas which are ecologically sensitive.
2. The Major Parks and Open Space designation applies to community and city-wide parks and other public and private open space lands.
3. The Watercourse designation applies to most of the creeks and drainage features.

The objectives of the Greenlands designation, under Part III s. 6.2.1, are:

a) To ensure the long-term preservation of lands that form a permanent natural resource base consisting of ecologically sensitive natural areas.

b) To recognize the importance of the Environmentally Sensitive Areas, Areas of Natural and Scientific Interest, Provincially and Regionally Significant Wetlands, the Niagara Escarpment, major creeks and associated valleylands and other significant natural features such as woodlots, hazard lands, Lake Ontario and Burlington Bay shorelines and areas of wildlife habitat.

c) To preserve and protect significant natural and cultural heritage features and landscapes; landforms performing important biological and ecological processes and functions; and areas providing non-intensive recreation opportunities.

d) To require an Environmental Evaluation of all development proposals affecting significant natural resource features on lands designated Greenlands.

The general Greenlands policies (s. 6.2.2) only permit very limited forms of development (e.g., single-detached dwellings on existing lots created under the *Planning Act*) and non-intensive forms of recreation outside of provincially significant wetlands and areas regulated by Conservation Halton (unless permission has been received).

Notably, even though the Region no longer recognizes ESAs in their Official Plan, the City of Burlington's Official Plan continues to identify them as an overlay (see Schedule B) to the Comprehensive Land Use Plan - Urban Planning Area, with the precise ESA boundaries to be determined in conjunction with the Region of Halton. Under Burlington's policies, any proposed development inside or within 50 m of an ESA requires an Environmental Evaluation Report.

S. 6.2.3 speaks to the protection and acquisition of natural features. S. 6.2.3(f) specifies: "*Significant natural features that are worthy of preservation and protection and areas where development should not be permitted will be identified in the early planning stages, particularly during secondary planning studies*".

Specific environmental policies related to watercourses and fish habitat are provided under s. 6.4. The primary objective of these policies is to ensure protection of life and property in the City's floodplains, but they also speak to promoting net gains in fish habitat and prohibit development within designated Watercourses (as mapped on Schedule B). Furthermore, they specify that: "*Any works within or near a watercourse shall be reviewed by the City and Conservation Halton for floodplain implications"* and that: "*New development adjacent to watercourses shall be subject to a setback from the stable top of bank, the regulatory floodplain and meander belt width (whichever is the greater) that are associated with the watercourse*" as determined by the City, in conjunction with Conservation Halton.

In general, the policies of the Burlington Official Plan are addressed in this EIR/FSS by addressing Regional NHS policies.

2.8.2 ENVIRONMENTAL EVALUATION POLICIES

S. 2.5 of the City of Burlington's Functional Policies (Part II) includes requirements for Environmental Evaluation Reports to be prepared by the proponent of a development to the satisfaction of the City for proposals within or adjacent to Greenlands, Environmental Protection Areas or Environmentally Sensitive Areas. As indicated in Section 2.5 (c) and (d), this Environmental Evaluation Report may fulfill the requirements of a Regional EIA and Conservation Authority's EIA. S. 2.5 (e) further refers to the use of the Region's EIA Guidelines, which have been considered in the development of this EIR/FSS.

The Terms of Reference for an Environmental Evaluation Report are to be determined through a pre-consultation process between the applicant, City and partner agencies (s. 5(g)) and boundaries of delineated natural heritage features are to be "corroborated by City staff" (s. 2.5(h)).

Components required as part of an Environmental Evaluation Report (EER) are to include buffers and development setbacks (s. 2.5(j)), and "[*c]onditions may be placed on any proposed development design to restore the natural character of degraded open space and environmental features*" (s.2.5(l)).

This EIR/FSS is intended to fulfil the requirements of the City's EER as well as the Region's EIA to the extent reasonably possible.

2.8.3 SUSTAINABLE DESIGN AND COMPATIBILITY

S. 2.7 of the Functional Policies in the City's Official Plan states that: "*To the greatest extent possible, proposed development shall be consistent with the goals and objectives of Sustainable Development*". This includes consideration for efficiency, accessibility (by foot, bicycle and public transit), preservation of existing trees and other vegetation, and compatibility with existing significant natural features. The Draft Plan supported by this EIR/FSS has incorporated sustainable development components as required by this policy.

2.8.4 CONTAMINATED AND POTENTIALLY CONTAMINATED SITES

S.2.8 of the Functional Policies in the City's Official Plan provide objectives and policies for contaminated and potentially contaminated lands. These policies specify that applicants must undertake the appropriate screening and studies as part of their applications in accordance with applicable Provincial legislation.

2.8.5 WATERSHED PLANNING POLICIES

S. 2.10 of the Functional Policies in the City's Official Plan provide objectives and policies related to watershed management. This section confirms the City's commitment to watershed-based planning as a basis for identifying and protecting the NHS (s. 2.10.1 (a) and (b)) as well as for protecting groundwater features, watercourses, wetlands, valleylands and floodplains (s. 2.10.1(d)).

Specific policies related to the implementation of watershed planning include recognition of the need to update watershed and sub-watershed studies in consultation with the Region and Conservation Halton. Specific policies relevant to this EIR/FSS include:

- 2.10.3(f) *Functional drainage designs, storm water management techniques and drainage facilities shall be completed with appropriate consultation with Conservation Halton, the Region of Halton, the Ministry of Natural Resources …*
- 2.10.3(g) Watercourses, *shorelines, valleylands and wetlands shall be left in their natural state and restored wherever possible. The City may consider proposals for the relocation and reconstruction of existing watercourses where it is determined to be environmentally appropriate and if approved by the regulatory agencies…*

These policies have been addressed through the preparation of the TDSPSS and the updating of it which occurred as part of the EIR/FSS study.

2.8.6 STORM WATER MANAGEMENT POLICIES

S. 2.11 of the Functional Policies in the City's Official Plan provide objectives and policies related to storm water management. These include consideration related to flooding, erosion, hydrogeology, storm water quality and sedimentation. In the pre-amble to these policies the Plan indicates that "[*p]reference shall be given to storm water management techniques that are naturalistic as opposed to man-made*" and objective 2.11.1(a) indicates the "*natural hydrologic and ecologic function of significant watercourses shall be maintained or restored*". This has particular relevance to this EIR/FSS which supports an Enhanced Stormwater Management (SWM) approach that incorporates a range of Low Impact Development (LID) measures.

Objectives relevant to this EIR/FSS include:

2.11.2.1(a) To ensure that future development does not increase the risk of property damage and danger to life from flooding.

2.11.2.1 (b) To reduce flood potential in areas that are flood-prone.

2.11.2.1 (c) To manage flooding concerns in a way that maintains or enhances fish habitat and other natural resource features.

2.11.2.2(a) To minimize the adverse impact of development on downstream watercourse erosion.

2.11.2.2(e) To ensure that future development does not increase the risk of property damage and danger to life from erosion.

2.11.2.3 (a) To control future development in a way that maintains and/or enhances significant groundwater recharge and prevents undesirable groundwater level decline and reduction in base flow to watercourses.

2.11.2.3 (b) To ensure base flow maintains permanent and seasonal fish habitat where it exists naturally.

2.11.2.3(c) To minimize the possible negative effects on groundwater quality from land use practices and/or development.

2.11.2.4 (a) To control the quality of storm water runoff from future developed surfaces so that the natural surface water and groundwater quality is maintained or restored.

The policies in S. 2.11.3 are also applicable. These policies provide guidance regarding stormwater management techniques, the use of existing subwatershed studies when planning for stormwater, natural hazards and watercourses, and the need to be consistent with existing applicable criteria and guidelines.

These policies have been considered and applied, where appropriate, in the EIR/FSS.

2.9 TREMAINE DUNDAS SECONDARY PLAN

While the development of a Secondary Plan for the Tremaine Dundas Study Area has been under consideration since 2007, a Plan has not yet been approved by the City of Burlington.

At their meeting on November 26, 2012, Burlington City Council provided direction to:

> *Direct the Director of Planning and Building to prepare a secondary plan for the Evergreen community based on Concept A or Concept B or a "hybrid" of the two concepts in principle, and providing land use policies that can achieve between 816 and 980 jobs, according to the concept ultimately determined and supported by an assessment of the issues outlined in report PB-82-12, including the comments from consultation with departments, agencies and the public;*

A Secondary Plan, including policies, for the Study Area that includes the Subject Property has been developed by Urban Strategies Inc., and has been submitted concurrently with this EIR/FSS. This Plan

includes policies related to community vision, land use structure, environmental strategy, land use design and transportation.

The Secondary Plan is atypical in that it was developed iteratively with this more detailed and technical document rather than along with the TDSPSS for reasons discussed previously. It is also unusual in that the Secondary Planning Area is relatively small scale and is more or less equivalent to the Study Area for the EIR/FSS. Consequently, the Secondary Plan benefitted from a more detailed knowledge of the natural heritage conditions and proposed functional servicing for the area than would normally be the case.

2.10 CONSERVATION HALTON REGULATION AND POLICIES

According to Policies 3.1 and 3.2 within the *Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Policy Document, Section 3 Development, Interference with Wetlands and Alterations to Shoreline and Watercourses* (Conservation Halton 2011), development is generally prohibited:

- within watercourses, wetlands, flooding and erosion hazards;
- within 15 m of the greater of stable top of bank, regulatory flood plain or predicted meander belt width of major valleys;
- within 7.5 m of the greater of stable top of bank, regulatory flood plain or the predicted meander belt width of minor valleys;
- within 120 m of PSWs and wetlands equal to or greater than 2 ha; and,
- within 30 m of wetlands less than 2 ha in size.

However, there are a number of policy exceptions to these general prohibitions. For example:

- new development may be permitted within 30 m to 120 m of a wetland that is Provincially significant or a wetland that is greater than 2 ha, if a site-specific impact assessment can demonstrate no negative impact to the hydrologic function of the wetland; and,
- new development may be permitted within 15 m to 30 m of a wetland that is not Provincially significant and smaller than 2 ha if a site-specific impact assessment can demonstrate no negative impact to the hydrologic function of the wetland.

In addition to its regulatory responsibilities under the *Conservation Authorities Act*, Conservation Halton provides an advisory role to municipalities through the planning process. Relevant policies provided in Section 4 (*Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Policy Document, Section 4 Land Use Planning Policies(* Conservation Halton 2011)) include:

- a minimum 7.5 m (minor valley) or 15 m (major valley) lot line setback from flooding and erosion hazards for new development (s. 4.2.3), and similar setbacks for valleylands (s. 4.3.2)
- a minimum 15 m vegetation protection zone from the limit of non-PSW wetlands less than 2 ha (s. 4.4.3)
- a minimum lot line setback of 30 m from PSW or other protected wetlands greater than 2 ha, and 15 m from other wetlands less than 2 ha from new development (s. 4.4.4), and

- a minimum 10 m development and site alteration setback from the treed dripline of significant woodlands outside the Greenbelt Plan (s. 4.6.4), in the absence of an up-to-date and approved subwatershed plan.

This policy direction has been considered and applied in this EIR/FSS.

- a minimum lot line setback of 30 m from PSW or other protected wetlands greater than 2 ha, and 15 m from other wetlands less than 2 ha from new development (s. 4.4.4), and
- a minimum 10 m development and site alteration setback from the treed dripline of significant woodlands outside the Greenbelt Plan (s. 4.6.4), in the absence of an up-to-date and approved subwatershed plan.

3. CHARACTERIZATION OF THE BIOPHYSICAL ENVIRONMENT

The following tasks have been completed to characterize the biophysical environment within the Study Area (see **Figure 1.2**) between 2012 and 2015:

- Background information collection and review;
- Consultations with the Study Team, City, Region and Agencies[6];
- Field investigations and related analyses; and
- Assessment of significant natural heritage features and functions.

A general description of the methods and/or approach used to complete these tasks for each discipline is provided in the following sections along with the findings, and related assessments.

3.1 BACKGROUND STUDIES

Background information pertaining to the biophysical environment within the Study Area was gathered and reviewed at the outset of this project. Primary and secondary information sources consulted for this study are listed below:

- Historical air photos (1934, 1956, 1978, 1995, 1999, 2002, 2005, 2006, 2008, 2010) and current air photos (2012)
- Ontario Breeding Bird Atlas (2001-2005) data for square 17NJ90, http://www.birdsontario.org/atlas/datasummaries.jsp?lang=en
- *Halton Environmentally Sensitive Areas, Consolidation Report* (Halton Region Planning and Public Works Department and North-South Environmental Inc., 2005)
- Bronte Creek Bank Stability Study (AMEC 2007a and 2015a)
- Phase One Environmental Site Assessment – Agricultural and Residential Property, 3232 Tremaine Road and 5421-5463 Dundas Street, Burlington, Ontario (AMEC 2015b)
- Hydrogeological Investigation (AMEC 2007b)
- Preliminary Geotechnical Investigation Report (AMEC 2007c)
- Evergreen Community Environmental Impact Statement (LGL Limited 2008a)
- Draft Tree Inventory (LGL Limited 2008b)
- Tremaine and Dundas Secondary Plan Subwatershed Study (AECOM 2009)
- Aurora District Ministry of Natural Resources Species at Risk Information Request response (M. Thompson-Black 2012) (see **Appendix B1**)
- Ontario Ministry of Natural Resources (OMNR) Natural Heritage Information Centre (NHIC) 2015 – Biodiversity Explorer (https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/mainSubmit.do)

[6] Notably, the consultations with the Region, City and Conservation Halton between 2012 and 2015 have been limited to without prejudice correspondences and information exchanges as a result of Evergreen's appeal regarding the site-specific Regional NHS mapping on its property.

(https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/mainSubmit.do)

- Evergreen Tree Inventory and Preservation Study (Urban Forest Innovations February 2015)

3.2 SUMMARY OF FORMAL SITE VISITS AND FEATURE STAKING

A pre-consultation meeting with the City, Region and agencies took place on September 26, 2007 (see **Appendix B2**). The Study Area and Subject Property were also visited in 2008 and 2012 by municipal and agency staff to review site conditions and natural features. A summary of these site visits is presented in **Table 3.2-1**. Notably, the consultations with the Region, City and Conservation Halton between 2012 and 2015 were limited to without prejudice correspondences and information exchanges as a result of Evergreen's appeal regarding the Region's NHS mapping on its property.

Table 3.2-1 - Summary of Site Visits with Municipal and Agency Staff

Date	Purpose of Visit	Participants and Affiliation
June 4, 2008	• To review watercourses and fish habitat; • To review and stake top of slope along Bronte Creek valley for segment closest to Evergreen property, including the wetlands around the off-site Pond	• Conservation Halton (K. McCormack) • Department of Fisheries and Oceans (J. Wingfield) • TDSPSS Team (Brent Tegler) • Region of Halton • LGL Limited (Ken Glasbergen)
July 9, 2008	• To stake wetland boundaries; • To stake watercourse boundaries and fish habitat; • To review and stake top of slope along Bronte Creek valley for segment closest to Evergreen property, including the wetlands around the off-site Pond	• Conservation Halton (K. McCormack) • Department of Fisheries and Oceans (J. Wingfield) • TDSPSS Team (Brent Tegler) • Region of Halton • LGL Limited (Ken Glasbergen)
August 30, 2012	• To review boundaries of significant woodlands; • To review small isolated wetland features in the agricultural fields; • To discuss discrepancies in NHS mapping between the TDSPSS, LGL Ltd. EIS and Beacon Environmental findings.	• Conservation Halton (P. Bond; K. Barrett) • Region of Halton (R. Clark; S. Dinka, R. Reinholt; R. Reitmeier) • Beacon Environmental (K. Ursic)
June 3, 2015	• To provide M. Sharp an opportunity to review the site features • To review the boundaries of Key Features, linkages and enhancements as identified by Beacon • To confirm points of agreement and disagreement to narrow issues before the Board	• Region of Halton (M. Sharp) • Beacon Environmental (K. Ursic)

Features staked prior to 2012 (i.e., the top of slope along Bronte Valley, including the wetlands around the off-site Pond, and the watercourses at the corners of Highway 407 and Tremaine Rd., and Dundas St. and Tremaine Rd. respectively) were confirmed in the field with the Region and Conservation Halton in August 2012, as indicated in **Table 3.2-1** above. The boundaries of the significant woodlands were staked by Beacon in 2013 and 2015, but remain to be confirmed by the Region. These staked boundaries are reflected in **Figure 2.1**, and also shown in more detail in **Drawing 1**.

As stated previously, the environmental consultants for the Region and Evergreen have reached an agreement with respect to the boundaries of Key Features and linkages to be depicted on the Subject Property, with the understanding that there may be minor modifications to the boundaries based on field verification by the Region and Conservation Halton.

3.3 PHYSICAL ENVIRONMENT

3.3.1 BEDROCK GEOLOGY

Preliminary Map No. P.495 (Ontario Department of Mines, 1968) shows the Study Area to be located at the northern edge of an area of shallow bedrock (overburden less than 7.6 m thick). According to water well records and borehole logs drilled at the Subject Property, the depth to bedrock in the vicinity of the Study Area ranges from 1.2 m to 13.1 m below ground surface.

Based on the findings of borehole data from the hydrogeological investigations completed on the Subject Property by AMEC (2007), bedrock was encountered in 12 of the 27 boreholes at depths of between 1.2 and 4.5 metres. The bedrock was described as reddish brown, weathered shale and is part of the Queenston Formation that is also visible in the valley walls of Bronte Creek. In boreholes where bedrock was not encountered, the boreholes were drilled through a maximum of 6.1 m of overburden. The average elevation of the top of bedrock reported in the boreholes was 155.8 metres above sea level (masl), with eight of the 12 boreholes reporting a top of bedrock within one metre of the average elevation. The highest and deepest reported top of bedrock elevations were 161.0 and 152.4 masl respectively.

The southeast corner of the Study Area and the area trending towards the north from Bronte Creek towards the eastern to central portion of the Subject Property lie in an area of shallow bedrock, with overburden thicknesses of 1.2 m to 6.7 m, generally coinciding with topographic low points. North of these areas, the overburden thickness varies from 12.2 m along Tremaine Road to 18.6 m near Bronte Creek to the northwest of the Study Area. Borehole drilling carried out at the Subject Property encountered weathered shale bedrock at 11 of 27 locations, ranging in depth from 1.4 to 4.7 m below ground surface. These locations were generally situated near the south-east corner of the Subject Property and trending to the north-west adjacent to Tremaine Road. Bedrock was encountered at 4.4 m below ground surface in the north central portion of the Subject Property. At the remaining 16 drilling locations, bedrock was not encountered in holes advanced to depths of 4.6 to 6.1 m below ground surface.

The Queenston Shale is compact and dense with relatively poor interconnectivity of pore spaces and does not readily fracture or dissolve. The top 3 to 5 m of the unit is generally weathered and may provide sufficient water for domestic use, however, it has been characterized in 'The Hydrogeology of Southern Ontario' as having a poor water-yielding capability based upon a statistical analysis of water well records (Singer *et. al.*, 2003). Hydraulic conductivity determined by slug testing of a monitoring well completed entirely in the Queenston Shale (Borehole 19A) was calculated to be 1.4×10^{-8} m/s, which is indicative of a low permeability material.

3.3.2 SURFICIAL GEOLOGY

Surficial geology at the Study Area has been investigated by drilling a total of 27 boreholes (BH) to depths ranging from 4.6 m to 9.6 m below ground surface (**Figure 3.1**). In 12 of these boreholes, monitoring wells were installed, with the base of screens set at depths between 4.6 and 9.1 m below ground surface. At BH-19 and BH-27, screens were placed at two levels in order to determine if vertical groundwater gradients are present. Records of boreholes are presented in **Appendix C1**. The locations of the cross-sections are shown on **Figure 3.2**. From the borehole records, Subject Property topography and water level information, four stratigraphic cross-sections (**Figures 3.3** to **3.6**) and a plan view of the surficial soil distribution (**Figure 3.7**) were produced.

As shown in **Figure 3.7**, the surficial soil covering the majority of the Study Area consists of Clayey Silt. Clayey Silt was encountered underlying from 0 to 300 mm of topsoil at 24 of the 27 borehole locations. At the three remaining locations, the surficial material was reported to be sand fill over the Clayey Silt (BH-23), Clayey Silt Till (BH-26) or sand fill over sand (BH-27). This surficial Clayey Silt unit extends to between 0.6 m and 1.4 m below ground surface. It contains trace to some sand and trace gravel and is generally soft to firm, but was found to be stiff at BH-24.

The surficial Clayey Silt or topsoil/fill is underlain by a clayey to sandy till at most locations. This till reported to be Clayey Silt Till at the locations of boreholes 4, 6, 8, 9, 12, 14, 15, 18, 20, 21, 22, 24, 25 and 26 and underlain by Silty Sand/Sandy Silt Till at the locations of boreholes 1, 2, 3, 5, 7, 10, 11, 13, 16, 17, 19, 23 and 27. Where found the Clayey Silt Till is underlain by Sandy Silt Till at all locations except for boreholes 20, 21, 24 and 25, indicating the Clayey Silt Till grades into the coarser till with depth. At BH-20, the Clayey Silt Till is reported to be underlain by sand, however, the blow counts of the sand are consistent with that of the sandy till, and it is likely that the sand is actually a sand till. At the remaining three locations, the Clayey Silt Till directly overlies bedrock.

The hydraulic testing of very similar geologic material to that at the Subject Property has been undertaken by others on a property north of the Highway 407 close to the Subject Property. This work included slug test results from four overburden monitoring wells completed in the clay and till type sediments and nine bedrock monitoring wells in the Queenston Shale (Golder 2004). The results of the testing indicate that the overburden sediments had hydraulic conductivity values between 3.9×10^{-7} and 3.6×10^{-8} m/s with a geometric mean of 1.2×10^{-7} m/s, while the bedrock units had hydraulic conductivity

values between $3.7x10^{-7}$ and $1.8x10^{-12}$ m/s with a geometric mean of $1.1x10^{-8}$ m/s. The results from the testing on the nearby property and similarity in the sediments between the two properties suggest that sediments underlying the Subject Property also have a low hydraulic conductivity. Hydraulic conductivity results are included in **Appendix C2**.

Hydraulic conductivities were determined by slug testing at 5 monitoring wells in 4 locations on the Subject Property. The results of the slug testing are presented in **Table 3.3-1**

Table 3.3-1 - Hydraulic Conductivities from Slug Testing

Monitoring Well ID	Screen Depth (mbgs)	Formation Description	Hydraulic Conductivity K (m/s)
BH-15	1.5 - 4.6	Silty Sand / Sandy Silt Till	1.0×10^{-06}
BH-19A	6.1 - 9.1	Weathered Shale	1.4×10^{-08}
BH-19B	1.5 - 4.6	Silty Sand / Sandy Silt Till - Weathered Shale	6.2×10^{-08}
BH-20	3.1 - 6.1	Silty Sand	1.3×10^{-05}
BH-24	1.0 - 4.1	Silty Sand / Sandy Silt Till	4.0×10^{-07}

As shown in the table, the hydraulic conductivities were found to be 1.3×10^{-5} m/s for the Silty Sand unit at BH-20, 1.0×10^{-6} to 4.0×10^{-7} m/s for the Silty Sand/Sandy Silt Till at boreholes BH-15 and BH-24, respectively, 6.2×10^{-8} m/s at BH-19B, screened across the interface between the Silty Sand/Sandy Silt Till and Weathered Shale and 1.4×10^{-8} m/s at BH-19A for the screen placed entirely within the Weathered Shale.

3.3.3 PHYSIOGRAPHY

The Study Area is located within the Peel Plain physiographic region (Chapman and Putnam, 1984). Map 2226 ("*Physiography of the South Central Portion of Southern Ontario*", Ontario Department of Mines and Northern Affairs, 1972) shows the Subject Property to be located in an area characterized as 'Till Plains (Drumlinized)'.

The Peel Plain is a level to undulating tract of clay soils covering 780 km^2 across the central portions of the Regional Municipalities of York, Peel and Halton. Elevation within this region varies from 150 m to 230 m above sea level (masl) with a gradual slope towards the south. The plain is cut by a number of valleys of the Credit, Humber, Don and Rouge Rivers and Bronte, Sixteen Mile and Etobicoke Creeks. The underlying soil of the plain is primarily a till (Halton Till) containing large amounts of shale and limestone. This is often overlain by a veneer of glaciolacustrine clay. In various places, stream valleys are bordered by trains of sandy alluvium.

3.3.4 TOPOGRAPHY

The TDSPSS EIR/FSS Terms of Reference (**Appendix A1**) recommended that topographic mapping be updated to meet City of Burlington and Conservation Halton requirements. A LiDAR survey was completed in August 2007 by J.D. Barnes to develop a topographic survey for the Subject Property. The LiDAR survey was supplemented by ground surveys (July 2007, July 2008, and November 2012) of existing elevations, particularly around the property line, culverts, watercourses, and the boundaries of natural features. The topographic information was compiled into an "existing ground surface", which was used to guide delineation of the existing drainage areas, depressions and watercourse channel cross-sections and for developing preliminary grading plans.

The Study Area lies in a relatively flat area, and elevations on the Subject Property range from approximately 156 to 168 masl. Most of the topographic features on the Subject Property are low northwest-southeast orientated ridges that are separated by shallow swales. The most prominent topographic feature in the Study Area is the Bronte Creek valley which forms the western boundary of the Study Area. Bronte Creek lies inside a steep walled valley at an elevation of approximately 125 masl, which is significantly below the surrounding tablelands.

3.3.5 SLOPES

The only slopes in the Study Area are associated with the Bronte Creek valleylands, which occur on the westerly portion of the Study Area. The valley slopes are approximately 20 to 25 m in height. The top of slope extends inland from the creek from 30 m to 200 m. A Preliminary Slope Stability Assessment was undertaken in 2007 (**Appendix D1**). An updated assessment was completed by AMEC in 2015 (**Appendix D2**). Based on the top of bank as staked by Conservation Halton and the projected long term stable top of slope determined by AMEC, no portion of the valley or the hazard lands associated with the valley slopes, extend onto the Subject Property.

3.3.6 SOILS

Cartography Section, Soil Research Institute, Research Branch, Canada Department of Agriculture, 1971 maps and classifies soils in the Study Area as Oneida Clay Loam, Chinguacousy Clay Loam, and Jeddo Clay Loam on the map.

- The Oneida Clay Loam has been classified as Brunisolic Gray-Brown Luvisol and are described as moderately well drained, and generally occurring in association with imperfectly drained Chingaucousy and poorly drained Jeddo soils, which have developed on fine textured glacial till.
- The Chinguacousy soils are classified as a Gleyed Gray-Brown Luvisol, found on gently sloping topographic positions and are imperfectly drained soils, which have developed in the clay and silty clay glacial till.

- The Jeddo soils are the poorly drained loam to clay loam, and are mainly found in depressional areas associated with undulating or rolling topography, in association with the Oneida and Chinguacousy soils. The soil parent material is a slightly stony calcareous clay till.

3.3.7 GROUNDWATER

3.3.7.1 GROUNDWATER ELEVATIONS

Water level observations were taken at all boreholes upon completion and in the 12 monitoring wells during subsequent site visits in 2007 (May 14, May 24, June 5, August 28, and September 24), 2012 (December 20), 2013 (February 21, April 2, May 6, May 31, June 24) and 2014 (April 24, May 2, June 13, August 27, November 5 and 7, and December 4). Groundwater elevations from the monitoring wells obtained during visits carried out to date are presented in **Table 3.3-2** and groundwater depths below ground surface are presented in **Table 3.3-3**. In addition, water levels were obtained in 2007 from 4 private wells; PW-1, PW-2, PW-3 and PW-4 and from the Infrastructure Ontario Pond (see **Figure 3.1** for locations) prior to these wells being decommissioned. Water level elevations from the private wells are shown in **Table 3.3-4**. Elevations from the Infrastructure Ontario Pond are shown in **Table 3.3-5**. The 2007 Infrastructure Ontario Pond elevations were obtained relative to surveyed stakes placed in the Pond in May, June and September, 2007 and the 2014 mini-piezometer and Pond elevations were obtained relative to surveyed stakes placed in April, 2014.

On June 5, 2007 water level readings were obtained from all the monitoring wells, however, following the April 2, 2013 visit the monitoring well at BH-9 was found to be inaccessible due to damage at surface and no further measurements were obtained from that location. Similarly, the monitoring well at BH-10 was found to be damaged at surface during the June 13, 2014 visit and is no longer accessible for measurements.

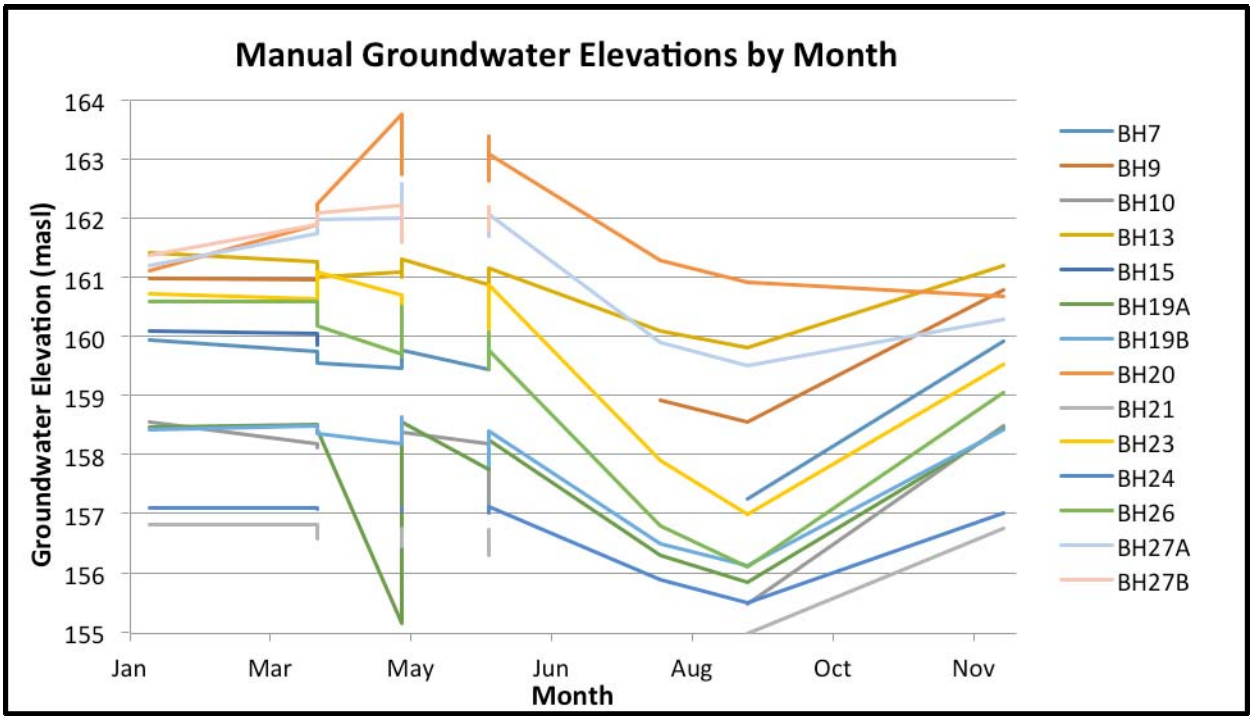
In general, where multiple water level readings have been obtained, the water levels have remained relatively unchanged throughout, except for a significant annual trend of declining levels noted towards the end of the summer, in August and September. These results indicate that there is a seasonal variation in the water table in the Study Area with water levels declining during late summer, then recovering to previous levels during the autumn months. This is shown graphically in **Figure 3.8** below.

Groundwater levels obtained at the most recent visit on June 13, 2014 ranged from 0.08 m above ground surface at BH-24 in an area of relatively low ground surface elevation to 3.49 m below ground surface at the most highly elevated groundwater monitoring location (BH20). Groundwater levels slightly above ground surface were also measured at BH-24 in the winter of 2012-2013 and in the spring of 2013. Above ground water levels were also measured at BH-7 in December 2012 and February 2013. The locations of BH-7 and BH-24 are at relatively lower elevations and are also locations of relatively shallow bedrock. It is believed that both these factors are contributing to the slightly artesian conditions

in these locations due to groundwater flowing from higher topography to lower topography during wet periods of the year.

Based on the observed water levels and screen placement in BH-7 and BH-24 (in shale), the observed upward gradients are small and when combined with the hydraulic conductivity of 1.4 x 10^{-8} m/s, the maximum discharge that could be expected due to the upward gradients would be on the order of 0.0157 mm/day (0.0157 L/day per m^2 of surface area) at BH-7 and 0.036 mm/day (0.036 L/day per m^2 of surface area) at BH-24. It is noted that the upward gradients were not continuous at either location. At BH-7 it was only observed on two occasions during winter months in 2012/2013, when discharge to surface would be unlikely due to frozen ground and was found during winter/spring months at BH-24. At BH-24 the amount of discharge would represent only about 1.5% of expected precipitation or about 2% of the expected actual evapotranspiration.

Figure 3.8 - Variation in Groundwater Elevations (2007-2014)



Comparison of groundwater elevations at the two monitoring points where screens were placed at two depths (BH-19 and BH-27) indicate that small vertical gradients are generally present and that in the majority of cases there is a downward gradient at both these locations. It is noted that at BH-19, small upward gradients, ranging from 0.004 to 0.017 m/m were observed during measurements taken between December and early May, while measurements taken between mid-May and September showed small downward gradients, ranging from 0.1 to 0.14 m/m. At BH-27, only one set of measurements taken in late May 2013 showed a small upward gradient of 0.009 m/m, with the remainder of the measurements showing small downward gradients at this location.

Table 3.3-2 - Observed Groundwater Elevations (May 2007 – December 2014)

BH ID	Surface Elevation (masl)	14-May-07	24-May-07	5-Jun-07	28-Aug-07	24-Sep-07	20-Dec-12	21-Feb-13	2-Apr-13	6-May-13	31-May-13	24-Jun-13	24-Apr-14	2-May-14	13-Jun-14	27-Aug-14	7-Nov-14	4-Dec-14
BH7	159.88	159.47	159.52	159.44		157.25	159.92	159.95	159.74	159.59	159.82	159.52	159.55	159.77	159.79	159.16	159.34	159.68
BH9	161.20		159.84	159.65	158.92	158.57	160.80	161.00	160.97									
BH10	158.87		158.30	158.18		155.48	158.49	158.56	158.19	158.19	158.38	157.08	158.12	158.37				
BH13	161.66	161.09	161.11	160.87	160.09	159.81	161.19	161.42	161.26	161.00	161.20	160.98	160.99	161.30	161.14	160.54	161.09	161.20
BH15	160.14		160.01	159.65			160.09	160.11	160.06	160.06	160.04	159.95	159.87		159.89	159.30	159.38	159.92
BH19B (Shallow)	158.77	158.18	158.23	157.82	156.50	156.13	158.36	158.43	158.49	158.37	158.65	158.28	158.36		158.41	158.03	157.87	158.40
BH19A (Deep)	158.61	155.15	157.57	157.76	156.31	155.85	158.44	158.47	158.51	158.44	158.37	158.28	158.43	158.57	158.25	157.88	157.65	158.31
BH20	166.57	163.77	163.64	163.40	161.29	160.92	160.68	161.11	161.90	162.74	162.84	162.63	162.25		163.08	161.70	161.01	161.52
BH21	157.06		156.45	156.30		154.97	156.76	156.83	156.83	156.61	156.76	156.54	156.58		156.74			
BH23	161.24	160.70	160.70	160.49	157.90	157.00	159.52	160.71	160.63	160.53	160.20	159.92	161.10		160.87	159.83	159.00	159.55
BH24	157.05		157.06	157.00	155.89	155.50	157.00	157.09	157.10	157.06	157.10	157.04	157.08		157.13	156.69	156.74	157.05
BH26	160.89	159.71	159.65	159.43	156.80	156.11	159.04	160.60	160.58	160.51	160.37	160.06	160.17		159.76	158.78	158.33	158.96
BH27B (Shallow)	163.08	162.22		162.05				161.37	161.89	162.14	161.57	161.79	162.08		162.19			
BH27A (Deep)	163.08	162.00	162.17	161.95	159.90	159.51	160.30	161.20	161.75	162.06	162.60	161.70	161.98		162.07	160.84	160.42	160.67

Table 3.3-3 – Observed Groundwater (depth from surface) (May 2007 – December 2014)

BH ID	Surf. Elev.	2007					2012	2013					2014					
	(masl)	5/14	5/24	6/5	8/28	9/24	12/20	2/21	4/2	5/6	5/31	6/24	4/24	5/2	6/13	8/27	11/7	12/4
BH7	159.88	0.41	0.36	0.44		2.63	-0.04	-0.07	0.14	0.29	0.06	0.36	0.33	0.11	0.09	0.72	0.54	0.20
BH9	161.20		1.36	1.55	2.28	2.63	0.40	0.20	0.23									
BH10	158.87		0.57	0.69		3.40	0.38	0.31	0.68	0.68	0.49	1.79	0.75	0.50				
BH13	161.66	0.57	0.55	0.79	1.57	1.85	0.47	0.24	0.40	0.66	0.46	0.68	0.67	0.37	0.52	1.12	0.57	0.46
BH15	160.14		0.13	0.49			0.05	0.03	0.08	0.08	0.10	0.19	0.27		0.25	0.84	0.76	0.22
BH19B (Shallow)	158.77	0.59	0.54	0.95	2.28	2.64	0.41	0.34	0.28	0.40	0.12	0.49	0.41		0.36	0.74	0.90	0.37
BH19A (Deep)	158.61	3.46	1.04	0.85	2.31	2.77	0.17	0.14	0.10	0.17	0.24	0.33	0.18	0.05	0.36	0.73	0.96	0.30
BH20	166.57	2.80	2.93	3.17	5.28	5.65	5.89	5.46	4.67	3.83	3.73	3.94	4.32		3.49	4.87	5.56	5.05
BH21	157.06		0.61	0.76		2.10	0.30	0.23	0.23	0.45	0.30	0.52	0.48		0.32			
BH23	161.24	0.54	0.54	0.75	3.34	4.24	1.72	0.53	0.61	0.71	1.04	1.32	0.14		0.37	1.41	2.24	1.69
BH24	157.05		-0.01	0.05	1.16	1.56	0.05	-0.04	-0.05	-0.01	-0.05	0.01	-0.03		-0.08	0.36	0.31	0.00
BH26	160.89	1.18	1.24	1.46	4.10	4.79	1.85	0.29	0.31	0.38	0.52	0.83	0.72		1.13	2.11	2.56	1.93
BH27B (Shallow)	163.08	0.87		1.04				1.71	1.19	0.94	1.51	1.29	1.00		0.89			
BH27A (Deep)	163.08	1.08	0.91	1.13	3.18	3.57	2.78	1.88	1.33	1.02	0.48	1.38	1.10		1.01	2.24	2.66	2.41

Red font signifies groundwater levels above existing ground surface or upward gradients

Table 3.3-4 - Groundwater Levels in Private Wells

	Top of Casing (TOC) Elevation (masl)	Groundwater Elevation (masl)		
Private Wells		23-May-07	28-Aug-07	24-Sep-07
PW-1 (near BH25)	155.50	154.99	155.32	154.05
PW-2 (near BH14 &16)	159.91	158.67		156.98
PW-3 (near quarry pond)	162.87	160.03	160.00	159.87
PW-4 (near 407)	164.84	163.39	162.35	Dry

The private well water levels indicate a trend of lowering water level in these wells between the spring and early autumn.

Table 3.3-5 - Water Level Elevations at the Infrastructure Ontario (IO) Pond (2007 & 2014)

Water Level Elevations at the Infrastructure Ontario Pond (2007)	Top of Stake Elevation (masl)	24-May-07 (masl)	5-Jun-07 (masl)	28-Aug-07 (masl)	24-Sep-07 (masl)
Stake 1	161.36	160.76			
Stake 2	161.71		160.41 - 160.46 (approx.)	Dry	Dry
Stake 3	161.87				160.41
Water Level Elevations at the Infrastructure Ontario Pond (2014)	**Top of Stake Elevation (masl)**	**02-May-14 (masl)**	**13-Jun-14 (masl)**	**29-Aug-14 (masl)**	
Stake 4	160.25	160.09	159.96		
Stake 5	160.38	160.10	160.00	159.93	
Stake 6	160.28	160.09	160.00	159.95	

The Infrastructure Ontario Pond water level measurements indicate a trend of lowering water level in the Pond from spring to early autumn.

On April 24, 2014, mini-piezometers were installed in the vicinity of the off-site Pond owned by Infrastructure Ontario and surface water features 14W-17 and 14W-17Cb (as shown in **Figure 3.9**). At the same time, surveyed stakes were placed as reference points to obtain surface water elevation measurements for comparison to the shallow groundwater measurements from the mini-piezometers. Water level elevations from these locations were obtained on May 2, June 13, and August 29, 2014 and are presented in **Table 3.3-6**. Stake 4, placed at the south edge of the Infrastructure Ontario Pond adjacent to MPZ4 could not be located on August 29, 2014. Comparison of the Infrastructure Ontario Pond elevations for 2007 and 2014, as shown in **Table 3.3-5**, indicates a drop in level of about 0.45 to 0.65 m during this period. This change may be due to a change in elevation of the Pond outlet or beaver activity in the Pond.

Table 3.3-6 – Manual Water Levels in Mini-piezometers and Surface Water (2014)

Mini Piezometer and Surface Water Locations	2-May-14	13-Jun-14	29-Aug-14	5 & 7-Nov-14	4-Dec-14
MPZ1 (14W-17Cb)	156.43	156.35	156.04	156.12	156.35
14W-17Cb (no stake, measurement taken from top of MPZ1)	156.33	dry	dry		
MPZ2 (14W-17 downstream)	156.60	156.53		156.48	156.49
Stake 2 (14W-17 downstream)	156.56	156.49			
MPZ3 (14W-17 upstream)	157.30	157.23		157.13	157.18
Stake 3 (14W-17 upstream)	157.29	157.23		157.16	157.17
MPZ4 (Infrastructure Ontario pond south)	160.11	160.28		159.51	159.50
Stake 4 (Infrastructure Ontario pond south)	160.09	159.96			
MPZ5 (Infrastructure Ontario pond northeast)	159.42	159.93	159.99	159.89	159.93
Stake 5 (Infrastructure Ontario pond northeast)	160.10	160.00	159.93		
MPZ6 (Infrastructure Ontario pond northwest)	160.13	160.10	159.92	159.85	159.96
Stake 6 (Infrastructure Ontario pond northwest)	160.09	160.00	159.95		

Water levels from the mini-piezometers and surface water measured in the spring of 2014 generally show a small declining trend in both shallow groundwater and surface water during this period; however, groundwater levels measured in MPZ4 and MPZ5, located to the north and south of the Infrastructure Ontario Pond were slightly higher in June than in May.

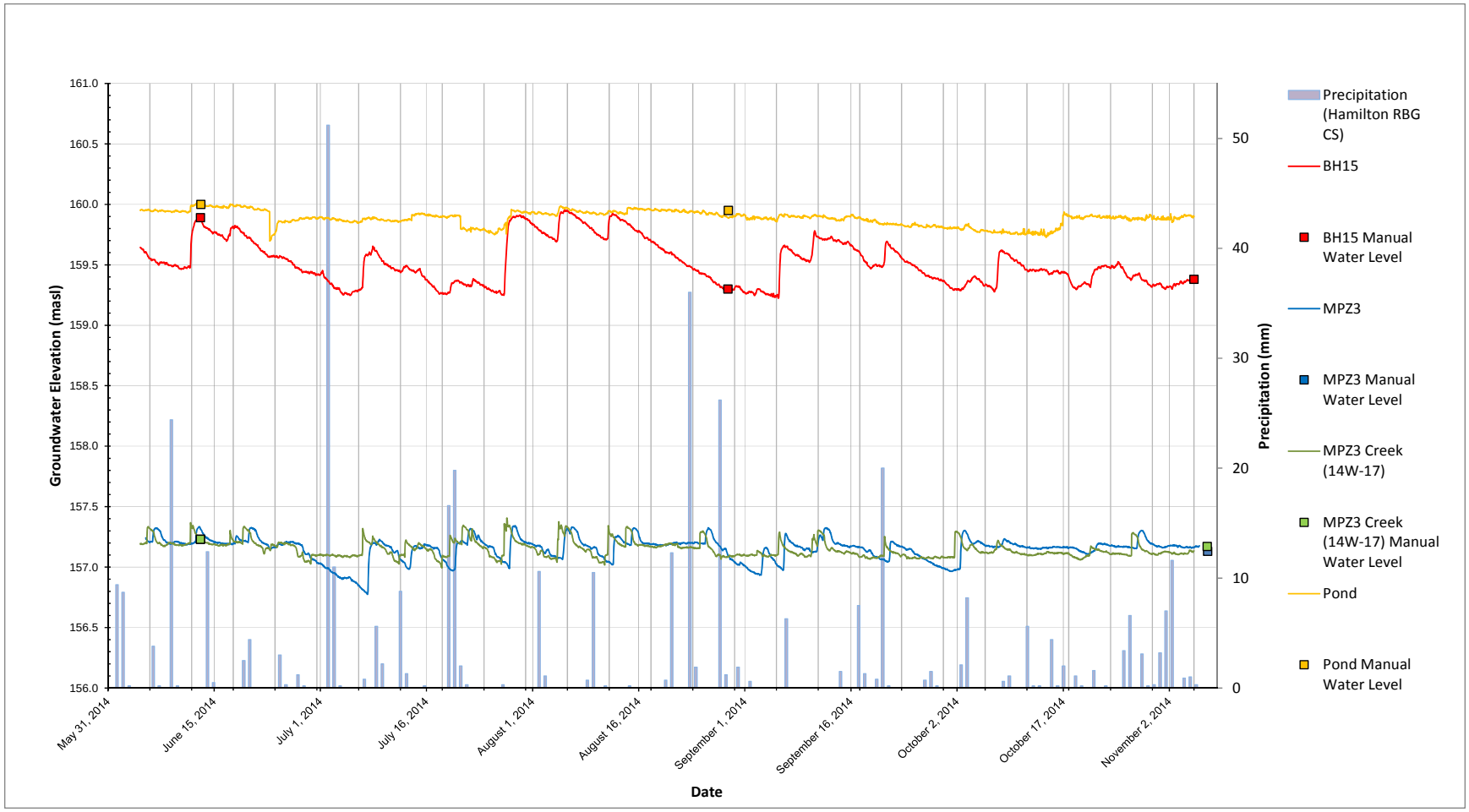
Comparison of water levels from mini-piezometer levels and surface water levels at 14W-17 and 14W-17Cb show that the adjacent groundwater levels were slightly higher or equal to the surface water levels indicating small gradients from groundwater to surface water indicative of some groundwater discharge to surface water at these locations during this period.

At the Infrastructure Ontario Pond, comparison of water levels from the mini-piezometers and surface water show small gradients from groundwater towards the Pond on the south and west sides and from the Pond to groundwater on the north side.

Automatic pressure transducers were installed at BH-15, mini-piezometer MPZ-3, watercourse 14W-17 and the Infrastructure Ontario Pond on June 4, 2014 and were programmed to record pressure and temperature data on an hourly basis (see **Appendix E**). In addition a barometric logger was also deployed at the site in order to provide atmospheric pressure data for barometric compensation of the transducer readings. The transducers remain in place at the time of this writing.

Baro-compensated water elevations recorded by the pressure transducers from installation on June 4, 2014 to the date of the latest data download on November 7, 2014 are presented in **Figure 3.10.** Manual water elevations recorded during this period at these locations are also displayed. In order to examine the relationship of water levels and precipitation events, total precipitation during the period of June 4 to November 27, 2014 as recorded by the Hamilton RBG weather station and provided by Environment Canada is also presented on this figure.

Figure 3.10 - Hydrograph of Groundwater and Surface Water Elevations (2014)



The water level as recorded by the pressure transducer (**Figure 3.10**) at the Infrastructure Ontario Pond is relatively stable, varying from a high level of 160.01 m asl in June, 2014 and low levels of 159.70 and 157.73 m asl in June and October, 2014 respectively. Overall there is a downward trend over the recording period, with a number of short term water level increases separated by periods of slow decrease. The incidents of water level increases appear to coincide with precipitation events in some cases, but some large precipitation events do not appear to have resulted in significant water level increase in the Infrastructure Ontario Pond. This may be due to the water level being maintained by the elevation of the outlet, with excess water flowing out of the Pond during large precipitation events.

Also, as shown on **Figure 3.10**, groundwater elevation at BH-15 varies from a high of 159.95 m in August 2014 to a low of 159.23 in September 2014. BH-15 is a shallow monitoring well located in the central portion of the Subject Property near the western property limit. BH-15 has a screened interval from 1.52 to 4.57 m below ground surface within the Silty Sand/Sandy Silt Till. The plot of water level elevations shows a series of relatively rapid water level increases followed by periods of slow decreases. The increases show a strong correlation with precipitation events, which generally peak one to two days following the onset of precipitation indicating a time lag between precipitation and infiltration to the water table at this location.

Variation in water level at 14W-17 and the nearby mini-piezometer MPZ-3 show similar trends, which appear to be correlated with precipitation events. From the transducer data, 14W-17 appears to have a base level at about 157.10 m asl at this location but approaches 157.0 m asl on occasion. Water level in the watercourse increases following precipitation events to a maximum elevation of about 157.3 m asl generally after a time lag of a few hours.

Similarly, in the nearby drive point mini-piezometer MPZ-3, water levels are seen to rise following precipitation events, to maximum levels similar to the level in 14W-17, but after a longer time lag. This results in conditions where prior to precipitation the water level in the watercourse may be higher than the level in MPZ-3. When precipitation occurs, the water level in 14W-17 begins to rise after a time lag of a few hours, reaches a peak value and then begins to fall as precipitation ends. In MPZ-3 there is a longer time lag before the water level begins to rise and then begins to rise to a peak value, which generally occurs when the level in 14W-17 has passed the peak value and has started to fall. At this point the level in MPZ-3 is generally above the level in 14W-17. Once the precipitation has ended, the level in 14W-17 falls to the base level and at a later time the level in MPZ-3 also falls. If there is sufficient time between precipitation events, the level in MPZ-3 generally falls to a level below that existing in 14W-17. This indicates that except for a few hours following precipitation events, when the groundwater response is lagging behind the surface water response to the end of precipitation, downward gradients from the surface to groundwater are present at this location.

In addition to natural precipitation and runoff, the water level and flow in 14W-17 is influenced by discharge of dewatering effluent from the Tansley Quarry located to the north east of the Subject Property on the north side of Highway 407. Since June 2009, water withdrawn to dewater the quarry has been discharged to an on-site lined decant Pond where it is allowed to settle for a minimum of 24

hours before being discharged to 14W-17. According to a 2011 report by Golder Associates (2011 Annual Monitoring Report – Tansley Quarry, Hanson Brick Ltd., Burlington, Ontario, 2011) the total volume discharged from the quarry during 2011, based on recorded pumping volumes, was 71,493 m^3. The discharge rate varied from 24 m^3/day to 808 m^3/day with an average daily rate of 419 m^3/day, with the pump operating for an average of 5 hours per day. Additional information regarding discharge practice at the quarry from the Golder Associates (2011) monitoring report indicates that pumping was not carried out continuously but only as needed when site operations were being carried out. According to the pumping records presented in Table 6 of the report, this amounted to a total of 899 hours over 172 days (at an average rate of about 79.5 m^3/hr or 22 L/s). The dewatering and discharge of water to 14W-17 from the Tansley Quarry is not believed to have significant effects on the Subject Property beyond helping to maintain the small wetland area and downward water gradients adjacent to the watercourse.

3.3.7.2 GROUNDWATER GRADIENTS

The groundwater levels obtained from the monitoring wells, from the private wells (PW-1 to PW-4), and the Infrastructure Ontario Pond indicate that the groundwater flow direction in the Study Area is influenced by the local topography, such that the flow gradient is from topographic high points towards the intervening swales, with the overall gradient following that of the surface drainage towards the south and east over most of the Study Area. Along the western portion of the Study Area, flow is expected to be downslope towards Bronte Creek.

Contoured water level elevations obtained during the most recent monitoring event (June 13, 2014) indicate groundwater flow in the area of the Subject Property to be from the north and west towards the south and east in the vicinity of the intersection of Tremaine Road and Dundas Street (**Figure 3.11**). Average gradients based on this figure are on the order of 0.56% from the north-west and 1.7% from the west.

3.3.7.3 GROUNDWATER FLOWS

Based on the average groundwater gradients and the estimated hydraulic conductivity of the subsurface materials, average linear velocity of groundwater flow is on the order of 0.29 to 0.89 m/yr. Groundwater fluxes from the Subject Property to onsite watercourses have not been calculated but, given that the local watercourses on the Subject Property are intermittent and often dry, baseflow contributions from groundwater are assumed to be zero, or at least insufficient to maintain flow in the creeks. Given the lack of groundwater discharge on the property, onsite infiltration is assumed to evapotranspire at a later date or contribute to groundwater discharge to offsite features.

3.3.7.4 GROUNDWATER QUALITY

Groundwater samples were collected from the monitoring wells at boreholes 7, 10, 13 and 19A and surface water samples were collected from 14W-17, 14W-17C and the Infrastructure Ontario Pond on

May 20, 2014. The samples were submitted to Maxxam Analytics for analysis of a suite of metals, inorganics and general chemistry parameters. The results of the chemical analyses are presented in

Table 3.3-**7** and are compared to values given in "Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy", July, 1994 (PWQO) and the Ontario Drinking Water Standards, Objectives and Guidelines, 2006 (ODWS). Values in excess of either the PWQO or ODWS in the table are presented in bold.

Values in excess of the PWQO were returned for total phosphorus at 14W-17Cb and the Infrastructure Ontario Pond, for aluminum at 14W-17, 14W-17Cb and the Infrastructure Ontario Pond, for iron at 14W-17Cb and the Infrastructure Ontario Pond, for uranium at BH-7, BH-10, BH-13, BH-19A and 14W-17Cb, and for zinc at 14W-17.

At all locations, the results exceeded the ODWS operational guideline for hardness. Iron exceeded the ODWS operational guideline at 14W-17Cb and the Infrastructure Ontario Pond. The ODWS aesthetic objective of 250 mg/L was exceeded for chloride at 14W-17, and for manganese at 14W-17 and the Infrastructure Ontario Pond. Aluminum exceeded the ODWS at 14W-17Cb and the Infrastructure Ontario Pond.

Elevated levels of nitrate were detected in groundwater and some surface water locations, but were below the ODWS of 10 mg/L. It is likely that the levels of nitrate and phosphorous are indicative of agricultural practices, as they are constituents of fertilizers, animal wastes and are found in areas serviced by septic systems. Elevated metal concentrations detected in the waters are likely naturally occurring as they are typical of the underlying shale bedrock found in the Study Area. The elevated chloride result from 14W-17 may be attributed to application of road salt in the vicinity of the adjacent Highway 407 and potentially from dewatering discharge from the Tansley Quarry.

In addition to groundwater quality information from groundwater samples, there are indications that groundwater is potentially impacted by hydrocarbon contamination in the southwest corner of the property. Two monitoring wells adjacent to the property line in this area (BH-20 and BH-27, **Figure 3.1**) show indications of a floating free oil phase in the well. The potential for groundwater contamination in this area is the focus of additional investigations.

A Phase One Environmental Site Assessment has been prepared and submitted as a separate document with the Draft Plan application. A work plan for a Phase Two Environmental Site Assessment is being prepared. The Phase One Environmental Site Assessment concluded that there is evidence of potentially contaminating activities related to the study area identified in the Environmental Site Assessment report. For additional information regarding the findings of the Phase One study, please refer to the Phase One report (AMEC 2015b).

Table 3.3-7 - Results of Water Quality Sampling (Study Area and Subject Property)

Calculated Parameters	Units	BH7	BH10	BH13	BH19A	14W-17	14W-17C	POND	PWQO	ODWS
Anion Sum	me/L	7.53	10.6	8.81	10.2					
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	300	450	310	390	220	160	110		
Calculated TDS	mg/L	400	530	480	**560**					500*
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.3	4.8	2.2	2.8	1.4	2.4	<1.0		
Cation Sum	me/L	7.63	11.2	9.47	10.5					
Hardness (CaCO3)	mg/L	**330**	**490**	**420**	**310**	**440**	**280**	**150**		80 - 100*
Ion Balance (% Difference)	%	0.690	2.61	3.64	1.45					
Langelier Index (@ 20C)	N/A	0.707	0.962	0.705	0.715	0.742	0.879	0.313		
Langelier Index (@ 4C)	N/A	0.458	0.715	0.457	0.468	0.496	0.629	0.063		
Saturation pH (@ 20C)	N/A	7.20	7.09	7.17	7.18	7.10	7.32	7.65		
Saturation pH (@ 4C)	N/A	7.45	7.34	7.42	7.42	7.35	7.57	7.90		
Inorganics										
Total Ammonia-N	mg/L	0.13	0.070	0.11	0.52	<0.050	0.064	<0.050	****	
Conductivity	umho/cm	700	930	820	940	1600	580	280		
Dissolved Organic Carbon	mg/L	1.0	1.0	0.90	1.1					5*
Total Organic Carbon (TOC)	mg/L					4.7	5.6	8.2		
Orthophosphate (P)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	0.021	<0.010		
pH	pH	7.91	8.05	7.88	7.89	7.84	8.19	7.96	6.5 - 8.5	6.5 - 8.5**
Total Phosphorus	mg/L					0.025	**0.060**	**0.049**	0.03[a]	
Dissolved Sulphate (SO4)	mg/L	23	37	76	110	170	65	18		
Alkalinity (Total as CaCO3)	mg/L	300	450	310	390	220	170	120		30 - 500**
Dissolved Chloride (Cl)	mg/L	19	13	13	6	**260**	27	8		250**
Nitrite (N)	mg/L	0.012	0.016	0.020	0.040	<0.010	0.020	<0.010		1
Nitrate (N)	mg/L	6.48	5.31	9.68	1.14	0.21	4.78	<0.10		10
Nitrate + Nitrite	mg/L	6.49	5.33	9.70	1.18					10
Metals										
Dissolved Calcium (Ca)	mg/L					120	78	45		
Dissolved Magnesium (Mg)	mg/L					32	21	9.2		
Dissolved Potassium (K)	mg/L					7	7	2		
Dissolved Sodium (Na)	mg/L					180	17	5.0		
Dissolved Aluminum (Al)	ug/L	<5.0	<5.0	<5.0	<5.0					
Total Aluminum (Al)	ug/L					**97**	**390**	**220**	75	100
Dissolved Antimony (Sb)	ug/L	<0.50	<0.50	<0.50	<0.50					
Total Antimony (Sb)	ug/L					<0.50	<0.50	<0.50	20	6
Dissolved Arsenic (As)	ug/L	<1.0	<1.0	<1.0	1.1					
Total Arsenic (As)	ug/L					<1.0	<1.0	<1.0	100	
Dissolved Barium (Ba)	ug/L	120	88	67	54					
Total Barium (Ba)	ug/L					54	52	24		1000

Calculated Parameters	Units	BH7	BH10	BH13	BH19A	14W-17	14W-17C	POND	PWQO	ODWS
Dissolved Beryllium (Be)	ug/L	<0.50	<0.50	<0.50	<0.50					
Total Beryllium (Be)	ug/L					<0.50	<0.50	<0.50	1100	
Dissolved Boron (B)	ug/L	350	210	38	1900					
Total Boron (B)	ug/L					**310**	46	16	200	5000
Dissolved Cadmium (Cd)	ug/L	<0.10	<0.10	<0.10	<0.10					
Total Cadmium (Cd)	ug/L					<0.10	<0.10	<0.10	0.5	5
Dissolved Calcium (Ca)	ug/L	58000	53000	63000	52000					
Total Calcium (Ca)	ug/L					120000	76000	42000		
Dissolved Chromium (Cr)	ug/L	<5.0	<5.0	<5.0	<5.0					
Total Chromium (Cr)	ug/L					<5.0	<5.0	<5.0	1, 8.9 ***	50
Dissolved Cobalt (Co)	ug/L	<0.50	<0.50	<0.50	<0.50					
Total Cobalt (Co)	ug/L					<0.50	<0.50	<0.50	0.9	
Dissolved Copper (Cu)	ug/L	<1.0	<1.0	6.7	<1.0					
Total Copper (Cu)	ug/L					<1.0	2.0	<1.0	5	1000*
Dissolved Iron (Fe)	ug/L	<100	<100	<100	<100					
Total Iron (Fe)	ug/L					100	**400**	**400**	300	300*
Dissolved Lead (Pb)	ug/L	<0.50	<0.50	<0.50	<0.50					
Total Lead (Pb)	ug/L					<0.50	<0.50	<0.50	5	10
Dissolved Magnesium (Mg)	ug/L	45000	86000	62000	43000					
Total Magnesium (Mg)	ug/L					32000	21000	8700		
Dissolved Manganese (Mn)	ug/L	<2.0	<2.0	<2.0	7.6					
Total Manganese (Mn)	ug/L					**99**	25	**79**		50**
Dissolved Molybdenum (Mo)	ug/L	9.9	4.8	1.4	25					
Total Molybdenum (Mo)	ug/L					5.1	0.79	<0.50	40	
Dissolved Nickel (Ni)	ug/L	<1.0	<1.0	<1.0	<1.0					
Total Nickel (Ni)	ug/L					<1.0	<1.0	<1.0	25	
Dissolved Phosphorus (P)	ug/L	<100	<100	<100	<100					
Dissolved Potassium (K)	ug/L	11000	6800	1700	17000					
Total Potassium (K)	ug/L					6800	7100	1800		
Dissolved Selenium (Se)	ug/L	<2.0	<2.0	<2.0	<2.0					
Dissolved Silicon (Si)	ug/L	5400	6000	6400	5100					
Total Silicon (Si)	ug/L					1900	890	760		
Total Selenium (Se)	ug/L					<2.0	<2.0	<2.0	100	10
Dissolved Silver (Ag)	ug/L	<0.10	<0.10	<0.10	<0.10					
Total Silver (Ag)	ug/L					<0.10	<0.10	<0.10	0.1	
Dissolved Sodium (Na)	ug/L	17000	28000	26000	90000					
Total Sodium (Na)	ug/L					190000	17000	4500		
Dissolved Strontium (Sr)	ug/L	13000	5700	660	16000					
Total Strontium (Sr)	ug/L					1900	510	160		
Dissolved Thallium (Tl)	ug/L	<0.050	<0.050	<0.050	<0.050					
Total Thallium (Tl)	ug/L					<0.050	<0.050	<0.050	0.3	
Dissolved Titanium (Ti)	ug/L	<5.0	<5.0	<5.0	<5.0					
Total Titanium (Ti)	ug/L					<5.0	8.7	5.0		
Dissolved Uranium (U)	ug/L	16	19	6.7	12					
Total Uranium (U)	ug/L					2.7	**5.2**	0.73	5	20

Calculated Parameters	Units	BH7	BH10	BH13	BH19A	14W-17	14W-17C	POND	PWQO	ODWS
Dissolved Vanadium (V)	ug/L	0.76	0.77	<0.50	1.4					
Total Vanadium (V)	ug/L					0.54	1.1	0.68	6	
Dissolved Zinc (Zn)	ug/L	<5.0	<5.0	<5.0	<5.0					
Total Zinc (Zn)	ug/L					**56**	<5.0	<5.0	20	5000

Notes:

* indicates an operational guideline which may affect treatment, disinfection or distribution of water

** indicates an aesthetic objective which may impair taste, odour or colour, or interfere with water quality control practices

*** PWQO for Chromium is 1 ug/L for Chromium VI and 8.9 ug/L for Chromium III,

**** PWQO value of 20 ug/L specified for ammonia is for un-ionized ammonia, which is temperature and pH dependent. At the prevailing levels of temperature and pH in the waters tested, all calculated values of un-ionized ammonia were below the specified 20 ug/L,

[a] PWQO indicates that current scientific evidence is insufficient to develop a firm Objective at this time. The specified value of 30 ug/L is the level at which excessive plant growth in rivers and streams should be eliminated.

3.3.8 SITE WATER BALANCE

A site water balance analysis identifies what proportion of annual precipitation is infiltrated to groundwater, intercepted as surface runoff, or lost through evapotranspiration. This information is important to demonstrate how, post-development, the flows to surface water, ground water and terrestrial heritage features will be impacted. The analysis is useful in that it assists with the identification of water management systems that can maintain and enhance the hydrologic regimes that sustain these environmental features.

The impact of the proposed development on recharge and discharge to local aquifers will depend upon the pre-existing site conditions, such as location and climatic factors, soil texture, topography and type of vegetative cover, as well as the type and extent of the proposed development.

Recharge to aquifers occurs through a number of mechanisms, which may include direct infiltration from precipitation, infiltration from watercourses, agricultural irrigation, leakage from municipal utilities such as water mains and sewers, and flow between aquifers. Recharge is a complex process dependent upon the interaction of numerous factors such as rainfall duration and intensity, temperature fluctuations, wind velocity, duration of sunlight, soil texture and moisture holding capacity, depth of water table, topography and type of vegetation, all of which vary in both space and time. Precise measurement of the components of recharge is difficult to achieve in practice and therefore approximations and simplifications are commonly employed to characterize the water balance of a particular property.

A water balance is generally evaluated using an equation having the following form:

$$P = \Delta S + ET + RO + I$$

P = precipitation
ΔS = change in soil moisture storage
ET = evapotranspiration
RO = surface runoff
I = infiltration

3.3.8.1 PRE-DEVELOPMENT WATER BALANCE

Meteorological data in the form of monthly average temperature and precipitation data, available from Environment Canada - Canadian Climate Normals 1981-2010 for the Royal Botanical Gardens (RBG - Hamilton) Meteorological Station (43°17'00" N, 79°53'00" W), approximately 15 km from the Subject Property, was used to prepare the water balance for the Subject Property. While soil moisture storage fluctuates on a short term basis between precipitation events and seasonally due to cycles of freezing and thawing, the net change in storage over the long term is assumed to be zero. Calculation of evapotranspiration was carried out using a computer program, EVAP, which uses an accounting procedure based on the methodology originally presented by Thornthwaite (1948). Inputs to the computer model are mean monthly temperature, monthly total precipitation, latitude and hemisphere of the location of interest and soil moisture holding capacity of the soil based upon the soil properties and vegetation. The difference between the mean annual precipitation and the mean annual evapotranspiration is the annual water surplus, which is available to either infiltrate the soil surface or to flow over the land surface. A portion of the infiltration may flow vertically and percolate down to recharge groundwater, while a second component, termed interflow, may move laterally through shallow soils and re-emerge locally to the surface in low lying areas or stream beds. Both the interflow and direct runoff, which has not infiltrated the ground surface, together form the total surface runoff component.

Information regarding existing soil conditions at the Subject Property was obtained through field investigations as well as from a review of Soil Map, Halton County, Ontario, Soil Report No. 43, published by Cartography Section, Soil Research Institute, Research Branch, Canada Department of Agriculture, 1971, which is consistent with the findings of the soil investigation carried out within the Subject Property. The Halton County Soil Map indicates that the Study Area soils are classified as clay loam. Vegetation at the Subject Property was classified as either woodland or agricultural based on a review of available satellite imagery, which was also used to calculate approximate areas for each of these two land uses for use in the water balance calculations. The water balance for each of the pre-development land uses on the Subject Property was calculated separately and then combined to produce the overall water balance for the Subject Property. For the purpose of determining the soil moisture and infiltration factors for use in the calculations, the agricultural cover was assumed to consist of medium rooted plants. Tables provided in the documentation accompanying the EVAP program were

then used to determine the applicable soil moisture retention value to be used for each land use (200 mm for the agricultural land and 400 mm for the woodland areas).

A summary of the climatic water balance for existing conditions on the Subject Property is provided in **Table 3.3-8**. Total annual surplus is the amount of water available after evapotranspiration has occurred. A water surplus of 299.36 mm/yr was calculated for the agricultural land use, and 282.36 mm/yr for the woodland.

Table 3.3-8 – Existing Annual Water Balance for the Subject Property

Land Use	Soil Moisture Storage	Annual Precipitation	Potential Evapotranspiration	Actual Evapotranspiration	Annual Surplus
	(mm/yr)	(mm/yr)	(mm/yr)	(mm/yr)	(mm/yr)
Agricultural	200	897.3	636.42	597.94	299.36
Woodland	400	897.3	636.42	614.94	282.36

Partitioning of water surplus between runoff and infiltration is dependent upon the soil type and texture, topography of the Subject Property and type of vegetation cover. These are accounted for through the use of infiltration factors according to a method referenced in MOE (2003) and MOEE (1995) and are calculated by summing individual factors representing the contributions of topography, soil type and vegetative cover conditions at the Subject Property.

On the Subject Property, these factors are calculated for the individual land use types in order to calculate the individual volumes then summed to obtain the total volume for the Subject Property as a whole based on the proportional area of each land use. For the agricultural land use, a topographic infiltration factor of 0.2, a soil infiltration factor of 0.2 and a vegetative cover factor of 0.1 was obtained from Table 2 in MOEE (1995). These factors were summed to obtain an infiltration factor of 0.5. For the wooded areas the individual factors were 0.2, 0.2 and 0.2, for topographic infiltration, soil infiltration and vegetative cover respectively giving an infiltration factor of 0.6. The total area of the Subject Property is 673,800 m^2, with the agricultural portion being 553,332 m^2 or 82.1% of the total area. The wooded areas occupy 120,468 m^2 or 17.9% of the total area of the Subject Property. **Table 3.3-9** shows the resulting water balance for existing site conditions.

Table 3.3-9 – Pre-development Water Balance Volumes for the Subject Property

Land Use	Area	Precipitation	Evapotranspiration	Infiltration	Runoff
	(m^2)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)
Agricultural	553,332	496,504.8	330,859.3	82,822.7	82,822.7
Wooded Areas	120,468	108,096.0	74,080.6	20,409.2	13,606.1
Total	673,800	604,600.7	404,939.9	103,231.9	96,428.9
% of Precipitation		100%	67.0%	17.1%	15.9%

A water balance for existing conditions was also carried out for the portion of the Study Area west of the Subject Property (between the west boundary of the Subject Property and Bronte Creek). This area consists of agricultural land, wooded area, the Infrastructure Ontario Pond and a school bus depot, consisting of a building and a gravel parking area. The portion of the Study Area minus the Subject Property is 546,200 m^2, with agricultural land use occupying 109,563 m^2, woodland occupying 399,905 m^2, the Infrastructure Ontario Pond occupying 12,151 m^2, the gravel parking area occupying 14,496 m^2 and the bus depot building occupying 871 m^2. **Table 3.3-** and
Table 3.3- show the results of water balance calculations for this area.

Table 3.3-10 - Existing Annual Water Balance for Study Area West of Subject Property

Land Use	Soil Moisture Storage	Annual Precipitation (mm/yr)	Potential Evapotranspiration (mm/yr)	Actual Evapotranspiration (mm/yr)	Annual Surplus (mm/yr)
Agricultural	200 mm/yr	897.3	636.42	597.94	299.4
Woodland	400 mm/yr	897.3	636.42	620.5	276.8
Pond	0 mm/yr	897.3	636.42	636.4	260.9
Gravel Lot	50 mm/yr	897.3	636.42	543.94	353.4
Building	0 mm/yr	897.3	636.42	89.7	807.6

Table 3.3-11 – Existing Water Balance Volumes for Study Area West of Subject Property

Land Use	Area	Precipitation	Evapotranspiration	Infiltration	Runoff
	(m^2)	(m^3/yr)	(m^3/yr)	(m^3/yr)	(m^3/yr)
Agricultural	118,777	106,578.6	71,021.5	17,778.5	17,778.5
Woodland	399,905	358,834.8	248,137.1	66,418.6	44,279.1
Pond	12,151	10,902.7	7,732.9	1,584.9	1,584.9
Gravel Lot	14,496	13,007.3	7,885.0	2,561.2	2,561.2
Building	871	781.5	78.1	0.0	703.4
Total	546,200	490,104.9	334,854.5	88,343.2	66,907.1
% of Precipitation		100	68.3	18.0	13.7

Table 3.3- shows the combined pre-development water balance volumes for the entire Study Area including the Subject Property.

Table 3.3-12 - Pre-development Water Balance Volumes for Total Study Area

	Area (m^2)	Precipitation (m^3/yr)	Evapotranspiration (m^3/yr)	Infiltration (m^3/yr)	Runoff (m^3/yr)
Total Study Area	1,220,000	1,094,705.6	739,794.4	191,574.9	163,336.0

% of Precipitation		100	67.6	17.5	14.9

3.3.9 SURFACE WATER AND DRAINAGE

The Subject Property lies within the Fourteen Mile Creek and Bronte Creek subcatchments. The limits of these subcatchments within the Subject Property are shown on **Drawing 2.** **Table 3.3-11** notes the subcatchments draining the Subject Property and the areas/percentages of the Subject Property lying within each subcatchment.

Table 3.3-13 - Existing Subcatchment Areas within Subject Property

AREA	SUBCATCHMENT AREAS		
	FOURTEEN MILE CREEK	**BRONTE CREEK**	**TOTAL**
Subject Property (ha)	51.5	18.3	69.8
Percentage of Subject Property in each Subcatchment	74%	26%	100%

3.3.9.1 SURFACE WATER DRAINAGE AREAS

As shown on **Drawing 2**, the Subject Property extends across two surface water catchment areas. Most of the Subject Property is located within the Fourteen Mile Creek catchment area. The Fourteen Mile Creek drainage crosses the eastern property limit along Tremaine Road at five existing culvert locations and at the Dundas Street and Tremaine Road intersection through an existing culvert. The six existing culverts within the Study Area were described in the TDSPSS and include one crossing at Dundas Street (FM-D1) and five crossings of Tremaine Road (FM-T1 to T-5) between Dundas Street and Highway 407. The existing 6 culverts are identified in the TDSPSS as:

- FM-D1 – 1000 mm circular CSP
- FM-T1 – 400 mm circular CSP
- FM-T2 – 500 mm circular CSP
- FM-T3 - 500 mm circular CSP
- FM-T4 – 500 mm circular CSP
- FM-T5 – 2700 mm circular CSP

The catchment area covering the west and northwest portion of the Subject Property is referred to as the Bronte Creek (Main Tributary) catchment area. As shown on **Drawing 2**, the northwest Bronte Creek subcatchment flows in a southwest direction. The northwest subcatchment flows through an existing Pond prior to discharging into the Bronte Creek. The southwest catchments outlet directly into Bronte Creek.

The hydraulic model received from AECOM (dated February 2009) included two culverts: culvert FM-T5 at Tremaine Road for north-eastern tributary 14W-17 and culvert FM-D1 at Dundas Street for south-eastern tributary 14W-17Cb. Culverts FM-T1 to FM-T4 are proposed to be removed through development of the Subject Property and lands to the east of Tremaine Road and therefore were not evaluated under existing conditions. The watercourses downstream of these crossings will be removed / realigned by others within the lands to the east.

The model geometry was updated based on the latest topographic survey. In particular, the size of culvert FM-T5 in the TDSPSS was noted to be a 2700mm CSP; however, the topographic survey indicates that this culvert is in fact a 2300mm CSP. **Table 3.3-12** summarizes the capacities for the key culverts.

Table 3.3-4 - EIR Subcatchment Area Culverts and Capacities

LOCATION	CULVERT ID	DRAINAGE AREA TO CULVERT (HA)	CULVERT SIZE AND TYPE	CULVERT INVERTS (m) U/S	D/S	CULVERT CAPACITY FROM HEC-RAS MODEL (m^3/s)
TREMAINE ROAD	FM-T5	10.37	2300MM CSP	155.96	155.54	27.50 >REGIONAL EVENT
DUNDAS STREET	FM-D1	19.05	1000MM CSP	154.56	154.18	1.80 ~REGIONAL

NOTE: The size and elevations of culverts were surveyed by J.D. Barnes in November 2012.

3.3.9.2 SURFACE WATER DRAINAGE FEATURES AND HYDROLOGIC CONNECTIONS

As noted in the previous section, the majority (~75%) of the Subject Property drains to Fourteen Mile Creek, while the remaining portion and adjacent lands (~25%) drain to the Lower Main Branch of the Bronte Creek.

Based on background information, site investigations and air photo interpretation there are five drainage features on the Subject Property and a total of seven within the Study Area. Five of the drainage features in the Study Area, including two on the Subject Property, are regulated by Conservation Halton (i.e., 14W-17, 14W-17Cb, BCT-R1, BCT-R3 and BC-R2 as shown in **Figure 3.9**). Tributary 14W-17 originates approximately 500 m northwest of the Study Area and Bronte Creek originates northwest of the Study Area, while the remaining three drainage features originate within the Study Area. The remaining features are considered hydrologic connections that originate in small wetland pockets within the agriculture fields or collect surface water runoff based on topography.

3.3.9.3 SURFACE WATER FLOW

The TDSPSS established existing flows for each subcatchment within the Subject Property for the 2 year to 100 year events and the Regional Storm utilizing a hydrologic model (GAWSER). It is noted that further modelling of existing conditions target flows is not required at the EIR/FSS stage. The existing peak flows were utilized in the HEC-RAS modelling to assess the capacity of the existing culverts and to determine the extent of the floodplain.

Based on the existing flows and contributing drainage area to each culvert crossing, unit rates were established in the TDSPSS. **Table 3.3-13** and **Table 3.3-14** reflect the existing peak flow information and unit rates provided in Table 3.6.1 and Table 4.3.3 of the TDSPSS, respectively. These target unit flow rates were used to determine the flow control requirements for the conceptual design of future SWM controls.

Table 3.3-5 - Existing Peak Flow Rates (from TDSPSS Table 3.3-6)

LOCATION	CULVERT ID.	DRAINAGE AREA (ha)	EXISTING PEAK FLOWS (m^3/s)						
			Reg.	100-yr	50-yr	25-yr	10-yr	5-yr	2-yr
Dundas Street W.	FM-D1	19.05	1.159	0.519	0.456	0.394	0.305	0.243	0.145
Tremaine Road	FM-T3	6.72	0.422	0.183	0.158	0.134	0.100	0.075	0.038
Tremaine Road	FM-T2	11.87	0.753	0.340	0.297	0.255	0.195	0.153	0.087
Tremaine Road	FM-T1	4.24	0.280	0.135	0.119	0.104	0.082	0.067	0.042
Tremaine Road	FM-T5	10.37	0.743	0.398	0.353	0.310	0.247	0.203	0.131
Tremaine Road	FM-T4	1.92	0.141	0.076	0.068	0.059	0.047	0.038	0.024

Table 3.3-6 - Unit Area Flow Rates (from TDSPSS Table 3.3-7)

LOCATION	CULVERT ID.	EXISTING PEAK FLOWS ($m^3/s/ha$)						
		Regional	100-yr	50-yr	25-yr	10-yr	5-yr	2-yr
Dundas Street W.	FM-D1	0.061	0.027	0.024	0.021	0.016	0.013	0.008
Tremaine Road	FM-T3	0.054	0.022	0.020	0.017	0.013	0.011	0.007
Tremaine Road	FM-T2	0.054	0.022	0.020	0.017	0.013	0.011	0.007
Tremaine								

Road	FM-T1	0.054	0.022	0.020	0.017	0.013	0.011	0.007
Tremaine Road	FM-T5	0.049	0.020	0.018	0.015	0.012	0.010	0.006
Tremaine Road	FM-T4	0.049	0.020	0.018	0.015	0.012	0.010	0.006

3.3.9.4 FLOODPLAIN ASSESSMENT

There are two existing floodplains within the Subject Property and both are within the Fourteen Mile Creek subcatchments. The northerly floodplain is associated with reach 14W-17 and the southerly floodplain is associated with reach 14W-17Cb (as shown on Figure 5.3.1 of the TDSPSS) (see **Drawing 3**).

The hydraulic model (HEC-RAS) prepared as part of the TDSPSS was provided by AECOM (dated February, 2009). This model was used as the baseline existing model for the Subject Property. The baseline model geometry was updated based on the latest topographic survey by J.D. Barnes (dated November 13, 2012), although the model cross-section numbering was maintained for consistency/comparison purposes. This "modified" existing model will be used as the basis for future conditions modeling, to be discussed in the following sections.

The Manning's roughness coefficient for the existing low flow channel was selected to be 0.030 (typical for natural channels), and the overbank Manning's roughness was assumed to be 0.08 to represent the existing dense vegetation/undeveloped floodplain conditions. These are consistent with the baseline AECOM model and Conservation Halton guidelines for channel modelling.

The selected contraction losses are 0.1 and the expansion losses are 0.3, except at the existing culverts at Dundas Street (FM-D1) and Tremaine Road (FM-T5), where 0.3 and 0.5 were selected for contraction and expansion, respectively. **Appendix F** includes the selected Manning's n values.

The size of culvert FM-T5, located along Tremaine Road just south of Highway 407, was revised from 2700mm to 2300mm CSP based on the latest survey as described in the previous section. The culvert can safely convey the existing Regional Peak flow of 7.33 m^3/s without overtopping Tremaine Road.

A 1000mm CSP culvert is located at Dundas Street (FM-D1). This culvert can convey approximately 1.80m^3/s prior to overtopping, which is sufficient to convey the peak existing Regional flow of 1.20 m^3/s.

The downstream boundary condition for the models was based on the TDSPSS model, which used the normal flow depth / downstream slope assumption for all modelled reaches.

The resulting existing Regional floodlines are indicated on **Drawing 3**. Complete HEC-RAS modeling output for the existing conditions scenario is enclosed in **Appendix F**.

3.3.9.5 SURFACE WATER QUALITY – TEMPERATURE AND CHEMISTRY

Continuous surface water temperature measurements are being collected from transducers installed in the Infrastructure Ontario Pond and 14W-17 in June 2014. An interim report has been included in this EIR/FSS (see **Appendix E**). Data collection will continue for at least one year.

One surface water sample was collected from the Infrastructure Ontario Pond in May 2014, with additional surface water quality samples collected from the Infrastructure Ontario Pond and 14W-17 in late August 2014. The results of the May 2014 sampling of the Pond are reported in **Section 3.3.7.4** (Groundwater Quality). An interim report has been included in this EIR/FSS. Additional surface water samples will be collected on a seasonal basis until at least one year of data is available.

3.3.10 FLUVIAL GEOMORPHOLOGY

A fluvial geomorphology study was completed for the Subject Property in support of the EIR/FSS. The fundamental goal of the assessment and subsequent recommendations was to ensure that the receiving watercourses and aquatic habitats are protected from disturbances (those related to land use changes) to the flow and sediment transport processes. These changes in flow and sediment transport characteristics have the potential to destabilize a stable system, or to aggravate existing unstable conditions.

The goal of the study was to match post-development erosion potential to the pre-development conditions, in order to preserve the existing channel forming processes and aquatic habitats. Achievement of this goal means maintaining the watercourse's form and function, both at the reach scale and within the broader context of the valley corridor. The measure of success in achieving this goal is based on observable physical, chemical, and biological parameters that indicate the overall health of the aquatic system.

In the case of land use change, ecological and morphological stressors can impair fluvial systems, degrading their benefits to humans and health as natural heritage features. Typical stressors may include:

1. Water quantity or flow regime changes;
2. Morphological adjustments of the channel or riparian zone;
3. Excessive erosion and/or sedimentation;
4. Deterioration of substrate quality;
5. Deterioration of water quality;
6. Decline of native species; and,
7. Introduction of alien species.

In most systems, these conditions arise from rapid or poorly-planned development where few or incomplete predictive studies of channel adjustment have been undertaken.

The form and function of the watercourses within the Study Area were assessed through a combination of fieldwork and existing background information. Background studies used to inform this assessment included:

- Evergreen Community Environmental Impact Statement, LGL Limited 2008a;
- Tremaine and Dundas Secondary Plan Subwatershed Study, AECOM 2009; and
- 2010 Creek Erosion Inventory and Assessment Study, AECOM 2011.

3.3.10.1 EXISTING CONDITIONS

The Subject Property is within the watersheds of Bronte Creek and Fourteen Mile Creek, draining generally to the southwest and southeast, respectively (**Drawing 2**). The Subject Property supports headwater features, mainly consisting of poorly defined first order channels. Due to the dominance of agricultural practices in this area, the majority of the drainage features on the Subject Property are ploughed and cropped and do not support natural riparian buffers. The planform of the headwater swales are generally the result of historical agricultural ditching works and tend to follow local topographical changes.

A large Pond is located within the lands owned by Infrastructure Ontario immediately to the west of the Subject Property. The Pond is believed to have been excavated for fill to facilitate the construction of Dundas Street in the 1950s. As shown on **Figure 3.9**, the Pond outlets to BCT-R1, flowing to Bronte Creek through a forested community having a "natural" alignment and planform. A previous outlet directed flows over the west bank of the Pond and down the Bronte Creek valley wall. This previous flow created a large headcut feature and initiated bank instability in this area. To reduce or eliminate flow at this outlet, the BCT-R1 outlet was widened and deepened by the existing landowner (Infrastructure Ontario). It appears that only the BCT-R1 outlet is now active.

The TDSPSS included a geomorphic assessment of watercourses in the Study Area. The assessment included use of a Rapid Geomorphic Assessment (RGA), Rapid Stream Assessment Tool (RSAT) and meander belt assessment to establish corridor widths and an overall classification of channel stability. **Table 3.3-7** provides a summary of the TDSPSS assessment results. For the purposes of this study, the results of the TDSPSS RGA and RSAT assessments were adopted; however, as per the direction provided in the TDSPSS, the meander belt assessment for 14W-17 and 14W-17Cb was refined based on the site-specific conditions. The meander belt assessment for BCT-R1 was adopted from the TDSPSS.

Table 3.3-7 - Summary of Fluvial Geomorphologic Analyses from TDSPSS

Reach	RGA	RSAT	Meander Belt (m)	Fluvial Geomorphic Classification
14W-17	0.00	22 (Moderate)	24*	Medium
14W-17Ca	N/A	N/A	N/A	Low
14W-17Cb	N/A	N/A	24*	Low
BCT-R1	0.09 (In Regime)	23 (Moderate)	36	High

*original recommendations from TDSPSSS.

See **Section 3.3.10.4** for revised, site-specific meander belt width dimensions.

3.3.10.2 WATERCOURSES AND HYDROLOGIC CONNECTIONS IDENTIFIED FOR RETENTION

The TDSPSS identified three watercourses within the Study Area to be retained: BCT-R1, 14W-17 and 14W-17Cb. The Study Team has also identified a number of hydrologic connections which do not require retention from a fluvial geomorphology perspective. Refer to **Figure 3.9** for the locations of these features.

(a) BCT-R1

The watercourse originates from the Infrastructure Ontario Pond, flowing within a deeply entrenched gully to Bronte Creek. Subsequent to the publication of the TDSPSS, the outlet from the Pond was deepened and widened by the Province to act as a formal Pond outlet. This resulted in a lowering of the permanent pool water elevation by approximately 1 to 2 metres, and likely resulted in changes to the flow regime within BCT-R1. The current flow regime within BCT-R1 is likely flashier due to the installation of the new Pond outlet.

In the reach of BCT-R1 immediately downstream of the Pond outlet, toe of slope erosion is apparent on both right and left banks, which is evidence of lateral bank erosion. The degree of lateral erosion is highest immediately downstream of the Pond outlet, consistent with erosion observed downstream of many water impoundment features due to the low sediment loads in the discharge water. Bed substrates are dominated by gravels mixed with fine, weathered shale particles. The morphological form of the channel is a mix of high gradient runs and step-pool sequences. The overall planform of the channel is stable due to its deeply entrenched valley. The TDSPSS defined this feature as a *High Fluvial Geomorphic Constraint*. The review and assessments undertaken as part of the current study have confirmed that this classification is appropriate.

(b) 14W-17

This watercourse is a tributary to Fourteen Mile Creek, traversing the northeast corner of the Subject Property. Twin concrete box culverts convey flow under Highway 407 and a 2300mm CSP culvert

conveys flow under Tremaine Road. Approximately 17 m upstream of the Tremaine Road culvert there is a rip-rap rock check dam which extends across the watercourse. This structure acts as a grade control, maintaining the upstream, shallow channel slope (<1%) and allowing for a cattail dominated marsh community to persist. Flow through the marsh is diffuse, with no defined low flow channel. The dominance of cattail within the channel creates conditions favouring sediment deposition and has resulted in the accumulation of fine sediment within the rooting zone of the cattails which overlay native substrates. The TDSPSS classified this watercourse as a *Moderate Fluvial Geomorphic Constraint*. The review and assessments undertaken as part of the current study have confirmed that this classification is appropriate.

(c) 14W-17Cb

This is a first order tributary to Fourteen Mile Creek, originating southeast of the Infrastructure Ontario Pond and flowing southeast towards the Tremaine Road and Dundas Street intersection. The reach of channel extending upstream from Dundas Street to the farm lane (approximately 157m in length) is identified as 14W-17Cb and has been identified within the TDSPSS as a feature to be retained as an open channel. This is the only reach of 14W-17C that has a vegetated riparian zone. This zone ranges in width from 6m (mid-reach) to approximately 16m in the wetland community near Dundas Street. Flow is intermittent and volumes are too small to form and maintain a defined low flow channel, resulting in disconnected overland flow paths that are dominated by vegetated hummocks. There is no evidence of erosion, formative sediment transport or other fluvial process within the channel. The TDSPSS classified this channel as a *Low Fluvial Geomorphic Constraint*. The review and assessments undertaken as part of the current study have confirmed that this classification is appropriate. The requirement to retain this feature is based on a combination of criteria rather than fluvial geomorphological considerations, and as a result of this assessment the re-location of this feature is considered acceptable.

(d) Hydrologic Connections Identified for Removal

There are a number of surface water features within the Subject Property (14W-17Aa, Ab, Ac; 14W-17Ba, Bb, Cc; 14W-17Ca, Cc as illustrated on **Figure 3.9**) that have very small catchment areas and do not convey flows sufficient for the development of defined channels. These features have been impacted by agricultural practices which have eliminated, by cropping practices, riparian zones and dominant channel forms that may have existed. Due to the lack of fluvial geomorphic form and function these features were not assessed during the TDSPSS. The current study has investigated these features in the field and determined that they should be classified as a *Low Fluvial Geomorphic Constraint* and may be removed.

Representative photographs of the individual surface water features are included in **Appendix G1**.

3.3.10.3 DRAINAGE DENSITY ASSESSMENT

The TDSPSS completed an evaluation of the drainage density for the Subject Property and determined "no drainage features were identified on the OBMs; as such, drainage density targets were not applicable." The TDSPSS further states, "As the management strategy identified in this study proposes maintaining Reach 14W-17 in its existing location, the drainage density target for this subcatchment has been achieved."

3.3.10.4 GEOMORPHIC ASSESSMENT

3.3.10.4.1 MEANDER BELT ASSESSMENT

A meander belt assessment was undertaken for watercourses 14W-17 and 14W-17Cb, as these were the only watercourses within the Subject Property identified for retention or realignment. The belt width delineation was completed in accordance with the *Belt Width Delineation Protocol* outlined in the Ministry of Natural Resource's technical guidelines and in conformance with the Natural Hazards Policy (3.1) of the PPS. The intent of meander belt width delineation is to use sound geomorphic principles, tools and techniques to establish the meander belt allowance to be used in planning exercises.

A meander belt width assessment is a planning tool that uses principles of fluvial geomorphology in consideration of long term patterns of erosion and deposition that influence a watercourse's planform and rate of erosion. The meander belt width is defined as the band of land on either side of a watercourse that could be expected to be occupied by that watercourse in a given planning horizon (typically 100 years). The assessment and prediction of future conditions allows for planning decisions related to potential erosion by the watercourse. With respect to different types of valley corridors, the meander belt width applies only to unconfined systems. For the purposes of this study, the differentiation between confined and unconfined systems was adopted from the criteria outlined in the TDSPSS. In this context, an unconfined system is one having valley wall heights less than 2 metres.

(a) Reach Delineation

The belt width is a planimetric property of a watercourse that defines its existing and previous meander pattern as a width of land on either side of the channel's main direction (axis) of flow. This land is deemed hazard land with respect to planning policies, accounting for the watercourse's potential tendency to meander over time within the confines of its meander belt. The width of this belt is determined by the creek's inherent ability to erode, which is governed by hydraulic forces (discharge) and by the nature of the channel material (erodible or resistive). In an effort to properly account for governing variations in hydrology, physiography, land use, geology and historical channel alteration, the Subject Property was assessed to determine if sub-reach delineations were required for this study. Based on the short length of channel being assessed and the overall consistent character of the Study

Area (e.g, soils, slope, hydraulics, land use), a single reach was identified within the entire study reach itself. No sub-reach delineations are used in this assessment.

(b) Meander Belt Axis Delineation

The meander belt axis can be defined as the centerline trend of the creek's meander pattern, oriented along the downstream direction of migration. The meander belt boundary generally parallels this axis on either side. The meander belt limits shown on **Figure 3.13** and **Figure 3.14** for watercourse 14W-17 and 14W-17Cb are centered on axes that bisect the pattern of both the 1961 and 2012 ortho-imagery. The meander belt axes for the study reaches have not changed appreciably over the 51 year period of record.

(c) Erosion Allowance Determined by Historical Analysis

An analysis to determine the erosion hazard allowance for the two unconfined systems (14W-17 and 14W-17Cb) was conducted using historical ortho-imagery. The oldest image available for the Study Area dates back to 1961 representing a 51 year period when compared against the most current image (2012). The intent of the historical analysis is to track changes in the study reach's meander pattern over time. An analysis of the historical pattern provides these general insights:

- **Belt width delineation**: The outer limit of the belt width is drawn by extending and then connecting boundary lines that are tangential to the extent of meanders. Meanders used for this exercise include the existing creek, and any historical patterns observed on the ortho-imagery. In the case of significantly altered channels, adjacent surrogate (or unaltered) reaches have been used to help define the belt width, if appropriate given the land use and other governing factors.
- **Erosion Rate Calculation:** By measuring the visible migration distance at the outer bends in each of the time frames, and dividing by the total period of record, a rate of meander migration can be calculated. This rate is then typically extrapolated to predict the 100 year migration limit. These limits can be used to define the belt width where appropriate to establish the meander component of the erosion hazard allowance.

The assessment of historical study reaches for the 14W-17 and 14W-17Cb alignments shows little change over a 51 year period. The reaches have both been historically altered to accommodate agricultural land uses. The realigned channels appeared to have maintained straightened planforms, indicating the study reach may have remained stable over time. For lateral bank erosion to occur, flow within the channel requires sufficient stream power to initiate erosion of bed or bank particles. Because the planform shows little change over time, it suggests there is insufficient stream power to cause bed and bank erosion. This is attributed to the small catchment areas and minimal flows being conveyed. In addition, the dense vegetation (grasses in 14W-17Cb and cattails in 14W-17) that persists throughout the features acts to resist erosion.

To confirm the aerial interpretation and help confirm the potential for the study reaches, adjacent surrogate reaches were investigated to determine if they were suitable in establishing the meander belt width. The reach immediately downstream of 14W-17 (downstream of Tremaine Road) has a slightly better defined low flow pattern, however the overall belt width was the same as the study reach (see **Figure 3.13**). The primary meander belt dimensions, safety factors and setbacks for watercourses 14W-17 and 14W-17Cb are identified on **Figure 3.13** and **Figure 3.14** and are indicated **Table 3.3-8**.

Table 3.3-8 - Meander belt widths for 14W-17 and 14W-17Cb

Reach	Meander Belt Width Allowance (m)	20% Safety Adjustment (m)	Total Meander Belt Width (m)
14W-17	12	2.4	14.4
14W-17Cb	13	2.6	15.6

The 20% safety adjustment factor has been applied as per the recommendations outlined in the TDSPSS, as a surrogate for historical erosion rates that cannot otherwise be determined because of the small, undefined nature of the watercourse.

3.3.10.4.2 Erosion Assessment - Tractive Force Analysis

At times, alterations to hydrologic processes could result from implementation of proponent works. Changes in volumes and timing of flow require assessment of the impacts on receiving watercourses. This can be accomplished by establishing erosion thresholds through a tractive force analysis for bed and bank erosion potential.

A tractive force analysis is a useful component of many development and related environmental impact studies because it allows investigators to identify erosion-sensitive reaches and provides guidance for engineering of stormwater management facilities with respect to the future flow regime.

The concept of a tractive force analysis is relatively simple: a stream system develops its pattern and profile over time by balancing, through erosion and deposition, the flow and sediment transport regimes. Therefore a watercourse develops a cross-sectional area and profile that allows for the transfer of water and sediment from the headwaters to the base level. When alterations to the watershed's hydrologic regime occur, the response of the watercourse is to adjust its cross-sectional area or to modify its gradient by erosion and deposition. These changes are not immediate. Also, the effects of cumulative perturbations to the watershed may result in perpetual instability.

Changing rural or agricultural lands to more impervious surfaces is one such perturbation which can result in considerable adjustment by the watercourse. Paved surfaces reduce the overland sediment supply as well as infiltration to the groundwater system. The net result is often a flashier flow regime and diminished baseflow.

Stormwater management ponds discharge water to receiving watercourses during periods in response to storm flow. The discharge of that flow has the potential to cause erosion or deposition in the watercourse. Both conditions can result in channel alterations downstream of the structure, particularly in erosion-sensitive reaches. The challenge for managers is to develop effective stormwater management strategies that minimize impact to receiving watercourses and do not contribute to channel instability.

Tractive force analysis (also known as excess shear, excess velocity, and excess stream power) allows geomorphologists to guide engineers with regards to the rate and timing of stormwater discharge from stormwater management ponds. The methodology for this analysis typically includes:

a. A site reconnaissance is undertaken to document the overall watercourse condition and to identify areas of potential instability. During this walk changes in soil type and bed characteristics are noted and digital photographs are taken. The reconnaissance also affords the investigator context with respect to future, detailed study (cross-section locations, etc.)
b. A rapid geomorphic assessment is undertaken to identify concerns with respect to channel form, bank properties, riparian conditions, substrates and flow characteristics. An indexed score is then used to classify the dominant system processes.
c. Once potential cross-sections have been identified, decisions are made regarding the need for further detailed analysis based on observed field conditions. The decision takes into account the relative stability to other reaches and the proximity to areas of concern or specific interest such as; areas of differing soil type, proximity to structures, or proximity to catchment hydrology flow changes.
d. Cross-sectional measurements of channel and bankfull conditions are surveyed. The channel slope is reach averaged and cross-sectional data is input into a flow model along with information regarding channel roughness. Hydraulic parameters are then calculated and summarized.
e. Bed samples of pavement and subpavement are collected and analyzed for grain-size distribution. The grain size distribution is used in the tractive force analysis. Bank materials may also be sampled.
f. Critical shear stress for the bank and bed material (pavement and subpavement) is determined using standardized methods for the D_{10}, D_{50} and D_{90} fraction of each sample.
g. Critical velocities for entrainment for the bank and bed material (pavement and subpavement) is determined using standardized methods for the D_{10}, D_{50} and D_{90} fraction of each sample.
h. Boundary shear stress is determined from the cross-sectional profile, slope and roughness components measured in the field. Comparisons are made between the critical and boundary shear at bankfull stage to establish erosion potential for each fraction.
i. Existing stage and velocity relationships at sections are determined using standard equations (e.g., Komar 1987) and a stage/velocity curve is developed. This curve is validated through direct measurement in the field of flow velocity on a minimum of three different flow events.
j. Critical discharge based in the critical/boundary shear relationship (as well as the critical velocity relationship) is then determined and reported to the engineer for use in the hydrological model as a threshold value. The hydrological model is then run against the threshold value to

determine exceedance for the pre-development and post-development scenarios. This data is input into the decision matrix for the sizing of the stormwater management pond.

k. Reporting includes critical shear, critical discharge, critical velocity, stream power and erosion potential for the selected cross-sections. These other critical thresholds are reported in case there are issues surrounding the use of shear stress as a decision-making tool.
l. Results are evaluated and the potential for impacts are determined for the post-development condition. Depending on the degree of impact, a mitigation plan is to be developed to deal with the erosion problems. This mitigation plan is to include an implementation plan as well as preliminary costing.
m. Recommendations are made from the perspectives of fluvial function of the watercourse as a component of the final study.

The determination of erosion thresholds using the tractive force/permissible velocity procedure does not require that an existing hydrologic model be in place. Thresholds and critical discharges can be established for any reach and then be available for input into the exceedance exercise upon development of the hydrologic model.

If thresholds have been developed for a reach and it has been more than 3 years before the hydrologic model is run, the thresholds need to be assessed to determine if they remain appropriate, as changes in the upstream area may have altered the sediment regime for the reach.

(a) Issues Relating to Low Threshold Discharges

At times the use of shear-based results may not be appropriate, particularly when the pavement material is comprised of agricultural runoff (very fine silts and clays that have been mechanically broken down into smaller particles). Determining the threshold for entrainment of this fine, cohesionless material is not possible using published methods. The same is true with the permissible velocity approach--threshold velocities for fine sediments relies on the Hjulstrom relationships, which were derived for cohesive sediments in fractions finer than sand. Under these conditions the threshold discharge could be so low that meeting the threshold rate may not be possible due to other constraints (such as minimum orifice sizes on Pond outlets which are tied to maintenance issues).

When this condition occurs, an alternative exceedance method can be applied. This method relies on the relationship between flow velocity in the channel under existing and then future conditions, and is in essence a side-by-side comparison of the two scenarios. The underlying principle is that velocities under existing conditions allow fine sediment to accumulate within the channel. If, under future conditions, that same sediment transport/deposition regime can be maintained, then there is no direct impact on the channel.

3.3.10.4.3 EROSION THRESHOLD ANALYSIS RESULTS – FOURTEEN MILE CREEK TRIBUTARIES

The existing channel was surveyed using a GPS Sokkia GRX-1 unit on the Sokkia network. Representative cross sections were established at locations of similar character or in areas of interest (i.e. evidence of bed or bank erosion). A long profile of the channel was surveyed to provide channel slope.

The morphology of the channel downstream of Dundas Road is predominantly a broad vegetated swale which does not have a defined low flow channel. As a result, the typically recorded metric of channel bankfull is not reported for cross sections 17CB, Map Identifier B and C. Rather, these cross sections report the channel capacity, which has a larger overall capacity compared to a defined low flow channel. The remaining cross sections, which have a defined low flow channel, report bankfull metrics.

The TDSPSS included a fluvial geomorphic assessment of the watercourses within the Subject Property and the receiving watercourses. This assessment included a Rapid Geomorphic Assessment (RGA) and a Rapid Stream Assessment (RSAT). This assessment identified sensitive erosion reaches, which were considered in establishing the cross sections present in the erosion threshold assessment reported below.

The results of the erosion assessment for each of the cross sections is summarized in **Table 3.3-9** and shown on **Figures 3.13 and 3.14**. Detailed assessment sheets for each cross-section are found in **Appendix G2**. The locations assessed in the Fourteen Mile Creek Subwatershed for erosion assessments are identified in **Figure 3.15**.

Based on the findings of the erosion threshold for each of the cross sections analyzed, the following erosion thresholds have been established.

Table 3.3-9 – Erosion Thresholds Identified for Watercourses 14W-17Cb and 14W-17

Subject Property Watercourse	Receiving Watercourse	Erosion Threshold Discharge (m^3/s)
14W-17Cb	Fourteen Mile Creek Tributary (W2 Channel)	1.58
14W-17	14WC (east of Tremaine Rd)	0.2

The relatively large threshold flows identified for these two watercourses are a result of the shallow channel slopes, wide flow areas and the well vegetated condition of the channels. Threshold values for the Fourteen Mile Creek tributary ranged from a high of 2.99 cms to a low of 0.11cms. The erosion threshold of 1.58 cms was based on the analysis completed at cross-section D (**Appendix G2**). This cross-section was deemed most appropriate because:

a) This is in the area identified in the TDSPSS as the most sensitive erosion site;
b) There was a defined low flow channel free of vegetation; and,
c) There was evidence of bank erosion.

The lowest erosion threshold was identified for Reach E at 0.11cms, considerably lower than the threshold in Reach D. Reach E is within a realigned channel within a relatively new subdivision. Field observation and survey data found a defined channel that appears to be incised, with less available floodplain connection than the upstream reaches. Surveyed cross sections identify the bankfull discharge for this reach as 1.47cms. Field observation found the reach is exhibiting signs of instability, with lateral bank erosion evident. It was determined that this reach was not appropriate for setting the erosion threshold because this is a constructed channel that is experiencing erosion under existing conditions.

The erosion threshold established for 14W-17 was based on a sensitive reach identified downstream of Tremaine Road. The reach located within the Subject Property is dominated by an emergent cattail marsh, lacks a defined low flow channel and is hydraulically controlled by a rip-rap rock check dam upstream of the Tremaine Road culvert. As a result, the reach within the Subject Property is stable and is not sensitive from an erosion perspective and has a high erosion threshold at approximately 20 cms. The sensitive erosion reach identified downstream is located in a reach of channel flowing adjacent to a farm field with exposed soils. The balance of the watercourse flows through a very well vegetated corridor. The erosion threshold for 14W-17 is reflective of the dominant soils (clay loam) and is set at 0.2 cms.

3.3.10.4.4 Erosion Threshold Analysis – Bronte Creek Tributary (BCT-R1)

The outlet from the Infrastructure Ontario Pond discharges to BCT-R1, which cuts through the Bronte Creek valley wall prior to its confluence with Bronte Creek. BCT-R1 is bedrock controlled by the Queenston Shale formation which dominates the Bronte Creek valley. This creates a specific scenario, in which the base plan and profile of the channel is relatively resistant to erosion (non-weathered shale is highly resistant to erosion) and is generally stable under large flow events. Conversely, the layer of alluvium overlying the bedrock, having its source as bed material and banks derived from the upper reaches, where the channel cuts through the overburden soils, is much more sensitive to erosion. As a result, a single grained erosion threshold for this type of system is not appropriate. To address the complexity of this system, the overburden bank material, accumulated bed substrates and bedrock shale were assessed.

Determining an erosion threshold for shale must consider differing states based on the degree of weathering of the shale. As shale weathers through repeated exposure to wetting and drying and freezing-thawing cycles it becomes brittle and much more susceptible to erosion. While the shale underlying the bed material is somewhat protected from these weathering processes, it is assumed they are still occurring, particularly given the intermittent nature of the channel and the presence of multiple fracture planes in the shale (vertical and horizontal) which allows for water movement. As the exposed shale of the banks is weathered and the shale underlying the bed substrates are assumed to be weathered, the analysis took the conservative approach of using weathered shale erosion thresholds.

Field characterization of the channel included three cross sectional surveys, channel longitudinal surveys and pebble counts of the bed substrate at each cross-section. The substrate found within the channel

represents material that accumulates over time as the valley walls erode and material is washed downstream from the Pond. This material is transported through the system, given the confined nature of the channel's valley, which does not provide any floodplain for energy dissipation and sediment deposition. Thus, these bottom substrates are transported through the system and have little impact on regulating the overall planform of the system. Accordingly, they were not used to establish the erosion threshold critical discharge. This assumption is based on the fact that sediment supply to the system through valley wall erosion by sub-aerial processes (including wetting and drying through precipitation) will continue.

Based on the analysis (see **Appendix G3**) the critical discharge for BCT-R1 was determined to be 0.76cms, based on the controlling weathered shale. The critical discharge was determined using the critical velocity method which provided a critical velocity of 1.82m/s for weathered shale (Komar 1987). Critical velocity was determined to be a more appropriate method for establishing the critical discharge over critical shear due to the supercritical nature of the flows within the channel. The channel slope is up to 7% in the lower reach (where it cuts through the shale), resulting in supercritical flow conditions (shallow flow depth and high velocity), at even low flow conditions. Under supercritical flow conditions, the effective bed shear is more difficult to quantify due to the effects of energy dissipation by turbulence.

As stated above, the plan and profile of the BCT-R1 channel is controlled by the shale bedrock, resulting in a stable pattern that has little risk of experiencing rapid changes in migration rates. Changes to the valley planform will occur over very long periods of time and will likely manifest as bed down cutting with minimal lateral migration. As a result, the conservative approach taken to establish a critical discharge for this watercourse will contribute to the long term stability of the system, and results in minimal risk to the proposed development of the Subject Property.

3.4 BIOLOGICAL ENVIRONMENT

Numerous ecological surveys and site assessments were completed within the Study Area and Subject Property, between 2007 and 2015. The purpose of these surveys and assessments was to: characterize the natural features and ecological functions associated with these areas, assess their significance in the context of the applicable Regional Official Plan (2014) policies and definitions, and confirm the boundaries of natural heritage features and areas to be included in the Regional NHS.

A summary of all ecological surveys completed within the Study Area in recent years is presented in **Table 3.4-1**. The locations and areas covered by the various ecological surveys are provided in **Figure 3.16**. Specific survey methods and findings are presented in the following sections.

Table 3.4-1 - Summary of Ecological Surveys in the Study Area from 2007 to 2015

Survey Type	Survey Date(s)	Surveyors
Ecological Land Classification (ELC) and Floristic Surveys	April 15, June 3 (ELC refinements), 2015 June 18, July 8 and 16; Sept 8, 2013 April 19, 2012	Beacon Environmental
	June 11, July 11, July 16, Sept 17, and Oct 1, 2008	North-South Environmental
	May 30-31, July 16-18, 2007	LGL
Tree Inventories	January 30, March 8, 2014	Urban Forest Innovations
	May - June 2007	LGL
Amphibians	April 13, May 12, June 1, 2014 April 19, May 6, June 11, 2013 April 19, May 23 2012	Beacon Environmental
	April 25, May 24, June 27, 2007	LGL
Reptiles	June 7, 2012 June 6, June 19, July 5, July 10, Aug 20, Aug 30, Sept 6, 2013	Beacon Environmental
Breeding Birds	June 6, 19, July 5, 2013 June 7, June 19 2012	Beacon Environmental
	June 8, June 16, July 6, 2008	North-South Environmental
	July 7 and 19, 2007	LGL
Lepidoptera and Odonata	June 6, July 10, August 20, Aug 30, 2013	Beacon Environmental
Winter Wildlife	February 13, 2014 February 20, 2013 December 12, 2012	Beacon Environmental
Aquatic Habitat	September 16 and 25, 2013	Beacon Environmental

Survey Type	Survey Date(s)	Surveyors
Assessment	June 12, July 9, Sept 12, 2008	North-South Environmental
Redside Dace Habitat Classification	August 8, 2012	MNRF Beacon Environmental
Feature Staking		
Woodlands	May 1, 2015 November 20, 2013	Beacon Environmental
	April 2007	LGL Limited
Wetlands	November 20, 2013	Conservation Halton
	July 9, 2008	Beacon Environmental
Top of Slope	June 4, 2008	Conservation Halton
Watercourse	July 9, 2008	Conservation Halton Department of Fisheries and Oceans

3.4.1 TERRESTRIAL RESOURCES

Terrestrial resources include terrestrial and wetland ecosystems, and associated species, and are distinguished from aquatic resources (such as watercourses and ponds) which are discussed in **Section 3.4.2** of this study. Terrestrial resources within the Study Area were documented using available background information combined with data collected through ecological surveys of vegetation and wildlife. Terrestrial resources on the Subject Property were previously documented through the Draft Environmental Impact Study (LGL Limited 2008a) and Draft Tree Inventory and Assessment (LGL Limited 2008b). Terrestrial resources for the broader Study Area were documented through the TDSPSS based on work done over 2008 and 2009. Information from these background studies has been reviewed and integrated and / or updated where appropriate to provide a comprehensive and accurate description of terrestrial resources.

The EIR/FSS Terms of Reference in the TDSPSS (**Appendix A1**) did not specifically identify the need for additional terrestrial surveys beyond confirmation of feature limits. However, given the number of years since the TDSPSS field work was undertaken and need to collect data at a sufficient level of detail to support a Draft Plan of Subdivision, the Study Team was of the opinion that undertaking more comprehensive ecological surveys for the purposes of documenting and verifying terrestrial resources (flora and fauna) was warranted. The following sections describe the various methods used to document the terrestrial resources (flora and fauna) within the Study Area, as well as the key findings.

3.4.1.1 ECOLOGICAL LAND CLASSIFICATION

Ecological Land Classification (ELC) is a standardized protocol used to classify and map ecological communities in Southern Ontario. The Ecological Land Classification (ELC) system for Southern Ontario (Lee *et al*., 1998) classifies ecological communities based on their vegetation composition and structure, site history, substrate type, moisture regime, drainage class, and other attributes. Under the ELC system, ecological communities are classified to the ecosite (scale > 1:10,000) or ecoelement (scale < 1:10,000) level depending on the specific application. Ecological communities within the Study Area were mapped and described to the ecosite level, and where possible to the ecoelement level, using ELC protocols.

Ecological communities on the Subject Property were previously classified and mapped as part of the Draft Environmental Impact Study prepared on behalf of Evergreen by LGL Limited (2008a). Ecological communities within the Study Area were also previously mapped by North-South Environmental as part of the work done in support of the TDSPSS. With the exception of a few areas (as noted in **Table 3.4-2**), ELC mapping for the Subject Property is generally consistent between these two studies.

To confirm that features were classified and mapped correctly, Beacon undertook additional field investigation of features on the Subject Property and within the Study Area in 2012, 2013 and 2015 (**Table 3.4-1**). As part of these surveys, the boundaries of ecological communities were refined using 2012 aerial photography and re-classified to reflect current conditions. Assessments were based on: vegetation and soils information gathered from representative communities and floristic surveys to document vegetation composition and structure for each representative community (including documenting species relative abundance and ranking dominant species according to vegetation strata - i.e., canopy, subcanopy, understory, and ground layers).

A total of 79 ELC polygons were generated for the Study Area representing 26 ecological community types. Ecological communities in the Study Area are listed and described in **Table 3.4-2** and mapped on **Figure 3.17**. ELC data cards corresponding with representative ecological communities are provided in **Appendix J1**.

As part of the ELC assessments, the hedgerows identified by the TDSPSS were also assessed and mapped. The hedgerow numbering from the TDSPSS (see Figure 3.3.1 in the TDSPSS, provided in **Appendix I**) has been adopted for ease of reference except for two additional short hedgerow units (labelled as H17 and H18 respectively) identified though the work done for this EIR/FSS. These hedgerows are described in **Table 3.4-2** and also shown in **Figure 3.17**.

Table 3.4-2 - Description of the ELC Communities within Study Area

ELC Unit	ELC Community Type	ELC Code	Description
1a	Cultural Meadow	CUM1	Old gravel pad colonized by meadow species such as cool season grasses, Tall Goldenrod, clovers, sweetclovers (*Melilotus* spp), and other weedy species. A few scattered trees and shrubs, including hawthorns, Green Ash (*Fraxinus pennsylvanica*), Black Walnut, and Tree of Heaven (*Ailanthus altissima*). This area was identified as a "disturbed fill pile" by LGL Ltd. (2008a) and as a cultural meadow inclusion within a broader cultural woodland area by the TDSPSS.
1b	Cultural Meadow	CUM1	Abandoned lawn dominated by cool season grasses mixed with old field forbs.
2a, 2b	Dry-Moist Old Field Meadow	CUM1-1	Old field dominated by cool season grasses, Tall Goldenrod (*Solidago canadensis* var. *scabra*), burdock (*Arctium* spp.), clovers (*Trifollium* spp.), fleabane (*Erigeron* spp.) and other field species. These areas contain sparse amounts of woody vegetation, such as Black Walnut, Manitoba Maple, hawthorns, and buckthorn, and other early successional trees and shrubs.
2c	Dry-Moist Old Field Meadow	CUM1-1	Old field dominated by cool season grasses, Tall Goldenrod, Creeping Thistle (*Cirsium arvense*), burdock, and other field species. Scattered trees and shrubs include Black Walnut and Manitoba Maple (*Acer negundo*).
2d	Dry-Moist Old Field Meadow	CUM1-1	Old field meadow dominated by grasses, Tall Goldenrod, asters, and Common Milkweed.
442e, 2f	Dry-Moist Old Field Meadow	CUM1-1	Meadow consisting of typical old field forbs and grasses
3	Tallgrass Prairie	TPO	A small prairie remnant on the rim of Bronte Creek that supports several prairie indicator species.
4	Cultural Thicket - Hawthorn	CUT1	Mid-aged thicket community dominated by hawthorns (*Crataegus* spp). Sparse canopy of Black Walnut. Understory dominated by Black Raspberry. Dominant ground covers include Garlic Mustard, Avens (*Geum urbanum, Geum canadensis*), Enchanter's Nightshade, and Calico Aster (*Symphyiotrichum lateriflorum*). This feature was formerly lumped within a broader cultural woodland unit by LGL Ltd. (2008a) and the TDSPSS; however, the species composition and vegetation structure is more characteristic of a thicket than a cultural woodland.
5	Gray Dogwood Cultural Thicket	CUT1-4	Large thicket at northwest corner of the property dominated by Gray Dogwood, with occurrences of Common Buckthorn and Red-osier dogwood. Old field species dominate the ground layer including Tall Goldenrod, Panicled Aster, grasses, Grass-leaved Goldenrod, burdock, and White Sweetclover (*Melilotus alba*), among others. Contains a small forest inclusion consisting of Shagbark Hickory, Basswood, Ironwood, and Bitternut Hickory.

ELC Unit	ELC Community Type	ELC Code	Description
6a	Cultural Woodland	CUW1	Mid-aged successional woodland at the corner of the tableland forest block. Canopy consists of Trembling Aspen (*Populus tremuloides*), Green Ash, and Black Walnut. Subcanopy consists largely of hawthorn and Green Ash. Understory sparse but includes Green Ash and Shagbark Hickory saplings and Gray Dogwood. Ground covers include Enchanter's Nightshade, Urban Avens (*Geum urbanum*). Garlic Mustard, and Tall Goldenrod.
6b	Cultural Woodland	CUW1	Woodland along edge of Bronte Creek valley dominated by hawthorn, Black Walnut, and Common Pear in the canopy and subcanopy layers. The understorey is dense and contains clusters of Black Raspberry. The ground cover consists of old field and forest species., including Garlic Mustard, Enchanter's Nightshade, White Snakeroot, and Wild Geranium (LGL Ltd. 2008a).
7a, 7f	Cultural Woodland - Black Walnut	CUW1	Mid-aged to mature naturalized Black Walnut plantation mixed with White Ash, several Butternut (*Juglans cinerea*), Oaks (*Quercus* spp), Black Cherry (*Prunus serotina*), Red Maple (*Acer rubrum*), and Shagbark Hickory (*Carya ovata*). Moderately dense understory dominated by Black Raspberry (*Rubus occidentalis*), Red Current (*Ribes rubrum*), with Gray Dogwood (*Cornus racemosa*), Common Buckthorn (*Rhamnus cathartica*), and Multiflora Rose (*Rosa multiflora*). Ground covers dominated by Tall Goldenrod, Garlic Mustard (*Alliaria petiolata*), White Snakeroot (*Ageratina altissima*), and Enchanter's Nightshade (*Circaea lutetiana*). The western boundary of 7a was recently refined in the field (June 3, 2015) in consultation with M. Sharp of behalf of the Region.
7b	Cultural Woodland - Black Walnut	CUW1	Woodland dominated by Black Walnut with lesser amounts of White Ash and White Poplar (*Populus* alba). Sub-canopy dominated by hawthorns, with White Ash, Black Walnut, and Pear (*Pyrus communis*). Understory sparse but includes Black Raspberry and Red Currant. Ground covers dominated by Avens, Thicket Creeper (*Parthenocissus vitacea*), grasses, and Garlic Mustard.
7c	Cultural Woodland - Black Walnut	CUW1	Successional woodland consisting largely of young to mid-aged Black Walnut and hawthorn. Open understory consists of Black Walnut saplings and Black Raspberry. Ground covers include Tall Goldenrod, grasses, Garlic Mustard, and White Snakeroot. This unit was formerly lumped within a broader cultural woodland unit by LGL Ltd. (2008a) and the TDSPSS. Although this area can be classified as a "cultural woodland" under the ELC system (Lee *et al.,* 1998), it does not meet the definition of "woodland" in the Regional Official Plan (s. 295) (2014) based on the established tree density requirements.
7d	Cultural Woodland - Black Walnut	CUW1	Young successional woodland with open canopy and understory of Black Walnut. Ground covers dominated by old field species such as Smooth Brome Grass (*Bromus inermis*), Tall Goldenrod, and Kentucky Blue Grass (*Poa pratensis*).

ELC Unit	ELC Community Type	ELC Code	Description
7e	Black Walnut Cultural Woodland	CUW1	Open woodland on south side of Pond, west of property, dominated by Black Walnut, Black Locust (*Robinia psuedo-acacia*), and Reddish Willow (*Salix* X *rubens*). Sparse subcanopy of hawthorn.
8	Cultural Woodland - Black Walnut-Hawthorn	CUW1	Successional woodland within tableland forest block with an open canopy of Black Walnut and Green Ash. Several mature remnant Red Oak trees along the south side. Subcanopy dominated by hawthorns, with Green Ash, Ironwood, and young Shagbark Hickory. Understory consists of Black Raspberry, Gray Dogwood, Green Ash, and Multiflora Rose. Ground covers dominated by Enchanters Nightshade, Avens, Garlic Mustard, and goldenrod.
9a	Cultural Woodland - Green Ash	CUW1	Dense stand of young regenerating Green Ash intermixed with Walnut and hawthorns. Understory vegetation includes Green Ash saplings and Gray Dogwood. Ground covers include grasses, Tall Goldenrod, Dandelion, and Heal-all (*Prunella vulgaris*), and other common field species.
9b	Cultural Woodland - Green Ash	CUW1	Small strip of woodland on west side of property consisting of a few young to mid-aged Green Ash, Bur Oak, Black Walnut and hawthorn. Understory is sparse, but includes Gray Dogwood, Black Raspberry, Red-osier Dogwood, and Black Walnut. Ground covers typical of old fields such as Tall Goldenrod, grasses, asters, and burdock.
10	Fresh-Moist Hemlock Coniferous Forest	FOC3-1	Mature coniferous forest located along Bronte Creek. Eastern hemlock dominates the canopy of the community. The dense canopy creates heavy shade, resulting in no sub-canopy and very little understory. The understory primarily consists of the occasional Maple-leaved Viburnum (*Viburnum acerifolium*). The ground layer is sparsely vegetated (10-25% cover) with species such as Herb-Robert, Enchanter's Nightshade, and Bluestem Goldenrod (*Solidago caesia*) as described in the TDSPSS.
11	Dry to Fresh Oak-Hickory Deciduous Forest	FOD2-2	Mature deciduous forest in Bronte Creek valley. Canopy dominants include Red Oak and Shagbark Hickory. The canopy trees are 10-20 m in height and cover greater than 60% of the forest. The sub-canopy is predominantly shagbark hickory. The understory primarily consists of Sugar Maple and White Ash saplings. Large patches of the ground layer are dominated by Garlic Mustard, with occurrences of Bluestem Goldenrod, False Solomon's Seal, and Urban Aven (*Geum urbanum*) as described in the TDSPSS
12	Dry-Fresh Oak-Hardwood Deciduous Forest	FOD2-4	This community, situated along Bronte Creek, is dominated by Red Oak. The subcanopy is also dominated by Red Oak in association with occasional Sugar maple, American beech, Ironwood, and Basswood. The understory and herbaceous layers have very little vegetation cover (10-25%). Understory shrubs include Witchhazel (*Hamamelis virginiana*), and Holmes' Hawthorn (*Crataegus holmesiana*). Ground covers include Pennsylvania sedge (*Carex pensylvanica*), Bluestem Goldenrod, False Solomon's Seal (*Maianthemum racemosa*), and Poison Ivy (*Rhus*

ELC Unit	ELC Community Type	ELC Code	Description
			rydbergii) as described in the TDSPSS.
13a	Dry-Fresh Sugar Maple-Beech Deciduous Forest	FOD5-2	This mature forest community forms the majority of the square woodland block on the property. American Beech (*Fagus grandifolia*) is abundant with Sugar Maple, American Basswood (*Tilia americana*), Red Oak (*Quercus rubra*), White Birch (*Betula papyrifera*), White Pine (*Pinus strobus*), and Ironwood (*Ostrya virginiana*). The understory is generally sparse but includes Common Buckthorn, Black Raspberry, and Gray Dogwood. Ground covers are generally sparse but include Garlic Mustard, Enchanter's Nightshade, sedges (*Carex* spp.), Herb Robert (*Geranium robertianum*), and other common woodland species.
13b, 13c	Dry-Fresh Sugar Maple-Beech Deciduous Forest	FOD5-2	Mature forest in Bronte Creek valley dominated by Sugar Maple and American Beech in the canopy and subcanopy, with occasional Eastern Hemlock. The canopy and sub-canopy are quite dense; therefore, the understory is less densely vegetated with species such as Tartarian honeysuckle, Maple-leaved Viburnum, Common Elderberry (*Sambucus canadensis*), and Gray Dogwood. The understory cover is variable, with the majority of understory vegetation occurring in canopy gaps. The ground layer cover is also variable, ranging from 50-60% cover. The predominant species in the ground layer includes White Lettuce (*Prenanthes alba*), False Solomon's Seal, Zig-zag goldenrod (*Solidago flexicaulis*), and Enchanter's Nightshade as described in the TDSPSS.
14a, 14b	Dry-Fresh Sugar Maple-Oak Deciduous Forest	FOD5-3	Mature forest community in Bronte Creek valley dominated by Sugar Maple in the canopy and sub-canopy, with occasional Red Oak and American beech. The canopy trees are 10-20 m high, and cover greater than 60% of the layer. The sub-canopy has equal coverage; however the trees in this layer are 2-10 m in height. The understory is sparsely vegetated (25-35% cover) containing species such as Witchhazel and Tartarian honeysuckle. The ground layer is also sparsely vegetated with species such as Wild Coffee (*Triosteum aurantiacum*) (AECOM 2009).
15a, 15b	Dry-Fresh Sugar Maple-Hickory Deciduous Forest	FOD5-5	Mature deciduous forest in southern portion of the tableland forest block consisting of Sugar Maple, Shagbark Hickory, Red Oak, Bur Oak, Ironwood, and various other hardwoods, as well as a few White Pine (*Pinus strobus)*. Subcanopy comprised of White Ash, Sugar Maple, hawthorn, and Ironwood. Open understory dominated by White Ash, Common Buckthorn, Gray Dogwood, and Black Raspberry. Ground covers sparse but include a mix of woodland forbs and graminoids such as Enchanter's Nightshade, Wild Strawberry, sedges, Thicket Creeper, Wild Geranium (*Geranium maculatum*), May-apple, Running Strawberry Bush (*Euonymous obovatus*), among others.

ELC Unit	ELC Community Type	ELC Code	Description
16	Fresh to Moist Sugar Maple - Hemlock Mixed Forest	FOD6-1	Mature mixed forest community within the Bronte Creek Valley, west of the Subject Property. The canopy consists of Sugar Maple and Eastern Hemlock (*Tsuga canadensis*) with associations of American Beech. Hemlock tree diameters range from 25 to 50 cm. The sub-canopy and understorey layers are sparse and consist of Sugar Maple and Beech. The understorey also includes scattered clusters of Red-berried Elderberry (*Sambucus racemosa* ssp. pubens) and Tartarian Honesuckle (*Lonicera tatarica*). Ground cover include Spotted Jewelweed and Pale Jewelweed (*Impatiens pallida*), White and Red Baneberry (*Actaea pachypoda* and *A. rubra*), Herb Robert, Enchanter's Nightshade, and Garlic Mustard as described in LGL Ltd. (2008a) and the TDSPSS.
17	Fresh-Moist Green Ash Lowland Deciduous Forest	FOD7-2	Lowland forest community west of the Subject Property dominated by Green Ash. The understory is sparse with species such as Green Ash, White Elm, Riverbank Grape (*Vitis riparia*), and Red-osier Dogwood. The ground layer contains a mixture of upland and wetland species such as Fowl Manna Grass, Poison Ivy, Stellate Sedge (*Carex radiata*), Wild Mint (*Mentha arvense*), Jack-in-the-Pulpit (*Arisaema triphyllum* ssp. *triphyllum*), and sedges as described in LGL Ltd. (2008a) and the TDSPSS.
18	Duckweed Mixed Shallow Aquatic	SAM1-2	Large Pond adjacent to Subject Property supporting a mix of floating leaved and submerged aquatic vegetation. Floating vegetation consists primarily of Watermeal (*Wolffia columbinana*). Submerged vegetation consists of pondweeds (*Potamogeton* spp.) and stonewort algae (*Chara* spp.). Based on descriptions of this feature from LGL Ltd. (2008a) and the TDSPSS, which classified this feature as a SAS1-8 and a SAF1-1 respectively, it is apparent that the vegetation in this feature is in a state of flux and can vary from year to year, perhaps due to recent adjustments to the off-site Pond outlet by Infrastructure Ontario.
19	Mineral Meadow Marsh	MAM2	Narrow marsh along drainage through agricultural field, disturbed by on-going farming practices. Consists largely of Purple Loosestrife, Reed Canary Grass, and Red Top (*Agrostis gigantea*), with scattered sedges (*Carex bebbii, C. vulpinoidea*) and a patch of Narrow-leaved Cattail.
20a	Rice Cutgrass Mineral Meadow Marsh	MAM2	Meadow marsh adjacent to large Pond dominated by Rice Cut Grass, with occurrences of Broad-leaved Arrowhead (*Sagitaria latifolia*) and Common Water-plantain (*Alisma plantago-aquatica*), Large Bur-reed (*Sparganium euycarpum*), and various other wetland forbs and graminoids.
20b	Rice Cutgrass Mineral Meadow Marsh	MAM2	Meadow marsh adjacent to large Pond dominated by Rice Cut Grass, in association with Reed Canary Grass, Rough Cocklebur (*Xanthium strumarium*), and Marsh Purslane (*Ludwegia palustris*).
21a	Reed Canary Grass Mineral Meadow Marsh	MAM2-2	Meadow marsh adjacent to large Pond dominated by Reed Canary Grass, Rice Cut Grass, Purple Loosestrife, and Panicled Aster, with various other wetland forbs.
21b	Reed Canary Grass Mineral	MAM2-2	Pocket meadow marsh consisting of Reed Canary Grass, Rice Cut Grass, Purple Loosestrife, Willowherb, and others.

ELC Unit	ELC Community Type	ELC Code	Description
	Meadow Marsh		
21c	Reed Canary Grass Mineral Meadow Marsh	MAM2-2	Very small meadow marsh at corner of tableland forest block dominated by Reed Canary Grass, with occurrences of Red Top, Purple Loosestrife, and Field Horsetail (*Equisetum arvense*). Disturbed by farm vehicle traffic.
22	Narrow-leaved Sedge Mineral Meadow Marsh	MAM2-5	Open meadow marsh within central forest block dominated by sedges (*Carex lupulina, Carex stipata, Carex bebbii, Carex vulpinoidea*), Fowl Manna Grasses (*Glyceria striata*), Fowl Bluegrass (*Poa palustris*), and Forget-me-not (*Myosotis laxa*).
23a, 23b	Forb Mineral Meadow Marsh	MAM2-10	Shaded meadow marsh within tableland forest block consisting of Fowl Manna Grass, sedges, Rice Cut Grass (*Leersia oryzoides*), Spotted Jewelweed (*Impatiens capensis*), and Sensitive Fern (*Onoclea sensibilis*).
23c	Forb Mineral Meadow Marsh	MAM2-10	Small meadow marsh pocket west of Subject Property along Pond dominated by Purple Loosestrife, Tall Goldenrod, willowherb, and Panicled Aster.
24a	Cattail Mineral Shallow Marsh	MAS2-1	Narrow marsh along drainage through agricultural field disturbed by on-going farming practices. Consists of Narrow-leaved Cattail (*Typha angustifolia*) at the southern end, and Purple Loosestrife (*Lythrum salicaria*), willowherb (*Epilobium* sp.), and various agricultural weeds along the narrow section.
24b	Cattail Mineral Shallow Marsh	MAS2-1	Small pocket wetland consisting of Narrow-leaved Cattail, Panicled Aster (*Symphyotrichum lanceolatum*), Purple Loosestrife, and Reed Canary Grass (*Phalaris arundinacea*).
24c	Cattail Mineral Shallow Marsh	MAS2-1	Marsh situated along 407 at north end of the Subject Property dominated by Narrow-leaved Cattail and Reed Canary Grass.
25	Red Maple Mineral Deciduous Swamp	SWD3-1	Deciduous swamp along Bronte Creek dominated by Red Maple (AECOM 2009).
26	Willow Mineral Thicket Swamp	SWT2-2	Thicket swamp and cultural thicket surrounding large Pond abutting west side of Subject Property. Dominated by scattered shrub willows including Slender Willow (*Salix petiolaris*), Heart-leaved Willow (*Salix eriocephala*), and Beaked Willow (*Salix bebbiana*), as well as Red-osier Dogwood, Gray Dogwood, young Green Ash, young Black Walnut, and hawthorns. Ground covers include a mix of meadow marsh and old field meadow species including Reed Canary Grass, Tall Goldenrod, Panicled Aster, Teasel (*Dipsacus fulanum*), Grass-leaved Goldenrod (*Euthamia graminifolia*), and Purple Loosestrife.
27a	Anthropogenic - Residential	ANT	Abandoned residential area with mid-aged planted Black Walnut (*Juglans nigra*) and a few White Ash (*Fraxinus americana*) and Sugar Maple (*Acer saccharum*). Ground covers consist of old field meadow species, including non-native grasses, goldenrod, clovers, burdock, and fleabanes.
27b, 27c	Anthropogenic - Residential	ANT	Existing residential lots with a canopy of Black Walnut trees. The majority of unit 27b was formerly lumped within a broader cultural

ELC Unit	ELC Community Type	ELC Code	Description
			woodland (unit 7a) by LGL Ltd. (2008a) and the TDSPSS. However this area contains an existing dwelling with associated buildings and has an understory of manicured lawn making the character of this area substantially different from a cultural woodland.
28	Anthropogenic - Commercial	ANT	Parking lot.
29	Agriculture	AG	Active agricultural fields in row crops (soy beans and corn)

Table 3.4-3 - Description of Hedgerows on the Subject Property

Map Unit #	Description
H1	Along Dundas St. Consists largely of White Ash and Black Walnut. Ground flora consists of old field species such as Smooth Brome, Tall Goldenrod, Asters, and Wild Grape.
H2	Along Dundas St. Consists of White Poplar, with a DBH range of 16-46 cm (LGL Ltd. 2008a).
H3	Consists largely of Black Walnut with American Basswood, Hawthorn, and Green Ash. Ground covers include grasses, Thicket Creeper, Tall Goldenrod, and Enchanter's Nightshade.
H4	Open canopy of Red Oak and Shagbark Hickory. Subcanopy of hawthorns, Buckthorn, and Black Walnut. Ground covers include grasses, Garlic Mustard, avens, and Enchanter's Nightshade. Identified as "significant" in the TDSPSS.
H5	Canopy dominated by mature Shagbark Hickory, Bur Oak, and White Ash. Dense subcanopy of hawthorns, White Ash, Shagbark Hickory, and Bur Oak. Ground covers dominated by Garlic Mustard, Avens, Poison Ivy, and Enchanter's Nightshade. Identified as "significant" in the TDSPSS.
H6	Mature closed canopy of Shagbark Hickory, Bur Oak, Green Ash, Red Oak, and Sugar Maple. Subcanopy consists largely of hawthorns. Dominant ground covers include Garlic Mustard, Poison Ivy, Avens, and Enchanter's Nightshade. Identified as "significant" in the TDSPSS.
H7	Canopy consists of Sugar Maple, Red Oak, Shagbark Hickory, and Black Walnut. Subcanopy dominated by hawthorns, with Shagbark Hickory, Black Walnut, and Bur Oak. Ground covers include Tall Goldenrod, Garlic Mustard, Wild Strawberry, and Avens. Canopy gaps with open meadow and gray dogwood thicket. Large, mature trees on east end; scrubby and shrub-dominated to the west. Identified as "significant" in the TDSPSS.
H8	Dominated by mature Red Oak, Shagbark Hickory, Black Cherry, Red Maple, Basswood, and Sugar Maple. Subcanopy of hawthorns, Ironwood, Sugar Maple, and Bitternut Hickory. Ground covers include Garlic Mustard, Avens, Enchanter's Nightshade, and Tall Goldenrod. Identified as "significant" in the TDSPSS.
H9	West half comprised of hawthorns; east half comprised of planted Colorado Spruce (*Picea pungens*).
H10	Dominated by hawthorns, with a sparse canopy of Black Walnut and Green Ash. Ground covers include Garlic Mustard, grasses, avens, and Tall Goldenrod.
H11	Open canopy of Black Walnut and a few Green Ash. Subcanopy of hawthorns, Buckthorn, and Black Walnut. Ground covers include Garlic Mustard, grasses, Avens, and Enchanter's Nightshade.
H12	Dominated by hawthorns, with cherry (*Prunus* sp.), Black Walnut, and Buckthorn. Ground convers include grasses, Garlic Mustard, Tall Goldenrod, and Tufted Vetch.
H13	Dominated by hawthorns, with cherry (*Prunus* sp.), Black Walnut, and Green Ash. Ground covers of grasses, Garlic Mustard, avens, and Enchanter's Nightshade.
H14 / H15	Dominated by hawthorns in association with Common Buckthorn, Pear, Green Ash, and Black Walnut. A few large, mature Bur Oak specimens. Ground covers include Smooth Brome, Garlic Mustard, Thicket Creeper, and avens.
H16	Dominated by hawthorns, with Buckthorn, Black Walnut, and White Poplar, and Bur Oak. Ground covers consist largely of grasses, Garlic Mustard, avens, and old field species.
H17	Dominated by Common Buckthorn, Green Ash, and Black Walnut.
H18	Dominated by hawthorns in association with Common Buckthorn, Green Ash, and Black Walnut.

The ecological communities within on the Subject Property are generally reflective of an agricultural/peri-urban land use matrix abutting a major creek valley system (Bronte Creek). The Bronte Creek valleylands occupy the western portion of the Study Area outside the Subject Property, and are largely forested with the exception of a dug Pond feature adjacent to the valley surrounded by wetland communities. The 407 ETR and Hydro One corridors at the northern limit of the Study Area are generally open, comprised of meadows and agricultural fields.

Vegetation communities on the Subject Property are predominantly agricultural, with the exception of two woodlands (i.e., herein referred to as the Central Woodland and Southern Woodland) and some hedgerow features. None of the ecological communities on the Subject Property are considered rare or significant at the Provincial level. However, there is a very small area of tallgrass prairie well outside the Subject Property but associated with the Bronte Creek valleylands in the vicinity of the Hydro One corridor which is considered provincially rare.

The recent ELC mapping and classification completed by Beacon Environmental is largely consistent with the previous mapping presented in the TDSPSS, with a few refinements summarized in **Table 3.4-4**.

Table 3.4-4 - Refinements to Vegetation Community Mapping from the Tremaine Dundas Secondary Plan Subwatershed Study (TSDPSS)

ELC Unit (ref. Figure 3.17)	Summary of TDSPSS vegetation unit assessments (see Appendix I) updated and refined through this study
ELC units 1a, 2a, 4, 7a, 7b, 7c, and 27b,	All of these ELC units were lumped together in the TDSPSS as part of a single Cultural Woodland (CUW1) unit. However, detailed field investigations found that this area is actually comprised of a mosaic of different cultural communities, including existing and former farm homesteads (unit 27b), thickets (unit 4), black walnut cultural meadow (unit 3a), meadows (units 1a and 2a), sparsely treed cultural woodland (unit 7c) and former orchard lands (unit 4). This study has mapped and classified these communities more accurately to reflect these findings.
ELC unit 1a – Cultural Meadow	The TDSPSS mapped this unit as a Cultural Woodland (CUW), however detailed field studies found that it is actually a Cultural Meadow (CUM1). This finding is more consistent with the LGL Ltd. (2008a) study which mapped the area as “disturbed” on account of the fill piles in the area, which have started to naturalize over time.
ELC unit 4 – Cultural Thicket	The TDSPSS mapped this feature as a Cultural Woodland (CUW), however detailed field surveys have found that the feature is more accurately described as a Cultural Thicket (C3.18) dominated by Hawthorns.
ELC unit 26 – Willow Thicket Swamp	The TDSPSS classified this feature similarly as a thicket swamp but the boundaries of this feature in the TDSPSS do not correspond with the limits of the wetland as staked by Conservation Halton on July 9, 2008. The TDSPSS erroneously projects the wetland limits at least 5 m further east than the actual surveyed lines. This has been corrected in this EIR/FSS.
ELC unit 19 – Meadow Marsh	The TDSPSS classified this feature similarly, however detailed field studies found this feature is considerably smaller and narrower than depicted in the TDSPSS mapping. This has been corrected in the current study.
ELC unit 24a – Shallow	The TDSPSS classified this feature similarly, however detailed field surveys found this feature is considerably smaller and narrower than depicted on the TDSPSS mapping. This has been

ELC Unit (ref. Figure 3.17)	Summary of TDSPSS vegetation unit assessments (see Appendix I) updated and refined through this study
Marsh	corrected in the current study.
ELC unit 14b – Deciduous Forest	The TDSPSS classified this feature similarly however, the mapping of this feature included the western portion of hedgerow feature H6. The mapping has been corrected in the current study to separate out the hedgerow feature.

3.4.1.2 FLORISTICS

Floristic surveys of the Subject Property and Study Area were previously completed by LGL Ltd. (2008a) and the TDSPSS respectively. LGL Ltd. (2008a) reported 206 vascular plant species from the Subject Property the TDSPSS reported 232 species from the broader Study Area. Beacon completed floristic surveys on the Subject Property and within approximately 120 m from the Subject Property into the Bronte valley between spring 2012 and fall 2013, and recorded 220 species. Species were documented according to the ecological communities in which they were observed, and recorded on ELC data cards. A checklist of all species recorded as part of past and current surveys has been compiled and is presented in **Appendix J2**. Nomenclature follows *Flora Ontario – Integrated Botanical Information System (FOIBIS)* (Newmaster and Ragupthy 2012), and species conservation status at the Provincial and Regional levels have been based on Provincial rankings from the Natural Heritage Information Centre (NHIC) and *The Vascular Plants of Halton Region* (Crins *et al.,* 2006) respectively.

In total, 346 species of vascular plants have been recorded from the Study Area and adjacent lands through floristic surveys completed by Beacon Environmental in 2012/2013, the TDSPSS, and LGL Ltd. (2008a). The majority of the species reported for the Study Area are ranked S5 by the Natural Heritage Information Centre (NHIC), indicating that the species are common and secure in Ontario. Seventeen (17) species are ranked S4 or S4? (apparently secure, uncommon but not rare) and three species are ranked S4S5 (secure/apparently secure). One species, *Potentilla norvegica*, is ranked SU (unrankable due to lack of information). Ninety-nine (99) species are ranked SNA (status not applicable, species not a target for conservation, typically exotic/introduced). Some of the observed species could only be identified to genus level, therefore their corresponding Provincial status rank is unknown.

One species, Butternut (*Juglans cinerea*) is a provincially Endangered SAR has been confirmed by work done by LGL Ltd., the TDSPSS and Beacon (discussed below in **Section 3.4.1.2.1**). No species ranked as provincially S1 (critically imperilled) or S2 (imperilled) have been recorded in the Study Area by any of the studies undertaken.

A number of regionally rare and uncommon plant species were observed in the Study Area (see **Table 3.4-5**). Three regionally rare and 23 regionally uncommon species were identified. The three regionally rare species are located on lands adjacent to the Subject Property (in ELC units 20a and 18). Of the 23 uncommon species recorded in Study Area, seven were found on the Subject Property, including Holmes' Hawthorn (*Crataegus holmesiana*), Fireberry Hawthorn (*Crataegus chrysocarpa*), Virginia Stickseed (*Hackelia virginiana*), Square Stemmed Monkey Flower (*Mimulus ringens*), Smooth Goldenrod

(*Solidago gigantea*), Carpenter's Square Figwort (*Scrophularia marilandica*), and Hairy Aster (*Symphyotrichum pilosum*). The locations of rare and uncommon species are provided in **Table 3.4-5**, where available, however specific locations of records from previous studies were not available, with the exception of Butternut trees. Therefore only species confirmed through Beacon's field studies are linked to specific ELC polygons.

Table 3.4-5 – Provincially and Regionally Rare and Uncommon Plant Species in Study Area

Scientific Name	Common Name	Beacon[1]	AECOM[2]	LGL[3]	S-Rank[4]	COSSARO[5]	Halton[6]	Location (ELC unit or Ecoelement)
Ambrosia trifida	Great Ragweed			√	S5		HU	Not specified
Anemone americana	Round-lobed Hepatica		√		S5		HU	FOC/ FOD
Ceratophyllum demersum	Common Hornwort	√		√	S5		HU	ELC unit 18
Crataegus chrysocarpa	Fireberry Hawthorn			√	S5		HU	Hedgerows; ELC unit 5, 7a, 7f, 9a, 15a, 17, 11, 14,
Crataegus holmesiana	Holmes' Hawthorn		√		S4S5		HU	CUM/CUT/CUW/MAM/FOD
Geranium bicknellii	Northern Crane's-bill			√	S4		H?	Not specified
Glyceria septentrionalis	Floating Manna Grass		√	√	S4		HU	MAM, ELC unit 23a/23b
Hackelia virginiana	Virginia Stickseed			√	S5		HU	ELC unit 6a
Heraclum maximum	Cow-parsnip		√		S5		HU	ELC unit 25
Juglans cinerea	Butternut	√	√	√	S3?	End		6b, 7a, 7c, 7e, 7f, 11, 13b, 27b
Lindernia dubia var. dubia	False Pimpernel	√			S4		HR	ELC unit 20a
Ludwigia palustris	Marsh Seedbox	√			S5		HU	ELC unit 20b
Lysimachia terrestris	Swamp Loosestrife		√		S5		HR	ELC unit 26
Mimulus ringens	Square-stem Monkey-flower	√		√	S5		HU	ELC unit 13a and 21a
Nuphar variegata	Bullhead Pond-lily		√		S5		HU	ELC unit 18
Nymphaea odorata	Fragrant White Water-lily		√		S5		HU	ELC unit 18
Oenothera biennis	Common Evening-primrose			√	S5		H?	Not specified
Polygonum amphibium	Water Smartweed			√	S5		HU	ELC unit 26
Polygonum lapathifolium	Dock-leaf Smartweed		√		S5		HU	ELC unit 26
Potentilla simplex	Old-field Cinquefoil		√		S5		HU	FOC

Scientific Name	Common Name	Beacon[1]	AECOM[2]	LGL[3]	S-Rank[4]	COSSARO[5]	Halton[6]	Location (ELC unit or Ecoelement)
Scrophularia marilandica	Carpenter's Square Figwort	√			S5		HU	ELC unit 7a
Solidago gigantea	Smooth Goldenrod	√	√		S5		HU	ELC unit 7a
Solidago juncea	Early Goldenrod	√	√	√	S5		HU	ELC unit 5, 9a
Spirodela polyrhiza	Common Water-flaxseed	√			S5		HR	ELC unit 18
Symphyotrichum pilosum var. pilosum	Hairy Aster		√		S5		HU	CUM/CUT/CUS/CUW/FOD
Symphyotrichum urophyllum	Arrow-leaved Aster		√		S4		HU	CUM
Taenidia integerrima	Yellow Pimpernel		√		S4		HU	ELC Unit 3
Vaccinium myrtilloides	Velvetleaf Blueberry		√		S5		HU	FOD
Wolffia columbiana	Columbia Watermeal	√					HU	ELC unit 18

[1] Observed by Beacon Environmental in 2012 and/or 2013. **√** = present

[2] Observed by AECOM (2009). **√**= present

[3] Observed by LGL Ltd. (2008a). **√**= present

[4] S-Rank (Provincial Status - NHIC) **S3** = Vulnerable; **S4** = apparently secure; **S5** = secure

[5] Committee on the Status of Species at Risk in Ontario. **End** = Endangered

[6] Halton (Regional Status - Crins *et al*, 2006). **HU** – Uncommon; **HR** – Rare; **H?** – May be rare or uncommon; requires further review

3.4.1.2.1 BUTTERNUT

Of the plant species recorded from the Study Area, only one species - Butternut (*Juglans cinerea*) - is a SAR. Butternut is ranked S3 (vulnerable) and is also listed as an Endangered species in Ontario. Butternut is in decline because of disease and mortality caused by the Butternut canker, for which there is no known cure or control method.

A total of 17 Butternut trees have been recorded within the Study Area. Fourteen of the Butternuts in the Study Area were evaluated in 2012 according to Butternut Health Assessments (BHA) protocols (see **Appendix J3**), and verified by OMNR, while two additional Butternut trees were identified as part of subsequent surveys in 2013 and one additional Butternut at the north end of ELC unit 27b was identified during a site visit on April 15, 2015.

For any proposed development or site alteration that might impact a Butternut or its habitat[7], a BHA is must be undertaken by a MNRF certified Butternut Health Assessor to determine if the Butternut is:

1. Non-retainable – the tree is in the advanced stages of disease as a result of Butternut canker
2. Retainable – the tree does not have Butternut canker or disease is not as advanced
3. Archivable – the tree could be useful in determining how to prevent or resist Butternut canker

Non-retainable trees (Category 1) are not protected under the *Endangered Species Act* (2007) and can be removed (pursuant to municipal requirements or by-laws) without a permit from MNRF. Retainable and archivable trees (Categories 2 and 3) are protected under the Act; therefore, permission must be obtained from MNRF to remove trees under these categories. Trees that are "non-retainable" and not "archivable" may be removed without a permit following a three week waiting period after assessment forms have been submitted to MNRF. Trees that are "retainable" may have their habitat disturbed or be removed with a permit, which typically involves mitigation for the proposed impacts to the tree and / or its habitat.

The fourteen Butternuts identified on site in 2012 were assessed by a certified Butternut Health Assessor, and formal assessments were submitted to MNRF in 2012 (provided in **Appendix J3**). However, no formal assessments were completed or submitted for the additional 3 (three) Butternut identified subsequently because their status may change over time.

Based on the formal assessments and observations from in 2012, 2013, and 2015, 10 (ten) Butternut in the Study Area were determined to be retainable and 7 (seven) were determined to be non-retainable, as illustrated in **Figure 3.18**. None of the Butternuts observed are considered archivable. Notably, two of the trees assessed in 2012 (#5 and #6) and considered retainable were subsequently noted as dead (and therefore non-retainable) on April 15, 2015. The formal BHA assessments conducted in 2012 and submitted to MNRF (**Appendix J3**) will need to be updated for the 14 assessed trees, and the three more recently identified trees will also require formal assessments submitted, if any of the Butternut, or their habitats, are to be disturbed as part of the implementation of the proposed Draft Plan.

3.4.1.3 TREE INVENTORY AND ASSESSMENT

Trees on the Subject Property were inventoried and assessed by LGL Limited in 2007 (LGL 2008b). The inventory focussed on hedgerow trees and included trees over 15 cm in diameter at breast height (DBH, measured 1.4 m from ground). LGL (2008b) tagged and assessed 298 trees on the Subject Property, which ranged in size from 15 cm to 104 cm DBH.

An updated tree inventory and assessment was completed on January 30 and March 8, 2014 by Urban Forest Innovations (UFI 2015) (**Appendix J4**). The UFI inventory assessed all trees greater than 15 cm

[7] Regulated habitat for Butternut trees is now specified as being a 25 m radius of land surrounding each individual tree.

DBH situated outside identified significant woodlands (as described in **Section 4**) on the Subject Property and immediately adjacent lands. Specimens of non-native and invasive Common Buckthorn were excluded from the inventory. The condition of each tree was assessed in terms of trunk integrity, canopy structure, and canopy vitality.

A total of 645 trees were tagged and assessed from the Subject Property and immediately adjacent lands. Stem diameters ranged from 15 cm to 118 cm DBH. Most of the trees inventoried were associated with hedgerow features.

A total of 23 species (including two identified to genus) were documented, with the predominant species being Black Walnut (*Juglans nigra*), accounting for almost half of the trees outside of significant woodlands, followed by Green Ash (*Fraxinus pennsylvanica*) and Shagbark Hickory (*Carya ovata*). More than 90% of the trees assessed were in good or fair condition. A summary of the findings is presented in **Table 3.4-6**. It should be noted that several Butternut trees were encountered (shown in **Figure 3.18**), but they all had stem diameters less than 15 cm DBH and consequently were not included in the inventory. Butternuts were assessed separately, as discussed in **Section 3.4.1.2.1** above.

Table 3.4-6 - Summary of species, diameters and condition of trees within Study Area

Species	Range of DBH (cm)	Conditions			
		Excellent	Good	Fair	Poor
American Elm (*Ulmus americana*)	16	0	1	0	0
Apple Species (*Malus* sp.)	17-49	0	1	4	3
Basswood (*Tilia americana*)	19-71	0	3	4	2
Bitternut Hickory (*Carya cordiformis*)	21-46	0	3	1	0
Black Cherry (*Prunus serotina*)	15-67	0	1	5	0
Black Walnut (*Juglans nigra*)	15-107	0	209	21	4
Bur Oak (*Quercus macrocarpa*)	16-102	0	27	8	1
Carolina poplar (*Populus × canadensis*)	15-47	0	2	3	2
Cherry Species (*Prunus* sp.)	17-28	0	1	5	0
Green Ash (*Fraxinus pennsylvanica*)	15-95	0	34	46	16
Ironwood (*Ostrya virginiana*)	16-46	0	6	5	0
Littleleaf linden (*Tilia cordata*)	16-40	0	6	8	0
Manitoba Maple (*Acer negundo*)	26-36	0	0	1	1
Norway Maple (*Acer platanoides*)	19-39	0	7	6	4
Paper Birch (*Betula papyrifera*)	23-31	0	1	2	1
Pear Species (*Pyrus* sp.)	16-91	0	13	15	6
Red Oak (*Quercus rubra*)	17-118	0	26	9	0
Shagbark Hickory (*Carya ovata*)	15-68	0	35	8	0
Silver Maple (*Acer saccharinum*)	16-65	0	2	12	2
Sugar Maple (*Acer saccharum*)	22-85	0	7	10	3
White Oak (*Quercus alba*)	20-80	0	4	1	0

Species	Range of DBH (cm)	Conditions			
		Excellent	Good	Fair	Poor
White Poplar (*Populus alba*)	16-81	0	8	18	7
White Willow (*Salix alba*)	21-42	0	2	2	0
Totals		***0***	***399***	***194***	***52***

3.4.1.4 MAMMALS

Targeted mammal surveys were not completed for the Study Area. Observations of mammals noted in LGL Limited (2008a) were based on incidental observation made during other field surveys. No mammal surveys were completed as part of the TDSPSS. Beacon recorded mammal observations incidentally on the Subject Property between 2012 and 2014. Mammal observations included noting evidence of mammal habitat utilization (tracks, scat, hair, etc.) as well as any concentrations. Winter surveys, under snow covered conditions, were completed in 2012/2013 and 2013/2014 to detect large and small mammal tracks.

Eleven species of mammals were reported from the Subject Property and immediately adjacent lands (i.e., within 120 m of the property line towards to Bronte Creek) incidentally by LGL Limited (2008a), as follows:

- Virginia Possum
- Eastern Cottontail
- Eastern Chipmunk
- Gray Squirrel
- Beaver
- Deer Mouse
- Muskrat
- Coyote
- Raccoon
- Striped Skunk
- White-tailed Dear

Beacon Environmental confirmed the presence of nine of these species between 2012 and 2014, and also observed Meadow Vole, but did not observe Virginia Possum. The following mammals were observed either during winter surveys or as incidental observations at other times of year (spring/summer/fall) in the Study Area:

- Eastern Cottontail (winter and summer)
- Eastern Chipmunk (summer)
- Gray Squirrel (winter and summer)
- *Peromyscus* mouse or other small mammal (winter)
- Meadow Vole (winter and summer)
- Muskrat (winter December in Pond)

- Coyote (winter)
- Raccoon (summer)
- Striped Skunk (summer)
- White-tailed Deer (winter and summer)

Significant concentrations of mammals were not observed anywhere in the Study Area. Gray Squirrel observations were particularly numerous in the Central Woodland (ELC Unit 13a) and in the forest cultural woodland along the Bronte Creek valley (ELC Unit 6b), but this species was present in all treed environments. Coyote tracks were recorded throughout the Subject Property. White-tailed Deer tracks and scat were observed in the fields around the Central Woodland, but no deer beds or concentrations of tracks were observed.

3.4.1.5 AVIFAUNA

A variety of avifaunal surveys were completed on the Subject Property and within the Study Area between 2007 and 2014. LGL Ltd. (2008a) completed point count surveys on the Subject Property and from the adjacent Pond in 2007. Breeding bird surveys within the Study Area were completed by North-South Environmental Inc. in 2008 as part of the TDSPSS.

Beacon completed breeding bird surveys on the Subject Property and adjacent lands (the extent of the breeding bird surveys study area is shown in **Figure 3.16**) in 2012 and 2013. Survey dates and details are presented in **Table 3.4-7**. Surveys were completed during the morning hours (between 5:45 am and 10:45 am) on days with low winds (Beaufort Scale 0-3) and with temperatures between 12^{O}C and 21^{O}C. All observations (visual and aural) were recorded. The survey routes were selected to maximize coverage of all habitats on the Subject Property and adjacent lands. Breeding bird monitoring is ongoing.

Winter wildlife surveys were undertaken in 2012/2013 and 2013/2014 to detect overwintering species.

Table 3.4-7 - Breeding Bird Survey Details

Details	June 7, 2012	June 19, 2012	June 6, 2013	June 19, 2013	July 5, 2013
Time of Day	5:45 am – 10:00 am	5:45 am – 9:00 am	6:30 am – 10:30 am	6:00 am – 10:45 am	5:45 am – 8:45 am
Temperature (^{o}C)	14 to 19	21	12	20	21
Wind Speed (Beaufort Scale)[1]	0-1	3	2-3	1	0-1
Precipitation (type)	None	None	None	None	Light rain
Cloud Cover (%)	70 to 30	75 to 5	10	2	10

[1]Beaufort Scale: **0** = calm, <1km/h; **1** = light air, 1-5.5 km/h; **2**= light breeze, 5.6-10 km/h; **3** = Gentle breeze, 12-19 km/h

A total of 104 breeding bird species are recorded in the Ontario Breeding Bird Atlas 2001-2005 (Bird Studies Canada 2006) for the 10 km^2 area that contains the Study Area. This list offers some indication of the species that could potentially occur in the Study Area provided that habitat conditions are suitable. However, the site-specific surveys conducted between 2007 and 2013 provide a much better indication of the breeding bird species supported by the Study Area compared to the much broader results of the Breeding Bird Atlas.

Observations of avian communities were generally consistent among the various surveys over the past eight years, with some minor variation. Beacon recorded a total of 43 breeding bird species from the Subject Property, and an additional 59 breeding and non-breeding species from the broader Study Area. LGL Ltd. (2008a) recorded 51 species from a similar study area. North-South Environmental Ltd. recorded 55 species with 53 breeding species in the TDSPSS study area (shown in **Figure 1.2**). Some variation in breeding bird diversity is expected between years as breeding bird communities vary somewhat from year to year and some of the quieter species can be missed in a year. Also, slightly different study areas were surveyed by different firms (i.e., the surveys completed for the LGL 2008a study were more focussed on the Subject Property, while the surveys completed for the TDSPSS encompassed the entire Study Area). It should also be noted that LGL surveys occurred late in the breeding season; therefore, some species recorded without breeding evidence may have been breeding species. In all, 68 breeding and 12 non-breeding bird species were recorded on the Subject Property and adjacent lands between 2007 and 2013. A complete list of breeding birds is presented in **Appendix J5**.

The Subject Property supports a diversity of birds reflective of the variety of habitats in the broader Study Area, and the proximity to the Bronte Creek valley system to the west. The presence of the Pond and surrounding wetlands, and the Bronte Creek valley outside but adjacent to the Subject Property add a number of species to the Study Area, as discussed below. The most common species on the Subject Property based on Beacon data were: Song Sparrow (*Melospiza melodia*) (15 pairs), Red-winged Blackbird (*Agelaius phoeniceus*) (11 territories or males), American Robin (*Turdus migratorius*) (9 pairs), and American Goldfinch (*Cardeulis tristis*) (9 pairs). These species are all abundant in southern Ontario and are tolerant of disturbed habitats. Between one and five pairs or territories of all other species were recorded.

The birds observed in the main breeding bird habitats found on the Subject Property (i.e., the Central Woodland, the Southern Woodland, and the agricultural fields and hedgerows), and in the adjacent lands outside the Subject Property (i.e., the Pond and associated wetlands, and Bronte Creek valley) are described in the following sections, and listed in **Appendix J5**. These habitat areas are identified in **Figure 2.1**.

(a) Central Woodland

The Central Woodland (comprised of ELC units 6a, 8, 13a, 15a, 15b, 22, 23a, 23b) supports some area-sensitive species, but in any one year does not appear to support more than one or two pairs of area-sensitive species in total. Area-sensitive species are those that require larger patches of suitable habitat in which to breed, or which are more productive in larger patches. Over the course of four survey years, the following area-sensitive species have been recorded: Pileated Woodpecker (*Dryocopus pileatus*), Hairy Woodpecker (*Picoides villosus*), White-breasted Nuthatch (*Sitta carolinensis*), Least Flycatcher (*Empidonax minimus*), and Scarlet Tanager (*Piranga olivacea*).

This suggests that while this woodland provides some habitat for area-sensitive species, it is not high quality habitat for this type of species. Higher quality habitat area-sensitive forest would contain multiple pairs of several species every year. It is likely that the Pileated Woodpecker uses the woodland as part of its territory, but that its main territory is within the Bronte Creek valley. Overall, within any given year, the number of breeding bird species in this woodland is relatively low (for example 13 species in 2012 and 16 species in 2013), and almost all species consist of one territory within the woodland.

Wood Thrush (*Hylocichla mustelina*) and Eastern Wood-Pewee (*Contopus virens*) have both been recorded in this woodland. Both of these species are relatively common in southern Ontario and are not considered Species at Risk in Ontario but are now listed as Threatened nationally by COSEWIC (Committee on the Status of Endangered Wildlife in Canada). These species are discussed further in the Species at Risk section.

(b) Southern Woodland and Associated Areas

No area-sensitive species were recorded in any of the four survey years in the Southern Woodland (ELC unit 7a) or associated areas with some wooded cover (ELC units 4, 7c, 27b). This woodland is smaller, younger, composed of different tree species, and more disturbed than the Central Woodland. Note that a greater diversity of species were recorded in this area than the Central Woodland because of the birds associated with the small adjacent clearings and thickets (ELC units 1a, 2c, 7b)are included (for example species such as Gray Catbird (*Dumetella carolinensis*), House Wren (*Troglodytes aedon*), Song Sparrow, Red-winged Blackbird and others). Despite this diversity, this area supports mostly common, disturbance tolerant species, with fewer forest specialist species than the Central Woodland.

(c) Agricultural Fields and Hedgerows

The cultivated fields support few bird species due to their anthropogenic nature, but include species such as Killdeer (*Charadrius vociferous*), Horned Lark (*Eremophila alpestris*), and Savannah Sparrow (*Passerculus sandwichensis*). A few Savannah Sparrows, an area-sensitive field species, were observed in the more open areas. This species is found frequently in both agricultural and old fields in southern Ontario. Although the Savannah Sparrow requires large areas of open land, it will breed in many types of large field habitats. It is a common to abundant species in southern Ontario.

The hedgerows on the Subject Property support a relatively high number of species, although most are common and disturbance-tolerant species. Species observed in hedgerows include American Robin, Brown Thrasher (*Toxostoma rufum*), and Warbling Vireo (*Vireo gilvus*), Cedar Waxwing (*Bombycilla cedrorum*), European Starling (*Sturnus vulgaris*), Northern Cardinal (*Cardinalis cardinalis*), Song Sparrow, Red-winged Blackbird, American Goldfinch, Orchard Oriole (*Icterus spurius*) and others. Orchard Oriole is listed as rare in Halton Region (McIlveen 2006), as discussed in **Section 3.4.1.5.2**. Northern Flicker (*Colaptes auratus*) and Red-bellied Woodpecker (*Melanerpes carolinus*) use some hedgerows, but it is presumed that their primary habitats are the woodlands (FOD and CUW units). Tree Swallow nests were observed in nest boxes in a more open hedgerow.

(d) Infrastructure Ontario Pond and Wetlands (outside the Subject Property)

The Pond (ELC unit 18) and surrounding wetlands and cultural communities are an important area for birds. Three broods of Wood Duck were observed in the Pond in June of 2012, indicating that it is an important brood-raising area for this species. Mallard was observed in 2013. The songbird species breeding in the vegetation around the Pond are mainly common thicket species, but there are many species represented in fairly high densities. Breeding songbirds include: Willow Flycatcher (*Empidonax traillii*), Gray Catbird, Yellow Warbler (*Dendroica petechia*), Common Yellowthroat (*Geothlyphis trichas*), Song Sparrow, Swamp Sparrow (*Melospiza georgiana*), Red-winged Blackbird, Baltimore Oriole (*Icterus galbula*) and American Goldfinch. A Least Flycatcher (area-sensitive) was recorded here in 2008.

Numerous bird species not observed breeding on the Subject Property have been observed feeding or resting in the wetland at various times of the year. It is not readily possible to determine how frequently or how important this function is for each species, but the number of birds using the wetland indicate that its overall function is important as a food source (either in the form of frogs, insects or other invertebrates), and as a roosting area for birds. The following birds have been observed at the wetland, with associated habitat use comments:

- Great Blue Heron *Ardea herodias* (feeding)
- Black-crowned Night-Heron *Nycticorax nycticorax* (feeding and possibly roosting)
- Canada Goose *Branta canadensis* or Cackling Goose *Branta hutchinsii* (64 observed Dec. 21, 2012, feeding and or roosting)
- Mallard (51 observed Dec. 21, 2012)
- Ring-necked Duck *Aythya collaris* (one observed Dec. 21, 2012)

- Wood Duck (observed Aug. 30, 2013)
- Red-breasted Merganser *Mergus serrator* (observed Aug. 30, 2013)
- Greater Yellowlegs *Tringa melanoleuca* (observed Aug. 30, 2013)
- Lesser Yellowlegs *T. flavipes* (observed Aug. 30, 2013)
- Chimney Swift (summer, likely sporadic feeding)
- Belted Kingfisher (summer, feeding, possibly nesting in Bronte Creek river banks)
- Tree Swallow (breeds in nest boxes nearby and summer feeding)
- Northern Rough-winged Swallow (feeding summer, presumably breeding nearby on Bronte Creek river banks)
- Bank Swallow (feeding summer, presumably breeding nearby on banks of Bronte Creek)
- Cliff Swallow (feeding in summer)

(e) Bronte Creek Valleylands (outside the Subject Property but within the Study Area)

The forested habitats of the Bronte Creek valleylands support a large variety of forest birds, including many area-sensitive species. Area-sensitive species noted from the area include Pileated Woodpecker, Hairy Woodpecker, White-breasted Nuthatch, Brown Creeper (*Certhia americana*), Black-throated Green Warbler (*Dendroica virens*), Black-and-white Warbler (*Mniotilta varia*), Ovenbird (*Seiurus aurocapillus*) and Scarlet Tanager. The distribution of these species within the Study Area indicates that the Bronte Creek valleylands provide higher quality habitat than is present in the woodlands on the Subject Property. It appears as if there may be more area-sensitive forest birds in the wider, northern part of the valley (ELC units 13c and 14b), although this may be an artifact of more survey effort having occurred in this part of the valley. The Eastern Wood-Pewee (nationally Special Concern) and Wood Thrush (nationally Threatened) are also found in the valley, as discussed in the following section.

Bank nesting species such as Bank Swallow, Rough-winged Swallow and Belted Kingfisher documented in the valley are likely using exposed creek banks in the vicinity of the Study Area.

3.4.1.5.1 AVIAN SPECIES AT RISK

Based on a review of available background information and data collected through field surveys, it was confirmed that the Study Area supports a number of birds that have been designated provincially and / or federally as SAR. The following is a summary of provincially and/or federally Endangered, Threatened, and Special Concern bird species recorded within the Study Area.

Only species that are listed as provincially Endangered or Threatened are protected by specific regulation under the *Endangered Species Act* (2007) of Ontario. No such bird species were confirmed as breeding on or adjacent to the Subject Property as part of recent studies. Habitat of the other SAR also require consideration, but under the broader category of Significant Wildlife Habitat (SWH) of the PPS. Two such bird species, Wood Thrush and Eastern Wood-Pewee, were confirmed within the Central Woodland on the Subject Property. Their protection is addressed through the identification of the Central Woodland as SWH, as described below.

(a) Barn Swallow (Threatened)

Barn Swallow (*Hirundo rustica*) is listed both nationally and provincially as Threatened. It is listed as Threatened due to population declines, although it is still a common species that is often observed. The species breeds in a variety of building types, especially barns, and is often observed flying or foraging over fields, meadows, waterbodies, watercourses and other successional habitats. This species was not observed as breeding on the Subject Property. Two Barn Swallows were observed flying over the south end of the Subject Property during one of the two visits in 2012. LGL Limited (2008a) also noted Barn Swallow in 2007 but did not observe evidence of breeding in the Study Area.

(b) Bobolink and Eastern Meadowlark (Threatened)

Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*) are area sensitive grassland species that are listed both nationally and provincially as Threatened. LGL Limited (2008a) notes that both these species were observed within the Study Area in 2007 prior to crop removal. These species have not been observed from the Subject Property since that time. There is no suitable habitat for these species on the Subject Property, as they do not nest in row crops, therefore they are no longer considered to be a breeding species on the Subject Property.

(c) Chimney Swift (Threatened)

Chimney Swift (*Chaetura pelagica*) is listed both nationally and provincially as Threatened. This species is most often found in older urban areas as their usual nesting habitat is within open chimneys, or within other human structures. Chimney Swift is an aerial insectivore that forages over a variety of habitats. It is virtually never observed perched, except when on its nest. As with several other SAR, it was listed in 2007 based on declining populations. A single Chimney Swift was observed drinking water from the Pond outside the Subject Property during surveys in 2007, and is not considered to be breeding on the Subject Property.

(d) Bank Swallow (Threatened)

The Bank Swallow (*Riparia riparia*) is listed both nationally and provincially as Threatened. Bank Swallow is an aerial insectivore which creates cavity nests in banks on large lakes, along rivers and in aggregate operations. It is still observed relatively frequently, although it has apparently experienced marked population declines. The TDSPSS recorded this species as breeding in the Study Area in 2008, but does not note where the species was nesting and the species was not re-confimed as part of surveys undertaken by Beacon in 2012 and 2013. There is no suitable nesting habitat on the Subject Property, however there may be nesting habitat along the Bronte Creek valley or possibly in the brick works on the west side of the river. The precise location of this 2008 observation is unknown, but is assumed to be in the Bronte Creek valleylands outside the Subject Property.

(e) Yellow-breasted Chat (Special Concern)

The Yellow-breasted Chat (*Icteria virens*) is listed both nationally and provincially as Special Concern. This species is a songbird that prefers thickets and other early successional habitats. It is very infrequently observed in Ontario, in part presumably because it is at the northern edge of its breeding

range. In Ontario, it does not show much site fidelity (i.e., it tends to use a given site for only a year or two). A single Yellow-breasted Chat was reported in the TDSPSS at the edge of the old field (ELC unit 2f) adjacent to Maple Deciduous Forest (ELC unit 14b) and close to Bronte Creek, but has not been observed in the Study Area since 2008.

(f) Wood Thrush (Threatened federally/Special Concern provincially)

Wood Thrush (*Hylocichla mustelina*) is listed as Threatened nationally and Special Concern provincially. Wood Thrush is a somewhat common songbird species of woodlands, especially larger deciduous woodlands. It has been listed because *"it has shown significant long and short-term declines in population abundance. The species is threatened by habitat loss on its wintering grounds and habitat fragmentation and degradation on its breeding grounds. It also suffers from high rates of nest predation and cowbird parasitism associated with habitat fragmentation on the breeding grounds"* (COSEWIC 2014). Three Wood Thrush were observed by Beacon in 2012 in deciduous forests in the Study Area – one in the Central Woodland (ELC unit 13a) on the Subject Property, and two in the Bronte Creek valley woodlands (ELC units 11 and 14b). The exact locations of previous observations of this species noted in LGL Limited (2008a) and the TDSPSS are unknown, but it is probable that they were from around the same locations.

(g) Eastern Wood-Pewee (Special Concern)

Eastern Wood-Pewee (*Contopus virens*) is listed as a species of Special Concern nationally and provincially. Despite its status, it is a very common songbird species of woodlands of all sizes, and is usually found in deciduous or mixed woodlands, and less frequently in coniferous forests. It can also be found in small, culturally derived woodlands with a semi-open canopy. It has been listed as Special Concern as *"it has experienced persistent declines over the past 40 years both in Canada and the United States. The 10-year rate of decline (25%) comes close to satisfying the criteria for Threatened. The causes of the decline are not understood, but might be linked to habitat loss or degradation on its wintering grounds in South America or changes in availability of insect prey"* (COSEWIC 2014). In any one year, up to four Eastern Wood-Pewee territories were observed in the Study Area. Observations of this species were made from the Central Woodland (ELC unit 13a) and forested portions of the Bronte Creek valleylands (ELC units 11 and 14b). The exact locations of previous observations of this species noted in LGL Limited (2008a) and the TDSPSS are unknown, but it is probable that they were from around the same locations.

3.4.1.5.2 Regionally Rare and Uncommon avian Species

The conservation status of avifauna in Halton Region was determined using McIlveen (2006). A list of all regionally uncommon and rare bird species is included in **Appendix J5**. A total of two regionally rare species and 15 regionally uncommon birds species have been recorded from the Study Area.

In addition to the species already discussed in the preceding section, there are two regionally rare bird species noted from the Study Area: Orchard Oriole (*Icterus spurius*) and Yellow-billed Cuckoo. Orchard Oriole species reaches the northern limit of its range in southern Ontario and is a species frequently

found in human-created semi-treed areas such as orchards, hedgerows, open woods, cemeteries, golf courses, and riparian forests. Orchard Oriole has increased notably in abundance in southern Ontario over the past few decades. For instance, there was a three-fold increase in the Ontario abundance of the species between the first Ontario Breeding Bird Atlas (1981 to 1985) and the second (2001 to 2005) (Cadman *et al.,* 2007). It is now found throughout most of the Carolinian zone (close to half of the atlas squares in the zone recorded this species) as well as in the southern edge of the Lake-Simcoe-Rideau area to the north. Thus, its status as regionally rare is thought to be historical. A single individual was observed in 2008 in the old field beside the railway (ELC unit 2f), while another individual was observed near the junction of hedgerows H4 and H11 in 2012.

Yellow-billed Cuckoo is an uncommon species in Ontario that is infrequently seen. It is found in a variety of open forest and early successional habitats. The TDSPSS reports that a single individual was observed in 2008 adjacent to the Pond just outside the Subject Property.

There are also 15 regionally uncommon species noted from the Study Area, several of which are area-sensitive forest species. Seven uncommon species have been noted as breeding on the Subject Property and 10 uncommon species have been noted as breeding in other portions of the Study Area outside the Subject Property (as listed in **Appendix J5**). The precise breeding location of three uncommon species is not known as they were recorded in the TDSPSS but no location data was provided. Non-breeding species are not discussed here as the status rankings apply to breeding birds only.

3.4.1.5.3 Non-breeding Summer Birds

Most observed non-breeding species have been discussed in the preceding sections. Other non-breeding species recorded in the Study Area, such as Ring-billed Gull (*Larus delawarensis*) appeared to be visiting the Study Area. Cooper's Hawk was also observed but not considered to be breeding in the Study Area.

3.4.1.5.4 Winter Birds

The Peel-Halton Christmas Bird Count is conducted annually. This count, conducted by volunteer birders, encompasses a circle that is 24 km in diameter. Over the last three winters (2010/2011 through 2012/2013), a total of 109 species (plus two hybrids) were observed. However, because the count area is so large and encompasses many habitat types in relation to the Study Area, the data is not very useful for site-specific analyses.

To obtain a better understanding of the avifaunal communities overwintering in the Study Area, Beacon Environmental conducted surveys in the winters of 2012/2013 and 2013/2014. Based on these winter surveys, a small number of wintering species has been found using the Study Area, with the exception of the Infrastructure Ontario Pond (ELC unit 18) which had a relatively high diversity of waterfowl use in early winter prior to the Pond freezing. The following is a list of wintering bird species recorded from the Subject Property:

- Wild Turkey

- Downy Woodpecker
- Blue Jay
- Black-capped Chickadee
- White-breasted Nuthatch
- Dark-eyed Junco
- American Tree Sparrow
- American Goldfinch
- House Finch

All of the above listed species are considered relatively common in southern Ontario and often observed in the winter. Most of these species also breed in the Study Area. The Dark-eyed Junco and American Tree Sparrow are songbirds that breed further north and winter in southern Ontario, amongst other locations. These latter species were observed in the early successional habitats adjacent to the Southern Woodland. While listed as regionally uncommon in Halton, Wild Turkey is a re-introduced species that has become quite common throughout much of southern Ontario. The tracks of this species were observed in many parts of the Study Area. With the exception of Wild Turkey, whose tracks were observed on every survey, most of the listed species were not observed on all visits. In other words, depending on the species, individuals observed may not be present on the Subject Property throughout the winter.

No additional wintering birds were recorded from the Study Area with the exception of the waterfowl listed previously in the Pond, and Hairy Woodpecker and Red-bellied Woodpecker in the tableland forest (ELC unit 14b) outside the Subject Property in the Bronte valley corridor.

3.4.1.6 REPTILES

There is limited background data available on what reptiles are present in the Study Area. Beacon made a request to MNRF at the outset of the work undertaken for all species records intersecting with the Subject Property and adjacent lands. In a letter dated April 23, 2012, MNRF indicated that the Study Area is known to support Snapping Turtle (*Chelydra serpentina*) and Milksnake (*Lampropeltis triangulum*) (both identified as Special Concern nationally and provincially) (**Appendix B1**). The data provided also included a historical record of an unspecified sensitive herpetile species (confirmed as a turtle in correspondence received March 12, 2014), however due to the historical nature of this record (i.e., dated 1942) the species is presumed extirpated.

Reptile observations were noted incidentally during ecological surveys of the Subject Property and Study Areas by LGL Limited (2008a) and North-South Environmental Inc. in 2008 (TSDPSS) respectively. To better document the reptile communities in the Study Area, Beacon conducted targeted surveys on the Subject Property and adjacent lands in 2012 and 2013. These surveys were intended to confirm species presence, and identify specialized reptile habitats such as snake hibernacula, turtle nesting and overwintering areas, as well as general foraging and basking habitats. Monitoring is ongoing.

To assess the turtle habitat, Beacon surveyed habitat conditions on the Subject Property and adjacent lands to identify areas that could be suitable for foraging, basking, nesting, and over-wintering. Aquatic features such as ponds were surveyed to assess for the presence/absence of turtle species. This was done by visiting such features on sunny days in spring and early summer when the probability of observing basking turtles was greatest. Additionally, lands surrounding the aquatic features were surveyed to identify areas suitable for nesting and examine them for egg casings.

To assess the distribution of snake populations and possible hibernacula, Beacon conducted searches of suitable habitats in 2013. Beacon also installed twenty-eight (28) cover boards across the Subject Property in early spring 2013. Cover boards can generally improve detection of snakes as they provide opportunities for shelter. Cover "boards" utilized for this study consisted of 1 m x 1.5 m sheets of black polyethylene (heavy duty garbage bags). These were installed in habitats where snakes were most likely to be found (i.e., at edges of woodlands and wetlands) and distributed widely to span the Subject Property. The cover boards were installed flush with the ground surface secured with pins, and assessed on seven occasions between June and September 2013. Observations recoded species, sex (if known), number of individuals, and approximate length.

Reptile survey and cover board locations are illustrated on **Figure 3.16**. Survey details are provided in **Table 3.4-8** and results are presented in **Table 3.4-10** below.

Table 3.4-8 - 2013 Reptile Survey Details

Details	June 6	June 19	July 5	July 10	Aug 20	Aug 30	Sept 6
Temperature (^{O}C)	12	20	21	23	28	27	14
Wind Speed (Beaufort Scale)[1]	2-3	1	0-1	2	1	1	1
Precipitation (type)	None	None	Light rain	None	None	None	None
Cloud Cover (%)	100	20-30	100	90	0	50-100	20

[1]Beaufort Scale: **0** = calm, <1km/h; **1** = light air, 1-5.5 km/h; **2**= light breeze, 5.6-10 km/h; **3** = Gentle breeze, 12-19 km/h

3.4.1.6.1 TURTLES

In addition to the MNRF record, a 2010 record for Snapping Turtle was found in the NHIC database. Midland Painted Turtle (*Chrysemys picta marginata*) and Snapping Turtle were reported from the Study Area by LGL Ltd. (2008a). The TDSPSS also reported occasional Snapping Turtles and two Painted Turtles at the edge of the Infrastructure Ontario Pond (ELC unit 18).

During the 2012 and 2013 field investigations, Beacon observed the same two turtle species in ELC unit 18. Turtle observations from 2012 and 2013 are summarized in **Table 3.4-9**.

Table 3.4-9 - Turtle Observations in ELC unit 18 (Pond) over 2012 and 2013

Date	Turtle Species	Number of Individuals	Habitat Use Notes
June 7 2012	Midland Painted Turtle	2	Basking in or around Pond (ELC unit 18)
June 19 2013	Midland Painted Turtle	19	Basking in or around Pond (ELC unit 18)
July 10 2013	Midland Painted Turtle	11	Basking in or around Pond (ELC unit 18)
Aug 20 2013	Midland Painted Turtle	26	Basking in or around Pond (ELC unit 18)
Aug 20 2013	Snapping Turtle	5	Swimming in or basking at surface of Pond (ELC unit 18)
Aug 30 2013	Midland Painted Turtle	14	Basking in or around Pond (ELC unit 18)

Additionally, a Painted Turtle shell (carapace and plastron) was found crushed (presumably by tractor) in the soybean field east of the Pond, suggesting that this species may range into the fields of the subject Property.

Both species listed above are considered relatively common in southern Ontario and are often observed in or along the edges of ponds, rivers or wetlands with open water and suitable basking habitat.

The Midland Painted Turtle inhabits water bodies such as ponds, marshes, lakes and slow-moving creeks with soft substrates, abundant basking sites and aquatic vegetation. Although the Midland Painted Turtle is widespread in Halton, it is not commonly observed in urban areas or intensively cultivated parts of the south and east of the Region (Crins *et al.* 2006).

Snapping Turtle is listed as a species of Special Concern nationally and provincially. Despite its status, it is a very common turtle and can be found in waterbodies and wetlands of all sizes that have slow-moving water with a soft mud or sand substrate and abundant vegetation. It has been listed as Special Concern because *"long-term studies of two populations in Ontario have demonstrated that even large and apparently secure populations are vulnerable to increases in adult mortality and do not recover quickly from declines. Life-history models indicate that only slight increases (0.1) in annual adult mortality (such as from road mortality or harvesting) will cause a population to be halved in under 20 years"* (COSEWIC 2008). The Snapping Turtle remains relatively abundant in eastern Canada and is also widespread throughout Halton (Crins *et al.* 2006). As indicated in the table above, Snapping Turtle was observed once in the Infrastructure Ontario Pond (ELC unit18).

3.4.1.6.2 SNAKES

In addition to MNRF records for Milksnake, Eastern Garter Snakes (*Thamnophis sirtalis sirtalis*) were reported by the TDSPSS in the Bronte Creek forest, and Eastern Garter Snake and Northern Brown Snake (*Storeria dekayii*) were reported by LGL Limited (2008a).

Snake species observed in the Study Area by Beacon include Eastern Garter Snake, Northern Brown Snake, Milksnake, and Red-bellied Snake (*Storeria o. occipitomaculata*). Snakes were observed under cover boards as well as existing natural and artificial cover objects. Garter Snakes were found in various locations in the Study Area, primarily within old field habitats, and along woodland edges and hedgerows. Dekay's Brown Snake and Red-Bellied Snake were found in similar habitats. Milksnake observations were limited to ELC unit 26, a thicket swamp adjacent to the large Pond (ELC unit 18).
Milksnake is Special Concern nationally and provincially, and considered regionally uncommon in Halton (Curry 2006). Several Milksnakes were found in ELC unit 26 (thicket swamp east of Pond). The Eastern Garter Snake, Dekay's Brown Snake, and Red-bellied Snake are common species in Ontario and Halton Region. Snake observations are summarized in

Table 3.4-10**.**

Table 3.4-10 - Results of 2013 Snake Surveys

Date	Species	Number observed	Location/ Cover Board #	Notes
June 06 2013	Milksnake	1	ELC unit 26 (SWT2-2), eastern edge	under existing/natural cover, approx. 40 cm snout-to-tail length
June 19 2013	Eastern Gartersnake	3	One under board 4 (ELC unit 1a, CUM1) Two in ELC unit 1a (CUM1)	under existing/natural cover
	Milksnake	1	ELC unit 26 (SWT2-2)	under existing/natural cover, approx. 20 cm head-tail length
July 5 2013	Eastern Gartersnake	3	Two in ELC unit 2a (CUM1) One under board 12 (Hedgerow 10)	
	Milksnake	1	ELC unit 26 (SWT2-2) - edge of field at wetland	under existing/natural cover
July 10 2013	Eastern Gartersnake	5	Two under board 10 (Hedgerow/CUM1) Two under board 4 (ELC unit 1a, CUM1) One near board 3 (ELC unit1a/ 2b, CUM1)	in open grass
	Milksnake	1	ELC unit 26 (SWT2-2), edge of field at wetland	under existing/natural cover
	Dekay's Brownsnake	1	Hedgerow 7 near board 25	under existing/natural cover
	Red-bellied Snake	1	Board 20 (Hedgerow 6)	
Aug 20 2013	Dekay's Brownsnake	2	ELC unit 26 at field-wetland edge	under existing/natural cover
	Eastern Gartersnake	4	One under board 10 (Hedgerow/CUM1) Two under board 19 (Hedgerow 5) One in ELC unit 1a,2a under existing/natural cover	three shed skins also found
Aug 30 2013	None			
Sep 06 2013	None			

All of the snake species listed above are considered relatively common in southern Ontario and can be associated with a wide variety of natural and cultural habitats. Eastern Gartersnake, Dekay's Brownsnake and Red-bellied Snake are all common throughout their respective ranges in Ontario and Halton Region.

Milksnake can be found in a variety of habitats including fields, swamps and open woodlands that provide suitable cover for egg laying, hibernation and thermoregulation. It can also be found in pastures, hayfields, barns, sheds and houses. It is widespread in Ontario but has been listed as Special Concern because *"anecdotal information indicates that it occurs in small numbers"* and the species is *"subject to high levels of road kill and is still deliberately killed because of its resemblance to venomous species"* (COSEWIC 2002). Milksnake is relatively common in natural areas and agricultural fields in Halton, but is generally absent from its urbanized areas and the intensive agricultural south-central portions of the Region. This species is also frequently found in abandoned farmland adjacent to urban areas prior to their development as these areas have high rodent populations and large amounts of artificial cover (Crins *et al.* 2006).

3.4.1.7 AMPHIBIANS

There is limited background data available on what amphibian species are present in the Study Area. In a letter dated April 23, 2012, MNRF indicated that there is a historical record of a herpetile SAR known from the Study Area; however does not distinguish the species or whether it is a reptile or amphibian for data sensitivity concerns. More informative are the results from the amphibian call surveys carried out by LGL Limited in the vicinity of the Pond adjacent to the Subject Property on three occasions in the spring of 2007. Details of these surveys are included in LGL Limited (2008a). Amphibians were also noted incidentally by North-South Environmental Inc. in 2008 as part of the TDSPSS.

LGL Limited (2008a) reported four frog species and one toad species, all of which were associated with the Infrastructure Ontario Pond adjacent to the property (ELC unit 18). Species documented were: Green Frog (*Rana clamitans*), Spring Peeper (*Pseudacris crucifer*), Gray Tree Frog (*Hyla veriscolor*), Wood Frog (*Rana sylvatica*), and American Toad (*Bufo americanus*). AECOM (2009) reported one Gray Tree Frog and one Spring Peeper calling from ELC unit 18 during a single late spring visit in 2008.

Beacon conducted amphibian call surveys on the Subject Property and adjacent lands in the spring and early summer of 2012, 2013, and 2014. Monitoring was completed in accordance with Environment Canada's Marsh Monitoring Program (2009) protocols. Potential breeding habitats such as wetlands and ponds were surveyed after dusk under suitable weather conditions. Weather details (i.e., air temperature, precipitation, wind speed, and cloud cover) of the 2012, 2013, and 2014 amphibian call surveys are summarized in **Table 3.4-11.**

Surveys were conducted using the point count method whereby the surveyor stands at a set point for a specific period of time and records all species that can be heard calling from the location. Each survey station was surveyed for three minutes. Calling activity for each species detected was assigned a call code as follows:

Call Code 1 - individuals of one species can be counted, calls not simultaneous
Call Code 2 - some calls of one species simultaneous, numbers can be reliably estimated
Call Code 3 - full chorus, calls continuous and overlapping.

For call codes 1 and 2, the estimated number of calling individuals was recorded.

The surveys focused on the Pond immediately to the west of the Subject Property, and wetlands within the Central Woodland and agricultural fields. The locations of amphibian monitoring stations are illustrated on **Figure 3.16**.

Table 3.4-11 - Amphibian Call Survey Details for field studies done in 2012, 2013 and 2014

Details	2012		2013			2014		
Date	19-Apr	23-May	18-Apr	6-May	11-Jun	13-Apr	12-May	1-Jun
Time	20:30	21:15	21:00	22:45	23:15	21:45	22:15	21:30
Temperature (^{o}C)	17	21	20	10	20	20	17	25
Wind (Beaufort Scale)[1]	2	1	1	0	0	1	1	1
Precipitation	None	None	None	None	None	None	None	None
Cloud Cover (%)	-	0	50	0	80	25	50	50

[1]Beaufort Scale: **0** = calm, <1km/h; **1** = light air, 1-5.5 km/h; **2**= light breeze, 5.6-10 km/h

Beacon recorded a total of four amphibian species from within and adjacent to the Subject Property during the 2012, 2013, and 2014 surveys. Species observed include Spring Peeper, Gray Tree Frog, American Toad, and Green Frog. This is consistent with the species recorded previously, except for Wood Frog. A summary of the survey results is presented in **Table 3.4-12.** A single Gray Tree Frog was also heard calling from Hedgerow 4 (H4). All the amphibian species documented by Beacon are common throughout their respective ranges in Ontario and Halton Region.

Table 3.4-12 - Breeding Amphibians Activity during Nocturnal Call Surveys (2012-2014)

Location (ELC unit)	2012		2013			2014		
	19-Apr	23-May	18-Apr	6-May	11-Jun	13-Apr	12-May	1-Jun
18	SPPE: 3 AMTO: 2(2)	SPPE: 3 GRTR: 2(6)	SPPE: 3	SPPE: 3	GRTR: 3	SPPE: 3 AMTO: 1(1)	SPPE: 3 GRTR: 1(2)	GRTR: 2(6) GRFR: 2(6)
21c	-	-	SPPE: 2(6) AMTO: 2(5)	GRTR: 1(1)	SPPE: 1(1)	-	SPPE: 2(2) GRTR 1(1)	-
Field east of ELC Unit 11	-	-	AMTO: 2(5)	-	-	-	-	-
19	-	-	-	-	-	AMTO – 2(3)	-	-

SPPE = Spring Peeper, AMTO = American Toad, GRTR = Gray Tree Frog, GRFR = Green Frog

Code 1 - Individuals can be counted; calls not simultaneous. Estimated number of individuals indicated in brackets

Code 2 - Calls distinguishable; some simultaneous calling. Estimated number of individuals indicated in brackets

Code 3 - Full chorus; calls continuous and overlapping.

Incidental amphibian observations include over 160 Green Frogs (young adults) around the edge of the Infrastructure Ontario Pond (ELC unit 18) and approximately 20 American Toad tadpoles in the Pond in 2012. An American Toad was also observed in the Central Woodland in 2012. Approximately 12 Green Frogs were heard calling from ELC unit 18 during daytime surveys on June 19, 2013. Other amphibians observed include a single observation of an immature Eastern Newt (*Notophthalmus viridescens*) in ELC unit 21c on August 30, 2013. A summary of incidental amphibian observations from 2012 and 2013 is presented in **Table 3.4-13.** Only targeted amphibian surveys were undertaken in 2014, therefore no incidental observations were recorded. All amphibians observed in the Study Area are common in Ontario and Halton Region.

Table 3.4-13 - Incidental Amphibian Observations Recorded in 2012 and 2013

Date	Amphibian Species	Quantity	Location
June 7 2012	Green Frog	>160	ELC unit 18
June 7 2012	American Toad	20	ELC unit 18
June 19 2013	Green Frog	12	ELC unit 18
July 10 2013	American Toad	3	Field edges
July 10 2013	Green Frog	4	ELC unit 18
Aug 20 2013	Green Frog	9	ELC unit 18

Date	Amphibian Species	Quantity	Location
Aug 30 2013	Eastern Newt (red eft – juvenile)	1	ELC unit21c
Aug 30 2013	Grey Treefrog	1	Field edge near ELC Unit 26
Sep 6 2013	American Toad	1	Field edge
Sep 6 2013	Grey Treefrog	1	ELC unit 1b

The results of the breeding amphibian surveys indicate that the most consistently productive amphibian breeding area is the Infrastructure Ontario Pond (ELC unit 18) and associated wetlands situated just west of the Subject Property.

Several smaller sites in close proximity to the Pond appear to be used variably by a smaller number of amphibians. These sites include ephemeral wet depressions in agricultural fields (favoured by American Toads) and small meadow marsh features (ELC units 19 and 21c) associated with the Central Woodland. The use of these other moist to wet sites by amphibians is variable and seems to be contingent on the amount of spring rainfall or snow melt in a given year, as well as annual variation in farming practices.

3.4.1.8 SALAMANDERS

Formal salamander studies (i.e., drift netting/trapping/collection) were not undertaken because (a) there were no recent records for salamanders on the Subject Property noted in by LGL Ltd. (2008a) or the TDSPSS, (b) initial surveys done by Beacon did not detect any suitable habitat for pond-breeding salamanders, and (c) wildlife surveys were not a requirement of the EIR/FSS Terms of Reference, therefore more general amphibian surveys were considered adequate for this site.

Beacon did survey the Subject Property and immediately adjacent lands in Bronte Creek valley for potentially suitable salamander breeding habitat in April 2012 and April 2013, as well as incidentally as part of other surveys. The only member of the Salamandridae family that was observed during field investigations was Eastern Newt, observed in ELC unit 21 – a reed canary grass meadow marsh in the southern corner of the Central Woodland. It is also likely that the Central Woodland and the woodlands associated with the Bronte Creek valley support populations of Eastern Red-backed Salamander, as portions of these woodlands contain suitable cover and substrates. However, despite efforts to flip logs and rocks, none were observed .

With respect to pond-breeding salamander species, suitable habitat is limited on the Subject Property. There are several depressions in the Central Woodland that do hold some water, but these are generally too shallow to support breeding activity. No evidence of breeding (i.e., spermatophores/egg masses) was noted from these depressions despite observing them during appropriate seasons. The only potential breeding habitat for salamanders would be the Pond and perhaps the vernal pools in the woodland immediately to the northwest of the Pond. However no evidence of salamander breeding (i.e., spermatophores/egg masses) was noted from these areas.

3.4.1.9 ODONATES AND LEPIDOPTERA

Surveys for Lepidoptera (butterflies) and Odonates (dragonflies and damselflies) were not conducted by LGL Ltd. (2008a) or as part of the TDSPSS. To address this data gap, Beacon conducted surveys for Lepidoptera and Odonates over the summer of 2013 in conjunction with reptile surveys. The survey area included the Subject Property and the Infrastructure Ontario Pond. Weather conditions on the survey dates are summarized in **Table 3.4-14.**

Table 3.4-14 - Weather conditions on dates of Odonate and Lepidopteran Surveys

Details	June 6, 2013	July 10, 2013	Aug 20, 2013	Aug 30, 2013
Temperature (^{O}C)	12	23	28	27
Wind Speed (Beaufort Scale)[1]	2-3	2	1	1
Precipitation (type)	None	None	None	None
Cloud Cover (%)	100	90	0	50-100

[1]Beaufort Scale: **0** = calm, <1km/h; **1** = light air, 1-5.5 km/h; **2**= light breeze, 5.6-10 km/h

A total of seven butterfly species and 11 dragonfly and damselfly species were recorded in the study area. Odonate and Lepidoptera observations are summarized in **Table 3.4-15.** One regionally rare dragonfly, Wandering Glider (*Pantala flavescens*), was observed in an old field on the Subject Property in 2013. Monarch Butterfly, a Special Concern species, was also observed in 2013.

Table 3.4-15 - Summary of 2013 Odonate and Lepidoptera Observations

Date	Scientific Name	Common Name	Number observed	Habitat	COSSARO[1]	S-Rank[2]	Halton[3]
Lepidoptera							
July 10 2013	*Danaus plexippus*	Monarch	2	Old field & Southern Woodland	SC	S4	C
July 10 2013	*Cercyonis sp*	Wood Nymph	1	Central Woodland			
July 10 2013	*Papilio polyxenes*	Black Swallowtail	2	Old field & wetland		S5	C
July 10 2013	*Nymphalis antiopa*	Mourning Cloak	1	Agricultural field		S5	C
July 10 2013	*Subfam. Theclinae*	Hairstreak species	1	Hedgerows			
July 10 2013	*Pieris sp*	Cabbage White	3	Farm fields & old field			
July 10 2013	*Colias philodice*	Common Sulphur	2	Hedgerows		S5	C
Odonates							
June 19 2013	*Pachydiplax longipennis*	Blue Dasher	1	Wetland		S5	C

Date	Scientific Name	Common Name	Number observed	Habitat	COSSARO[1]	S-Rank[2]	Halton[3]
June 19 2013	*Libellula pulchella*	12-Spot Skimmer	1	Old field & wetland		S5	C
June 19 2013	*Sympetrum sp.*	Meadowhawk species	2	Old field			
July 10 2013	*Anax junius*	Green Darner	1	Wetland		S5	C
July 10 2013	*Sympetrum sp.*	Meadowhawk species	1	Wetland			
July 10 2013	*Pantala flavescens*	Wandering Glider	1	Old field		S4	R
July 10 2013	*Ladona julia*	Chalk-fronted Corporal	1	Wetland Pond		S5	C
Aug 20 2013	*Sympetrum obtrusum*	White-faced Meadowhawk	1	Old field & hedgerow		S5	C
Aug 20 2013	*Aeshna sp*	Mosaic Darner	2	Wetland & old field			
Aug 20 2013	*Tramea lacerata*	Black Saddlebags	1	Old field		S4	C
Aug 20 2013	*Enallagma sp*	Bluet species	5	Wetland Pond			
Aug 30 2013	*Anax junius*	Green darner	1	Old field		S5	C
Aug 30 2013	*Aeshna sp*	Mosaic Darner	3	Old field & wetland			
Aug 30 2013	*Enallagma sp*	Bluet species	3	Wetland Pond			
Aug 30 2013	*Sympetrum obtrusum*	White-faced Meadowhawk	4	Old field & farm fields		S5	C
Aug 30 2013	*Libellula sp.*	Skimmer species	1	Wetland			
Sep 6 2013	*Tramea lacerata*	Black Saddlebags	3	Old fields		S4	C

[1] Committee on the Status of Species at Risk in Ontario. **SC** = Special Concern

[2] S-Rank (Provincial Status - NHIC) **S4** = apparently secure; **S5** = secure

[3] Halton (Regional Status - Wormington, 2006; Rothfels, 2006). **C =** Common; **R** = Rare

The Monarch butterfly is a Species at Risk in Ontario and is designated Special Concern due to declining population numbers primarily resulting from loss of wintering habitat in Mexico and stop-over habitat in North America. However, it is considered common in Halton Region and is generally common throughout southern Ontario.

Wandering Glider, observed in an old field on the Subject Property, is a dragonfly that has been assigned a status of “rare” in Halton, but whose distribution and abundance are not well-studied.

All other butterflies and dragonflies that could be identified to the species level observed on the Subject Property are considered provincially secure or regionally common. A number of individuals observed could only be identified to the genus level.

3.4.2 AQUATIC RESOURCES

The EIR/FSS Terms of Reference outline the requirements for the aquatic resource investigations in the following three categories: EIR Subcatchment Areas Level of Detail, Draft Plan Level of Detail, and Modified Stream Reaches. However for the purpose of this study, data was collected to address all three phases, as reported in the following sections. The fish and fish habitat assessment has also been prepared in accordance with the EIR/FSS Terms of Reference, and builds on the data collected and analyses conducted in the TDSPSS.

3.4.2.1 AQUATIC HABITAT ASSESSMENT

Based on background information, site investigations and air photo interpretation there are five drainage features on the Subject Property and a total of seven within the Study Area. Five of the drainage features are regulated by Conservation Halton (i.e., 14W-17, 14W-17Cb, BCT-R1, BCT-R3 and BC-R2) as shown in **Figure 3.9**. Both Tributary 14W-17 and Bronte Creek originate northwest of the Study Area, while the remaining three drainage features originate within the Study Area. The remaining drainage features are considered hydrologic connections that originate in small wetland pockets within the agricultural fields, or collect surface water from runoff based on local topographic variations.

Aquatic habitat assessments have been completed through various studies on the watercourses and hydrologic connections identified on the Subject Property and Study Area. As part of this study, Beacon has reviewed and summarized all existing information to characterize the watercourses and drainage features. In addition to the available background information, Beacon undertook aquatic habitat assessments of watercourses and reconnaissance level assessments of the hydrologic connections on and adjacent to the Subject Property on September 16 and 25, 2013. The assessment of aquatic resources and habitat within the Subject Property was completed based on the Rapid Assessment Methodology as described in Section 4 Module 4 of the Ontario Stream Assessment Protocol (OSAP) (Stanfield *et al.,* 2010). The surveys involved a visual assessment of the following characteristics of each watercourse:

- stream morphology, runs, pools, riffles;
- channel width and depth profile, bank height, bank stability;
- substrate types and distribution;
- seepage areas;
- dams and obstructions;
- riparian and in-stream cover type and extent;
- floodplain vegetation;
- wetland and Pond areas; and
- side channels and floodplain.

The approximate locations of aquatic habitat assessment sites in the Study Area are shown on **Figure 3.16**. Aquatic resources in Bronte Creek are well documented, and the creek is also well outside the

Subject Property, therefore Beacon did not complete any additional site-specific surveys on Bronte Creek's tributaries in the Study Area.

Beacon assessed the watercourses located on the Subject Property to document the existing aquatic conditions, and completed a detailed comparison of features with the findings from the TDSPSS. The features were classified according to flow regime, defined as follows:

- **Permanent Watercourse** – maintains continuous surface flows most years, well defined low-flow.
- **Intermittent Watercourse** – water flows for several months during the year, typically during the spring and early summer when water table is high, and late fall; these watercourses have a defined high-flow channel with a poorly defined or absent low flow channel.
- **Ephemeral Watercourse** – water flows for a short period of time primarily in response to snow melt (spring freshet) or storm events, typically have no clearly defined high or low-flow channel or sorting of substrate, frequently occurring as vegetated swales or bare soils rills in agricultural fields where they are often ploughed through.

The results of these assessments are described in the following sections.

3.4.2.1.1 Fourteen Mile Creek Tributaries (Regulated Watercourses)

The Fourteen Mile Creek drains a watershed area of approximately 40 km^2, contains several large tributaries and flows directly into Lake Ontario. The majority of the Subject Property is located within this watershed.

There are two watercourses regulated by Conservation Halton (14W-17 and 14W-17Cb) located within the Subject Property. These two watercourses and several hydrologic connections were assessed on the Subject Property to determine flow conditions and to identify potential aquatic habitat features.

Tributary 14W-17 originates approximately 1 km northwest of the Subject Property and is described as a permanent watercourse. This channel was realigned in association with the construction of Highway 407. The watercourse flows through a cattail mineral shallow marsh (ELC unit 24c). At the time of the investigation the channel was choked with terrestrial vegetation and there was minimal surface flow. Substrates consisted mostly of rip-rap with areas of fines including silt and sand. The feature is poorly defined in some areas with dispersed flow. The watercourse flows through a 2300mm CSP culvert under Tremaine Road.

14W-17Cb is located at the south east corner of the Subject Property by Dundas Street. The TDSPSS described this feature as a vegetated swale or depression that has no defined morphology. Tributary 14W-17Cb was assessed as an intermittent watercourse and was dry during the September 2013 site visit. Similar to the findings in the TDSPSS, feature conditions upstream of the farm laneway were ploughed and planted. Several small rills were observed which convey water to the small CSP culvert located under the laneway. Feature conditions immediately downstream of the laneway to the

hedgerow/fence line were also ploughed, planted and driven through. No obvious signs of water conveyance were noted within this reach and likely water movement is through the tire tracks.
On the downstream side of the hedgerow/fence line, a vegetated swale was evident towards Dundas Street along 14W-17Cb. The swale feature was dry and planted to the edges with soybean crops, then flowing through a cattail mineral shallow marsh (ELC unit 24a). Soils were moist in this location however there was no evidence of standing or pooled water. As detailed in the TDSPSS, downstream of Dundas Street, this watercourse is classified as an intermittent, channelized or straightened system that does not provide fish habitat. An on-line pond is also located downstream (off-site) which likely acts as a fish migration barrier to upstream reaches.

3.4.2.1.2 Bronte Creek (Regulated Watercourses) and Infrastructure Ontario Pond

Bronte Creek is located adjacent to the Subject Property along the south-western edge of the Study Area and is a permanently flowing watercourse. Bronte Creek drains an area of approximately 312 km^2 and drains directly into Lake Ontario. There are three watercourses associated with Bronte Creek regulated by Conservation Halton (BC-R2, BCT-R1 and BCT-R3) located outside of the Subject Property but within the Study Area. Background information was used from the TDSPSS to characterize these watercourses, as described below.

BCT-R1 is a steep deeply entrenched channel that originates from the Infrastructure Ontario Pond (ELC unit 18) and is an intermittent watercourse that discharges into Bronte Creek. The Pond overflow is lined with rip-rap and gradually flows into a naturalized channel within the valley. The channel is located in a deciduous forest (ELC unit 13c) which provides good riparian cover.

The Pond is approximately 1.2 ha in size, and is located adjacent to the main Bronte Creek valley. The Pond is fed by surface water and runoff from the agricultural fields and discharges to BCT-R1. The Pond is more than 2m deep and contains dense aquatic vegetation including milfoil (*Myriophyllum sp.*). In-situ chemistry sampling done during the TDSPSS found anoxic conditions below the 2 m depth interval.

3.4.2.1.3 Hydrologic Connections

As described above in **Section 3.3.9**, there are several surface water features (i.e., hydrologic connections) within the Subject Property (i.e., 14W-17A - a, b, c; 14W-17B - a, b, c; 14W-17Cc, BCT-R2, BCT-R3b) that have very small catchment areas and do not convey flows sufficient to create defined channels. These features have been altered by historical and ongoing agricultural practices which have changed their function.

During the September 2013 site visit, each of these features was found to be dry. Additional channels were observed that have likely been constructed for agricultural purposes to convey ephemeral flows away from the fields during the spring freshet and high rain events. Their capacity to convey nutrients and allochthonous material to downstream reaches is likely low due to poor channel definition,

agricultural practices and lack of connectivity to downstream reaches. Therefore all of these features have been assessed as low constraint, which is consistent with the TDSPSS constraint ranking.

3.4.2.2 FISH COMMUNITY ASSESSMENT

Fish community assessments in the Study Area were based entirely on background information. Conservation Halton, MNRF and other environmental consultants have previously undertaken fish sampling at multiple locations within proximity of the Subject Property between 1990 and 2002. Fish community records compiled by LGL Limited (2008a) and the TDSPSS from a variety of sources, including MNRF and Conservation Halton, were used to characterize the main branch of Bronte Creek and Fourteen Mile Creek tributaries, as described in the following sections.

3.4.2.2.1 FOURTEEN MILE CREEK TRIBUTARIES

Fish community surveys have been completed in reach 14W-17 downstream of Tremaine Road. Several fish species were captured within the pools, including; Brook Stickleback (*Culaea inconstans),* Fathead Minnow *(Pimephales promelas),* White Sucker *(Catostomus commersonii*), and Creek Chub. Downstream of the Study Area, fish species reported from the west branch of Fourteen Mile Creek include:

- Creek Chub
- Western Blacknose Dace (*Rhinichthys obtusus*)
- White Sucker
- Fathead Minnow
- Brook Stickleback
- Brown Bullhead (*Ameiurus nebulosus*), and
- Redside Dace.

The fish species identified are a mix of coolwater and warm water species, and are all common in Ontario, and moderately tolerant to environmental or anthropogenic stresses, except for Redside Dace, discussed further in the following section.

Tributary 14W-17 may provide direct fish habitat during periods of high water levels when low flow does not create a barrier to fish movement. Tributary 14W-17Cb provides indirect fish habitat by conveying flow and nutrients to downstream reaches.

3.4.2.2.2 BRONTE CREEK

Adjacent to the Subject Property but within the Study Area, Bronte Creek has been classified as providing warm water sport fish habitat with high aquatic ecosystem health (Conservation Halton 2002). This portion of Bronte Creek supports a diverse resident warm water fish community and provides a migratory corridor/spawning area for Lake Ontario salmonids.

Two aquatic Species at Risk, have been identified within the Bronte Creek watershed: Redside Dace (*Clinostomus elongatus*) and Silver Shiner (*Notropis photogenis*). Redside Dace are found in Bronte Creek, upstream of Progreston Falls (approximately 16 km northwest of the Study Area), while Silver

Shiner is common in the lower reaches of Bronte Creek (as per the TDSPSS). Silver Shiner has been collected from Bronte Creek within the Study Area, in addition to reaches upstream and downstream (as per the TDSPSS).

Within the lower reaches of Bronte Creek, 44 species of fish were reported between 1990 and 2002 as summarized in the TDSPSS. Common species include:

- Northern Hog Sucker (*Hypentelium nigricans*)
- River Chub (*Nocomis micropogon*)
- Rock Bass (*Ambloplites rupestris*)
- Pumpkinseed (*Lepomis gibbosus*)
- Common Shiner (*Luxilus cornutus*)
- Bluntnose Minnow (*Pimephales notatus*), and
- Creek Chub (*Semotilus atromaculatus*).

The fish species identified are a mix of cool water and warm water species. All of the species are common in Ontario and moderately tolerant to environmental or anthropogenic stresses.

Fisheries information for the Infrastructure Ontario Pond is very limited. There are historical reports that bass were stocked by a local landowner. Prior efforts to catch fish from the Pond have not been successful. As part of the TDSPSS, experimental gill nets of varying sizes were deployed into the Pond for approximately 4 hours in September 2008. No fish were collected. Electrofishing the shoreline also resulted in no fish.

3.4.2.2.3 REDSIDE DACE (CLINOSTOMUS ELONGATUS)

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, in the Holland River drainage, in 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, although this species is most often present in gravel/cobble bed habitat and with a shallow surface covering of silt or detritus (RDRT 2010). Redside Dace is a coolwater species usually associated with water temperatures that do not exceed 24°C and dissolved oxygen concentrations of at least seven milligrams per litre (McKee and Parker 1982).

Redside Dace spawning typically occurs when water temperatures reach 16°C to 18°C on gravelly riffles, where it lays its eggs in the gravel nests of other common tolerant coolwater fishes such as Creek Chub

(*Semotilus atromaculatus*) and Common Shiner (*Luxilus cornutus*). This strategy improves egg survival through the guarding behaviour of these species which protect the eggs and keep them free of silt.

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), using overhanging vegetation as cover and as feeding areas, as insects are often concentrated in these areas.

These specialized spawning and feeding strategies make Redside Dace more susceptible to habitat disturbance than other coolwater fish species. In addition, because they are most often associated with small, cool headwater streams, they are sensitive to siltation and tend not to be widely dispersed. 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 aquatic ecosystems. When habitat quality starts to decline, Redside Dace are immediately affected (TRCA 2004).

Redside Dace is listed as Endangered and protected (along with its regulated habitat) under the Ontario *Endangered Species Act* (2007). It also has an S-rank of S2 indicating that it is imperilled and vulnerable to extirpation in the Province (NHIC 2013).

The Redside Dace Recovery Strategy was prepared in February 2010 and provides a framework for securing the sustainability of Redside Dace in Ontario. Ontario Regulation 293/11 was released in July 2011, and s. 29.1(1) defines Redside Dace habitat as:

i. any part of a stream or other watercourse that is being used by a Redside dace,
ii. any part of a stream or other watercourse that was used by a Redside dace at any time during the previous 20 years and that provides suitable conditions for a Redside dace to carry out its life processes,
iii. the area encompassing the meander belt width of an area described in subparagraph i or ii,
iv. the vegetated area or agricultural lands that are within 30 metres of an area described in subparagraph iii, and
v. a stream, permanent or intermittent headwater drainage feature, groundwater discharge area or wetland that augments or maintains the baseflow, coarse sediment supply or surface water quality of a part of a stream or other watercourse described in subparagraph i or ii, provided the part of the stream or watercourse has an average bankfull width of 7.5 metres or less.

Targeted Redside Dace sampling carried out by Conservation Halton in 2007 showed that there is a substantial population of Redside Dace in Fourteen Mile Creek.

The MNRF was contacted on April 12, 2012 to request information on the presence of regulated Redside Dace habitat on and adjacent to the Subject Property. The response from OMNR (M. Thompson-Black 2012), indicated that 14W-17 is regulated habitat for Redside Dace (**Appendix J6**).

Further consultation with MNRF was sought to clarify the classification and the extent of regulated habitat on the Subject Property. John Pisapio (Biologist with Aurora District MNRF) visited the Subject Property on August 8, 2012 to undertake a more in-depth evaluation of reach 14W-17 and tributary 14W-17Cb, both tributaries to the West Branch of Fourteen Mile Creek. Based o the site visit, MNRF concluded the following with regards to regulated Redside Dace habitat on and in the vicinity of the Subject Property:

- Tributary 14W-17 (west of Tremaine Road, within the Subject Property) – Redside Contributing Habitat
- Tributary 14W-17 (east of Tremaine Road, outside the Subject Property) – Redside Recovery Habitat
- Tributary 14W-17Cb (west of Tremaine Road, within the Subject Property) – Not Redside Dace Habitat

3.4.2.2.4 SILVER SHINER

The Silver Shiner is listed as Threatened and has a Provincial S-rank of S2/S3, indicating that it is provincially imperilled and vulnerable to extirpation (NHIC 2013).

A Recovery Strategy has not yet been prepared for the Silver Shiner, nor has a specific habitat type been regulated for this species. Within Conservation Halton's jurisdiction, Bronte Creek is the only watercourse that has been identified as supporting Silver Shiner populations.

The Silver Shiner is a silvery, elongate fish that reaches a maximum length of about 14.3 cm. In Canada, this species is present only in southwestern Ontario where it occurs most frequently in tributaries of lakes St. Clair (Thames River), Erie (Grand River) and Ontario (Bronte Creek). Silver Shiner is found primarily in larger watercourses with widths typically greater than 20 m, typically in deep riffles or pools.

Not much is known about the Silver Shiner spawning and it is assumed that they migrate upstream and spawn in deep riffles. Spawning occurs when water temperatures reach 18°C to 24°C in late May to mid-June. The Silver Shiner is an opportunist that feeds at the surface or in-mid water, feeding on aquatic larval insects, worms, crustaceans, water mites and algae. It sometimes leaps out of the water to catch flying insects.

Destruction and degradation of habitat have been the major factors in the reduction of Silver Shiner distribution. Siltation, poor water quality, dams and other barriers, channelization, introduced species, and bait harvesting have all reduced suitable habitat and food sources for this species.

3.4.2.3 AQUATIC HABITAT CATEGORIZATION AND ANALYSIS

An aquatic habitat assessment for the Subject Property and adjacent lands was undertaken as part of the TDSPSS based on the 1999 Natural Heritage Reference Manual, North Oakville Subwatershed Study (2008), and the DFO Drain Classification System (DFO 1999) as recommended by MNRF and cited in the TDSPSS.

Aquatic habitat was categorized as "critical", "important", or "marginal" based on: 1) habitat rarity; 2) habitat sensitivity to development; 3) contribution to fish community; 4) presence of ground water discharge; 5) degree of naturalness/level of disturbance; 6) the presence of habitat supporting Species at Risk; and 7) the presence of habitat supporting coldwater fish species. This categorization methodology is presented in **Table 3.4-16** and the results of this methodology, as it applies to the reaches in the Study Area, are presented in **Table 3.3- 17** that follows.

Beacon applied the Aquatic Habitat Categorization system used in the TDSPSS to confirm aquatic conditions as observed during the 2013 aquatic habitat assessment. Based on this categorization, Beacon Environmental with the findings of the TDSPSS, as indicated in **Table 3.4-16** and as summarized below, with the exception of the categorization of 14W-17:

- Bronte Creek is "critical habitat" based on a combination of factors, including: presence of Silver Shiner (fish SAR), seasonal occurrence of migratory salmonids (coldwater species), the likely occurrence of spawning and nursery habitats, and the relatively natural condition of the stream channel.
- Watercourse 14W-17, at the northeast end of the Subject Property, is "critical habitat" (not "important habitat" as indicated in the TDSPSS) based on its contribution of flows to Redside Dace habitat in downstream reaches of the west branch of Fourteen Mile Creek, as well as probable groundwater inputs.
- The Pond and its outlet channel (BCT-R1) are "important habitat" as they contribute indirectly to fish habitat through conveyance of flow and organic inputs to Bronte Creek.
- Watercourse 14W-17Cb, at the southeast end of the Subject Property, which drains to the west branch of Fourteen Mile Creek, is "marginal habitat".
- Other drainage features on the Subject Property convey ephemeral flows to Bronte Creek or the west Branch of Fourteen Mile Creek, but do not support aquatic habitat.

Table 3.4-16 - Aquatic Habitat Categorization System*

Stream Categorization	Rarity of Habitat	Sensitivity to Development	Function of Habitat in Sustaining Fisheries	Groundwater Discharge	Existing Level of Habitat Degradation and Modification	Habitat Supports Species at Risk	Coldwater Status
Critical Habitat	Habitat is rare within the regional area	Highly sensitive to Activities associated with urban development (e.g., temperature modifications, SWM discharge, flow modifications, and sedimentation)	Plays a critical role in sustaining the resident fish community (i.e., spawning or nursery habitat)	Groundwater Discharge present	Channel has not been modified or degraded (stream in natural state).	Has been confirmed as supporting SAR species	Habitat is known to support coldwater species
Important Habitat	Habitat is common to uncommon within the regional area	Moderately sensitive to activities associated with urban development	Important but not critical in sustaining the resident fish community (i.e., feeding areas and benthic production areas)	No groundwater discharge present	Channel has been somewhat modified or degraded but habitat features remain	Habitat is not known to support SAR species	Habitat is not known to support coldwater species
Marginal Habitat	Habitat is very common within the regional area	Not sensitive to activities associated with urban development	Contributes indirectly to the sustenance of the resident fish community	No groundwater discharge present	Channel is highly modified or degraded (no buffer, channelized, or ploughed through)	Habitat is not known to support SAR species	Habitat is not known to support coldwater species
No Habitat	No habitat	No sensitivity	No habitat	No groundwater	No habitat	No habitat	No habitat

* Adopted from the Tremaine Dundas Secondary Plan Subwatershed Study (TDSPSS, AECOM 2009)

Table 3.4-17 - Aquatic Habitat Classification Assessment (Reaches within Study Area)

Stream Reach/Habitat Unit	Source of Classification	Rarity of Habitat	Sensitivity to Development	Function of Habitat in Sustaining Fisheries	Groundwater Discharge	Existing Level of Habitat Degradation and Modification	Habitat Supports Species at Risk	Coldwater Status	Stream Categorization
BRONTE CREEK CATCHMENT AREA									
Bronte Creek	TDSPSS	Habitat is common within the regional area.	Moderately sensitive to activities associated with urban development.	Plays a critical role in sustaining the resident fish community.	No Groundwater discharge observed.	Channel has not been modified or degraded.	Has been confirmed as supporting SAR species.	Habitat supports migratory coldwater species.	Critical habitat
	Evergreen EIR	***Agree***	***Agree***	***Agree***	***Unknown***	***Agree***	***Agree***	***Agree***	***Critical habitat***
FOURTEEN MILE CREEK CATCHMENT AREA									
Northeast tributary to west branch/ (14W-17)	TDSPSS	Habitat is very common within the regional area.	Moderately sensitive to activities associated with urban development.	Important but not critical in sustaining the resident fish community.	Groundwater discharge suspected.	Channel is highly modified or degraded.	Habitat is not known to support SAR species.	Habitat is not known to support coldwater species.	Important Habitat
	Evergreen EIR	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Has been confirmed as supporting SAR species. (Contributing RSD habitat)***	***Agree***	***Critical Habitat***
Southeast tributary to west branch (upper reach)/14W-17Ca)	TDSPSS	No habitat	No sensitivity	No habitat	No groundwater	No habitat	No habitat	No habitat	No habitat
	Evergreen EIR	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***No habitat***
Southeast tributary to west branch (lower reach/14W-17Cb)	TDSPSS	Habitat is very common within the regional area	Not sensitive to activities associated with urban development	Contributes indirectly to the sustenance of the resident fish community	No groundwater discharge observed.	Channel is highly modified or degraded	Habitat is not known to support SAR species	Habitat is not known to support coldwater species	Marginal Habitat
	Evergreen EIR	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Marginal Habitat***
POND CATCHMENT AREA									
Wetland	TDSPSS	Habitat is very common within the regional area.	Not sensitive to activities associated with urban development	Contributes indirectly to the sustenance of the resident fish community	No Groundwater discharge observed	Channel is highly modified or degraded	Habitat is not known to support SAR species	Habitat is not known to support coldwater species	Marginal Habitat
	Evergreen EIR	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Marginal Habitat***
Outlet channel/ BCT-R1	TDSPSS	Habitat is uncommon within the regional area.	Highly sensitive to activities associated with urban development.	Contributes indirectly to the sustenance of the resident fish community.	No Groundwater discharge observed. Perennial seepage from Pond present. Deciduous swamp wetland present at outlet to Bronte Creek	Channel has been somewhat modified or degraded but habitat features remain.	Habitat is not known to support SAR species.	Habitat is not known to support coldwater species.	Important Habitat
	Evergreen EIR	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Agree***	***Important Habitat***

3.4.2.4 AQUATIC HABITAT – THERMAL REGIMES

In aquatic systems, thermal regime is a key component in sustaining the ecological integrity, and affects the distribution and abundance of aquatic species. As the only "critical habitat" within the Subject Property, temperature data collected at Tributary 14W-17 was analyzed to verify the thermal regime which was only superficially assessed as part of the TDSPSS.

The TDSPSS reported that spot water temperatures measured in the early afternoon within this tributary were <20°C (e.g., 17.5°C, 19.6°C and 18.2°C), while air temperatures were generally >25°C.

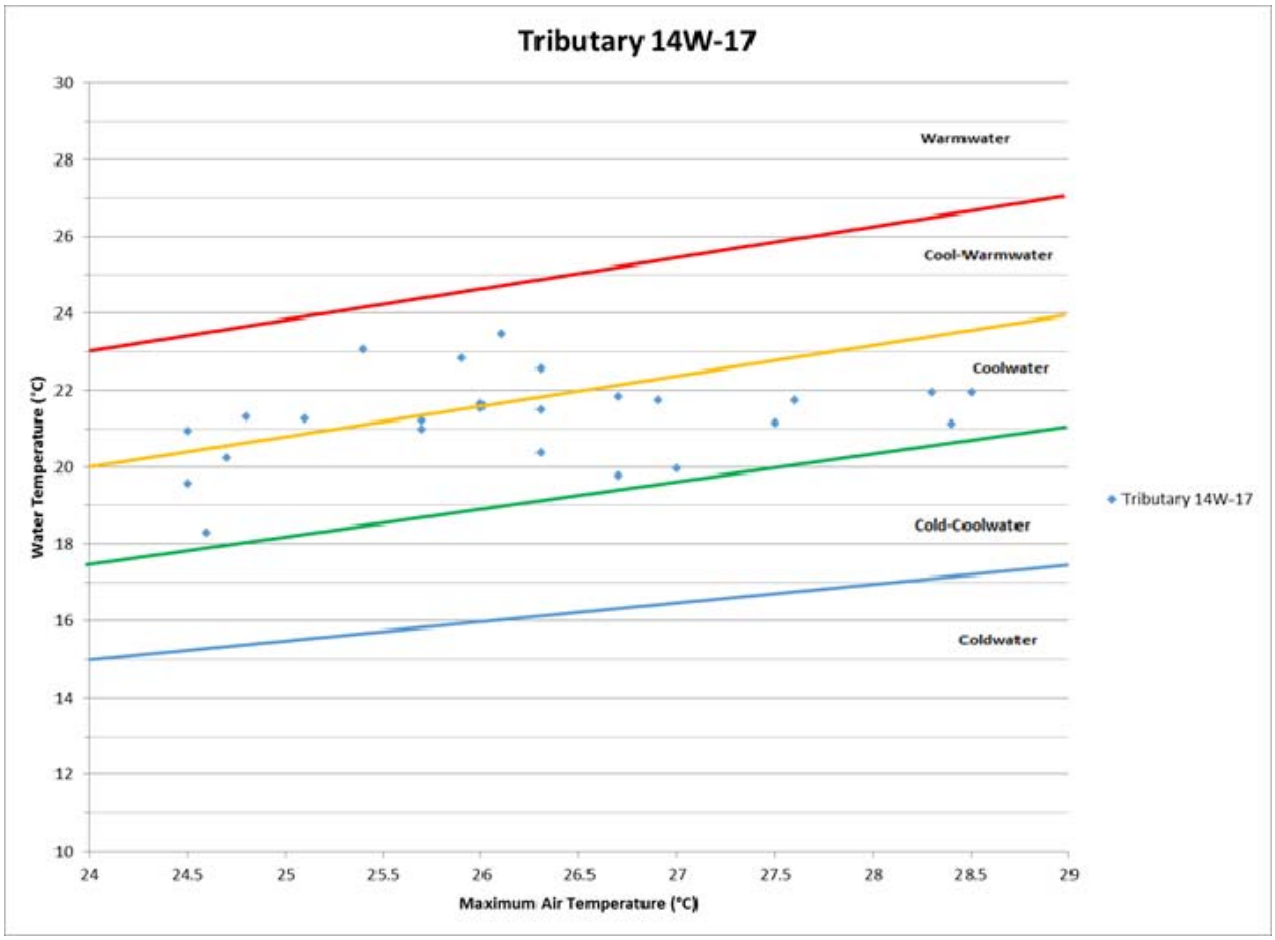
In-stream temperatures at Tributary 14W-17 were monitored by AMEC using temperature loggers deployed from June 2014 to November 2014. The temperature data was provided to Beacon to analyse and determine the thermal water regime. Air temperature was taken from the Hamilton RBG weather station for the analysis.

To characterize the thermal regime, the temperature data were plotted using a nomogram as outlined in the 'Evaluation of a Simple Method to Classify the Thermal Characteristics of Streams Using a Nomogram of Daily Maximum Air and Water Temperatures' (Chu *et al.,* 2009). This nomogram uses the temperature data from July 1 to August 31, when the daily maximum air temperature is above 24.5°C. On these days, the corresponding daily maximum water temperature as measured between 16:00 and 18:00 is plotted against the corresponding daily maximum air temperatures. Analysis of the temperature data was further refined by plotting the daily water and air temperature maximums using the thermal classification nomogram as described in Chu *et al.,* (2009). The use of the nomogram allows for the thermal regime to be described using five thermal categories (coldwater, cold-coolwater, coolwater, cool-warmwater and warmwater).

The thermal stability model indicates that Tributary 14W-17 supports a mostly coolwater thermal regime, as shown in **Figure 3.19** below. This means that when air temperatures are above 24.5°C during the hottest time of the day (16:00-18:00 hours) water temperatures remained below 24°C. On occasion water temperatures recorded during this period were classified as cool-warmwater, however based on the nomogram still remained below 24°C, so is considered coolwater.

Within the Study Area but outside the Subject Property, Bronte Creek has been classified as providing warmwater sportfish habitat with high aquatic ecosystem health (Conservation Halton, 2002). Its tributaries within the Study Area are also assumed to be warmwater based on the available background information.

Figure 3.19 - Temperature Nomogram for Aquatic Habitat in Tributary 14W-17



4. PRELIMINARY NATURAL HERITAGE SYSTEM (NHS)

Natural Heritage Systems (NHS) are networks of natural areas designed to conserve natural features and ecological functions within fragmented landscapes. As stated in the TDSPSS, an NHS is "*intended to protect environmental features and functions, and local and regional linkages necessary to sustain native biodiversity*". The importance of maintaining and enhancing the NHS is recognized by the Province, Region of Halton and City of Burlington in their current natural heritage policies, as outlined in this study. It is notable that in the most recent update to the Provincial Policy Statement (2014), the identification of a NHS has been made a requirement for municipalities, like Burlington, in Ecoregions south of the Canadian Shield (i.e., Ecoregions 6E and 7E).

The Regional Official Plan (2014), which includes the overarching policies regarding NHS identification and protection which the City must comply with, requires a systems based approach. This systems approach is based on the identification and inclusion of the components specified as the basis for the Regional NHS, as listed in s. 115.3 and s. 115.4 (see **Section 2.7**). The definitions of the various components provide guidance as to when these components become part of the NHS[8].

This EIR/FSS identifies a recommended NHS that was prepared in two stages:

1. PRELIMINARY NHS: First, a Preliminary NHS was identified based on careful consideration for the applicable policies and legislation (**Section 2**), existing conditions as determined from both background information and site-specific field assessments (**Section 3**), and consideration for the types of land uses as envisioned through the Secondary Plan (on an iterative basis). It includes Key Features, enhancements to Key Features, linkages, buffers and some additional components (e.g., watercourses) as specified in the Region's Official Plan. The development of the Preliminary NHS is described in this section (**Section 4**).

2. PROPOSED NHS: The second stage of this exercise was to identify the Proposed NHS in the context of the more detailed land use information provided in the Draft Plan. The Proposed NHS is comprised of the same components as the Preliminary NHS, but also includes additional enhancements to Key Features which were identified as opportunities by the Study Team in

[8] As noted previously, the NHS identified in the TDSPSS was incorporated into the mapping of the ROPA 38 NHS. Although the TDSPSS NHS is referenced in this EIR/FSS, it is understood that the ROPA 38 NHS is equally being referenced, with the caveat that, at the time of writing, neither NHS is in full legal force and effect. Evergreen's appeal of the ROPA 38 mapping of the NHS on its property is not intended as an appeal of the NHS policy framework in ROPA 38. The appeal relates to the manner in which the policies were applied to create the NHS boundaries.

relation to the more detailed proposed Draft Plan. The Proposed NHS maximizes opportunities for building NHS integrity and function in an urbanized context. The additional components of the Proposed NHS are described in **Section 6.3**, along with the description of the proposed development.

The development of the Preliminary NHS is described in detail in this section, and demonstrates how a systems based approach was undertaken by evaluating and confirming all required components of a Regional NHS using the following process:

- First, the identification of Key Features was confirmed based on the detailed technical work and an evaluation of the various features in relation tot eh applicable Regional policies and definitions (**Section 4.1**);
- Second, an evaluation of features requiring consideration in the Regional NHS that are not Key Features (i.e., watercourses, other wetlands and floodplains) (**Section 4.3**);
- Third, appropriate linkages were identified in relation to the confirmed Key Features (**Section 4.3**);
- Fourth, appropriate buffers to the Key Features were identified based on both consideration of the sensitivities of the Key Features and the nature of the anticipated land uses in the adjacent lands (as being contemplated through the Secondary Plan) (**Section 4.4**);
- Finally, enhancements to Key Features, primarily within but also a few outside of Key Features in a couple of areas, were identified based on technical and policy-based considerations where appropriate[9] opportunities were identified (**Section 4.5**).

Although hedgerows are not a component of the Regional NHS, several hedgerows in the Study Area were identified as "significant" and priorities for conservation if possible, and therefore a section that speaks to the hedgerows is included in **Section 4.6**.

The process for identifying the Preliminary NHS in the Study Area (including the Subject Property) involved careful consideration of the policies and supporting guidance documents of the PPS (2014), Greenbelt Plan (2005), Region's Official Plan (2014), and City of Burlington's Official Plan (2008) (as described in **Section 2**).

[9] In the context of the Preliminary NHS, which was developed prior to the detailed land use plans and proposed Draft Plan, enhancements outside of Key Features were limited to areas that (a) were considered appropriate from an ecological perspective, and (b) woudl not constrain potentially developable areas.

4.1 IDENTIFICATION OF KEY FEATURES

As part of this EIR/FSS, the Study Team has identified Key Features for inclusion in the Regional NHS and the Greenbelt NHS in the Study Area based on: (a) the completion of more detailed, site-specific studies of the terrestrial and aquatic features within and adjacent to the Subject Property (as provided in **Section 3.4**), and (b) the application of the Region's Official Plan (2014) policies. The following sections describe how the significance of the various ecological features and related functions within the Study Area have been evaluated. Discrepancies between the Key Features recommended through this EIR/FSS for inclusion in the NHS, and the features recommended for inclusion in the TDSPSS NHS are noted where applicable.

Significant natural heritage features, called "Key Features" in the Region's Official Plan (2014), that were evaluated as part of this EIR/FSS include those listed in Section 2.1 of the PPS (2014) and in Section 115.3 (1) of the Region's Official Plan (2014) as follows:

- significant habitat of endangered and threatened species[10] (**Section 4.1.1**)
- significant wetlands (provincially and regionally significant) (**Section 4.1.2**)
- significant woodlands (**Section 4.1.3**)
- significant valleylands (**Section 4.1.4**)
- significant areas of natural and scientific interest (ANSI) (**Section 4.1.5**)
- significant wildlife habitat (SWH) (**Section 4.1.6**), and
- fish habitat (**Section 4.1.7**).

4.1.1 SIGNIFICANT HABITAT OF ENDANGERED AND THREATENED SPECIES

Provincially Endangered and Threatened species, and their habitats, are protected under the *Endangered Species Act* (2007) as described in **Section 2.2**. A total of 10 provincially Endangered and Threatened species have been recorded from the Study Area and Subject Property based on records from prior studies (i.e., MNRF records, LGL td. 2008a, TDSPSS work done over 2008) with confirmation of habitat use for three of these species based on more current studies undertaken by Beacon between 2012 and 2015. These species are listed in **Table 4.1** along with discussion related to their habitat.

Table 4.1 - List of Provincially Endangered and Threatened Species for Study Area

Species	Provincial Status	Habitat Comments

[10] The current Provincial Policy Statement (2014), which municipalities must be consistent with, no longer uses the term "significant" to describe the habitat of endangered and threatened species, and clearly defers the identification of and provision of any permissions to develop within such habitats to the applicable Provincial and Federal requirements.

Species	Provincial Status	Habitat Comments
FISH		
Redside Dace	Endangered	Tributary 14W-17 was confirmed as "contributing habitat" for Redside Dace by MNRF. Notably, Bronte Creek is no longer considered "occupied habitat" for Redside Dace by MNRF (see **Appendix J6**), but the creek is still considered significant for Silver Shiner (see below).
Silver Shiner	Threatened	Bronte Creek is still considered habitat for Silver Shiner based on the available background.
PLANTS		
Butternut	Endangered	A total of seventeen Butternut trees occur within the woodlands of the Bronte Creek valleylands, as well as in woodlands and open habitats on the southern portion of the Subject Property (see **Figure 3.18**). As discussed in **Section 3.4.1.2.1**, 10 of the Butternut are considered "retainable" while seven of the Butternut are considered "non-retainable".
Eastern Flowering Dogwood	Endangered	Not observed in recent years in the Study Area and assumed to be extirpated.
BIRDS		
Yellow-breasted Chat	Endangered	Not observed in recent years in the Study Area. Species has low site fidelity and it is not expected to return to the Study Area to breed.
Bank Swallow	Threatened	No breeding habitat present or observed in the Subject Property. Some habitat may exist outside the Subject Property but within the Study Area (i.e., Bronte Valley), but species not observed during recent surveys.
Bobolink	Threatened	Habitat in the Study Area no longer suitable, and species not observed during recent surveys.
Meadowlark	Threatened	Habitat in the Study Area no longer suitable, and species not observed during recent surveys.
Barn Swallow	Threatened	No breeding habitat present, and species not observed during recent surveys.
Chimney Swift	Threatened	No breeding habitat present, and species not observed during recent surveys.

As shown in **Table 4.1**, of the 10 species listed only three have been confirmed as having extant habitat within the Study Area: two fish species (Redside Dace and Silver Shiner) and one plant (Butternut), as previously identified in the TDSPSS.

Silver Shiner

Silver Shiner habitat is associated exclusively with the Bronte Creek valley within the Greenbelt Plan Area, and well-outside of the Subject Property. Bronte Creek, and its associated valley and woodlands (as discussed below), are all identified as Key Features within the Preliminary NHS (see **Figure 4.1**).

Redside Dace

Watercourse 14W-17 at the northeastern corner of the Subject Property has been confirmed as contributing Redside Dace habitat by MNRF. The Key Feature extent for this Endangered species encompasses the watercourse segment plus the associated riparian lands to the bankfull limit. This habitat also overlaps with a wetland area that, largely because it is within the riparian area to contributing Redside Dace habitat, is considered significant.

The Redside Dace habitat on the Subject Property and the associated wetland are both considered Key Features, and have been included as part of the Preliminary NHS (see **Figure 4.1**). This is consistent with the TDSPSS NHS mapping (TDSPSS Figure 3.8.1) which included this watercourse segment and the associated wetlands as part of the NHS.

Butternut

The primary rationale behind protecting at least some apparently healthy specimens of Butternut is to allow researchers to find pathogen-tolerant trees, if they exist, and / or allow for some trees or populations to develop tolerance to this pathogen, if possible. Consequently, the law does not protect all Butternut trees, and under the current regulation for this species, some Butternut trees can be removed in accordance with the established requirements under the *Endangered Species Act (2007).* Such trees would not be considered "significant habitat" requiring protection by MNRF as described in **Section 3.4.1.2.1**. Notably, while the Region's policies still use the term "significant" in regard to "habitat of Endangered and Threatened species", the PPS (2014) and *Endangered Species Act* (2007) do not.

Seventeen (17) Butternut trees have also been documented within the Study Area (see **Figure 3.18**), both within and outside of the Subject Property. The habitat of the seven "non-retainable" Butternut does not need to be considered for protection as part of the NHS. The habitat of the "retainable" Butternut (i.e., a 25 m radius around each stem) must be addressed under the current protocols established for this species under the *Endangered Species Act* (2007) as described in **Section 3.4.1.2.1**, and may be protected or removed with approval from MNRF.

Fourteen (14) of the seventeen (17) Butternut trees identified in the Study Area are within the Greenbelt Plan Area or within areas identified for protection as part of the Preliminary NHS on the Subject Property (i.e., significant woodland or linkage), and as a result their habitat will be protected. The three Butternut trees (i.e., #5, 6 and 7 as shown on **Figure 3.18**) outside of the Greenbelt Plan Area and the Preliminary NHS were considered non-retainable based on a recent site visit (April 15, 2015) by a certified Butternut Health Assessor, and therefore can be removed under the *Endangered Species Act* (2007) without a permit from MNRF as long as updated assessments are submitted and MNRF does not object within three weeks of assessment submission. Care will need to be taken as part of implementation of the proposed development that protected Butternut, and their associated habitat, are flagged to ensure they are appropriately protected.

4.1.2 SIGNIFICANT WETLANDS

No provincially significant wetlands have been identified within or adjacent to the Subject Property, or within the broader Study Area. The nearest evaluated wetland is the provincially significant North Oakville-Milton West Wetland Complex (as shown in **Figure 1.3**). Portions of that wetland complex are associated with riparian marsh habitats along Tributary 14W-C to the east side of Tremaine Road, east of the Study Area.

There are however, a number of unevaluated wetlands that have been identified within the Study Area. Since the completion of the TDSPSS, Halton Region has amended its Official Plan (2014) to include additional policies and definitions related to the evaluation of significant natural heritage features, including wetlands. The four Regional criteria related to defining wetland significance from s. 276.5 of the Region's Official Plan (2014) are as follows:

Significant wetland means:

1) *for lands within the Niagara Escarpment Plan Area, Provincially Significant Wetlands and wetlands as defined in the Niagara Escarpment Plan that make an important ecological contribution to the Regional Natural Heritage System;*
2) *for lands within the Greenbelt Plan Area but outside the Niagara Escarpment Area, Provincially Significant Wetlands and wetlands as defined in the Greenbelt Plan;*
3) *for lands within the Regional Natural Heritage System but outside the Greenbelt Plan Area, Provincially Significant Wetlands and wetlands that make an important ecological contribution to the Regional Natural Heritage System; and,*
4) *outside the Regional Natural Heritage System, Provincially Significant Wetlands.*

To ensure compliance with Regional policies, all wetland features within the Study Area have been evaluated against the above noted criteria for wetland significance. The majority of the wetlands in the Study Area have been assessed as "regionally significant" based on these criteria. These include all wetlands included in the TDSPSS NHS, except for one small wetland area in the agricultural field (ELC unit 19), discussed further below. The detailed studies undertaken for this EIR/FSS also identified five small wetland areas (i.e., ELC units 22, 23a, 23b, 24b and 21c) not identified through the TDSPSS.

An overview of each wetland identified through the EIR/FSS, whether or not it was identified in the TDSPSS, and its assessed significance through this study is provided below.

Table 4.1-2 - Wetland Significance According to Current Analyses and Regional Criteria

ELC Unit(s) (Fig. 3.17)	Description and Assessment of Wetland Units	Regional Criteria for Significance Satisfied
18	• This dug Pond (1.251 ha) is a large shallow aquatic community within Greenbelt NHS (referred to herein as the "Infrastructure Ontario Pond" or "Pond"). • Identified as part of the TDSPSS NHS. • Contained entirely within the Greenbelt Plan Area.	Criterion 2*
19	• Small isolated wetland (0.165 ha) within the agricultural fields comprised of a disturbed meadow marsh dominated by invasive species (Reed Canary Grass, Purple Loosestrife). • Not identified as a wetland constraint in the TDSPSS report, but mapped as part of the NHS even though it was not staked by Conservation Halton as part of previous field staking exercises in the Study Area. • Not considered significant in this study based on its small size, low diversity, and limited contribution to wildlife habitat, which results in it not making an important ecological contribution to the Regional NHS.	None
20a, 21a	• Two contiguous, small meadow marsh wetlands (0.323 ha together) east of the dug Pond. • Identified as part of the TDSPSS NHS. • Contained entirely within the Greenbelt Plan Area.	Criterion 2*
20b, 23c	• Two contiguous, small meadow marsh wetlands (0.137 ha together) west of the Pond. • Identified as part of the TDSPSS NHS. • Contained entirely within the Greenbelt Plan Area.	Criterion 2*
21b	• Small meadow marsh (0.045 ha) wetland north of the Pond. • Identified as part of the TDSPSS NHS. • Contained entirely within the Greenbelt Plan Area.	Criterion 2*
21c	• Small meadow marsh (0.032 ha) at corner of Central Woodland. • Included in the TDSPSS NHS but not specifically identified as a wetland. • This wetland is extremely small and does not exhibit functions that would make an important ecological or hydrologic contribution to the NHS.	None
22	• Small meadow marsh (0.126 ha) dominated by native species along ephemeral watercourse within central woodland (significant). • Included in the TDSPSS NHS but not specifically identified as a wetland. • Considered significant in this study because it makes an important ecological contribution to the NHS.	Criterion 3
23a,b	• Two meadow marsh units (0.125 ha, 0.092 ha) dominated by native species along an ephemeral swale within the Central Woodland.	Criterion 3

ELC Unit(s) (Fig. 3.17)	Description and Assessment of Wetland Units	Regional Criteria for Significance Satisfied
	• Included in the TDSPSS NHS but not specifically identified as a wetland. • Considered significant in this study because it makes an important ecological contribution to the NHS.	
24a	• Small wetland (0.123 ha) along Tributary 14W-17Cb within the agricultural field that is ploughed seasonally and farmed. When the wetland is present, it is limited to the riparian zone and dominated by cattails. • This wetland was identified in the TDSPSS NHS but not considered high constraint due to its low quality. • Not considered significant in this study due to the small size and low quality of the vegetation, thus it does not make an important ecological contribution to the NHS.	None
24b	• Small wetland (0.053 ha) classified as a meadow marsh within the agricultural field. • This wetland was not identified as part of the TDSPSS NHS. • Its functions are limited to runoff conveyance and storage, and thus it is not considered significant as it does not provide an important ecological contribution to the NHS.	None
24c	• Small marsh community (0.484 ha) associated with Tributary 14W-17. • This wetland was identified in the TDSPSS NHS but not considered high constraint due to its low quality. • Considered significant in this study because it provides important ecological functions that contribute to the NHS, including water quality contributions to a downstream Redside Dace fishery.	Criterion 3
25	• Red Maple Swamp (0.866) in floodplain of Bronte Creek. • Identified as part of the TDSPSS NHS. • Contained entirely within the Greenbelt Plan Area.	Criterion 2* and meets definition of wetland in Greenbelt Plan
26	• Willow thicket swamp community (1.54 ha) adjacent to dug Pond. • Identified as part of the TDSPSS NHS. • Contained entirely within the Greenbelt Plan Area.	Criterion 2*

* A number of these wetlands are less than 0.5 ha (which is the size threshold for defining "wetlands" in the Greenbelt Plan), however they are all considered significant because, cumulatively, they make important ecological contributions to the NHS, as documented in this study.

In summary, as detailed in **Table** , the four significant wetland areas in the Study Area are:

- The swamp beside Bronte Creek in the Greenbelt Plan Area (ELC unit 25)
- The Pond (ELC unit 18) and associated wetland areas in the Greenbelt Plan Area (ELC units 9b, 20a, 20b, 21a, 21b, 23c, and 26)
- The small wetlands within the Central Woodland on the Subject Property (ELC units 22, 23a and 23b), and
- The small wetland associated with north-eastern watercourse 14W-17 (ELC unit 24c).

These four areas of significant wetlands are considered Key Features of the NHS and have all been included within the NHS identified on **Figure 4.1**.

The TDSPSS NHS also includes the swamp beside Bronte Creek, the Pond and associated wetlands, and the small wetland associated with watercourse 14W-17. The TDSPSS NHS did not identify the wetlands within the Central Woodland, although these were nonetheless included in the TDSPSS by virtue of being contained within a significant woodland. The only real difference between the TDSPSS NHS and the Preliminary NHS with respect to significant wetlands is the inclusion of ELC unit 19 in the TDSPSS NHS. The rationale for excluding this feature from the Preliminary NHS is provided in **Section 4.1.2.1** below.

4.1.2.1 ELC UNIT 19

Based on the technical evidence provided by Evergreen's environmental consultant, the Region has agreed that ELC unit 19 is not significant and does not warrant inclusion in the Regional NHS (see **Figure 2.1** and **Figure 3.17**). Furthermore, the feature was not staked by Conservation Halton in 2008 when they were on site reviewing the staked limits of the valley and other wetlands. This evidence is as follows:

- A review of historical aerial photography going back to 1934 revealed that this wetland feature was not present prior to 1954 and was established by anthropogenic activities. This wetland feature developed in the agricultural field as a result of nearby construction activities on the site which modified natural drainage patterns. The construction of a farm laneway across a drainage swale in this area has contributed to some localized impoundment and wetland establishment adjacent to the laneway. Additionally, the construction of a large borrow pit to the northwest on the adjacent property has resulted in the creation of a large Pond. In former years, when this Pond was fully inundated, it would spill over into the field which sustained wetland conditions in a portion of the agricultural field. Despite this, the wetland feature would be ploughed and farmed as conditions permitted (i.e., in dry years).

- Recently, the Pond on the adjacent property was modified to construct an emergency overflow and this has effectively lowered the maximum surface water elevation in the Pond and reduced the extent of the inundation which has sustained this wetland feature. As a consequence of cutting off this runoff source, the size of this wetland feature has decreased, and is expected to gradually continue to decrease in size due to these drainage modifications. It is estimated that between 2008 and 2012, that the area of the wetland has decreased from 0.29 ha (as per the TDSPSS) to 0.16 ha.

- In terms of its ecological importance, ELC unit 19 exhibits very low plant species diversity, and limited wildlife habitat diversity. The wetland is dominated by reed canary grass and purple loosestrife and has little habitat structure. The wetland is also too shallow and ephemeral to provide any substantial aquatic breeding habitat for amphibians and over three years of amphibian surveys

(between 2012 and 2014), the only calling amphibian recorded in the unit was a single American Toad (see **Table 3.4-12**).

Given that this wetland: (a) appears to be of anthropogenic origin, (b) now receives less runoff and has a reduced physical size as compared to when it was included in the TDSPSS NHS, (c) is not regulated by Conservation Halton, and (d) does not provide important ecological contributions to the Regional NHS, it has not been included within the Preliminary NHS.

4.1.3 SIGNIFICANT WOODLANDS

The Bronte Creek valleylands, within the Greenbelt NHS, are almost entirely wooded and form a relatively contiguous band of forest along the western side of the Study Area, largely outside of the Subject Property. On the Subject Property, there are two wooded areas on the tablelands: one large woodland situated centrally on the Subject Property (referred to herein as the "Central Woodland") and a smaller wooded area adjacent to Dundas Street (referred to herein as the "Southern Woodland") (see **Figure 2.1**).

In order to assess significance, the wooded features were screened against the current applicable Regional definition of "woodland" which is based on stem densities as per the *Forestry Act* (1998) (see **Section 2.7**) and criteria for "significant woodland"[11] (s.277) as follows:

> *a woodland 0.5 ha or larger determined through a Watershed Management Plan, a Subwatershed Study or a site specific Environmental Impact Assessment to meet one or more of the four following criteria:*
>
> *(1) the Woodland contains forest patches over 99 years old;*
>
> *(2) the patch size of the Woodland is 2 ha or larger if it is located in the Urban Area, or 4 ha or larger if it is located outside the Urban Area but below the Escarpment Brow, or 10 ha or larger if it is located outside the Urban Area but above the Escarpment Brow;*
>
> *(3) the Woodland has an interior core area of 4 ha or larger, measured 100m from the edge, or*
>
> *(4) the Woodland is wholly or partially within 50m of a major creek or certain headwater creek or within 150m of the Escarpment Brow.*

All wooded features within the Study Area were assessed to determine: (a) if they meet the definition of woodland, and (b) if so, whether they meet the definition of "significant woodland". The evaluation was applied to wooded ELC units, either individually or as groupings where canopy gaps between units did

[11] Although the recently updated PPS (2014) states that significant woodlands *"are to be identified using criteria established by the Ontario Ministry of Natural Resources"*, MNRF has not developed specific criteria for evaluating woodland significance outside the Greenbelt Plan Area (although some guidance is provided in the Natural Heritage Reference Manual (OMNR 2010)). Therefore, the approved Regional definition for woodlands and criteria for significant woodlands have been applied.

not exceed 20 m in width. The hedgerow features associated with the agricultural field in the eastern portion of the Study Area were excluded from the evaluation as linear strips of trees that define a laneway or a boundary between fields are not considered woodlands by the Region of Halton (as per the definition cited above).

The Bronte Creek valleylands, situated to the west of the Subject Property are comprised predominantly of a mixture of different types of wooded areas (i.e., the forests, treed swamps and cultural woodlands as shown in **Figure 3.17**). Collectively, these wooded areas qualify as significant because they meet all four Regional criteria for woodland significance. Notably, cultural woodland ELC units 7e and 7d, which are narrow polygons along the eastern edge of the valleylands and the western edge of the agricultural fields, both have adequate canopy cover (i.e., greater than 35%) to qualify them as Cultural Woodlands under the ELC system, but do not have high enough tree densities to qualify them as woodlands under the Regional definition. This assessment is consistent with the findings of the TDSPSS.

The Central Woodland on the Subject Property is comprised of a combination of cultural woodland (ELC units 6a and 8) and forested areas (ELC units 13a, 15a and 15b), as well as three narrow units of meadow marsh. Collectively, these wooded areas qualify as significant woodland because: at least one of them contains forest patches over 99 years old (criterion 1) and collectively the wooded areas have an overall patch size of approximately 8 ha (criterion 2). This assessment is consistent with the findings of the TDSPSS.

In southern portion of the Subject Property, there are three wooded features that satisfy the Regional definition of a “woodland” based on tree densities: the mature Black Walnut cultural woodland in the southerly portion (ELC Unit 7a), the cultural Hawthorn thicket in the northerly portion (ELC unit 4), and the immature Black Walnut cultural woodland (ELC unit 7b). Although Hawthorns are typically categorized as shrubs rather than trees, because they do reach the size of small trees and occur in sufficient densities in this unit, this unit has been considered woodland.

In southern portion of the Subject Property, the cultural meadow habitats (ELC units 1a, 1b, 2a, 2b and 2c), a sparsely treed Black Walnut cultural woodland (ELC unit 7c), and a residential property that has a canopy of Black Walnut but an understorey that is largely manicured that also contains a driveway, house and other structures (ELC unit 27b) do not meet the Regional definition of “woodland”. A tree density assessment of ELC unit 7c and portions of the adjacent units was undertaken (see **Appendix J7**) that confirmed the required stem densities do not exist in this unit for it to qualify as a woodland under the Regional definition.

The three units meeting the definition of “woodland” within the southern portion of the Subject Property were then screened for significance according to the Regional criteria (cited above):

- Cultural woodland ELC Unit 7a meets the criteria for significance based on its size exceeding 2 ha (criterion 2). This unit does not meet any of the other criteria for woodland significance.

- Cultural woodland ELC unit 7b and adjacent cultural thicket ELC unit 4 are separated from the ELC Unit 7a by more than 25 m, and there is a clear gap between these woodland features (as illustrated in **Appendix J7**).
- The woodland patch formed by ELC Units 4 and 7b is just over 0.8 ha (well under the 2 ha threshold for significance), and does not meet any of the other criteria for woodland significance.

Based on this assessment, the boundaries for the significant woodland in this portion of the Study Area include only ELC unit 7a. This assessment is somewhat divergent from the findings in the TDSPSS NHS which combined wooded, successional and non-wooded features within a larger cultural woodland feature and considered the entire unit significant. The Region's environmental consultant has, based on the technical analysis described above, agreed to the recommended boundaries presented in this EIR/FSS (shown in **Figure 2.1**). Notably, the western boundary to the Southern Woodland (ELC unit 7a) was refined by the Region's and Evergreen's environmental consultants on June 3, 2015 during a site visit prior to the finalization of the agreement regarding Key Feature boundaries.

Other wooded features in the Study Area that were evaluated but did not qualify as significant woodlands include ELC units 27b, 27c, 7c, 7d, 7e, 9a, and 5. Assessments were as follows:

- Like ELC unit 27b, ELC unit 27d is a residential properties. These areas have treed canopies over landscaped lawns and residential structures, and generally do not satisfy the size and density established in the Region's woodland definition. As such, they were classified as anthropogenic and not evaluated for their significance.
- ELC units 7d, 7e and 9a have enough trees to qualify as cultural woodland features but insufficient tree stem densities to satisfy the Region's woodland definition.
- ELC unit 5 is a cultural thicket dominated by Gray Dogwood, which retains the size and form of a shrub, and therefore does not meet the Region's woodland definition.

A summary of the significant woodland evaluation is presented below:

Table 4.1-3 - Summary of Significant Woodland Feature Assessment in the Study Area

Wooded Areas (ha)	ELC Units	Regional Criteria for Significance Satisfied
Bronte Creek Valleylands (35.5 ha)	6b , 7d, 7e, 7f, 9a,10, 12, 14a, 14b, 17 and 17b (assessed collectively) – outside the Subject Property	1, 2, 3 and 4
Central Woodland (7.8 ha excluding the wetlands within the feature; 8.1 ha including the wetland units)	6a, 8, 13a, 15a and 15b (assessed collectively) – on the Subject Property	1 and 2
Southern Woodland (2.4 ha)	7a – on the Subject Property	2
Cultural Woodlands (1.1 ha)	7b, 7c, 7d, and 9a (all assessed individually except for unit 7b which was assessed with unit 4) – on the Subject Property	None
Cultural Thicket (1.8 ha)	4 (assessed with unit 7b) and 5 – on the Subject Property	None
Residential Landscaped Areas (2.6 ha)	27b, 27c, and 27d (units not defined as woodlands therefore not assessed for significance) – both on and outside of the Subject Property	N/A

In summary, this assessment found that the following three woodland areas qualify as significant woodlands under the PPS and the Region's Official Plan (2014):

- The Bronte Creek Valleyland Forests adjacent to Subject Property (ELC units 6b ,7e, 7f, 9a, 10, 11, 12, 13a, 13b, 14a, 14b, 16, 17, and 25)
- The Central Woodland on the Subject Property (ELC units 6a, 8, 13a, 15a and 15b), and
- The Southern Woodland on the Subject Property (ELC unit 7a).

These three significant woodlands are considered Key Features of the NHS and have all been identified within the Preliminary NHS on **Figure 4.1**.

While the Bonte Creek Valleyland Forests and Central Woodland are both identified in the TDSPSS, the Southern Woodland (as discussed above) captures a mixture of areas, some of which did not meet the applicable criteria under more detailed site-specific examination. The Region's environmental consultant has agreed to the recommended boundaries for the Southern Woodland presented in this EIR/FSS (as shown in **Figure 2.1**) based on the technical evidence above, and these are the boundaries carried forward into the Preliminary (and the Proposed) NHS.

4.1.4 SIGNIFICANT VALLEYLANDS

The valleylands in the Study Area are entirely within the Greenbelt Plan Area along the Bronte Creek corridor. The Greenbelt Plan's definitions for valleylands and significant valleylands are consistent with those in the PPS. The Key Feature, significant valleylands, is not a defined term in the Region's Official Plan (2014) however, the term "significant" from the Region's Official Plan applies, and is consistent with the PPS (2014) definition:

> *276.4(5) in regard to other components of the Regional Natural Heritage System, ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system.*

Significant valleylands are normally identified by municipalities with input from their agency partners. The physical boundaries of valleylands are typically defined by the top of slope (as per the Greenbelt Plan Technical Guidelines, 2012). As part of the TDSPSS, Conservation Halton confirmed the top of valley slope to the Bronte Creek, and also staked the top of valley slope along the tributary to Bronte Creek from the Infrastructure Ontario Pond (BCT-R1) immediately to the west of the Subject Property. This resulted in two distinct valleyland setback lines south of the Pond (ELC unit 18) that converge (as presented in **Section 5**), but are both well outside of the Subject Property within the Greenbelt Plan Area.

The valleylands of Bronte Creek and tributary BCT-R1, both outside the Subject Property and within the Greenbelt Plan Area, represent the only confined valley features within the Study Area, and as such is regulated and considered a major creek and valley system by Conservation Halton.

This EIR/FSS concurs with the assessment of these valleylands as significant, and has adopted the staked boundaries of this feature as the limits of the significant valleylands. No portion of the valleyland or its projected long-term stable top of slopes extends onto the Subject Property, although this feature is a significant part of the overall NHS as the largest Key Feature within the system at the Secondary Plan / subwatershed study scale. These significant valleylands are considered Key Features of the NHS, have been included within the Preliminary NHS identified on **Figure 4.1**.

Although significant valleylands aren't specifically identified in the TDSPSS NHS mapping, the eastern boundary to the significant valleylands of the NHS, which reflects the top of bank as staked by Conservation Halton (plus a 15 m buffer), is consistent with the "top of slope" limit as identified in the TDSPSS (**Appendix I**), effectively capturing the same area as within the Preliminary (and Proposed) NHS.

4.1.5 SIGNIFICANT AREAS OF NATURAL AND SCIENTIFIC INTEREST (ANSI)

There are no provincially or regionally significant Areas of Natural or Scientific Interest (ANSIs) within or extending into the Study Area. As shown in **Figure 1.3**, outside the Study Area, portions of the Bronte Creek valleylands immediately to the northwest of the Hydro One transmission corridor form part of the regionally significant Zimmerman Valley Life Science ANSI, and the Bronte Creek valleylands immediately

south of Dundas Street form part of the provincially significant Bronte Creek Provincial Park Nature Reserve Life Science ANSI.

4.1.6 SIGNIFICANT WILDLIFE HABITAT (SWH)

The Key Feature, significant wildlife habitat (SWH), is not defined in the Regional Official Plan (2014). However, the word "significant" as defined in the Official Plan applies, and is consistent with the definition in the PPS (2014):

> *276.4(5) in regard to other components of the Regional Natural Heritage System, ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system.*

The Provincial definitions in conjunction with the supporting *Significant Wildlife Habitat Technical Guide* (OMNR 2000) have been used as the primary guidance in identifying Candidate SWH in this EIR/FSS, in particular Table 10.1 and Appendix Q. The *Draft Eco-regional Criteria Schedules for 7E* (OMNR 2012) have also been considered, particularly where guidance was otherwise lacking.

SWH is one of the natural heritage feature categories that requires site-specific, comprehensive analysis to identify candidate features. SWH is an umbrella for a wide range of unique and specialized habitat types that are often, but not always, captured within other significant natural heritage features and areas. Although proponents may identify candidate SWH through subwatershed studies, Secondary Plans or EIAs, it is typically the responsibility of the municipality to confirm SWH within its jurisdiction, with consideration for available technical guidance from the MNRF. Neither the City of Burlington nor the Region of Halton have undertaken a jurisdiction-wide assessment of SWH, nor have they specifically identified any SWH through their Official Plans or any supporting technical documents. Therefore, this responsibility tends to fall to the proponents on a site-specific basis.

The evaluation of SWH has been divided into the following four categories, as per the available guidance and provided in **Table 4.1-4** below:

- seasonal concentration areas
- rare vegetation communities or specialised habitats for wildlife
- habitats of species of conservation concern, excluding the habitats of endangered and threatened species, and
- animal movement corridors.

Table 4.1-4 - Evaluation of Candidate Significant Wildlife Habitat (SWH) in the Study Area

Category	Habitat Considerations	Provincial Guidance / Criteria	Applicability to the Study Area	Candidate SWH Present
Seasonal Concentration Areas				
White-tailed deer winter yard	• forests with at least 60 % canopy closure • conifer cover (white cedar, hemlock) particularly important in southern Ontario	• protect the entire area of the deer yard • core areas in yards less than 10 km^2 should be entirely protected • protect at least 85% of core areas in larger yards • from a landscape perspective, ideally 10-30% of total deer range should be conifer-dominated stands, with a minimum conifer component of 70% and crown closure of 60% • ideally a minimum of 40% of deer range should be second growth or regenerating stands, occurring within 800 m of conifer shelter • as much as 300 m around certain deer yards may have to be protected if disturbance or other factors may affect the functions of the habitat	• White-tailed deer are present in the Study Area, however OMNR mapping does not identify any winter deer yards for the area. The woodlands are largely deciduous. Coniferous forest cover is minimal. • No significant concentrations of deer tracks (or other evidence of deer) was recorded during winter surveys in 2012/2013 and 2013/2014.	NO
Moose late winter habitat	N/A	N/A	N/A. Moose do not occur in this part of the province	**N/A**
Colonial-nesting birds	• islands, shoals, peninsulas, and some shorelines • treed swamps • cliffs and banks	• protect the area of the site • protect an additional area to protect the birds from disturbance. The width of this area will vary depending on sensitivity of birds, local site conditions, and adjacent land use (see Appendix C of the SWH Technical Guide – OMNR 2000 - and the Decision Support System)	• There are no populations of colonial nesting birds recorded from the Study Area. It is possible that the exposed banks along Bronte Creek could provide some suitable habitat.	NO
Raptor wintering areas (hunting, roosting)	• undisturbed fields for hunting small mammals • adjacent forests for roosting of some species	• protect the area of the site • protect several large blocks of fields (minimum of 15 ha, preferably much larger) • protect key roosting sites adjacent to these areas • an additional 100 m width adjacent to this habitat may have to be protected to ensure that raptors are not disturbed	• Available habitat in the Study Area is not large enough for significant numbers of diurnal raptors to feed. • Some limited raptor wintering likely occurs on a local scale within the Hydro One corridor north of the Study Area.	NO
Landbird/ shorebird/ butterfly migratory stopover area	Landbird • open water shorelines with adjacent mature forests, old fields and grasslands • forest cover along watercourses, forested ravines Shorebird • undisturbed shorelines of water bodies (rivers, large lakes), marshes Butterfly • shorelines of large lakes - Great Lakes shorelines and adjacent lands within 5 km (especially Lake Ontario & Lake Erie) are very important • forest, old field, and undisturbed open lands • Fields with milkweed very important habitat for monarch butterflies	• protect the area of the site • since the minimum threshold size of this habitat is unknown, existing significant sites should be protected in their entirety and not be reduced in area • protection of undisturbed sites with a diversity of suitable habitats and structure will improve the sustainability of long-term populations • for shorebirds, an additional 100 m may have to be protected to ensure the birds are not disturbed	• Negligible habitat present for shorebird stopover. • Bronte Creek valley and the associated tableland forests could be a landbird stopover as it is within 10 km of Lake Ontario. Although migrant landbirds likely use the valleylands, there is no reason to suspect that particular concentrations occur here. Nonetheless, the forested valleylands could qualify as Candidate SWH. • Despite the presence of some Monarchs, the subject property would not be considered a butterfly stopover area given that the Study Area has no history of concentrations. Most stopover concentration areas are very close to Lake Ontario, and the presence of a few Monarchs would be expected in most sites with open early successional habitat in southern Ontario.	YES (Landbirds – Bronte Creek valleylands)

Category	Habitat Considerations	Provincial Guidance / Criteria	Applicability to the Study Area	Candidate SWH Present
Wild turkey winter range	• coniferous forests • spring and seeps • pocket of conifer may suffice	• protect the area of the site • this habitat is best protected by protecting as many mature conifer stands and patches of conifers within hardwood stands, as well as springs and seeps, as possible • an additional 100 m or more may need to be protected so that birds are not disturbed	• Tracks of species were observed during winter surveys in 2012/2013 and 2013/2014. However, the species has become common and widespread since re-introduction and large concentrations were not observed, and the conifer stands in the Study Area are very limited therefore optimal habitat is not present.	NO
Turkey vulture summer roost	• site specific	• protect the area of the site • additional areas that should be considered part of significant wildlife habitat will vary according to local site conditions (e.g., height of cliff, adjacent land use, local topography, how remote the site is)	• No roosts were recorded within the Study Area during the various ecological surveys.	NO
Bat/reptile hibernacula	Reptile hibernacula • often in large forested areas, depending on species • rocky outcrops, talus slopes • corridor required Bat hibernacula • Caves, mines	• protect the area of the site • protection of all bat hibernacula is desirable because this habitat is limited • protect an additional 200 m from the entrance to bat hibernacula, although individual site inspections may find that a smaller protected area will provide adequate protection • this habitat for snakes is best protected by maintaining a variety of protected natural areas (see Chapter 2, OMNR 2000)	• No mines or caves (i.e., potential bat hibernacula) occur in the Study Area. • No concentrations of reptiles or potential reptile hibernacula were observed during surveys in the Study Area.	NO
Bullfrog concentration area	• permanent wetlands, shorelines, other riparian areas • permanent water	• protect the area of the site • protection of wetlands and undisturbed shorelines will help to maintain long- term populations and fish habitat	• No bullfrogs were detected from the Pond during breeding amphibian surveys conducted between 2007 and 2013.	NO
Rare Vegetation Communities or Specialised Habitat for Wildlife				
Rare Vegetation Communities	• Variable	• protect the area of the site • the amount of area that should be protected will vary depending on species' communities sensitivity to disturbance, adjacent land uses, area of community, hydrological conditions	• There is a small patch of Tallgrass Prairie associated with the Bronte Creek valley rim immediately south of the Hydro One corridor. This community, (ELC Unit 3) is considered rare in Ontario. No other provincially rare vegetation communities occur in the Study Area.	YES
Marten and Fisher denning sites	N/A	N/A	N/A. Marten and Fisher do not occur in this portion of the province.	N/A
Mink and Otter feeding / denning sites	• forested shorelines (often along large lakes) • wetlands • islands	• protect the area of the site • protect as much wetland and undeveloped, undisturbed shorelines on lakes, rivers, and streams as possible • a large area may need to be protected if disturbance becomes a problem (100 m)	• N/A. River Otter does not occur in this part of the province. • While not documented through the ecological surveys, Mink could be present along Bronte Creek as habitat conditions are suitable (coniferous and mixed forest shorelines) and therefore riparian habitats along Bronte Creek could potentially qualify.	YES (Mink – Bronte Creek valley)
Moose aquatic feeding areas/ calving areas/ mineral licks	N/A	N/A	N/A. Species absent from this part of the province.	N/A

Category	Habitat Considerations	Provincial Guidance / Criteria	Applicability to the Study Area	Candidate SWH Present
Black bear/ other mammal foraging areas	N/A	N/A	N/A. Black Bear are generally absent from this part of the Province and their presence is not tolerated by local wildlife management authorities.	N/A
Waterfowl nesting habitat	• wetlands, water bodies, and • adjacent grasslands within 120 m of water	• protect the area of the site (approximately 120 m of upland grassland cover within water) • protect as many upland grassland areas adjacent to wetlands and other water bodies • the entire area encompassing several small ponds should be protected	• Suitable habitat for waterfowl nesting is present within the Study Area. The margins of the Pond (ELC unit 18) and surrounding wetlands and early successional habitats (ELC units 26, 21a, 20a, 21b, 2d, 23c) provide suitable nesting habitat; however productivity is considered low. Known breeding species consist of up to 3 pairs of Wood Duck and 1 pair of Mallard. Since these species have not been observed in all years and occurred in small numbers, these areas are not considered Candidate SWH.	NO
Waterfowl staging areas	• wetlands • shorelines of water bodies with emergent vegetation • larger wetlands preferred for staging and moulting • grassy/ shrubby areas for nesting	• protect the area of the site • protect large wetlands and shorelines of large water bodies • an additional 100 to 300 m may have to be protected depending on sensitivity of birds, local site conditions, and adjacent land use	• Potential suitable habitat is present in the Infrastructure Ontario Pond. Although not a particularly large body of water, the Pond (ELC unit 18) does support some waterfowl staging and therefore could potentially qualify as Candidate SWH.	YES (Infrastructure Ontario Pond)
Osprey nesting habitat	• forested shorelines (often along large lakes) • wetlands • islands	• protect the area of the site • protect as much wetland and undeveloped, undisturbed shorelines (and islands) of large lakes and rivers as possible • protect large trees adjacent to wetlands and water bodies • an additional 100 m for Ospreys may be required if the area is subject to disturbance	• No suitable habitat present in the Study Area. The Pond, in its current form is unproductive to supporting a healthy fishery.	NO
Raptor hunting areas	• undisturbed open fields • minimum of 15 ha, preferably larger than 30 to 50 ha	• protect the area of the site • protect as many large (minimum of 10 ha, preferably larger), contiguous blocks of undisturbed grasslands as possible • a larger area may be necessary for sites surrounded by incompatible land uses (e.g., 100 m)	• Habitat availability for raptor hunting in the Study Area is limited to the Hydro One corridor (ELC unit 2f) as this is the only open area that is not regularly farmed. The area is too small (<10 ha) to qualify as Candidate SWH.	NO

Category	Habitat Considerations	Provincial Guidance / Criteria	Applicability to the Study Area	Candidate SWH Present
Sites supporting area-sensitive species	• largest areas of unfragmented forests, grasslands, wetlands • mature, closed canopy forests with multiple vegetation strata preferred by many species of forest birds • minimum size of these areas may be at least 30 ha, but may be larger than 100 ha	• protect the area of the site • where they exist, protect blocks of forest of at least 30 ha, and preferably with 50 ha or more • protect forest patches with at least 4 ha forest interior, and preferably larger areas • protection of as much forest as possible, with a variety of age classes, structure, • and composition will provide important habitat for many other wildlife species • in areas with little remaining forest cover, but where pre-settlement forest cover was high, a long-term recovery objective might be to eventually have 30% of planning area in native forest cover (Chapter 11)	• There are recent records of area-sensitive forest bird species from the Bronte Creek valley. The relative abundance of area-sensitive forest birds in the valley compared to other natural areas in the Region is sufficiently high to be qualify the area as Candidate SWH. • The Central Woodland supports limited numbers area-sensitive forest species, with only one or two individuals in any given year, and therefore would not qualify as Candidate SWH. • Area sensitive grassland species have been recorded from the Hydro One corridor (ELC unit 2f), however the size of the area (<10 ha) is insufficient to qualify for this category of Candidate SWH.	YES (Bronte Creek valleylands)
Woodland amphibian breeding ponds	• forests; often associated with • wetlands, but may be in upland forests	• protect the area of the site • protect as many ponds (including vernal ponds) and adjacent woodlands as possible • the amount of area that requires protection will vary depending on local site • conditions such as slope, amount of riparian vegetation, high water mark, height and density of adjacent trees, and groundwater and surface water conditions	• There are a couple vernal ponds in the Study Area (ELC units 21c and 17). These features are shallow and ephemeral. ELC unit 21c appears to support some limited amphibian production, but not in sufficient numbers to qualify as Candidate SWH.	NO
Amphibian breeding ponds (not woodland associated)	• Not listed in Significant Wildlife Technical Guide (2000) (except as 'other'), but included in the Draft Eco-regional Criteria for 7E (2012)	Draft Guidance: • Wetlands and pools (including vernal pools) >500m^2 (about 25m diameter) supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNR mapping and could be important amphibian breeding habitats. • Presence of shrubs and logs increase significance of pond for some amphibian species because of available structure for calling, foraging, escape and concealment from predators.	• The Pond (ELC unit 18) is known to support amphibian breeding for several species in sufficient numbers to be a Candidate SWH.	YES (Infrastructure Ontario Pond)
Turtle nesting areas	• shorelines (sand/gravel), wetlands • open sunny areas with soft/loose substrates (sand)	• protect the area of the site • protect as many undeveloped, undisturbed shorelines with sandy soils • an additional 30 to 100 m may have to be protected depending on local site conditions such as slope, amount of vegetation, adjacent land use, and the amount of nest predation	• Painted Turtle and Snapping Turtle are known to occur in the Pond (ELC unit 18), however nesting areas for these species have not been confirmed despite surveys on the Subject Property and immediately adjacent lands. It is probable that nesting sites are present in the wetlands around the Pond but could not be confirmed.	NO
Turtle wintering areas / habitat	• Not listed in Significant Wildlife Technical Guide (2000) (except as 'other') but included in the Draft Eco-regional Criteria for 7E (2012)	Draft Guidance: • For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate dissolved oxygen.	• Painted Turtle and Snapping Turtle have been observed in the Pond (ELC unit 18). It is presumed that these species overwinter in the Pond or adjacent wetlands and therefore these areas would qualify the Pond and adjacent wetlands as Candidate SWH.	YES (Infrastructure Ontario Pond and surrounding wetlands)
Old-growth or mature forest stands	• Forests	• protect the area of the site • protect as many mature stands as possible	• While there is no old-growth forest in the Study Area, there are some forest stands that are considered mature. These are associated with portions of forest communities in the Bronte Creek valleylands (ELC units 13b, 13c, 16, 10, 12, 14a and 14b), and portions of the Central Woodland on the Subject Property (ELC units 13a, 15a and 15b).	YES (Bronte Creek valley and Central Woodland)

Category	Habitat Considerations	Provincial Guidance / Criteria	Applicability to the Study Area	Candidate SWH Present
Forest stands providing a diversity of habitats	• Large, older, undisturbed forest • Forest with a diversity of features, such as tree cavities, fallen logs, abundant forest structure, soil moisture conditions, and food plants for wildlife	• protect the area of the site • protect as much forest with a variety of age classes, structure and composition as possible • maintain at least six cavity trees per ha; one supercanopy tree (tree taller than the remainder of the woodland) per 4 ha; at least seven or eight mast-producing trees of each species per ha.	• The forest stands associated with the Bronte Creek valleylands exhibit a relatively high diversity in terms of their structure and composition. This is due largely to the variable topography and exposures along the valley. Collectively, all of the forested habitats along the Bronte Creek valleylands could qualify as Candidate SWH.	YES (Bronte Creek valleylands)
Areas of high diversity	• often forested areas • often larger natural areas with diversity of habitats including wetlands • sites may have remarkable diversity of just one group (e.g., plants, insects), several groups (e.g., plants, birds, reptiles, amphibians), or several community types (e.g., forest, wetland)	• protect the area of the site • protect a good representation of these sites more area may be required, particularly if the site is surrounded by incompatible land use	• The forest stands and wetlands associated with the Bronte Creek valleylands support a relatively high diversity of flora and fauna. Collectively, all of the forest and wetland habitats along the Bronte Creek valleylands could qualify as Candidate SWH.	YES (Bronte Creek valleylands)
Cliffs, caves	• associated with geological features	• protect the area of the site or portion of the site where habitat value appears to be the greatest (e.g., ledge where birds nest or roost) and provide additional area if required • the area protected will vary depending on local site conditions amount of vegetation, amount of disturbance, size of site; a buffer may not be required	• No cliffs or caves occur within the Study Area.	NO
Seeps, springs	• often in forested land with slopes • headwater areas	• protect the area of the site or portion of the site where habitat value appears to be the greatest • size of the habitat protected will vary depending on local site conditions such as slope, amount of vegetation, height and density of adjacent trees, groundwater conditions • protect recharge areas	• No springs were observed in the Study Area. Minor seeps occur in multiple locations along the base of the Bronte Creek valley slope. These seeps are generally small and seasonal and would not qualify as Candidate SWH.	NO
Habitat of Species of Conservation Concern				
Raptors – Conservation Concern	• Variable	• protect the area of the site and an area of at least 200 m around active nests (some species are more tolerant and smaller areas may suffice) • protect the largest and oldest contiguous forests of at least 30 ha (preferably 50 to over 100 ha) or the largest existing forest blocks remaining in the planning area • protect areas around inactive nests as well, as they may be re-used • plan for no reduction in area of existing forest cover in the planning area • plan for no increase in forest fragmentation in the planning area • there should be no activities permitted within 200 m of an active nest during the nesting season (Mar 1- Aug. 1 [Sept. 1 in northern areas])	• No raptor species of conservation concern have been identified in the Study Area, although the forested habitats along the Bronte Creek valleylands could potentially support such species.	NO

Category	Habitat Considerations	Provincial Guidance / Criteria	Applicability to the Study Area	Candidate SWH Present
Area-sensitive birds - Conservation Concern Species	• large unfragmented forests with • diversity of vertical structure • large swamps, marshes, bogs, or fens • large, unfragmented areas of grassland	• protect the area of the site • protect large contiguous forests or grasslands with at least 4 ha (preferably at least 10 ha or more) of interior or the remaining forests and grasslands with the largest existing interiors • maintain as much forest cover in the landscape as possible (ideally 30% forest cover) • plan for no reduction in area of existing forest or large grassland • plan for no increase in fragmentation of forest or large grassland cover	• None of the forest area-sensitive birds observed within the Study Area are considered species of conservation concern. • None of the grassland area-sensitive birds observed within the Study Area (excluding historical records) are considered species of conservation concern.	NO
Grassland birds - Conservation Concern	• large, unfragmented areas of grassland	• protect the area of the site • protect largest contiguous undisturbed grasslands of at least 30 ha (preferably 50 ha or more) or the largest existing expanse of grassland in the planning area • additional area may be required for sites surrounded by incompatible land use (200 m)	• The subject property and adjacent lands do not support significant communities of grassland birds.	NO
Other Birds - Conservation Concern	• Variable		• Eastern Wood-Pewee and Wood Thrush are listed nationally as Special Concern and Threatened respectively, but not listed provincially. Both of these species were observed in the Central Woodland on the Subject Property as well as in Bronte Creek valley. Despite their status, both species are relatively common and widespread, and their presence would not qualify the areas as Candidate SWH. • Orchard Oriole, documented on the Subject Property, is considered rare in Halton, but is not identified as triggering Candidate SWH because its' populations are on the increase.	NO
Amphibians - Conservation Concern	• Ponds, wetlands	• protect the area of the site • protect best examples of suitable habitat for the species of concern • in general, protect as many wetlands and breeding ponds as possible • additional area may be required around significant breeding ponds	• All species of amphibians observed within the Study Area are common and not of conservation concern.	NO
Reptiles - Conservation Concern	• Variable	• protect the area of the site • protect all known hibernacula • protect all known nesting sites • protect best examples of suitable habitat for the species of concern • in general, protect a diversity of natural areas, and protect areas of suitable habitat in areas where specific species are known to occur • buffers may be required around hibernacula and nest sites	• Milksnake and Snapping Turtle are both designated Special Concern and S3, and considered species of conservation concern. • Snapping Turtle has been observed in the Pond (ELC unit 18) and likely overwinters and nests in the Study Area, but not on the Subject Property. The low abundance of Snapping Turtles would likely not qualify the area as Candidate SWH. • Milksnake was observed in ELC Unit 26 adjacent to the Pond. No hibernacula were observed. The relatively low abundance of this species would not qualify the area as Candidate SWH.	NO

Category	Habitat Considerations	Provincial Guidance / Criteria	Applicability to the Study Area	Candidate SWH Present
Mammals - Conservation Concern	• Variable	• protect the area of the site • protect best examples of suitable habitat for the species of concern • in general, protect a diversity of natural areas • protect as much forest, wetland, undisturbed grassland, and shoreline as possible	• No mammal species of conservation concern were recorded from the Study Area. As such no areas have been potentially identified as Candidate SWH.	NO
Insects - Conservation Concern	Variable	• protect the area of the site • protect several colonies of species' food plant • protect best examples of suitable habitat for the species of concern • in general, protect areas with diversity of plant species	• No insect species of conservation concern were recorded from the Study Area incidentally during other wildlife surveys. As such no areas have been potentially identified as Candidate SWH.	NO
Plants - Conservation Concern	• Variable	• protect the area of the site • additional area may be required to protect sensitive species or sites surrounded • by incompatible land use • in general, protect a diversity of natural areas	• There are a number of plant species of conservation concern known to occur in the Study Area (ref. **Table 3.4-5**). These are all regionally rare species (except for Butternut, which is addressed under habitat for Endangered and Threatened species). The highest abundance and diversity of these species is associated with the Bronte Creek valleylands, which and could qualify that portion of the Study Areas as Candidate SWH. The significant plants (excluding Butternut) observed by Beacon outside the valleylands do not occur in sufficient numbers to qualify as candidate SWH.	YES (Bronte Creek Valleylands)
Animal Movement Corridors				
	• Elongated, naturally vegetated parts of the landscape used by animals to move from one habitat to another. For example, • riparian zones and shorelines, wetland buffers, stream and river valleys, woodlands • anthropogenic features such as hydro and pipeline corridors, abandoned road and rail allowances, fencerows and windbreaks	• Not available	• The Bronte Creek valleylands form a Regional scale linkage within the NHS. The Bronte Creek valley would qualify as Candidate SWH based on its linkage functions at the Regional level.	YES (Bronte Creek valleylands)

A summary of the Candidate SWH identified through these analyses is provided in **Section 4.1.6.4** below. However, prior to the summary, some additional discussion of the rationale for not considering turtle nesting areas, Milksnake habitat and the lands between the Pond and the Central Woodlands as an animal movement corridor under Candidate SWH is provided below (i.e., **Section 4.1.6.1**, **Section 4.1.6.2** and **Sections 4.1.6.3**) as suggested by the Region's environmental consultant.

4.1.6.1 TURTLE NESTING AREAS

According to Provincial guidance (OMNR 2000, Appendix Q), identification of Candidate SWH for turtle nesting areas should include, among other things: evidence of nests or adult females during nesting season, evidence of use by several species and areas relatively undisturbed by human activities. As discussed in **Section 3.4.1.6.1**, no turtle nesting was observed on the Subject Property or around the anthropogenically-created Pond where turtle have been observed swimming on the surface.

Although no turtle nesting areas were observed in the Study Area despite extensive field studies, it is our opinion based on the habitat types present in the Study Area that they would likely be nesting in open areas in close proximity to the Pond such as in ELC Unit 26 which contains spoil piles (i.e., mounds of excavated dirt) that are open (not treed), raised above the water table, and may be suitable. Evidence of turtle nesting was not previously documented by LGL Ltd. (2008a), the TDSPSS or Beacon despite multiple years of investigation, therefore additional surveys are likely be unsuccessful given the relatively low numbers of individuals present.

This EIR/FSS identifies the Pond and adjacent wetlands as Candidate SWH for general turtle habitat and as over-wintering areas, but did not identify the adjacent wetlands specifically as Candidate SWH for Snapping Turtle nesting due to the lack of confirmed sites, and the fact that the mounds around the Pond are a result of anthropogenic activities. Nonetheless, this Candidate SWH area includes the presumed nesting areas, and falls within the NHS, and will therefore be protected.

4.1.6.2 MILKSNAKE HABITAT

According to Provincial guidance (OMNR 2000, Appendix Q), identification of Candidate SWH for species/habitats of conservation concern should focus on, among other things: species deemed locally significant or of conservation concern by a municipality, species/habitats with the lowest representation in a planning area, species/habitats experiencing severe declines, and areas with relatively large populations.

Milksnake, a species identified as Special Concern nationally and provincially, is known to be difficult to detect. However, given the level of effort of the reptile searches and the targeted efforts directed at snake detection by Beacon (see **Section 3.4.1.6**) the conclusion that this species has a low abundance in the Study Area seems warranted. The fact that between two and four individuals were recorded from one location during a season long investigation that involved 29 cover boards in potential habitats across the Study Area (primarily within the Subject Property), as well as efforts at incidental

observations, and the absence of any other current records (i.e., for more than 20 years) supports the assessment of low abundance. The species was last recorded from the Bronte Creek Environmentally Sensitive Area in 1993. Surveys in 2003/2004 during the Halton Natural Areas Inventory did not include any Milksnake observations from the Bronte valley, nor did the TDSPSS.

Furthermore, despite their Provincial Special Concern status, Milksnake are considered common in Halton, and are generally more abundant in agricultural and rural portions of the Region than in urban areas.

Based on these findings, the wetlands around the Pond have not been identified as Candidate SWH for Milksnake as a species of conservation concern. Nonetheless, these wetlands are captured as Candidate SWH for turtle habitat / wintering areas and will be protected as part of the NHS.

4.1.6.3 ANIMAL MOVEMENT CORRIDOR

According to Provincial guidance (OMNR 2000, Appendix Q), identification of Candidate SWH for animal movement corridors should consider, among other things, corridors that: are already naturally vegetated and contain water sources, have high overall species diversity and is known/likely to be used by large numbers of species (including rare species).

As indicated above, the Bronte Creek valley represents a Regional scale linkage and based on the species documented from this area, as well as its known habitat functions, the EIR/FSS has identified the Bronte Creek valley as Candidate SWH for its animal movement corridor functions. However, the lands between the Pond and the Central Woodland are not thought to qualify based on the available guidance. Although both the Pond and associated wetlands outside the Subject Property and the Central Woodland are both considered Candidate SWH, the Central Woodland is identified for having mature treed areas, not supporting the types of habitats that might trigger the identification of this linkage as an animal movement corridor (e.g., amphibian breeding area, deer wintering area).

The field and hedgerow between the Pond and the Central Woodland were examined on numerous occasions to assess wildlife utilization of this area as part of the various wildlife surveys (described in **Section 3.4.6** through **Section 3.4.10**). This linkage, while considered an important part of the Regional NHS at the local scale, is not considered Candidate SWH as an animal movement corridor for the following reasons:

- The Central Woodland primarily provides habitat for birds, which do not require a substantial terrestrial corridor to travel the short distance from the Central Woodland to the Bronte Creek valley habitats.

- Based on the available data, the linkage area likely supports some movement of a few common mammals, but in relatively low numbers. This linkage area was not identified as an area of high

or even moderate traffic for mammals, and significant concentrations of mammals were not observed anywhere on the Evergreen property or adjacent lands during incidental observations of wildlife made by Beacon in conjunction with other surveys (for vegetation, amphibians, reptiles, and birds) and winter surveys conducted between 2012 and 2014. Furthermore, the species of mammals documented were all relatively common, urban adapted species such as Eastern Cottontail, Deer Mouse, Striped Skunk, Racoon and Meadow Vole. The most abundant mammal observed was Grey Squirrel (particularly in the Central Woodland). Coyote tracks were recorded throughout the Subject Property and White-tailed Deer tracks have also been noted.

- Although the linkage is likely locally important for several common amphibian species, based on the available data the number of species using this corridor would be too low to qualify as Candidate SWH. Three species of amphibians (i.e., Spring Peeper, American Toad and Grey Treefrog) were documented on or adjacent to the Subject Property. These species are known to breed in ponds / wetlands and then spend much of the remainder of their life cycles in upland wooded habitats (foraging, overwintering, etc.), and therefore are known to migrate between suitable ponds / wetlands and nearby upland woodlands on a seasonal basis. These species also migrate for dispersal between suitable habitat areas. In the Study Area, these species were observed in relatively high abundances in the Pond adjacent to the Evergreen property in 2012, 2013 and 2014. However, only a few individuals of each of these species were also documented in 2013 and 2014 in the small ephemeral pond at the southwest corner of the Central Woodland, and none were documented in 2012 (see **Table 3.4-12**).

- Based on this information, the Pond and adjacent wetlands and forests are, based on this information, assumed to be the primary and more productive habitat for these amphibians while the Central Wetland provides some supporting habitat for these species, particularly in wetter years when the small, shallow pond associated with the Central Woodland holds water for a sufficient amount of time to support breeding for these species.

- Based on the available data, the linkage area may also support some reptile (snake and turtle) movement, but the number of species using this corridor would be too low to qualify as Candidate SWH. Most of the reptiles (Midland's Painted Turtle, Snapping Turtle, Eastern Garter Snake, Dekay's Brownsnake, Red-bellied Snake, and Milksnake) observed on or adjacent to the Evergreen property are associated with the Pond on the adjacent lands. As for the amphibians, the vast majority of these observations were associated with the Pond and surrounding wetlands and cultural communities in the lands adjacent to the Evergreen property.

- Winter wildlife surveys were completed to detect concentrations of mammal tracks (**Section 3.4.1.5.4**), and the area was also examined during the amphibian breeding season to detect movements of frogs and / or salamanders (**Section 3.4.1.7**). Based on the findings of these surveys, there was no evidence of concentrated wildlife movements in this area, and no evidence of use by rare species.

4.1.6.4 SUMMARY OF CANDIDATE SWH

Based on the findings of the SWH evaluation presented in **Table** , there are twelve categories of SWH that could qualify specific areas within the Study Area as Candidate SWH. A summary is presented in **Table** and mapped in **Figure 3.18**.

Table 4.1-5 - Summary of Candidate Significant Wildlife Habitat within the Study Area

Significant Wildlife Habitat Type	Qualifying Areas
1. Landbird Migratory Stopover Area	Forested portions of the Bronte Creek valleylands
2. Rare Vegetation Communities	Tallgrass Prairie (ELC unit 3) associated with the Bronte Creek valley rim
3. Mink Feeding and Denning Sites	Riparian areas along the Bronte Creek valleylands
4. Waterfowl Staging Area	Pond feature (ELC unit 18)
5. Sites Supporting Area-Sensitive Forest Species	Forested portions of the Bronte Creek valleylands
6. Amphibian Breeding Ponds	Pond feature (ELC unit 18)
7. Turtle Wintering Areas / Habitat	Pond feature (ELC unit 18) and adjacent wetlands
8. Mature Forest Stands	Mature forested portions of the Bronte Creek valleylands and Central Woodland
9. Forests providing a Diversity of Habitats	Forested portions of the Bronte Creek valleylands
10. Areas of High Diversity	Bronte Creek valleylands
11. Species of Conservation Concern	Plants in the Bronte Creek valleylands
12. Animal Movement Corridors	Bronte Creek valleylands

Three areas have been identified as meeting one or more of the criteria for Candidate SWH as follows:

a. the Bronte Creek valleylands in the Greenbelt Plan Area (landbird migratory stopover area, rare vegetation community, mink feeding and denning sites, sites supporting area-sensitive forest species, forests providing a diversity of habitats, areas of high diversity, habitat for species of conservation concern, and animal movement corridors)
b. the Pond and associated wetlands in the Greenbelt Plan Area (waterfowl staging area, amphibian breeding ponds, and turtle habitat/wintering areas), and
c. the Central Woodland on the Subject Property (old growth and mature forest stands).

These three Candidate SWH areas (represented by the 12 different SWH categories listed in **Table 4.1-5**) are considered Key Features of the NHS. They have all been identified on **Figure 3.18**, and included within the Preliminary NHS identified on **Figure 4.1**.

Although the TDSPSS does not specifically map SWH areas, or include a comprehensive SWH screening, it describes three areas considered SWH (TDSPSS Section 3.9.5). These include the Bronte Creek Corridor (equivalent to area “a”), the Pond and wetland habitat (equivalent to area “b” above), and successional habitats, also primarily associated with the Bronte Creek valleylands and adjacent habitats (area “a”). The analyses completed as part of this EIR/FSS identifies the Central Woodland (area “c”) as an additional Candidate SWH area based on the presence of mature forested areas.

4.1.7 FISH HABITAT

Fish habitat in the PPS (2014) and Regional Official Plan (2014) is defined as in the *Fisheries Act* as discussed in **Section 2.1**. Within the Study Area, as presented in **Section 3.4.2**, there is direct and indirect fish habitat, as well as hydrologic features that do not provide fish habitat, as summarized in Table table. In addition, fish habitat that is considered cold or coolwater is considered more sensitive than warmwater fish habitat, therefore thermal regimes are also listed in the table where known. Notably, while the thermal regime of 14W-7 is based on field data collected by this Study Team, the other thermal regimes are based on available background information.

Table 4.1-6 - Overview of fish habitat identified in the Study Area

Water Feature (ref. Figure 3.9)	Fish Habitat Classification	Thermal Regime	Comments
14W-17	Possible Direct Fish Habitat*	coolwater	also Redside Dace (provincially Endnagered) contributing habitat
14W-17Aa	Not Fish Habitat	N/A	
14W-17Ab	Not Fish Habitat	N/A	
14W-17Ac	Not Fish Habitat	N/A	
14W-17Ba	Not Fish Habitat	N/A	
14W-17Bb	Not Fish Habitat	N/A	
14W-17Bc	Not Fish Habitat	N/A	
14W-17Bd	Not Fish Habitat	N/A	
14W-17Ca	Not Fish Habitat	N/A	
14W-17Cb	Indirect Fish Habitat	warmwater	considered a suitable candidate for re-location
14W-17Cc	Not Fish Habitat	N/A	
Bronte Creek	Direct Fish Habitat	warmwater	also Silver Shiner (provincially Threatened) habitat
BCT-R1	Indirect Fish Habitat	warmwater	
BCT-R2	Not Fish Habitat	N/A	
BCT-R3	Indirect Fish Habitat	warmwater	
BCT-R3a	Indirect Fish Habitat	warmwater	
BCT-R3b	Not Fish Habitat	N/A	
Pond (ELC unit 18)	Possible Direct Fish Habitat	warmwater	

*during high water levels when fish can easily move from downstream reaches

All water features confirmed as fish habitat are identified for inclusion in the Preliminary NHS (**Figure 4.1**). This is consistent with the TDSPSS NHS.

Notably, tributary 14W-17Cb, which is considered indirect fish habitat and of limited habitat value, is recognized in the TDSPSS and in this EIR/FSS as a feature that could be re-located as long as its ecological and hydrological functions are maintained and protected with an appropriate setback and buffer (if required).

4.2 EVALUATION OF OTHER NATURAL HERITAGE COMPONENTS

Other natural heritage features, identified in s. 115.3 of the Region's Official Plan, which were considered in this EIR/FSS for potential inclusion in the Regional NHS include:

- watercourses (**Section 4.2.1**)
- wetlands other than those identified as Key Features (referred to herein as "other wetlands") (**Section 4.2.3**), and
- regulated floodplains (**Section 4.2.4**).

Specifically, the following sections of the Region's Official Plan (2014) require consideration of the following :

115.3(5) *watercourses that are within a Conservation Authority regulation limit or that provide a linkage to a wetland or a significant woodland;*

115.3(6) *wetlands other than those considered significant under Section 115.3(1)b);*

115.4(2) *Regulated Flood Plains as determined, mapped and refined from time to time by the appropriate Conservation Authority.*

The following sections describe how these components have been evaluated within the Study Area and Subject Property, and whether or not they have been included in the Preliminary or Proposed NHS.

4.2.1 WATERCOURSES (S. 115.3(5))

Watercourses are defined in the Regional Official Plan (2014) as (s. 289.1): "*An identifiable depression in the ground in which a flow of water regularly or continuously occurs"*. This is the same definition as s. 28 (25) of the *Conservation Authorities Act*. Conservation Halton regulates watercourses, as defined above, but does not regulate any of the drainage features or swales on the Subject Property classified as "hydrologic connections" (see **Figure 3.9**).

The TDSPSS identified watercourses regulated by Conservation Halton and further classified each watercourse as a high, medium or low constraint feature. There are two regulated watercourses on the Subject Property: 14W-17 and 14W-17Cb. Watercourses 14W-17 and 14W-17Cb were identified as medium constraint watercourses in the TDSPSS. However, this EIR/FSS considers 14W-17 as high constraint due to the fact that it has been confirmed as contributing habitat for Redside Dace by MNRF. Both watercourses are included in both the TDSPSS NHS and the Preliminary NHS.

The TDSPSS indicates that low constraint watercourses primarily function as conveyance features and can be removed and that medium constraint watercourses are to be retained as open features along with their riparian corridors with the potential for relocation subject to the approval of Conservation Halton. This EIR/FSS recommends that watercourse 14W-17 be protected in situ and that watercourse reach 14W-17Cb can be re-located provided the realignment incorporates natural channel design

principles and includes riparian buffers and meets setback requirements specified in the TDSPSS and Conservation Halton.

4.2.2 OTHER WETLANDS (S. 115.3(6))

Section 4.1.2 included an evaluation of all wetlands within the Study Area to determine their significance using the Regional Official Plan (2014) criteria under s. 115.3(1)(b). Through that evaluation it was determined that wetlands corresponding with ELC Units 19, 21c, 24a and 24b on the Subject Property did not satisfy criteria for wetland significance.

According to the Region's Official Plan (2014) s. 115.3(6), wetlands other than those considered significant under s. 115.3(1)b) may be included as components of the Regional NHS. A brief description of these wetland features, and confirmation of whether or not it is recommended to be included in the NHS is provided below.

4.2.2.1 ELC UNIT 19

As discussed in **Section 3.5.2.1**, this small 1,636 m^2 meadow marsh wetland is located in an agricultural field to the southeast of the Infrastructure Ontario Pond is not natural and became established following excavation of the Pond. Recent drainage modifications have resulted in a reduction to runoff contributions from the Pond and consequentially a reduction in size due to ploughing activities. Additionally the wetland is not regulated by Conservation Halton and was not staked during the TDSPSS. Given its small size and its lack of habitat value, as well as its anthropogenic origin, the EIR/FSS has determined that this wetland feature does not provide a functional contribution to the Regional NHS, and has therefore not been identified as requiring protection. As indicated previously, the Region's environmental consultant has agreed, based on the technical information provided, that this feature does not warrant inclusion in the NHS.

4.2.2.2 ELC UNIT 21C

This small 332 m^2 reed canary grass marsh wetland is located at the southwest corner of the Central Woodland. Given its small size and its lack of habitat value, the EIR/FSS has determined that this wetland feature does not provide a functional contribution to the Regional NHS, and has therefore not been identified as requiring protection. Nonetheless, it is located within the linkage between the Central Woodland and the Bronte Creek valley as well as the woodland buffer (see **Section 4**) and will be retained within the NHS.

4.2.2.3 ELC UNIT 24A

This 1,230 m^2 riparian wetland associated with watercourse 14W-17Cb. The feature has not been identified in this EIR/FSS for protection due to its limited habitat functions. In addition, the EIR/FSS concurs with the TDSPSS that this watercourse may be realigned, which would result in removal of the

wetland. However, as part of the mitigation measures, a wetland feature will be recreated within the realigned watercourse block (see **Section 7**).

4.2.2.4 ELC UNIT 24B

This small 528 m^2 agricultural wetland feature is located north of the Southern Woodland, outside of the proposed buffer (see **Section 4**). This feature was also not identified as wetland on the TDSPSS ELC mapping, likely due to its small size. This wetland feature is not regulated by Conservation Halton. Given its small size and its lack of habitat value, the EIR/FSS has determined that this wetland feature does not provide a functional contribution to the Regional NHS, and has therefore not been identified as requiring protection. The Region's environmental consultant has agreed, based on the technical information provided, that this feature does not warrant inclusion in the NHS.

4.2.3 REGULATED FLOOD PLAINS (S. 115.4(2))

Flood plain is defined in the PPS (2014) and Regional Official Plan (2014) as (s. 237) as: " *for river, stream, and small inland lake systems, the area, usually low lands adjoining a watercourse, which has been or may be subject to flooding hazards".*

Conservation Halton identifies flood plains for all regulated watercourses. As outlined in **Section 3.3.6.4** and as shown on **Drawing 3**, flood plain mapping has been prepared for both regulated watercourses on the Subject Property (i.e., 14W-17 and 14W-17Cb). The flood plains related to these two watercourse segments are included within the Preliminary NHS (**Figure 4.1**).

Notably, re-location of 14W-17Cb is considered appropriate in the TDSPSS, as well as in this EIR/FSS, subject to Conservation Halton approvals.

4.3 LINKAGES

The importance of maintaining, and where possible improving, connections between and among protected natural features and areas, particularly in urbanizing settings, is well-recognized in both the current scientific literature (e.g., see papers cited in Environment Canada 2013, OMNR 2010) and the PPS (2014). Although ecological connections (often referred to as corridors or linkages) can facilitate the movement and spread of some undesirable natural elements (e.g., invasive species, plant pathogens), they are generally considered important for supporting the movement of some plants and wildlife[12] between "core areas" or Key Features, which for many species is critical to their life cycles as well as their long-term meta-population persistence.

[12] As noted in Environment Canada's *How Much Habitat is Enough?* (2013), corridors or linkages are not required at all scales by all species to facilitate movement or in all landscape contexts.

It is also well-recognized that determining an appropriate linkage width and form for a given site is challenging, and that the current science does not provide any definitive direction on these matters (OMNR 2000). However, general guidance that has emerged from the "corridor/linkage" literature, indicates that corridors/linkages should be identified at different scales, that corridor/linkage widths should be determined based on a functional assessment of what species the corridor is expected to support, and that the current and anticipated landscape contexts both need to be considered. Plant and wildlife species tend not to "envision" or plan a route, but rather move instinctually along the best route in response to complex environmental and physiological triggers, likely based on a perception of "least cost" to self (Environment Canada 2013). Therefore, a corridor/linkage should provide a relatively direct and short connection between habitats and ideally provide an appropriate level of cover for the species that may use it.

Linkages are a component of the Regional NHS (s. 115.3(3)), and are defined in the Region's Official Plan (s. 255) as an area that provides connectivity between Key Features for plants and animals. The definition does not prescribe a minimum or maximum width for this component and states that: "*The extent and location of the linkages can be assessed in the context of both the scale of the proposed development or site alteration, and the ecological functions they contribute to the Regional Natural Heritage System"* (see **Section 2.7.1** for the full definition). The determination of the location of the linkages is discussed in **Section 4.3.1** below, while the recommended extent of the linkages is discussed in **Section 4.3.2**. Notably, these have been determined based on their current ecological functions as well as their anticipated ecological functions in the context of an urbanized setting.

As stated above, the Region`s and Evergreen`s environmental consultants have agreed that the location and extent of the linkages (as identified in **Figure 2.1** and both the Preliminary and the Proposed NHS) are appropriate for this Study Area.

4.3.1 LOCATION OF LINKAGES

The TDSPSS identified three ecological linkages in the Study Area as follows:

- A Regional linkage along the Bronte Creek corridor
- A local linkage between what is referred to in this study as the Central Woodland and the Infrastructure Ontario Pond and associated wetlands in the Greenbelt Plan Area, and
- A local linkage between what is referred to in this study as the Southern Woodland and the Bronte Creek valley corridor.

The assessments completed as part of this EIR/FSS concur that one Regional-scale and two local-scale linkages in the locations identified in the TDSPSS NHS (see **Appendix I**) are appropriate for this Study Area given the nature and ecological functions identified for the various Key Features (as described in **Section 3.4**). Specifically:

- BRONTE CREEK CORRIDOR REGIONAL-SCALE LINKAGE: The Bronte Creek corridor is recognized as a Regional scale linkage that connects to portions of the valley upstream and downstream of the Study Area. This Regional scale linkage provides for landscape connectivity between the upper portions of the Bronte Creek watershed on and above the Niagara Escarpment and Lake Ontario in the lower portion of the watershed. Furthermore, the Bronte Creek valleylands, immediately north of Highway 407, intersect with the Trafalgar Moraine which forms a significant east-west linkage through the Glenorchy Conservation lands to the east, providing connectivity to the Sixteen Mile Creek valley system. These Regional scale linkages represent the most significant corridors within the urban portions of Halton Region. Within the Study Area, this corridor / linkage is comprised of several Key Features, provides a number of important habitat functions, and supports habitat for a threatened fish species as well as a number of significant bird species (see **Figure 3.18**).

- TWO LOCAL-SCALE LINKAGES: On the Subject Property, local scale connectivity is currently supported by the hedgerows and agricultural fields that facilitate movement of local wildlife populations between the significant woodlands on the Subject Property and the Bronte Creek valleylands. The Central Woodland and Southern Woodland features are both relatively close to the Regional scale natural linkage features, being situated within about 100 m of the Bronte Creek woodland / wetland edge. Since the Central Woodland and Southern Woodland features provide some supporting habitat for a number of species (primarily birds but also some amphibians and mammals) that primarily occur and breed in the Bronte Creek corridor (including the Pond and associated wetlands), maintenance of naturalized linkages between these woodland features and the Bronte Creek corridor will help support the continuation of this function in an urbanized setting, and potentially enhance this function.

In addition, just north of the Subject Property, some possible linkage functions are provided along the Hydro One transmission corridor that runs parallel to the south side of the 407 ETR. This corridor is comprised of open fields and thicket habitats that offer little resistance to movement of local wildlife populations. However, these lands have not been specifically identified as “linkage” because many species of wildlife will be discouraged from using this area for movement due to the traffic volumes along the highway and the presence of the transmission lines, and therefore the linkage function is considered limited.

4.3.2 EXTENT OF LINKAGES

The extent of the Bronte Creek valley Regional scale linkage is defined by its extant width, which ranges from about 100 m to more than 400 m wide within the Study Area, and is wider in some areas if the portions of the valley outside the Study Area are considered.

The two local-scale linkages, which are almost entirely on the Subject Property, are currently comprised of agricultural fields with some hedgerows along their edges. The width and extent of these two local-

scale linkages between the Central and Southern Woodlands on the Subject Property and the adjacent Bronte Creek corridor were determined for Preliminary NHS (see **Figure 4.1**) based on: (a) consideration of the species expected to use the corridors (as summarized in **Section 4.1.6.3**), (b) the linkages identified in the TDSPSS (see **Appendix I**), and (c) the following basic conservation biology principles intended to maximize their functionality for supporting wildlife movement:

- maintaining linkages whose width is no more than twice their length
- providing the shortest and most direct connection possible in the given landscape context, and
- ensuring the linkage is maintained, or restored to a natural state.

Based on these considerations, the Preliminary NHS identifies two local-scale linkages, as shown in **Figure 4.1**, between about 100 m and 200 m wide. Both linkages are wider than they are long, provide the shortest and most direct route to (and from) the adjacent Bronte Creek valley, and will be restored from their current agricultural land use to a naturalized state (as described in **Section 8.1**). These linkages are both intended to support the movement of small mammals, amphibians, reptiles and deer, although the linkage to the Southern Woodland is not expected to be used by amphibians other than toads.

For the **Southern Woodland**, the width of the Preliminary NHS linkage ranges from about 124 m to 192 m, while its length ranges from about 108 m to 102 m (as shown in **Figure 4.1**). This linkage extends slightly outside the Subject Property. As compared to the TDSPSS, the linkage has been extended further to the northwest, resulting in a wider link extending across the top of the school bus depot in the adjacent lands.

For the **Central Woodland**, the linkage builds on and encompasses the hedgerow running between the Central Woodland and the Bronte Creek corridor and encompasses a portion of the hedgerow running to the south (identified as H5 and H4 in the TDSPSS, and in **Figure 3.17**). This linkage is entirely within the Subject Property. This results in a linkage that is between 120 m and 159 m wide, and between about 89 m and 94 m long (as shown in the Preliminary NHS - **Figure 4.1**).

The extent of the Bronte Creek corridor linkage in the TDSPSS and this EIR/FSS are identical, while the extent of the two local-scale linkages is comparable. The TDSPSS recommends that the local-scale linkage between the Central Woodland and the Infrastructure Ontario Pond and associated wetlands in the Greenbelt Plan Area should be about 200 m wide, while the local-scale linkage between the Southern Woodland and the Bronte Creek valley corridor should be about 100 m wide. However, once wetland ELC unit 19 is removed from the NHS (as recommended in this study – see **Section 4.1.2.1** – and

agreed as appropriate by the Region`s and Evergreen`s environmental consultants), the width of this linkage is effectively reduced to closer to 100 m [13].

Given the proximity of both the Central and the Southern Woodlands to the protected Key Features in the Bronte Creek corridor (i.e., within 100 m), the species expected to use these linkages (e.g., some urban adapted mammals, a few relatively common amphibians), and the intent to enhance the current linkage areas (which are being farmed) through naturalization (as described in **Section 8.1**), linkages in the range of 100 m to 200 m wide, such as those being proposed between both these wooded features and the Bronte Creek corridor lands, are considered more than adequate to support the current, and enhance the anticipated, linkage functions.

4.4 BUFFERS

The purpose of a buffer, as per s. 220.1.1 of the Region`s Official Plan (2014) is ``*to protect the* [*Key*] *features and ecological functions of the Regional Natural Heritage System by mitigating impacts of the proposed development or site alteration*". The buffer definition in the Region`s Official Plan (2014) also directs that the extent of buffers "*shall be based on the sensitivity and significance of the Key Features and watercourses and their contribution to the long term ecological functions of the Regional Natural Heritage System"*. This section:

- provides some context for buffers based on the current science and policy guidance (**Section 4.4.1**), and then
- demonstrates how buffers for the Key Features and watercourses in the area have been determined (**Section 4.4.2**) based on:
    - a) their ability to protect Key Features and mitigate anticipated impacts associated with proposed development or site alterations, and
    - b) the assessed sensitivity of Key Features in question in terms of their intrinsic ecological functions, and any anticipated changes in these functions that may result from the proposed adjacent land uses as contemplated through the Secondary Plan (discussed in more detail in **Section 6.1**).

[13] Notably, Environment Canada's *How Much Habitat is Enough?* (2013), which is based on a critical review of the current science, concludes that although connectivity widths will vary depending on the objectives of the project and the features being connected, corridors of at least 50 m to 100 m in width are generally adequate to facilitate species movement (albeit not support breeding habitat) in the context of southern Ontario. This paper also states that in urban environments, consideration of urban edge effects may result in a need for wider corridors.

4.4.1 CURRENT UNDERSTANDING OF ECOLOGICAL BUFFERS AND POLICY GUIDANCE

As noted in the current science, and the TDSPSS, the identification of ecologically appropriate buffers is one of several management strategies that can help to mitigate potential urban impacts at the site-specific scale (such as physical encroachments, light pollution, noise, and spread of invasive and exotic plants), however they cannot be expected to mitigate broader landscape-scale impacts associated with urbanization such as habitat scarcity and fragmentation, or cumulative noise from nearby roads, railways and air traffic.

The available science has demonstrated that buffers are able to help attenuate sediments and pollutants, screen against human disturbances (such as noise), serve as a habitat transition zone, and contribute to the protection of the given area (e.g., by maintaining microclimate conditions or limiting the spread of invasive species) (Beacon Environmental 2012). However, they are not intended to provide habitat functions in and of their own right. Therefore, while buffers may be included as part of a NHS, and typically support some incidental ecological functions, they should always be identified on the basis of their protective or mitigative functions in relation to the features they are intended to protect and the type of adjacent land use giving rise to the need for protection (rather than their potential ability to provide ecological functions).

Although the PPS (2014) does not provide any policies that specifically discuss buffers in relation to natural heritage features and areas, nor does it define the term, some guidance is provided in the *Natural Heritage Reference Manual* (OMNR 2010). This manual was developed to support interpretation and implementation of the natural heritage policies of the 2005 PPS, but in the absence of an updated manual can be used in relation to the 2014 PPS. The manual recognizes the lack of specific direction related to buffers in the PPS, but acknowledges that the use of buffers has become a standard consideration for many planning agencies in the Province (p. 129). It also states that:

- buffers can be used to address the PPS requirement of "no negative impacts on the natural features or their ecological functions" through their ability to mitigate some of the impacts associated with development in the adjacent lands (p. 44);
- buffers "*should be determined once the nature of the development is known and the extent of potential impacts can be determined*" (p. 44);
- "*[a]ppropriate widths for buffers vary depending on the sensitivity and functions of the features and proposed adjacent land uses*" (p. 129), and
- "*[b]uffers must be determined and rationalized on the basis of their ability to protect natural features and their associated functions" which "vary with the feature and the proposed adjacent land use*" (p. 129).

4.4.1.1 BUFFERS VERSUS SETBACKS

Although the two terms are often used interchangeably, buffers should be distinguished from setbacks because they are identified primarily on ecological grounds, whereas setbacks are primarily driven by

hazard and / or planning considerations. Typically a "setback" refers to a within lot distance between a built structure and the lot limit, and sometimes it refers to an engineering constraint such as a hazard lands limit. In contrast, a "buffer" is typically a defined distance from the boundary of the protected feature in relation to the adjacent land use which is already, or will be managed to become, naturalized. In the case of forested habitat edges or steep slopes, buffers can and often overlap with hazard-based setbacks, and in practice, buffers can also mitigate potential hazards by providing a vegetated hazard zone, so the two can overlap. However, they are not the same.

4.4.2 DETERMINATION OF BUFFERS TO KEY FEATURES IN THE STUDY AREA

Buffers for the Key Features in the Study Area were determined based on: (a) site and feature-specific consideration of the ecological sensitivity of each of the Key Features, and (b) consideration for the types of adjacent land uses being contemplated through the Secondary Plan. These are each discussed in more detail in **Section 4.4.2.1** and **Section 4.4.2.2** below.

4.4.2.1 CONSIDERATION OF KEY FEATURE AND WATERCOURSE SENSITIVITY

The Central Woodland's level of ecological sensitivity to disturbance is considered low to moderate based on the fact that:

- it has already been disturbed by former farming practices (i.e., partial clearing for pasturing)
- it does not support old-growth elements, significant vegetation communities, or habitat for threatened or endangered species
- the more mature components of the woodland have experienced substantial declines due to Beech Bark Disease
- there is evidence that the mature Oak and Pine components of this woodland have been "highgraded" in the past (i.e., large specimens were selectively removed), contributing to the abundance of tolerant species (i.e., Maple)
- it is considered Candidate SWH due to the presence of mature trees in some areas but not for other wildlife-related functions
- it provides potential habitat for some area-sensitive forest interior bird species, but in very low abundances due to the very limited amount of interior habitat, and
- its feature boundaries are already well-established and have been effectively hardened by many years of agricultural activities in the immediately adjacent lands creating a well-defined woodland edge abutted by cultivated areas.

The Southern Woodland's level of ecological sensitivity to disturbance is considered low based on the fact that:

- it is a cultural woodland, regenerating on lands formerly used as an orchard
- it does not support old-growth elements, significant vegetation communities, or habitat for threatened or endangered species, and
- it does not support any types of Candidate SWH.

The wetlands associated with the Pond (which are outside but immediately adjacent to the Subject Property) are assessed as having a moderate level of ecological sensitivity to disturbance based on the fact that:

- they were recently disturbed and are the by-product of anthropogenic activities related to creation of the Pond
- they do not support significant vegetation communities, or habitat for Threatened or Endangered species
- the communities along the feature edge are Green Ash cultural woodland and Willow thicket swamp, both vegetation communities that are not very sensitive to development
- they directly support one type of Candidate SWH – turtle habitat / wintering area, and surround the Pond which supports three types of Candidate SWH (i.e., waterfowl staging area, amphibian breeding area, and turtle habitat / wintering area), and
- their feature boundary on the northeastern side is already well-established and has been effectively hardened by many years of agricultural activities in the immediately adjacent lands creating a well-defined woodland edge abutted by cultivated areas.

The wooded edge of the Bronte Creek valley considered to have a low to moderate level of sensitivity based on the fact that:

- portions of it have been disturbed and degraded by former farming practices (e.g., partial clearing for pasturing) and include a number of cultural communities
- the woodlands do not provide habitat for any provincially Threatened or Endangered species, and the creek itself – which provides habitat for a provincially Threatened fish species - is setback by more than 100 m from the feature edge
- the mature forested communities in the valley are concentrated closer to Bronte Creek and away from the edge abutting the Subject Property
- the one small rare vegetation community contained within this feature (i.e. Tallgrass Prairie) is well setback from the woodland edge (i.e., more than 100 m) and
- south of the Pond (i.e., ELC units 6b, 7d, 7e, 7f) along the edge of the Bronte Creek corridor are largely cultural woodlands with limited sensitivity to development impacts, while the significant woodlands northwest of the Pond along the edge of the Bronte Creek corridor are Green Ash woodlands (i.e., ELC unit 9a), also with limited sensitivity to development impacts and anticipated to be largely regenerating once impacted by Emerald Ash Borer
- even though the area supports several types of Candidate SWH, maintenance of these is not expected to require extensive buffers as they are currently being sustained in a context where the feature boundaries have been well-established and effectively hardened by many years of agricultural activities in the immediately adjacent lands.

Watercourse 14W-17 at the corner of Highway 407 and Tremaine Road is assessed as having relatively high ecological sensitivity based on the fact that:

- it is considered "contributing habitat" for the provincially Endangered Redside Dace by MNRF (see **Section 3.4.2**), and
- it is considered coolwater fish habitat based on the analyses conducted as part of this study (see **Section 3.4.2.4**).

Watercourse 14W-17Cb at the corner of Dundas Street and Tremaine Road is assessed as having relatively low ecological sensitivity based on the fact that:

- it was considered "marginal habitat" in the TDSPSS , and
- it is considered warmwater fish habitat and provides indirect fish habitat by conveying flow and nutrients to downstream reaches.

4.4.2.2 CONSIDERATION OF ADJACENT LAND USES

In addition to the intrinsic sensitivities of each of the Key Features and watercourses on and immediately adjacent to the Subject Property, the types of land uses being contemplated adjacent to these features through the Secondary Plan was considered to determine appropriate ecological buffers. The Secondary Plan, which is being submitted concurrently with this EIR/FSS, was developed collaboratively by the Study Team to ensure that the environmental protection and sustainability objectives are achieved. Since 2012, Beacon has provided input to the land use plan concepts by providing guidance on Key Features and appropriate ecological buffers with consideration to the mix of land uses within the Secondary Plan area, including residential, business, employment, and open space. Additionally, Schollen and Company and Urbantech provided considerable input in regard to the land use concepts to ensure that elements of a sustainable stormwater management strategy could be incorporated to the fullest extent possible for the Evergreen community. The land use plan has gone through multiple iterations based on input from the study team to ensure environmental protection and sustainability objectives are achieved.

Based on this information, the following anticipated land uses were contemplated adjacent to the various Key Features and watercourses:

- Central Woodland (significant woodland): The lands adjacent to this square Key Feature are presently comprised of agricultural fields and are row cropped. There is a farm lane running along the western edge of the feature that is considered suitable for pedestrian trail. In addition, the lands between the Pond wetlands and this Key Feature have been identified as a linkage (as described in **Section 4.3** above). Proposed adjacent land uses are:
    - business corridor uses to the north
    - a single-loaded road to the east
    - residential to the south, and
    - a combination of single family residential and linkage to the west.

- Southern Woodland (significant woodland): This pear-shaped Key Feature is currently surrounded by cultural and early successional habitats, as well as some cultural structures (including a heritage building) on all sides except to the south where the feature abuts Dundas Street. Proposed adjacent land uses are:
    - residential to the north and east, with a single loaded road also running along the eastern side, and
    - Linkage and opens space to the west.

- Infrastructure Ontario Pond Wetlands (outside but adjacent to the Subject Property) (regionally significant wetlands): This Key Feature is adjacent to the Bronte Creek valley and woodlands to the west, flanked by cultural woodlands within the Greenbelt Plan Area to the north and south, and flanked by an agricultural field on the Subject Property to the east. In addition, the lands between this Key Feature and the Central Woodland have been identified as a linkage (as described in **Section 4.3** above). Proposed adjacent land uses are:
    - residential land uses to the north of the wetlands on the Subject Property beyond the cultural woodland feature (which is within the Greenbelt Plan Area)
    - a linkage to the west and residential land uses south of the proposed linkage, and
    - a special, ecologically sensitive, road through this linkage (as envisioned through the TDSPSS) to support community connectivity between the residential areas.

- Bronte Valley Corridor Woodland Edge North of the Pond (significant woodland): The lands adjacent to this Key Feature are presently comprised of agricultural fields and are row cropped. Proposed adjacent land uses are residential.

- Bronte Valley Corridor Woodland Edge South of Pond outside but adjacent to the Subject Property) (significant woodland): The lands to the north, west and south of this Key Feature are outside the Subject Property and contained within the Greenbelt Plan Area, and do not require consideration of buffers. The lands adjacent to this Key Feature to the east are agricultural. Notably, much of the woodland along this edge is part of a cultural woodland feature (see **Figure 3.17**). Proposed adjacent land uses are residential.

- Watercourse 14W-17 (on the Subject Property) and associated regionally significant wetland: This NHS feature is immediately surrounded by cattail marsh wetlands (see **Figure 3.17**) which are flanked by cultural meadow to the north and east, and agricultural lands to the south. This feature is within a future transitway corridor identified for Highway 407. Proposed adjacent land are business corridor to the south of it.

- Watercourse 14W-17Cb (on the Subject Property) and associated wetland: This NHS feature also has a narrow band of cattail wetland vegetation along it and is otherwise surrounded by agricultural lands (see **Figure 3.17**) except for its southern end which abuts Dundas Street. Proposed adjacent land uses are employment lands and mixed use.

Notably, because buffers are intended to help protect Key Features from adjacent land uses, buffers were only determined and applied in areas where Key Features abut lands anticipated to have some form of development. This included residential / commercial / business / mixed uses, roads, and open space where specific uses had not yet been determined. Consequently, no buffers were applied to Key Features abutted by other Key Features or by linkages, except in the case of the "special" road suggested through the linkage. In this case buffers were identified to ensure that the road alignment would be located outside the area where buffers to a local road from the Key Features would otherwise be located.

4.4.2.3 BUFFER DETERMINATION AND APPLICATION

Applying buffers to the western boundary of the Subject Property is complicated by the fact that this boundary intersects with the Greenbelt Plan Area boundary in a number of areas. As described in **Section 2.6**, certain Key Features within the Greenbelt Plan Area (including significant woodlands and significant wetlands) require 30 m vegetation protection zones to the extent that this zone falls within the Greenbelt Plan Area. Therefore, in some sections along the western Subject Property boundary, the buffer is more than what is recommended below to be consistent with the requirements of the Greenbelt Plan.

Based on: (a) site and feature-specific consideration of the ecological sensitivity of each of the Key Features and watercourses on the Subject Property (**Section 4.4.2.1**), and (b) consideration for the types of adjacent land uses being contemplated through the Secondary Plan (**Section 4.4.2.2**), the following buffers were recommended:

a) 10 m from dripline of the Central Woodland
b) 10 m from dripline of the Southern Woodland
c) 10 m from dripline of the Bronte Creek valley woodlands (or up to 30 m within the Greebelt Plan Area boundary, whichever is greater)
d) 15 m from the staked edge of the Pond wetlands (or up to 30 m within the Greenbelt Plan Area boundary, whichever is greater)
e) 15 m from the stable top of valley slopes of significant valleylands in the Bronte Valley (or up to 30 m within the Greenbelt Plan Area boundary, whichever is greater)
f) 10 m from dripline of the Bronte Creek valley woodlands (or to the Greenbelt Plan Area boundary, whichever is greater)
g) 30 m from the bankfull channel for cool or cold water habitat found in 14W-17, and
h) 15 m from the bankfull channel for warmwater habitat found in 14W-17Cb.

The recommended buffers are illustrated in **Figure 4.1**.

For the two watercourses, additional setbacks were also incorporated into the Preliminary NHS, including the meander belt width allowance, a safety factor and the flood plain. More detail in this regard is shown in **Figure 5.1** and discussed in Section 5.

4.4.3 DISCUSSION OF BUFFERS RECOMMENDED IN THE TDSPSS

The guidance in the TDSPSS related to buffers, as per objective 2.7 was to "*establish appropriate feature-specific buffers for protection of natural habitats*" that conform to the applicable policies. However, based on the application of buffers in the TDSPSS NHS, and evidence provided before the Board in June 2015, the actual approach taken regarding buffers was the generic application of precautionary 30 m buffers on all "core" or Key Features, except for the wetlands associated with 14W-17 to which a 15 m buffer was applied.

In general, the EIR/FSS approach to buffers responds to of site-specific considerations as it required by the policies of the Regional Official Plan and thus differs from the TDSPSS approach which applied buffers using a generic and precautionary approach.

For the purposes of the Draft Plan approval and implementation, the buffers recommended in this EIR/FSS are expected to protect and enhance the current ecological functions of the identified Key Features and watercourses based on the assessments above, and are also considered to conform with the Region's Official Plan (2014) policies.

4.5 ENHANCEMENTS

Enhancements to Key Features are identified as a component of the Regional NHS (s. 115.3(2)) and are defined in the Regional Official Plan (2014) (s. 229.1.1) as **"***ecologically supporting areas adjacent to Key Features and/or measures internal to the Key Features that increase the ecological resilience and function of individual Key Features or groups of Key Features*". This approach implements PPS natural heritage s. 2.1.2 which states that the: "*The diversity and connectivity of natural features in an area … should be maintained, restored or, where possible, improved*…" and the definition of *Natural Heritage System* which indicates that the system includes "...lands which have been restored or have the potential to be restored to a natural state…". These policies recognize that the ecological integrity of natural areas is often impaired due to land use transformations (e.g., clearing for agriculture or urbanization) and that in such areas, opportunities may exist to restore or enhance Key Features of the NHS through a variety of management and stewardship measures either within the Key Feature or adjacent to it..

The TDSPSS generally recognizes enhancement of core areas (including linkages) as a key management strategy for ensuring an NHS that can be sustained in an urbanizing context, and speaks about different opportunities for enhancement including:

- Protecting and naturalizing the floodplain and the meander belt (Objective 2.3 from the TDSPSS)
- Maximizing on-site infiltration (Objective 2.4 from the TDSPSS)
- Naturalization around stream corridors and wetlands (Objective 2.5 from the TDSPSS)
- Managing trails and invasive species in the woodlands (TDSPSS Section 5.3.3.2)

However, no specific areas for enhancements within or outside the NHS are identified in the TDSPSS NHS (see **Appendix I**), although the mapped linkages are called "enhanced linkage corridors".

For the purposes of this study, in order to be consistent with the NHS framework provided by ROPA 38, enhancements have been specifically identified as distinct areas within or adjacent to Key Features or watercourses and/or linkages, where specific management activities intended to improve and build more resilience into the system are proposed to be implemented.

On the Subject Property, the Key Features and watercourses have all been impacted by decades of farming around them, as well as some historical grazing and logging within the features themselves. Consequently, some of the best opportunities for enhancements on the Subject Property are in the form of invasive species management and habitat restoration within the Key Features themselves.

Given this context, in the Preliminary NHS, enhancements have primarily been identified within Key Features with one small additional enhancement area identified in a piece of land on the Subject Property that falls within the Greenbelt Plan Area and is between the outer limit of the required vegetative protection zone and the Greenbelt Plan Area boundary where development would not be feasible (see **Figure 4.1**). Although not mapped specifically as "enhancements", naturalization of the buffer areas (which are currently farmed lands) and the linkages (also largely currently farmed lands) are also envisioned (as discussed in more detail in **Section 8.1**).

Additional enhancements outside Key Features, buffers and linkages have also been identified in the Proposed NHS, as discussed in **Section 6.3**.

4.6 SUMMARY OF COMPONENTS IN THE PRELIMINARY NHS

The Preliminary NHS is illustrated in **Figure 4.1**.

Key Features and Watercourses

Based on the assessment of natural heritage features in **Section 4.1** and **Section 4.2** above, it was determined that the Study Area supports the following Key Features and watercourses:

- significant habitat of Endangered and Threatened species (Silver Shiner in Bronte Creek, Redside Dace in 14W-17 and Butternut scattered in the southern portion of the Study Area)
- significant woodlands (the Bronte Valley Woodlands, Central Woodland and Southern Woodland)

- significant valleylands (the Bronte Creek valley)
- regionally significant wetlands (associated with 14W-17, within the Central Woodland, and surrounding the Pond outside the Subject Property)
- significant wildlife habitat (associated with the Bronte Creek valley, Pond / surrounding wetlands, and portions of the Central Woodland); and
- fish habitat (14W-17, 14W-17Cb, Bronte Creek, BCT-R1, BCT-R3, BCT-R3a and possibly the Pond).

These Key Features and watercourses are equivalent to the core preserve areas identified in the TDSPSS NHS (**Appendix I**) with the exception of some refinements to the boundary of the Southern Woodland (as described above) and the removal of the small, isolated wetland outside the Greenbelt in the agricultural lands agreed to between the environmental consultants for the Region and Evergreen, (identified in the TDSPSS as a MAM2-2 unit and ELC unit 19 in this study) and explained above.

Linkages

The Preliminary NHS includes three linkages, which are consistent with those identified in the TDSPSS, as follows:

- A Regional linkage along the Bronte Creek corridor
- A local linkage of between 120 m and 159 m wide between the Central Woodland and the Infrastructure Ontario Pond and associated wetlands in the Greenbelt Plan Area, and
- A local linkage of between 124 m and 192 m wide between the Southern Woodland and the Bronte Creek valley corridor.

These linkages have also been the subject of agreement between the environmental consultants for the Region and Evergreen.

Buffers

The following buffers were recommended for the Key Features on and immediately adjacent to the Subject Property:

a) 10 m from dripline of the Central Woodland (or to the Greenbelt Plan Area boundary, whichever is greater)
b) 10 m from dripline of the Southern Woodland (or to the Greenbelt Plan Area boundary, whichever is greater)
c) 15 m from the staked edge of the Pond wetlands (or the Greenbelt Plan Area boundary, whichever is greater)
d) 15 m from the stable top of valley slopes of significant valleylands in the Bronte Valley (or the Greenbelt Plan Area boundary, whichever is greater)
e) 10 m from dripline of the Bronte Creek valley woodlands (or to the Greenbelt Plan Area boundary, whichever is greater)
f) 30 m from the bankfull channel for cool or cold water habitat found in 14W-17, and
g) 15 m from the bankfull channel for warmwater habitat found in 14W-17Cb.

Notably, because buffers are intended to help protect Key Features from changes in adjacent land uses, buffers were only applied in areas where Key Features abut lands anticipated to have some form of development. Consequently, no buffers were applied to Key Features abutted by other Key Features or by linkages, except in the case of the “special” road suggested through the linkage.

Enhancements to Key Features

As part of the Preliminary NHS, enhancements were primarily identified within Key Features with one small additional enhancement area identified in a piece of land on the Subject Property in the Greenbelt Plan Area where development would not be feasible. Additional enhancements have been identified in the Proposed NHS in relation to the proposed Draft Plan.

5. SUMMARY OF CONSTRAINTS TO DEVELOPMENT

One of the primary objectives of the EIR/FSS, as identified in the Terms of Reference provided in the TDSPSS, is to identify potential constraints related to the anticipated development of the Subject Property. The identification of both physical and natural heritage constraints to development is primarily necessary to guide the design and servicing of the proposed development so as to avoid or minimize impacts to the NHS within the Study Area. Addressing constraints to development can also present opportunities for both mitigating impacts, and enhancing the NHS, thereby providing a foundation for a sustainable community.

The physical and biological / natural heritage constraints to development identified through this study are summarized in **Section 5.1** and **Section 5.2**, respectively. This EIR/FSS builds on the constraints identified in the TDSPSS, and uses the information gathered through the refined and updated assessments completed for this EIR/FSS (as provided in **Section 3** and **Section 4**) to refine the constraints.

The natural heritage constraints are illustrated in **Figure 5.1**. This mapping illustrates the constraints that underlie the Preliminary NHS (shown in **Figure 4.1**), and are identified in **Table 5.2-1**, but does not illustrate all of the physical constraints (particularly those related to groundwater and surface water) identified in **Table 5.1-1** that were considered the development of the proposed Draft Plan (described in **Section 6**) and the impact assessment (provided in **Section 7**).

5.1 PHYSICAL CONSTRAINTS TO DEVELOPMENT

Physical constraints to development are related to surface and groundwater features and areas, and also include setbacks related to natural hazards (e.g., slopes and floodplain) and anthropogenic hazards (e.g., utility corridors) in the landscape. The following physical constraints related to the Study Area are summarized in **Table 5.1-1**:

- Groundwater / Surface Water Quantity
- Watercourses
- Meander Belt
- Stream Erosion
- Floodplain Hazards
- Slope Hazard and Valleyland Setbacks
- Utility Corridors

The extent of the various constraints has been determined based on a combination of site-specific assessments (**Section 3**), feature stakings with the Region and Conservation Halton (**Table 3.2-1**), and application of the appropriate policies (**Section 2**).

Table 5.1-1 - Summary of Physical Constraints to Development

Category	Constraints to Development
Groundwater / Surface Water Quantity	Fourteen Mile Creek and several of its tributaries receive groundwater discharge from the surrounding lands. These surface flows and groundwater discharge (baseflow) to the creek and certain tributaries represent a development constraint. This constraint cannot be addressed with a buffer or setback, but rather requires broader consideration of surface and groundwater management options across the Subject Property (e.g., LID measures to promote recharge on site and contribute to maintaining baseflows, a de-watering plan for during construction if required, appropriate controls for stormwater runoff to ensure the receiving watercourses can sustain their current functions in terms of flood conveyance, water quality, and erosion processes).
Watercourses **(ref. Figure 3.9)**	The Study Area includes Bronte Creek and its tributaries in the adjacent lands (Bronte Creek, BCT-R1, BCT-R3, BCT-R3a) which are considered major watercourse systems by Conservation Halton and present constraints to development. The Fourteen Mile Creek tributaries on the Subject Property (14W-17, 14W-17Cb) are considered minor watercourse systems by Conservation Halton and also present constraints to development. Generally no development or site alteration is permitted within a watercourse; although crossings of watercourses and realignments of medium or low constraint watercourses may be permitted provided a study is completed to address environmental impacts and the necessary permits are obtained from Conservation Halton and/or MNRF. 14W-17Cb represents less of a constraint because it is a minor system with very limited natural heritage functions and therefore is considered, both by the TDSPSS and this EIR/FSS, as a candidate for relocation provided its hydrologic and ecological functions are maintained and / or enhanced. Where a watercourse provides fish habitat, development buffers of 15 m or 30 m are required for warmwater and cool/coldwater fisheries respectively by Conservation Halton. All of the watercourses listed above are considered warmwater except for 14W-17.
Meander Belt **(ref. Figure 5.1)**	Two watercourses have been identified for retention within the Subject Property: 14W-17 located in the north east corner and 14W-17Cb located in the south east corner. A meander belt assessment was completed for both of these features. The assessment determined the meander belt for channel 14W-17 to be 12m and the meander belt for 14W-17Cb to be 13 m. When a 20% factor of safety is added the meander belts become 14.4 m and 15.6 m respectively. These meander belts represent a zone in which development is not permitted by Conservation Halton. In the case of 14W-17Cb, the relocated watercourse would also require application of a comparable meander belt.
Stream Erosion	Erosion thresholds have been established along the critical reaches of the relevant portions of the Fourteen Mile Creek Tributaries (downstream of 14W-17 and 14W-17Cb). Critical discharge

Category	Constraints to Development
	rates have also been established. These discharge rates represent a constraint in so far as development outflows from stormwater management areas will need to be governed by these thresholds and rates.
Floodplain Hazards	The existing floodplains for the two Fourteen Mile Creek tributaries within the Subject Property (14W-17 and 14W-17Cb) are defined in the TDSPSS hydraulic model, which was further refined for the EIR/FSS based on the latest topographic survey (see **Section 3.3.9.4**). The existing model geometry has been updated for future conditions to assess the impact of development on the floodplains. The hydraulic properties of the channel have also been adjusted to represent the ultimate development conditions based on MNRF guidelines. A full range of return period flood events (2 to 100 year and Regional) have been modeled to calculate the water levels for different storm events and to design the SWM measures. The Regional Storm floodplain is identified as the regulatory floodplain in this study. This represents a constraint in so far as for any proposed alteration of existing floodplains, the stage-storage discharge must be preserved as per the TDSPSS, and the existing riparian storage is to be maintained or exceeded under proposed conditions for all return period events.
Slope Hazard and Valleyland Setbacks **(ref. Figure 5.1)**	Within the Study Area, steep slopes that could potentially represent slope hazards are only found in the Bronte Creek valleylands outside the Subject Property. Bronte Creek is considered a major valley system. Development and site alteration are generally not permitted within 15 m of the physical top of slope or long-term stable top of slope, whichever is greater. Since the Subject Property does not overlap with the valley slopes or their setbacks, there are no slope hazards that would constrain future development.
Utility Corridors	The northern boundary of the Subject Property is traversed by a Hydro One transmission corridor. A setback to this corridor may be required.

5.2 NATURAL HERITAGE CONSTRAINTS TO DEVELOPMENT

The majority of the natural heritage constraints associated with the Study Area (primarily within the Subject Property) are related to protected features and related linkages, buffers and setbacks, and are included in the Preliminary NHS (**Figure 4.1**)**.** A summary of these NHS components and the extent to which they constrain future development on the Subject Property is provided below in **Table 5.2-1.** The feature-specific constraints that underlie the Preliminary NHS are illustrated in **Figure 5.1**.

Table 5.2-1 - Summary of Natural Heritage Constraints

Category	Constraints to Development
Significant Habitat of Endangered and	S. 118.2(a) of the Region's Official Plan (2014) prohibits development and site alteration within significant habitat of Endangered and Threatened species except in accordance with applicable Provincial legislation or regulations. The Study Area supports habitat for three provincially Endangered or Threatened species - Silver Shiner, Redside Dace and Butternut.

Threatened Species	Silver Shiner occurs exclusively within Bronte Creek within the adjacent lands and well-away from any proposed development and only represents a limited constraint to development in so far as any stormwater being directed towards the creek must be treated for quality and controlled in terms of quantity. Tributary 14W-17 has been confirmed as contributing habitat for Redside Dace and as such represents a constraint to development in that it requires protection of the stream corridor to the bankfull limit. However, this is more than captured within the 15 m setback to the regionally significant wetland associated with the watercourse and the 30 m watercourse setback for coolwater systems required by Conservation Halton. The presence of contributing Redside Dace habitat in Tributary 14W-17 also means that stormwater management discharged to this watercourse must comply with MNRF's guidelines for the protection of water quality and mitigation of temperature impacts from stormwater runoff generated by the development. The habitat of Butternut does not represent a significant constraint to development because all of the trees identified as retainable are within areas identified for protection in the Preliminary NHS (ref. **Figure 3.18**), and the three trees identified outside the Preliminary NHS are considered non-retainable, and therefore can be removed following submission of formal Butternut Health Assessments and allowing three weeks for MNRF review. These matters are to be addressed as per the provisions of the Provincial *Endangered Species Act* (2007) related to this species.
Significant Wetlands	S. 118.2(a) of the Region's Official Plan (2014) prohibits development and site alteration within significant wetlands. There are no provincially significant wetlands or evaluated wetlands within the Study Area. A number of the wetland features on the Subject Property do, however, qualify as regionally significant (see **Section 4.1-2**). These include • The swamp beside Bronte Creek in the Greenbelt Plan Area (ELC unit 25) • The Pond (ELC unit 18) and associated wetland areas in the Greenbelt Plan Area (ELC units 9b, 20a, 20b, 21a, 21b, 23c, and 26) • The small wetlands within the Central Woodland on the Subject Property (ELC units 22, 23a and 23b), and • The small wetland associated with north-eastern watercourse 14W-17 (ELC unit 24c) on the Subject Property. The Region's Official Plan does not prescribe buffers for regionally significant wetlands; these are to be determined on a site-specific basis through an EIR or subwatershed study. The TDSPSS recommended buffers of 15 m to significant wetlands smaller than 2 ha, and 30 m buffers to significant wetlands greater than 2 ha outside the Greenbelt, which is generally consistent with Conservation Halton policies (2011). Buffers of 15 m have been appllied to all regionally significant wetlands in the Study area

	requiring buffers based on site specific ecological consideration (see **Section 4.4.2.1**): • The swamp beside Bronte Creek in the Greenbelt Plan Area (ELC unit 25) is surrounded by protected areas and does not require a buffer • The wetland areas associated with the Pond in the Greenbelt Plan Area (ELC units 9b, 20a, 20b, 21a, 21b, 23c, and 26) are just over 2 ha but have a 15 m buffer applied where development is contemplated in the adjacent lands based on ecological considerations • The small wetlands within the Central Woodland on the Subject Property (ELC units 22, 23a and 23b) are within the larger Central Woodland and do not require independent buffers, and • The small (less than 2 ha) wetland associated with northeastern watercourse 14W-17 (ELC unit 24c) on the Subject Property has a 15 m buffer applied. Although Conservation Halton's policies indicate a 30 m buffer to wetlands greater than 2 ha is normally required, a 15 m buffer is recommended for the Pond wetlands for the reasons provided in **Section 4.4.2**.
Significant Valleylands	The Bronte Creek valley is considered a major valley system by Conservation Halton and qualifies as a significant valleyland under the PPS (2014), as well as a Key Feature under the Region's Official Plan. The Greenbelt Plan policies generally do not permit the alteration of Key Features within the Greenbelt NHS, including significant valleylands. Conservation Halton does not permit development and site alteration within major valleylands without a permit, and generally requires a setback of 15 m from the stable top of slope (in this case, as staked by Conservation Halton staff on June 4, 2008). No portion of the Subject Property overlaps with the significant valleyland, or the associated 15 m setback from the stable top of slope, and although it has been identified as a constraint, it does not limit potential development of the Subject Property because it falls entirely within the adjacent lands on the Subject Property.
Significant Woodlands	S. 118.2(b) of the Region's Official Plan (2014) does not permit the alteration of any components of the Regional NHS, including significant woodlands, unless it has been demonstrated that there will be no negative impacts on the natural features and areas or their ecological functions. The Subject Property supports two woodland features that satisfy the Regional significant woodland criteria (i.e., the Central Woodland and Southern Woodland), and has the Bronte Creek valley woodlands in its immediately adjacent lands to the west, which also qualify as significant. The Bronte Creek valley woodlands, because of their location within the Greenbelt NHS, require a 30 m vegetation protection zone to the extent that it can be applied within the Greenbelt Plan Area. Outside the Greenbelt Plan Area, the Region's Official Plan (2014) does not prescribe buffers for significant woodlands; these are to be determined on a site-specific basis through an

	EIR or subwatershed study. The TDSPSS applied precautionary 30 m buffers to all significant woodlands in the Study area. Conservation Halton (2011) recommends buffers of 10 m from the dripline to significant woodlands outside the Greenbelt where no subwatershed study exists. A buffer of 10 m from the dripline to all significant woodlands within and adjacent to the Subject Property has been applied based on the site-specific analyses conducted, as described in **Section 4.4.2**.
Significant Wildlife Habitat (SWH) **(ref. Figure 3.18)**	S. 118.2(b) of the Region's Official Plan (2014) does not permit the alteration of any components of the Regional NHS, including SWH, unless it has been demonstrated that there will be no negative impacts on the natural features and areas or their ecological functions. Three areas have been identified as meeting one or more of the criteria for Candidate SWH as follows: a. the Bronte Creek valleylands in the Greenbelt Plan Area (landbird migratory stopover area, rare vegetation community, mink feeding and denning sites, sites supporting area-sensitive forest species, forests providing a diversity of habitats, areas of high diversity, habitat for species of conservation concern, and animal movement corridors) b. the Pond and associated wetlands in the Greenbelt Plan Area (waterfowl staging area, amphibian breeding ponds, and turtle habitat/wintering areas), and c. the Central Woodland on the Subject Property (old growth and mature forest stands). Neither the Greenbelt Plan (2005) nor the Region's Official Plan (2014) prescribe buffers for SWH; these are to be determined on a site-specific basis. The TDSPSS does not make any recommendations in this regard either, nor does Conservation Halton. All the Candidate SWH areas fall within significant woodlands and / or significant wetlands and therefore buffers of at least 10 m or 15 m respectively have been applied.
Fish Habitat **(ref. Figure 3.9)**	S. 118.2(a) of the Region's Official Plan (2014) prohibits development and site alteration within fish habitat except in accordance with applicable Federal legislation or regulations. The fish habitat outside the Subject Property within the adjacent lands is located within the Bronte Creek valley corridor, is considered warmwater, and is also habitat for the provincially Threatened Silver Shiner. However, the creek is well away from the Subject Property and within protected Greenbelt Plan Area lands, therefore no buffers have been applied. Bronte Creek and its tirbutaries still represent a limited constraint to development in so far as any stormwater being directed towards the creek must be treated for quality and controlled in terms of quantity. On the Subject Property, watercourse 14W-17 is considered coolwater habitat as well as contrinbuting habitat for the Endangered Redside Dace, and watercourse 14W-17Cb is considered warmwater habitat. The Region's Official Plan (2014) does not prescribe buffers for fish habitat, however Conservation Halton (2011) requires a 15 m buffer on either side of warmwater watercourses, and 30 m on either side of cold or coolwater watercourses. These buffers have been applied to

	14W-17Cb and 14W-17 respectively, as shown in **Figure 5.1**. In addition, stormwater runoff from the development will need to be controlled to comply with the requirements specified by MOECC for total suspended solids removal and the protection of water quality, and thermal mitigation of any stormwater directed to 14W-17will be of particular concern.

6. PROPOSED DEVELOPMENT, NHS AND FUNCTIONAL SERVICING SYSTEM

The Official Plan Amendment, Zoning By-Law Amendment, and Draft Plan of Subdivision being proposed for the Subject Property are comprised of a mixed-used land use plan, including a significant residential component, which is generally in accordance with the direction of the City of Burlington's Council (from September 26, 2011 and November 26, 2012).

The Secondary Plan, which is being submitted concurrently with this EIR/FSS, was developed iteratively with the EIR/FSS. Consequently, this Secondary Plan benefitted from a more detailed knowledge of the natural heritage conditions and proposed functional servicing for the area than would normally be the case. An overview of the Secondary Plan is provided in **Section 6.1.**

The land use planning approach adopted for the Subject Property, also provided in this section, is predicated on the principles of environmental protection, conservation and sustainability, described in **Section 6.2**. These principles are reflected in the proposed Draft Plan (described in **Section 6.3**) which integrates a Proposed Natural Heritage System (NHS). The Proposed NHS builds on the Preliminary NHS (described in **Section 4**), and includes additional enhancements in relation to opportunities identified in relation to the proposed Draft Plan, as described in **Section 6.4**. This is followed by a description of the Conceptual Trails Plan (**Section 6.5**) intended to balance human access to and interaction with nature, with protection of the NHS and its associated ecological functions.

Section 6.6 through **Section 6.9** provide information related to the functional servicing of the proposed Draft Plan including:

- Stormwater Management (**Section 6.6**)
- Roads (**Section 6.7**)
- Grading (**Section 6.8**), and
- Servicing (**Section 6.9**).

Key elements of the sustainable approach to community design adopted for the Subject Property include:

- taking an "environment first" approach by designing the community on an iterative basis with detailed knowledge of the nature and sensitivity of the NHS components, including integrating opportunities for additional enhancements (including proposed naturalization and restoration both within and outside of Key Features);
- incorporating a suite of Low Impact Development (LID) measures that will: (a) provide enhanced stormwater management to improve water quality and erosion control with the need for minimal conventional stormwater management infrastructure, and (b) complement the ecological functions of the NHS by providing on-site infiltration and additional naturalized areas outside the NHS; and

- ensuring that the road proposed through one of the local linkages is designed to mitigate any potential impacts related to its function (including narrowing the road, applying speed calming measures, naturalizing the lands on the east and west side of the road, and integrating an ecopassage under the road for amphibians, reptiles and small mammals).

These elements are described within the broader context of the proposed development in the following sections.

6.1 OVERVIEW OF THE SECONDARY PLAN

The Secondary Plan (USI 2015) being submitted concurrently with this study includes a vision for a sustainable community. This vision is supported by policies that are very supportive of:

- protecting, maintaining, and enhanceing the natural environment
- sustainable community design
- incorporating best practices with respect to water, wastewater and stormwater management (including LID measures as appropriate)
- a mixed-use community that meets or exceeds the Provincial Growth Plan targets for population and employment density, and
- a community with efficiently planned and well-connected roadways, as well as pedestrian, transit and cycling connections.

The policies of the proposed Secondary Plan prepared by Urban Strategies Inc. provides clarity as to what kinds of uses are anticipated in these categories and how they should perform and contribute to the community as a whole. These policies also, notably, preclude development within any Key Features, and limit the types of activities permitted in other NHS components.

Different aspects of the Secondary Plan provide the basis for the structure of the proposed development, and are illustrated through a series of five figures that graphically represent a progressively more detailed view of the planned land uses for the Subject Property. Each of these figures is described briefly below.

Community Structure (Figure 6.1)

The proposed Community Structure reflects the mixed use nature of the development including residential, employment and mixed uses areas. These areas are identified the boundaries of the Preliminary NHS (including the Greenbelt Plan Area), illustrating an “environment first” approach, which is supported by the policies contained in the Secondary Plan.

Natural Heritage System and Open Space (Figure 6.2)

This figure reflects the boundaries and the components of the Preliminary NHS (albeit simplified within the Greenbelt Plan Area) as recommended and supported by this EIR/FSS study (see **Section 4**). The Preliminary NHS, as shown on this figure, is comprised of Key Features, linkages, and buffers, with opportunistic enhancement areas yet to be determined. Notably, the Key Features and linkages, as

mapped, also reflect boundaries for these NHS components as agreed to by the Region's and Evergreen's environmental consultants through the recent Board process. The figure also reflects how buffers were developed with consideration for the land uses as envisioned in the Community Structure and Land Use Plan, and have been applied only where some type of development (including a road or an open space type development) is anticipated.

Land Use (Figure 6.3)

This figure (which is intended to be comparable to the City of Burlington Official Plan (2006) Schedule B, Comprehensive Land Use Plan - Urban Planning Area) builds on and provides more detail than the Community Structure. The land use categories referred to in the legend are generally reflective of existing land use designations in the City of Burlington's Official Plan. The land use figure shows a greater level of detail with respect to streets and associated development blocks, and also provides more detail within the community structure categories of employment, mixed use and residential.

Transportation Network (Figure 6.4)

This figure illustrates the proposed transportation network. In a departure from traditional suburban subdivision structure, the network for this community seeks to introduce a porous, connected set of streets and blocks that allow for efficiency and flexibility for how people enter and exit the community.

Reflecting the strong environmental principles behind this plan, the local street proposed through the natural heritage system linkage between the Bronte Creek valleylands / Pond and the Central Woodland is identified as a "special street" and, in policy, requires a number of unique considerations and design accommodations to mitigate any potential impacts the road might present to the ecological linkage functions of this NHS component.

Conceptual Trails Network and Parks (Figure 6.5)

This figure identifies the proposed parks and open space, and the proposed trails within greenways and the NHS, which are complemented by the pedestrian connectivity to be provided along the community sidewalks. This network identified linkages between the existing (albeit informal) trails within the Bronte Creek valley and the proposed community, and also provides trails that provide opportunities to connect with natural heritage within the community itself, and outside the community.

6.2 SUSTAINABILITY OBJECTIVES

In order to implement the vision for sustainability of the Secondary Plan, the proposed Draft Plan was developed by integrating a suite of innovative technologies to achieve a range of sustainability objectives, as follows, that fall within the following categories:

A. Natural Heritage

A-1	Preserve and protect Key Features
A-2	Restore degraded/impacted Key Features

A-3 Enhance ecological functions of Key Features
A-4 Maintain/enhance functional contribution to off-site Key Features
A-5 Maintain/enhance linkages between Key Features
A-6 Protect and enhance habitats for significant species on site
A-7 Enhance habitat for downstream SAR (Redside Dace)
A-8 Route trails to avoid sensitive features/habitats
A-9 Promote on-site salvage and re-use of biological materials in habitat restoration (e.g., logs, rocks)
A-10 Enhance urban forest cover with park and street tree plantings

B. Water Resources

B-1 Implement Low Impact Development (LID) based stormwater management to promote attenuation, filtration, moderate discharge rates and enhance water quality
B-2 Mitigate temperature increase in water discharged, particularly to downstream SAR habitat
B-3 Enhance aquatic habitat on-site
B-4 Promote harvesting of rainwater from rooftop areas for re-use
B-5 Provide enhanced urban tree canopy to promote interception
B-6 Provide greenways along main streets to accommodate LID system
B-7 Maintain pre-development flows
B-8 Maintain surface water contributions to on-site and off-site key features

C. Multi-Modal Transport

C-1 Provide connected pedestrian trail system
C-2 Link trails and bicycle routes to transit
C-3 Provide transit supportive development form

D. Energy and Climate

D-1 Encourage energy efficiency in building design and construction
D-2 Increase urban tree canopy to mitigate heat island effects and provide shade

6.3 PROPOSED DRAFT PLAN

The proposed Draft Plan is provided in **Drawing 4.**

The proposed Draft Plan of subdivision for the Subject Property addresses the City of Burlington Council's direction of September 26, 2011 (staff report PD-36/11) (as confirmed in November 2012, staff report PB-82-12) to support a mixed use development in this location that incorporates environmentally sustainable neighborhood development and building policies. The proposal includes:

- Mixed use, employment and residential uses;

- A robust NHS, including linkages to the off-site Bronte Creek valley to the west;
- Innovative LID stormwater management strategies that are focused on managing stormwater runoff close to its source;
- Connections to the City of Burlington's proposed cycling and trail network that will facilitate engagement with the natural heritage surrounding the site and provide opportunities for recreation; and
- A transit supportive density to make efficient use of planned rapid transit investment along Dundas Street (Bus Rapid Transit) and Highway 407 (Highway 407 transit way).

The proposed Draft Plan preserves 19.6 hectares of natural heritage features and associated buffers, linkages and enhancements, and includes approximately 2 hectares of proposed parkland and 3 hectares open space.

As outlined in **Section 6.1**, the proposal seeks to introduce a porous, connected set of streets and blocks that support efficiency and flexibility with respect to local transit by providing a grid of local collector streets, local streets and laneways. A special street within the ecological linkage between the Central Woodland and the off-site Pond /wetlands is also proposed, and described in more detail in **Section 6.7**.

6.4 PROPOSED NATURAL HERITAGE SYSTEM (NHS)

The Proposed NHS for the Study Area is illustrated in **Figure 6.6**. This NHS is comprised of the Key Features, linkages, buffers, and enhancements identified as part of the Preliminary NHS (see **Figure 4.1**), but also includes a number of additional enhancements identified during the process of developing proposed Draft Plan (as provided in the figure). These include:

- Protection of hedgerow #8 (H8 on **Figure 3.17**), which wa identified as a "significant" hedgerow in the TDSPSS, through an enhancement north of the Central Woodland that also serves to provide a buffer between residential and business corridor land uses;
- Enhancements along the buffered Bronte Creek significant woodland edge north and south of the Pond that provide additional areas for naturalization behind the proposed residential lots;
- Small enhancements around the linkage to / from the Central Woodland that may further support the linkage function;
- Substantial enhancements around the Southern Woodland, effectively surrounding the entire feature and providing the opportunity, over time, for these lands to succeed into a larger woodland and a community amenity for nature appreciation, and
- the re-located 14W-17Cb tributary in its proposed location with an associated buffer area to accommodate the various required setbacks and buffer naturalization described in **Section 6.4.1**.

The types of enhancements contemplated include management activities both within and outside of Key Features , as described in more detail in **Section 8.1**, and include:

- Habitat creation and restoration (e.g., wetland and vernal pool creation, forest diversity restoration, introduction of turtle nesting and basking structures, etc.)
- Habitat quality enhancement (e.g., waste removal, invasive species management)
- Biomass recycling (e.g., plant salvage, introduction of bird nesting structures), and
- Linkage habitat enhancement (e.g., introduction of ecopassage, naturalization of former agricultural lands).

In addition to the various enhancements identified on the Subject Property, potential enhancements that could be undertaken in the adjacent lands, in consultation with adjacent landowners, within the broader Study Area context are also identified.

In comparison to the TDSPSS NHS, the Proposed NHS for provides more types of ecological enhancements within a broader range of areas, and consequently is likely to result in greater overall system resiliency to stressors presented by urban land uses.

6.4.1 RELOCATION OF 14W-17CB

Watercourse 14W-17Cb currently flows in a southeasterly direction and crosses Dundas Street at an approximate 45^{o} angle at the intersection of Dundas Street and Tremaine Road. The proposed Draft Plan relocates this watercourse slightly to the west and aligns it in a north-south orientation. This will necessitate the removal of the existing culvert at the intersection of Tremaine and Dundas and the installation of a new culvert beneath Dundas Street. The new culvert will cross Dundas Street at a 90^{o} angle thereby lessening the length of enclosed watercourse as compared to the current culvert.

It is anticipated that the installation of the new culvert will be coordinated with the Region's upgrades to Dundas Street. In addition, in order to re-connect the realigned watercourse to the existing watercourse on the south side of Dundas Street, a watercourse channel will be created on the south side of Dundas Street on lands owned by Infrastructure Ontario. The entire realigned watercourse will be designed using natural channel design and a Permit will be obtained from Conservation Halton. Permission will also be obtained from Infrastructure Ontario for the portion of the proposed works on their property. The newly created watercourse block will be vegetated as per Conservation Halton's landscaping guidelines and will greatly enhance the riparian corridor as compared to the existing 14W-17Cb.

6.5 CONCEPTUAL TRAILS PLAN

A Conceptual Trails Plan is provided in **Figure 6.7**. This plan, which has been developed to complement the Conceptual Trails and Parks Network within the Secondary Plan (**Figure 6.5**), has been developed based on consideration for:

- the existing conditions (including existing informal paths and trails) and Key Feature sensitivities
- the Proposed NHS and proposed Draft Plan (**Drawing 4**)

- potential connections identified in the Draft City of Burlington Community Trails Strategy, and
- current City trail standards.

The Conceptual Trails Plan presented in **Figure 6.7** has also been developed with the following guiding principles (that are consistent with the management objectives of the TDSPSS) in mind:

- establishing a careful balance between supporting appropriate access and protecting the identified Key Features and their ecological functions
- building on existing access points and pathways / trails wherever they are not thought to be contributing to degradation of the features or functions within the NHS
- providing trail access through proposed naturalization / habitat enhancement areas
- providing logical routes and access points that are likely to encourage use of the established formal trails (and discourage creation of informal trails), and
- ensuring an appropriate level of connectivity within the Subject Property as well as to trails and roadway connections outside the Subject Property.

Currently, there is an existing informal trail outside the Subject Property within the Bronte Creek valley that runs from the north side of Dundas Street through the wooded valleylands along Bronte Creek, around the existing Pond, and continues in a north-west direction towards the Hydro corridor. There is also an existing laneway to / from the residence off Dundas Street, and an existing farm laneway along the edge of the Central Woodland. The Conceptual Trails Plan builds on all of these existing pathways. Any trail connections between the Subject Property and the adjacent Infrastructure Ontario, City or Regional lands would need to be discussed with the respective landowners.

New proposed trails on the Subject Property have been intentionally kept out of Key Features (except where they build on existing trails considered to be of limited impact), and for the most part directed to Key Feature buffers (with the intent for them to be located within the outer 5 m of the buffer (as illustrated in **Figure 6.8**), or enhancement / linkage / open space areas outside the Key Feature buffers. In some cases, such as the Southern Woodland, there would be opportunities for the trails to be located in the parklands outside of any buffer areas. Similarly, with respect to the Central Woodland, it is anticipated that the single loaded road on the east side of the woodland will have a sidewalk within the right-of-way, thereby eliminating the need for a trail within the woodland buffer along the eastern perimeter.

Future potential trail connections between the Subject Property and areas outside of the Subject Property have been identified in the Draft City of Burlington Community Trails Strategy. There are also future plans by the Region to construct a 3.0 m multi-use paved trail within the Dundas Street boulevard (including the incorporation of a 1.5 m bicycle lane within the roadway on both sides of the Dundas Street future reconstruction). In addition, maps of the Draft City of Burlington Community Trails Strategy indicate potential trail connections at the north and south ends of the property. Bronte Creek Provincial Park is located south of the Subject Property and the Park provides a unique amenity open space for the residents of the community. Potential roadway links along Dundas Street have been identified with the

brown arrows while potential links to the northeast and south have been identified with transparent ovals in **Figure 6.7**.

At this time, the City does not have updated trail guidelines to share or reference since they are pending the finalization of the Community Trails Strategy. However, based on past experience and our own observation working within the City of Burlington, the following types of trails would generally be acceptable:

- Primary Trail: 3 m to 4 m paved trail
- Secondary Trail: 2 m to 3 m granular trail
- Tertiary Trail: 1 m to 2 m wood chip trail

In the Evergreen Community, potential user groups are expected to include pedestrians / hikers (walkers, hikers, joggers and runners), cyclists, and users with personal mobility devices. The type of trails in the various locations will ultimately be determined in consultation with the City and other relevant partners, however our preliminary recommendation is for the bulk of the trails shown on the Subject Property within the Proposed NHS and associated enhancement areas to be 2.4 m wide with a granular surface (stonedust surface with granular sub-base) (as illustrated in **Figure 6.8**).

6.6 STORMWATER MANAGEMENT (SWM) STRATEGY

The stormwater management (SWM) strategy that has been developed for the Subject Property is based on a blend of the conventional SWM approach identified in the TDSPSS combined with a range of LID measures suited to the site designed to meet the sustainable design objectives of the Evergreen community (as outlined in **Section 6.2**), and is herein referred to as the "Enhanced SWM Approach".

In developing the Enhanced SWM Approach, the Study Team relied upon the environmental management strategies identified in the TDSPSS, but also further explored opportunities to integrate additional LID components, where feasible, by examining techniques being implemented elsewhere in southern Ontario and North America. These various LID systems and techniques were evaluated based on their feasibility for application to the Subject Property, overall costs compared to conventional methods, and their associated environmental benefits.

The Enhanced SWM Approach provides for improved protection of the NHS against some of the indirect impacts associated with development, while satisfying conventional SWM design criteria. To be consistent with the sustainable design objectives for the Evergreen community, the Enhanced SWM Approach incorporates LID technologies to manage stormwater runoff in terms of both quantity control and quality enhancement, including thermal mitigation.

The Enhanced SWM Approach presented in the following sections consists of the following:

a) an overview of the design objectives and criteria established through the TDSPSS (**Section 6.6.1**)

b) a discussion of a conventional stormwater management approach (**Section 6.6.2**)
c) a description of the Enhanced SWM approach that integrates LID (**Section 6.6.3**)
d) a discussion of LID precedents and applications (**Section 6.6.4**)
e) a discussion of LID maintenance, operation and ownership (**Section 6.6.5**)
f) mechanisms for integrating the Enhanced SWM Approach into the pproposed Draft Plan (**Section 6.6.6**)
g) testing of the Enhanced SWM Models (**Section 6.6.7**)

6.6.1 SWM DESIGN OBJECTIVES AND CRITERIA FROM THE TDSPSS

The primary purpose of stormwater management is to protect and enhance natural features including woodlots, wetlands and watercourses by mitigating impacts related to urbanization including flooding and erosion. The objectives and targets as they relate to hydrology, peak flow control, hydrogeology, water quality, fisheries protection, LID, source pollution protection and various types of SWM measures (as discussed in Section 5.3.6 of the TDSPSS).

The TDSPSS recommends that the SWM strategy satisfy the criteria described in the following subsections.

Peak Flow Control

The TDSPSS recommends that SWM systems be designed to control post development peak flows to target unit flow rates presented in TDSPSS Table 5.3.1 for the 2 year to 100-year events and Regional Storm. No new hydrologic modeling of existing conditions in the subcatchment is necessary to establish existing conditions target peak flows. Target peak flows for the full range of events are included in the following sections and were calculated on the basis of respective subcatchment boundaries. Provision of storage within the lots and greenways to retain the difference between the post-development and pre-development runoff volumes will achieve the peak flow control requirements.

Erosion Control

The TDSPSS identifies the need to complete erosion threshold and erosion control analyses as part of an EIR/FSS so that existing channel erosion or aggradation is not exacerbated by development. The recommended approach to erosion threshold analysis is set out in the TDSPSS.

The purpose of the erosion threshold analysis is to determine the limits for the allowable release from the site based on the most sensitive reaches along a continuous channel. In the TDSPSS, the erosion threshold analysis was focused on watercourses south of Dundas Street and east of Tremaine Road that will ultimately receive drainage from the Study Area. The analysis identified the most sensitive reaches to be impacted by urbanization and provided erosion thresholds (TDSPSS, Table 4.7.1) at key locations that will govern the SWM facility targets.

The following targets have been established for discharges into the following features (and downstream receivers):

- Reach 14W-17Cb: critical discharge of 1.58 m^3/s should be the governing threshold for any releases draining into this feature south of Dundas Street / east of Tremaine Road.
- Reach 14W-17: critical discharge of 0.2 m^3/s should be the governing threshold for any releases draining into this feature and downstream watercourse east of Tremaine Road
- Reach BCT-R1: critical discharge of 0.76 m^3/s should be the governing threshold for any releases draining into the Bronte Creek valley to the west of the subject lands via this reach.

Section 3.3.10.4.3 describes the erosion exceedance analyses which established the above targets.

Water Quality Control

The TDSPSS recommendations for water quality control focus on the management of phosphorus, suspended solids, chloride, dissolved oxygen and temperature. The focus on these water quality parameters is, "*…intended to provide controls to meet the objective of not permitting further enrichment of the streams (i.e. nutrient control), fisheries protection and overall water quality protection*". It further notes that SWM systems are to be designed to meet targets set out in TDSPSS Section 5.0.

With respect to each of these water quality parameters, TDSPSS recommendations specific to Fourteen Mile Creek are:

- Provide Enhanced Level of water quality protection in accordance with the MOE SWM Planning and Design Manual. This level of control provides for the removal of 80% of suspended solids, will meet the target of no net increase in Phosphorous loading and will provide the recommended control for overall water quality protection. No further analysis of Phosphorous loading is necessary.
- Chloride recommendations relate to City of Burlington's salt management plan and do not require any further analyses in the EIR/FSS.
- Watercourse 14W-17 is recognized as Redside Dace habitat (important habitat) in the TDSPSS (Section 4.9).
- While a portion of Watercourse 14W-17C is identified as a "no habitat" stream (reach 14W-17Ca), the remaining portion is identified as a "marginal habitat" stream (14W-17Cb).

The TDSPSS also included recommendations to maintain the thermal regime of the watercourses, which has been adopted when designing the Enhanced SWM Approach for the Subject Property. Similar criteria apply to the lands discharging into the Bronte Creek system, with the exception of quantity control.

In addition to the MOE and TDSPSS quality control guidelines, the MNRF's *Draft Guidance for Development Activities in Redside Dace Protected Habitat* (February 2011) recommends the following SWM / water quality control criteria to mitigate potential impacts on Redside Dace and their habitat:

- Stormwater discharge from urban areas should not exceed 25mg/L total suspended solids (TSS) above background levels

- Discharge temperatures for SWM facilities connected to Redside Dace streams should be below 24^{o}C
- Dissolved oxygen concentrations of at least 7 mg/L are preferred
- Post-development runoff of first 5 to 15 mm of precipitation should be retained on site in order to maintain the pre-development hydrologic cycle
- Direct connection of storm water management facilities should be avoided where possible to minimize potential for sediment release and increased water temperatures, and
- Enhanced nutrient / contaminant removal to be considered through the use of hybrid / wetland facilities or low-impact development (LID) strategies.

The recommended MNRF SWM criteria for Redside Dace can generally be addressed through conventional SWM measures and LIDs, which will provide minimum 80% TSS removal and retention of runoff on-site, however confirmation of TSS background levels, post-development concentrations, thermal mitigation, and dissolved oxygen require pre-development and post-development monitoring in order to optimize SWM infrastructure design.

Infiltration

The TDSPSS notes that the management of groundwater resources focuses on the management of the hydrologic cycle. For groundwater, the overall goal was stated to be, "*to maintain infiltration as close to current levels as possible*". It further notes that the soils in the Study Area have low permeability and the water table is shallow; which precludes the development of large scale infiltration facilities. The TDSPSS identified groundwater discharge in Bronte Creek Valley as a significant contribution to the surface water system and recommended riparian corridor management as the most effective means of preserving groundwater discharge. Best efforts are to be made to address maintenance of groundwater recharge as recommended for specific areas.

Section 6.6 of this EIR/FSS addresses the water balance and recommended methods of improving post-development groundwater recharge.

SWM Facility Numbers/Locations

The TDSPSS completed a preliminary assessment of the required numbers and locations of SWM ponds to meet the SWM design criteria and presented preliminary locations for ponds in each subcatchment in the Secondary Plan area. The preliminary analysis identified five conceptual ponds (Ponds 1, 2, 3 and 4; note Pond 5 is also labelled as Pond 4) that drain to Fourteen Mile Creek and Bronte Creek (TDSPSS-Figures 4.2.1 to 4.2.3). The corresponding drainage boundaries are indicated in Figure 5.3.3 of the TDSPSS.

The TDSPSS established target unit peak flows for the 2-year to 100-year events and the Regional Storm using the GAWSER model. It is also noted that further modeling of existing conditions target flows is not required at the EIR/FSS stage. In accordance with these recommendations, TDSPSS unit flow rates have been used, along with the respective pre-development drainage areas to calculate pre-development peak flows at Dundas Street and Tremaine Road for the Fourteen Mile Creek subcatchments.

Table 6.6-1 summarizes the target peak flow rates that would be used for a conventional SWM facility design. These targets have also been used to evaluate alternative SWM strategies (i.e., LID).

Table 6.6-1 - Pre-Development Target Flows

RETURN PERIOD (YRS.)	TARGET PEAK FLOWS FOR NORTH SWM FACILITY[1] (m^3/s) AREA= 19.01 HA	TARGET PEAK FLOWS FOR SOUTH SWM FACILITY[2] (m^3/s) AREA= 35.16 HA
2	0.193	0.27
5	0.316	0.46
10	0.394	0.58
25	0.503	0.75
50	0.579	0.87
100	0.657	0.99
REGIONAL	1.306	2.19

1. Target Flows for North Facility= Sum of existing peak flows at FM-T3,FM-T4 and FM-T5 (TDSPSS-Table 3.6.1.)
2. Target Flows for South Facility= Sum of existing peak flows at FM-T1,FM-T2 and FM-D1 (TDSPSS-Table 3.6.1.)

6.6.2 DISCUSSION OF A CONVENTIONAL SWM APPROACH FOR THE SUBJECT PROPERTY

As described in the previous section, the TDSPSS proposed that the SWM targets for quality and quantity control could be met if five (5) SWM facilities (wet ponds) were implemented as shown in TDSPSS Figures 4.2.1 to 4.2.3. Two facilities were proposed at the northwest corner of the subject lands to manage drainage discharged to the Bronte Creek Valley; three facilities were placed along the east property line to manage drainage to Reach 14W-17, Reach 14W-17A, and Reach 14W-17Cb.

However, based on a more detailed analysis of pre and post development flows, quantity and quality control requirements, and grading, it was determined that several drainage areas could be combined and the SWM facilities could be consolidated. Only two (2) conventional SWM management facilities are required to service the portion of the Subject Property that drains to Fourteen Mile Creek.

The north-eastern facility would discharge to reach 14W-17 (North SWM facility) and the south-eastern facility discharge to reach 14W-17Cb (South SWM facility).

As there are no quantity control requirements in the Bronte Creek system, storm flows from the Subject Property in the Bronte Creek subcatchments would be directed to the existing Pond on the Infrastructure Ontario property with pre-treatment through a forebay cell located on the Subject Property. This approach would ensure that the MOE TSS removal and erosion control requirements are met prior to discharge into the Bronte Creek Tributary (BCT-R1) while eliminating the need for the three additional ponds originally proposed in the TDSPSS.

The North SWM facility would capture drainage associated with culverts FM-T3, FM-T4 and FM-T5. The South SWM facility would capture drainage from culverts FM-T1, FM-T2 and FM-D1.

A conventional SWM approach would consolidate the ponds proposed in the TDSPSS, instead of using the unit flow rates specified in Table 5.3.1; total existing condition peak flows from **Table 3.6-1** are used to calculate the target flows for SWM facility sizing.

The locations of the conventional ponds are shown on **Drawing 5**.

A continuous overland flow route would be provided within the Draft Plan in order to safely convey major system flows in excess of the minor system up to the 100-year event to the SWM facilities. Should the major system flow exceed the conveyance capacity of any given road, the storm sewer would be sized to accommodate the excess flows such that the road capacity was not exceeded (i.e., 100-year capture areas). Please refer to **Drawing 5** for overland flow routes under this conventional SWM scenario.

The conventional SWM facilities would attenuate post-development flows to pre-development levels according to the TDSPSS unit rates and would release the controlled flows into the adjacent watercourses.

This conventional approach is consistent with typical subdivision developments. However, based on the recommendations in the TDSPSS, the Study Team has gone beyond the conventional SWM approach and is recommending an Enhanced SWM Approach that integrates LID, as outlined in the following sections.

6.6.3 ENHANCED STORMWATER MANAGMENT APPROACH (LID)

The TDSPSS recommended that the EIR/FSS examine alternative approaches to the conventional SWM management system that was described in the preceding section, and that these alternatives be evaluated to determine the extent to which they can be incorporated as part of the overall SWM strategy, while still meeting the goals, objectives and targets of the TSDPSS.

The Enhanced SWM Strategy is focussed on managing SWM runoff close to its source and implementing a 'treatment train' system that employs a number of processes including interception, absorption, attenuation, infiltration, retention and evapotranspiration to moderate runoff rates, improve water quality and promote shallow groundwater recharge. The Enhanced SWM Approach is based on a view that regards runoff as a renewable resource rather than a waste by-product of urbanization. Consequently, the strategy includes initiatives that facilitate the re-use of runoff for irrigation purposes, attenuation of stormwater in the soil layer to nourish vegetation and the replenishment of shallow groundwater reserves through infiltration.

A number of sustainability initiatives were considered in the process of generating the Enhanced SWM Approach for the Evergreen community. It should be noted that a number of other initiatives were proposed for evaluation by the design team, for example the implementation of a 'third pipe' foundation drain collector (FDC) system was proposed as a means to maintain cool water discharge and enhance base flow in the watercourses downstream of the Subject Property. However, based upon the technical evaluation involving the water resources, geotechnical and hydrogeological disciplines on the consulting team it was determined that the implementation of an FDC system would not be feasible due to a lack of soil permeability and ambient groundwater elevations.

SWM systems are designed and implemented to manage the quantity and quality of urban runoff and generally consist of the following components:

- Lot level, or source control measures (i.e. reduced lot grades, roof drainage control or storage, porous pavements, rain gardens, grassed swales, etc.);
- Infiltration measures (i.e. infiltration basins and trenches, exfiltration pipes or porous pavement, etc.); and,
- End-of-pipe measures (i.e. detention wet ponds or wetlands, oil/grit separators, etc.).

In reviewing the feasibility of implementing an Enhanced SWM Approach, consideration was given to the following factors:

- ability to meet SWM goals, objectives and targets listed in **Table 6.6-1;**
- suitability of substrates and groundwater conditions;
- site topography and size of contributing drainage areas;
- compatibility with urban form and natural features, and
- municipal servicing requirements.

In evaluating the practical feasibility of implementing non-conventional SWM systems such as LID, guidance was obtained from the *MOE Stormwater Management Planning and Design Manual, March 2003*, (referred to herein as the *MOE SWMP Design Manual*). LID is a development design approach that is intended to better manage potential environmental impacts at or close to their source so as to minimize their downstream effects. In regard to stormwater, LID approaches aim to manage stormwater runoff from urban development so as to replicate the natural or pre-development hydro-regime of a watershed. This is achieved through implementation of engineered small scale at source hydrologic controls that include pre-treatment, filtration, infiltration, storage and re-use.

The TDSPSS recommended implementation of a number of LID design measures to be considered for incorporation into the proposed Draft Plan. Recommendations included conservation of natural features, reduction in amount of impervious areas, storage through bioretention, rain gardens, green roofs, rain barrels and cisterns, vegetated filter strips and permeable pavement.

One of the objectives of the Land Use Plan was to incorporate a sustainable SWM strategy. Part of this strategy was to identify, at the early planning stages, opportunities to utilize LID approaches to

managing stormwater while also accommodating conventional storm water management approaches where necessary.

To maximize the extent of development area that could be managed using LIDs, streets and blocks were configured and aligned so as to optimize opportunities for integration of LID systems in close proximity to runoff sources. Linear greenways were introduced along the major north-south oriented streets in order to accommodate attenuation galleries, bioretention cells and depression storage areas, as well as to accommodate cycling trails and enhance the extent of canopy cover along the streets. Parks were strategically located to afford the opportunity to attenuate excess runoff during high-intensity rainfall events while at the same time accommodating recreational and social programming requirements and strengthening the overall connectivity of the open space system.

The Enhanced SWM Approach described above, combined with the Proposed NHS, represent key inputs used to establish the framework for the proposed Draft Plan. In preparing the proposed Draft Plan, it was necessary to test the LID approach to determine the extent to which it is feasible to implement, as is described below.

6.6.3.1 LID PRECEDENTS

Although the application of LID technologies is widely regarded as a relatively new and innovative approach to managing stormwater runoff and achieving other SWM objectives, in fact many LID systems have been implemented throughout the Greater Toronto Area (GTA) through the previous one-and-a-half decades. Some of the earliest installations, including the installation of a permeable pavement demonstration parking lot at Seneca College's King Campus and the implementation of a porous pipe/infiltration system in Ottawa, Ontario, were installed over 20 years ago. Both of these installations have been monitored since the time of their initial construction and the data compiled has confirmed the functional efficacy and long-term sustainability of these LID solutions.

Since the time that these initial LID installations were implemented in Ontario, a number of LID systems have been deployed. These projects have been integrated into a broad range of land-use types and environmental contexts. LID systems have been installed in situations where soils are conducive to rapid infiltration as well as sites where soils are impervious or where the groundwater table is relatively high. The key to the successful application of LID technologies lies in the ability to select the appropriate suite of techniques based on an understanding of the characteristics of the Subject Property and the water management objectives that are required to be achieved.

A number of examples are presented in **Appendix K**.

6.6.4 ENHANCED SWM APPROACH OWNERSHIP AND MAINTENANCE OPTIONS

The implementation of the Enhanced SWM Approach on the Subject Property will require the adoption of alternative approaches to ownership and operation of the various LID technologies proposed in comparison to conventional SWM approaches. It is important to note that all of the techniques listed in **Tables 6.5.2** and **6.5.3** are presented to demonstrate the scope of possibilities that could be applied. The final determination of the most appropriate techniques was made in the process of generating the Enhanced SWM Approach. The implementation of the Enhanced SWM Approach will require the adoption of alternative approaches to ownership and operation of the various LID technologies proposed in comparison to the conventional 'pipe and pond' approach.

Some of the technologies proposed will be privately-owned and operated, whereas others will be privately owned and operated but controlled by the municipality, and others still will be in public ownership and operated and maintained by the municipality in order to ensure that in all cases the systems function as intended in order to ensure the long-term performance of the system. The following list of ownership and maintenance options lists a range of options for implementation of LID techniques listed in **Tables 6.6-2** and **6.6-3**.

Ownership/Operation Key

A. Private ownership (homeowner) provision for 15% failure rate to account for modification by homeowner over time.
B. Private ownership (homeowner) integrated with sump pump system to ensure function.
C. Private ownership – enactment of driveway by-law that requires a permit for replacement and requires permeable pavement to be used.
D. Private ownership of system/municipality ownership of control mechanism within public right-of-way.
E. Private ownership of trees. Enactment of a tree removal by-law to regulate the removal and require replacement.
F. Public ownership and operation by municipality. Operation plan provided by developer as a condition of approval.

Maintenance Requirements Key

1. *No maintenance required*
2. *Pre-treatment to minimize sediment accumulation, periodic (infrequent 5-10 years) sediment/debris removal and maintenance of sump pump.*
3. *Annual sweeping and periodic (infrequent 5-10 years) topping up of granular jointing material.*
4. *Litter removal and routine weeding/plant maintenance.*
5. *Annual inspection of observation ports and inlets. Seasonal removal of litter from inlets, weeding and plant maintenance cleaning out of inlet aprons (infrequent 5-10 years).*
6. *Clean out of catchbasin sumps.*
7. *Routine maintenance of fountain components, clean out of litter and debris. Annual winterizing of foundation component.*
8. *Annual inspection and cleaning of roof drain scuppers.*
9. *Routine removal of litter debris. Infrequent (10 years+) removal of accumulated sediment.*

Given that some LID measures are be on private property (i.e., permeable pavement driveways), the approval agencies sometimes have concerns with long-term maintenance and the potential for these features to be removed over time. With respect to precedents related to driveway replacement and tree removal by-laws, the City of Markham has enacted regulatory tools to provide them with the opportunity to maintain these features on the landscape. The City's driveway by-law requires property owner to secure a permit to replace or expand a driveway. The by-law places limits on the size of driveways and also includes a list of contractors that are licensed to construct or replace driveways in the City of Markham. The City of Markham also requires the landowner to secure a permit to facilitate the removal of trees on private property. Both of these tools could be enacted by the City of Burlington to ensure that permeable pavement driveways and parking lots are not replaced with non-permeable paving as well as to ensure that trees that are planted to enhance interception are not removed.

With regard to requirements for maintenance, monitoring through the Sustainable Technologies Evaluation Program (STEP) that is being implemented by the Conservation Authorities of Ontario provides a database of performance levels and maintenance requirements over time for various types of LID technologies. The monitoring data indicates that LID technologies such as permeable pavement and infiltration galleries, if properly maintained, exhibit very little loss in performance over time. Routine maintenance for each LID technology differs from that associated with conventional storm sewer/end-of-pipe pond systems in that they require routine maintenance, described further below, whereas a SWM pond requires an extensive clean out and restoration operation once its capacity is reached. This one-time clean out and restoration operation constitutes a significant disruption of pond operation and considerable expense (several hundred thousand dollars per pond) in order to ensure the long-term performance of the pond over time.

In contrast, LID technologies such as permeable pavement require relatively low cost maintenance that is performed on a routine basis. In the case of permeable pavement, sweeping using conventional street sweeping equipment is required along with periodic topping up of jointing aggregate. With respect to biofilters, maintenance requires cleaning out or replacement of the inlet media which, contingent on the design of the inlet, may be required on a five to ten year basis.

The designs for various LID technologies should be developed with the emphasis on easing maintenance requirements; however, it is important to recognize that all SWM systems, be they conventional or LID-based, will require maintenance. The differences lie in the type and frequency of maintenance required.

The Enhanced SWM Approach for the Subject Property will be designed with a practical approach to addressing requirements for operations and maintenance that will seek to place an obligation on the private landowner to maintain components of the system, thereby reducing requirements for maintenance and the associated costs for the municipality.

Table 6.6-2 - Potential LID Techniques (Residential)

Community Component	Potential LID Technique	Ownership/ Operation Scenario	Maintenance Requirements
Low Density Residential (Single Detatched Lots)	Increased topsoil depth	A	1
	Rainwater harvesting cisterns	B	2
	Permeable pavement driveways	C	3
	Enhanced rear yards swales	A	1
	Rain gardens	A	4
Medium Density Residential (Townhouse Lots)	Increased topsoil depth	A	1
	Rainwater harvesting cisterns	B	2
	Permeable pavement driveways	C	3
	Biofilters	D	5
Mixed-Use/ Live-Work	Rainwater harvesting cisterns	A	2
	Biofilters in parking areas	D	5
	Permeable pavement	C	3
	Parking lot storage	D	6
	Enhanced tree canopy cover	C	1

Table 6.6-3 - Potential LID Techniques (Employment & Open Space)

Community Component	Potential LID Technique	Ownership/ Operation Scenario	Maintenance Requirements
Employment	Rainwater harvesting cisterns	A	2
	Biofilters in parking areas	D	3
	Stormwater fountains/features	D	7
	Parking lot storage	D	6
	Permeable pavement	C	3
	Roof top storage	D	8
Parks/Open Space	Integration of biofilters	F	5
	Integration of surface storage	F	9
	Enhanced tree canopy cover	F	1
	Sub-surface storage	F	9
	Infiltration galleries to serve streets/ development areas	F	5
Rights of Way	Enhanced boulevards/greenways to incorporate biofilters, swales or retention storage	F	5
	Integration of permeable pavement into lay-bys	F	3
	Enhanced tree canopy cover	F	1

Many of the potential LID options listed above have been implemented and are in operation at various locations throughout the GTA and beyond. Examples from the GTA are particularly relevant as they have been exposed to climatological variations including summer heat and winter frost, as well as rates of

snowfall and rainfall that are typical of the Evergreen community context. Specific examples are presented in **Appendix K.**

6.6.5 INTEGRATING LID OPTIONS INTO THE PROPOSED DRAFT PLAN

In order to successfully achieve the SWM objectives and criteria set out in the TDSPSS it will be necessary to implement an integrated system comprising a suite of various LID solutions for managing stormwater, also known as the 'treatment train'.

To implement the 'treatment train', it was necessary to subdivide the proposed mixed-use community according to the different mixed lands uses (i.e. low density residential, medium density residential, employment, live-work, open space and streets), then develop customized LID solutions that are best suited to the land use and site conditions. This approach regards the community as a mosaic of smaller catchment areas, each with its own specific characteristics that in-turn present different opportunities.

There are a number of LID solutions that have been identified for implementation within the Evergreen community. Opportunities to implement these solutions have been examined on a site specific level with consideration to the proposed land use and catchment conditions. The LID solutions recommended for each land use are described below and will be further refined through detailed design.

A. **Low Density Residential** (Single Detached Lots)
- Increased topsoil depth
- Permeable pavement driveways
- Enhanced rear yard swales
- Rain gardens

B. **Medium Density Residential** (Townhouse Lots)
- Increased topsoil depth
- Rainwater harvesting cisterns
- Permeable pavement driveways
- Biofilters

C. **Mixed-Use/Live-Work**
- Rainwater harvesting cisterns
- Biofilters in parking areas
- Permeable pavement
- Parking lot storage
- Enhanced tree canopy cover

D. **Employment**
- Rainwater harvesting
- Biofilters in parking areas
- Stormwater fountains/features
- Parking lot storage

		• Permeable pavement • Roof top storage
E.	**Parks/Open Space**	• Integration of biofilters • Integration of surface storage • Enhanced tree canopy cover • Sub-surface storage • Infiltration galleries to serve streets / development areas
F.	**Rights of Way**	• Enhanced boulevards/greenways to incorporate biofilters, swales or retention storage • Integration of permeable pavement into lay-bys • Enhanced tree canopy cover

As required, end-of-pipe SWM facilities, such as dry retention ponds, can be provided to augment the LID solutions in order to achieve the required quantity control targets. These facilities could consist of above-grade or subsurface facilities in open space areas and will be designed to integrate with the urban form of the proposed community. **Figures 6.7 to 6.9** illustrate in more detail the range of LID solutions to be applied to the various land uses identified in the Land Use Plan.

6.6.5.1 VISUALIZING THE LID/ SWM STRATEGY

Figures 6.9 to 6.11 illustrate how the various LID techniques will be applied with each of the various land-use types that comprise the Evergreen community. The perspective sketches illustrate LID solutions to be applied to employment, commercial and mixed-use land use scenarios as well as the proposed 'Greenways' along the major streets within the proposed Evergreen community. Each of the LID solutions presented was tested as described in **Section 6.6.5**. The outcome of this detailed testing exercise confirmed the relative efficacy of each of the LIDs proposed as components of the Enhanced SWM Approach.

6.6.6 TESTING THE ENHANCED SWM APPROACH

To determine the feasibility of implementing the Enhanced SWM Approach for the proposed Draft Plan, it was necessary to compare and contrast this approach with a conventional approach. The assessment, completed by Urbantech, involved quantification of the rainfall / runoff relationship for pervious and impervious areas in order to define targets for post-development storage volumes required to achieve stormwater quality improvement, quantity control, flood management and erosion mitigation targets. The targets established for these various parameters where then used to evaluate the Enhanced SWM approach.

6.6.6.1 SWM MODELS

To establish the type and scale of LID and conventional SWM techniques that would be required to be implemented on a particular lot to address SWM objectives, excluding major storm and flood control objectives, a suite of models were developed and tested. The models were proposed based on each of the various lot configurations and land use types that are proposed to comprise the Evergreen community.

It should be noted that the LID solutions are not intended to address major storm and flood control requirements. Those requirements will be addressed using conventional SWM systems which will direct overflows to Bronte Creek and provide storage using dry detention ponds and underground storage systems to control runoff that cannot be stored / controlled by the proposed LID solutions.

In order to test the feasibility of the Enhanced SWM Approach, an evaluation of the potential techniques was completed utilizing a series of 'models' that were developed for each land-use type that will comprise the Evergreen Community. The models were prepared utilizing the general lot configurations illustrated on the Land Use Plan prepared by Urban Strategies Inc. (see **Figure 6.3**). Building footprints and the extent of impervious cover areas were defined for each land use type based upon an examination of the zoning by-laws imposed on similar developments and land use types approved previously in the same geographic area as the Evergreen community. The purpose of the model evaluation exercise was to determine the type, size, scale and extent of each LID proposed to be applied to each land use "model".

On the basis of a preliminary evaluation, the modelling exercise demonstrated that SWM objectives could be achieved utilizing the suite of LID measures proposed. The proposed Enhanced SWM Approach relies on a combination of source controls, conveyance controls and centralized facilities, working as a comprehensive system to manage stormwater runoff. A fundamental component of Enhanced SWM Approach is the segregation and redirection of runoff from different sources to the appropriate type of LID technology in order to optimize the performance of the overall system. Utilizing this approach, runoff from rooftop sources is considered to be relatively clean whereas runoff emanating from roads and parking lots is regarded as "dirty" because it contains higher levels of hydrocarbons, metals, sediment, chlorides and other particulates. In response, it is preferred that runoff from rooftop sources be segregated from surface runoff and that it be treated differently. For example, runoff from rooftop areas is suitable for harvesting and reuse as a source of irrigation water whereas runoff from road and parking lot surfaces is not well-suited to this type of reuse due to high concentrations of sodium chloride and hydrocarbons which can impair plant growth. In response, the Enhanced SWM Approach proposed for the Evergreen development has been designed to direct runoff to different sets of LID treatment systems depending upon its source.

The land use matrix has a bearing on the applicability and functional efficacy of various LID measures. Single detached residential lots typically offer higher pervious to impervious area ratio while

employment and commercial land uses tend to offer a limited amount of pervious area in relation to the area of impervious surfaces including rooftops and parking areas.

With regard to the above, the Enhanced SWM Approach for the Subject Property was generated by dissecting the Draft Plan into a number of "Models" utilizing land use type, lot configuration and typical allowable cover to define the extent of pervious and impervious cover within each "model". Twelve land use "models" were developed in total encompassing the following land use typologies:

- Rear lane townhomes
- Single detached residential of varying lot sizes
- Business corridor
- Mixed-use corridor
- ROW area serviced by the proposed greenway

The various land use models are illustrated on **Figure 6.9** through to **Figure 6.15**.

For each land use model the extent of post development pervious area and impervious area was calculated and runoff storage volume targets were determined (refer to **Appendix L1**).

A schematic LID system for each land use model was prepared to determine the type and approximate size and configuration of LID technologies required to achieve the storage volume targets established by Urbantech. Because the LID systems proposed for each model will be privately-owned, the process of developing the LID scenario for each land use model included factoring in the need for redundancy as well as the need to discount the applicability of certain LID initiatives in order to offset the potential for modification of the property by the homeowner.

For example, where the use of extra depth (300mm) topsoil is proposed, the calculation for determining the storage volume associate with this LID measure was executed assuming that only 50% of the installation would remain functional over the long term, although this technique would be applied to 100% of the landscaped area within a single detached lot.

The LID system was also aimed at relying on solutions that are passive and that do not require homeowner action to facilitate their operational efficiency. For example, rain barrels were not proposed as an LID initiative due to the fact that many homeowners may not empty their rain barrels between precipitation events, compromising their ability to reduce runoff volumes. LID initiatives such as rear yard swales or depression storage areas were not utilized due to the tendency of homeowners to modify rear yard grading through the installation of patios, decks, swimming pools and gardens.

LID solutions that were integrated into the proposed LID scenario for the residential models included:

- Permeable pavement driveways with extended sub-base
- 300mm depth topsoil over 50% of the landscape area
- Front yard rain gardens with sub-surface attenuation and short-term surface attenuation to a maximum depth of 300mm.

For the business corridor models, the proposed LID systems comprised:

- Permeable pavement in parking areas
- Attenuation galleries
- Green roofs

The scenario for the mixed-use corridor model relies upon 300mm depth topsoil and permeable pavement driveways and walkways to achieve the desired storage volumes.

Figure 6.9 through to **Figure 6.15** provide an illustration of the LID scenario proposed for each Land Use Model at a schematic level of detail. These figures also provide a calculation of the performance of each LID scenario in terms of storage volume as well as the quantity of surplus storage available to achieve a percentage of redundancy in the performance of the LID system for each Model.

In all of the models, the target Regional Storm storage volumes were exceeded. Redundancy ranged from 1% – 73%, however additional modelling under dynamic conditions was required to confirm the performance (i.e., taking into account infiltration rates, peak timing, etc.). Each model was further simulated under a range of design storms (25 mm to 100-year and Regional storms) using the EPA SWMM hydrologic modelling software. The results of these simulations are included in **Appendix L1** and are described in the following sections. In general, it was found that both the lot-level and greenway LID measures can reduce the runoff volumes by nearly 40% and up, which addresses flood control for the majority of design events (25mm and 2-year to 100-year).

Within the overall Enhanced SWM Approach, runoff from road surfaces is treated separately from the runoff that is addressed by the LID scenarios for each land use type. Runoff from road surfaces is proposed to be directed to a system of linear Greenways that are located adjacent to one side of the major north/south aligned roads within the development. Water from the surface of roads is directed to the Greenways through a combination of overland flow, catchbasins and storm sewers. The Greenways comprise depression storage underlain by a subsurface granular-filled attenuation gallery (refer to **Figure 8.5E** by Urbantech). The LID system that will address road runoff is intended to be owned and operated by the municipality.

In situations when stormwater volumes exceed the storage capacity of the Greenways, such as during the Regional storm, supplementary runoff is proposed to be directed to dry detention storage areas within the park / open spaces that are situated at the downstream ends of the Greenway corridors. An emergency outlet into the Bronte Creek valley can also be implemented to manage excess flows if required based on further detailed analysis of the overall LID performance.

In addition to their attenuation function, the Greenway corridors also contribute to runoff reduction through interception and evapotranspiration because they are proposed to support a dense tree

canopy. In addition, the Greenways will assist in achieving other sustainability objectives that relate to active transportation and reduced urban heat island effect.

The proposed Enhanced SWM Approach can provides sufficient storage volume to manage the stormwater runoff volumes and peak flows such that the existing flow targets identified in the TDSPSS are achieved. In contrast to a conventional SWM strategy, the proposed LID measures also provide volume control in addition to peak flow control. This approach is feasible for application to the majority of the residential lots and ROW areas subject lands draining to the 14W-17 watercourses. The commercial areas will be developed as site plans and will implement on-site LID and other SWM BMPs to achieve the targets.

6.6.6.2 FEATURE BASED WATER BALANCE ANALYSIS

One of the key environmental management objectives of the TDSPSS and the EIR/FSS is to maintain the existing hydrologic regime of wetlands, woodlands, watercourses and waterbodies within the Study Area. Maintaining the existing hydrologic regime of these runoff dependent features in a post development environment is important to sustaining the ecological integrity and functions of these features, provided that the existing condition is generally reflective of a desirable natural state, as is the case.

To meet these objectives a feature based water balance analysis was applied to features within the Proposed NHS that are directly dependent upon surface runoff and seasonal inundation and could potentially be affected by drainage alterations resulting from proposed development on the Subject Property. Features considered included the Infrastructure Ontario Pond, watercourses BCT-R1, 14W-17, 14W-17Cb, wetlands in the Central Woodland, and the NHS to the west of the Subject Property.

The first step of the feature based water balance analysis was to establish the natural range of variation in monthly surface runoff values to these features. Since these features are sustained by precipitation and surface runoff, with minimal or negligible groundwater inputs, the assessment does not include a groundwater component. To establish ecologically appropriate future runoff volume targets, climate data was examined to determine the natural range of variation in runoff volume contributions for the various features. This was achieved by determining the minimum, maximum and average monthly runoff values for the contributing drainage areas for these features. Hydrologic modelling using the GAWSER model provided by Conservation Halton was undertaken to determine pre and post – development monthly runoff volume contributions to the various features under an unmitigated scenario as well as a mitigated scenario using LIDs.

Hydrographs for these monthly runoff volumes were generated to compare and contrast the annual hydroregime to these features relative to their natural range of variability. The hydrographs allow for quick recognition of those features where the post development hydroregime deviates from the pre development conditions or the natural range of variation. This analysis was used to test and optimize

the LID strategy to achieve post-development hydroregimes that are within the natural range of variation of the features and in some cases emulate the pre-development condition.

The findings of the feature based water balance analysis are described below and summarized in Table 6.6-4 . Hydrographs for the various features are presented on **Figures 6.16A** to **6.16G.**

The above referenced figures illustrate that the post-development runoff to the existing features meets or exceeds the existing runoff to the features, thereby preserving the existing hydrology of the feature. If required at detailed design, further analysis can be conducted to "fine-tune" the amount of drainage directed to the feature; however as a starting point, the grading and drainage for the Subject Property indicate that more than sufficient runoff volume can be directed to the existing features, thereby ensuring that the existing monthly targets can be met. Mitigation measures to address erosion / point-source inflow into the wetlands under post-development conditions will be implemented at detailed design. The foregoing calculations were based on the "average" water balance values estimated through the hydrogeologic study by AMEC. These results are therefore not representative of specific dry or wet years.

Specific design consideration has been given during the preparation of the grading and drainage plans to manage the drainage into and out of the existing natural features on Subject Property. **Drawing 2** illustrates the location and contributing existing surface drainage areas to the woodland, wetland and watercourse features.

Specific findings were noted as follows:

Central Woodland – The proposed diversion of the majority of the drainage area external to this feature eliminates the runoff volume entirely. Therefore, mitigation in the form of connected roof tops (0.25 ha) from the adjacent employment lands has been proposed to match the peak volumes occurring in March. As illustrated on **Figure 8.4A**, this has the effect of providing a more consistent source of runoff during the summer months which, although within the range of existing conditions, exceeds the "average" existing conditions. This impact can be addressed at detailed design through the provision of attenuation swales in the NHS buffer.

Infrastructure Ontario Pond – Although the total post-development drainage area to the Infrastructure Ontario Pond remains approximately equal to existing conditions, there is a diversion of drainage from the east inlet (designated as B1) to the north inlet (designated as B2). As indicated in the corresponding **Figures 8.4B** and **8.4C**, the unmitigated drainage into the east inlet is negligible, while the unmitigated drainage into the north inlet is considerably higher than the existing range. The reduced drainage to the east inlet could reduce the effectiveness of the proposed linkage between the Central Woodland and the Pond; therefore, additional rooftop areas are proposed to be directed to the east inlet as mitigation for the reduced runoff volumes. The increased volumes directed to the north inlet pose no ecological

concern, however the proposed pre-treatment forebay cell will provide a measure of erosion protection / attenuation prior to discharge of flow into Infrastructure Ontario Pond.

FM-T5 – Figure 8.4D indicates that due to the proposed increase in impervious area resulting from development directed to the FM-T5 outlet and corresponding watercourse feature, the unmitigated post-development monthly runoff volumes will be consistently above the existing average for the entire year, although still within the range of existing conditions. Implementation of LID measures can replicate the existing pattern of wet springs / dry summer by mimicking the natural hydrologic response to flows and providing attenuation / volume reduction as opposed to conventional SWM facilities which provide attenuation only with more frequent discharge of runoff volumes.

FM-D1 – Due to the large increase in impervious area directed to FM-D1 and the corresponding watercourse, the unmitigated post-development runoff volumes are higher than the existing range of runoff volumes as shown on **Figure 8.4E**. Similar to FM-T5, implementation of LID measures can reduce the post-development runoff (particularly in the summer months) to achieve a hydrograph more consistent with the existing range of runoff volume conditions.

Bronte Creek Valley and Tableland Woodlands west of Subject Property – The diversion of the majority of drainage from the Bronte Creek Valley and Tableland Woodlands area results in minimal input of runoff volume to these features under post-development conditions as illustrated in **Figure 8.4F**. In order to maintain the existing runoff volumes and conditions within this NHS area, a minimum mitigation area of 1.4 ha (assumed to be 55% impervious) was identified. Addition of the mitigation area can maintain the existing hydrograph within the existing range of wet/dry conditions. This mitigation area can be provided in the form of roof tops or equivalent ROW drainage, assuming that adequate quality control (80% TSS removal) is provided.

Southern Woodland – This feature was considered for the water balance analysis, however it was noted that, due to the existing and proposed grades, no changes to the Southern Woodland drainage area will occur under post-development conditions. Therefore, no further analysis was required.

Table 6.6-4 - Feature Based Water Balance Analysis Summary

Feature / Outlet	Results / Figure	Total Existing Surface Drainage Area (excluding feature)	Developable Area in EIR/FSS Study Area	Post-Development Drainage Area (No mitigation)	Potential Impact	Minimum Mitigation Area / LID Requirements
Central Woodland	6.16A	0.50ha	0.49 ha	0.01 (existing drainage area)	Reduced runoff to feature; potential impacts to wetlands and/or seasonal pools in feature	0.2 ha (roofs / impervious area)
Infrastructure Ontario Pond						

Feature / Outlet	Results / Figure	Total Existing Surface Drainage Area (excluding feature)	Developable Area in EIR/FSS Study Area	Post-Development Drainage Area (No mitigation)	Potential Impact	Minimum Mitigation Area / LID Requirements
East Inlet (B1)	6.16B	12.0 ha	10.6 ha	2.4 ha (existing drainage area)	Reduced runoff to feature	No mitigation area required. No LID controls required.
North Inlet (B2)	6.16C	5.5 ha	2.2 ha	15.1 ha	Increased runoff to feature	No mitigation required. LID controls required to attenuate excess runoff volumes.
North-west inlet (B3)	Not modelled	8.2	0 ha	8.2 (existing drainage area)	No change	No mitigation area required. No LID controls required
Total Pond / Pond Outfall	6.16D	**30 ha**	**12.8**	**30 ha**		
FM-T5	6.16E	8.0 ha	7.5 ha	7.5 ha (developed drainage area)	Increased runoff to feature	No mitigation required. LID controls required to attenuate excess runoff volumes.
FM-D1	6.16F	19.05 ha	19.41	41.90 (developed drainage area)	Increased runoff to feature	No mitigation required. LID controls required to attenuate excess runoff volumes.
NHS west of Subject Property	6.16G	3.0 ha	2.65 ha	0.35 ha (existing drainage area)	Reduced runoff to feature; potential impacts to seasonal pools in feature and flows to tributaries	Mitigation area of 1.4 ha development area (~55% imp) or equivalent area from roof tops or ROW required.

Section 6.6 summarizes the existing and proposed surface drainage conditions, and outlines the approach to mitigation. Detailed water balance calculations are to be completed as part of the detailed design to refine the required mitigation areas.

Water quality for post-development drainage discharged to the existing features will meet the MOE's criteria for Enhanced (Level 1) phosphorus and TSS removal. With respect to discharge to Redside Dace habitat (Reach 14W-17), the MNRF's *Draft Guidance for Development Activities in Redside Dace Protected Habitat* (February 2011) as described in **Section 6.6.4** will be considered as well. The majority of post-development drainage directed to the existing features will be "clean" runoff from vegetated areas and rooftops. Quality control for the balance of drainage to the features (namely the watercourses) will be accomplished by a treatment-train approach to SWM through the use of LIDs. As per the TDSPSS recommendations regarding water quality, SWM facilities providing Level 1 (enhanced) quality controls have been deemed to provide phosphorus removal acceptable for discharge into natural features, although combinations of LID and other SWM BMPs providing a combined TSS removal efficiency of 80% and Total Phosphorus removal efficiency of 65% would be acceptable in terms of meeting Level 1 (enhanced) quality control requirements.

The post-development drainage areas directed to the natural features were confirmed to be sufficient through the use of the monthly existing and post-development monthly water balance results provided in the TDSPSS (Tables 4.4.1 and 4.4.2).

6.6.6.3 EROSION THRESHOLD EXCEEDANCE ANALYSIS

The erosion thresholds established for the watercourses proposed to receive stormwater runoff from the Subject Property were used to evaluate the proposed release rates. Specifically the downstream reaches of watercourses 14W-17Cb, 14W-17 and BCT-R1 were evaluated as outlined in **Table 6.6-5**

Table 6.6-5 - Results of D/S Erosion Threshold Assessment (14W-17Cb, 14W-17 & BCT-R1)

Watercourse	Erosion Threshold Critical Discharge (cms)
14W-17Cb (downstream of Dundas Street)	1.58
14W-17 (east of Tremaine Road)	0.2
BCT-R1 (shale bedrock valley)	0.76
BCT-R1 (accumulated bed substrates)	0.04

A GAWSER continuous flow model was developed by Urbantech Consulting based on the TDSPSS model provided by Conservation Halton. Continuous flows were generated using thirty years of precipitation data spanning from 1962 to 1992. The model provided flows in three scenarios: 1) ***Scenario 1*** existing conditions; 2) ***Scenario 2*** post development conditions without any SWM controls; and, 3) ***Scenario 3*** post development conditions based on the Enhanced SWM Approach. The modeled flow rates were evaluated to determine the number of hours flows occur above the established erosion thresholds (exceedance hours) for the receiving watercourses.

The erosion threshold assessment (**Section 3.3.10**) which established the thresholds for the downstream watercourses found the existing channels to be stable and experiencing rates of erosion anticipated for a channel in state of equilibrium. In fact, the majority of the well vegetated and shallow channel 14W-

17Cb downstream of Dundas Street showed no signs of erosion, with similar conditions observed in channel 14W-17. The well vegetated condition of these channels, along with their shallow profile (flows spread over a broad area under high flow conditions) provides high resistance to bed mobilization (vegetative rooting zone increases soil stability) and good energy dissipation due to high friction and tortuous flow path created by the rough vegetated surface. Watercourse BCT-R1 was found to be stable as it is bedrock controlled. The channel cuts through the shale bedrock as it flows into the Bronte Creek valley. While there is evidence of active transport of fines (weathered shale) to larger cobbles within the channel, the dominant channel form is controlled by the shale bedrock that the channel is cutting through. As a result, shale bedrock was used to set the erosion threshold for the overall channel form.

The erosion threshold assessment evaluated and compared existing and post development flow conditions against the established erosion threshold values. As channel erosion is a function of the stream power exerted by flow acting on the bed and banks of a channel, proposed flows should minimize conditions which result in an increase in the frequency of exceedance above the critical erosion threshold. Release rates from the Subject Property are considered acceptable if they maintain or reduce (though not to a significant degree) the existing erosion threshold exceedances. Generally this is achieved through SWM mitigation measures, which are employed in such a way as to mimic the existing conditions or improve the stability of an already unstable system through the reduction of flows exceeding the erosion threshold.

The GAWSER model found that peak flows increased in all receiving watercourses with larger post-development area and imperviousness if no mitigation measures were employed (LID or storage) while peak flows were reduced to existing rates when LID measures were employed. The model also found that while peak flows were reduced, the overall volume of water discharged to the receiving systems 14W-17Cb and BCT-R1 increased from the existing conditions (see **Section 6.6.6.2** for greater detail on water balance). This is to be expected as the impervious surface area increased as a result of urbanizing the landscape, resulting in a corresponding increase in surface runoff. Increasing the volume of water released into a receiving watercourse does not necessarily create a negative condition. If the additional volume is released in a manner which increases the duration of low flow conditions, below erosion threshold targets, an overall benefit can be realized. Longer flow duration, particularly in headwater channels, can improve aquatic habitat conditions by reducing the frequency the channel dries up or possibly even creating permanent flow conditions. In addition, since the primary weathering process in shale is a continual cycle of wetting and drying, more permanent flow over the course of a year could reduce the number of wet/dry cycles the shale is exposed to, resulting in decreased weathering and longer term stability.

The erosion threshold exceedance analysis tallied the number of hours over the thirty year GAWSER model in which flows exceeded the established erosion thresholds. The same analysis was then completed for post development flow conditions with and without the implementation of LID measures for stormwater control. **Table 6.6-6** presents the results of the exceedance analysis.

Table 6.6-6 - Erosion Threshold Exceedance Analysis Results

EXCEEDENCE HOURS: EVERGREEN SITE			
CONDITION*	BCT-R1	14W-17 (FM-T5)	14W-17Cb (FM-D1)
	THRESHOLD (m^3 sec^{-1})		
	0.76**	0.20	1.58
	HOURS THRESHOLD EXCEEDED		
Scenario 1 EXISTING	0	0	0
Scenario 2 POST NO LID	0	23	0
Scenario 3 POST WITH LID	0	0	0

Note: Watercourses are identified as the receiving waterbody (i.e. 14W-17) within the Study Area and also by the culvert outlet identifier (FM-T5). The erosion thresholds reported in the table were established for the downstream reaches of these watercourses, downstream of the Subject Property.

* using the Results of the GAWSER model output for thirty years of data

** Erosion threshold for the shale bedrock channel valley

The results of the erosion threshold exceedance analysis found that under the existing conditions there were no exceedances of the erosion threshold for the receiving watercourses. This is consistent with the stable conditions observed within the receiving watercourses. When the proposed future release rates were assessed with LID control measures, again no exceedances were found. The lack of flows exceeding the calculated thresholds can be attributed to the form and character of the receiving watercourses. Watercourse 14W-17Cb downstream of Dundas Street is dominated by a broad, shallow channel which is vegetated throughout. This results in a very stable channel form which is resistant to erosion. As an added measure of analysis, Cross Section B from the erosion threshold assessment was also analyzed as part of the erosion threshold exceedance analysis. The erosion threshold determined for this cross section was 0.91 cms, which is lower than the erosion threshold of 1.58 cms determined for the reach. This lower threshold value was not used to establish the overall erosion threshold value for the watercourse for the reasons outlined in Section 3.4.5; however as a measure of conservatism it has also been analyzed. The exceedance analysis found: 1) under existing flow conditions there were no hours of exceedance; 2) under post development with no LID measures there are 7 hours of exceedance; and, 3) under post development with LID measures implemented there are no hours of exceedance. This additional analysis confirms the stability of the channel under existing conditions and post development with the implementation of LID measures.

The 14W-17 channel is similar in form to the downstream reaches of 14W-17Cb, with the added benefit of the stormwater discharge being routed through an on-line broad, shallow cattail marsh community, which provides an added measure of energy dissipation and storage. The erosion threshold was established for a short reach of channel which flows along the edge of a farm field, and for the most part outside of the riparian vegetation. This resulted in a lower conservative erosion threshold. The exceedance analysis found flows from the Subject Property did not exceed the erosion threshold when LID measures are implemented. This is anticipated as post development flows with LID measures show a reduction in peak flows that closely match existing monthly discharge volumes into 14W-17. As the predominant hydraulic change is limited to the reduction in peak flows, post development discharge will

not result in an increase in erosion threshold exceedances in the receiving watercourse over the existing conditions, as verified by the exceedance analysis.

The stability of channel BCT-R1 is the result of the shale bedrock which it cuts through. Due to the generally high erosion threshold provided by the shale, the overall channel behaviour (lateral and vertical movement) is stable in the existing condition and is expected to be stable under post development conditions. BCT-R1 is strongly incised, with flow conveyed at the bottom of a V-shaped valley. While this larger valley form is stable, for reasons just discussed, finer material is transported through the feature. These finer materials are predominantly weathered shale with a mix of cobbles and boulders that have been deposited on the bottom of the valley feature over time. So, while the overall channel valley form is stable (shale bedrock controlled), the finer materials are mobile and will be transported downstream when flows are sufficiently high.

An exceedance analysis of the substrates accumulating within the bedrock valley channel cross-section was completed to quantify potential changes in bed erosion/mobility rates between existing and post development flow conditions. Through the field characterization and erosion threshold assessment it was established that cross-section 3 (see **Appendix G3**) was the most sensitive reach in BCT-R1. This cross-section falls within the steepest and most incised portion of the valley. The d_{50} of the bed material in this reach was 17mm with a channel slope of approximately 7%. An erosion threshold critical discharge of 0.04 cms was established for the bed which was assessed against the GAWSER model results. Hours of exceedance for the existing and post development flows are provided in **Table 6.6-7**.

Table 6.6-7 - Number of Hours Exceeding the Calculated Erosion Threshold of 0.04 m3/s

Flow Condition*	Exceedance Hours	% Change from Existing
Existing	2698	0
Post Development no LID	2832	5
Post Development with LID	2284	-15

* for Bed Material within BCT-R1 for Existing and Future Flow Conditions using the GAWSER 30

Year Time Span Model Output

The results of the assessment show that the bed of BCT-R1 is quite mobile which would be expected considering the generally small size of the bed material, the steep channel slope and the confined nature of the channel. The assessment also shows that the number of exceedance hours will be reduced in the post development condition by approximately fifteen percent with the implementation of LID measures. Based on the two erosion threshold assessments for BCT-R1, the shale bedrock valley and the accumulated substrates within the bedrock valley, the channel should not experience additional erosion above the existing conditions post development with the implementation of LID measures.

Overall, the erosion threshold assessment found the post development stormwater releases into the downstream receiving watercourses are below the established erosion threshold limits when LID measures are implemented. As a result, channel erosion above existing conditions is not anticipated in the receiving watercourses as a result of the proposed development.

6.6.7 PROPOSED ENHANCED STORMWATER MANAGEMENT SYSTEM

The TDSPSS established objectives for water quality control, water quantity control, erosion control, thermal mitigation, and feature-based water balance that the proposed development is required to meet. A conventional approach to meeting these objectives was examined; the TDSPSS objectives could be generally achieved through the use of SWM facilities (wet ponds). However, an enhanced strategy was considered to support the Draft Plan and NHS features. Testing of feasible LID management practices was completed to determine if the TDSPSS targets could be met through the use of LIDs. The Enhanced SWM Approach proposed by Evergreen incorporates the enhanced measures and LID practices and is conceptually illustrated in **Drawing 8.7/Appendix L1**.

As shown on **Drawing 8.7**, some portions of the Subject Property (northwest and west side), drain to Bronte Creek which does not require any quantity control. For these areas, conventional SWM is proposed in the form of storm sewers. Erosion and quality control can be achieved using conventional end-of-pipe treatment using oil/grit separators as well as LIDs.

The Enhanced SWM Approach for the balance of the site will be LID based and will function as follows:

- It is anticipated that post- to pre-development quantity control for the individual lots can be provided within the lots based on preliminary modelling. The volume of runoff to be retained on the various lot types has been calculated by subtracting the post-development runoff volume from the pre-development runoff volume. This process was completed for each lot type and was used to guide the sizing of the proposed lot-level LID controls. Furthermore, detailed modelling of the individual lots and LIDs was completed to ensure post-to-pre control was achievable under dynamic conditions (i.e. 24-hour storm distribution for the various return period events, as well as the 25mm, 4-hour storm and the Regional storm). Refer to **Appendix L1** for details**.**
- The clean, controlled runoff from the lots is proposed to be directed into a “clean” trunk storm sewer as shown on **Drawing 8.7**, which may be smaller than a conventional storm trunk sewer on account of the lot-level controls. Essentially, the sewer would be conveying the equivalent of pre-development flows and runoff volume from the lots. The clean trunk sewer will discharge into the proposed realigned 14W-17Cb channel corridor. Similarly, the business corridor and mixed-use blocks would control runoff to pre-development conditions on-site and release clean/controlled flows into the “clean” trunk storm sewer. Post-to pre-development flow / runoff is typical for site plans and can easily be achieved through both conventional and LID measures on-site and was not analyzed in detailed at this stage.
- Storm runoff from the ROWs would be directed to the street level LIDs / “greenways” along Streets B and G and major system storage areas within the open space / park areas for treatment and control prior to capture into the “clean” trunk sewer. The greenways have been tested using a dynamic model and it was confirmed that each greenway can convey and control the contributing ROW drainage area. Refer to **Appendix L1** for details.
- ROW runoff would be captured into conventional catchbasins and directed to a conventional storm sewer system which discharges into the greenways. Major system flow from the ROW can also be discharged to the greenways via curb cuts / curb inlets. To minimize the extent of storm

infrastructure necessary to manage both the lot and site plan drainage ("clean" pipes) and the ROW drainage (conventional drainage), it is proposed to reduce the number of catchbasins such that the first 100m of ROW length drains overland prior to being captured by inlets. This eliminates the need for both conventional and "clean" storm sewers on short portions of road. Catchbasins would be provided at critical locations (intersections, low points, and according to the City criteria for longer portions of road).

- ROW areas that cannot be directed to a greenway will be controlled via LIDs located in the open space blocks (i.e., parks).
- Laneways are proposed to be paved with permeable pavement and directed to the clean water system.
- With respect to storm drainage system design, the clean pipe system will be designed for the maximum "pre-development" flow from the lots and ROW, while the conventional pipe system will be sized according to the City of Burlington's criteria for post-development flow conveyance (i.e. 5-year minor system / 100-year major system).

Peak flows and volumes arriving at the site outlets to Fourteen Mile Creek will be equal to or less than the existing target flow rates that were defined in the TDSPSS. This is due to the fact that post- to pre-development flow control will be provided within the lots, business corridor and mixed-use corridor areas, and the ROW areas can be controlled within the greenways and other open space blocks.

The runoff reduction (in millimetres) from post-development conditions (with no LIDs) versus post-development conditions (with LIDs) was calculated for each design event and each residential model type and ROW / greenway area. **Appendix L1** describes the results of this analysis. The runoff reduction was then introduced into the post-development GAWSER model for the Subject Property to account for the storage / runoff reduction achievable by the proposed LIDs. The LID runoff reduction was simulated in GAWSER as a "diversion to groundwater" to achieve the estimated LID performance.

Based on the GAWSER results, the post-development (with LID) scenario demonstrates that the existing targets at FM-D1 and FM-T5 can be matched, although some residual major system storage is required to manage the less frequent storms (25-year to 100-year and Regional) .

- The additional storage volume required to meet the targets at FM-D1 (approximately 9,400m^3) can be accommodated in the proposed park areas north of Dundas Street, either as surface storage or sub-surface storage. This is not expected to impact the proposed use of the park areas, since the storage would be required during the less-frequent events only when the parks are not likely to be in use. As an alternative to providing this storage, a by-pass to the Bronte Creek valley could be proposed to manage the excess flows in place of storage, since Bronte Creek does not require quantity controls at this location in the system. Additional details on this alternative approach are provided below.
- No additional storage beyond that provided within the LIDs is required to control the flows at drainage node FM-T5. This is due to the fact that the post-development drainage area to this outlet is lower than the pre-development area, and the proposed site plan and greenways can manage the post-development flows.

It is recognized that the municipality and agencies may have concerns with the long-term maintenance and performance of the LIDs. To address this potential concern, a number of "fail safe" or contingency measures are available that provide additional SWM storage in the event that the LID system does not operate as designed. These include:

- a portion of the storm flows from the Subject Property can be diverted into the Bronte Creek valley via an "emergency overflow pipe" from the FM-D1 outlet. Since no quantity control is necessary at this location in the Bronte system, the system can receive additional flows. Based on the HEC-RAS model provided by Conservation Halton for the Bronte Creek valley, an increase in flow from the Subject Property will not impact the water levels / peak flows resulting from the large upstream drainage area. A flow splitter structure would be designed within the proposed clean water trunk to convey flows into the appropriate outlets and emergency flows into Bronte Creek as depicted on **Drawing 7**. If the flows in the clean trunk exceed the allowable release rate to FM-D1, a flow splitting structure could direct the excess flows to the emergency outfall into the Bronte Creek valley. Based on preliminary modelling results which demonstrate that the proposed LID controls (combined with minimal storage for the less frequent events) can achieve the TDSPSS target flows at FM-D1 and FM-T5, this emergency outlet may not be required, but should be discussed further with the agencies to evaluate the cost/benefit of this additional infrastructure (including associated maintenance) versus the risk of LID failure and downstream impacts; and
- provision of additional major system storage in the open space / park areas. Designing the parks as dry ponds would provide an opportunity for control of excess / emergency flows.

Based upon the modelling, assessment and comparative analysis the application of an Enhanced SWM Approach throughout the proposed Evergreen development will be successful in achieving the necessary SWM targets while accruing additional benefits related to shallow groundwater recharge, water balance, reduced urban heat island effect and mitigation of temperature increases in runoff discharged to the watercourses that are located downstream of the Subject Property.

6.6.8 SITE WATER BALANCE

Section 3.4.4 the TDSPSS recommends the use of a hierarchy of stormwater controls with preference for source control (site level), then conveyance system control, followed by end-of-pipe control. In addition, where feasible, the use of infiltration measures, including the diversion of drainage to pervious surfaces as well as designed infiltration facilities, surface retention, and storage is encouraged, to help maintain predevelopment water balance conditions. The TDSPSS further states that, the implementation of the foregoing would be subject to best efforts to meet water balance objectives, including reduced runoff volumes and maintenance of groundwater levels, and the hierarchy of SWM controls.

As outlined in Section 3.3.8 of the EIR/FSS, a site water balance analysis identifies what proportion of annual precipitation is infiltrated to groundwater, intercepted as surface runoff, or lost through evapotranspiration. This information is important to demonstrate how, post-development, the flows to

surface water, ground water and terrestrial heritage features will be impacted. The analysis is useful in that it assists with the identification of water management systems that can maintain and enhance the hydrologic regimes that sustain these environmental features.

The impact of the proposed development on recharge and discharge to local aquifers will depend upon the pre-existing site conditions, such as location and climatic factors, soil texture, topography and type of vegetative cover, as well as the type and extent of the proposed development.

A pre-development Water Balance for the Subject Property was calculated and presented in **Section 3.3.8.**

6.6.8.1 POST DEVELOPMENT WATER BALANCE FOR THE SUBJECT PROPERTY

Development of property from rural and agricultural land use to urban residential and commercial/industrial land uses has effects on the natural water balance, primarily due to the addition of impervious surfaces, such as roads, parking lots, driveways and buildings. Impervious surfaces retain water at the surface, preventing infiltration into the soil, and removal of vegetation decreases the evapotranspiration component of the water balance within the affected area. Evaporation from impervious surfaces is a relatively minor component (estimated herein at 10% of precipitation) as compared to the 67% of precipitation occurring with existing vegetation in the Subject Property. The net effect of the creation of impervious surfaces is therefore that most of the precipitation incident upon the area becomes surplus water and direct runoff, and natural infiltration is reduced.

Additional effects may also occur due to compaction of soil due to heavy vehicle traffic across the Subject Property during construction, which would act to reduce the infiltration capacity of the underlying soils. Also, conversion of agricultural land or wooded areas to lawns has an effect upon the amount of evapotranspiration, as shallow rooted grasses draw water from less deep soil zones than trees and some agricultural crops. Runoff may be reduced by flattening of the Subject Property due to cut and fill operations.

In order to calculate a post-development water balance for the Subject Property, the proposed Draft Plan was used to identify the proposed land uses (**Figure 6.4B**). The percentage of impervious area for each of the land use categories was estimated for use in the calculation of infiltration and runoff from each area. For the pervious areas, the infiltration factor for topography was increased from 0.2 to 0.3 to account for reduction in topography due to grading, and the soil moisture retention value was reduced from 200 mm to 100 mm for the non-wooded pervious areas to account for the change in vegetation from crops to grass when calculating evapotranspiration using the EVAP program. For the impervious areas, an evaporation factor of 10% was estimated to account for direct evaporation. The results of the post development calculations are presented in

Table 6.6-8.

Table 6.6-8 - Post-Development Water Balance for Subject Property (prior to mitigation)

	Area (m^2)	Precipitation (m^3)	Evapotranspiration (m^3)	Surplus (m^3)	Infiltration (m^3)	Runoff (m^3)
Pervious Areas	335,230.0	300,801.9	196,961.7	103840.2	57,781.6	46,058.6
Impervious Areas	338,570.0	303,798.9	30,379.9	273419.0	0.0	273,419.0
Total	673,800.0	604,600.7	227,341.6	377,259.2	657,781.6	319,477.6
% of Precipitation		100.0%	37.6%	62.4%	9.6%	52.8%

As can be seen in comparison with the results of the pre-development calculations presented in **Table 3.3-**, the percentage of evapotranspiration has been reduced by nearly half due to the effects of development. Infiltration has also been reduced from 16.6 to 10% of precipitation and the largest component of the water balance is now surface runoff due to the effect of creating a large area of impervious surfaces.

6.6.8.2 MITIGATION

Potential impacts to the water balance from development may be minimized through the use of various LID measures for SWM to attempt to maintain the post-development infiltration volumes as close to the pre-development levels as possible. Such measures may include such components as directing roof leaders to pervious areas, increasing topsoil thickness to retain more water in storage, soak away pits and dry wells, constructed infiltration galleries or trenches, pervious pipe systems, and grass swales.

The Subject Property is underlain by primarily clayey silt soil and shale bedrock having relatively low hydraulic conductivity, which tends to limit the rate of infiltration. In response, the LID storm water management system that is proposed promotes the utilization of solutions that absorb, attenuate and exfiltrate storm water runoff rather than those that rely on infiltration. Notwithstanding the relatively low hydraulic conductivity of the soils, the biofilters, rain gardens, permeable pavement and detention areas will achieve some degree of incidental infiltration. **Appendix L1** includes the lot-level LID modelling results (runoff reduction per lot type) which take into account the limited infiltration rates. Despite the relatively low infiltration rates, the provision of storage within the LID management practices can attenuate a portion of the rainfall volume.

Measures such as directing runoff from roofs, driveways and parking lots to bioretention areas, utilizing permeable pavement, implementing rainwater harvesting systems and increasing topsoil depth will be effective in attenuating runoff and improving water quality. These techniques have been utilized within several developments within the City of Markham where soil and groundwater conditions are similar to those encountered at the Evergreen site.

In order to demonstrate the potential for mitigation from redirecting runoff to pervious areas, a water balance was calculated adopting this measure. A 10% factor was subtracted from the precipitation incident upon all pervious areas other than roads. The amount of excess water was then added to the amount of precipitation incident upon the pervious area of the Subject Property to obtain a total water volume reaching the pervious surface. This volume was then divided by the pervious area to obtain a simulated infiltration depth and was distributed throughout the year in proportion to the existing monthly value of average precipitation. These simulated precipitation values were then used as input to the EVAP program to calculate the expected evapotranspiration under these conditions. The calculated evapotranspiration was then subtracted from the total of precipitation and redirected runoff to obtain the water surplus and the surplus was partitioned into infiltration and runoff portions using the previously described infiltration factors. The results of these calculations are presented in **Table 6.6-9.**

Comparison of the results of **Table 3.3-14** with the results from the non-mitigation calculations in **Table 3.3-13** shows that evapotranspiration has been slightly increased, infiltration has been increased from under 10% to over 20% of precipitation and runoff volume has been decreased from 52.8% to 38.2%.

The magnitude of the effect of redirecting runoff would depend upon the amount of runoff that could be redirected in practice to the pervious areas. The values obtained in Table 3.3-14 are based upon redirecting all the available runoff from the impervious areas other than roads and redistributing it equally over all the pervious areas of the Subject Property. This calculation represents an idealized case, however the results demonstrate the potential for mitigating effects of development through the use of such methods.

6.7 ROAD NETWORK

The proposed Draft Plan utilizes the City of Burlington's standard 8.5 m laneways, 18.5 m and 20 m ROW sections for local streets and a 27 m collector street ROW. A "greenway" landscape strip is provided (as a separate block) along Street G and portions of Street B to facilitate implementation of LIDs and the local trail system. **Drawing 8.5E** illustrates the proposed ROW sections. The proposed Draft Plan identifies the various ROW dimensions.

6.7.1 ECOPASSAGE

An ecopassage is identified along "Street "C" where it traverses the NHS linkage between the Central Woodland on the Subject Property and the Bronte Creek valleylands and Greenbelt to the west of the Subject Property. The primary function of this ecopassage is to support the movement of amphibians, and possibly reptiles, between the Infrastructure Ontario Pond and associated wetlands outside the Subject Property (the primary habitat area) and the Central Woodland on the Subject Property by mitigating the potential impacts of the "special street" proposed through the linkage. The linkage

overlaps with an agricultural field and portions hedgerows H4 and H5 (see **Figure 3.17**) and is the narrowest point between the Central Woodland and the Bronte Creek valleylands.

While there is no evidence to suggest that the area is being utilized extensively as a wildlife corridor, it is understood that under existing condition various types of wildlife do move between the Central Woodland and the valleylands and Infrastructure Ontario Pond (as discussed in **Section 4.1.6.3** and **Section 4.3**), and that maintenance of a largely undeveloped linkage in this location will support this ecological connectivity in an urbanized context.

The Land Use Options discussed in the TDSPSS identified a "Special Road" in this location, and recommended that if a road needs to be constructed through a linkage, that it be designed to minimize impacts to wildlife and to retain the linkage functions. Section 5.3.3.5 of the TDSPSS identified a number of factors to be considered as part of the road design to ensure that connectivity for a wide range of species can be effectively maintained. Factors to be considered included:

- species movements
- roadway design (width, grade, side slopes, barriers, lighting)
- road traffic (volumes, speeds, calming)
- ecopassage design (culverts, funnelling structures)

Based on our investigations and knowledge of wildlife associated with the Study Area, and wildlife most likely to migrate between the Central Woodland and the Bronte Creek valley, incorporating an ecopassage into the road segment that crosses this NHS linkage is an appropriate measure to mitigate some of the potential conflicts between wildlife and vehicular traffic, particularly if integrated with other design measures as listed above. Ecopassages are more regularly being utilized in Ontario to mitigate impacts of motorized vehicles on wildlife by directing wildlife off roadways and providing alternative crossing routes.

Specific considerations to be incorporated into the ecopassage design include:

- provide grade separation between the road and surrounding lands and to facilitate culvert crossings
- integrate a lipped or ledged retaining wall and/or fencing on both sides of the road to prevent small wildlife from crossing on the road and to funnel them to the ecopassage
- incorporate at least 1 primary large (2 m wide and 1 m tall) concrete box culvert
- Maximize openness ratio of culvert by making it as short as possible (the retaining wall will help in this regard)
- Minimize width of road to facilitate shorter culvert lengths and crossing distances
- Incorporate a vent or grate into the culvert crossing to allow for air circulation
- Modify drainage conditions in the adjacent landscape to create aquatic and terrestrial conditions inside the culvert (note: culverts that provide both wet and dry environments are more effective)

- Naturalize the lands adjacent to the road to create a variety of habitat and provide cover and shelter for wildlife
- post signage to inform motorist of wildlife crossing seasons
- incorporate traffic calming measures (speed bumps) into road and post speed limit of 25 km/h to minimize vehicular conflicts with larger wildlife.

The proposed ecopassage is illustrated on **Drawing CP1.**

6.8 GRADING

The topographic surveys described in **Section 3.3.4** formed the basis of the existing conditions analysis and the conceptual post-development grading plan described further in this section. The Preliminary Grading Plan was designed to address sub-surface servicing requirements (gravity drainage and cover), define post-development catchments, and provide a serviceable development fabric that accommodates the City's requirements for road and lot grading.

The site grading generally involves filling to provide suitable cover over the proposed servicing infrastructure while tying into existing grades along the site boundary (i.e., at the property lines and NHS boundaries)

The Subject Property will be graded in a manner consistent with its existing topographic features and will satisfy the following objectives:

- Maintain existing watershed drainage divide, to the extent possible
- Minimize cut to fill operations
- Reduce the need for retaining walls
- Maintain general landform character
- Provide minimal impact to abutting properties
- Achieve SWM /environmental objectives
- Provide overland flow conveyance for major storm conditions
- Provide adequate cover above proposed servicing.

The site will be graded to suit the City of Burlington's design criteria and will consider constraints imposed by storm drainage, the proposed 14W-17Cb channel realignment, the Proposed NHS and boundary roads. Proposed road grades will utilize the City of Burlington minimum 0.50% slope. If required at detailed design, sawtooth grading will be introduced to minimize the extent of fill on the Subject Property. Sawtooth road grading conforms to the City's minimum 0.50% road grade. The net slope will accommodate major system flow conveyance. Please refer to **Drawing 8.4** for preliminary site grading and overland flow routes and **Drawings 8.5A** to **8.5D** for grading cross-sections including the proposed realigned watercourse channel plan and profile (14W-17Cb).

The following factors have been taken into account in developing the Preliminary Grading Plan:

- Protection of the Proposed Natural Heritage System;

- Maintaining to the extent feasible the drainage divide between Bronte Creek and Fourteen Mile Creek as recommended by the TDSPSS;
- Integration of the development with Dundas Street and Tremaine Road with consideration to future widening of these existing roads;
- Stormwater drainage outlet locations and elevations;
- Off-site drainage outlet elevations for the realigned watercourse at Tremaine Road and Dundas Street; and,
- Groundwater elevations and potential de-watering requirements.

6.9 SERVICING

6.9.1 WASTEWATER

6.9.1.1 EXISTING INFRASTRUCTURE

Colonel William Parkway Wastewater Main

In order to service the Subject Property, the existing Colonel William Parkway 600 mm diameter wastewater main located in the daylight triangle at Dundas Street must be extended westerly along Dundas Street to the Subject Property. The as-constructed design information for the 600 mm diameter wastewater main was prepared by Stantec Consulting Ltd. in March 2012 and obtained from Halton Region. This sewer is sufficiently deep to service the Subject Property via a connection at Dundas Street and future Street "V". Refer to **Drawing 8.10** for details.

6.9.1.2 WASTEWATER DESIGN CRITERIA

The design criteria and standards for the recommended Wastewater Servicing Plan were obtained from the 2003 "*Design Criteria, Contract Specifications and Standard Drawings*" prepared by Halton Region. Additional information was obtained from the September 2009 "*Tremaine Road Secondary Plan - Water and Wastewater Servicing Assessment*". The design criteria used are presented below:

Average per capita flow rate: 365L/c/d
Peak flow factor – residential: PFR=1+14/(4+P0.5)
Peak flow factor – commercial: PFC=0.8 x (1+14/(4+P0.5))
Infiltration/Inflow allowance: 0.286L/s/ha
Residential High Density: 135p/ha
Residential Low Density: 55p/ha
Equivalent Population Commercial: 90p/ha
Minimum sewer size (commercial): 300mm
Minimum sewer size (residential): 200mm
Minimum / maximum velocity: 0.6m/s to 3.0m/s

The wastewater analysis for the study area with respect to Halton Region's wastewater treatment capacity was conducted based on the following criteria:

Average Day Flow Residential	365 L/p/day
Average Day Flow Industrial	17.5 m^3/ha/day
Average Day Flow Commercial	25.8 m^3/ha/day
Average Day Flow Institutional	11.0 m^3/ha/day

Preliminary wastewater drainage areas and design sheets are included in **Appendix L2.**

6.9.1.3 EXTERNAL WASTEWATER REQUIREMENTS

In accordance with the Region of Halton Master Plan Update (2008), the Region planned future wastewater infrastructure to service lands throughout South Halton. This will be achieved through a series of trunk mains, pump stations and forcemains.

6.9.1.4 PROPOSED WASTEWATER SERVICING

The Subject Property wastewater servicing will be accommodated through the existing 600 mm gravity wastewater main located at Colonel William Parkway and Dundas Street. The Colonel William Parkway wastewater main was sized to accommodate sanitary flows from the entire Tremaine and Dundas Secondary Plan Area and North Oakville lands. This existing infrastructure provides the wastewater outlet for the Subject Property.

The existing Colonel William Parkway 600 mm diameter wastewater sewer will be extended westerly along Dundas Street for approximately 900 m. This wastewater sewer is identified as Region of Halton Project 3706. It will then be extended an additional 400 m to the Subject Property. The proposed internal wastewater sewer diameters range from 250 mm to 375 mm with an average slope of approximately 0.3%. Internal sanitary sewers will be constructed along the proposed streets and individual service connections will be provided for each unit within the development.

Please refer to **Drawing 8.10** for preliminary sanitary drainage concept and **Appendix L2** for the sanitary design sheets.

The Region of Halton 2011 Master Servicing Plan identifies Project 3706 as the only Development Charge wastewater infrastructure to service the Subject Property.

6.9.1.5 INTERIM WASTEWATER SERVICING

As provided for above, Halton Region recently installed the Regional wastewater trunk sewer within Dundas Street along the frontage of the Subject Property to the outfall at Third Line. Therefore, interim wastewater servicing will not be required for these lands.

6.9.2 WATER SERVICING

The Subject Property is located within an area that represents an extension of the Region of Halton Zone ML-3 Lake-Based Water District. There is an existing 900 mm transmission main (lake-based supply) located along Dundas Street across the Subject Property frontage that will provide the water supply for the site. A future 600 mm watermain will be extended northerly along Tremaine Road, as part of Region of Halton Project 5853 and it has been identified to continue easterly through North Oakville along a future right-of-way as shown on **Drawing 8.11.** The existing 900mm watermain on Dundas Street will need to be deflected / lowered to accommodate a drainage culvert that will connect the realigned watercourse (14W-17Cb) on the Subject Property with a proposed new watercourse channel downstream along the south side of Dundas Street. These works will be coordinated with the Region of Halton and the downstream landowner (Infrastructure Ontario). Refer to **Drawing 8.11** for the channel plan and profile, which conceptually illustrates the location of the proposed watermain lowering.

6.9.2.1 WATER SUPPLY DESIGN CRITERIA

The water supply and distribution system for the proposed development will be designed in accordance with the latest Region of Halton standards and specifications such that adequate pressures and fire flows are achieved. Water design criteria are derived from the "*Tremaine Road Secondary Plan - Water and Wastewater Servicing Assessment*" (Region of Halton 2009) and are as follows:

Water Design Criteria	
Average Day Residential Demand	330 L/cap/day
Maximum Day Factor	1.9
Peak Hour Factor	3.0
Density - Detached and Semi-Detached	3.5 persons/unit
Density - Townhouse	2.6 persons/unit

The final grade elevation of the proposed development will range between 155.0 m to 168 masl and can be serviced by a single feed connection to the existing 900 mm watermain along Dundas Street with a potential second connection to the Tremaine Road watermain.

Refer to **Drawing 8.11** for watermain locations. Final watermain sizing and pressure zone boundary limits will be completed at the detailed design stage based on the actual development characteristics. Furthermore, the water distribution system will be looped in order to provide system security via connections to the watermain at Dundas Street and along Tremaine Road.

Individual service connections will be provided to the lots within the development from the watermain on the fronting street.

7. IMPACT ASSESSMENT AND RECOMMENDED MITIGATION

After the determination of the Proposed NHS, a further function of the EIR/FSS is to assess the potential impacts of the proposed development (as described in **Section 6**) on the Proposed NHS in the Study Area. The impact assessment presented in this study examines the potential effects of proposed development at the site level, as well as the broader EIR/FSS Study Area level (identified in **Figure 1.2**) as recommended in the TDSPSS EIR/FSS Terms of Reference (provided in **Appendix A1**). The impact assessment presented in this EIR/FSS is also intended to fulfill the requirements of a Regional Environmental Impact Assessment (EIA) and City of Burlington Environmental Evaluation Report (EER) in support of the proposed Draft Plan application, and has been prepared to be in general accordance with the Halton Region EIA Guidelines (2014).

s. 118(2) of the Regional Official Plan requires the application of a systems based approach in implementing the RNHS. This includes not permitting the alteration to any components of the NHS "*unless it has been demonstrated that there will be no negative impacts on the natural features and areas or their ecological functions*", and refining the boundaries of the Regional NHS (as per s. 116.1) at a stage in the process where it still allows for flexibility in enhancing the ecological functions of the system components. Although the ROPA 38 RNHS boundaries set out in Maps 1 and 1G are not in full force and effect at the date of this EIR/FSS. Were those maps in force, this EIR/FSS provides a reasonable basis for refining those boundaries to coincide with the boundaries of the Proposed NHS because the refinements will result in no negative impacts on any of the components of the RNHS.

S.118(3) requires Evergreen, as a proponent of a development that meets the criteria of s. 118(3.1) to carry out an EIA. The stated purpose of the EIA is to "*demonstrate that the proposed development... will result in no negative impacts to that portion of the [RNHS] affected by the development…*"

"Negative Impacts" is defined in the Regional Official Plan (s. 260.2) to mean:

> *260.2(1) in regard to water, degradation to the quality and quantity of water, sensitive surface water features and sensitive ground water features, and their related hydrologic functions, due to single, multiple or successive development or site alteration activities;*
> *260.2(2) in regard to fish habitat, any permanent alteration to, or destruction of fish habitat, except where, in conjunction with the appropriate authorities, it has been authorized under the Fisheries Act; and*
> *260.2(3) in regard to other components of the Regional Natural Heritage System, degradation that threatens the health and integrity of the natural features or ecological functions for which an area is identified due to single, multiple or successive development or site alteration activities.*

This section is comprised of a comprehensive matrix (**Table 7.0**) that addresses the "no negative impacts" policy test. This matrix includes: a description of how the various development activities might

affect the Proposed NHS and its functions, recommends various mitigation measures to be implemented, where appropriate, to avoid or reduce potential impacts (and any associated monitoring or management actions required), and predicts the net impact. Net impacts have been classified as positive, negative or neutral based on their anticipated impact on the NHS. As a last step, whether there will be a negative impact, according to the above noted definition is determined.

In undertaking the impact assessment, the Study Team utilized an integrated multi-disciplinary approach to address potential effects of development on some of the more complex biophysical relationships that exist in the Study Area. For example, assessing the relationships between ground and surface water resources in sustaining fish habitat in Fourteen Mile Creek and Bronte Creek, and the feasibility of mitigating impacts through the Enhanced SWM Approach.

As indicated in **Table 7.0**, under the proposed Draft Plan development is generally confined to areas external to the NHS with the exception of: a special road crossing the local linkage between the Pond and Central Woodland, the proposed re-alignment of 14W-17Cb, and the potential installation of erosion controls at the Pond outlet (outside the Subject Property).

Trails (and some related grading) are also planned within some components of the Proposed NHS, but outside of Key Features except in areas where existing trails are already well-established.

As such, direct impacts to the NHS have generally been avoided, and the impact assessment is largely focussed on addressing potential indirect impacts on the Proposed NHS, rather than direct impacts that would otherwise need to be addressed if development was proposed within the NHS.

The impact assessment also speaks to the impacts of anticipated tree removals outside the Proposed NHS required to accommodate development.

Table 7.0 – Impact Assessment Matrix

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
PHYSICAL ENVIRONMENT					
Geology	**Bedrock Geology**	The bedrock geology of the Study Area is described in **Section 3.3.1**. Bedrock underlying the Study Area consists of Queenston Shale and has been found at a depth of between 1.2 and 13.1 m bgs on the Subject Property.	It is not anticipated that bedrock will be substantially exposed or disturbed by the proposed development however, shale may be encountered during the excavation of the realigned watercourse block on the Subject Property and on the property to the south of Dundas Street.	The detailed design will identify the potential requirement for over-excavation in the event shale is encountered and will identify the desirability of adding alluvium, Granular B, etc.	Neutral
	Surficial Geology	The surficial geology on the Subject Property is described in **Section 3.3.2.** The overburden depth ranges from 1.2 m bgs to 13.1 m bgs and is comprised primarily of Clayey Silt Till underlain by Silty Sand/Sandy Silt Till or bedrock.	Site grading is anticipated to impact upon the surficial geology. Cutting will reduce the depth of the overburden and filling has the potential to change to the stratigraphy through mixing. Considering that the stratigraphy is primarily Clayey Silt Till that is variably underlain by more coarse tills, it is not anticipated that these modifications will substantially impact the till substrates.	Conserve overburden on the site by maintaining a cut/fill balance so as to minimize exportation or importation of fill materials. Avoid mixing coarser and finer grained substrates during fill operations.	Neutral
Landform	**Physiography**	The physiography of the Study Area is described in **Section 3.3.3.** Study Area is situated on the Peel Plain. Bronte Creek valleylands represent the only character-defining landform within the Study Area.	The proposed development will not significantly affect the physiography of the site as it is relatively flat. Development will occur a substantial distance away from the Bronte Creek valley and will not affect the valley landform.	No mitigation required.	Neutral
	Topography	The topography of the Study Area is described in **Section 3.3.4.** The Study Area lies in a relatively flat area, and elevations on the Subject Property range from approximately 156 to 168 masl. <u>Cut/fill changes to existing topography:</u> The proposed development will not significantly affect the topography of the site as it is relatively flat. As described in **Section 6.7**, municipal standards require a suitable depth of cover above storm and sanitary sewers and watermains for frost protection. Services (particularly sanitary sewers) must also be at a sufficient depth to service basements. This requires filling certain areas of the existing site to a suitable level. In other areas, the existing topography may not meet municipal standards for maximum road slopes, therefore cutting certain areas of the site is required. Further constraining the proposed grading/cut/fill is the requirement to match existing servicing inverts and existing boundary grades. <u>Changes to existing slopes / drainage patterns:</u> Refer to "Surface Water", below.	Cutting and filling the site results in changes in surface drainage patterns (see "Surface Water", below) as well as potential impacts to existing vegetation. Changes in topography can alter surface water contributions to adjacent natural features.	Existing grades along property lines, and along the outer edge of buffers, will be matched under post-development conditions to minimize impacts to topography. Existing surface drainage characteristics will be maintained or replicated in order to sustain adjacent natural heritage features and vegetation communities.	Neutral
	Slopes	The proposed development does not overlap with any valleylands and there are no slope hazards associated with the Subject Property. As described in **Section 3.3.5**, a preliminary slope stability assessment was undertaken by AMEC in 2007 and an updated assessment was completed by AMEC in 2015. The assessments determined that neither the top of valley slope nor the projected long term stable top of slope overlap with the Subject Property. As	None	No mitigation required	Neutral

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
		such, future development will not be impacted upon by slope instability.			
Soils	**Topsoil**	<u>Removal of existing topsoil:</u> Topsoil stripping and stockpiling will be required to facilitate grading of the Subject Property. Existing topsoil, including organic matter, will be stripped and stockpiled to facilitate earthworks and to ensure building foundations and infrastructure bedding are placed on stable material. A portion of the stockpiled topsoil will be utilized in open space areas as well as residential yards in the development (see **Section 6.7**).	Stripping and stockpiling of topsoil can result in loss of organic material/nutrients. During site grading activities, topsoil porosity can be reduced due to earth-moving machinery (i.e., scrapers) and topsoil stockpiling, which can reduce the infiltration capacity of the soil to be re-applied to the site. Specific potential impacts could include: • Compaction of topsoil as a result of machinery movement and handling of soil • Compaction of topsoil as a result of compression under weight of stockpile • Sterilization of topsoil due to extended duration of stockpiling • Compaction of surface of subsoil layer as a result of machinery movement • Loss of depth of topsoil cover and potential for attenuation of stormwater runoff due to a decrease in the extent of post-development topsoil cover and depth • Loss of topsoil due to erosion by wind or rainfall runoff	• Prohibit machinery encroachment into areas that are proposed to remain undisturbed or that are proposed for naturalization • Where possible, limit height of topsoil stockpile to a maximum of 3 m and stockpile for a maximum of 1 year (preferably less than 6 months) • Stockpile organic-rich surface layer of topsoil separately from subsurface layers • Test topsoil and supplement with required amendments to facilitate proper soil chemistry to support plant growth • Scarify compacted sub-surface soil layer prior to installation of topsoil profile post-development • Provide a minimum depth of 300mm of topsoil over all areas (post development) and place topsoil with an emphasis on minimizing soil compaction • Provide temporary cover over topsoil stockpiles to mitigate erosion resulting from wind and precipitation. Direct surface runoff away from topsoil stockpiles and implement erosion and sediment control initiatives. Stabilize topsoiled/finegraded areas with vegetation cover after topsoil placement. Utilise erosion blankets/terraseeding or other methods to stabilize topsoil on slopes where required.	Neutral
Groundwater Resources	**Groundwater Flows, Patterns and Gradients (Deep and Shallow)**	Replacement of permeable soil cover with impermeable paving and buildings.	As outlined in **Section 3.3.5.2**, overprinting of soils with paving and buildings will reduce evapotranspiration, while increasing runoff and directing water to smaller unpaved areas where recharge will be focused, resulting in a lowering of the water table in some areas, and increasing the water table in others compared to the pre-development condition.	Pre-development groundwater flow is very limited due to the tight nature of local till sediments so the magnitude of potential effects is small. Net reductions in infiltration due to an increase in impervious area can be offset through the use of LID solutions that promote infiltration in addition to their primary attenuation function. The biofilters, rain gardens and other LID systems proposed are intended to store stormwater runoff and increase the extent and length of duration of contact between stored water and subsurface soils, encouraging a degree of infiltration. Notwithstanding the impervious nature of the soils that underlie the Subject Property, incidental infiltration will occur, contributing to the maintenance of groundwater flows and patterns.	Possible slight increase in groundwater discharge to surface water features due to increased recharge compared to pre-development conditions, but increase will be too small to be measurable.
		Installation of subsurface utilities on gravel beds below the water table.	Installation of subsurface utilities can create pathways for groundwater flow along utility corridors that may be different from pre-development groundwater flow directions.	Use of clay collars at strategic points along sewers and utility trenches, including between utility trenches and basements will prevent groundwater from travelling along trenches towards downgradient areas and basements and mimic the very low groundwater flows present under pre-development conditions. Clay collars should have an upper elevation or relief pipe that allows water to overtop the collars in the event of backup of water levels in infiltration galleries. Infiltration features are likely to be of most use in preserving or increasing pre-development flows to local	Neutral

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
				surface water features if placed along the downgradient (east, northeast and southeast) sides of the property.	
		As outlined in **Section 3.3.4.1**, there is minor groundwater discharge to the top end of 14W-17Cb. The proposed relocation of this watercourse will move it slightly to the west of this discharge point.	Loss of groundwater discharge to surface water features can result in loss of flow and loss of thermal mitigation.	There is a small amount of groundwater discharge at the northern limit of 14W-17Cb in its current location. The watercourse will be realigned slightly to the west at a slightly lower elevation and, as such, it is possible that it will continue to receive the same small amount of groundwater discharge. This watercourse will also see more sustained surface water flows with thermal mitigation from the LID measures which will replicate the small amount of groundwater discharge at the current location.	Positive / Neutral. Potentially positive impact due to the thermal regulation provided by LID measures and potential for groundwater interception within realigned watercourse block.
		Removal of hydrologic connections that have minor groundwater discharge.	Minor groundwater discharge was detected at BH-7 (as outlined in **Section 3.3.4.1**). As the amount of expected discharge is minimal, no significant impacts to discharge are expected to occur.	Minor groundwater discharge at BH-7 will be eliminated through the placement of fill in this location. No mitigation is proposed. Discharge is uncommon and of minimal volume at this location.	Slight negative impact at this specific location however, overall positive impact to groundwater as result of LID measures.
	Groundwater Quality (Deep and Shallow)	See groundwater flow and patterns. Existing groundwater quality is hard but this is characteristic of groundwater in the area. As outlined in **Table 3.3-7**, existing groundwater quality is already slightly elevated compared to surface water in terms of sodium and chloride.	As outlined in **Section 6.6** (Enhanced SWM Strategy), LID systems will enhance water quality through pollutant filtration, uptake, attenuation and biological processing. However, neither conventional SWM nor LID measures will mitigate sodium and chloride migration. The change in land use, in combination with direction of winter runoff from roads to LID measures, might result in a slight increase in sodium and chloride concentrations in groundwater, however these are unlikely to affect local surface water features due to the very slow rate of groundwater discharge to local watercourses.	None. Due to the tight soils and lack of an underlying aquifer, the net effect is likely too small to be measureable.	Neutral
Surface Water	**Drainage Density**	The proposed Draft Plan for the Subject Property maintains Reach 14W-17 in its existing location, consistent with the TDSPSS; therefore the proposed plan meets the drainage density targets as presented in the TDSPSS.	None	Not applicable	Neutral
	Drainage Catchment Areas	As outlined in **Section 6.6** proposed changes to site grading result in the following changes to existing drainage patterns	See below	See below	
		Culverts FM-T1 to FM-T4 will be decommissioned as part of the development of the lands east of Tremaine Road. The existing drainage areas tributary to these culverts will be redirected to the	FM-T1 to FM-T4 – the redirection of the entire drainage area west of Tremaine Road from these crossings results in reduced flows to the downstream reaches which may impact habitat	FM-T1 to FM-T4 – no mitigation necessary – hydrologic connections east of Tremaine Road will be decommissioned as part of future development.	Interim: Negative

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
		FM-D1 crossing.	and natural features in the downstream reaches. FM-D1 – the increase in drainage area (and imperviousness) related to development to this outlet results in increased peak flows, runoff volume and duration at FM-D1. If not attenuated, these increases have potential to increase flooding upstream and downstream of Dundas Street and increase erosion in the downstream reaches.	FM-D1 – SWM controls and LID measures are proposed to attenuate peak flows, retain post-development runoff volume on site, and provide extended detention volume / controls to mitigate erosion impacts downstream.	Ultimate: Neutral Net: Neutral
		The drainage areas to BCT-1 (Bronte Creek) and FM-T5 will approximately match existing conditions.	BCT-1 and FM-T5 – since the surface water drainage areas to these outlets remains relatively unchanged, the potential impact at these outlets is related to the increased imperviousness only, which has potential to exacerbate peak flows and erosion downstream.	BCT-1 – No mitigation is required based on modelling results. Results indicate the post-development peak flow released into the Bronte Creek valley is less than the existing peak flow. FM-T5 - No mitigation is required based on modelling results. Results indicate the post-development peak flow released into FM-T5 is less than the existing peak flow.	Neutral
		Existing drainage areas to natural features (wetlands, woodlots, and other NHS components) will be altered	The impact to natural areas as a result of drainage catchment changes is addressed under “Feature Based Water Balance” in **Section 6.6.6.2**.	See Feature Based Water Balance in **Section 6.6.6.2.**	
	Watercourses and Infrastructure Ontario Pond (Flow Regime, Erosion)	Changes in flow regime	Impacts include reduced / increased flows, erosion, changes in water level in existing Infrastructure Ontario Pond, potential channel erosion/aggradation. The proposed drainage area to the existing Infrastructure Ontario Pond is approximately equal to the existing drainage area, however the proposed development will increase the impervious area and therefore the total runoff volume discharged into the Pond. This will have the effect of an overall increase in the Pond water levels during rainfall events and increase in frequency of flows into the Pond during rainfall events. However, since the Pond outlet is fixed, the existing “permanent pool” elevation will remain the same, although the drawdown time of the facility will increase.	Release rates have been established that maintain the existing flow regime within the receiving watercourses. The resulting impact on the Infrastructure Ontario Pond (increased frequency of flow) is favorable; therefore no mitigation (with the exception of appropriate erosion and water quality control) is required.	Positive
	Flows	<u>Increase in flow / volume / duration at Bronte Creek outlets:</u> Changes to imperviousness and drainage area directed to the Bronte Creek valley may result in increased flows (velocities) and runoff volume.	Increased flows / volume can result in erosion along the Bronte Creek valley and BCT-R1, resulting in channel erosion and/or potential slope instability.	Erosion threshold determined for BCT-R1 as outlined in **Section 6.6.6**. Release rate is below threshold so no impacts to toe erosion are expected and no associated impacts to overall slope stability. Flow control (quantity control and extended detention) through conventional facilities is typically used to reduce erosive energy. No SWM facilities are proposed at the Bronte Creek outlets, however the proposed drainage area to be discharged to the Bronte Creek Valley is less than the existing area. Model results summarized in **Appendix L1** indicate that there is no net increase in flows to this outlet under post-development conditions. The proposed LID measures on the Subject Property will provide storage for the increased runoff volumes and attenuate peak flows. Erosion control / erosion protection measures are proposed	Neutral

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
				at the drainage outlet into the Bronte Creek valley as indicated on **Drawing 8.7** and **Drawing 12**.	
		As outlined in **Section 4.1.7**, Watercourse 14W-17Cb is proposed to be realigned to the west.	Potential channel instability due to changes in the flow regime or due to an inappropriately sized realigned channel.	The channel design for 14W-17Cb is based on the anticipated flow regime. This realigned channel, incorporating a naturalized riparian corridor, will provide greater stability and ecological functions than the existing channel.	Positive
	Water Quality (Temp., Chemistry)	Development of the Subject Property results in the following potential stressors to water quality: • Increased sediment loading to watercourses during topsoil stripping / earthworks operations; • Increased heavy metal / chloride concentrations in post-development stormwater runoff resulting from vehicles / road salt; • Increased loading of fine particulate matter from impervious surfaces; and, • Increased temperature of surface runoff due to interaction with warm surfaces (asphalt/roof tops)	Discharge of sediment and other pollutants into watercourses have the potential to disrupt aquatic habitat/impact aquatic species by interfering with turbidity/visibility, feeding and by increasing surface water temperatures. Heavy metals and chlorides can impact groundwater and surface water resources.	As outlined in **Section 6.6** (SWM/LID Plans), under post-development conditions, water quality control in the form of LIDs and a forebay (upstream of existing Infrastructure Ontario Pond) will provide appropriate TSS removal to MOECC standards and meet MNRF Redside Dace recommendations regarding water quality. The integration of subsurface LID systems will result in a reduction in the temperature of stormwater discharged into receiving watercourses (in comparison to a conventional end-of-pipe SWM system). As outlined in **Section 6.6.2** (Overall Environmental Enhancement / Sustainability Strategy), increased urban tree cover throughout the development will assist in reducing surface albedo, contributing to a modest reduction in the temperature of stormwater runoff discharged from the Subject Property. As outlined in **Section 8.3** (Erosion Control Plan), release of sediment into the watercourses will be mitigated through the use of erosion and sediment control practices during construction.	Neutral
	Geomor-phological Processes	As outlined in **Section 3.4**, development of the Subject Property results in the following potential stressors to geomorphological processes: • Changes in the flow regime within the receiving watercourses • Loss of First Order swales	Changes in flow can cause channel instability in the receiving watercourses. Loss of headwater swales can result in a loss of flow to downstream receiving watercourses. It can also result in a loss of sediment and nutrient inputs in the receiving systems.	As outlined in **Section 6.6.6** (Erosion Threshold Exceedance Analysis), release rates have been established to ensure erosion thresholds are not exceeded beyond the existing conditions. **Section 3.4.5** and **Section 3.4.6** detail how the release rates are set to maintain the existing sediment transport characteristics in the receiving systems.	Neutral
Water Balance	**Site Water Balance**	**Section 3.3.5.1** details the methodology for determining the pre-development water balance. Development of the Subject Property will increase impervious cover and alter the existing hydrologic cycle (rainfall-runoff-infiltration-evapotranspiration on monthly and annual basis).	Potential impacts include increase in surface runoff, which relates to increased erosion, flood flows, and flow duration. Groundwater recharge is expected to be reduced through increased impervious area however, pre-development recharge is very low, and this is unlikely to have a measurable effect on baseflows.	Mitigate reductions in groundwater recharge through use of LID installations that function to attenuate stormwater runoff and promote contact with subsurface soils, catalyzing a degree of infiltration. The implementation of the proposed Enhanced SWM Approach will result in flow attenuation, increased detention in the topsoil layer and increased contact with subsoils. This will assist in promoting an overall site water balance.	Slight positive increase in groundwater recharge. Rreliable source of runoff from hard surfaces during rainfall events
	Feature Based Water Balance	As outlined in **Section 6.6.8** (Feature Based Water Balance) there will be a diversion (decrease or increase) of drainage area to some natural features due to the proposed storm drainage scheme.	See below	See below	

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
		Central Woodland – A diversion of approximately 0.5 ha from the existing woodland drainage area is proposed.	Central Woodland – Diversion of the 0.5 ha area from the existing woodland will reduce flows / runoff volume discharged into the feature compared to existing conditions. This may impact the frequency of flow and wetland/woodland form and function.	Central Woodland – The strategic diversion of rooftop runoff is proposed to direct clean runoff to the Central Woodland to maintain the existing range of monthly runoff volumes as illustrated in **Figure 6.16A**	Neutral
		Southern Woodland – is "self-contained" and therefore the proposed development will not alter the existing drainage areas.	N/A	N/A	N/A
		West NHS along Bronte Creek Valley - A diversion of approximately 2.65 ha of clean rooftop runoff along the west side of the Subject Property is proposed as a result of development.	West NHS along Bronte Creek Valley – the diversion of 2.65 from the existing West NHS will reduce flows / runoff volume discharged into the feature compared to existing conditions. This may impact the frequency of flow and vegetation species in this feature.	West NHS along Bronte Creek Valley – the strategic diversion of rooftop runoff is proposed to direct clean runoff to the NHS along the Bronte Creek valley to maintain the existing range of monthly runoff volumes as illustrated in **Figure 6.16G**.	Neutral
		Infrastructure Ontario Pond and BCT-R1 – While the overall drainage area to the Pond (and BCT-R1) remains approximately the same under post-development as in pre-development conditions, the drainage area to the individual inlets to the Pond will change.	Infrastructure Ontario Pond and BCT-R1 – reduction of flow to the east inlet of the Infrastructure Ontario Pond may impact the vegetation species in that location, as well as any existing connectivity between the Central Woodland and the Pond. The north inlet will receive more runoff than under existing conditions, which could result in erosion issues.	Infrastructure Ontario Pond and BCT-R1 – As illustrated in **Figures 6.16B** to **8.4D**, the east inlet to the Pond will have a decrease in monthly runoff volumes but the north inlet will have a compensating increase. Since the total volume directed to the Pond falls within the existing range of monthly runoff volume results, no mitigation is proposed. Erosive energy associated with the increased flow / volume at the north inlet will be mitigated by the proposed forebay structure that will be implemented to provide water quality control.	Neutral
		FM-D1 – Due to the increase in overall drainage area and imperviousness to FM-D1 under post-development conditions, additional flows runoff volume will approach this feature.	FM-D1 – the increase in drainage area (and imperviousness) related to development to this outlet results in increased peak flows, runoff volume and duration at FM-D1. These increases have potential to increase flooding upstream and downstream of Dundas Street and increase erosion in the downstream reaches.	FM-D1 – the application of LID / SWM controls will ensure that the future flows and volumes discharged to FM-D1 fall within the existing range of monthly runoff volumes as illustrated in **Figure 6.16F**.	Neutral
		FM-T1 - FM-T4 – proposed diversion of flows from FM-T1 - FM-T4.	FM-T1 to FM-T4 – the redirection of the entire drainage area west of Tremaine Road from these crossings results in reduced flows to the downstream reaches which may impact habitat and natural features in the downstream reaches.	FM-T1 to FM-T4 – these features will be removed through development of the lands east of Tremaine Road; therefore, no mitigation is required and no water balance analysis was conducted. Should development of the Subject Property proceed in advance of the removal of the features east of Tremaine, a temporary mitigation strategy may be required (subject to detailed staging design during the site alteration approval process). The proposed high density / commercial lands along the west side of Tremaine Road are a potential source of interim runoff to the features east of Tremaine Road.	Interim – Negative Ultimate – Neutral
		FM-T5 – The FM-T5 drainage area will remain relatively unchanged; however increased imperviousness is proposed as a result of development.	FM-T5 – since the surface water drainage areas to these outlets remains relatively unchanged, the potential impact at these outlets is related to the increased imperviousness only, which has potential to exacerbate peak flows and erosion downstream. With respect to the Infrastructure Ontario Pond, The decreased drainage area to the east inlet of the Pond is compensated by an increased drainage area to the north inlet. The north inlet will therefore experience longer flow duration and additional flows / erosive energy.	FM-T5 – **Figure 6.16E** indicates that the proposed LIDs in the subject lands tributary to FM-T5 are sufficient to maintain the existing range of monthly runoff volumes to FM-T5.	Neutral
Key Features	**Significant Habitat of**	This EIR/FSS has confirmed that there are habitats for extant populations of three species that are provincially Endangered or	See below	See below	

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
	Endangered and Threatened Species	Threatened in the Study Area: Redside Dace (a Provincially Endangered fish), Silver Shiner (a Provincially Threatened fish) and Butternut (a Provincially Endangered tree).			
		Redside Dace 14W-17 n the northeast corner of the Subject Propert has been confirmed as ”contributing habitat” by MNRF for Redside Dace populations in Fourteen Mile Creek downstream. Contributing Habitat includes the watercourse channel and associated riparian environment to its bankfull width.	No development or servicing is proposed within the Tributary 14W-17 channel on the Subject Property. The limits of the proposed development have been established more than 30 m from the bankfull width of this watercourse. The area between the watercourse and the development has been identified as an NHS buffer and will be naturalized to enhance the riparian functions. The risk of direct impacts to the watercourse and habitat for this species is considered neutral to positive. Conventional development has the potential to impact on watercourses and aquatic habitats I.e., increases in overall runoff volume can result in erosion, the runoff discharge period to the watercourse can be shortened, and runoff from urbanized lands can be warmer and contain sediments as well as contaminants which in turn can adversely impact the thermal regime and water quality). However, the proposed development for the Subject Property has been designed using an Enhanced SWM Approach to provide protection to natural features including watercourses through LID measures rather than SWM ponds to control runoff and pollutants from the development. The proposed development utilizes several different LID techniques as described in **Section 6.6**. The use of LID measures will result in increased sediment removal greater than 80% and provide thermal mitigation to the receiving waterbodies. Under the Enhanced SWM Approach, the volume of water to 14W-17 will increase but the release of the water will maintain pre-development flow rates in the tributary. As a result, no impacts are anticipated to Redside Dace in downstream reaches from increased erosion or sedimentation. The increased volume of water to downstream reaches may also increase the area of Redside Dace habitat in areas that otherwise could not support sufficient flows for fish passage.	Naturalize 30 m buffers to 14W-17 as per the Proposed NHS. The enhanced riparian buffer will provide greater shading and cooling of the tributary. The proposed riparian buffers are more than adequate to protect the habitat from any potential impacts related to human encroachment or sedimentation Stormwater runoff discharge to the watercourse will be cooled and attenuated in LID measures which will provide subsurface controls and infiltration areas that will cool the runoff by contact with the ground and keep water temperatures cooler than ambient conditions in the summer months. Maintain hydrologic regime of riparian wetland to pre-development levels to the extent feasible by matching drainage areas or providing mitigation areas to account for post-development diversions. Maintain and/or enhance thermal regime of the watercourse to pre-development levels through the use of strategic landscaping and placement of LID controls as described in **Section 6.6.** Control peak flows through the use of LID controls as described in **Section 6.6** to reduce potential for increased erosion. Releases to 14W-17 have been set to lower peak flows and not to exceed the erosion thresholds identified in **Section 6.6.6.3**. Provide water quality to enhanced protection levels using SWM/LID in accordance with MNRF *Draft Development Guidelines for Redside Dace Habitat* (2011) as outlined in **Section 6.6**.	Neutral-Positive
		Silver Shiner Bronte Creek supports populations of Silver Shiner.	The habitat of Silver Shiner is contained within the Bronte Creek valley and is far removed from the proposed development on the Subject Property. No development or servicing is proposed in the vicinity of Bronte Creek. As such, risk of direct impacts to the habitat of this species is considered low to none. There is a very low risk of the proposed development indirectly impacting the habitat of this species with respect to creek flows. While the proposed development will result in a net increase in runoff volumes to Bronte Creek, this increase is nominal relative to the existing volumes presently being conveyed by the creek.	Match post-development catchment areas to pre-development catchment areas to maintain the subwatershed drainage divide. Use LID measures to promote infiltration and reduce runoff volumes being discharged to Bronte Creek. Control of peak flows through the use of LID measures as described in **Section 6.6** to reduce potential for increased erosion along Tributary BCT-R1. Release rates to Tributary BCT-R1 have been set to lower peak flows and not to exceed the erosion thresholds.	Neutral
		Butternut There are 17 Butternut trees that occur within the woodlands of the	The proposed Draft Plan will directly impact on the habitat of three trees (#5, 6, and 7 as shown on **Figure 3.18**). Although	The habitat of Butternut is regulated under the *Endangered Species Act* (2007), however non-retainable trees can be	Positive

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
		Bronte Creek valleylands as well as in the woodlands and open habitats on the southern portion of the Subject Property (see **Figure 3.18**).	the original assessments in 2012 confirmed #6 and #7 as being retainable, and #4 as being non-retainable (as per **Appendix J3**), a recent site visit (April 15, 2013) by a Butternut Health Assessor found all three trees to be dead, and therefore non-retainable. Therefore their habitat would not be considered protected or significant, and removal would be permitted.	removed without a permit as long as current assessments completed by a certified Butternut Health Assessor are submitted to MNRF, and no activity is undertaken within three weeks to allow MNRF to review the assessments. Updated Butternut assessments will be submitted to MNRF for review. Plantings of trees along with other naturalization is recommended in the buffers and linkage associated with the Southern Woodland, as well as the enhancement areas identified in the Proposed NHS.	
	Provincially Significant Wetlands	There are no Provincially Significant Wetlands (PSW) within the Study Area. The closest PSW is the North Oakville – Milton West PSW Complex. The closest part of this PSW complex is situated along Tributary 14W-17, 250 m to the east of the Study Area.	The proposed development will not directly impact upon the PSW; however, there is some a potential that the small PSW unit associated with Tributary 14W-17 downstream of the Subject Property (see **Figure 1.3**) could be indirectly affected by changes in flow volumes and water quality. Refer to discussion of **Redside Dace** habitat above.	The integrity of the PSW unit and its riparian habitat functions to be maintained by implementing the SWM and LID measures specified in this EIR/FSS. Refer to discussion of **Redside Dace** habitat above.	Neutral
	Regionally Significant Wetlands	The significance of all wetland features in the Study Area was assessed using applicable Regional criteria (**see Section 4.1.2**). Most of the wetland features within the Study Area were determined to be Regionally significant; however there are several small wetlands that do not provide an important ecological contribution to the Regional NHS and therefore are not considered significant. Rgionally significant wetlands on the Subject Property correspond with ELC units 20a, 20b, 21a, 21b, 22, 23a, 23b, 23c, 24c, 25 and 26. ELC wetland units 19, 21c, 24a and 24b are not considered Regionally significant.	With the exception of ELC wetland unit 19 and 24b, all wetlands on the Subject Property will be protected and retained within the Proposed NHS. Portions of non-significant wetland ELC unit 19 will be removed as part of the proposed development. This will result in the loss of approximately 0.14 ha of wetland habitat. Non-significant wetland ELC unit 24b is associated with Tributary 14W-17Cb and is ploughed seasonally. Under the proposed Draft Plan, this tributary channel will be relocated to the west of its current location (see **Figure 6.6**).	Ecological buffers of 15 m have been applied to the Regionally significant wetlands that will be retained in the Proposed NHS. The buffers specified are more than adequate to protect the ecological and hydrological functions of these wetlands. The loss of 0.14 ha of wetland habitat resulting from the removal of ELC Unit 19 can be compensated for by creating an equivalent area of wetland habitats in the nearby enhancement areas (as pproposed in **Section 8.1**). Wetland unit 24b will be re-created within the realigned watercourse block. No loss of wetland habitat is anticipated as an equivalent amount of wetland (or more) will be re-created. Wetland soils and seedbank from this wetland can be salvaged for the realigned channel.	Neutral
	Significant Woodlands	All of the significant woodland features in the Study Area and on the Subject Property are contained within the Proposed NHS and will be protected from direct impacts as the proposed Draft Plan has been designed around the proposed NHS.	The proposed Draft Plan will not directly impact upon any of the significant woodlands as they are all contained within the Proposed NHS. The proposed development and associated servicing has been designed around the proposed NHS. There is a potential that the proposed development may indirectly impact some significant woodlands features. While the significant woodlands associated with the Subject Property are not particularly unique or sensitive, development on the adjacent lands has the potential to result in the following indirect impacts on woodland features and functions: • Construction related impacts • Grading and drainage related impacts • Human and pet encroachment related impacts	• Apply 10m buffers to the staked dripline of all significant woodlands abutting areas to be developed (including adjacent to roads, parks and open space) • Establish fencing at outside limit of buffer • Implement tree protection and erosion and sediment control measures in advance of site alteration activities • Naturalize buffers using native species as per Conservation Halton landscaping guidelines • Locate trails between the buffer and rear lot lines of development blocks where possible; where trails are within the buffer, site the trail within the outer 4 m to 5 m of the buffer • Encourage users of trails to stay on the formalized routes through the use of signs, plantings and fencing • Distribute an information pamphlet to educate future residents about the do's and don'ts about lving adjacent to protected natural areas • Maintain drainage regimes of significant woodland	Neutral

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
				features as described in **Section 6.6.8** (feature-based water balance). See **Feature Based Water Balance** section above.	
	Significant Valleylands	The Bronte Creek valleylands represent the only significant valleylands in the Study Area. No portion of the valleyland or its projected long-term stable top of slope extends onto the Subject Property.	The proposed Draft Plan will not overlap with or impact significant valleylands. The proposed development is setback more than a minimum of 15 m from the long-term stable top of slope.	An erosion threshold assessment of BCT-R1 has been completed (**Section 6.6.6.3**) and found the feature is cutting through bedrock shale. The erosion threshold is therefore based on a weathered shale threshold. To ensure accelerated erosion does not occur in BCT-R1, stormwater runoff discharge targets for the Infrastructure Ontario Pond have been established below the established erosion threshold for BCT-R1.	Neutral
	Significant Wildlife Habitat (SWH)	The Study Area has been confirmed to support Candidate Significant Wildlife Habitat (SWH). The EIR/FSS includes an evaluation of Significant Wildlife Habitat in the Study Area (**Table 4.1-4**). It was determined that most of the Candidate SWH identified in the Study Area is directly associated with the Bronte Creek valleylands and not the Subject Property. The only Candidate SWH associated directly with the Subject Property is the mature forest within the Central Woodland feature. All Candidate SWH is protected within the Proposed NHS.	The proposed Draft Plan will not directly impact upon any of the areas supporting Candidate SWH as they are being protected within the Proposed NHS. On the Subject Property, portions of the Central Woodland have been identified as supporting Candidate SWH due to the presence of mature forest components. The proposed development is not anticipated to impact directly or indirectly on on the mature forest areas. Impacts to Candidate SWH associated with the Infrastructure Ontario Pond and wetlands, and the Bronte Creek valley woodlands are also not anticipated as these areas are contained on the neighbouring property and are well away from the proposed development. While the development of the Subject Property may increase human use of the valleylands, there are already informal trails within the area being used by nearby residents and farmers, and so the species in the area are already largely tolerant of this type of disturbance.	Potential indirect impacts to Candidate SWH in the Study area can be reduced by implementing the following mitigation measures identified for significant woodlands and significant wetlands: • Application of 10 m buffers to the staked dripline of all significant woodlandsand 15 m to significant wetlands abutting areas to be developed (including adjacent to roads, parks and open space) • Establish fencing at outside limit of buffer (except to allow for wildlife and pedestrian crossings at appropriate locations) • Implement tree protection and erosion and sediment control measures in advance of site alteration activities • Naturalize buffers using native species as per Conservation Halton landscaping guidelines • Locate trails between the buffer and rear lot lines of development blocks where possible; where trails are within the buffer, site the trail within the outer 4 m to 5 m of the buffer; where trails are within the Key Feature, build on well-established informal trails or, where necessary identify direct connections that will limit vegetation clearing and grading • Encourage users of trails to stay on the formalized routes through the use of signs, plantings and fencing • Provide specific outreach information related to Snapping Turtle and Milksnake • Maintain drainage regimes of significant features as described in **Section 6.6.8** (feature-based water balance). See **Feature Based Water Balance** section above.	Neutral
	Significant Areas of Natural or Scientific Interest (ANSIs)	There are no Provincially or Regionally Significant ANSIs that overlap with the Study Area**.** The Regionally Significant Zimmerman Valley Life Science ANSI, and Provincially Significant Bronte Creek Provincial Park Nature Reserve Life Science ANSI are outside the Study Area (see **Figure 1.3**).	Not applicable	Not applicable	Not applicable
	Fish Habitat	<u>Bronte Creek:</u> Within the Study Area, Bronte Creek has been classified as providing warm water sport fish habitat with high aquatic ecosystem health (Conservation Halton 2002). This reach of Bronte Creek supports a diverse resident warm water fish	The proposed development and associated servicing will not directly or indirectly impact fish habitat in Bronte Creek or its tributaries.	See discussion regarding Silver Shiner in earlier section of this table under **Significant Habitat of Endangered and Threatened Species**.	Neutral

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
		community and provides a migratory corridor/spawning area for Lake Ontario salmonids. Sampling completed during the TDSPSS did not yield any fish from the Pond.	See discussion regarding Silver Shiner in earlier section of this table under **Significant Habitat of Endangered and Threatened Species**.		
		Fourteen Mile Creek Tributary 14W-17: may provide direct fish habitat during periods of high water levels when low flow does not create a barrier to fish movement. The reach on the Subject Property is also confirmed as "contributing habitat" for Redside Dace (see discussion for **Significant Habitat of Endangered and Threatened Species**).	As outlined in the MNRF's *Draft Guidance for Development Activities in Redside Dace Protected Habitat* (February 2011), the following impacts to Redside Dace can occur as a result of development: • Stormwater discharge exceeding 25mg/L total suspended solids (TSS) above background levels, which can result in turbidity and interfere in redside dace feeding activity. • Increase in temperature of effluent storm water above 24 degrees Celsius as a result of long drawdown times / exposure to warm surfaces • Reduction of dissolved oxygen concentrations below 7 mg/L due to nutrients in SWM facilities and storage depths and increase in other water quality parameters / pollutants. • Disruption of the pre-development hydrologic cycle. The proposed development and associated servicing is not anticipated to adversely impact upon fish habitat in Fourteen Mile Creek and its tributaries. See discussion regarding Redside Dace in earlier section of this table under **Significant Habitat of Endangered and Threatened Species**.	Implement 30 m coolwater watercourse buffers as per the Proposed NHS and Conservation Halton policies. The proposed riparian buffers adjacent to the channel are more than adequate to protect fish habitat from any potential impacts related to human encroachment or sedimentation. Provide water quality to MOECC Enhanced levels and thermal mitigation to MNRF standards. SWM/LID for 14W-17 will be provided in accordance with MNRF *Draft Development Guidelines for Redside Dace Habitat*. See discussion regarding Redside Dace in earlier section of this table under **Significant Habitat of Endangered and Threatened Species**.	Neutral
		Fourteen Mile Creek Tributary 14W-17Cb**:** provides indirect fish habitat by conveying flow and nutrients to downstream reaches.	The proposed Draft Plan will impact directly upon Fourteen Mile Creek Tributary 14W-17Cb as it is proposed that this watercourse be relocated. This impact is considered temporary as it is proposed that this channel be restored and enhanced to the west (see **Figure 6.6**) provide for improved habitat functions.	Implement 15 m warmwater watercourse buffers as per the Proposed NHS and Conservation Halton policies. The proposed riparian buffers adjacent to the channel will be more than adequate to protect fish habitat from any potential impacts related to human encroachment or sedimentation. Provide water quality to MOECC Enhanced levels.	Neutral
Regulated Watercourses		Regulated watercourses form part of the proposed NHS. There are several watercourses in the Study Area that are regulated by Conservation Halton: Bronte Creek and its tributaries (BCT-R1, BCT-R3, and BCT-R3a) are regulated as are portions of the Fourteen Mile Creek and its tributaries (14W-17 and 14W-17Cb) (see **Figure 3.9**).	All of the regulated watercourses within the Study Area will be retained under the proposed Draft Plan, although 14W-17Cb is recommended for re-location. No impacts are anticipated to the regulated watercourses and their functions provided they are buffered and enhanced in accordance with the recommendations of this EIR/FSS.	Application of appropriate buffers and setbacks to the regulated watercourses when adjacent to development, including the re-located watercourse.	Neutral
			Bronte Creek and its tributaries will be maintained in their current state. Potential slope stability impacts are outlined under **Slope Stability.**	No development proposed within 15m of stable top of bank. Potential slope stability impacts are outlined under **Slope Stability.**	Neutral
			14W-17 will be maintained it its current location. No changes to the floodplain or meander belt are proposed.	Existing hazard lands are contained within the watercourse block and buffered as per Conservation Halton requirements (7.5m buffer block from the greatest hazard).	Neutral
			Tributary 14W-17Cb is proposed for realignment. Impacts include the need to realign a portion of the watercourse south of Dundas Street (on Infrastructure Ontario lands) as well as the need to install a new culvert beneath Dundas Street and	14W-17Cb will be designed using natural channel design as per Conservation Halton's requirements. All hazard lands will be contained within the realigned watercourse block and buffered as per Conservation Halton requirements	Neutral

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
			the removal of the existing culvert beneath Dundas Street. The culvert will need to be sized to accommodate Regional Storm flows in order to ensure no overtopping of Dundas Street. The tributary is being relocated away from a minor source of groundwater discharge.	(7.5m buffer block). Implementation of BMP's during proposed watercourse relocation using natural channel design. The re-alignment will result in the creation of approximately 78 m of additional stream length and potential fish habitat. The culvert beneath Dundas Street will be sized to convey the Regional Storm flow thereby protecting Dundas Street from flooding from this tributary. The depth of the realigned watercourse will be the same as, or lower than, the existing invert, which may provide the potential for interception of groundwater. Stormwater flow from the LID measures will augment minor losses in groundwater discharge and will aid with thermal mitigation.	
Other Wetlands		Non-significant wetlands and unregulated wetlands may be considered components of the Regional NHS according to the Regional Official Plan (2014). As outlined in **Section 5.1**, most wetlands in the Study Area will be retained within the proposed NHS, with the exception of two small wetland features on the Subject Property (ELC units 19 and 24c).	The proposed Draft Plan will see the removal of two small wetland features. The ecological functions associated with these features are extremely limited. The removal of these features will not impact significantly on the functions of the Proposed NHS.	Mitigation for the loss of wetland habitat and associated ecological functions will be achieved by creating additional wetland habitats in the enhancement areas.	Neutral
Linkages		One Regional scale and two local scale linkages have been identified in both this study and the TDPSS. The Bronte Creek valley is recognized as a Regional scale linkage that connects to portions of the valley upstream and downstream of the Study Area, and provides for landscape connectivity between the upper portions of the Bronte Creek watershed on and above the Niagara Escarpment and Lake Ontario. Local scale connectivity is currently provided by the hedgerows and agricultural fields that facilitate movement of local wildlife populations between the woodland habitats on the Subject Property and the Bronte Creek valleylands. The Central Woodland and Southern Woodland features are both relatively close to the Regional-scale natural linkage features, being situated within about 100 m of the Bronte Creek woodland / wetland edge. Since the Central Woodland and Southern Woodland features provide some supporting habitat for a number of species that primarily occur and breed in the Bronte Creek corridor, creation of naturalized linkages between these features and the Bronte Creek corridor will help support the continuation of this function in an urbanized setting, and potentially enhance this function.	The proposed development does not overlap with the Regional linkage provided by the Bronte Creek valleylands and will not directly or indirectly impact this Regional linkage. The linkage between the Southern Woodland and the Bronte Creek valley will be maintained in a natural state and portions of this linkage that are currently agricultural fields will be reforested to enhance this local scale linkage. The local scale linkage between the Central Woodland and the Bronte Creek valleylands will be similarly enhanced, but will be traversed by a road which has the potential to interfere with linkage functions. The location of this "special road" was identified in the TDSPSS, requiring design features to mitigate potential wildlife-vehecular conflicts. Both of the proposed local scale linkages are wider than they are long, provide the shortest and most direct route to the adjacent Key Features, and are proposed to be restored from their current agricultural land use to a naturalized state.	The local scale linkage between the Southern Woodland and the Bronte Creek valleyland does not require mitigation as it is simply being enhanced from current conditions. Recommended mitigation related to the "special road" traversimg the linkage between the Central Woodland and the Bronte Creek valleyland includes: • an ecopassage near the southern part of the linkage to facilitate the movement of amphibians, reptiles and small mammals • design measures in the ROW to direct wildlife to the ecopassage and discourage crossing over th e road • reduced speed limits combined with signs to advise of wildlife movement, and • naturaliztion of the lands outside the "special road" in the linkage.	Neutral
Buffers		Buffers are components of the NHS and have been applied to Key Features where development is proposed in the adjacent lands for the purpose of reducing impacts to Key Features and their functions. Buffers thesmselves are considered a mitigation measure and have been determined based on: (a) site and feature-specific consideration of the ecological sensitivity of each of the Key	Buffers generally have a neutral or positive impact on Key Features by reducing the potential for impacts associated with adjacent land uses and activities. Buffers can be multi-purpose and accommodate some complimentary uses / design components such as fences, trails and LID measures.	Buffers, by definition, are a form of mitigation. Their functions can be enhanced through naturalization and complimented by education and fencing. Where buffers are multi-purpose and require accommodation of trails, their function can be maintained through designs that complement the buffer functions (see **Figure 6.8**).	Positive

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
		Features and watercourses on the Subject Property (**Section 4.4.2.1**), and (b) consideration for the types of adjacent land uses being contemplated through the Secondary Plan (Section **4.4.2.2**), as follows: • 10 m from dripline of significant woodlands (or to the Greenbelt Plan Area boundary, whichever is greater) • 15 m from the staked edge of regionally significant wetlands (or the Greenbelt Plan Area boundary, whichever is greater) • 15 m from the stable top of valley slopes of significant valleylands in the Bronte Valley (or the Greenbelt Plan Area boundary, whichever is greater) • 15 m from the bankfull channel for warmwater habitat (i.e., 14W-17Cb), and • 30 m from the bankfull channel for cool or cold water habitat (i.e., 14W-17).	Buffer functions can, however, be diminished by certain (typically unauthororized) uses / components if their design is not complimentary to the buffer functions such as the introduction of invasive species through landscaping.	The overall intent of the trail design (as illustrated in **Figure 6.7**) is to balance providing connectivity in the community and access / exposure to the protected natural areas with the protection of these areas and their ecological functions. This is always a challenge in an urbanizing context and requires ongoing monitoring to assess effectiveness. On the Subject Property, trails have been recommended both outside of buffers (i.e., along sidewalks and/or within open space) and within buffers, but generally outside of Key Features. Trails between rear lot lines and Key Features can help discourage some types of encroachment into the Key Features. Where trails are proposed within buffers, they will be created at the outer limit of the buffer to maximize the area for naturalized plantings between the trail and the Key Feature (as per **Figure 6.8**). Drainage – swales / strategic grading within the buffer is required to direct runoff from the natural features away from future rear-yards to the intended outlets, as well as to prevent overtopping of the proposed trail network where possible. In cases where runoff will be directed into NHS features (for water balance mitigation), swales and/or level spreaders will be employed where necessary to mimic natural drainage patterns.	
Enhancements to Key Features		A number of enhancements within and outside of Key Features of the have been identified in the Study Area and Subject Property as part of the Proposed NHS where there are opportunities to restore or enhance ecological functions that can improve the ecological integrity of the Key Features and overall NHS. A Conceptual Restoration and Enhancement Plan was developed as part of the EIR/FSS and is presented in **Section 8.1** based on the following ecological themes: 1. Biomass Recycling 2. Habitat Creation and Restoration 3. Habitat Quality Enhancement 4. Habitat Linkage Enhancement The locations of the proposed enhancement areas are identified on **Figure 6.6** and illustrated in more detail in **Figure 8.1**.	Implementation of the Conceptual Restoration and Enhancement Plan will assist in attaining both the pbjectives of the Regional NHS (as per the the Region;'s Official Plan (2014) as well as the TDSPSS goals and objectives: • to enhance the ecological integrity of the NHS • to strengthen the ecological resiliency of the NHS • to strengthen ecological connections within the NHS • to restore natural habitats and ecological functions to the NHS, and • to recycle the biomass and biodiversity from development areas within the NHS. These enhancement measures are anticipated to have a net positive effect on the proposed NHS as many of the areas identified for enhancement are currently being actively farmed.	Not applicable	Positive
Regulated Watercourses		Regulated watercourses form part of the proposed NHS. There are several watercourses in the Study Area that are regulated by Conservation Halton. Bronte Creek and its tributaries (BCT-R1, BCT-R3, and BCT-R3a) are regulated as are portions of the Fourteen Mile Creek and its tributaries (14W-17 and 14W-17Cb) (see **Figure 3.9**)	All of the regulated watercourses within the Study Area will be retained under the proposed Draft Plan. No impacts are anticipated to the regulated watercourses and their functions provided they are buffered and enhanced in accordance with the recommendations of this EIR/FSS.		Neutral
			Bronte Creek and its tributaries will be maintained in their current state. Potential slope stability impacts are outlined under **Slope Stability.**	No development proposed within 15m of stable top of bank. Potential slope stability impacts are outlined under **Slope Stability.**	Neutral

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
			14W-17 will be maintained it its current location. No changes to the flood plain or meander belt are proposed.	Existing hazard lands are contained within the watercourse block and buffered as per Conservation Halton requirements (7.5m buffer block from the greatest hazard).	Neutral
			Tributary 14W-17Cb is proposed for realignment. Impacts include the need to realign a portion of the watercourse south of Dundas Street (on Infrastructure Ontario lands) as well as the need to install a new culvert beneath Dundas Street and the removal of the existing culvert beneath Dundas Street. The culvert will need to be sized to accommodate Regional Storm flows in order to ensure no overtopping of Dundas Street. The tributary is being relocated away from a minor source of groundwater discharge.	14W-17Cb will be designed using natural channel design as per Conservation Halton's requirements. All hazard lands will be contained within the realigned watercourse block and buffered as per Conservation Halton requirements (7.5m buffer block). Implementation of BMP's during proposed watercourse relocation using natural channel design. The realignment will result in the creation of approximately 78m of additional stream length and potential fish habitat. The culvert beneath Dundas Street will be sized to convey the Regional Storm flow thereby protecting Dundas Street from flooding from this tributary. The depth of the realigned watercourse will be the same as, or lower than, the existing invert, which may provide the potential for interception of groundwater. Stormwater flow from the LID measures will augment minor losses in groundwater discharge and will aid with thermal mitigation.	Neutral
Wildlife	**Birds**	The bird communities in the Study Area are relatively diverse and generally reflective of the different habitat types present (woodlands, wetlands and fields). The communities are generally comprised of common to widespread species; however some of the better quality habitats do support uncommon species. The Bronte Creek valleylands support a large variety of forest birds, including many area-sensitive species. The Pond is noteworthy in that is supports a diverse assemblage of waterfowl and songbirds. On the Subject Property, the bird communities are generally reflective of the agricultural land use. The cultivated fields support few bird species due to poor cover and habitat. The numerous hedgerow features support a relatively high number of species, although most are common and disturbance-tolerant. The Central Woodland supports common forest species, including some area-sensitive species; however, the abundance is relatively low as the woodland is isolated and the amount of interior habitat is limited. The Southern Woodland supports a greater diversity of species than the Central Woodland because of the abundance of successional habitat (clearings and thickets). The Southern Woodland does not support area-sensitive species, but does support many common, disturbance tolerant species.	The bird communities associated with the Bronte Creek valleylands, Pond and wetlands are not expected to be affected by the proposed adjacent development. Forest area-sensitive bird species habitat in the Study Area will also be unaffected as none of this habitat is proposed for removal. The proposed Draft Plan is confined primarily to portions of the Subject Property that are agricultural, including fields and hedgerows as well as some successional habitats. It is anticipated that the composition of the bird communities associated with these habitats will change. The bird communities associated with the hedgerows and early successional areas will be replaced by bird communities typically associated with residential neighbourhoods. In some cases, the same species would be expected to be present in both existing and proposed habitats (for example Mourning Dove, Blue Jay, American Robin, Northern Cardinal etc.), although the diversity of species is likely to be slightly lower. Potential indirect impacts may include predation of birds by pets and light disturbance from construction and new land uses.	Buffers from the woodland dripline will minimize direct disturbances / encroachments from the proposed development. Areas that are proposed for restoration such as the buffers, linkages and enhancement areas that are currently agricultural will provide some habitat for early successional species for some time, thus most 'hedgerow' species will remain. In the long-term, a larger forested area will be present. This will benefit avian forest species. Light impacts will be mitigated through the use of directional and dark sky lighting that minimizes the amount of light spill into the surrounding natural areas.	Neutral
	Mammals	Twelve common and widespread mammal species were observed in	The proposed development is expected to affect the relative	Linkages will be designed to be as mammal friendly as	Neutral

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
		the Study Area. There were no notable concentrations of any species, nor unusual or rare species observed.	abundance and movement of mammal species somewhat across the Study Area due to a change in habitat type. However, all species observed are expected to persist in the area and their overall populations should be unaffected by proposed development. For example, populations of Raccoon, Striped Skunk and Grey Squirrel may become more abundant in an urban residential environment, whereas species such as White-tailed Deer and Coyote might be less abundant in this area. While most of the mammal species noted from the Subject Property are adapted to urban and peri-urban environments, the introduction of roads can impacts some populations.	possible. In addition to the proposed ecopassage that will facilitate movement of small mammals such as racoons and skunks. It is recommended that signage and other safety measures be implemented along the proposed "special road" crossing of the linkage between the Central Woodland and the Bronte Creek valleylands.	
	Reptiles	*Turtles*: Numerous Midland Painted Turtles (up to 26) and Snapping Turtles, a Special Concern species, (up to 5) were observed in the Infrastructure Ontario Pond (ELC unit 18). Turtles were not observed elsewhere expect for a dead predated Painted Turtle east of the Infrastructure Ontario Pond.	*Turtles:* The Pond habitat will be retained in the Proposed NHS as will the surrounding wetlands, and most of the adjacent early successional habitat. Additionally, there will be a buffer applied to the significant wetlands and woodlands surrounding the Pond that will be naturalized. As the habitat for turtles is contained within the Proposed NHS, no direct impacts from the proposed development are anticipated. Hwever, the introduction of roads in the vicinity of the Infrastructure Ontario Pond can result in potential impact to turtle populations. With respect to the hydrologic regime, the proposed development will increase the impervious area and therefore the total runoff volume discharged into the Pond. This will have the effect of an overall increase in the Pond water levels and increase in frequency of flows into the Pond during rainfall events. However, since the Pond outlet is fixed, the existing "permanent pool" elevation will remain the same, although the drawdown time of the facility will increase due to the additional runoff volume generated on the post-development surfaces.	*Turtles:* Potential impacts to turtles from the road through the linkage can be mitigated by incorporating barriers to prevent turtles from crossing over the road and directing them through an ecopoassge. Provision of quality suitable habitat within and around the Pond may also encourage turtles to remain in the Pond area. The Pond presently provides very few opportunities for turtle nesting or basking (for Midland's Painted Tutles). The resulting impact to the Infrastructure Ontario Pond (increased frequency of flow) will create conditions more favorable to turtles; therefore no mitigation (with the exception of appropriate erosion and water quality control) is required. Water quality will be addressed through the implementation of a forebay structure upstream of the north inlet of the existing Pond.	Positive
		Snakes: Four species of snakes were observed in the Subject Property: Eastern Garter Snake, Northern Brown Snake, Milksnake, and Red-bellied Snake. All species, with the exception of Milksnake, are considered common and widespread to uncommon. Milksnake is a Provincial species of Special Concern. These species were most often observed in hedgerows and early successional habitats. It should be noted that surveys were not completed in the Bronte Creek valleylands to the west and one would expect to find a similar assemblages as that area contains similar habitats. The Milksnake was observed in ELC unit 26.	*Snakes:* Most of the hedgerow features will be removed; however, much of the edge habitat associated with woodland and wetland features will be retained in the proposed NHS within the buffers. Development will result in the removal of successional habitats that are favourable to these snake species however, the Conceptual Restoration and Enhancement Plan proposes the creation of successional habitats and snake hibernacula. It is expected that development will displace some local populations and force them to utilize habitats that are adjacent to the Bronte Creek valleylands. ELC unit 26, where the Milksnake was observed, will be retained in the Draft Plan, and there is no anticipated direct impact to this species. Movement of snakes between natural areas could be affected	*Snakes:* The three common species of snakes are expected to persist on site as there will be suitable habitat for them provided in the Proposed NHS. In addition, early successional habitat will be created in a number of enhancement areas, along with one or more snake hibernacula to provide enhanced habitat. Potential road mortality of snakes moving between the Bronte Creek valley and Central Woodland will be mitigated by a wildlife passage and associated wildlife barriers for directing wildlife to the passage as well as a reduced speed limit and signage.	Neutral

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
			(through mortality) by new roads. Indirect impacts could include predation by pets as well as human/snake interactions.	Milksnake habitat will be retained and will have a 10 m to 15 m naturalized buffer due to its occurrence in a significant woodland / significant wetland area.	
	Amphibians	Six species of amphibians were recorded in the Study Area: Green Frog, Spring Peeper, Gray Tree Frog, Wood Frog, American Toad and Eastern Newt. All of these species are common in southern Ontario and none are Species at Risk. The large majority of amphibian observations were made in the Infrastructure Ontario Pond/wetland (ELC unit 18) to the west of the Subject Property. This Pond provides habitat especially for Green Frog, Spring Peeper and Grey Tree Frog all of which are abundant (**Table 3.1-2**). One small area of meadow marsh (ELC Unit 21c) contained very small numbers of frogs, and a few American Toads were heard calling from inundated fields. A single Eastern Newt was also seen in this unit. This species likely uses the Pond during its adult phase and the woodlands during its juvenile stage.	There is anticipated to be a negligible impact to amphibians due to the proposed development. The prime habitat for breeding amphibians is the Infrastructure Ontario wetland/Pond and this and areas surrounding it will be retained (as will the small meadow marsh areas that contained a few frogs) with a naturalized buffer. The Eastern Newt habitat is also to be retained (Pond and woodland). Some amphibian species (Spring Peeper and Grey Tree Frog especially) would be expected to move outside the Infrastructure Ontario Pond in the non-breeding season. The following areas, which might be used during the non-breeding season are all proposed for retention: marsh and thicket swamp around Infrastructure Ontario Pond; woodland along Bronte Creek valley, and Central Woodland. If either non-breeding frogs or Eastern Newt were to move from the Infrastructure Ontario Pond/wetland areas east to the Central Woodland across the linkage they would potentially be affected by the proposed road in this area.	To mitigate potential roadway related impacts on local amphibian populations, an ecopassage will be constructed under this roadway to facilitate linkage functions between the Central Woodland, the Infrastructure Ontario Pond and Bronte Creek valleylands along with other mitigation measures listed above in the **Linkage** discussion. Additionally, habitat enhancements for amphibians are proposed beyond the mitigative requirements. It is proposed that vernal pools and other amphibian habitat be created around the Southern Woodland and within the enhancement areas.	Positive
	Odonates and Lepidoptera	Seven butterfly species and 11 dragonfly and damselfly species were recorded in the Study Area in 2013 (**Section 3.4.1.9**). The Infrastructure Ontario Pond/wetland supports a relatively high diversity of species. Odonates were also observed in meadow habitats elsewhere on the Subject Property but in much lower numbers. Butterflies were observed in a variety of habitats, including non-native species. Monarch (Special Concern provincially, but considered common in Halton) were observed as individuals in two locations. None of the other species observed are considered rare or significant. From a habitat perspective, the most productive area for these taxa is the Infrastructure Ontario Pond and associated wetlands.	The proposed Draft Plan will not affect the Infrastructure Ontario Pond and associated wetland habitats that have been identified to be most productive breeding and feeding habitats and supporting the greatest diversity of taxa. These habitats are contained within the Proposed NHS and will be protected, and enhanced. Since the Draft Plan is generally confined to lands that are cultivated, and these lands are generally unproductive for native taxa, and impacts to local populations will be minimal. The Draft Plan will result in the removal of hedgerows, successional habitats and one small wetland. These areas are somewhat productive but support a low diversity of more common species.	The removal of successional habitats will have minimal impact upon local populations of odonates and Lepidoptera. Additionally, habitat enhancements for odonates and Lepidoptera are proposed beyond the mitigative requirements. Loss of successional habitats will be offset by the creation of meadow and wetland habitats in the enhancement areas, linkages and buffers that are currently in agricultural production.	Neutral-Positive
Vegetation	**Vegetation Communities**	A total of 79 ELC polygons were generated for the Study Area representing 26 ecological community types (see **Section 3.5.1.1** for descriptions). Vegetation communities within the Study Area are generally reflective of an agricultural/peri-urban land use matrix abutting a major creek valley system (Bronte Creek) south of a large transportation corridor (407 ETR) and a utility corridor. Vegetation communities on the Subject Property are predominantly	The proposed Draft Plan has been designed to avoid impacting natural vegetation communities. The majority of the natural vegetation communities are contained within the proposed NHS and will be protected. Development on the Subject Property will impact upon features that are outside the proposed NHS including agricultural fields, two small wetlands (ELC Units 19 and 24b), hedgerow features (portions of H4, portions of H5, H6, portions of H7, H9-H18), successional cultural meadow (ELC units 2a-c),	Loss of vegetation cover related to the proposed will be mitigated by landscaping portions of the site with appropriate native species. Opportunities for restoration of vegetation cover exist within the development area as well as in the Proposed NHS off-site Enhancement Areas. Given that most of the area proposed for development is comprised of agricultural lands, it is anticipated that the proposed development will result in a net increase in permanently vegetated areas, as each lot, park and LID	Positive

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
		agricultural, with the exception of two woodlands and several hedgerow features. None of the ecological communities on the Subject Property are considered rare or significant at the Provincial level. There is a very small area of tallgrass prairie to the northwest of the Subject Property in the vicinity of the Hydro One corridor within the Study Area which is considered provincially rare.	cultural thicket (ELC units 4 and 5), and cultural woodland (ELC unit 7b). None of these communities are significant or exhibit functions that would warrant their inclusion in the proposed NHS. While the removal of these features will result in a temporary loss of vegetation cover from the site, their removal is not anticipated to impact adversely on the integrity of the NHS. With the exception of some hedgerow features, the quality of these other vegetation communities is generally poor and any impacts resulting from the removal of these features can be mitigated through site landscaping and restoration of Enhancement Areas, linkages and buffers.	block will be landscaped and permanently re-vegetated.	
	Plants	The Study Area supports a high diversity of plant species. Noteworthy species associated with the Study Area and Subject Property are listed in **Table 3.4-5**. The Bronte Creek valleylands support a high abundance of native species including regionally rare and uncommon species, owing to its abundance of natural communities. The plant species composition on the Subject Property is however, more reflective of its agricultural history with native species diversity being highest in the Central Woodland and relatively low elsewhere in the agricultural and cultural communities.	The proposed Draft Plan has been designed to avoid impacting natural vegetation communities. Almost all populations of regionally rare and uncommon species are contained within the Proposed NHS and will not be directly impacted by the proposed development, which will be confined to the agricultural and cultural vegetation communities. The only exceptions are populations of two regionally uncommon hawthorn species associated with some of the hedgerows. The proposed development will result in the partial removal of these hawthorn populations. While the removal of vegetation features will result in a temporary loss of vegetation cover from the site as well as populations of common native and exotic plant species, their removal is not anticipated to have an adverse impact on the integrity of the NHS. The impact of removing hawthorn can be mitigated by re-planting of these species on the site.	Impacts to populations of regionally uncommon hawthorns can be mitigated by collecting seed from affected trees and planting in adjacent, protected areas. Additionally, habitat enhancements plants are proposed in conjunction with and beyond the mitigative requirements for other NHS components through site landscaping and the restoration of enhancement areas, linkages and buffers.	Neutral-Positive
	Trees	There are substantial tree resources associated with the Study Area. All of the trees associated with the Proposed NHS in the Study Area will be protected. There are also trees associated with hedgerows and successional habitats that are outside the Proposed NHS, many of which will be removed as part of implementation of the proposed Draft Plan. An inventory of all trees with diameters (dbh) of 15 cm or greater outside of significant woodlands was completed by UFI (see **Appendix J4**). The findings of the Tree Inventory and Preservation Plan are as follows: • Total number of trees inventoried within the Study Area (outside of significant woodlands): 645 o Number of trees inventoried within the Subject Property (outside of significant woodlands): 561 o Number of off-site trees (all to be retained): 84 • Total number of trees identified for preservation: 266 o within the NHS buffers, linkages and enhancement areas: 139 o within the proposed development: 45	It is estimated that the proposed Draft Plan will require the removal of approximately 377 trees from the Subject Property due to grading, servicing and lotting conflicts. This represents between 58% of the trees on the Subject Property outside the significant woodlands. The loss of these trees will result in a temporary loss of tree canopy and associated ecological functions.	In addition to the 266 inventoried trees identified for preservation, additional opportunities to preserve select trees internal to the development limits may be identified and will be examined at the detailed design stage. The loss of tree cover is to be addressed through plantings of street trees and landscaping in parks, as well as plantings in linkages, buffers and enhancement areas where opportunities exist. It is anticipated that the combination of these plantings, particularly over time, will result in a more extensive tree canopy on the Subject Property than currently exists as much of the area proposed for development is presently agricultural.	Neutral - Positive

COMPONENT	CATEGORY	DESCRIPTION	POTENTIAL IMPACTS	RECOMMENDED MITIGATION	NET IMPACTS
		o outside the Subject Property: 84 • Number of trees expected to be removed under the proposed Draft Plan: 377 • Proportion of inventoried trees to be retained: 42%			

8. IMPLEMENTATION PLANS

The following sections outline how the management plans critical to meeting the no net impact requirements of the Region's Official Plan (2014), and to achieving a net positive impact with respect to the NHS will be implemented. These Plans identify: how the Proposed NHS will be enhanced both within and outside of Key Features, how tree retention and removals outside of the significant woodlands is to be addressed, how erosion / sediment and de-watering / wells are to be addressed as part of construction, and the framework for comprehensive environmental monitoring to ensure that (among other parameters) water quality, quantity and erosion control targets are being met.

These are, specifically the following plans described in more detail below:

- Conceptual Restoration and Enhancement Plan (**Section 8.1**)
- Tree Inventory and Preservation Plan (**Section 8.2**)
- Erosion and Sediment Control Plan (**Section 8.3**)
- De-watering and Well-decommissioning Plan (**Section 8.4**), and
- Environmental Monitoring Plan (**Section 8.5**).

8.1 CONCEPTUAL RESTORATION AND ENHANCEMENT PLAN

The Conceptual Restoration and Enhancement Plan (provided in **Figure 8.1**) is primarily intended to be applied to areas within the Proposed NHS (as shown on **Figure 6.6**), both within and outside of Key Features, but also includes some areas within linkages and buffers that would benefit from enhancement.

The Conceptual Restoration and Enhancement Plan compliments the other environmental management strategies and plans presented in this study (such as the Conceptual Trails Plan, the Enhanced SWM Approach Plan, and the Tree Preservation Plan) in that it identifies specific areas and strategies for: (a) implementing a number of the recommended mitigation measures related to habitat restoration / creation identified in the impact assessment (**Table 7.0**), and (b) implementing habitat–related enhancements that go beyond what is required in relation to mitigation. Implementation of these measures is expected, over time, to contribute to the long-term protection, maintenance and improvement of the NHS within the Study Area.

While the bulk of these proposed measures are for lands which are on the Subject Property, a number of potential enhancements have also been identified in relation to Key Features located in the adjacent lands to the Subject Property. Implementation of these measures will, obviously, require agreement from the relevant landowners. Once the extent and nature of opportunities is confirmed, a more detailed Restoration and Enhancement Plan (inclusive of area–specific planting plans, prescriptions and specifications) will be required for the detailed design stage in consultation with the City of Burlington and Conservation Halton, and if agreement is reached, the owner(s) of the adjacent lands.

8.1.1 GOALS AND THEMES OF THE RESTORATION AND ENHANCEMENT PLAN

The goals of the Conceptual Restoration and Enhancement Plan are:

- to enhance the ecological integrity of the Proposed NHS
- to strengthen the ecological resilience the Key Features within the Proposed NHS
- to strengthen ecological connections between Key Features within the Proposed NHS
- to sustain and restore natural habitats and ecological functions to the Proposed NHS, and
- to recycle the biomass and biodiversity from development areas within the NHS.

The Management Strategy presented in the TDSPSS includes a series of goals and objectives that relate primarily to the protection of natural heritage features and functions, but also speak to opportunities for strengthening linkages and managing habitats. These opportunities are being carried forward in more detail as part of the Restoration and Enhancement Plan.

The Conceptual Restoration and Enhancement Plan has been developed around the following ecological themes:

1. Biomass Recycling
2. Habitat Creation and Restoration
3. Habitat Quality Enhancement
4. Habitat Linkage Enhancement

A description of the various recommended restoration and enhancement measures associated with these four ecological themes is presented below. A map illustrating how these themes have been applied to the Subject Property and adjacent lands is presented in **Figure 8.1**. A table summarizing which specific restoration and enhancement techniques (as described in the sub-sections below) proposed to be applied to each of the identified areas is presented in **Table 8.1-1** below.

Table 8.1-1- Summary of Proposed Restoration and Enhancement Opportunities

Ecological Theme	Enhancement Class	Enhancement Unit (ref. Figure 8.1)*
Biomass Recycling	Recycling Native Species	Various
	Recycling Biomass and Rocks	Various
Habitat Creation and Restoration	Wetland Creation, Naturalization and Enhancement	1,8,9,11,12,13,B
	Forest Restoration	2,3,4,5,6, 7,8,9,11,14,B
	Specialized Wildlife Habitat	
	Vernal Pools	4,6, 8,9,11,12
	Open Country Grassland	D
	Floating Wetland Islands	C
	Snake Hibernacula	2,3,8,9,15; B
	Turtle Nesting Sites	8,9,B, C
	Turtle Basking Structures	C
	Swallow Nesting Structures	2, 15, D

Ecological Theme	Enhancement Class	Enhancement Unit (ref. Figure 8.1)*
	Bat Houses	12,15; A
	Bluebird Nest Boxes	Various
	Wood Duck Nest Boxes	Various (near water)
	Osprey Nesting Platforms	Various (near water)
Habitat Enhancement	Waste and Debris Removal	Various
	Invasive Plant Species Control	2,3,4, 12, 15; A
	Native Plant Species Diversification	Various
Linkage Enhancement	Linkage Habitat Enhancements	9, 11
	Ecopassage	10

* Note: Letters denote areas outside the Subject Property, while numbers are assigned to areas within the Subject Property

8.1.2 BIOMASS RECYCLING

Portions of the Subject Property outside the Proposed NHS boundary support ecological resources that will be removed to accommodate future development under the proposed Draft Plan. These resources include rocks and boulders, topsoil and associated native soil seed banks, native groundcovers and woody vegetation (logs, branches and root wads). While these resources are presently associated with cultural features (i.e., agricultural fields, hedgerows, cultural woodlands and thickets) that are not considered significant from an ecological or policy perspective, they collectively represent biological assets that could be integrated into the Proposed NHS in creative ways to enhance the system and reduce the extent of biomass and biodiversity being removed from the landscape.

The ecological health of the various ecological communities that comprise the Proposed NHS is considered moderate to poor (see **Section 4.4.2.1**), and the ecological integrity of the system has been severely diminished by ongoing and cumulative human activities, particularly over the past century. Many of the natural features comprising the Proposed NHS have been altered, and their biomass and biodiversity have been degrraded. Salvaging biomass and biodiversity from the developable lands and re-utilizing it within the Proposed NHS Enhancement Areas can potentially benefit the Proposed NHS by enriching soils, stimulating nutrient cycling, retaining local biodiversity, and enhancing structural diversity and wildlife habitat.

The types of biomass recycling activities that could be used within the Subject Property and Study Area include: (a) native plant recycling, and (b) recycling of logs, rocks and other biological assets, as described in the following two subsections.

8.1.2.1 RECYCLING NATIVE SPECIES

The Subject Property supports hedgerows, cultural woodlands, cultural thicket, and other habitats that are external to the Proposed NHS and will not be preserved under the proposed Draft Plan. Some of these features support populations of common native trees and shrubs such as Bur Oak, Choke Cherry, Prickly Gooseberry and Bitternut Hickory, as well as several regionally uncommon species, including

Canada Plum, Holmes Hawthorn, and Fireberry Hawthorn. Additionally, there are localized populations of native woodland groundcovers such as May-apple that have been identified within specific hedgerows. Biodiversity recycling should be employed to retain the genetics of these populations in the landscape through live transplantations, seed collection and planting, and transfer of soil seed banks.

Enhancement areas that would benefit from this form of Biodiversity Recycling are listed in **Table 8.1-1** below and identified on **Figure 8.1.**

8.1.2.2 RECYCLING OTHER FORMS OF BIOMASS

The Subject Property also supports large volumes of biomass in the form of woody vegetation and debris, as well as rocks and boulders,that will not be preserved in their current state under the proposed Draft Plan.

Woody debris including logs, branches, and root wads as well as rocks can also be re-used in variety of wildlife habitat creation projects. For example:

- rocks and root wads can be used to create snake hibernacula
- trunks from larger trees can be arranged around the Pond adjacent to the Subject Property to create turtle and frog basking structures
- logs can be scattered in existing forest habitats where they can contribute to nutrient cycling and provide habitat for a variety of organisms such as insects, arthropods, small mammals, reptiles and amphibians, and
- brush piles created from shrubs and branches can provide refuge for mammals and reptiles.

Wood debris not designated for use in habitat creation projects could be chipped on-site and used to amend agricultural soils in enhancement areas or as a source of mulch for restoration plantings.

8.1.3 HABITAT CREATION AND RESTORATION

8.1.3.1 WETLAND CREATION, NATURALIZATION AND ENHANCEMENT

Existing wetland habitats on the Subject Property are limited to riparian wetlands associated with tributaries to Fourteen Mile Creek, small wetlands within the agricultural fields, and wetlands within the Central Woodland. These wetlands offer little to no amphibian breeding habitat functions and are also limited in terms of other ecological functions. However, opportunities exist to create new, higher functioning wetland habitats in several locations on the Subject Property.

The Conceptual Restoration and Enhancement Plan identifies several locations for small wetland creation projects on the Subject Property and adjacent lands. Opportunities include:

- wetland creation in portions of the agricultural fields to the east and southeast of the Pond (on Infrastructure Ontario property)

- vernal pool creation within the Central Woodland and other areas identified for forest restoration to provide habitat for pond breeding amphibians
- meadow marsh wetland habitat creation in the linkage between the Central Woodland and the Infrastructure Ontario Pond to facilitate amphibian movement between these two areas
- wetlands or swales to compliment entrances / exists to the proposed ecopassage, and
- creation of a meadow marsh at the north end of ELC unit 29 (on Infrastructure Ontario property), identified as Area 13 in **Figure 8.1**, to offset the proposed removal of the non-significant wetland represented by ELC unit 19 and provide enhanced (larger, more biodiverse) amphibian breeding habitat.

8.1.3.2 WOODLAND RESTORATION

The bulk of the Subject Property and portions of the adjacent lands are presently farmed. These cultivated fields are situated immediately adjacent to the Proposed NHS Key Features and, where not identified for development, represent an opportunity to create a mosaic of habitat types including forests, wetlands and meadows.

Forest habitats can be restored, over time, to portions of these areas by planting suitable native coniferous and deciduous trees, shrubs, and groundcovers using conventional methods as well as direct seeding. These plantings could also be supplemented with salvaged biomass and transplanted material to introduce habitat structure (as described in **Section 8.1.2** above). In addition, specialized wildlife habitats (hibernacula, vernal pools and turtle nesting habitats) could be created within these areas using pit and mound restoration methods. Restoration of natural forest habitats in these areas would increase the amount and quality of forest cover in the Study Area, and enhance the ecological integrity of the Proposed NHS as a whole, including its linkage functions.

Forest restoration is a long term management exercise that involves accelerating natural succession, ongoing monitoring and adaptive management. However, in the eastern North American zone, abandoned natural areas with the appropriate soils and seed sources, tend to naturally succeed to woodlands, and so this is a reasonable longer term objective for portions of this Study Area.

8.1.3.3 SPECIALIZED WILDLIFE HABITAT

Portions of the Subject Property and adjacent lands present numerous opportunities to introduce specialized wildlife habitats. This study has identified a number of NHS enhancement areas as well as NHS Key Features that have been degraded (e.g., Southern Woodland, portions of the Central woodland) and could greatly benefit from the introduction of specialized wildlife habitats. Introducing such habitat elements will serve to enhance the ecological integrity of the Proposed NHS. The Conceptual Restoration and Enhancement Plan identifies the following specialized wildlife habitats as appropriate for various locations within the Study Area:

- Vernal Pools
- Open Country Grassland

- Floating Rafts
- Snake Hibernacula
- Turtle Nesting Sites
- Turtle Basking Structures
- Swallow Nesting Structures
- Bat Houses
- Bluebird Nest Boxes
- Wood Duck Nest Boxes
- Osprey Nesting Platforms

Possible locations of the various proposed specialized wildlife habitats listed above are illustrated on **Figure 8.1**.

8.1.4 HABITAT ENHANCEMENT

Proposed habitat enhancement measures include: waste and debris removal, invasive plant species control, and native plant diversification. These are each described in more detail in the following three sub-sections.

8.1.4.1 WASTE AND DEBRIS REMOVAL

There are many areas in the Proposed NHS that contain waste and debris. Items including fill and concrete, discarded farm equipment, scrap metal, old hay bales, obsolete fences, and derelict vehicles. The waste on the Subject Property should be removed and disposed of in an appropriate manner, and the affected areas should be remediated and restored using native vegetation. The proposed clean-up would be another measure that enhances the quality of the Proposed NHS.

8.1.4.2 INVASIVE PLANT SPECIES CONTROL

Field investigations have identified the presence of numerous invasive plant species within Key Features on the Subject Property and adjacent lands. Invasive species represent a major threat to the ecological integrity of the Proposed NHS. Some of the most problematic species noted include Brome Grass, Quack Grass, Orchard Grass, Common Reed, Hybrid Cattail, Garlic Mustard, Dame`s Rocket, Celandine, Comfrey, Common Buckthorn, Tartarian Honeysuckle, Manitoba Maple, White Poplar and Norway Maple.

The control and management of these species requires a targeted approach that is focused on areas that presently support high quality assemblages of native vegetation and is focussed follow-up control as well as rapid replacement with native species. Invasive species control is a long-term endeavour that requires ongoing monitoring and adaptive management.

The Conceptual Restoration and Enhancement Plan identifies areas on the Subject Property and adjacent lands that would derive the greatest ecological benefits from implementation of invasive species control measures.

8.1.4.3 NATIVE PLANT SPECIES DIVERSIFICATION

The significant woodlands on the Subject Property and adjacent lands exhibit relatively low levels of structural diversity and species diversity, particularly the Southern Woodland. This is due in part to the disturbance history and lack of appropriate management. Lack of good forestry practices has also contributed to the loss of species diversity. Removald of mature, commercially valuable species (e.g., Pine, Hemlock and Oak) as well as the presence of pathogens such as Beech Bark Disease has altered the composition of the native forest stands in the Study Area resulting in stand homogenization by more shade tolerant species such as Maple. The Conceptual Restoration and Enhancement Plan identifies areas that would benefit from management efforts focused on diversification of structure and species composition. Such efforts would serve to enhance the ecological integrity of the Proposed NHS.

There are several woodland habitats on the Subject Property that are comprised almost entirely of Black Walnut and Hawthorn (e.g., ELC unit 7a). These stands have developed in areas that were formerly farmed or orchard lands, and support low levels of native species diversity. These areas would benefit from diversification through selective removals and under planting with other native trees and shrubs.

One of the limitations of Black Walnut stands are that the trees release an allelopathic chemical called juglone that can inhibit the recruitment of other native tree species. This limitation can be overcome by utilizing juglone tolerant species such as those listed in **Table 8.1-2** below.

Table 8.1-2 - Juglone Resistant Trees and Shrubs for Underplanting Black Walnut Stands

Scientific Name	Common Name	Habit
Acer nigrum	Black Maple	Tree
Acer rubrum	Red Maple	Tree
Acer saccharum	Sugar Maple	Tree
Carya cordiformis	Bitternut Hickory	Tree
Carya ovata var. ovate	Shagbark Hickory	Tree
Euonymus obovata	Running Strawberry-bush	Shrub
Hamamelis virginiana	American Witch-hazel	Shrub
Lonicera dioica	Douglas Honeysuckle	Vine
Prunus serotina	Wild Black Cherry	Shrub
Prunus virginiana var. virginiana	Choke Cherry	Shrub
Quercus alba	White Oak	Tree
Quercus rubra	Northern Red Oak	Tree
Ribes americanum	Wild Black Currant	Shrub
Ribes cynosbati	Prickly Gooseberry	Shrub
Sambucus nigra ssp. canadensis	Common Elderberry	Shrub

Scientific Name	Common Name	Habit
Thuja occidentalis	Northern White Cedar	Tree
Tsuga canadensis	Eastern Hemlock	Tree

8.1.5 LINKAGE ENHANCEMENT

A functional linkage exists between the Central Woodland and the Pond/wetlands to the west of the Subject Property. This area provides limited cover and habitat structure which facilitates some movement of small mammals and amphibians. It appears to be used by mammals such as white-tailed deer, and to a lesser extent by pond breeding amphibians that overwinter in the woodland and migrate to and from the wetlands and Pond on the neighbouring property.

The area between the Pond and Central Woodland is comprised of an agricultural field. While the field offers little resistance to wildlife movement for larger mammals, it does not provide sufficient cover and habitat structure to facilitate movement of small mammals and amphibians. Restoration of forest and wetland habitats to this area would likely improve opportunities for both large and small wildlife movement to and from the Central Woodland.

The Conceptual Restoration and Enhancement Plan proposes that a series of wetlands and drainage swales be created within this linkage area to make conditions more suitable for amphibians and small mammals. The introduction of wet depressions along with habitat structures (logs, stumps and rock piles) would be expected to significantly enhance linkage functions in this portion of the Proposed NHS.

It should be noted that the proposed Draft Plan (like the TDSPSS) proposes that a road bisect this linkage area to support connectivity between the residential areas in the Evergreen Community. While the road could potentially impede some wildlife movement across this area, or result in wildlife mortality, the combination of linkage enhancements (as discussed above) as well as integration of an ecopassage in the road design (as discussed in **Section 6.7**) with other complimentary design measures (e.g., signs and reduced speed limits), should support safe wildlife movement across this area.

8.2 TREE PRESERVATION PLAN

As described in the Impact Assessment matrix presented in **Table 7**, there are 645 trees that were inventoried and assessed by UFI (2015) outside the significant woodlands in the Study Area.

Most of the trees outside the significant woodlands are within the 18 hedgerows on the Subject Property (see **Table 3.4-3** and **Figure 3.17**). Section 4.8.1 of the TDSPSS identifies Hedgerows H4 through H8 as “significant” hedgerows based on the presence of mature, healthy, native hardwood tree species and their potential ecological linkage function (although they are not all specifically incorporated into the TDSPSS NHS). The ability to protect these five hedgerows through the design and grading of the proposed Draft Plan was reviewed through the Tree Inventory and Preservation Plan process.

Hedgerow H8 is protected in its entirety, and a portion of Hedgerow H7 is protected in the proposed Draft Plan within linkage and enhancement areas. Portions of Hedgerows H4 and H5 are also protected in the proposed Draft Plan however, the grading for Street C may impact upon tree retention. The use of retaining walls will be consodered at the detailed design in order to minimize the amount of grading required in the vicinity of Hedgerows H4 and H5. A small portion of Hedgerow H6 within the buffer to the Central Woodland is also identified for retention.

Overall, of the 645 trees inventoried outside of the significant woodlands, 268 (42%) have been identified for preservation: 139 within the buffers, linkages and enhancements of the NHS (including hedgerows); (b) 45 within the proposed development area , and (c) 84 in the lands immediately adjacent to but outside the Subject Property.

Notably, these estimates of trees for preservation and removal are based on the preliminary grading plans and will need to be confirmed and potentially refined at the detailed design stage.

The Tree Inventory and Preservation Study (see **Appendix J4**) has been prepared by UFI (2015) in accordance with Regional Official Plan s. 147(5)(f) and City of Burlington Specification No. SS12. The Study also includes specific measures for tree preservation to be implemented prior to and during construction.

In addition to implementation of the preservation of trees as specified in the report (**Appendix J4**), the temporary canopy loss related to the removal of approximately 379 trees is proposed to be addressed by planting street trees and landscaping in parks within the Draft Plan area, as well as additional tree plantings within linkages, buffers and enhancement areas (in conjunction with other naturalization) where opportunities exist. Many of these opportunities are illustrated in the Conceptual Restoration and Enhancement Plan (see **Figure 8.1**). It is anticipated that these plantings will, over the long-term, result in the establishment of a more extensive tree canopy than currently exists as much of the area proposed to be developed is presently agricultural and will be transformed, in part, to urban land uses that will incorporate tree planting treatments as part of the overall urban design. In addition to these plantings, it is expected that some residents and property owners will plant trees, further contributing to the enhanced canopy cover in the urban matrix.

8.3 EROSION AND SEDIMENT CONTROL PLAN

Erosion prevention and sediment control plans will be prepared to the satisfaction of the City and Conservation Halton prior to earthworks operations. The erosion and sediment control plans will include details regarding the proposed erosion mitigation measures, tree protection fencing, sediment management, watercourse protection and stockpile locations. Typical practices to be employed include (but are not limited to) sediment fence, tree protection fencing, cut-off swales, rock check dams, filter socks, sediment traps / temporary sediment ponds, and temporary soil stabilization measures.

8.4 DEWATERING AND WELL DECOMMISSIONING PLAN

8.4.1 WELL DECOMMISSIONING

The *Ontario Water Resources Act* Ontario Regulation 903 (O.Reg. 903 as amended) requires that well owners immediately abandon a well if it is not being used or maintained for future use as a well. Therefore, all monitoring wells or private wells existing on the Subject Property should be properly decommissioned by a licensed well technician once it is established that they are no longer to be used for ongoing monitoring of water levels or water quality. This would apply to all existing wells within areas of proposed development. However, shallow wells which would be entirely removed during site grading would not require decommissioning as the grading would remove any potential contaminant pathway related to the well. Groundwater monitors existing within the Subject Property or Study Area that are located in areas not affected by development may be retained for use in on-going monitoring during the pre-development, development and post development periods. Additional monitoring points may need to be installed to replace wells removed due to development.

8.4.2 DEWATERING

An assessment of water level elevations obtained from the monitoring wells on the Subject Property and the elevations provided on **Drawing 9** (Preliminary Site Grading) indicates that in much of the area to the south and east of the Central Woodland, for a portion of the year (predominantly during the spring months) it is likely groundwater will occur within 3 m of the ground surface, and may be within 1 m of the ground surface adjacent to Tremaine Road and in the south central portion. Therefore, it is expected that temporary dewatering of excavations may be required in these areas for construction of water mains, sewers and basements. In addition, it is likely that permanent sump pumps may be required to remove potential inflow to basements constructed below grade in these areas.

Due to the relatively low permeability of the near surface soils, extensive construction dewatering is not anticipated. The volume of dewatering required will be largely dependent upon the depth and areal extent of the excavations. With regard to building construction, minimal dewatering is expected for buildings with slab-on-grade foundations, whereas more extensive dewatering could be required for buildings constructed with basements or underground parking in some portions of the site.

Excavations are expected to be carried out in low permeability Clayey Silt Till. Localized sand seams or fractures may exist within the Till which would be expected to drain fairly rapidly and could be managed through drainage to sumps which could be pumped to maintain a dewatered condition during construction. If possible, scheduling of excavation works during periods of low groundwater levels, such as late summer, would minimize temporary dewatering requirements.

As only minor seepage into excavations is anticipated, dewatering volumes are not expected to exceed 50,000 L/day, thus triggering the requirement of obtaining a Permit to Take Water (PTTW) from the

MOECC. However, in specific cases this will depend upon the proposed areal extent and depth of excavation, and groundwater levels and soil conditions at the location of excavation.

A PTTW application requires the applicant to identify: the quantity of water to be withdrawn, the time period of dewatering, the point of discharge, expected zones of influence and potential for effects on other uses and natural features, as well as monitoring and mitigation measures. The necessity of submitting an application for a PTTW would be identified subsequent to detailed design.

With respect to the LID measures being proposed, placement of granular bedding materials may result in the creation of preferential flow paths for infiltrating surface water or groundwater. Anti-seepage collars should be provided at strategic points along infiltration galleries, sewers and other utility trenches, including between utility trenches and basements. These collars are intended to prevent continuous flow along the backfilled excavations towards down gradient areas and basements, and etain the very low groundwater flows present under pre-development conditions. Collars should have an upper elevation or relief pipe to allow water to overtop the collars in the event of backup of water levels in infiltration galleries.

8.5 ENVIRONMENTAL MONITORING PLAN (EMP)

Both the TDSPSS and the Region's EIA Guidelines (2014) require a monitoring strategy / program / plan to fulfill the requirements of the EIR/EIA. The purpose of monitoring is typically to (a) ensure that mitigation measures (including protection/avoidance) have been implemented, and (b) that such measures are functioning as intended. In the context of a development proposal such monitoring usually spans a period of five to 10 years and includes collection of: (1) baseline data prior to construction (note this can and often does include data collected as part of the original study, (2) data collection / site supervision during construction, and (3) data collection / documentation following construction.

The TDSPSS included recommendations for the implementation of a Monitoring Strategy for the purposes of evaluating the performance and effectiveness of the various Management Strategies that were recommended to ensure protection and enhancement of terrestrial and aquatic resources in the Study Area. The recommended Monitoring Strategy was to be adaptive and provide the necessary feedback to identify, develop and implement contingency plans as required. It was also to be focussed on the maintenance and enhancement of, first, aquatic systems and, secondly, terrestrial systems.

The Monitoring Strategy recommended in the TDSPSS was to be comprised of the following components:

a. Construction monitoring and inspection of Erosion and Sediment Control measures and Dewatering activities (TDSPSS Section 6.5.2)
b. Performance monitoring of the SWM and LID Systems (TDSPSS Section 6.5.4), and
c. Effectiveness monitoring of SWM and LID Systems in achieving subwatershed plan objectives for water quality, flow and habitat quality (TDSPSS Section 6.5.5).

In addition to the recommended Monitoring Strategy, the TDSPSS also recommended a Monitoring Program (Section 6.5.6) to focus on monitoring changes to terrestrial and aquatic systems and functions, as well as the physical environment [stream morphology, erosion, peak flows, groundwater regimes, and water quality (temperature & chemistry)].

Based on the recommendations of the TDSPSS with respect to monitoring, the Study Team has developed an single Environmental Monitoring Plan (EMP) that fulfils the various monitoring objectives outlined in the TDSPSS within a cohesive framework that incorporates natural heritage monitoring (aquatic and terrestrial), as well as monitoring of water resources and LIDs. The EMP developed by this Study Team makes recommendations regarding the specific environmental parameters to be monitored as well as the monitoring frequency, duration and agency responsibilities.

The objectives of the proposed EMP are described below, and the specifics of the plan are detailed in **Table 8.5-1.** Monitoring of natural heritage resources, water resources and LIDs in the Study Area will be required to evaluate changes to the biophysical environment over time as the lands are urbanized, and to verify that the proposed mitigation measures and management systems have been successfully implemented and are performing as designed.

Targeted monitoring is generally more effective at yielding the necessary feedback information to adaptively manage environmental systems. Therefore, the EMP has been scoped to target biophysical parameters that are most likely to detect any changes as result of future development.

The EMP includes recommendations for undertaking biophysical monitoring (1) prior to development, (2) during development, and (3) following development:

1. The objective of pre-development monitoring is to establish baseline conditions for the various biophysical parameters that will be monitored.
2. Monitoring during development is intended to verify that all the recommended protection measures (erosion and sediment controls, dewatering programs, etc.) are performing as intended and that impacts to the environment are being avoided or mitigated.
3. Post-development monitoring is intended to evaluate the effectiveness of the various environmental management strategies and to evaluate compliance with the recommendations of the TDSPSS and EIR/FSS.

Where monitoring has identified performance deficiencies or lack of compliance with objectives, contingency measures will need to be developed. It is understood that implementation of the EMP is an iterative process that will require ongoing consultations between the Study Team, City and review agencies.

Table 8.5-1 below describes the proposed Environmental Monitoring Plan (EMP).

Table 8.5-1 – Proposed Environmental Monitoring Plan (EMP)

Ecosystem Component	Objective(s)/Rationale	Monitoring Parameter(s)	Monitoring Indicator(s)	Methods/Protocols/Analyses/Sites	Frequency & Duration			Comments
					Pre-Development	During Construction	Post-Development	
Groundwater Resources	To assess changes in the groundwater elevations and flow conditions	Groundwater Level	Groundwater elevations	Manual measurement in all on-site monitoring wells and continuous data logger readings at selected locations. Specific locations should be discussed with Conservation Halton, and additional monitoring wells may be required. For the Southern Woodland, use existing monitoring wells. For the Central Woodland, install two monitoring wells - one upgradient and one downgradient of the woodand - with one of these being a multi-level installation. These should be located near the edge of the woodland or near existing trails so as to cause a minimum of disturbance at surface during installation.	Monthly manual for 1 year, and quarterly thereafter. Hourly data logger readings for at least 2 years prior to site preparation (i.e., grading).	Quarterly manual and hourly data logger readings downloaded quarterly during active construction. Weekly manual readings and logger downloads should construction dewatering be required.	Continued monitoring with quarterly manual and hourly data logger readings for 3 years following construction period.	
		Groundwater Flow Patterns	Groundwater elevations	Manual measurement in all on-site monitoring wells and continuous data logger readings at selected locations. Specific locations should be discussed with Conservation Halton, and additional monitoring wells may be required.	Monthly manual for 1 year, and quarterly thereafter. Hourly data logger readings for at least 2 years prior to site preparation (i.e., grading).	Quarterly manual and hourly data logger readings downloaded quarterly during active construction. Weekly manual readings and logger downloads should construction dewatering be required.	Continued monitoring with quarterly manual and hourly data logger readings for 3 years following construction period.	
	To assess groundwater quality as part of dewatering activities to ensure discharged water is within standards.	Groundwater Quality	Temperature, Conductivity	Continuous data logger	Hourly data logger readings for at least 2 years prior to site preparation (i.e., grading).	Hourly data logger readings maintained during the construction period.	Hourly data logger readings continued for 3 years following construction period.	
			Chemistry	Sampling and Laboratory Analyses – Parameters to be determined through discussions with MOECC.	Once to establish baseline conditions.	Daily measurement of turbidity, pH and temperature, weekly sample analysis during active dewatering periods.	Quarterly sampling for 1 year following construction period.	
Surface Water Resources	To assess changes in water quantity as a result of urbanization.	Quantity	Flow Rates	Continuous data loggers	To be determined in consultation with Conservation Halton	To be determined in consultation with Conservation Halton	Annually for 3 years following 100% build out	
			Water Levels - SWM Dry Pond	Read permanently installed staff gauge.	N/A	N/A	Reading of staff gauge and recording of water levels immediately after storm event and again at 24 and 48 hour interval after the storm event.	Timing of monitoring: monitor 3 events annually (spring, summer and fall) same time each year for 3 years
			Water Levels - Infrastructure Ontario Pond, 14W-17, Central Woodland, Southern Woodland	Automatic pressure transducers should be installed in order to obtain “continuous” water level data. In addition to the transducer data, periodic site visits should be carried out in order to inspect and maintain the monitoring points, to measure water levels manually, to check transducer function and download	Site visits - three annually (spring, summer and fall) for at least one year, but preferably two	Site visits - three annually (spring, summer and fall)	Site visits - three annually (spring, summer and fall) two years	

Ecosystem Component	Objective(s)/Rationale	Monitoring Parameter(s)	Monitoring Indicator(s)	Methods/Protocols/Analyses/Sites	Frequency & Duration			Comments
					Pre-Development	During Construction	Post-Development	
				transducer data.				
	To assess changes in water quality as a result of urbanization.	Quality	Water Quality - Infrastructure Ontario Pond, 14W-17, Central Woodland, Southern Woodland	Automatic pressure transducers should be installed in order to obtain "continuous" temperature data. In addition to the transducer data, periodic site visits should be carried out in order to inspect and maintain the monitoring points, to check transducer function, download transducer data, and obtain water quality samples. Water quality parameters to include general chemistry, metals and inorganic parameters but be confirmed in consultation with agencies.	Site visits - three annually (spring, summer and fall) for at least one year, but preferably two.	Site visits - three annually (spring, summer and fall).	Site visits - three annually (spring, summer and fall) for at least one year, but preferably two.	Regular water quality monitoring reports (monthly) to be prepared to summarize findings of inspections and sampling tests.
			Sediment	Confirm that MOE 'Enhanced' Protection is provided (at least 80% TSS removal)	Once at each outlet from the site to establish baseline condition during a representative rainfall event (10mm).	Downstream water samples to measure TSS to be collected: After rainfall event of 10mm or greater.	Downstream water samples to measure TSS to be collected: After rainfall event of 10mm or greater.	
				Regular Inspection	N/A	Routine inspections of all ESC installations are to be conducted on a daily basis as well as: • Prior to forecasted rainfall events • During rainfall events to observe in-site performance • After rainfall events to identify requirements for repair/ maintenance Certified erosion & sediment inspectors will be involved in the design and monitoring of the proposed E&SC works.	N/A	
	To confirm that ESC measures have been implemented and are performing as per specifications		Sediment and Erosion Controls	Photographic record of site conditions from common view point. Photographic record sites will be established in 14W-17, 14W-17Cb and BCT-R1.	Once to establish baseline conditions. Not applicable for 14W-17Cb which is to be realigned.	Annually until 100% build out.	Annually for 5 years following 100% build out.	Timing of Monitoring: Spring (after Spring freshet and prior to plant growth). Same time each year
Geomorphology	To assess changes in channel morphology as a result of urbanization	General site conditions	Repeated, monumented photographs	Repeated measurement of control sections will quantify the percentage decrease/ increase in cross-sectional area. Cross sections will be established in 14W-17, 14W-17Cb and BCT-R1. Cross-section area should not change by more than 10% over the annual monitoring period.	Once to establish baseline conditions. Not applicable for 14W-17Cb which is to be realigned.	Annually until 100% build out.	Annually for 5 years following 100% build out.	Timing of Monitoring: Summer/Fall (after Spring freshet). Same time each year
		Channel form	Cross-sectional Dimensions	Erosion pins will be established at selected cross-sections. Repeated measurement of erosion pins will	Once to establish baseline conditions. Not applicable for	Annually until 100% build out.	Annually for 5 years following 100% build	Timing of Monitoring:

Ecosystem Component	Objective(s)/Rationale	Monitoring Parameter(s)	Monitoring Indicator(s)	Methods/Protocols/Analyses/Sites	Frequency & Duration			Comments
					Pre-Development	During Construction	Post-Development	
				be undertaken to quantify erosion rates. Cross sections will be established in 14W-17, 14W-17Cb and BCT-R1. Bank erosion or migration should not exceed a rate of 10 cm/yr over the annual monitoring period.	14W-17Cb which is to be realigned.		out.	Summer/Fall (after Spring freshet). Same time each year
		Bank erosion rates	Bank Erosion Rates	Repeated survey of bed morphology, in reference to a local benchmark. Long profiles will be established in 14W-17, 14W-17Cb and BCT-R1.	Once to establish baseline conditions. Not applicable for 14W-17Cb which is to be realigned.	Annually until 100% build out.	Annually for 5 years following 100% build out.	Timing of Monitoring: Summer/Fall (after Spring freshet). Same time each year
		Bed morphology	Long Profile	Channel substrate will be evaluated through a Wolman pebble count to determine the increase/decrease of the percentage of fines and D_{50}. Pebble counts will occur at each of the established cross section monitoring stations in 14W-17, 14W-17Cb and BCT-R1. Percentage of fines: substrate sizes should not vary more than half a standard deviation from the current D50.	Once to establish baseline conditions. Not applicable for 14W-17Cb which is to be realigned.	Annually until 100% build out.	Annually for 5 years following 100% build out.	Timing of Monitoring: Summer/Fall (after Spring freshet). Same time each year
		Percentage of fines, D_{50}, D_{84}, Wolman pebble count	Substrate Composition	Vegetation resources will be classified according to ELC standards. The area of each ELC vegetation type will be estimated using aerial photography. GIS analyses will be used to compare changes in area over time.	Annually for two years prior to commencement of site preparation activities.	Every 5 years until 100% build out.	Once at 5 years following 100% build out.	
Terrestrial Resources - Vegetation	To assess changes in the type and extent of natural vegetation cover in the Study Area over the long term.	Natural Vegetation Cover	Vegetation community type and extent	The floristic quality of vegetation communities within the natural heritage system will establish by undertaking a floristic quality assessment (FQA). These values can be compared over time to identify trends.	Annually for two years prior to commencement of site preparation activities	Every 5 years until 100% build out.	Once at 5 years following 100% build out.	
	To assess changes in floristic quality within the natural heritage system over time.	Floristic Quality	Species Composition	Vegetation surveys will identify populations of invasive species. The location of the species and their population densities will be mapped and described to facilitate comparison over the long-term with monitoring efforts.	Annually for two years prior to commencement of site preparation activities	Every 5 years until 100% build out.	Once at 5 years following 100% build out.	
	To assess changes in the distribution and abundance of invasive plant species over time.	Invasive Species	Invasive Species Populations	Breeding bird surveys will utilize the protocols previously employed in this EIR/FSS.	Annually for two years prior to commencement of site preparation activities	Every 5 years until 100% build out.	Annually for 5 years following 100% build out.	
Terrestrial Resources - Wildlife	To assess changes in the resident avian communities over time.	Avifaunal Community	Composition, Abundance and Distribution of Breeding Birds	Amphibian and reptile surveys will utilize the protocols previously employed in this EIR/FSS.	Annually for two years prior to commencement of site preparation activities	Every 5 years until 100% build out.	Annually for 5 years following 100% build out.	
	To assess changes in the resident amphibian and reptile communities over time.	Amphibian and Reptile Communities	Composition, Abundance and Distribution of Amphibians and Reptiles	OSAP will be used to characterize watercourse reaches in the Study Areas and immediately downstream for changes to aquatic habitat over time.	Once to establish baseline conditions	Every 5 years until 100% build out.	Annually for 5 years following 100% build out.	
Aquatic Resources	To assess changes to fish habitat.	Aquatic Habitat Quality	Form and Condition of Instream and Riparian habitats	Collect instream water samples upstream and downstream of the LID outfall locations and at discharge points.	Quarterly for two years prior to commencement of site preparation activities.	Every 5 years until 100% build out.	Annually for 5 years following 100% build out.	

Ecosystem Component	Objective(s)/Rationale	Monitoring Parameter(s)	Monitoring Indicator(s)	Methods/Protocols/Analyses/Sites	Frequency & Duration			Comments
					Pre-Development	During Construction	Post-Development	
	To assess changes in water chemistry.	Water Chemistry	Total Phosphorus, E. Coli, TSS	Temperature loggers to be installed upstream and downstream of the LID outfall locations and at discharge points and monitored continuously on an hourly basis.	Annually for two years prior to commencement of site preparation activities	Every 5 years until 100% build out.	Annually for 5 years following 100% build out.	
	To assess changes in water temperature.	Fish and Redside Dace Habitat	Water Temperature	Surface flow should be monitored in 14W-17Cb and 14W-17 downstream of SWM discharge input locations, and at the pond outlet on BCT-R1. Exact locations of stream flow monitoring stations will be established in the field as stations require limited influence from upstream obstructions and downstream back-watering. Stations should be established at the cross-over point on a run, with the cross-sections surveyed and monumented with steel bars on both banks. In addition, level loggers should be installed in the channel cross section and spot depth and discharge measurements should be made at the logger cross sections.	At least six times per year (bi-monthly), annually for two years prior to commencement of site preparation activities	Every 5 years until 100% build out.	Annually for 5 years following 100% build out.	
	To assess changes in stream flows.	Surface Water Flow	Flow Rates/ Discharge Curves.	Level loggers to be installed at the upstream side of culverts FM-D1, FM-T1, FM-T2, and FM-T3 under existing conditions and at FM-D1 under post-development conditions. Level loggers to be installed at the upstream side of culverts FM-T4 and FM-T5 under existing conditions and FM-T5 under post-development conditions.	Monthly at commencement of site preparation activities.	Weekly during periods of active construction and monthly during construction inactivity until 100 % build out.	Monthly for one year following 100% Build Out or as determined by Conservation Halton.	
	To assess aquatic habitat protection measures	Erosion and Sediment Control Measures	Condition and Performance of Erosion and Sediment Control Measures	Buffers will be planted and naturalized using native species. The condition of these plantings will be assessed using standard vegetation plots.	None	Annually until 100% build out.	Once at 5 years following 100% build out.	
Natural Heritage System - Buffers	To evaluate the effectiveness of the prescribed buffers in reducing encroachment related impacts to protected features within the natural heritage system.	Buffer Condition	Condition of buffer plantings	The interface between the development and natural heritage system will be surveyed to document evidence of human disturbance. Observations will be categorized according to disturbance type, extent and magnitude of effect.	None	Annually until 100% build out.	Once at 5 years following 100% build out.	
		Buffer Integrity and Function	Human related disturbance	The condition of enhancement plantings will be assessed using standard vegetation plots.	None	Annually until 100% build out, in accordance with landscaping warranty requirements.	Once at 5 years following 100% build out.	
Natural Heritage System – Enhancement Areas	To assess the success of naturalization plantings within enhancement areas	Enhancement Planting Condition	Vegetation type, form and health	The Conceptual Restoration and Enhancement Plan (**Figure 8.1**) proposed the creation of additional wetland and forest communities on agricultural lands. The extent of these new habitats will be measured using the vegetation monitoring protocols described above. The plan has also proposed the creation of specialized wildlife habitats including grassland, vernal pools, floating islands, basking, nesting and overwintering structures. The level of utilization	None	Annually/seasonally until 100% build out.	Annually for up to 2 years following 100% build out, then once at 5 years following 100% build out.	

Ecosystem Component	Objective(s)/Rationale	Monitoring Parameter(s)	Monitoring Indicator(s)	Methods/Protocols/Analyses/Sites	Frequency & Duration			Comments
					Pre-Development	During Construction	Post-Development	
				associated with these enhancement efforts will be documented by surveying the features using standard protocols.				
	To assess the performance of various wildlife habitat enhancements within enhancement areas	Wildlife Habitat Function	Due to the variety of wildlife habitat enhancements proposed within enhancement areas, it will be necessary to monitor these using a variety of indicators to determine whether created wildlife habitats are being utilized as intended.	It is propose that linkage utilization be recorded using wildlife cams and through track surveys. Additionally, monitoring of roadkill wildlife should be undertaken to ascertain whether the wildlife barriers and culvert associated with the ecopassage is functioning as designed.	Annually for two years prior to commencement of site preparation activities.	Annually/seasonally until 100% build out.	Annually for up to 2 years following 100% build out.	
Natural Heritage System – Linkages	To assess the performance of the NHS linkages and ecopassage in facilitating wildlife movement across the Study Area	Linkage Function	Linkage specific species surveys to document species utilization.					

9. POLICY CONFORMITY

Table 9.0 summarizes how this EIR/FSS and the proposed Draft Plan address the applicable requirements of the various Federal, Provincial, Regional, City and Conservation Authority policies and regulations. Relevant excerpts of these policies and regulations are provided in **Section 2**, and information regarding conformity with the relevant requirements is provided in various sections of the EIR/FSS, but is summarized here for ease of reference.

Table 9.0 –Conformity to Relevant Policies and Legislation

Policy / Regulation	Evaluation of Draft Plan Conformity as provided in this EIR/FSS
Fisheries Act (1985) as updated in 2013	All direct and indirect fish habitat within the Study Area has been identified for protection as part of the Preliminary and Proposed NHS. No development or site alteration is proposed within any of these features except for 14W-Cb (warmwater, indirect fish habitat) which is recommended for re-location (as per the TDSPSS) and whose functions will be maintained and enhanced. Based on the above, the Evergreen EIR/FSS is consistent with the requirements of the *Fisheries Act*. At detailed design, completion of the online process for authorization under Section 35 of the *Fisheries Act* will be completed prior to works being undertaken as required.
Species at Risk Act (2002)	The provisions of this Act do not apply to the Study Area except in relation to birds covered under the *Migratory Birds Convention Act*, as described below.
Migratory Birds Convention Act (1994)	Protocols for ensuring conformity with this Act in relation to vegetation clearing will be developed and implemented as part of the detailed design process.
Endangered Species Act (2007)	Habitat for two provincially Endangered species (Redside Dace and Butternut) and one provincially Threatened species (Silver Shiner) has been confirmed in the Study Area. The proposed Draft Plan will not negatively impact the habitat of these species. With respect to Butternut, updated assessments of all recorded trees in the Study Area will be submitted to MNRF as part of the detailed design process in accordance with the requirements of the Act.
Provincial Policy Statement (PPS) (2014) – Natural Heritage	The Preliminary and Proposed NHS capture all significant natural heritage features and areas identified in the PPS, and provide linkages between these features and areas. No development (other than trails and some SWM measures) are proposed within any of these significant features and areas. The design of the Proposed Draft Plan also recognizes, maintains and (where possible) enhances connections between these features, as well as between these features and the surface/groundwater resources on which they depend.

Policy / Regulation	Evaluation of Draft Plan Conformity as provided in this EIR/FSS
	A series of mitigation measures have been identified to address the few direct impacts as well as the indirect impacts anticipated to the Proposed NHS in relation to the proposed Draft Plan. No negative impacts are anticipated to the significant features and areas, or the NHS as a whole, as long as these measures are implemented. The Proposed NHS also identifies a number of enhancement areas (with associated habitat naturalization/creation/restoration activities) intended to improve both the quality of the features within the system as well as connectivity between them.
PPS (2014) - Water	This EIR/FSS includes an integrated review and assessment of groundwater, natural heritage features/areas and surface water in order to provide a comprehensive understanding of the relationship between these elements in the Study Area, and to identify appropriate management solutions to address potential negative impacts associated with the proposed Draft Plan. The EIR/FSS has been completed on a subwatershed basis, and the stormwater and servicing for the Subject Property have been designed so that ground and surface water features are protected, and potential negative impacts are mitigated. The protected natural features and areas have been carefully considered as part of this assessment. In addition, extensive low impact development (LID) measures have been integrated into the proposed Draft Plan to maximize on-site infiltration. This approach is consistent with the PPS (2014) requirement to ensure that SWM practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.
PPS (2014) – Natural Hazards	The physical top of bank of Bronte Creek (as staked by Conservation Halton in 2008) has been protected within the Preliminary and Proposed NHS. The slope stability assessment has confirmed that the long-term stable top of bank is not on the Subject Property, and will not be impacted by the proposed development. In addition, flooding and erosion hazards for the two Fourteen Mile Creek tributaries (14W-17 and 14W-17Cb) on the Subject Property have been modelled and incorporated into the development plans such that no new development will be at risk.
PPS (2014) – Sewage, Water and Stormwater	The SWM for the site has been designed to meet the quality, quantity and erosion targets established by the TDSPSS. The Enhanced SWM Approach also promotes best practices by incorporating stormwater retention, re-use and LID measures.
Greenbelt Plan (2005)	A small portion of the Subject Property and a large portion of the Study Area is within the Greenbelt Plan Area. All Key Features within the Greenbelt Plan NHS are protected from development. No development is proposed within the Greenbelt Plan Area, except for some SWM measures. Opportunities for habitat enhancement have also been identified and recommended.

Policy / Regulation	Evaluation of Draft Plan Conformity as provided in this EIR/FSS
	A vegetative protective zone has been applied to significant woodlands and significant wetlands (as required by the Plan) where development is proposed in the adjacent lands. This zone is up to 30 m wide or to the limit of the Greenbelt Plan Area. In addition, buffers as recommended in this EIR/FSS have been applied to Key Features as appropriate where the feature and/or buffer extends outside the Greenbelt Plan Area boundary.
Halton Region Official Plan (2014) – NHS	The Preliminary and Proposed NHS for the Study Area were developed using a systems-based approach in accordance with the Region's current Official Plan policies. Key Features, other features (i.e., watercourses, other wetlands and floodplains), linkages, buffers and enhancements to Key Features were identified in a manner that is consistent with the applicable definitions and criteria for these NHS components. Differences between the Preliminary NHS identified as part of this EIR/FSS and the TDSPSS/Regional NHS as shown in Map 1 (and Map 1G) of the current Official Plan reflect refinements made to Key Features and linkages as a result more detailed site-specific studies. These refinements have been agreed to by the Region's environmental consultant. These refinements also reflect the application of different buffers, as recommended in this EIR/FSS, which the Region has not yet agreed to. Several modest enhancements to Key Features have also been identified. The Proposed NHS identified as part of this EIR/FSS includes the same Key Features, linkages, buffers and enhancements as the Preliminary NHS, but also includes a number of additional enhancement areas where opportunities were identified in relation to the proposed Draft Plan. No development (other than trails and some SWM measures) are proposed within any of the Key Features or other features, buffers and enhancements areas within the Proposed NHS. No development other than trails, some SWM measures and a "special road" have been proposed within the linkages within the proposed NHS. A series of mitigation measures have been identified to address the few direct impacts as well as the indirect impacts anticipated to the Proposed NHS in relation to the proposed Draft Plan. No negative impacts are anticipated to the Key Features or the NHS as a whole, as long as these measures are implemented. This, along with other components of the EIR/FSS, addresses the Region's requirement for an EIA.
Halton Region Official Plan (2014) – Environmental Quality	The EIR/FSS has been prepared in accordance with the TDSPSS Terms of Reference and, as such, has incorporated the quantity, quality and erosion controls required for SWM. In addition, alternative engineering standards have been proposed to promote on-site infiltration and incorporate a "special road" designed to minimize conflicts between wildlife and vehicles.
Halton Region Official Plan (2014) – Trails	A Conceptual Trails Plan is proposed in-keeping with the Region's trails policy. On-site trails are identified and off-site trails are proposed and will be subject to an agreement of Infrastructure Ontario.

Policy / Regulation	Evaluation of Draft Plan Conformity as provided in this EIR/FSS
Halton Region Official Plan (2014) – Urban Services	The FSS meets the Region's requirements for an FSR.
City of Burlington Official Plan (2006) – Natural Heritage	The City's natural heritage policies have been addressed by having a study that complies with both the PPS (2014) and the Regional Official Plan (2014) with respect to natural heritage.
City of Burlington Official Plan (2006) – Environmental Evaluation	The EIR/FSS includes all the requirements of an Environmental Evaluation, including the identification of buffers and setbacks.
City of Burlington Official Plan (2006) – Sustainable Design and Compatibility	Sustainability and compatibility are at the forefront of the Evergreen Community design. This EIR/FSS specifically speaks to the protection of the NHS, integration of LID measures, provision of enhanced tree cover and NHS enhancements.
City of Burlington Official Plan (2006) – Contaminated and Potentially Contaminated Sites	Potential soil contamination has been identified in a small area in the southwestern portion of the Study Area. This is issue is addressed in the Phase One Environmental Site Assessment prepared by AMEC (2015b).
City of Burlington Official Plan (2006) – Watershed Planning	The Evergreen EIR/FSS has been prepared on a subwatershed basis and generally in accordance with the TDSPSS Terms of Reference, thereby meeting the City's watershed planning policies.
City of Burlington Official Plan (2006) – Stormwater Management	The SWM Strategy included in this EIR/FSS addresses ground and surface water management from both a quantity and a quality perspective. This includes LID measures to maximize on-site infiltration (and reduce the volume and peaks of stormwater flows). In addition, water quality and quantity, and erosion targets identified in the TDSPSS have been met through the incorporation of various LID measures.
City of Burlington Official Plan (2006) – Parks and Open Space	The parks have been located and sized to meet the City's standards.
Conservation Halton Regulation and Policies (2011)	Conservation Halton regulates the valleylands, wetlands and watercourses in the Study Area. These features and areas are all protected in the Preliminary and Proposed NHS, and through the design of the proposed Draft Plan. The physical top of bank of Bronte Creek (as staked by Conservation Halton in 2008) has been protected within the Preliminary and Proposed NHS. The slope stability assessment has confirmed that the long-term stable top of bank, as well as Conservation Halton's 15m regulated allowance, are not on the Subject Property, and will not be impacted by the proposed development. Flooding and erosion hazards for the two Fourteen Mile Creek tributaries (14W-17

Policy / Regulation	Evaluation of Draft Plan Conformity as provided in this EIR/FSS
	and 14W-17Cb) have been modelled and incorporated into the development plans such that no new development will be at risk. The watercourse blocks have also incorporated 7.5 m setbacks from the greatest hazard. The <2ha wetland associated with watercourse 14W-17 has been protected and a 15m buffer (contained within the erosion hazard) has been applied to it. The <2ha wetland associated with watercourse 14W-17Cb will be re-created in a realigned watercourse channel with appropriate setbacks and buffers. The wetlands surrounding the Pond (outside the Subject Property) are protected and have a 15 m buffer applied to them as well. These wetlands, cumulatively, are slightly larger than 2 ha. Although Conservation Halton's policies indicate that wetlands >2 ha generally require a 30 m buffer, because these wetlands are a result of anthropogenic activities and currently have no buffer (i.e., farming occurs right up to the feature edge), a 15 m buffer is considered appropriate. Evergreen will apply for permits as required, pursuant to Ontario Regulation 162/06, at the detailed design stage.

10. CONCLUSIONS

Between 2012 and 2015 the Evergreen Study Team undertook comprehensive studies in their respective disciplines and worked together to develop a technically sound and integrated document that:

- responds to the City of Burlington's September 2011 Council direction (as amplified in November 2102) "to incorporate environmentally sustainable neighbourhood development and building policies into the Secondary Plan as criteria for the approval of residential subdivision, site plan and employment lands development within the area
- meets the objectives and fulfills the Terms of Reference of the TDSPSS
- is consistent with the Region's Official Plan (2014) and addresses all other applicable policies and regulations
- fulfil the requirements of an Environmental Impact Assessment (EIA) for the Region and an Environmental Evaluation Report (EER) for the City
- supports a progressive and creative proposed Draft Plan for the Subject Property that appropriately balances natural heritage protection within a sustainable community design in the northeastern corner of Burlington's urban area, and
- provides the technical information and analyses needed to support an Official Amendment (and Secondary Plan), a Draft Plan of Subdivision, and a Zoning By-Law Amendment.

Implementation of the Proposed NHS, the recommended mitigation measures and the recommended additional enhancements will maintain and substantially improve the ecological quality, health and integrity of the Key Features in the Study Area, serve to maintain ecological connectivity within the Study Area, and contribute positively to the integrity of the broader NHS. The Enhanced SWM Strategy outlined for the Subject Property, as implemented through the proposed Draft Plan, will also contribute to the protection and enhancement of the Key Features in the Study Area.

The EIR/FSS demonstrates how the various goals, objectives, targets and management strategies identified in the TDSPSS can effectively be implemented through a Draft Plan of Subdivision for the Subject Property. The EIR/FSS also demonstrates that the proposed development will have no negative impacts on the Proposed NHS in accordance with the Region's Official Plan (2014) (including the Region's EIA Guidelines) and the City of Burlington's EER requirements.

The TDSPSS was intended to serve as a "living document", following an Adaptive Environmental Management (AEM) approach that allows for refinements to management strategies in response to new information and environmental policies. This EIR/FSS is an integrated document that builds on the findings and recommendations of the TDSPSS through the completion of more detailed studies and analyses. This has have resulted in refinements to the NHS, as well as a comprehensive set of recommendations for ongoing management and monitoring in the context of a Draft Plan of subdivision on the Subject Property.

The Proposed NHS identifies a well-connected NHS comprised of Key Features, linkages, buffers and enhancement areas that is generally comparable to the TDSPSS NHS but incorporates refinements to the Key Features, linkages and buffers based on more site-specific considerations as well as more enhancement areas than contemplated in the TDSPSS.

The Proposed NHS will effectively protect, restore and enhance natural features and ecological functions associated with the Study Area, particularly as long as the recommended mitigation measures are implemented. No development is proposed within the Key Features, and very limited activities are proposed within the buffers and linkages. The Enhanced SWM Strategy recommended for the proposed Draft Plan includes a number of LID measures and other approaches which will also protect and enhance the Proposed NHS by maximizing on-site infiltration, ensuring water quantity and quality controls are in place, and providing additional green spaces to support NHS functions. Furthermore, the extensive range of additional enhancements envisioned through the Proposed NHS is expected to build more native diversity and resilience into the system than currently exists.

In summary, the EIR/FSS has developed implementation plans for the various environmental management strategies identified in the TDSPSS in a manner which satisfies the requirements of the TDSPSS, the Region's Official Plan (2014) and the City's Official Plan (2006). These implementation plans help ensure that the required mitigation is implemented to ensure the no negative impacts test is met. These implementation plans are also fundamental to ensuring the design and implementation of a mixed-use community on the Subject Property meets the City's vision for a sustainable community.

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