

**Starwood Drive, Guelph ON,  
Scoped Environmental Impact Study for a  
Proposed Mixed Residential/Commercial  
Development**



**Prepared for:**  
**Coletara Development**  
c/o Starwood-Watson Holdings Inc.  
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Project No. 1367

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Scoped Environmental Impact Study for a Proposed Mixed  
Residential/Commercial Development**

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## 1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained by Coletara Development to complete a scoped Environmental Impact Study (EIS) for a proposed mixed use residential and commercial development on lands located southwest of the Starwood Drive and Watson Road intersection in the City of Guelph (herein, 'subject property'; Figure 1). The landowner is proposing to develop the subject property with condominium buildings, a retirement residence, a common amenity building, associated above- and below-ground parking, commercial space, roadways, and landscaped areas. Four single-detached residential lots are also proposed for a small, triangular parcel of land within the northwest end of the subject property.

The subject property contains few existing natural features, being dominated by disturbed, open lands that have historically experienced topsoil removal, and more recently fill deposits. The western property boundary borders cultural woodland that occurs off-site. A row of larger deciduous trees is found growing along the property boundary. The subject property is also located within 120m of a portion of the Clythe Creek Provincially Significant Wetland (PSW). Any proposed development within 120m of the wetland boundary as well as within or adjacent to a woodland requires the preparation of a scoped EIS to demonstrate that no negative impacts to the features will occur as a result of the proposed undertaking (GRCA 2012, City of Guelph 2012).

The subject property is located adjacent to two properties that are also currently undergoing development application processes, and for which EISs have been drafted. NRSI is currently completing an EIS for a proposed residential development on the property to the west, known as the 55 & 75 Cityview Drive property (herein, 'Cityview Drive property') (NRSI 2013). Additionally, an EIS has been drafted by North-South Environmental Ltd. (NSE) for the property located immediately southwest of the subject property, known as Cityview Ridge (NSE 2012). Due to the close proximity of both properties, results from these studies have been included and/or referenced in this report to supplement NRSI field data collected for the subject property. Results from these studies will be used to more fully characterize and assess the ecological significance of the surrounding natural features.

This report provides a characterization of existing natural features and functions within and adjacent to the subject property based on desktop and field survey information. It also identifies

natural heritage-related constraints as well as opportunities for development. An impact analysis was also completed which was based on the comparison of the on-site natural feature characterization results with details of the proposed development.

In support of the EIS, V.A. Wood (Guelph) Inc. completed a preliminary geotechnical investigation within the subject property (V.A. Wood (Guelph) Inc. 2013). Gamsby and Mannerow provided a functional servicing report (Gamsby and Mannerow 2013a) which detailed the proposed water supply, storm sewer, and sanitary services (October 2013) as well as a Hydrogeological Study Report (2013b). The functional servicing and hydrogeology reports are included in Appendix I and II, respectively.

### 1.1 Study Area

For the purposes of this report, the term 'subject property' refers to the lands where the development is proposed to occur (Figure 1). The term 'study area' refers to the subject property plus lands within the surrounding 120m. Biological surveys were undertaken by NRSI on the subject property while legacy data collected from agencies encompassed the entire study area to ensure that all surrounding natural features were considered.

The subject property is approximately 2.71ha in size and is bounded by Starwood Drive to the north, woodlands to the west and to the south, and Watson Parkway to the east (Figure 1). The subject property is predominantly comprised of open, disturbed lands while a row of deciduous trees lines the western property boundary. The subject property also contains a temporary sediment basin in the southern portion of the property where sediments carried from surface water runoff are allowed to settle prior to runoff entering the storm sewer system. A low (approximately 1m) berm and large partially vegetated swale run parallel to the western property boundary (approximately 5m from the boundary) along the majority of its length. This swale enters the triangular northwest parcel from the west, and turns south to follow the west subject property boundary. The swale is narrowly channelized with gabion baskets where it bends around the subject property boundary to flow southward.

# Watson-Starwood EIS Subject Property

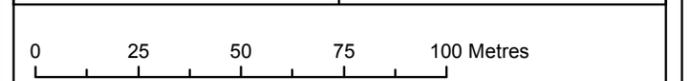
### Legend

- Subject Property
- 55 & 75 Cityview Lands
- Provincially Significant Wetland (PSW) & OPA 42 - Significant Natural Area



Map Produced by Natural Resource Solutions Inc. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI. Data provided by MNR© Copyright: Queen's Printer Ontario. Imagery: First Base Solutions, 2010.

Project: 1367 Date: July 22, 2013	NAD83 - UTM Zone 17 Size: 11x17" 1:1,750
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## 1.2 Project Scoping

In order to determine a study approach for the Starwood EIS, existing natural heritage information was first gathered and reviewed to identify key natural heritage features and species that are known or have potential to occur within the study area. Sources of existing natural heritage information for this project was obtained from the draft EIS for the adjacent Cityview Drive property (NRSI 2013) as well as from the draft EIS completed for the adjacent Cityview Ridge property to the south (NSE 2012). Detailed characterizations of the natural features and ecological functions of each property have been carried out through their respective EISs, both of which were initiated in support of residential development applications. Furthermore, existing available information from these assessments was utilized to the fullest extent for the purposes of this study. Details of the field surveys completed by NRSI as part of the Cityview Drive EIS are summarized in the Starwood Drive EIS Terms of Reference (TOR) provided in Appendix III. For details of the surveys completed within the Cityview Ridge property, please refer to the draft Cityview Ridge EIS Report (NSE 2012).

Additional sources of existing information on natural features and species are listed below. A full list of sources is provided in Section 7.0 of this report.

- Grand River Conservation Authority (GRCA);
- Ontario Ministry of Natural Resources (Normington 2013), Guelph District;
- OMNR Natural Heritage Information Centre (NHIC) Biodiversity Explorer (OMNR 2010a);
- City of Guelph Official Plan (2011);
- Guelph Natural Heritage Strategy (Dogan & Associates 2009);
- Clythe Creek Overview Study (Ecologistics 1998);
- Digital air photos; and,
- Land Information Ontario (LIO) spatial data.

Based on preliminary review of existing information, several natural features were identified as occurring within and adjacent to (within 120m) the subject property. These features include:

**Woodlands** – Natural Area/Cultural Woodlands as defined by the City of Guelph OPA 42 (currently under appeal) (City of Guelph 2012);

**Wetland** - Clythe Creek PSW complex, which is currently designated as Core Greenlands under the City of Guelph Official Plan, a Significant Natural Area under OPA 42, and as regulated lands under GRCA's Ontario Regulation 150/06 *Regulation of Development, Interface with Wetlands and Alterations to Shorelines and Watercourses*; and

**Watercourse** - a tributary of Clythe Creek has been identified as traversing the subject property, as mapped by the GRCA and OMNR; however, aerial imagery indicates that the feature no longer exists.

To further identify wildlife species potentially occurring within the study area, initial species lists were compiled to provide information on species reported from the vicinity of the study area (1km radius) using various atlases, including the Ontario Mammal Atlas (Dobbyn 1994), the Ontario Butterfly Atlas (Toronto Entomological Association (TEA) 2013), and the Ontario Reptile and Amphibian Atlas (Ontario Nature 2013). Data on breeding birds in the area was extracted from the Ontario Breeding Bird Atlas (Bird Studies Canada (BSC) *et al.* 2006). As this atlas provides data based on 10x10km survey squares, information on breeding birds from the square that overlaps the study area (square #17NJ62) was compiled. These initial species lists were used to guide the scope and type of wildlife field surveys required.

Based on these initial species lists, a total of 12 Species at Risk (SAR), 14 Species of Conservation Concern (SCC), and 46 regionally significant species were identified as having records from within the vicinity of study area. For the purposes of this report, SAR are defined as species listed as Threatened or Endangered provincially. Species designated as Special Concern provincially, or designated as Threatened or Endangered under the federal *Species at Risk Act*, are considered SCC and are discussed further within the context of Significant Wildlife Habitat (SWH) (Section 5.1). A preliminary screening exercise was conducted on these species to identify which species have suitable habitat within the study area. This involved cross-referencing the preferred habitat for reported SAR and SCC (OMNR 2000) against habitats known to occur on the subject property or adjacent lands. This was completed to ensure that the potential presence of all SAR and SCC within the study area was adequately assessed in this EIS. Suitable habitat for one SAR (barn swallow (*Hirundo rustica*)) and six SCC (red-headed woodpecker (*Melanerpes erythrocephalus*), golden-winged warbler (*Vermivora chrysoptera*), common nighthawk (*Chordeiles minor*), eastern milksnake (*Lampropeltis triangulum*), eastern ribbonsnake (*Thamnophis sauritus sauritus*), and western chorus frog (*Pseudacris triseriata*)), were found to exist within the study area. Potential habitat for these species is primarily constrained to the existing row of trees and associated regenerating woody vegetation, and the wetland and woodland located on the Cityview Drive property within 120m of the subject property boundary. These species are discussed in Section 4.0 of this report under their respective biota subsections (e.g., Birds). Full results of the SAR and SCC screening exercise are provided in Appendix IV.

A preliminary screening for the presence of SWH was also completed for the study area (Appendix V). The Significant Wildlife Habitat Technical Guide (SWHTG) is a guideline document that outlines the types of habitats that the OMNR considers significant in Ontario as well as criteria to identify these habitats (OMNR 2000, OMNR 2012a). The SWHTG groups SWH into four broad categories: seasonal concentration areas, rare vegetation communities and specialized wildlife habitat, habitats of species of conservation concern, and animal movement corridors. Based on the results of this preliminary screening exercise, there is potential for snake hibernacula to occur within the subject property, as well as habitat for the species of conservation concern red-headed woodpecker (west property trees) and common nighthawk (open lands of the subject property adjacent to nearby woodland). These habitats are discussed further in Section 5.1 of this report. Full results of the SWH screening are provided in Appendix V.

Based on the findings described above, a Terms of Reference (TOR) for the EIS was developed by NRSI and submitted to the City of Guelph and GRCA for their review and approval. The City of Guelph’s Environmental Advisory Committee (EAC) reviewed the study TOR, and on February 8, 2013 provided comment to NRSI on the study approach (see Appendix III). One of the comments made was that the EIS was to address the recommendations made in the Clythe Creek Overview Study (Ecologistics 1998).

A summary of the key recommendations of the Clythe Creek Overview Study have been summarized in Table 1.

**Table 1. Summary of Clythe Creek Overview Study recommendations**

Study Recommendation	Context/Details of Recommendation
#1- Upland woodland areas are to be retained where possible	<ul style="list-style-type: none"> <li>a) Historical clearing of vegetation has impacted the Clythe Creek subwatershed resulting in reduced forest cover, reduced wildlife habitat, degradation of wetlands, degradation of aquatic habitat and water quality within Clythe Creek and its tributaries.</li> <li>b) Retention of existing woodlands and natural vegetation is important to help conserve diversity</li> <li>c) The restoration of natural areas is recommended to increase woodland cover.</li> </ul>

Study Recommendation	Context/Details of Recommendation
#2- Natural Areas/Wildlife	<ul style="list-style-type: none"> <li>a) Restoration of natural areas is recommended to increase woodland cover, including planting native trees and plants</li> <li>b) Detailed plant and wildlife surveys are recommended as part of subsequent EIS. Opportunities for enhancement of natural vegetation areas should be examined. Planting native tree and plants is recommended to increase wildlife habitat.</li> </ul>
#3- Wetlands and Other Sensitive Habitats	<ul style="list-style-type: none"> <li>a) A complete OWES evaluation should be conducted on associated wetlands</li> <li>b) Wetlands are to be maintained</li> <li>c) Appropriate width buffers of natural vegetation are to be retained or created along wetland areas for the protection of sensitive habitats</li> </ul>
#4- Preservation and Enhancement of Aquatic Habitat	<ul style="list-style-type: none"> <li>a) Removal of existing on-line ponds</li> <li>b) Use of dry or wet ponds with modified subsurface discharges to help lower water temperatures</li> <li>c) Preservation and augmentation of tree cover along creeks to mediate stream temperature</li> <li>d) The use of natural channel design techniques and bioengineering methods to increase quality of aquatic habitat</li> </ul>
#5- Groundwater	<ul style="list-style-type: none"> <li>a) Groundwater inputs to watercourses are to be maintained</li> <li>b) Existing groundwater recharge conditions must be maintained</li> <li>c) Any groundwater takings (dewatering) must be evaluated to ensure local aquatic and terrestrial functions are maintained</li> <li>d) Groundwater quality degradation from road salting, fertilizer, spills, septic systems, etc is to be controlled</li> </ul>

Each of the Clythe Creek Overview Study recommendations presented in Table 1 are addressed in Section 8.0 of this report to demonstrate how they are met through avoidance of direct impact by the proposed development, recommended mitigation measures including ecological restoration opportunities, or if particular Overview Study recommendations are not applicable to the subject property.

The GRCA approved the study TOR on February 13, 2013, pending updates addressing comments raised by EAC. Following revision and re-submission of the TOR to the City and GRCA, the finalized TOR was approved on June 27, 2013 and is provided in Appendix III.

## 2.0 Relevant Policies, Legislation, and Planning Studies

With respect to the natural environment, conformance to all applicable municipal, provincial and federal policies and guidelines is necessary throughout all phases of the project. A summary of policies, legislation, and guidelines pertinent to this project are summarized below.

These relevant policies, legislation, guidelines and planning studies are used to define what are known as 'significant' natural areas, features, and habitats. They are further used to guide the layout of the proposed development by establishing boundaries and protective development setbacks (buffers) from any identified significant areas, features, or habitats.

Section 5.0 of this report provides a summary of significant natural areas, features and habitats identified within the study area as it relates to the policies, legislation, guidelines and planning studies discussed in this section.

### 2.1 Provincial Policy Statement

The Ontario Provincial Policy Statement (PPS) (OMMAH 2005) is issued under Section 3 of the Ontario Planning Act, R.S.O. 1990. Section 3 of the Act requires that decisions affecting planning matters "shall be consistent with" policy statements issued under the Act. The PPS came into effect on March 1, 2005, and applies to all applications submitted on or after this date. The PPS provides policy direction on land use planning and development matters that are of provincial interest which protect the natural environment as well as public health and safety.

Section 2.0 *Wise Use and Management of Resources*, provides policies on protecting the Province's natural heritage, water, agricultural, mineral, cultural heritage and archaeological resources. Section 2.1 *Natural Heritage*, identifies seven types of natural heritage features to be protected:

- significant habitat of endangered species and threatened species;
- provincially significant wetlands;
- fish habitat;
- significant woodlands south and east of the Canadian Shield;
- significant valleylands south and east of the Canadian Shield;
- significant wildlife habitat; and,
- significant areas of natural and scientific interest.

Development and site alteration is not permitted in:

- significant habitat of endangered species and threatened species; and,
- provincially significant wetlands.

Development and site alteration may be permitted within and adjacent to the remaining significant natural heritage features if the ecological function has been evaluated and it has been demonstrated through an EIS that there will be no negative impacts on the natural features or on their ecological functions.

Based on a preliminary analysis of the natural features present, PSW is known to occur adjacent to the subject property. Significant wildlife habitat and habitat of endangered and threatened species are potentially located within the study area, as defined by the PPS (OMMAH 2005).

#### 2.1.1 Natural Heritage Reference Manual

The OMNR Natural Heritage Reference Manual (OMNR 2010b) provides technical guidance for implementing the natural heritage policies of the PPS. The manual presents the Province's recommended technical criteria and approaches for being consistent with the PPS in protecting natural heritage features and areas and natural heritage systems in Ontario.

This manual was consulted in the completion of this EIS when evaluating the presence of natural heritage features protected under the PPS within the study area.

#### 2.1.2 Significant Wildlife Habitat Technical Guide

The OMNR SWHTG was prepared to assist planning authorities and other participants in the land use planning system (OMNR 2000) to adequately protect SWH features to ensure their continued existence and functional value within the planning district and province in general. The SWGHTG is a detailed technical manual that provides information on the identification, description, and prioritization of SWH. The manual is intended for use in the municipal policy and development process under the Planning Act. A series of SWHTG addenda have been prepared by the OMNR that provide further details on characterizing and identifying significant wildlife habitat for Ecoregions 5E, 6E, and 7E (OMNR 2012a).

This technical guide was consulted in completing this EIS when evaluating presence of SWH as defined under the PPS within the study area.

## 2.2 Endangered Species Act, 2007

Species designated as Threatened or Endangered in Ontario automatically receive legal protection under the *Endangered Species Act* (ESA) (Government of Ontario 2007) and their habitats are protected generally under the Act (i.e. areas essential for breeding, rearing, feeding, hibernation and migration). The ESA (Subsection 9(1)) 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).*

Clause 10(1)(a) of the ESA 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”*

In order to balance social and economic considerations with protection and recovery goals, the ESA also enables the Minister of Natural Resources to issue permits or enter into agreements with proponents in order to authorize activities that would otherwise be prohibited by subsections 9(1) or 10(1) of the Act provided the legal requirements of the Act are met.

The ESA is of relevance to this EIS given the potential presence of habitat for one species regulated under this Act (barn swallow) within the study area. This species and its habitat is afforded protection under the ESA and as such, requires the establishment of development setbacks as well as obtaining approvals for any works occurring within the identified regulated area. Further assessments, including field-based studies, were completed to determine the potential presence and significance of this species to the subject property (Section 4.0).

### 2.3 Migratory Birds Convention Act, 1994

The federal *Migratory Birds Convention Act* (MBCA) (Government of Canada 1994) is applied through *The Regulations Respecting the Protection of Migratory Birds* that states that “[...] no person shall disturb, destroy or take a nest, egg [...] of a migratory bird.” This law protects all birds aside from the introduced species European starling, house sparrow, and rock pigeon. Bird nests that are destroyed during the course of construction and other related activities are referred to as “incidental take” and this is illegal except under the authority of a permit obtained through the Canadian Wildlife Service.

Implications of the MBCA have potential to occur during the construction phase of the project when the subject property is cleared and grubbed of vegetation.

### 2.4 City of Guelph Official Plan, 2001

The City of Guelph Official Plan (OP) designates PSWs, such as the Clythe Creek PSW located immediately west of the subject property, and its adjacent lands (i.e., within 120m), part of the City’s ‘Greenlands System’ (City of Guelph 2001). More specifically, these lands are defined as ‘Core Greenlands’ (City of Guelph 2001).

The Core Greenlands land use designation recognizes areas of the Greenlands System that have greater sensitivity or significance. Development is not permitted within a PSW, and the City encourages that all development proposals minimize impacts on PSW and their ecological value and function (City of Guelph 2001).

Although development is prohibited within PSWs, development may be permitted within adjacent lands if the proponent completes an EIS that meets City requirements and demonstrates that the proposed development will not:

- a) Result in a loss of the wetland’s ecological function;
- b) Create subsequent demand for future development which will negatively impact on the wetland’s ecological function;
- c) Conflict with existing site-specific wetland management practices; and
- d) Result in loss of contiguous wetland.

Although the Clythe Creek PSW does not extend onto the subject property, the subject property is considered 'adjacent land' to the PSW as it falls within 120m of the boundary. Consequently, this EIS addresses potential impacts to the adjacent PSW that may be caused by the proposed development.

#### 2.4.1 City of Guelph Official Plan Amendment 42 (OPA 42)

In 2010, OP Amendment 42 (OPA 42) was brought forth to City of Guelph Council. This amendment focuses on defining a Natural Heritage System under the OP that would replace the existing 'Core and non-Core Greenland' policies, as described in Section 2.4. The purpose of the Natural Heritage System would be to establish a sustainable greenspace network throughout the City (City of Guelph 2012). OPA 42 was adopted by Council on July 27, 2010, with an Official Plan Consolidation released in December 2012. As OPA 42 requires consistency with the PPS, review and approval from the Minister of Municipal Affairs and Housing (OMMAH) is required. A decision was made by the OMMAH on February 2011 but has since been appealed to the Ontario Municipal Board. With regard to this project, consideration should be made to OPA 42 as it will be the upcoming strategy for protecting natural heritage features within the City of Guelph.

The subject property occurs immediately adjacent to woodlands on the Cityview Drive property that are designated as Natural Area- Cultural Woodlands under OPA 42 (City of Guelph 2012).

Clythe Creek PSW, located on the adjacent Cityview Drive property, is designated as a Significant Natural Area under OPA 42. As the subject property is located within 120m of the PSW, it is considered an 'adjacent land' under the City of Guelph's Official Plan (City of Guelph 2011). As described in Section 6.1.3 of OPA 42, development or site alteration may be permitted within 'adjacent lands' to Significant Natural Areas provided that it has been demonstrated through an EIS that there will be no negative impacts on the feature or its ecological functions (City of Guelph 2012). In addition, portions of the 30m buffer from the confirmed PSW boundary extends onto the subject property from the adjacent Cityview Drive property. Development or site alteration is not permitted within PSW buffers, except as permitted under Section 6.1.4 of OPA 42 (City of Guelph 2012).

## 2.5 Regulation 150/06 – Development, Interference with Wetlands and Alterations to Watercourses and Shorelines

The *Regulation of Development, Interface with Wetlands and Alterations to Shorelines and Watercourses* (Ontario Regulation 150/06), is a regulation issued under *Conservation Authorities Act*, R.S.O. 1990. Through this regulation, the GRCA has the responsibility to regulate activities in natural and hazardous areas (i.e., areas in and near rivers, streams, floodplains, wetlands, slopes and the Lake Erie shoreline).

As portions of the subject property have been identified within GRCA regulated lands, a permit will be required from the GRCA under the Reg. 150/06 to proceed with development within these areas. In addition, as the development is proposed within 120m of these features, a scoped EIS is required to evaluate and demonstrate that there will be no negative impacts on the identified natural feature or its ecological functions as described under Reg. 150/06 (GRCA 2013).

## 2.6 Municipal Tree By-law

The City of Guelph *Tree By-Law 19058* (City of Guelph 2010) states that [...] “*no person may destroy or injure, or cause or permit the destruction or injuring of a regulated tree [...]*”.

Exemptions apply to this clause and are described in Section 4 of the by-law.

A regulated tree is defined as [...] “*a specimen of any species including deciduous or coniferous growing woody perennial plant, supported by a single root system, which has reached, or could have reached a height at least 4.5m from the ground at physiological maturity, is located on a lot that is greater than 0.2 hectares (0.5 acres) in size and has a DBH of 10cm*” [...].

When applying for a permit to destroy or injure a regulated tree, a Tree Protection Plan is required to demonstrate how the remaining trees will be protected from injury. This plan is provided in Appendix VI of this report.

## 3.0 Field Methods

### 3.1 Terrestrial Field Surveys

Terrestrial field surveys were undertaken within the subject property to characterize natural features and identify significant wildlife habitats and/or significant plant and animal species that have potential to be adversely affected by the proposed development. Due to the close proximity of the adjacent Cityview Drive property, field data collected in support of the EIS for that property have been included in this report to supplement data collected within the Starwood Drive subject property as necessary.

#### 3.1.1 Vegetation Surveys

##### 3.1.1.1 Vascular Flora Inventory

All species of vascular flora observed within the subject property were recorded during all site visits (November 9, 2012, March 5, 6 and 26, 2013, May 3, 2013). Vegetation within 120m of the subject property on the Cityview Drive property was also inventoried during site visits completed on May 13, 2009, June 23, 2009, and October 4, 2012, as well as a tree inventory completed on March 13, 2013. Due to the degree of human disturbance of the site, multi-season vegetation surveys were not completed within the subject property.

##### 3.1.1.2 Tree Inventory, Health Assessment and Dripline Delineation

A comprehensive inventory of all trees  $\geq 10\text{cm}$  in diameter at breast height (DBH) within the proposed development footprint was completed by NRSI Certified Arborists on March 5 and 6, 2013, and May 3, 2013 (see Appendix I of the Tree Protection Plan for the full inventory). An additional tree inventory specific to the triangular northwest parcel was also completed on October 31, 2013. Because the inventories were conducted during the leaf-off period, tree assessments were based on the structural condition of each tree, but not the foliar health characteristics. Each tree was tagged with a pre-numbered aluminum forestry tag, and the following information was recorded for each:

- species;
- diameter at breast height measurement (DBH);
- crown radius (metres);
- general health (good, fair, poor, very poor);
- potential for structural failure (low, medium, high);
- tree location (lot or block number); and,

- general comments (i.e. disease, aesthetic quality, development constraints, sensitivity to development).

General health characteristics and potential for failure were assessed for each inventoried tree. The details of the criteria used to evaluate each tree are outlined in Table 1 of the Tree Protection Plan (Appendix VI).

The dripline of the row of trees located along the west property boundary was delineated and flagged by an NRSI Certified Arborist in March 2013. A site visit was completed with City of Guelph staff on March 26, 2013 to review and confirm the flagged dripline boundary.

### 3.1.2 Other Wildlife Surveys

All incidental observations of mammals (as well as evidence such as tracks, scats, dens, etc.), reptiles, amphibians, birds, butterflies and dragonflies were documented on all field visits.

### 3.2 Aquatic Field Surveys

Site surface water drainage characteristics were documented within the subject property during the November 9, 2012 site visit. This field work was completed to verify the presence or absence of a watercourse that GRCA and OMNR mapping showed traversing the property, but was not readily visible in recent (2010) aerial photography.

## 4.0 Existing Conditions

### 4.1 Physiography, Geology, Soils and Drainage

The subject property generally slopes from the northwest to the southeast with an average gradient of 2% toward the temporary sediment basin in the southeast corner (Gamsby and Mannerow 2013b). The topography of the site is stepped (exp Services Inc. 2011) as a result of historic fill deposition. Subsurface soils within the property have been described as “*sandy silt till, comprising sandy silt, trace gravel, and scattered with seams of wet silt and sand*” (Gamsby and Mannerow 2013b).

As described above, GRCA and OMNR watercourse mapping indicated that a tributary of Clythe Creek traverses the subject property. A site visit was conducted by an NRSI aquatic biologist on November 9, 2012, to verify the presence or absence of this watercourse, which was not apparent from recent (2010) aerial photography of the subject property.

NRSI aquatic biologists did not observe any surface water features within the subject property. Therefore, the watercourse identified on GRCA and OMNR mapping as traversing the subject property was confirmed to no longer exist on or within 30m of the subject property.

Documentation of the absence of this feature was provided by NRSI to GRCA (Nathan Garland) and the City (Adele Labbe) for review in February 2013. This included 360 degree video as well as photographic documentation. A map with all the locations in which documentation was obtained was also provided (Appendix VII).

Rear-yard drainage from residential properties located west of the subject property (Silurian Drive) discharge into a vegetated swale within the triangular northwest parcel. Stormwater then drains via overland flow through this swale through the gabion-lined channel that exists at the property corner between the triangular northwest parcel and the main subject property land parcel. Another partially vegetated swale then directs the surface runoff parallel to the west property boundary toward the temporary sediment basin at the south end of the property. From there, stormwater is conveyed via stormsewer under Watson Parkway North toward the existing stormwater management pond located just east of Watson Parkway North (Gamsby and Mannerow 2013b). This stormwater management pond was designed to accommodate drainage from future development located on the subject property, and is an approved and constructed feature. The stormwater management pond ultimately discharges to Clythe Creek.

The berm that parallels the west property boundary effectively acts as a barrier preventing overland stormwater flow from travelling between the subject property and the PSW (Gamsby and Mannerow 2013b). The berm extends parallel to the majority of the length of the west subject property boundary. Where the berm doesn't currently exist within the north and south ends of the property, historic topsoil removal has left the western end of the subject property below the grade of the adjacent property to the west. Photographs of the berm are provided in Appendix VIII.

Local shallow groundwater flow within the subject property is inferred to move in a primarily southerly direction toward Clythe Creek. Groundwater flow in the shallow overburden substrates is estimated to flow southeasterly, toward the stormwater management facility across Watson Parkway South and Clythe Creek beyond (Gamsby and Mannerow 2013b).

A hydrogeological report prepared for the Cityview Drive property (Anderson GeoLogic Ltd. 2011) reported relatively saturated conditions within the vertical profile of the soil, with the water table likely occurring at a depth of no greater than 2m, and occurring at shallower depths toward the PSW until the water table essentially meets or occurs just below the ground surface at the PSW. A downward hydraulic gradient was measured at all wells within the property, suggesting that *"there is not a strong upward hydraulic gradient in the area approaching the PSW"*. Together with findings that a small watercourse entering the PSW was ephemeral and not groundwater fed, the report concluded that *"the PSW located at the northwest end of the property is fed directly by surface water runoff"*. Further, the report stated *"there is no apparent upwelling or discharge of groundwater to the PSW"* (Anderson GeoLogic Ltd. 2011).

Groundwater flow throughout the majority of the subject property does not appear to be directed toward the PSW. However, a component of groundwater flow from low-lying areas along the west end of the subject property toward the PSW likely exists under high water table conditions (i.e., during spring). Site investigations revealed no evidence of groundwater seepage or springs within the subject property (Gamsby and Mannerow 2013b).

The subject property is located within the overall capture zone for several municipal supply wells, including the City's Clythe Well, which is located approximately 400m of the subject property (Gamsby and Mannerow 2013b). It is inferred that the site is in an area of groundwater

recharge. A vulnerability assessment completed by Gamsby and Mannerow (2013b) concluded that the subject property falls within a zone classified as Wellhead Protection Area (WHPA)-B.

A historic buried bedrock valley is believed to generally orient with Clythe Creek in the vicinity of the subject property, and that it branches northwesterly approximately 500-700m northeast of the property (Gamsby and Mannerow 2013b). The location of the buried valley was approximated based on correlation with bedrock well yield, with the increase in well yield thought to relate to paleo-karst or increased secondary porosity, which are features associated with buried bedrock valleys (Gamsby and Mannerow 2013b).

#### 4.2 Designated Natural Areas

A portion of the Clythe Creek PSW Complex, considered a Significant Natural Area under OPA 42 (under appeal) (City of Guelph 2012) occurs in proximity to (within 120m of) the subject property on the adjacent Cityview Drive property to the west. Approximately 1.5ha of the Clythe Creek PSW complex exists on the adjacent Cityview Drive property. This wetland was originally mapped by the OMNR by air photo interpretation; however its boundaries were delineated in the field by NRSI biologists and confirmed by GRCA staff on June 8, 2009. In total, the wetland complex is 103.35ha in area and is comprised of two wetland types - swamp and marsh. Within the Cityview Drive property this wetland is made up of deciduous swamp, dominated by poplars (SWDM4-5) and swamp thicket dominated by red-osier dogwood (SWTM2-1) (NRSI 2013).

#### 4.3 Terrestrial Environment

##### 4.3.1 Vegetation

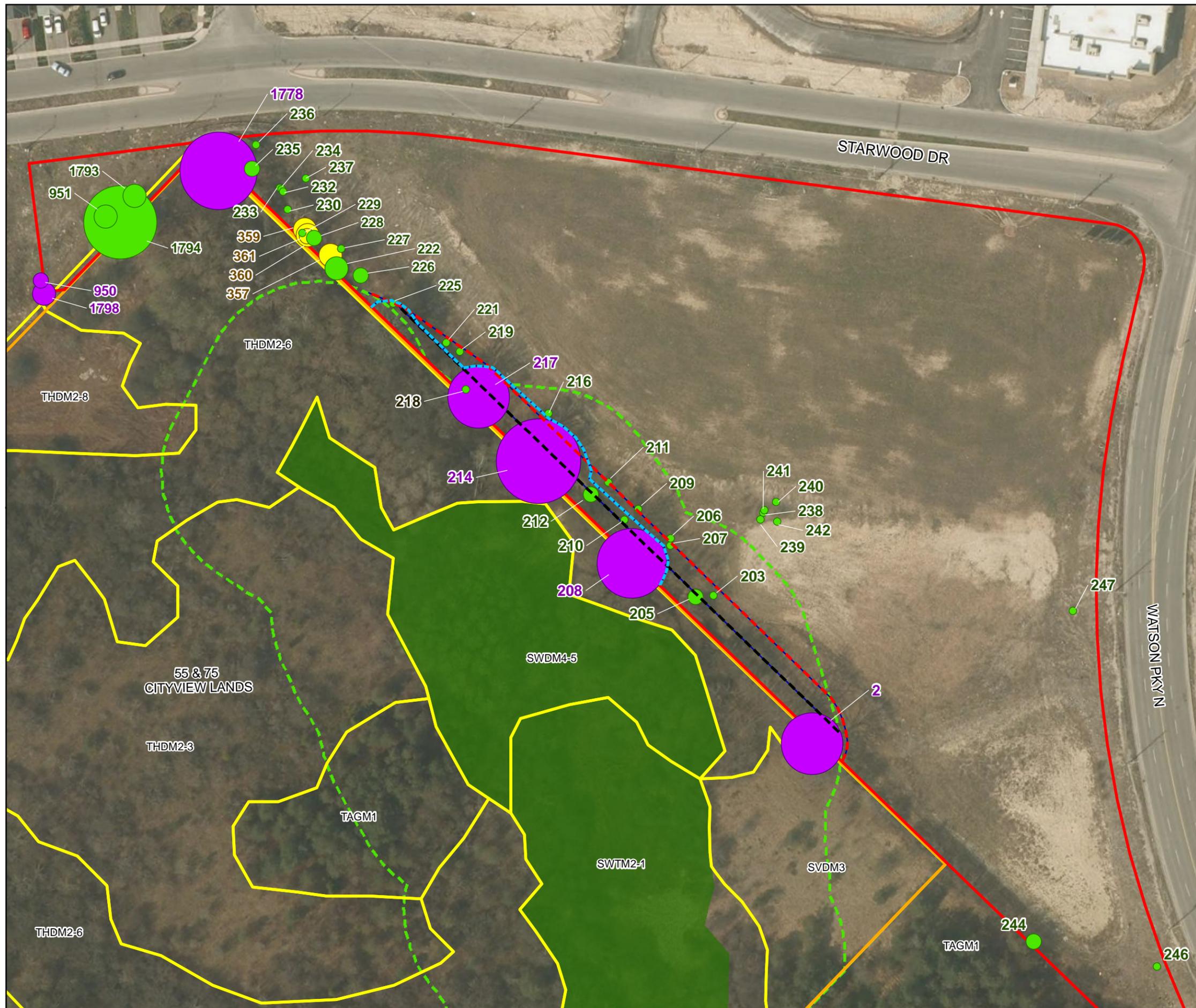
###### 4.3.1.1 Vegetation Communities

The majority of the subject property consists of open, disturbed lands that have been stripped of topsoil and have had fill deposited. A row of large deciduous trees was found growing along the property boundary, with small, surrounding areas of young, regenerating trees and shrubs. The triangular northwest parcel also consists of disturbed lands on which fill has been deposited. The triangular parcel is primarily open with scarce tree or shrub cover, and occurs adjacent to a buckthorn-dominated thicket located on the Cityview Drive property immediately to the south.

No other natural features were documented within the subject property. Figure 2 identifies the location of trees inventoried within the subject property.

# Watson-Starwood EIS

## Inventoried Tree Locations, Adjacent Vegetation Communities, and Natural Feature Constraints



**Legend**

- Subject Property
  - 55 & 75 Cityview Lands
  - Development Limit (10m)
  - Grading Limit (5m)
  - Dripline
  - Limit of Lands within 30m of PSW Boundary
  - Provincially Significant Wetland (PSW) & OPA 42 - Significant Natural Area
- Tree Inventory (size based on radius)**
- Shared Trees
  - NRSI Tagged Trees
  - Previously Tagged Trees
  - Ecological Land Classification (ELC)
- (SWDM4-5) Poplar Mineral Deciduous Swamp Type  
 (SWTM2-1) Red-osier Dogwood Mineral Deciduous Thicket Swamp Type  
 (TAGM1) Coniferous Plantation  
 (THDM2-3) Chokecherry Deciduous Shrub Thicket Type  
 (THDM2-6) Buckthorn Deciduous Shrub Thicket Type  
 (THDM2-8) Raspberry Deciduous Shrub Thicket Type  
 (WOD) Deciduous Woodland



Map Produced by Natural Resource Solutions Inc. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI. Data provided by MNR© Copyright: Queen's Printer Ontario. Imagery: First Base Solutions, 2010.

Project: 1367 Date: November 6, 2013	NAD83 - UTM Zone 17 Size: 11x17" 1:1,000
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Six vegetation communities have been identified that occur adjacent to (within 120m of) the subject property within the Cityview Drive property (see Figure 3 of NRSI (2013)). These include the following:

Scotch Pine Coniferous Plantation (TAGM1)

One small coniferous plantation dominated by scotch pine (*Pinus sylvestris*) occurs within the Cityview Drive property within 120m of the subject property boundary. The trees in this plantation are in good health and appear to be young to mid-aged.

Mineral Cultural Savannah (SVDM3)

This small vegetation community is dominated by a high proportion of non-native species such as common buckthorn (*Rhamnus cathartica*), yarrow (*Achillea millefolium*), common dandelion (*Taraxacum officinale*), barnyard grass (*Echinochloa crusgalli*), Canada thistle (*Cirsium arvense*), butter-and-eggs (*Comandra umbellata*), black medick (*Medicago lupulina*), and common plantain (*Plantago major*). Scattered trees including Manitoba maple (*Acer negundo*), bur oak (*Quercus macrocarpa*), hawthorn (*Crataegus* spp.), and scotch pine.

Chokecherry Cultural Thicket (THDM2-3)

This thicket community is dominated by chokecherry (*Prunus virginiana*) but a variety of other small trees and shrubs such as common buckthorn, white cedar (*Thuja occidentalis*), white ash (*Fraxinus americana*), scotch pine, tartarian honeysuckle (*Lonicera tatarica*), common crabapple (*Malus pumila*), downy serviceberry (*Amelanchier arborea*), red cedar (*Juniperus virginiana*), nannyberry (*Viburnum lentago*), bending wayfaring tree (*Viburnum lantana*), and red-osier dogwood (*Cornus stolonifera*). Groundcover is dominated by grasses but common meadow species such as yarrow, black-eyed Susan (*Rudbeckia hirta*), dandelion, Canada goldenrod (*Solidago canadensis*), and New England aster (*Symphotrichum novae-angliae*) are also abundant.

Mineral Deciduous Swamp (SWDM4-5)

This wetland vegetation community, which forms part of the PSW, is dominated by trembling aspen with smaller numbers of Manitoba maple, green ash (*Fraxinus pennsylvanica* var. *subintegerrina*), and white elm (*Ulmus americana*). The subcanopy

is dominated by trembling aspen and Manitoba maple, while the understory is comprised of red-osier dogwood, glossy buckthorn (*Rhamnus frangula*), and Virginia creeper (*Parthenocissus quinquefolia*). Groundcover consists of species common to wet areas such as ostrich fern (*Matteuccia struthiopteris*), tall white aster (*Symphotrichum lanceolatum*), jewelweed (*Impatiens capensis*), and reed canary grass (*Phalaris arundinacea*). This wetland was previously not mapped by the GRCA or MNR but due to its high proportion of wetland plants (>60%) and its soil characteristics (abundant mottling in the upper soil layers) it was classified as wetland.

#### Red-osier Dogwood Mineral Swamp Thicket (SWTM2-1)

This wetland community type was previously mapped by the GRCA and OMNR and is included in the Cylthe Creek PSW complex. The PSW is dominated by red-osier dogwood, glossy buckthorn, reed canary grass, and tall white aster.

#### Buckthorn Deciduous Shrub Thicket (THDM2-6)

This is the largest vegetation community found in the subject property. It is identified in the OPA 42 (2010) as 'cultural woodland'. The canopy, subcanopy and understory are dominated by a thick, impenetrable stand of common buckthorn, an exotic and highly invasive species. Scotch pine, chokecherry, hawthorns, and riverbank grape (*Vitis riparia*) are also present within these layers in smaller numbers. Groundcover is only prevalent in areas where the canopy allows light penetration and consists of dandelion, avens species (*Geum* spp.), common mullein (*Verbascum thapsus*), field horsetail (*Equisetum arvense*), and sedges (*Carex alopecoidea* and *C. houghtoniana*). Within this vegetation community there are two small inclusions which are characterized by a Scotch pine plantation (TAGM1) and a red-raspberry (*Rubus idaeus*) thicket (THDM2-8).

One additional vegetation community was identified adjacent to (within 120m of) the subject property, within the Cityview Ridge property (NSE 2012):

#### Scotch Pine Coniferous Forest (TAGM1)

The following description of this vegetation community has been extracted from NSE (2012):

*“The canopy and sub-canopy are dominated by scots pine (Pinus sylvestris). The canopy is 10-25 m high and the sub-canopy is 2-10 m in height. The canopy vegetation covers 35-60% while the sub-canopy vegetation covers greater than 60% of the community. In addition to the scots pine in the sub-canopy, occasional black walnut (Juglans nigra) and white spruce (Picea glauca) are found in this layer. The understory (1-2 m) contains an abundance of European buckthorn (Rhamnus cathartica), as well as occasional black walnut and green ash saplings, and riverbank grapevine (Vitis riparia), all of which cover greater than 60% of the community. The ground layer (0.2-0.5 m high, 25-35% cover) contains a variety of floral species which grow in scattered patches. Typical species in the ground layer include enchanter’s nightshade (Circaea lutetiana), European buckthorn seedlings, kentucky bluegrass (Poa pratensis), and wild strawberry (Fragaria virginiana). It appears that this community is transforming into a buckthorn thicket and as the relatively short-lived scots pine die off, the buckthorn will likely take its place.”*

Note that this ELC community type (CUP3-3) is now classified as TAGM1 (Coniferous Plantation) under the 2008 ELC classification codes (Lee 2008).

#### 4.3.1.2 Vascular Flora

A total of 47 vascular flora species were identified within the subject property. A complete list of these species is appended to this report (Appendix IX). The vegetation present within the subject property is a mixture of native and non-native species, predominantly forbs and cold season grasses with young trees and willow saplings establishing along the western property boundary. Vegetation coverage within the subject property is sparse due to disturbances caused by topsoil removal and fill deposition.

No vascular plant SAR or SCC were observed within the subject property. In addition, no vascular plant species considered to be regionally significant were observed. Areas along the west property boundary can be described as early successional habitat with numerous pioneer species including a number of non-native grasses and forbs.

#### 4.3.1.3 Tree Inventory

In total, 57 trees were inventoried, of which 46 (80.7%) are native species and 11 (19.3%) are non-native. Nine tree species were identified. A complete list of trees inventoried is provided in Appendix I of the Tree Protection Plan (Appendix VI) and tree locations within the subject property are shown on Figure 2. The majority of the trees inventoried are located along the western property boundary, including many that are growing on the boundary.

Table 2 provides a list of trees inventoried, whether they are native or non-native and their overall condition.

**Table 2. Summary of inventoried trees**

Common Name	Scientific Name	Good	Fair	Poor	Very Poor	Total
<b>Native Species</b>						
American Basswood	<i>Tilia americana</i>		2	1		3
Balsam Poplar	<i>Populus balsamifera</i>	9	11			20
Bur Oak	<i>Quercus macrocarpa</i>	1	5	1	1	8
Trembling Aspen	<i>Populus tremuloides</i>	2				2
Peach-leaved Willow	<i>Salix amygdaloides</i>	1				1
Willows	<i>Salix</i> ssp.	7	3			10
Poplar	<i>Populus</i> sp.	1				1
<b>Total</b>		<b>21</b>	<b>21</b>	<b>2</b>	<b>1</b>	<b>45</b>
<b>Non-Native Species</b>						
Manitoba Maple	<i>Acer negundo</i>		6	4		10
Siberian Elm	<i>Ulmus pumila</i>		1			1
White Willow	<i>Salix alba</i>	1				1
<b>Total</b>		<b>1</b>	<b>7</b>	<b>4</b>		<b>12</b>
<b>Overall Total</b>		<b>22</b>	<b>28</b>	<b>6</b>	<b>1</b>	<b>57</b>

In total, seven trees were identified as being in poor or very poor condition, three of which were found to have a high risk of structural failure.

For more information about the tree inventory completed for the subject property, the reader is referred to the Tree Protection Plan (Appendix VI).

## 4.3.2 Wildlife

### 4.3.2.1 Birds

A total of 113 breeding bird species are reported from the vicinity of the study area (10x10km range) (BSC *et al.* 2006). Twenty-nine of these species were observed by NRSI biologists during surveys completed on the adjacent Cityview Drive property in completion of the EIS for that property. Twenty-four of these species displayed some evidence of breeding. It should be noted that despite the close proximity of the Cityview breeding bird surveys to the subject property, notable differences in habitat composition are evident as the subject property is dominated by open, disturbed lands with minimal natural cover present

Five bird species were incidentally observed within the subject property during the November 2012 and May 2013 site visits, including American goldfinch (*Spinus tristis*), house sparrow (*Passer domesticus*), black-capped chickadee (*Poecile atricapillus*), blue jay (*Cyanocitta cristata*) and northern cardinal (*Cardinalis cardinalis*). A complete list of all bird species known to occur in the vicinity of the study area, including species observed within the subject property, is provided in Appendix X.

Based on a review of background information sources (OBBA, NHIC), 11 federally and/or provincially-significant bird species are known from the vicinity of the study area. The study area contains suitable breeding habitat for four of these species: red-headed woodpecker, barn swallow, golden-winged warbler, and common nighthawk. Within the subject property, potentially suitable habitat is predominantly associated with the row of mature trees along the property boundary and the adjacent narrow band of regenerating woody vegetation. Of these species that have suitable breeding habitat on-site, only barn swallow was observed during NRSI site investigations of the adjacent Cityview Drive property on June 10, 2009. However, the observed individual did not display any evidence that it was using the Cityview Drive property for breeding. Neither the subject property nor the adjacent Cityview Drive or Cityview Ridge properties provide appropriate nesting habitat for barn swallows. No bird SAR or SCC were observed within the adjacent Cityview Ridge property (NRSI 2013, NSE 2012).

Table 2 provides a summary of significant species (SAR and SCC) known to occur or observed in the study area, their current status ranks, and preferred habitats.

**Table 3. Bird Species at Risk and Species of Conservation Concern observed within the study area or known from the study area vicinity**

Scientific Name	Common Name	SRANK <sup>1</sup>	COSEWIC <sup>2</sup>	COSSARO <sup>3</sup>	SARA	Background Source	Habitat Preference <sup>4,5,6,7</sup>	Suitable Habitat within Subject Property	NRSI Observed
<i>Cardellina canadensis</i>	Canada Warbler	S4B	T	SC	Schedule 1	BSC et al. 2006	Interior forest habitats with a dense, well-developed shrub and vegetation understory; along riparian zones or wet bottomland habitat. require tracts of land which are >30ha	No	No
<i>Chaetura pelagica</i>	Chimney Swift	S4B, S4N	T	THR	Schedule 1	BSC et al. 2006	Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water	No	No
<i>Chordeiles minor</i>	Common Nighthawk	S4B	T	SC	Schedule 1	BSC et al. 2006	Open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs	Yes	No
<i>Dolichonyx oryzivorus</i>	Bobolink	S4B	T	THR		BSC et al. 2006	Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50ha.	No	No
<i>Hirundo rustica</i>	Barn Swallow	S4B	T	THR		BSC et al. 2006	Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water.	Yes	Yes

<i>Ixobrychus exilis</i>	Least Bittern	S4B	THR	T	Schedule 1	BSC et al. 2006	The least bittern breeds specifically in dense marshes dominated by emergent growth such as cattails. The bittern requires large marshes with a stable water level as the nests are usually built within 10cm of open waters. This open water is also needed for the bittern to forage as it is an ambush forager (Gov't of Canada 2012) .	No	No
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	S4B	THR	SC	Schedule 1	BSC et al. 2006	Red-headed woodpecker is known as a habitat generalist that may use deciduous forests, wooded swamps, fields, or pastures, but typically requires a territory of about 4 ha in size. Red-headed woodpeckers prefer to nest in the cavities of trees that are at least 40cm diameter at breast height (dbh) (OMNR 2000).	Yes	No
<i>Haliaeetus leucocephalus</i>	Bald Eagle	S2N, S4B	SC	NAR		Normington 2013	Bald eagle habitat tends to consist of large continuous areas of mature, old growth deciduous or mixed woods around large lakes or rivers (OMNR 2000). This species requires large (>255 ha) areas of open woodlands with tall trees for nesting, shelter, feeding as well as roosting (OMNR 2000).	No	No
<i>Icteria virens</i>	Yellow-breasted Chat	S2B	END	E	Schedule 1	Normington 2013	Yellow-breasted chat prefers dense thickets on forest edges, riparian areas within overgrown clearings. (Gov't of Canada 2012). Yellow-breasted chats nest above the ground in bushes, vines, etc. (OMNR 2000).	No	No

<i>Sturnella magna</i>	Eastern Meadowlark	S4B	T	THR		BSC et al. 2006	Open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees; old orchards with adjacent, open grassy areas >10 ha in size.	No	No
<i>Vermivora chrysoptera</i>	Golden-winged Warbler	S4B	T	SC	Schedule 1	BSC et al. 2006	Early successional habitat; shrubby, grassy abandoned fields with small deciduous trees bordered by low woodland and wooded swamps; alder bogs; deciduous, damp woods; shrubby clearings in deciduous woods with saplings and grasses; brier-woodland edges; requires >10 ha	Yes	No

<sup>1</sup>OMNR 2013, <sup>2</sup>COSEWIC 2012, <sup>3</sup>OMNR 2012b, <sup>4</sup>OMNR 2000, <sup>5</sup>Layberry et al. 1998, <sup>6</sup>COSEWIC 2003, <sup>7</sup>COSEWIC 2010

**Legend**

S1- Critically Imperiled	E/END- Endangered
S2- Imperiled	T/THR- Threatened
S3- Vulnerable	SC- Special Concern
S4- Apparently Secure	NAR- Not at Risk

Additionally, 48 species known from the 10x10km OBBA square that overlaps with the study area are considered regionally significant in Wellington County, 23 of which are also considered regionally rare (Dougan & Associates 2009). NRSI biologists observed two regionally significant species within the adjacent Cityview Drive property: the Baltimore oriole (*Icterus galbula*) and the American redstart (*Setophaga ruticilla*). Both of these species demonstrated evidence of possible breeding within the cultural woodland (WOD) on that property.

Baltimore oriole was also identified within the woodland and swamp communities located at the eastern end of the Cityview Ridge property (NSE 2012). Other regionally significant bird species documented within the Cityview Ridge EIS were observed in areas beyond 120m from the subject property boundary.

Both Baltimore oriole and American redstart have potential to occur along the western end of the subject property where they may use the row of mature trees along the property boundary or the adjacent narrow band of adjacent woody vegetation. However, neither of these species were observed within the subject property during field investigations.

#### 4.3.2.2 Herpetofauna

Twenty-nine species of herpetofauna are known to occur within the vicinity of the study area (Ontario Nature 2013). A complete list of herpetofauna known from the study area, including their current status rankings, is shown in Appendix XI. Of species known from the study area, seven are federally or provincially-listed SAR. Suitable habitat for three of these species (eastern milksnake, eastern ribbonsnake, and western chorus frog) occurs within the subject property or the surrounding 120m of adjacent lands. The subject property itself does not contain suitable habitat for eastern ribbonsnake or western chorus frog. While milksnake may occur within the subject property (e.g., for basking, foraging), its significant habitat is considered the hibernaculum; no hibernacula were observed within the subject property (see Section 5.3). Table 3 provides a summary of significant herpetofauna species known to occur or observed in the study area, their current status ranks, and preferred habitats.

**Table 4. Herpetofauna Species at Risk and Species of Conservation Concern observed within the study area or known from the study area vicinity**

Scientific Name	Common Name	SRANK <sup>1</sup>	COSEWIC <sup>2</sup>	COSSARO <sup>3</sup>	SARA	Background Source	Habitat Preference <sup>4,5,6,7</sup>	Suitable Habitat within Subject Property	NRSI Observed
<i>Graptemys geographica</i>	Northern Map Turtle	S3	SC	SC	Schedule 1	Ontario Nature 2013; NHIC 2013	Large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water.	No	No
<i>Chelydra serpentina serpentina</i>	Common Snapping Turtle	S3	SC	SC	Schedule 1	Ontario Nature 2013; NHIC 2013, Normington 2013	Permanent or semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddybanks or bottoms. The species often uses soft soil or clean dry sand on south-facing slopes for nest sites and may nest at some distance from water.	No	No
<i>Emydoidea blandingii</i>	Blanding's Turtle (Great Lakes/St Lawrence population)	S3	T	THR	Schedule 1	Ontario Nature 2013; NHIC 2013, Normington 2012	Shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs; not readily observed.	No	No

<i>Lampropeltis t. triangulum</i>	Eastern Milksnake	S3	SC	SC	Schedule 1	Ontario Nature 2013; NHIC 2013, Normington 2013	Farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings; often uses communal nest sites.	No (hibernacula)	No
<i>Thamnophis sauritus septentrionalis</i>	Eastern Ribbonsnake (Great Lakes population)	S3	SC	SC	Schedule 1	Ontario Nature 2013; NHIC 2013, Normington 2013	Sunny grassy areas with low dense vegetation near bodies of shallow permanent quiet water; wet meadows grassy marshes or sphagnum bogs; borders of ponds, lakes or streams; hibernates in groups	No	No
<i>Ambystoma jeffersonianum</i>	Jefferson Salamander	S2	E	THR	Schedule 1	Normington 2013	Damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding; hides under leaf litter, stones or in decomposing logs	No	No
<i>Pseudacris triseriata</i>	Western Chorus Frog	S3	T	NAR	Schedule 1	Ontario Nature 2013; NHIC 2013	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools ponds and temporary pools	No	No

<sup>1</sup>OMNR 2013, <sup>2</sup>COSEWIC 2012, <sup>3</sup>OMNR 2012b, <sup>4</sup>OMNR 2000, <sup>5</sup>Layberry et al. 1998, <sup>6</sup>COSEWIC 2003, <sup>7</sup>COSEWIC 2010

**Legend**

S1- Critically Imperiled      E/END- Endangered  
S2- Imperiled              T/THR- Threatened  
S3- Vulnerable            SC- Special Concern  
S4- Apparently Secure   NAR- Not at Risk

No reptile species were observed within the subject property or the Cityview Drive property, while only one amphibian species, the American toad (*Bufo americanus*), was observed within the Cityview Drive property. No amphibians were observed within the subject property. No significant herpetofauna species were documented within the Cityview Ridge property (NSE 2012).

#### 4.3.2.3 Mammals

Thirty-three mammal species are known from the vicinity of the study area (Dobbyn 1994). Of these, two species are considered provincially significant: little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*). Table 4 provides a summary of significant mammal species known to occur in the study area, their current status ranks, and preferred habitats.

No mammal SAR or SCC were observed within the study area, including within the adjacent Cityview Drive and Cityview Ridge properties. A complete list of mammal species known from the study area and their current status can be seen in Appendix XII.

**Table 5. Mammal Species at Risk and Species of Conservation Concern observed within the study area or known from the study area vicinity**

Scientific Name	Common Name	SRANK <sup>1</sup>	COSEWIC <sup>2</sup>	COSSARO <sup>3</sup>	SARA	Background Source	Habitat Preference <sup>4,5,6,7</sup>	Suitable Habitat within Subject Property	NRSI Observed
<i>Myotis lucifugus</i>	Little Brown Myotis	S5	E	END		Normington 2013	Uses caves, quarries, tunnels, hollow trees or buildings for roosting; winters in humid caves; maternity sites in dark warm areas such as attics and barns; feeds primarily in wetlands, forest edges.	No	No
<i>Myotis septentrionalis</i>	Northern Myotis	S3?	E	END		Normington 2013	Hibernates during winter in mines or caves; roosts in houses, manmade structures but prefers hollow trees or under loose bark.	No	No

<sup>1</sup>OMNR 2013, <sup>2</sup>COSEWIC 2012, <sup>3</sup>OMNR 2012b, <sup>4</sup>OMNR 2000, <sup>5</sup>Layberry et al. 1998, <sup>6</sup>COSEWIC 2003, <sup>7</sup>COSEWIC 2010

**Legend**

S1- Critically Imperiled	E/END- Endangered
S2- Imperiled	T/THR- Threatened
S3- Vulnerable	SC- Special Concern
S4- Apparently Secure	NAR- Not at Risk

NRSI biologists observed evidence of one mammal species (raccoon (*Procyon lotor*) tracks) during the November 2012 site visit. Within the adjacent Cityview Drive property, NRSI biologists directly or indirectly documented the presence of seven mammal species, all of which are common species in Ontario. This included direct observations of white-tailed deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), and star-nosed mole (*Condylura cristata*) as well as indirect evidence including raccoon tracks, the skull of a Virginia opossum (*Didelphis virginiana*), and a coyote (*Canis latrans*) den with fresh scat nearby. The coyote den, which appeared to be active during the 2009 field surveys, was located in the far northeast corner of the Cityview Drive property within the area mapped as deciduous savannah (SVDM3). This area is immediately west of the Starwood property boundary.

#### 4.3.2.4 Butterflies and Odonata

A total of 64 butterfly species is known to occur within the vicinity of the study area (Layberry *et al.* 1998). NRSI biologists observed 12 butterfly species within the adjacent Cityview Drive property, including the monarch (*Danaus plexippus*), a SCC. However, none of these species were identified within the subject property or identified as occurring in areas within 120m of the subject property. A complete list of butterflies known from the study area and their current status rankings can be seen in Appendix XIII.

Four dragonfly species were identified within the Cityview Drive property, including the ebony jewelwing (*Calopteryx maculata*), lance-tipped darner (*Aeshna constricta*), Halloween pennant (*Celithemis eponina*), and widow skimmer (*Libellula luctuosa*). All of these species are common in Ontario, although the Halloween pennant is considered a regionally significant species (Dougan & Associates 2009). However, none of these species were identified within the subject property or identified as occurring in areas within 120m of the subject property. A complete list of odonates (dragonflies and damselflies) known from the study area and their current status rankings can be seen in Appendix XIII.

#### 4.4 Aquatic Environment

As described in Section 4.4, a stormwater management swale has been constructed that enters the west side of the triangular northwest parcel, turns southeast at the north corner of the subject property, and runs southeasterly adjacent to the west property boundary. Within the triangular parcel the naturally vegetated swale ranges up to approximately 7m in width and is contained within constructed earthen berms. The swale banks are reinforced with gabion baskets where it bends around the north corner of the property, turning southeast. Downstream of the gabion banks the swale widens to approximately 7-10m where it occurs alongside a low (approximately 1m) earth berm along its southern side. The swale acts as a settling area during periods of increased precipitation. It was observed to be dry during all site visits except on the October 31, 2013 site visit, when small pools of standing water were observed where the swale occurs within the triangular northwest parcel. The swale feature was determined to provide neither direct nor indirect fish habitat.

## 5.0 Significance and Sensitivity of Natural Features

Findings of the background review and field surveys were utilized to assess the presence of any provincially or locally significant natural heritage features within the study area. A summary of the results of this assessment is discussed in Sections 5.1 through 5.5.

### 5.1 Clythe Creek Provincially Significant Wetland/Guelph OP Core Greenlands/OPA 42 Significant Natural Area

As discussed in Sections 1.2 and 4.2, a portion of the Clythe Creek PSW complex occurs west of the subject property, in the adjacent Cityview Drive property (Figure 1). This wetland has also been designated as Core Greenland within the current City of Guelph Official Plan (City of Guelph 2001), and has been mapped as a Significant Natural Area under OPA 42 (City of Guelph 2012). Adjacent lands to the PSW (defined as 120m (City of Guelph 2001, 2012)) extend onto the subject property. See Section 2.0 for constraints to development within PSWs, City of Guelph Core Greenlands, Significant Natural Areas under OPA 42 (under appeal) and their adjacent lands.

### 5.2 Cultural Woodland/OPA 42 Natural Area

The discussion of woodlands in this section is in reference to the wooded area west of but within 120m of the subject property boundary and excludes portions that have been designated as PSW and Significant Natural Area under OPA 42.

Under the existing City of Guelph Official Plan, the woodlands that occur adjacent to the western portion of the subject property are not designated as Significant Woodlands (City of Guelph 2001). The woodlands also do not meet the criteria of Significant Woodlands under OPA 42 (under appeal) as the woodlands can be largely characterized as 'cultural' with a high proportion of non-native, invasive tree and shrub species such as common buckthorn dominating the canopy, sub-canopy, and understory. The large proportion of common buckthorn, as well as occasional Manitoba maple, scotch pine, tartarian honeysuckle, common crabapple and a variety of cold season grasses and non-native forbs indicates a high level of disturbance historically. Given the number of successional species and non-native invasive species present, and the relatively low number of mature trees found within this area, it is quite

likely that the existing feature has regenerated from an abandoned agricultural field or pasture.

OPA 42 defines 'cultural woodlands' as the following:

*“a woodland with tree cover between 35% and 60% originating from, or maintained by, anthropogenic influences and culturally based disturbances (e.g., planting or agriculture, clearing, recreation, grazing or mowing); often having a large proportion of introduced (i.e., non-native) species (as per the Ecological Land Classification System for southern Ontario) and with shrubs, grasses, and/or herbaceous ground cover. These may be second or third growth woodlands that occur on land that has been significantly altered by human disturbance where the original forest was completely or mostly removed at various points in time (e.g., from agriculture, grazing, gravel extraction) and may include a small proportion of planted trees but has undergone natural succession to the point where tree cover is between 35% and 60%, with grass and herbaceous ground covers, and possibly shrubs as well. “*

### 5.3 Significant Wildlife Habitat

Three candidate SWH types were initially identified for the subject property and/or the surrounding 50m (defined as adjacent lands for SWH following City of Guelph (2012)):

- Snake Hibernacula
- Red-headed Woodpecker Habitat
- Common Nighthawk Habitat

Snakes overwinter individually or communally within specialized subterranean environments that are returned to across multiple years. Snake hibernacula are situated below the frost line and must feature sufficient moisture to avoid desiccation. Snake hibernacula are commonly associated with old crumbling building foundations and stone walls. They may also make use of animal burrows.

No potential snake hibernaculum features were observed within the subject property following field investigations.

Red-headed woodpeckers are known to use habitats that include open, deciduous woodlands with little understory, field with scattered large trees, wooded swamps, and small woodlots and forest edges. They typically require at least 4ha of habitat (OMNR 2000). Further, common nighthawk habitat includes open ground and open woodlands (OMNR 2000). However, neither of these species was observed during breeding bird surveys completed for the Cityview Drive property, as well as during other site visits made to the subject property. These species were therefore considered not present within the study area.

No other SWH types were confirmed to be present within the study area. See Appendix V for the complete SWH screening tables for seasonal concentration areas, rare vegetation communities, specialized wildlife habitat, habitat for species of conservation concern, and animal movement corridors.

#### 5.4 Habitat of Locally Significant Species

NRSI observed two regionally significant bird species, the American redstart and the Baltimore oriole in adjacent woodlands. Their populations are considered secure (S5) in Ontario and are commonly encountered in a variety of habitats throughout southern Ontario. The American redstart generally prefers habitats that offer moist, deciduous, second-growth woodlands with abundant shrubs but can also be found in thickets, orchards and often in riparian areas (Sherry and Holmes 1997). The species forages primarily on insects ranging from the ground level through to the near canopy and builds nests primarily within deciduous trees (Sherry and Holmes 1997). Baltimore oriole prefers areas of deciduous woodland edge (often in riparian areas) as well as more open habitats with scattered trees (Rising and Flood 1998). The species often nests in tall, widely-spaced trees but will also frequent the understory to forage for insects and fruits (Rising and Flood 1998). Oriole nests are generally built in the canopy of large isolated trees (including those within an urban setting) frequently within American elm, silver maple and poplar trees. Given the habitat preferences for each species, suitable habitat exists for each species within the woodlands that occur adjacent to the subject property within the Cityview Drive and Cityview Ridge properties. Within the subject property, suitable habitat for these species is represented by the row of mature trees along the west property boundary, and the adjacent narrow band of regenerating woody vegetation. However, no locally significant species were observed within the subject property across NRSI site visits.

Section 6.1.6.3.3 of OPA 42 indicates that:

*“Development and site alteration may be permitted within all or portions of the habitat of locally significant wildlife species and established buffers where it has been demonstrated through an EIS or EA, to the satisfaction of the City, that there will be no negative impacts on the local habitat that is necessary for the maintenance and survival of the species.”*

## 6.0 Opportunities and Constraints Analysis

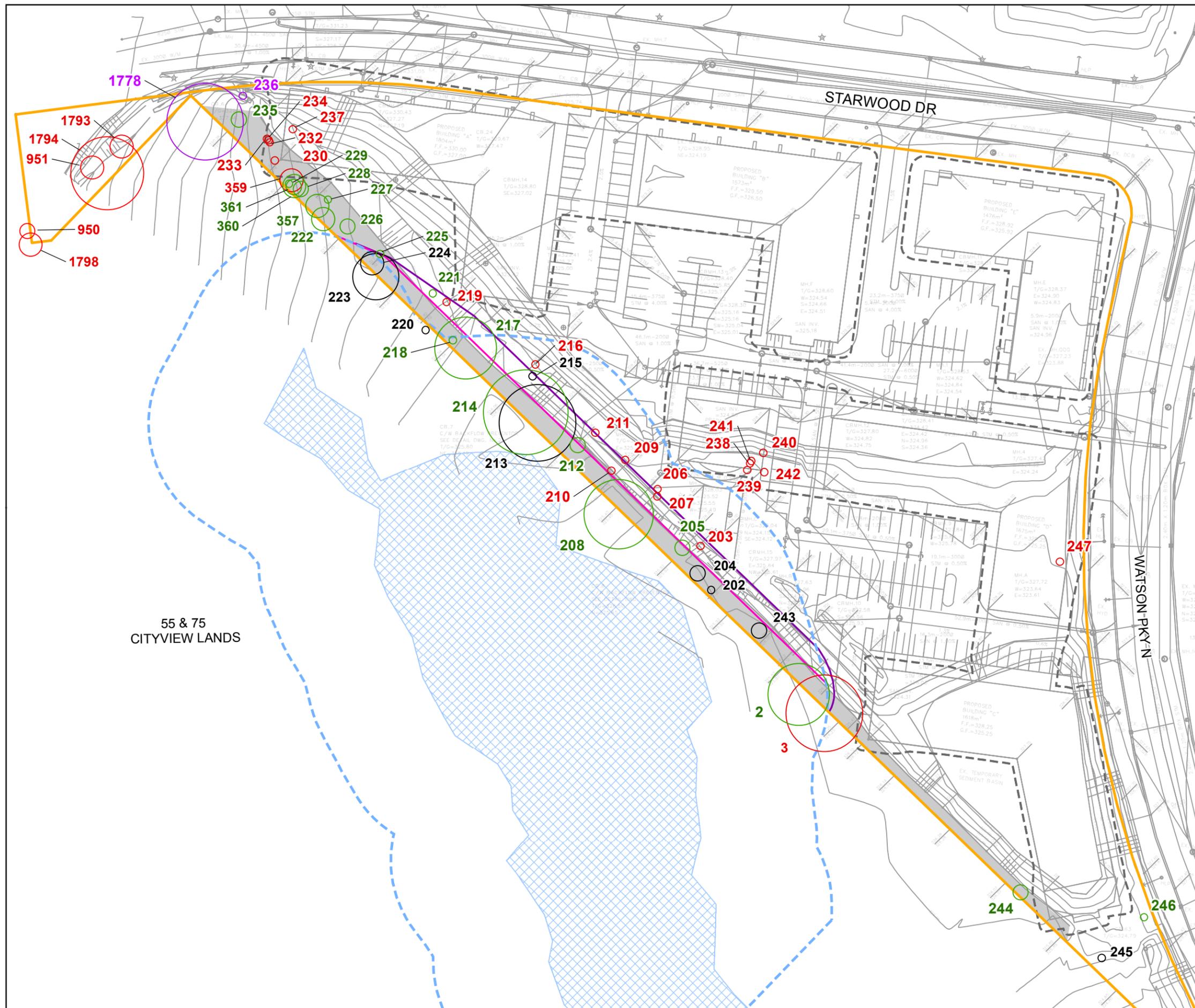
As discussed in Section 2.0, development setbacks from PSW boundaries are required as per the PPS (OMMAH 2005), GRCA Wetland Policy (GRCA 2003) and City of Guelph OP (City of Guelph 2001) and OPA 42 (City of Guelph 2012) (currently under appeal). Naturally vegetated buffers are required for natural heritage features such as wetlands to protect their form and ecological function, as well as to mitigate against negative effects from a proposed development.

Typically, a 30m buffer beyond the boundary of a PSW is recommended by the GRCA (GRCA 2003), and 30m has been listed as a minimum buffer width from a PSW in OPA 42 (currently under appeal) (City of Guelph 2012). This 30m buffer would extend onto the subject property as shown on Figure 2. Accordingly, the site concept has been designed such that all buildings, driveways and most impervious surfaces (excepting a swimming pool, which will not cause significant impact to the adjacent natural features (see Section 7.0)) occur entirely outside of lands within 30m of the confirmed PSW boundary, although site grading and placement of SWM systems would occur within this buffer as described in Section 7.0 (see Figure 3). A 30m setback for placement of apartment buildings and associated impervious surfaces (e.g., parking lots) will be important to effectively maintain the form and function of, and mitigate human disturbances to, the adjacent PSW.

A common practice is that retained trees be buffered by at least the tree dripline to provide those trees adequate rooting zones to survive and maintain their structural integrity. NRSI biologists delineated the dripline of the large property-shared bur oaks that run along the west subject property boundary and this dripline was reviewed and confirmed in the field by City of Guelph staff. A 10m area along the west property boundary was found to capture the outer limit of the confirmed dripline. This line generally encompasses the tree dripline, and has been mapped as the Development Limit (Figure 2). Structures, internal roads/driveways or other impervious surfaces should be generally excluded from within this 10m setback from the property boundary. Additionally, it is recommended that lands within this Development Limit setback be restored as described in Section 7.6.

Figure 3

# Watson-Starwood Tree Protection Plan



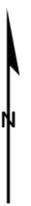
### Legend

- Subject Property
- Tree to be removed due to layout & grading (scaled to crown)
- Tree to be removed due to 55&75 Cityview Drive grading (scaled to crown)
- Tree in poor/very poor condition (scaled to crown)
- Tree to be retained (scaled to crown)
- Development Layout
- Development Limit (10m)
- Development Setback (5m)
- - - Excavation Limit
- Existing Extent of Berm
- Provincially Significant Wetland Buffer (30m)
- Provincially Significant Wetland (PSW) & OPA 42 - Significant Natural Area



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Project: 1367 Date: November 7, 2013	NAD83 - UTM Zone 17 Size: 11x17" 1:1,000
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The existing berm is currently functioning to prevent surface hydrological connections between the main (large) parcel of the subject property and the PSW. As described in Section 4.3, the PSW is fed directly by surface water runoff originating from the Cityview Drive property (Anderson GeoLogic Ltd. 2011).

It is recommended that this berm be retained as shown within the Grading Plan (Figure 3) in order to maintain the surface hydrological separation between the subject property and the adjacent PSW. In doing so, site grading would occur up to the berm, while maintaining the lip of the berm above the surrounding grade. Stormwater runoff will therefore be contained within the subject property, as it is currently, and discharged to the adjacent municipal stormwater pond across Watson Blvd. N (a limited amount of stormwater drainage will sheet flow across flat-graded, grassed areas toward the PSW as a result of proposed site grading at the north and south ends of the property as discussed further in Section 7.4.2). Accordingly, a linear setback, parallel to and 5m from the west subject property boundary, was defined to capture land from the top of the berm to the property boundary. This setback would be considered the Grading Limit as shown on Figure 2. This 5m buffer should be left naturalized. Lands within the Grading Limit should be considered no-touch during and post-construction, with the exception of the recommended native species restorations.

Subject property lands within 30m of the PSW boundary are currently highly disturbed due to historic topsoil removal and fill placement. A consequence of this topsoil removal is that the roots of the mature row of trees along the west property boundary do not extend to their east-facing driplines where a swale was historically cut. Existence of the berm, and maintenance of this function within the proposed development plan, contains surface drainage to within the subject property, thereby not influencing the hydrologic balance of the adjacent PSW. For these reasons, a 10m Development Limit is considered a suitable setback to buffer the PSW from the proposed development, within which will be a 5m Grading Limit to protect berm functionality and allow continued natural regeneration. Further, subject property lands within 30m of the PSW boundary, outside of the 10m Development Limit, will be designed strictly for passive land uses as a property amenity greenspace.

The site grading plan for the adjacent Cityview Drive property requires the removal of all inventoried trees that occur just south of the triangular northwest parcel. The details of the

proposed tree removal are described in the Tree Protection Plan appended to the draft Cityview Drive EIS (NRSI 2013, Appendix IV). The woody species to be removed are primarily non-native, invasive common buckthorn and fast-growing, disturbance tolerant species such as Manitoba maple and trembling aspen. These species are located within a community described as Buckthorn Deciduous Shrub Thicket (THDM2-6; see Figure 2). Consequently, no natural feature constraints occur within or adjacent to the north property triangular parcel.

Opportunity for development lies within the remaining open and disturbed areas of the subject property so as to limit or avoid potential impacts to natural heritage features, habitats and species.

## **7.0 Impact Analysis and Recommendations**

### **7.1 Description of the Proposed Undertaking**

The client proposes to develop the subject property to accommodate four residential condominium buildings, one retirement residence, and one common amenity building, with associated below-ground and surface parking areas, driveways and parking access ramps, and landscaped areas including gardens and a swimming pool (see Functional Servicing Report (Appendix I), Hydrogeology Study Report (Appendix II), Grading Plan (Appendix XIV)).

The condominium buildings will front onto Starwood Drive and Watson Parkway North. Four of the five condominium buildings will be four storeys high, while one (proposed Building E (the retirement residence)) will be six to eight storeys high. The condominium buildings will collectively contain 294 units, while the retirement residence will contain 105 units. All condominium/residence buildings will contain below-ground parking garages with access ramps at ground level. A total of 453 parking spaces will be provided across surface and below-ground parking areas. Gardens will be situated variously throughout the subject property, but predominantly along the west end of the property between Buildings A and C. A swimming pool is to be located immediately southwest of Building F.

Four single-detached residential lots are proposed for development within the triangular northwest parcel, fronting Starwood Drive (see Appendix XIV). The lot fabric for these proposed residential lots is currently shared between the subject property and the adjacent Cityview Drive property.

Details on the proposed stormwater management facility for the proposed residential lot development can be found within the Functional Servicing Report (Gamsby and Mannerow 2013a) in Appendix I.

### **7.2 Approach to Impact Analysis**

Potential impacts arising from the proposed undertaking were determined by comparing the details of the proposed undertaking with the characteristics of the existing natural features and their functions. The following is a description of the types of impacts that are discussed.

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

### 7.3 Direct Impacts and Mitigations

#### 7.3.1 Site Grading and Vegetation Removal

The approach to identifying and delineating the natural features and associated buffers was aimed at avoiding direct impacts from development on important natural features. Within the subject property, the locations and driplines of trees along the west property boundary were mapped and delineated. Although located on the adjacent Cityview Drive property, the PSW was delineated by NRSI (as part of the EIS for that property), thus identifying the extent of the 30m development setback within the subject property. The delineation of these natural features and associated buffers/setbacks (Figure 2) have informed the development layout; therefore, direct impacts to these natural features have been avoided. Figure 3 presents the proposed development layout overlaid onto the existing natural features and associated buffers/setbacks. A digital drawing of the proposed residential lot layout for the triangular northwest parcel was not available for mapping purposes at the time of report preparation and is therefore not shown on Figure 3.

Direct impacts to existing vegetation communities and species are expected to be insignificant as the proposed development footprint is located within lands that are heavily disturbed (e.g., through historic topsoil removal and fill deposition) and thus dominated by common, non-native species (e.g., yellow rocket (*Barbarea vulgaris*) and thistles (*Cirsium* spp.)). The proposed development will entirely replace the existing disturbed lands. The row of mature trees along the west property boundary (Figure 2) will be retained. As described in Section 6.0, it is recommended that a development setback of 10m from and paralleling a portion of the west property boundary (Figure 2) be established, which generally encompasses the driplines of trees to be retained. This development setback, within which buildings and other impervious

surfaces should be excluded, will effectively maintain the health and integrity of the retained trees from the proposed development.

Typically, a 30m buffer beyond the boundary of a PSW is recommended by the GRCA (GRCA 2003), and 30m has been listed as a minimum buffer width from a PSW in OPA 42 (currently under appeal) (City of Guelph 2012). Lands within 30m of the PSW boundary are shown on Figure 2. As shown on Figure 3, the proposed development will encroach into lands within 30m of the PSW boundary. However, the development has been planned such that all buildings are located outside of this 30m zone, and such that lands within the 30m zone, outside of the 10m development setback, are primarily passive-use, pervious-surface “greenspace”, consisting of sodded grounds, gardens, and gravel walking paths. The development plan includes an outdoor in-ground swimming pool within the 30m zone, located immediately southwest of Building F as shown on Figure 3. Due to the relatively small size of the swimming pool footprint within the total amount of land within 30m of the PSW boundary (including outside the subject property), and due to the hydrological disconnect between the subject property and the PSW (see Section 4.4), the location of the pool within the 30m zone is not expected to negatively impact the PSW provided that measures are followed to minimize potential for human access or disturbance to the wetland post-construction. These measures could include fencing along the property line as well as signage indicating no trespassing into the adjacent natural features (see Section 7.5).

As shown on Figure 3 and the site grading plan (Appendix XIV), the existing berm will be retained. A drainage swale at the foot of the berm will also be maintained and/or enhanced to continue to collect and convey water for discharge to the existing SWM pond across Watson Pkwy N. The height and configuration of a section of the berm will be modified, as shown on the grading plan, to properly accommodate the swale at that location.

Where the berm exists parallel to the west property boundary, site grading will occur up to but short of the lip of the berm in order to maintain the topographical rise needed to prevent overland stormwater discharge to the adjacent PSW. In all cases, grading will not extend past the Grading Limit as shown on Figure 3. No vegetation removal will occur beyond the grading limit to the property boundary other than as recommended to enhance the ecological quality of the feature as described in Section 7.7. Although the property is to be developed in phases across multiple years, it is recommended that the entirety of berm grading occur at one time to

ensure that berm functionality to inhibit surface water drainage to the adjacent property be maintained across years of site development.

Where the berm does not currently exist at the north and south ends of the west property boundary, and outside of lands within 30m of the PSW boundary, grading will occur up to the property boundary in order to optimize the site grades for the proposed land use. Grading at these locations will require the removal of 20 inventoried trees (excluding trees to be removed due to poor condition and/or high hazard state) and various shrubs that occur along and adjacent to the west subject property boundary. See the Tree Protection Plan for more details about proposed tree removals and retention as a result of the proposed development (Appendix VI). No shared-property trees, which straddle the subject property boundary, will be removed without the consent of the neighbouring property owner. Shared-property trees are identified on Figure 2.

Land will be graded and removed of vegetation within the Development Limit (10m from property boundary) up to a maximum of the Grading Limit (5m from property boundary). Vegetation to be removed in this zone will include regenerating young trees and shrubs, as well as 13 inventoried trees as shown in the Tree Protection Plan (7 of which will be removed due to poor condition/hazard state). Grading will therefore occur within the driplines of hedgerow trees to be retained along the property boundary. However, because a swale was cut several years ago, which exists within the 10m Development Limit, the roots of these trees do not extend to the driplines along their east-facing sides. Therefore, no impact to these trees is anticipated as a result of site grading past the 10m Development Limit, provided that no grading extends past the 5m Grading Limit and other protective measures are followed as detailed in the Tree Protection Plan. It is recommended that land west of the 10m Development Limit be restored with native vegetation plantings, as described in Section 7.7, to enhance the value of this buffer.

As shown on Figure 3, the development plan shows an underground parking garage ramp to Building C occurring in close proximity to the southeast end of the Development Limit where it extends around the dripline of the southernmost large tree to be retained (Tree # 2 (bur oak)). However, as described above, the roots of this tree do not extend to the dripline where the swale is located. Therefore, construction of the underground parking garage ramp at this location is not anticipated to impact the adjacent retained tree provided that protective measures are implemented as described in the Tree Protection Plan.

Additional areas of land will be excavated, beyond the building footprints themselves, for construction of the buildings including underground structures (e.g., parking areas), as shown on Figure 3. None of the excavation areas encroach into the 10m Development Limit or the 5m Grading Limit, with only a very small encroachment into the 30m setback from the PSW anticipated near the proposed Building F (Figure 3). As such, excavation required for on-site construction is not anticipated to negatively impact existing natural features within development setbacks. No excavation or other site works will occur outside of the defined property boundaries; where excavation zones are shown to encroach outside of the property limits as shown on Figure 3, shoring and/or other construction measures will be implemented to maintain all site works within the subject property boundaries.

The vegetation species to be removed within the subject property are all species common to the surrounding landscape, including non-native species such as common buckthorn and glossy buckthorn. No significant species are to be removed within the subject property.

Twenty of the inventoried trees are anticipated to be removed based on the extent of the proposed site grading and/or excavation for construction of underground structures. Of these trees, all are in fair to good condition with medium to low risk of structural failure. All are <5cm dbh (except one 19cm dbh willow), and most are close to the 10cm dbh size. Many are located on fill that has been deposited on-site and consist of pioneer tree species. Half (10) are non-native willows, the remainder are aspen. No off-property trees will be affected.

It is assumed that the triangular northwest parcel will be entirely graded for development. As with the main subject property parcel, the small triangular parcel has been heavily disturbed due to the historic removal of topsoil and placement of fill. Consequently, no significant natural features will be directly impacted by the proposed development at this location. As described in Section 6.0, the existing buckthorn-dominated shrub thicket on the adjacent Cityview Drive property is to be removed according to the site grading plan for that property (NRSI 2013). The proposed development will require the removal of five inventoried trees within the north property triangular parcel, as well as a relatively small number of regenerating young trees and shrubs.

As discussed in Section 6.2 of the Tree Protection Plan (Appendix VI), City of Guelph Tree By-law Number (2010)-19058 requires that native or non-native trees in fair to good condition must

As discussed in Section 6.2 of the Tree Protection Plan (Appendix VI), City of Guelph Tree By-law Number (2010)-19058 requires that native or non-native trees in fair to good condition must be replaced at a compensation ratio of 3:1. A list of trees exempt from compensation is provided in the same section of the Tree Protection Plan. Twenty-eight native/non-native trees that are in fair to good condition will require removal due to the proposed grading and/or excavation for the underground parking (this does not include Trees # 1778, #236, #950 or #1798 that will require removal due to the neighbouring Cityview Drive development). Permission from the adjacent Cityview Drive property landowner will be required as these trees are shared. Application of the 3:1 ratio used by the City requires that 84 compensation tree plantings would be required. However, since most of these trees are very small, almost all <15cm dbh, and consist of pioneer species that would provide poor long-term tree canopy, it is recommended that the landscape requirements for this proposed condominium development would provide for adequate replacement. In addition, naturalization of the lands within the 10m distance from the western property boundary, as discussed in Section 7.6, will provide ample space for additional tree plantings.

### 7.3.2 Impacts to Wildlife and Their Habitats

As described in Section 5.4, the locally significant species American redstart and Baltimore oriole were observed within woodlands on the Cityview Drive property, while Baltimore oriole was also observed within the Cityview Ridge property. These species may use the row of trees along the subject property boundary, and surrounding young trees and shrubs, and may thus experience minor disturbance as a result of the proposed removal of some vegetation along the west end of the subject property. However, the amount of vegetation to be removed is negligible relative to nearby habitat available within the Cityview Drive and Cityview Ridge properties, and the majority of the large shared-property row of trees will be retained. Altogether, these, and other common species of wildlife observed to use or known to potentially use the surrounding habitats, are not expected to be significantly impacted by the proposed vegetation removal.

Because the current condition of the property provides relatively little ecological value, removal of existing vegetation as planned (e.g., see Tree Protection Plan) is not expected to cause any significant impact to local wildlife populations or to the ecological functions collectively provided by the natural features on the local landscape.

Vegetation clearing should occur outside the bird nesting season (May 1-July 31) so as to avoid disruption to nesting activities of birds in the vicinity, and to avoid destruction of active nests. The destruction of migratory birds and their nests is prohibited under the federal *Migratory Birds Convention Act*, 1994. If vegetation clearing cannot be avoided during the bird breeding season, a qualified avian biologist must be retained to carry out a nest search ahead of clearing activities.

### 7.3.3 Impacts Associated with a Walking Trail

As described in the approved TOR, opportunity for construction of a public walking trail within the subject property is to be explored for feasibility and potential impact to adjacent natural features. The trail was suggested to run along the west property line which would constitute a linear northwest-southeast connection between Starwood Drive and Watson Parkway South, and potentially link to other existing trails in the immediate vicinity. Based on the proposed site development and grading plan (Figure 3), the most feasible location for this trail within the subject property would be within the 5m Grading Limit that encompasses the berm and areas to be naturalized up to the subject property boundary (as described in Section 7.7). As shown on Figure 3, the land located between the 10m Development Limit and the 5m Grading Limit is to be graded to maintain berm functionality as well as to enhance the swale feature for stormwater collection and discharge. Trail location within this 5m zone would therefore not be recommended. A public trail within the property to the east of the 10m Development Line would present both security and privacy concerns for the adjacent condominium residences and is not recommended.

As described in Section 6.0, the land west of the 5m Grading Limit is intended to be left for continued natural regeneration of vegetation, supplemented by plantings of native restoration species as described in Section 7.6. This zone is intended to provide a natural buffer to the PSW and woodland located on the Cityview Drive property, and following recommended restoration work, should be considered “no touch” in terms of future property use. Construction of the trail in this location would also necessarily occur immediately adjacent to, and well within the driplines of the retained row of mature trees along the property boundary. Construction of the trail would therefore require removal of vegetation within the majority of the 5m Grading Limit setback, with potential for adverse impacts to the immediately adjacent mature tree row. Trail construction would also represent potential for indirect impacts to the PSW given its close

proximity as well as cause privacy concerns for adjacent condominium owners and users of the property's common amenity space (e.g. pool).

Trail construction along the Cityview Drive side of the subject property boundary is also not recommended due to the close proximity of the PSW. A trail situated along the Cityview Drive side of the property boundary would place it well within the PSW buffer, as well as immediately adjacent to the PSW boundary in at least two locations.

Section 6.1.5.3.3 (5) of the City of Guelph OPA 42 (City of Guelph 2012) states that the formalization of existing ad hoc trails may be permitted within Significant Wetlands and their buffers provided various conditions are met, including but not limited to (i) they are considered essential to the City's trail system or integral to the scientific, educational or passive recreational use of the property, and (ii) no reasonable alternative location exists. An existing informal trail was not observed along the subject property boundary. Further, the City of Guelph's Trail Master Plan does not show an existing or proposed trail in this location (City of Guelph 2005). Construction of a new trail within the buffer of and/or immediately adjacent to a Significant Wetland therefore does not align with the policies of Section 6.1.5.3.3 (5) that specifically address public trails. A public trail route that follows the subject property boundary on either side is therefore not recommended. A more feasible trail location that causes less potential for impact to the PSW may exist elsewhere within the Cityview Drive property.

#### 7.4 Indirect Impacts and Mitigations

Construction-phase activities of the proposed development have potential to cause indirect impacts on the surrounding terrestrial natural features and functions, if not mitigated appropriately. Recommended mitigation measures are provided for each potential impact.

##### 7.4.1 Disturbance to Protected Natural Features and Wildlife Habitats

Vegetation clearing, grading, and other construction activities have the potential to inadvertently destroy, damage and degrade the edges of adjacent protected natural features unless the boundaries of these features are clearly marked. For example, construction activities can cause scarring and decreased health of adjacent trees whose branches or root systems have been damaged by machinery or affected by construction-related dust and sedimentation. Damage to

trees and other vegetation can also be caused by the compaction of soils within tree rooting zones along woodland edges.

Direct damage and indirect disturbances can cause stresses on the natural features that weaken their ecological integrity. In these states, natural features are more prone to establishment and proliferation of invasive, non-native species such as common buckthorn. Proliferation of invasive, non-native species within natural communities decreases their ecological value such as by suppressing native species, diminishing biodiversity and reducing habitat suitability.

As a general means to limit ecological impacts during construction, efforts should be made to clearly demarcate the limits of development, including vegetation cutting and grading boundaries, so as to prevent unnecessary encroachment into the surrounding natural features. These boundaries should be clearly marked using either bright-coloured snow fencing, or silt fencing erected for the purposes of on-site stormwater runoff control. A design plan should be selected that minimizes clearing of natural features to the extent possible.

The Grading Limit should be clearly marked using snow fencing and silt fencing to ensure no inadvertent encroachments into or disturbances to the adjacent vegetation. The 5m Grading Limit zone to the property boundary is considered to be a no-touch area during all construction operations. Where no Grading Limit has been defined adjacent to the west property boundary, the property boundary itself should be similarly delineated with silt fencing to ensure no encroachment or erosion and sedimentation impacts to the natural features on the adjacent properties.

Protection measures for retained trees should be followed as recommended in the Tree Protection Plan. In order to achieve grading within the 5 to 10m zone, the tree protection fencing (and associated silt fencing) is recommended to be installed at the 5m Grading Limit line. Although this is within the dripline, there will be no disruption of root zones nor overhead branches. Once this grading is completed, the area should be reviewed by an arborist and the feasibility and effectiveness of moving the fence out to the 10m line should be determined (construction sequencing has not been detailed at the time of preparing this report, as such final grading may occur later in the construction sequence making the fence relocation less effective).

Increased disturbance caused by excessive noise, dust, vibrations, artificial night-time lighting, and proximity of human presence during construction may cause certain wildlife species to abandon or avoid the area for travel, nesting, roosting or foraging. However, these impacts are anticipated to be minimal, localized, and temporary, and it is expected that displaced wildlife species will return to the vicinity of the subject property following construction.

Excessive noise caused by site preparation and construction activities may cause wildlife to temporarily avoid the area. These noise impacts can be mitigated by restricting the daily timing of construction activities to between 7:00 am and 7:00 pm.

Any lighting equipment associated with construction activities should be turned off following cessation of daily construction activities, or at least turned away from the adjacent natural features so as to prevent 'lightwash' of these areas.

Impacts due to dust should be mitigated for by moistening areas of bare, dry soil with water as needed during construction activities to reduce the amount of dust produced.

#### 7.4.2 Changes to Hydrologic Regime

Changes to the hydrologic regime to areas within and surrounding the subject property, such as through increases or decreases in the quantity of groundwater and/or surface water inputs to natural features, can cause stress and die-back of vegetation adapted to the current hydrologic regime. Over long-term periods this can lead to changes in ecological community composition.

As described in Section 4.3 and 4.4, the hydrologic regime of the subject property does not influence the PSW and surrounding natural features on the adjacent properties. The PSW was observed to be fed directly by surface water runoff, with no apparent upwelling or discharge to the wetland. Furthermore, existence of the berm currently prevents overland flow of surface water from the subject property to the PSW, and retention of this feature as part of this development will ensure continuation of this function. Therefore, the PSW is not believed to be directly influenced by surface water or groundwater flow from the subject property.

Consequently, no hydrological impacts to the PSW or surrounding woodlands west of the subject property are anticipated due to the proposed development (Gamsby and Mannerow 2013b).

Following a vulnerability assessment and review of potential Drinking Water Threats given the site's location within a WHPA-B zone, it was determined that the proposed development does not create any Significant Threats to municipal wells (Gamsby and Mannerow 2013b).

Due to the continued presence of overburden soils post-development, providing a level of protection to groundwater resources, and because of the relatively limited size of the subject property, no impacts to the local groundwater system are anticipated as a result of the proposed development (Gamsby and Mannerow 2013b). A component of groundwater recharge is expected to be lost through stormwater collection and direction off-site to the SWM pond. However, because infiltration and/or stormwater overflow from the SWM pond into Clythe Creek is anticipated, water inflows to the SWM pond are expected to generally maintain the overall water budget within the Clythe Creek subwatershed (Gamsby and Mannerow 2013b). Additionally, removal of the existing sediment basin at the south end of the property will be compensated for through construction of a catch basin at this location, whereby stormwater will be discharged via municipal storm sewer to the SWM pond east of Watson Parkway South (M. Nelson, Gamsby and Mannerow, pers. comm. May 2013). Potential reductions to stormwater infiltration that likely occur within the low-lying areas of the west end of the property will be mitigated by facilitating continued overland flow and infiltration through maintenance of the existing swale feature (Gamsby and Mannerow 2013b).

As described in Gamsby and Mannerow (2013b), studies have identified the presence of buried bedrock valleys in the general vicinity of the subject property. However, studies completed by Gamsby and Mannerow showed no evidence that the shallow groundwater system at the subject property is affected by the presence of a buried valley in the subject property vicinity, or from paleo-karst features that may exist within the bedrock system. The shallow groundwater system in the overburden soils is believed to provide a level of separation from these features. These findings are further detailed in Gamsby and Mannerow (2013b).

Field investigations completed by Gamsby and Mannerow did not yield evidence of direct surface water connections between the north end of the subject property and the PSW. Further, no evident surface water channels were observed entering the north end of the PSW (M. Nelson, Gamsby and Mannerow, pers. comm. May 2013). Because site grading is planned to extend to the west property boundary north of the northern terminus of the berm and associated

Grading Limit (see Figure 3), outside of the 30m zone from the PSW boundary, stormwater drainage from the rear half roof of Building A, including the associated gardens, is expected to sheet flow into the adjacent property and ultimately the PSW (M. Nelson, Gamsby and Mannerow, pers. comm. May 2013). However, the amount of water to be discharged at this location is expected to be relatively minimal, particularly in relation to the overall catchment area for the PSW. This hydrologic input to the PSW is therefore not anticipated to negatively affect the form or ecological functioning of the wetland or its surrounding natural features, provided that measures are installed to ensure sheet flow dispersal and avoid flow channelization. The provision of grassed/vegetated areas, with relatively flat grading, will increase the likelihood that dispersed water will be conveyed via sheet flow. Energy dissipation structures should be installed in sloped areas as required.

Although no impacts to the groundwater system are anticipated as a result of the proposed development, recommendations have been made in Gamsby and Mannerow (2013b) to mitigate potential impacts should limited de-watering be required during construction activities.

#### 7.4.3 Water Quality Impairments

Decreases in water quality, such as through discharge of deleterious substances in stormwater runoff, can cause both acute and chronic toxicity impacts within biological communities. These impacts include increased mortality rates, impaired health conditions, decreased reproductive productivity and other reproductive impairments. Environmental contaminants are also known to biomagnify 'up the food chain', where higher-level predators are particularly susceptible to impacts. Water quality impairments can also pose health risks to humans wherever there is potential to come into contact with untreated or inadequately treated water discharge.

As described in the Hydrogeological Study (Gamsby and Mannerow 2013b), an assessment was completed to evaluate potential threats to drinking water sources given the subject property's location within an area designated as WHPA-B. Three main categories of potential drinking water threat were identified associated with the proposed development:

- Road salt application;
- Snow storage; and,
- The establishment, operation or maintenance of a system that collects, stores, transmits, treats, or disposes of sewage including:

- Sewage system or sewage works – discharge of untreated stormwater from a stormwater retention pond); and,
- Sewage system or sewage works – sanitary sewers and related pipes.

Road salt application was considered to be a “moderate” threat to drinking water sources. It is recommended that the proposed development maintain an impervious surface area of less than 80% to ensure the threat level does not elevate to “significant” (Gamsby and Mannerow 2013b).

The threat of snow storage run-off to drinking water sources was determined to be low to moderate for the proposed development. No significant threats were identified as snow storage areas will be less than 0.5ha (Gamsby and Mannerow 2013b).

The drinking water threat imposed by specific chemicals associated with SWM systems (e.g., aluminum, cadmium, lead) was determined to be low to moderate. No significant threats were therefore identified with respect to the proposed SWM system (Gamsby and Mannerow 2013b). This conclusion was based in part on the SWM facility being designed to discharge to land or surface water, with a drainage area of 1-10ha, and the predominant area land use being high density residential (Gamsby and Mannerow 2013b).

#### 7.4.4 Erosion and Sedimentation

During construction, areas of bare soil will be exposed which have the potential to erode during rainfall events. In the event of a heavy rainfall, sediment-laden runoff can enter adjacent natural areas by way of overland flow. Currently, stormwater drainage is primarily contained within the subject property due to the existing gradient toward the sediment basin and the west property berm. However, as the site is graded, particularly along the west end north and south of the retained berm, conditions may arise that would permit overland flow to adjacent properties if not sufficiently controlled.

Soil compaction also has potential to occur as a result of heavy machinery and the stockpiling of heavy materials in the area of development. Soil compaction can greatly reduce the permeability of soils and affect their ability to retain water during rain/snow melt events. This will result in an increase in surface water run-off which will ultimately increase the erosion potential and the amount of sediment being transported into adjacent natural areas and features.

In order to protect on-site and off-site natural features from potential impacts due to sediment, a Sediment and Erosion Control Plan must be implemented prior to any construction activities on the site. As described in the Functional Site Servicing Report (Gamsby and Mannerow 2013a), a Sediment and Erosion Control Plan has been developed for use during construction of the proposed development. This plan includes the following recommendations:

- Installation of silt fencing along the property boundary in all locations where runoff may discharge to adjacent lands;
- Wrapping the grates of catch basins with filter cloth, to be maintained until all building and landscaping activities have been completed;
- Inspection and maintenance of all silt fencing on a weekly basis by site staff during active construction or after a rainfall event of 13mm or greater, with maintenance to be carried out within 48 hours; and,
- Removal of silt fencing only after construction and landscaping has been substantially completed, including removal of any accumulated sediment.

Provided these recommendations are implemented, erosion and sedimentation impacts to adjacent natural features are not anticipated (Gamsby and Mannerow 2013).

## 7.5 Induced Impacts and Mitigations

Induced impacts are described as those that are not directly related to the construction or operation of the facilities in question, but rather arise from the use of the natural areas as a result of the development. Given the proposed land use as a high density residential development as well as four single-detached residential houses, the increased human proximity may present ecological stresses on the adjacent natural features if not appropriately controlled or mitigated.

Uncontrolled public access into the adjacent natural features may result in vegetation trampling and unauthorized trail creation, as well as littering, garbage deposition, and vegetation damage through vandalism. These activities can subsequently cause proliferation of non-native invasive vegetation species such as common buckthorn and garlic mustard (*Alliaria petiolata*).

As the adjacent PSW and woodlands are located on separate, privately-owned properties, “No Trespassing” signage should be installed at selected locations along the property boundary.

Native restoration plantings, to be established within the 5m and 10m setback zones from the west property boundary, should be designed using densely spaced woody species to discourage human access and use of the areas beyond the 10m Development Limit.

Altogether, these measures should substantially reduce the amount of public trespassing into the adjacent natural features from the subject property.

Increased human population in the area will also increase the potential for domestic animal (e.g. cat (*Felis catus*)) and other development-tolerant predatory mammal (e.g. raccoon) access to adjacent natural areas. Easier access provided to these animal groups may impact nesting success and direct mortality among certain small-size wildlife, such as passerine birds. Education of condominium residents with respect to the values and significance of the neighbouring natural areas is one tool that can be used, including the negative implications of permitting cats to roam outdoors near these sensitive areas. This information can be presented in the form of a Condominium Owner's Guide.

Post-construction lighting designs within the subject property have the potential to cause 'lightwash' within the adjacent natural features if lighting systems are not directional. Lightwash within adjacent natural features may cause certain species of wildlife to avoid using the area due to the disturbance that light may cause for roosting. Lighting designs will be provided at the detailed design stage. Lighting designs should therefore include directional lighting for all areas within the residential development to eliminate lightwash.

## 7.6 Cumulative Impacts

The subject property has historically undergone considerable modification resulting from agricultural uses and more recently topsoil removal and fill placement. Further modification of the landscape is anticipated due to further residential development to the west (i.e., within the Cityview Drive and Cityview Ridge properties). In order to evaluate the potential for cumulative impacts resulting from this development, it is necessary to look beyond the boundaries of the subject property to the neighbouring lands, particularly to the west of the property. This approach looks at the character and potential changes that are occurring or may occur in the future on surrounding lands within the neighbouring properties.

Cumulative impacts may arise as a result of the following:

- Spatial crowding
- Temporal crowding
- Spatial lags
- Temporal lags
- Shared impact linkages

The following provides a brief discussion on each of these potential sources of cumulative impacts.

#### *Spatial Crowding*

Spatial crowding occurs when a development proposal occurs in close proximity to others, such that there is potential for relatively minor impacts from each undertaking to add up (or combine) since they overlap in space. The subject property is designated for residential development in the City's Official Plan and is within a highly urbanized area. The off-site ponds that will receive stormwater from the subject property have been designed to accommodate and treat this additional stormwater. Based on this analysis no cumulative impacts to Clythe Creek are anticipated.

Although much of the PSW is situated within the neighbouring 55 & 75 Cityview Drive property, where residential development is proposed, as well as on the Cityview Ridge properties to the southwest. The development of these sites will encircle the PSW and associated natural area, leading to potential spatial crowding over-time. The Draft Plans for each of these developments have made recommendations for retention of natural features, plus suitable setbacks to minimize direct and indirect impacts to the greatest extent possible.

#### *Temporal Crowding*

Temporal crowding can occur when phases of a development or different developments overlap in time. Although it is anticipated that development of the lands within the study area will occur over time, as demands arise and landowners progress through the subdivision, the current study has been completed to guide these developments in terms of environmental concerns and impact mitigation. Adherence to the design/layout guidelines recommended in this report should avoid significant impacts from temporal crowding.

The stormwater management strategy for the property utilizes services that are already constructed and functioning. Therefore, the potential for temporal crowding is not seen as significant for this proposal.

#### *Spatial Lags*

Spatial lags occur in cases where potential impacts are not found for some distance from the proposed undertaking. An example of this is when wetland or aquatic features are affected due to changes in infiltration patterns some distance away. Maintenance of on-site surface flow and infiltration patterns as recommended by Gamsby & Mannerow is important to control off-site impacts.

#### *Temporal Lags*

Cumulative impacts that arise from temporal lags are those that occur after time has elapsed between the source of the impact and the possible effect. An example of this is when compounds released change to some more problematic compound after some time of exposure to the environment.

No cumulative impacts from temporal lags are anticipated to result from this development.

#### *Shared Impact Linkages*

Shared impact linkages are similar to spatial and temporal crowding, but focus on cases where more than one development that may not actually overlap in time or space, affects the same component of the ecosystem. An example of this is when one land use change affects the breeding grounds of a species, while a second development affects the over-wintering habitat of the same species. The proposed undertaking does not impact natural habitats nor affect wildlife movement patterns, and as such are not anticipated to result in impacts.

### 7.7 Preservation, Restoration and Enhancement of Natural Features

The Tree Preservation Plan has identified trees that overlap with the proposed development and site grading; it is anticipated that these trees will require removal to accommodate the proposed development. However, efforts should be made to retain and incorporate native, non-invasive trees and shrubs into the development plan where feasible. Where trees require removal,

transferrable individuals (e.g., saplings) should be transplanted to areas of the property outside of the development footprint. Protection fencing, in the form of silt fencing or hoarding, should be used to prevent unnecessary damage or disturbance to the root systems of retained vegetation as described in the Tree Preservation Plan.

Lands within the 5m Grading Limit should be left to naturally regenerate (with the exception of recommended removal of hazard trees and restorations described below) and should be left in a natural state. It is anticipated that lands west of the subject property boundary, on the Cityview Drive property, will continue to naturally regenerate into more mature woodland with the remaining row of mature trees along the property boundary forming its eastern edge. The integrity of this future woodland edge can be actively enhanced through removal of non-native species, and plantings of native, non-invasive tree and shrub species to supplement the existing stand. It is also recommended that land between the 5m Grading Limit and the 10m Development Limit be restored with vegetation plantings to enhance the ecological value of this development setback. This would include increasing the number and diversity of tree and shrub species within this zone. Selected species should be native to the region. Restoration plantings can be selected to ensure a more dense coverage within the 10m development setback zone, including along the subject property boundary, further mitigating human intrusion into areas of active restoration and natural regeneration, and natural features located west of the subject property. A Restoration Planting Plan is recommended to detail aspects of these plantings, such as species, numbers of individuals, and specific locations within the subject property.

The Landscape Plan for the subject property should incorporate native trees or shrubs, and preferentially species that are found within the surrounding region. Trees that are highly susceptible to disease (e.g. ash, affected by emerald ash borer (*Agilus planipennis*)) should be avoided. The establishment of woody vegetation within the subject property as a component of site development is anticipated to enhance the ecological quality of the property (e.g., through provision of additional bird nesting habitat) relative to the current site condition, which is largely devoid of trees, highly disturbed and dominated by invasive vegetation species.

## 7.8 Impact Assessment and Mitigations Summary

A summary of potential impacts associated with the proposed development, recommended mitigations and the significance of impacts once mitigated, are presented in Table 5.

**Table 6. Summary of potential development impacts, recommended mitigation measures and resulting significance of impact**

Potential Impact	Recommended Mitigation Measure(s)	Resulting Impact Significance
<b>Design and Construction Phase</b>		
Vegetation/habitat removal along the subject property west boundary	<ul style="list-style-type: none"> <li>• Limit unnecessary vegetation removal and degradation by clearly demarcating the boundaries of construction zones and any other areas required for construction of the proposed development;</li> <li>• Development limits for built structures and impervious surfaces (with the exception of the underground parking ramp to Building C) will respect the dripline plus 1m of all retained hedgerow trees, represented by the Development Limit boundary, in order to limit disturbance to these trees and associated edge habitat;</li> <li>• A 5m zone between the west property boundary and Grading Limit will be left as a no-touch zone within the site development (with the exception of recommended vegetation restoration), in order to buffer the adjacent row of mature trees, facilitate natural vegetation regeneration, and preserve the existing berm;</li> <li>• Root zones of the retained row of trees along the property boundary will not be impacted where grading is to occur up to the Grading Limit due to the historic removal of topsoil in the location of the swale immediately east of the Grading Limit;</li> <li>• Areas within 30m of the PSW boundary, outside of the 10m Development Limit, are to be considered passive amenity “greenspace” for the proposed development, including pervious surfaces (sod, gravel walking paths) and excluding buildings or other built structures (excluding the pool);</li> <li>• Tree removal will be individuals of fair to poor condition and/or representing a hazard and individuals within the proposed graded areas as shown in the Tree Protection Plan; removal of trees in fair-good condition should be minimized to the extent possible;</li> <li>• Existing lands within the subject property are not of high ecological quality and their removal is not considered to cause a significant impact to wildlife populations on the surrounding landscape;</li> </ul>	Not Significant
Bird nesting disruption and avoidance, and active nest destruction	<ul style="list-style-type: none"> <li>• Time vegetation removal activities to occur outside the typical bird breeding season (May 1 – July 31);</li> <li>• If vegetation removal must occur during the bird breeding season, retain an avian biologist to survey for active nests just prior to vegetation removal activities.</li> </ul>	Not Significant
Damage or other disturbance to the adjacent protected natural features and their vegetated buffers	<ul style="list-style-type: none"> <li>• Clearly demarcate the limits of construction with brightly coloured snow fencing or silt fencing following the recommended buffer setbacks (along Grading Limit; otherwise, property boundary);</li> <li>• Tree protection fencing with signage is to be installed around retained trees as described in the Tree Protection Plan;</li> <li>• Designated areas for construction lay-down, vehicle access and parking, equipment storage, materials stockpiling, and any on-site construction offices should be located entirely outside of the PSW buffer, and preferably not adjacent to the buffer;</li> </ul>	Not Significant

Potential Impact	Recommended Mitigation Measure(s)	Resulting Impact Significance
Wildlife avoidance of the area, and other impacts associated with dust, excessive noise, vibration, artificial lighting and proximity of human presence	<ul style="list-style-type: none"> <li>Moisten areas of bare, dry soil with water as needed during construction activities to reduce the amount of dust produced in areas of construction;</li> <li>Restrict the daily timing of construction activities to between 7:00hr and 19:00hr;</li> <li>Lighting associated with construction activities should be turned off following daily cessation of activities or directed away from adjacent natural features;</li> <li>These construction-related impacts are expected to be temporary, minimal and localized.</li> </ul>	Not Significant
Impacts to hydrologic regime within and adjacent to the subject property	<ul style="list-style-type: none"> <li>As described in Section 7.4.2, the proposed development is not anticipated to alter the hydrological regime within or outside of the subject property;</li> <li>If short-term de-watering is required during construction, de-watering should be subject to re-introduction to the system through re-infiltration or surface flow to the existing west property swale as described in Gamsby and Mannerow (2013b).</li> </ul>	Not Significant
Water Quality Impairment	<ul style="list-style-type: none"> <li>Implement erosion and sediment control measures;</li> <li>The development should be planned so that no more than 80% of the property comprises impervious surface in order to mitigate risk to drinking water resources from road salt application;</li> <li>Implement Spill Response Plan.</li> </ul>	Not Significant
Erosion and sedimentation	<ul style="list-style-type: none"> <li>Install erosion and sedimentation facilities prior to any area grading operations</li> <li>Inspect and monitor all erosion control measures, with repairs completed as required</li> <li>Operate and store all materials and equipment in a manner that prevents any deleterious substance from leaving the site</li> <li>Re-vegetate completed areas as soon as possible following construction</li> </ul>	Not Significant
Soil Compaction	<ul style="list-style-type: none"> <li>Construction vehicles and equipment are to be kept outside of the Grading Limit boundary, and their presence/use within the Development Limit and PSW buffer should be minimized;</li> <li>Stockpiles are to be located away from the natural features and PSW buffer.</li> </ul>	Not Significant
<b>Post-Construction Operations</b>		
Human entry into the adjacent natural features and setbacks, with associated disturbances (e.g., vegetation trampling, trail formation, litter)	<ul style="list-style-type: none"> <li>Lands within the 10m Development Limit, including the 5m Grading Limit, should be actively restored during the landscaping phase to remove non-native vegetation and to discourage human intrusion. A Restoration Planting Plan is recommended to further detail these recommendations.</li> <li>Signage should be installed warning of “no trespassing” within the adjacent natural features on the Cityview Drive property.</li> <li>A Condominium Owner’s Guide should be distributed to educate/inform residents about the importance of the adjacent natural features and how to mitigate impacts (e.g., such as caused by roaming cats).</li> </ul>	Not Significant
Impacts to wildlife in adjacent natural areas due to artificial lighting	<ul style="list-style-type: none"> <li>Install directional lighting to prevent lightwash of adjacent natural features</li> </ul>	Not Significant

## 8.0 Summary

NRSI was retained by Coletara Development to conduct an EIS for a proposed condominium and residential lot development at a property located southwest of the intersection of Starwood Drive and Watson Parkway South in Guelph, Ontario. This report provides a summary of the natural features within the study area and provides an analysis of impacts based on details of the proposed development provided by the project team (e.g., grading plan, hydrogeological and stormwater management study).

The subject property is currently dominated by disturbed lands historically removed of topsoil and deposited with fill. Natural features within the subject property are limited to an existing row of mature trees (predominantly bur oaks) along the west property boundary, which is surrounded by younger regenerating trees and shrubs along and immediately adjacent to the property boundary. A small number of young trees and shrubs occur within the largely open and disturbed land of the triangular northwest parcel. The main subject property parcel features a raised berm, with associated swale on its east side, which run parallel to the west property boundary for much of its length. Consequently the roots of trees located along the west property boundary do not extend out to their east-facing driplines due to the presence of the cut swale. The subject property is situated immediately east of 55 and 75 Cityview Drive, for which NRSI is currently completing a separate EIS for a development proposal (NRSI 2013), and is located northeast of a property referred to as "Cityview Ridge" for which an EIS was recently drafted by North-South Environmental (NSE 2012). As per the accepted TOR, data from these studies was utilized where applicable, in combination with original field data, to fully characterize the existing natural features and species located in the subject property and adjacent lands within 120m.

A portion of the Clythe Creek PSW occurs just west of the subject property boundary, within the Cityview Drive property. Consequently, an area of land 30m from the confirmed PSW boundary extends onto the west end of the subject property. The proposed development layout has been designed such that all buildings, roads, and most other impervious surfaces are located outside of this 30m zone from the PSW boundary. With the exception of a proposed swimming pool, lands within this 30m zone

are planned to consist of passive, pervious surfaces (e.g., sod, gardens, permeable surface walking paths).

A hydrogeological study completed for the subject property (Gamsby and Mannerow 2013b) concluded that the existing berm contains surface stormwater flow to within the property, preventing drainage to the adjacent Cityview Drive property and PSW. Stormwater drainage within the subject property currently flows along a southeast gradient toward an existing sediment basin prior to discharging water via storm sewer under Watson Parkway South to a stormwater management pond.

A hydrogeological assessment of the PSW concluded that it is surface water-fed, receiving drainage from lands outside of the subject property, and is not influenced by groundwater upwelling (Anderson GeoLogic Ltd. 2011). Further, groundwater flow through a majority of the subject property doesn't appear to be directed toward the PSW. As such, no hydrological impacts to the PSW or surrounding woodlands west of the subject property are anticipated due to the proposed development (Gamsby and Mannerow 2013b).

Based on these findings, a Development Limit, parallel to and 10m from the west property boundary, was delineated and considered sufficient to buffer the PSW from development. Built structures and impervious surfaces are to be generally excluded from the 10m development setback. Within that, a Grading Limit 5m from the west property boundary was delineated to define an area of natural regeneration and to retain and protect the existing berm and its surface hydrological separation of the abutting properties. These setbacks represent the primary constraints to development within the subject property.

The areas to be directly impacted by the proposed development are highly disturbed and therefore of low ecological quality. No significant natural features, or provincially significant plant or wildlife species will be directly impacted by the proposed development. The proposed development plan shows no structures or impervious surfaces within the 10m Development Limit.

The locally significant species Baltimore oriole and American redstart were collectively observed within the adjacent Cityview Drive and Cityview Ridge properties, and suitable edge habitat exists for these species along the western boundary of the subject property. Proposed vegetation removal will represent a negligible loss of habitat for these species relative to the core habitat found elsewhere within the adjacent properties; consequently, the proposed development is not anticipated to significantly impact these species. Three SWH types initially identified as having potential to occur within the subject property (snake hibernacula, and habitat for the species of conservation concern red-headed woodpecker and common nighthawk) were determined not to be present within the study area.

A Restoration Plan, as part of a Landscape Plan, is recommended to guide restoration of the existing vegetation within the 10m development setback, including removal of non-native species and directed plantings of native, non-invasive tree and shrub species selected as appropriate for the local conditions (e.g., soils, topography). Similarly, establishment of a diverse assemblage of native landscape tree species within the proposed development, as directed by a Landscape Plan, will represent an improvement in tree cover and habitat opportunities (e.g., by providing additional bird nesting habitat) relative to the existing conditions.

Recommendations are provided to minimize impacts and ensure that mitigation measures are installed and functioning. These include recommendations to mitigate direct, indirect, induced, and cumulative impacts that may arise during the proposed development. If these recommendations are implemented, negative impacts arising from this development are not anticipated.

Table 6 summarizes how the recommendations of the Clythe Creek Overview Study are met through a combination of avoidance of direct impact, and recommendations of mitigation measures, and restoration and enhancement opportunities.

**Table 7. Summary of Clythe Creek Overview Study recommendations with associated comments and proposed mitigations related to the proposed development.**

Study Recommendation	Context/Details of Recommendation	Suggested Measure of how to Address Recommendation
#1- Upland woodland areas are to be retained where possible	<ul style="list-style-type: none"> <li>a) Historical clearing of vegetation has impacted the Clythe Creek subwatershed resulting in reduced forest cover, reduced wildlife habitat, degradation of wetlands, degradation of aquatic habitat and water quality within Clythe Creek and its tributaries.</li> <li>b) Retention of existing woodlands and natural vegetation is important to help conserve diversity</li> <li>c) The restoration of natural areas is recommended to increase woodland cover.</li> </ul>	<ul style="list-style-type: none"> <li>a) The proposed development does not encroach into the woodlands located on the neighbouring properties.</li> <li>b) Native plantings within the defined development setbacks will enhance existing woodland cover.</li> </ul>
#2- Natural Areas/Wildlife	<ul style="list-style-type: none"> <li>a) Restoration of natural areas is recommended to increase woodland cover, including planting native trees and plants</li> <li>b) Detailed plant and wildlife surveys are recommended as part of subsequent EIS. Opportunities for enhancement of natural vegetation areas should be examined. Planting native tree and plants is recommended to increase wildlife habitat.</li> </ul>	<ul style="list-style-type: none"> <li>a) Native plantings within the defined development setbacks will enhance existing woodland cover and wildlife habitat.</li> <li>b) Detailed plant and wildlife surveys were undertaken as part of the EIS in combination with the EIS work completed for the adjacent properties.</li> </ul>
#3- Wetlands and Other Sensitive Habitats	<ul style="list-style-type: none"> <li>a) A complete OWES evaluation should be conducted on associated wetlands</li> <li>b) Wetlands are to be maintained</li> <li>c) Appropriate width buffers of natural vegetation are to be retained or created along wetland areas for the protection of sensitive habitats</li> </ul>	<ul style="list-style-type: none"> <li>a) This evaluation has been completed by OMNR</li> <li>b) The proposed development will not encroach upon the wetland</li> <li>c) Lands within 30m of the PSW boundary have been identified on the subject property; however, due to existing site conditions (e.g., presence of berm separating surface drainage between properties), alternative setbacks to the PSW have been proposed as described in Section 5.1</li> </ul>
#4- Preservation and Enhancement of Aquatic Habitat	<ul style="list-style-type: none"> <li>a) Removal of existing on-line ponds</li> <li>b) Use of dry or wet ponds with modified subsurface discharges to help lower water temperatures</li> <li>c) Preservation and augmentation of tree cover along creeks to mediate stream temperature</li> </ul>	<ul style="list-style-type: none"> <li>a) Not applicable to the study area</li> <li>b) Not applicable as SWM pond (wet pond) already exists east of Watson Pkwy S. Modifications to this pond is outside the scope of this project</li> <li>c) Not applicable as no watercourses are present</li> </ul>

	d) The use of natural channel design techniques and bioengineering methods to increase quality of aquatic habitat	within the subject property d) Not applicable as no watercourses are present within the subject property
#5- Groundwater	<p>a) Groundwater inputs to watercourses are to be maintained</p> <p>b) Existing groundwater recharge conditions must be maintained</p> <p>c) Any groundwater takings (dewatering) must be evaluated to ensure local aquatic and terrestrial functions are maintained</p> <p>d) Groundwater quality degradation from road salting, fertilizer, spills, septic systems, etc is to be controlled</p>	<p>a) At its closest point, the subject property is approximately 220 m from Clythe Creek with no water courses on the subject property. Based on the limited size of the subject property compared to the overall catchment area and distance from the creek, impacts to the groundwater system beyond the local scale are not expected. Groundwater flow patterns are expected to be maintained as part of development with no impacts to the adjacent PSW. Consequently, groundwater inputs to the Clythe Creek system are not expected to be impacted.</p> <p>b) Pre-development, stormwater run-off is collected in a temporary stormwater pond/sediment basin with overflow via a catch-basin to the municipal stormwater pond, on the opposite (i.e. east side) of Watson Parkway. Recharge occurs through the filled and vegetated areas of the property. Post-development, a portion of recharge will be maintained by surface discharge of stormwater from the roof for sheet flow and infiltration. The remaining stormwater run-off from impermeable areas will be directed to the municipal stormwater pond via catch basins and piping, where water will be subject to infiltration and/or overflow to Clythe Creek. Consequently, overall inputs to the Clythe Creek system are expected to remain similar, pre- and post- development.</p> <p>c) No groundwater dewatering is currently planned as part of the development, with structures proposed to be completed above the high water table. Should some structural works (such as footings or foundations) extend below the water table, temporary dewatering may be required. Dewatering over 50,000L per day will require a Permit to Take</p>

		<p>Water from the MOE, with review and evaluation of the potential to impact local resources under that process. Should dewatering be required as part of construction, it is recommended that it be discharged on-site for overland flow and recharge.</p> <p>d) Based on the proposed development, impacts to groundwater quality are not anticipated. Run-off water quality is designed to be controlled within the municipal stormwater pond.</p>
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**APPENDIX I**  
Functional Servicing Report (Gamsby and Mannerow)

**FUNCTIONAL SERVICING REPORT  
PROPOSED RESIDENTIAL DEVELOPMENT  
COLETARA DEVELOPMENTS  
STARWOOD DRIVE AND WATSON PARKWAY  
CITY OF GUELPH**

**GAMSBY AND MANNEROW LIMITED  
PEOPLE ENGINEERING ENVIRONMENTS  
GUELPH – OWEN SOUND – LISTOWEL – KITCHENER – EXETER**

November 2013  
Our File: 412-086



Gamsby and Mannerow  
ENGINEERS



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**FUNCTIONAL SERVICING REPORT  
PROPOSED RESIDENTIAL DEVELOPMENT  
COLETARA DEVELOPMENTS  
STARWOOD DRIVE AND WATSON PARKWAY  
CITY OF GUELPH  
Our File: 412-086  
November 6, 2013**

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## **1.0 INTRODUCTION**

In support of the Zone Change Application, this functional servicing report has been prepared by Gamsby and Mannerow Limited to document the preliminary servicing requirements for the proposed residential development at Starwood Drive and Watson Parkway in the City of Guelph.

The topographic survey of the site was provided by Stantec Consulting Limited on November 29, 2012. The site layout was prepared by Michael Spaziani Architect Inc. (dated July 12, 2013). The existing and proposed site details are shown on the General Plan (Gamsby and Mannerow Limited Drawing No. 1).

## **2.0 EXISTING CONDITIONS**

### **2.1 LAND USE**

The 2.71-hectare site is currently vacant. The site includes a temporary sediment basin that was constructed at the time of the Grangehill Estates development. The site is bound by Starwood Drive to the north, existing residential development and wood lot to the west, existing wood lot to the south, and Watson Parkway North to the east.

### **2.2 TOPOGRAPHY**

The site generally drains in a northwest to southeast direction at an average gradient of 2%, towards the temporary sediment basin located in the southeast corner of the site. The temporary sediment basin discharges via an existing ditch inlet catchbasin to the existing municipal storm sewer on Watson Parkway, ultimately outletting to the existing municipal stormwater management facility on the east side of Watson Parkway North.

### **2.3 SOILS**

A geotechnical investigation of the site was completed by EXP Services Inc. (dated November 28, 2011). From the borehole logs, the subsurface soils are described as sandy silt till, comprising of sandy silt, trace gravel, and scattered with seams of wet silt and sand. Due to the high silt content of the on-site soils, opportunities for recharge will be limited. A copy of the geotechnical investigation has been included in Appendix "A".

people engineering environments

Gamsby and Mannerow Limited • Guelph, Owen Sound, Listowel, Kitchener, Exeter

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### **3.0 PROPOSED DEVELOPMENT**

The intent of the Owner at this time is to develop five (5) residential condominium buildings and one (1) common amenity building, along with the associated below grade and surface parking, driving and landscaped areas. Following development of the site, the ground cover will include rooftop, asphalt and landscaped areas.

Under this application the Owner is also proposing to develop four (4) single family lots along the Starwood Drive frontage.

### **3.1 SITE GRADING**

The site layout and internal roads are shown on the General Plan (Gamsby and Mannerow Limited Drawing No. 1). The grade and elevations of the internal road network and proposed buildings are controlled by the existing centre line road elevation of Watson Parkway North and Starwood Drive, and the major overland flow route to Watson Parkway North.

The site has been graded to match the existing elevations along the property limits where feasible.

Proposed grading of the four (4) single family lots has not been included with this submission. Grading of the four (4) lots will be completed under separate application to conform with the City of Guelph requirements and to match the existing grades on Starwood Drive and the adjacent lots.

### **3.2 WATER SUPPLY**

Water service for the proposed development will be provided by the extension of a 150 mm diameter watermain from the existing 150 mm diameter watermain stub on Starwood Drive. The 150 mm watermain will be extended throughout the site to the existing 150 mm diameter watermain stub on Watson Parkway North, to provide a looped connection. On-site fire hydrants will be installed as required to provide the necessary fire protection.

As part of the site plan approval process for the site, the water service sizing, and points of connection within the right-of-way will be confirmed.

Water service for the four (4) single family lots will be provided via the extension of individual water service laterals from the existing 300 mm watermain on Starwood Drive.

### **3.3 SANITARY SERVICE**

The extension of a 200 mm diameter sanitary sewer from the existing 525 mm diameter sanitary sewer on Watson Parkway North will provide sanitary service to the residential development. The sanitary sewer (minimum grade of 0.5%) will be installed at sufficient depth to provide a gravity outlet for the below grade parking garages.

As part of the site plan approval process for the site, the sanitary sewer service sizing and connection location within the right-of-way will be confirmed.

Sanitary service for the four (4) single family lots will be provided via the extension of individual sanitary service laterals from the existing 450 mm sanitary sewer on Starwood Drive.

### **3.4 STORM SEWER**

Storm service for the proposed development will be provided by the extension of a 675 mm diameter storm sewer service from the existing 2400 mm x 1200 mm box storm sewer on Watson Parkway North. The existing box storm sewer outlets to the existing municipal stormwater management facility, located on the east side of Watson Parkway North.

On-site storm sewers will be sized to convey the 5-year design storm event. The storm sewers (minimum grade of 0.5%) will be installed at a minimum depth of 1.5 metres below the finished grade where feasible. Where 1.5 meters of cover is not feasible, insulation will be provided.

Based on an allowable runoff coefficient for the site of  $C=0.75$ , as provided by the City of Guelph (dated September 25, 2013), on-site stormwater management controls will not be required.

Major storm runoff from the site will be conveyed within the limits of internal road network, discharging to the Watson Parkway North right-of-way and ultimately to the existing municipal stormwater management facility located on the east side of Watson Parkway North.

Runoff generated from the rooftops of the proposed buildings will discharge directly to the on-site storm sewer system.

The lands to the west of the site, which consist of the rear yards of the residential lots on Silurian Drive (approximately 0.73 hectares), currently discharge to the northwest corner of the site and are conveyed overland to the existing sediment basin. As part of this development, the existing sediment basin will be removed and the elevation of the site will be raised. In order to provide an outlet for the runoff generated from the external lands, a catchbasin and 450 mm diameter storm sewer will be provided at the northwest corner of the site, discharging to the existing 900 mm diameter storm sewer stub from Starwood Drive.

As part of the site plan approval process for the site, the storm sewer service sizing and connection locations will be confirmed.

Foundation drainage for the proposed four (4) single family lots will be provided via sump pumps discharging to grade. Stormwater management controls for the four (4) lots has not been provided. Runoff generated from the four (4) lots will be directed to either the Starwood Drive right-of-way or towards the existing wetland area.

#### **4.0 SEDIMENT AND EROSION CONTROL PLAN**

A silt fence will be installed along the property boundary in all locations where runoff will discharge from the site to adjacent lands. The silt fence will serve to minimize the opportunity for water borne sediments to be washed on to the adjacent properties.

Once catch basins have been installed, the grates will be wrapped with filter cloth. This feature will be maintained until all building and landscaping has been completed.

Inspection and maintenance of all silt fencing will start after installation is complete. The fence will be inspected on a weekly basis during active construction or after a rainfall event of 13 mm or greater. Maintenance will be carried out, within 48 hours, on any part of the facility found to need repair.

Once construction and landscaping has been substantially completed, the silt fence will be removed, any accumulated sediment will be removed and the landscaping will be completed.

After construction of the complete development, erosion will not occur and sediment transport will be minimal.

## 5.0 CONCLUSIONS

In summary:

- Connection to the existing 150 mm diameter watermain stubs on Watson Parkway North and Starwood Drive will provide water service to the proposed development.
- The extension of a 200 mm diameter sanitary sewer from the existing 525 mm diameter sanitary sewer on Watson Parkway North will provide sanitary service to the development.
- Storm sewers will be designed to convey the 5-year design storm and will discharge to the existing 2400 mm x 1200 mm box storm sewer located on Watson Parkway North, ultimately discharging to the existing municipal stormwater management facility located on the east side of Watson Parkway North.
- As part of the site plan approval process for the site, the water, sanitary and storm service sizing, and points of connection within the right-of-way will be confirmed.
- Major storm runoff will be conveyed within the limits of internal road network, discharging to the Watson Parkway North right-of-way and ultimately to the existing municipal stormwater management facility located on the east side of Watson Parkway North.
- Prior to construction, a silt fence will be installed along the property boundary in all locations where runoff will discharge from the site to adjacent lands. This will minimize the transport of sediment off-site during the construction period.

All of which is respectfully submitted.

GAMSBY AND MANNEROW LIMITED

Per:



Angela Kroetsch, P.Eng.



Encl.  
SP/AK

cc. Helmuth Strobel, Coletara Development

W:\Kitchener\412-2012\412086\Reports and Manuals\412086 Functional Servicing Report\_November\_2013-11-06.doc

**FUNCTIONAL SITE SERVICING REPORT  
PROPOSED RESIDENTIAL DEVELOPMENT  
COLETARA DEVELOPMENTS  
STARWOOD DRIVE AND WATSON PARKWAY  
CITY OF GUELPH  
Our File: 412-086  
November 6, 2013**

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**APPENDIX "A"  
GEOTECHNICAL INVESTIGATION**

**EXP Services Inc. (dated November 28, 2011)**

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## **Guelph Watson 5-3 Inc.**

**Geotechnical Investigation  
Proposed Townhouse Development  
Watson Parkway North and Watson Road  
Town of Guelph, Ontario**

**Project Number**  
BRM-00601607-A0

**Prepared By:**  
**exp Services Inc.**  
70 Gibson Drive, Unit 12  
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Canada

**Date Submitted**  
November 28, 2011

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## 1. Introduction

This report presents the results of a geotechnical investigation carried out for the proposed townhouse development in the Town of Guelph, Ontario. The work was authorized by Mr. Peter Murphy of Guelph Watson 5-3 Inc.

The proposed development is located on the east and west sides of Watson Parkway North, south of Watson Road in the Town of Guelph, Ontario. The project involves the development of a proposed townhouse subdivision together with the necessary municipal infrastructure such as roads, sewers, water and other services.

The purpose of the geotechnical investigation was to determine the subsurface soil and groundwater conditions at the site and, based on this information, to provide an engineering report with geotechnical recommendations pertaining to the design and construction of the proposed residential development.

The comments and recommendations given in this report are based on the assumption that the above-described design concept will proceed into construction. If changes are made either in the design phase or during construction, this office must be retained to review these modifications. The result of this review may be a modification of our recommendations or it may require additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

As part of the Terms of Reference for this investigation, limited environmental sampling and testing was carried out to provide a preliminary assessment of the chemical quality of the soils at the site.

## 2. Site Description

The Site is located on the west and east sides of Watson Parkway North, south of Watson Road in the Town of Guelph, Ontario. The site generally comprised open undeveloped land. A stockpile of topsoil is located at the southwest corner of Watson Parkway North and Watson Road, and an existing library building is located at the northwest corner of Watson Parkway North and Starwood Drive.

The site is generally flat and the ground surface generally sloping downwards toward the south side of the property.

### 3. Fieldwork

The fieldwork was carried out on October 31 and November 1, 2011, and comprised fifteen (15) sampled boreholes put down at the approximate locations shown on the attached Borehole Location Plan (Drawing No. 1).

The boreholes were advanced to a depth of about 6.5 m below existing grade. One borehole terminated at a depth of 3.3 m due to auger refusal. The boreholes were advanced using continuous flight solid stem auger equipment owned and operated by a specialist drilling contractor. In each borehole, samples were recovered using a conventional split spoon equipment and standard penetration test method.

Water levels were observed in the open boreholes during the course of the fieldwork. In addition, monitoring wells were installed in four (4) boreholes to establish the stabilized groundwater level at the site.

The fieldwork was supervised throughout by an **exp** soils engineer who directed the drilling and sampling operations, prepared borehole logs, made groundwater observations during and upon completion of drilling, and processed the recovered samples. In the laboratory, the samples were classified as to their olfactory, visual and textural characteristics. Natural moisture content tests were carried out for all recovered samples, with results presented on the Log of Borehole sheets. In addition, grain size analysis was carried out on two (2) soil samples.

Borehole locations and ground surface elevations were located in the field by **exp Services Inc.** The ground surface elevation at each borehole location was referenced to a temporary benchmark (TBM) as described below:

TBM: Top nut of fire hydrant in the parking lot  
near the northwest of existing library

Elevation: 100.00 m (assumed)

## 4. Subsurface Conditions

### 4.1 Subsoils

The detailed profiles encountered in each borehole and the results of laboratory moisture content are indicated on the attached borehole logs (Drawing Nos. 2 to 16). It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect transition zones, for the purpose of geological design and should not be interpreted as exact planes of geological change. The "Notes on Sample Description" preceding the borehole logs are an integral part of and should be read in conjunction with this report.

The stratigraphy encountered at the site, as revealed in the boreholes, is variable and generally comprised sandy silt and sandy silt till, overlying a deposit of sand in Boreholes 3, 7, 8 and 14. A sand and gravel layer was encountered below the sandy silt till in Boreholes 4 and 11. Locally, surficial pavement structure and fill was encountered in Borehole 9. In Borehole 14, the sandy silt unit was described as possible fill.

A brief description of the soil profiles, in order of depth, follows:

#### ***Pavement Structure***

Borehole 9 was put down on the existing pavement structure adjacent to the library and encountered surficial pavement structure comprising about 65 mm asphaltic concrete over 225 mm of granular base materials.

#### ***Fill***

Fill was encountered below the surficial pavement structure in Borehole 9. The fill extended to a depth of about 2.8 m below existing grade. The fill material comprised brown sandy silt, with trace gravel. The relative density of the fill was typically loose. Moisture contents of the fill ranged from about 6 to 13 %.

#### ***Sandy Silt***

A discontinuous surficial deposit of sandy silt was encountered in Boreholes 1, 2, 5, 13, 14 and 15, extending to depths of about 0.6 to 3.1 m below existing grade. In Borehole 14, the sandy silt deposit contained topsoil inclusions (possible fill). This deposit was found to be loose to compact. Moisture contents ranged from 6 to 13 %, indicating a moist to wet condition. A grain size analysis was carried out for a representative soil sample. The results are shown on the enclosed Appendix A.

***Sandy Silt Till***

A sandy silt till deposit was encountered in all the boreholes. In Boreholes 4, 5, 6, 7, 8, 11 and 14 the sandy silt till deposit extended to depths ranging from about 3.1 to 6.2 m. Borehole 13 refused on a boulder at a depth of 3.3 m below existing grade. The sandy silt till extended to beyond the maximum investigated depth of about 6.5 m in the other boreholes. The glacial till comprised sandy silt, trace gravel, and scattered wet silt and sand seams. Cobbles and boulders were noted within the sandy silt till deposit. The relative density of the sandy silt till was found to be compact to very dense. Moisture contents of the sandy silt till deposit ranged from 4 to 15 %, but typically about 7 to 9 %. A grain size analysis was carried out for a representative soil sample. The results are shown on the enclosed Appendix A.

***Sand***

Below the sandy silt till, a deposit of sand was encountered in Boreholes 3, 7, 8 and 14, and extends to beyond the maximum investigated depth of about 6.5 m below existing grade. The sand deposit was found to contain some gravel and existed in a compact to very dense state. Moisture contents ranged from 6 to 19 %, indicating a moist to saturated condition.

***Sand and Gravel***

Locally, a sand and gravel deposit was encountered below the sandy silt till in Boreholes 4 and 11, and extends to beyond the maximum investigated depth of about 6.5 m below existing grade. This deposit contained cobbles and boulders and was found to be very dense. Moisture content was about 4 %, indicating a moist condition.

**4.2 Groundwater**

Groundwater conditions were observed in the open boreholes during the course of the fieldwork and in the piezometers installed in selected boreholes for subsequent groundwater measurements.

Piezometers were installed in Boreholes 4, 6, 11 and 13. The measured groundwater levels are presented in the table below:

**Table 1:  
Groundwater Level Readings**

Borehole No.	Water Level Measurement (m)	
	On Completion	November 16, 2011
1	5.89	-

2	4.37	-
3	2.59	-
4	Dry	(15 days) 6.05
5	3.58	-
6	6.52	(16 days) 6.10
7	5.03	-
8	Dry	-
9	5.03	-
10	6.05	-
11	5.03	(15 days) 5.83
12	Dry	-
13	5.03	(15 days) 5.85
14	4.56	-
15	4.02	-

Upon completion of drilling, groundwater levels ranging from 2.59 m to 6.52 m below existing grade were recorded in most of the boreholes. No free ground water was encountered in Boreholes 4, 8 and 12 upon completion of drilling. After a period of approximately 15 to 16 days, groundwater levels measurements in the piezometers installed in the boreholes ranged from 5.83 m to 6.10 m below existing grade.

The groundwater levels reflect the conditions at the time of the investigation. Groundwater levels are subject to seasonal fluctuations.

## 5. Engineering Discussion and Recommendations

### 5.1 General

The project involves the development of a proposed townhouse subdivision together with the necessary municipal infrastructure such as roads, sewers, water and other services.

The following subsections provide geotechnical engineering guidelines for the design and construction of the proposed development.

### 5.2 Site Grading

Final site grades had not been established at the time of this investigation. However, it is anticipated that some regrading (cut and fill operations) will be carried out at the site.

The following procedures are recommended for the construction of cut and fill operation for roads and building areas at the site, where required:

1. All pavement structure topsoil, organic, debris or deleterious materials should be removed from the proposed pavement areas. Within the proposed building areas, the existing fill/possible fill should also be removed.
2. The exposed subgrade surface should be proofrolled with a heavy roller and inspected by geotechnical personnel from **exp Services Inc.** Any loose spots encountered during the process should be subexcavated and replaced with approved on-site or imported materials, compacted to 100 % standard Proctor maximum dry density.
3. The area can then be brought up to the final subgrade level with approved on-site or imported material. The material should be placed in lifts not exceeding 300 mm and compacted to at least 95 % standard Proctor maximum dry density to within 300 mm of final subgrade level for the roads. The upper 300 mm of final subgrade level should be compacted to at least 98 % standard Proctor maximum dry density. Compaction to 100 % standard Proctor maximum dry density is recommended within the proposed building areas.
4. Fill slopes should not be steeper than two horizontal to one vertical and should be protected from surface erosion with sodding.
5. All backfilling and compaction operations must be supervised on a full-time basis by geotechnical personnel from **exp Services Inc.** to approve material and ensure the specified degree of compaction has been obtained.
6. The soil bulking factors (i.e. volume after excavation/volume before excavation) for the on-site excavated materials are typically in the range of 1.1 to 1.2.

## **5.3 Sewer and Watermain Installation**

### **5.3.1 Excavation and Groundwater Control**

The sewer trenches are expected to extend up to 5 m below existing grade. Based on the results of the investigation, excavation will generally be carried out within the native sandy silt, sandy silt till and sand.

It is considered that excavation may be carried out in open cuts using conventional equipment. Side slopes of temporary excavation must conform to the Occupational Health and Safety Act (OHSA) and local regulations. Within the meaning of OHSA, the sandy silt, sandy silt till and moist sand are classified as Type 2 soils; the wet sand deposit is classified as a Type 3 soils. Locally, within the variable surficial deposits where loose/soft materials are encountered, or within zones of persistent seepage at depth, it may be necessary to flatten the side slopes.

In general, for excavations carried out within the sandy silt, sandy silt till and moist sand, it is our opinion that seepage from the wet sand seams within these deposits which enter the trench excavation can be controlled and removed by conventional sump pumping techniques in conjunction with oversized excavations.

Where wet sand deposits are encountered at deeper depths (i.e. Borehole 3), a more extensive groundwater control measures may be required. The groundwater level should be depressed to at least 0.6 m below the invert level prior to installing the pipes. It is further recommended that test pits be excavated to the proposed invert levels along the proposed sewer alignment in this area prior to final tendering in order to further assess the dewatering requirement. Prospective contractors are encouraged to attend in order to evaluate the effectiveness of dewatering using their own equipment. Any dewatering control systems should be designed and installed by specialist contractors.

### **5.3.2 Pipe Bedding**

It is anticipated that sewer pipes with inverts located at a depth of up to 5 m below the existing grade will be founded in the native compact sandy silt till or sand.

In general, the pipe bedding may consist of a minimum thickness of 150 mm of compacted OPSS Granular "A" material. Where wet conditions are encountered, the pipe bedding may comprise 150 mm of 19 mm clear stone material. However, the clear stone bedding must be completely wrapped in a geotextile filter fabric with a filtration opening size of 100 microns or smaller to prevent the migration of fines from the surrounding soils, which may result in settlement of the pipes.

The bases of the excavation in the competent native soils should remain stable provided adequate groundwater control is implemented and excavations are not left open for extended periods of time and the work is done in accordance with good construction practice.

The bedding material should be placed in thin lifts not more than 150 mm thick and compacted to at least 95% standard Proctor maximum dry density. Particular attention should be given to ensure material placed beneath the bottom quadrants of the pipe is adequately compacted.

Backfill within a 300 mm thick zone above the pipe should also consist of granular material which can be more readily compacted with light equipment to avoid damaging the pipes.

### **5.3.3 Backfilling Operations**

The existing native soils which are not contaminated with organic/topsoil and other obviously unsuitable material may be reused as trench backfill if the moisture content are within 2 percent of their optimum values. In this regard, the majority of the excavated soils are generally suitable for proper compaction. Any large boulders encountered should be removed from the backfilling material. Locally, wet sand deposits may be encountered and will require some drying for proper compaction.

Any excavated topsoil/organic should not be used for trench backfilling purposes. These materials may be used in landscaping areas. The topsoil may also be used in open parklands subject to approval by the Town.

Any organic or excessively wet or otherwise deleterious material should not be used for backfill purposes. Any shortfall of suitable on-site excavated material can be made up with imported clean approved fill or granular material, OPSS Granular 'B' or equivalent.

In general, the native sandy silt and sandy silt till are not free draining and therefore should not be used where this characteristic is required, or in confined areas. Imported granular material conforming to OPSS Granular 'B' would also be suitable for these purposes.

In areas where substantial cutting and filling is required, the compaction of the fill should be monitored full-time by a representative of this office.

All backfilling and compaction operations must be closely examined by representatives of this office to ensure uniform compaction to specification requirements, especially in the vicinity of manholes and catchbasins, near the ends of compaction runs, and in all areas that are not readily accessible to compaction equipment, etc. All backfilling should be placed in maximum 300 mm horizontal lifts and uniformly compacted to 95 % standard Proctor maximum dry density. Within the upper 300 mm of road subgrade, the fill material should be compacted to at least 98 % standard Proctor maximum dry density. Smaller lifts may be required depending on the size of compaction equipment used by the contractor and the moisture content of fill at the time of construction.

To minimize potential problems, backfilling operations should follow closely after excavation so that only minimal length of trench slope is exposed. This will minimize wetting of the subgrade material. Should construction extend to the winter season, particular attention should be given to ensure that frozen material is not used as backfill.

### **5.3.4 Sedimentation Control**

For sedimentation control, silt fencing should be installed around the site perimeter using a geotextile filter fabric such as Terrafix R270.

## **5.4 House Construction**

### **5.4.1 Foundation Considerations**

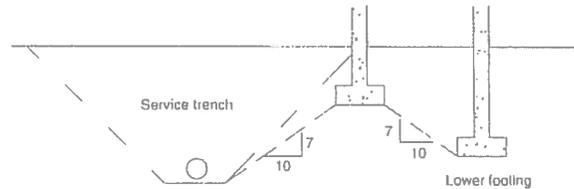
Based on the results of the investigation, it is considered that the site is generally suitable for construction of residential dwellings. In general, footings founded on the native compact sandy silt or sandy silt till below all existing fill/possible fill at or below depths of about 1 to 3 m may be designed using a bearing capacity of 150 kPa (S.L.S), subject to inspection by **exp Services Inc.** during construction. The factored bearing capacity at ULS is 225 kPa.

In any proposed fill areas at the site, structures may be founded on compacted 'engineered fill' and also designed for a bearing capacity of 150 kPa (S.L.S) and 225 kPa at ULS. The engineered fill should be constructed, following the guidelines set out in the 'Site Grading' section, with approved on-site or imported material compacted to 100 % standard Proctor maximum dry density, under full-time monitoring by **exp Services Inc.** The native soils will be suitable for engineered fill purposes. Portion of the soils may require air drying for proper compaction. The boundaries of the 'engineered fill' must be laid out by a surveyor in consultation with engineering staff from **exp Services Inc.**

Masonry structures built from concrete blocks or bricks are very sensitive to differential settlements and the walls can crack as a result of the slightest movement. We recommend that whenever the footings are supported on engineered fill, poured concrete basement walls should be reinforced with 2-15M steel rebars above the footings and below the window sill. If the basement walls are made from concrete blocks, equivalent top and bottom reinforcing should be provided as designed by a structural engineer.

#### **5.4.1.1 Foundation General**

Footings which are to be placed at different elevations should be located such that the higher footings are set below a line drawn up at 10 horizontal to 7 vertical from the near edge of the lower footing, as indicated on the following sketch:



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

All footings exposed to seasonal freezing conditions should be protected from frost action by at least 1.2 m of soil cover or equivalent insulation, depending on the final design requirements.

The total and differential settlements of well designed and constructed footings placed in accordance with the above recommendations, are expected to be less than 25 mm and 20 mm, respectively.

It should be noted that the recommended bearing capacities have been calculated by **exp** from the borehole information for the design stage only. The investigation and comments are necessarily ongoing as new information on underground conditions becomes available. For example, it should be appreciated that modifications to bearing levels may be required if unforeseen subsoil conditions are revealed after the excavation is exposed to full view or if final design decisions differ from those assumed in this report. For this reason this office should be retained to review final foundation drawings and to examine footing conditions.

#### 5.4.2 Floor Slab Construction and Permanent Drainage

The floor slab may be constructed as a slab-on-grade on a properly prepared subgrade (i.e. on native undisturbed soils or engineered fill). In this regard, all topsoil, fill and other obviously unsuitable material should be removed from the entire underfloor area and the exposed subgrade thoroughly proofrolled. Any soft spots detected should be sub-excavated and the area brought up to design grades using approved clean fill in the manner described in the "Site Grading" section of this report.

A 200 mm layer of 19 mm clear stone should be placed between the prepared subgrade and the floor slab to serve as a moisture barrier.

It is recommended that the foundation walls be covered with a bituminous spray and a drainage sheet. In addition, a weeping tile surrounded with 300mm of 19 mm clear stone and wrapped with a filter cloth should be installed around the perimeter of the basement and connected to a frost free outlet.

#### 5.4.3 Earth Pressure on Subsurface Walls

The lateral earth pressure acting on the basement walls may be calculated from the following equation:

$$p = k(\gamma h + q)$$

Where:  $p$  = the pressure on kPa acting against any subsurface wall at depth,  $h$ , below the ground surface;

$k$  = the earth pressure coefficient considered to be appropriate for the subsurface walls, for this case, 0.4;

$\gamma$  = the bulk unit weight of the retained free draining granular backfill;  
20.4 KN/m<sup>3</sup>

$h$  = the depth in m below the ground surface at which the pressure,  $p$ , is to be computed; and

$q$  = the value of any adjacent surcharge in kPa which may be acting close to the wall.

The above expression assumes that there will be no significant build-up of hydrostatic pressure behind the wall.

## 5.5 Pavement Construction

The recommended pavement structures provided in Table 2 are based upon an estimate of the subgrade soil properties determined from visual examination and textural classification of the soil samples. Consequently, the recommended pavement structures should be considered for preliminary design purposes only. A functional design life of fifteen years has been used to establish the pavement recommendations. This represents the number of years to the first rehabilitation, assuming regular maintenance is carried out. Other thickness combinations can be used provided the Granular Base Equivalency (GBE) is maintained and any minimum component thickness specified by the Town of Guelph.

**Table 2**  
**Recommended Pavement Structure Thickness**

Pavement Layer	Compaction Requirements	Local Residential Roadways
Asphaltic Concrete	92 – 96.5 % Maximum Relative Density	40 mm HL-3 50 mm HL-8
19 mm Crusher-Run Limestone or Sand and Gravel Material meeting OPSS Granular 'A' Base requirements	100% SPMDD*	150 mm

50 mm Crusher-Run Limestone or Sand and Gravel Material meeting OPSS Granular 'B' Base requirements	100% SPMDD *	300 mm
---	--------------	--------

+ Not more than 5% passing No. 200 Sieve

\* Denotes standard Proctor maximum dry density, ASTM-D698

The subgrade must be compacted to 98 % SPMDD for at least the upper 300 mm.

The foregoing design assumes that construction is carried out during dry periods and that the subgrade is stable under the load of construction equipment. If construction is carried out during wet weather, and heaving or rolling of the subgrade is experienced, additional thickness of sub-base course material may be required.

The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped to provide effective surface drainage toward catchbasins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening.

Additional comments on the construction of roadways are as follows:

1. As part of the subgrade preparation, proposed roadways should be stripped of any organic/topsoil and other obviously unsuitable material. Fill required to raise the grades to design elevations should be organic-free and at a moisture content which will permit compaction to the densities indicated. The subgrade should be properly shaped, crowned then proofrolled in the full-time presence of a representative of this office. Soft or spongy subgrade areas should be subexcavated and properly replaced with suitable approved backfill compacted to 95% SPMDD.
2. Longitudinal subdrains should be installed along the curbs since the subgrade will comprise poorly drained silty soils.
3. To minimize the problems of differential movement between the pavement and catchbasins/manhole due to frost action, the backfill around the structures should consist of free-draining granular such as Granular 'B' sand and gravel material.
4. The most severe loading conditions on the pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted lanes, half-loads during paving, etc. may be required, especially if construction is carried out during unfavorable weather.

## 5.6 Limited Environmental Soil Testing

Six (6) soil samples were submitted for chemical analysis. The samples were analyzed for selected general and inorganic parameters to determine the chemical nature of the in-situ soils and the disposal options for excess soil generated at the site during construction. The results were compared with soil standards listed in Table 2 (Full Depth Generic Site Condition Standards in a Potable Ground Water Condition) and Table 3 (Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition) from the "Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act", dated July 27, 2009. The results are enclosed in Appendix B.

Based on the analytical results, all the soil samples tested met the criteria for all property uses listed in Table 2 and Table 3. As such, excess soil generated at the site during construction may be disposed of at any land based site accepting residential/industrial/commercial clean fill, subject to approval from the owner of the receiving site.

## 6. General Comments

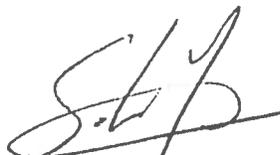
**Exp Services Inc.** should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, **Exp Services Inc.** will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc. could be greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

More specific information with respect to the conditions between samples, or the lateral and vertical extent of materials may become apparent during excavation operations. The interpretation of the borehole information must, therefore, be validated during excavation operations. Consequently, during the future development of the property, conditions not observed during this investigation may become apparent; should this occur, **Exp Services Inc.** should be contacted to assess the situation, and additional testing and reporting may be required. Trow has qualified personnel to provide assistance in regards to future geotechnical and environmental issues related to this property.

Yours truly,

**Exp Services Inc.**



So-Lim Yip, P. Eng.  
Project Engineer



Peter Chan, P. Eng.  
Manager, Markham Office



cc: Client (3)  
exp Markham (1)  
exp Brampton (1)

## Appendix A: Grain Size Analysis

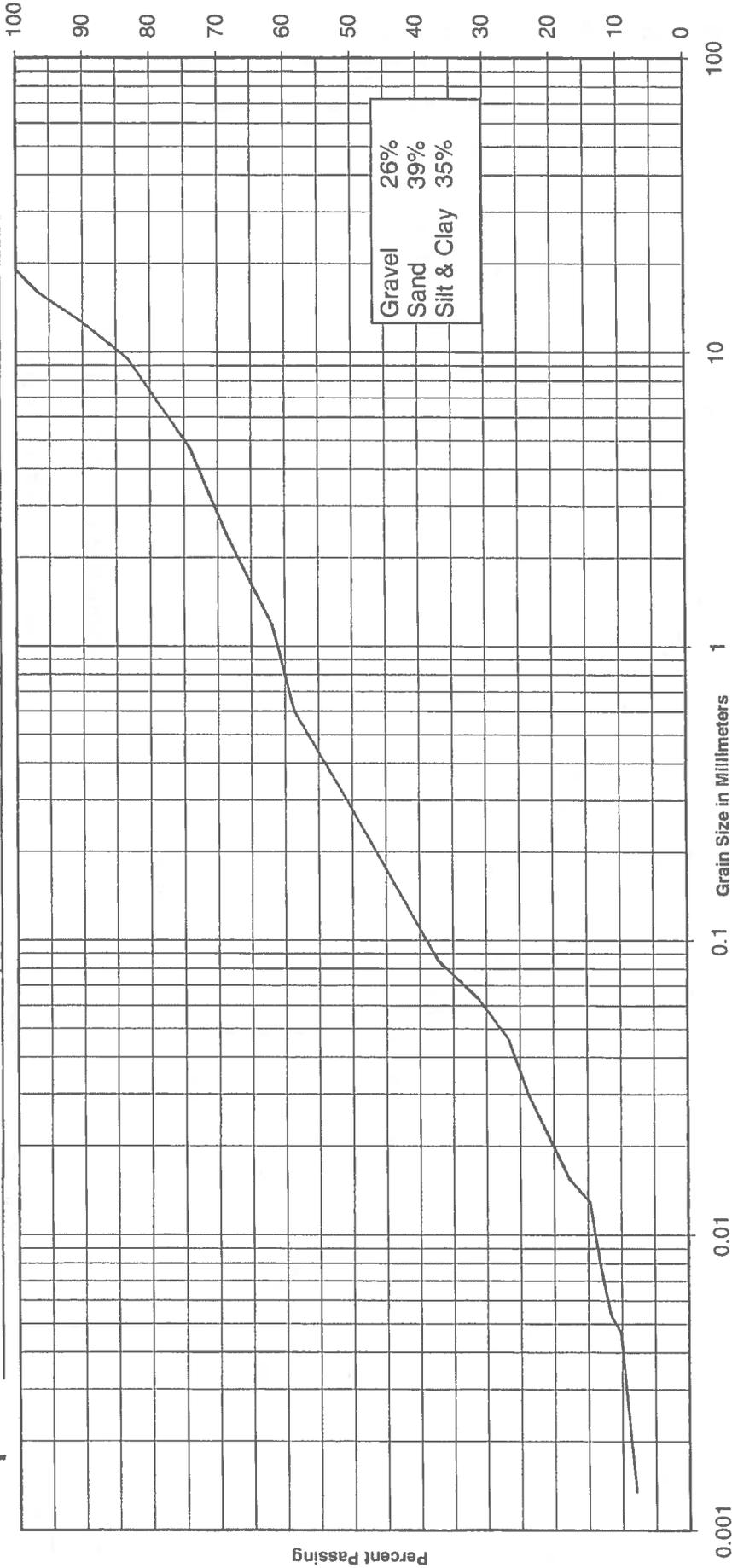
UNIFIED SOIL CLASSIFICATION SYSTEM

### GRAIN SIZE DISTRIBUTION

PROJECT NO: BRM-00601607-A0



SILT & CLAY		SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



Gravel 26%  
 Sand 39%  
 Silt & Clay 35%

ENCLOSURE No.: 1

**Classification of Sample:**  
**Silty Sand, some Gravel**

PROJECT: Watson Parkway
LOCATION: Watson Parkway
BOREHOLE #: 10
SAMPLE #: SS4 (Lab# 409)
DEPTH: 2.29 to 2.75 m
ELEVATION: N/A



## Appendix B: Results of Soil Chemical Analysis



Your Project #: BRM00601607AO  
Site Location: PROPOSED TOWNHOUSES - WATSON RD.  
Your C.O.C. #: 25478511, 254785-11-01

**Attention: Solim Yip**  
exp.  
70 Gibson Dr  
Unit 12  
Markham, ON  
L3R 4C2

Report Date: 2011/11/14

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B1H3008**  
Received: 2011/11/03, 15:00

Sample Matrix: Soil  
# Samples Received: 6

Analyses	Quantity	Date	Date	Laboratory Method	Method Reference
		Extracted	Analyzed		
Hot Water Extractable Boron	6	2011/11/09	2011/11/09	CAM SOP-00408	R153 Ana. Prot. 2011
Free (WAD) Cyanide	6	N/A	2011/11/09	CAM SOP-00457	SM 4500CN-I
Conductivity	6	N/A	2011/11/09	CAM SOP-00414	APHA 2510
Hexavalent Chromium in Soil by IC Ⓞ	6	N/A	2011/11/09	CAM SOP-00436	EPA SW846-3060/7199
Acid Extr. Metals (aqua regia) by ICPMS	6	2011/11/09	2011/11/09	CAM SOP-00447	EPA 6020
Moisture	6	N/A	2011/11/07	CAM SOP-00445	McKeague 2nd ed 1978
pH CaCl2 EXTRACT	3	2011/11/08	2011/11/08	CAM SOP-00413	SM 4500 H
pH CaCl2 EXTRACT	3	2011/11/09	2011/11/09	CAM SOP-00413	SM 4500 H
Sodium Adsorption Ratio (SAR)	2	2011/11/03	2011/11/09	CAM SOP-00102	EPA 6010
Sodium Adsorption Ratio (SAR)	4	2011/11/03	2011/11/10	CAM SOP-00102	EPA 6010

**Remarks:**

Maxxam Analytics has performed all analytical testing herein in accordance with ISO 17025 and the Protocol for Analytical Methods Used In the Assessment of Properties under Part XV.1 of the Environmental Protection Act. All methodologies comply with this document and are validated for use in the laboratory. The methods and techniques employed in this analysis conform to the performance criteria (detection limits, accuracy and precision) as outlined in the Protocol for Analytical Methods Used In the Assessment of Properties under Part XV.1 of the Environmental Protection Act.

The CWS PHC methods employed by Maxxam conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following the 'Alberta Environment Draft Addenda to the CWS-PHC, Appendix 6, Validation of Alternate Methods'. Documentation is available upon request. Maxxam has made the following improvements to the CWS-PHC reference benchmark method: (i) Headspace for F1; and, (ii) Mechanical extraction for F2-F4. Note: F4G cannot be added to the C6 to C50 hydrocarbons. The extraction date for samples field preserved with methanol for F1 and Volatile Organic Compounds is considered to be the date sampled.

Maxxam Analytics is accredited by SCC (Lab ID 97) for all specific parameters as required by Ontario Regulation 153/04. Maxxam Analytics is limited in liability to the actual cost of analysis unless otherwise agreed in writing. There is no other warranty expressed or implied. Samples will be retained at Maxxam Analytics for three weeks from receipt of data or as per contract.

- \* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
- \* Results relate only to the items tested.

(1) Soils are reported on a dry weight basis unless otherwise specified.



Maxxam Job #: B1H3008  
Report Date: 2011/11/14

exp.  
Client Project #: BRM00601607AO  
Site Location: PROPOSED TOWNHOUSES - WATSON RD.  
Sampler Initials: LC

-2-

Encryption Key

Sara Saroop

14 Nov 2011 12:20:33 -05:00

Please direct all questions regarding this Certificate of Analysis to your Project Manager

SARA SAROOP, Project Manager  
Email: SSaroop@maxxam.ca  
Phone# (905) 817-5700 Ext:5821

=====  
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 2

Page 2 of 12

Maxxam Job #: B1H3008  
 Report Date: 2011/11/14

exp. Client Project #: BRM00601607AO  
 Site Location: PROPOSED TOWNHOUSES - WATSON RD.  
 Sampler Initials: LC

**O'REG 153 INORGANICS PACKAGE (SOIL)**

Maxxam ID	LM6783	LM6784	LM6785	QC Batch	RDL	QC Batch
Sampling Date	2011/11/01 09:30	2011/10/31 12:30	2011/10/31 08:30	BH 4 SS3	BH 2 SS4	BH 8 SS2
Units	BH 4	BH 2	BH 8	SS3	SS4	SS2
Calculated Parameters						
Sodium Adsorption Ratio	N/A	0.26	0.31	2670550	2670550	2670550
Inorganics						
Chromium (VI)	ug/g	<0.2	<0.2	2676304	<0.2	0.2
Conductivity	mS/cm	0.17	0.14	2676166	0.17	0.002
Free Cyanide	ug/g	<0.01	0.01	2674566	<0.01	0.01
Moisture	%	5	9	2674005	6	1
Available (CaCl2) pH	pH	7.81	7.67	2674789	7.92	2674789
Metals						
Hot Water Ext. Boron (B)	ug/g	0.21	0.09	2676033	0.09	0.05
Acid Extractable Antimony (Sb)	ug/g	0.2	<0.2	2676061	<0.2	0.2
Acid Extractable Arsenic (As)	ug/g	3	2	2676061	2	1
Acid Extractable Barium (Ba)	ug/g	25	17	2676061	22	0.5
Acid Extractable Beryllium (Be)	ug/g	0.2	<0.2	2676061	<0.2	0.2
Acid Extractable Boron (B)	ug/g	<5	<5	2676061	<5	5
Acid Extractable Cadmium (Cd)	ug/g	0.2	0.3	2676061	0.3	0.1
Acid Extractable Chromium (Cr)	ug/g	8	8	2676061	8	1
Acid Extractable Cobalt (Co)	ug/g	4.2	2.8	2676061	2.8	0.1
Acid Extractable Copper (Cu)	ug/g	21	9.9	2676061	8.4	0.5
Acid Extractable Lead (Pb)	ug/g	20	19	2676061	17	1
Acid Extractable Molybdenum (Mo)	ug/g	<0.5	<0.5	2676061	<0.5	0.5
Acid Extractable Nickel (Ni)	ug/g	8.5	5.2	2676061	5.3	0.5
Acid Extractable Selenium (Se)	ug/g	<0.5	<0.5	2676061	<0.5	0.5
Acid Extractable Silver (Ag)	ug/g	<0.2	<0.2	2676061	<0.2	0.2
Acid Extractable Thallium (Tl)	ug/g	0.05	<0.05	2676061	<0.05	0.05
Acid Extractable Uranium (U)	ug/g	0.33	0.36	2676061	0.42	0.05
Acid Extractable Vanadium (V)	ug/g	16	13	2676061	14	5
Acid Extractable Zinc (Zn)	ug/g	110	120	2676061	120	5
Acid Extractable Mercury (Hg)	ug/g	<0.05	<0.05	2676061	<0.05	0.05

N/A = Not Applicable  
 RDL = Reportable Detection Limit  
 QC Batch = Quality Control Batch



Success Through Science

Maxxam Job #: B1H3008  
Report Date: 2011/1/14

exp. Client Project #: BRM00601607AO  
Site Location: PROPOSED TOWNHOUSES - WATSON RD.  
Sampler Initials: LC

**O'REG 153 INORGANICS PACKAGE (SOIL)**

Maxxam ID	LM6786	LM6787	LM6788	
Sampling Date	2011/11/01	2011/11/01	2011/11/01	
	BH 11 SS3	BH 13 SS4	BH 14 SS2	
Units	QC Batch	QC Batch	QC Batch	RDL
<b>Calculated Parameters</b>				
Sodium Adsorption Ratio	N/A	0.29	0.31	0.27
<b>Inorganics</b>				
Chromium (VI)	ug/g	<0.2	<0.2	<0.2
Conductivity	mS/cm	0.13	0.14	0.15
Free Cyanide	ug/g	<0.01	0.01	0.01
Moisture	%	6	10	9
Available (CaCl2) pH	pH	7.86	7.64	7.64
<b>Metals</b>				
Hot Water Ext. Boron (B)	ug/g	0.09	0.08	0.28
Acid Extractable Antimony (Sb)	ug/g	<0.2	<0.2	<0.2
Acid Extractable Arsenic (As)	ug/g	2	2	3
Acid Extractable Barium (Ba)	ug/g	20	16	28
Acid Extractable Beryllium (Be)	ug/g	<0.2	<0.2	0.2
Acid Extractable Boron (B)	ug/g	<5	<5	<5
Acid Extractable Cadmium (Cd)	ug/g	0.5	0.4	0.4
Acid Extractable Chromium (Cr)	ug/g	8	7	10
Acid Extractable Cobalt (Co)	ug/g	3.3	2.6	3.6
Acid Extractable Copper (Cu)	ug/g	10	8.7	11
Acid Extractable Lead (Pb)	ug/g	29	22	26
Acid Extractable Molybdenum (Mo)	ug/g	<0.5	<0.5	<0.5
Acid Extractable Nickel (Ni)	ug/g	6.3	5.1	7.1
Acid Extractable Selenium (Se)	ug/g	<0.5	<0.5	<0.5
Acid Extractable Silver (Ag)	ug/g	<0.2	<0.2	<0.2
Acid Extractable Thallium (Tl)	ug/g	<0.05	<0.05	0.06
Acid Extractable Uranium (U)	ug/g	0.43	1.1	0.39
Acid Extractable Vanadium (V)	ug/g	15	17	17
Acid Extractable Zinc (Zn)	ug/g	230	130	160
Acid Extractable Mercury (Hg)	ug/g	<0.05	<0.05	<0.05

N/A = Not Applicable  
RDL = Reportable Detection Limit  
QC Batch = Quality Control Batch



Maxxam Job #: B1H3008  
Report Date: 2011/11/14

exp.  
Client Project #: BRM00601607AO  
Site Location: PROPOSED TOWNHOUSES - WATSON RD.  
Sampler Initials: LC

**Test Summary**

Maxxam ID LM6783  
Sample ID BH 4 SS3  
Matrix Soil

Collected 2011/11/01  
Shipped  
Received 2011/11/03

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	2676033	2011/11/09	2011/11/09	AZITA FAZAELI
Free (WAD) Cyanide	TECH	2674566	N/A	2011/11/09	LOUISE HARDING
Conductivity	COND	2676166	N/A	2011/11/09	NEIL DASSANAYAKE
Hexavalent Chromium in Soil by IC	IC/SPEC	2676304	N/A	2011/11/09	CHRIS LI
Acid Extr. Metals (aqua regia) by ICP/MS	ICP/MS	2676061	2011/11/09	2011/11/09	HUA REN
Moisture	BAL	2674005	N/A	2011/11/07	VALENTINA KAFTANI
pH CaCl2 EXTRACT		2674789	2011/11/08	2011/11/08	XUANHONG QIU
Sodium Adsorption Ratio (SAR)	CALC/MET	2670550	2011/11/10	2011/11/10	AUTOMATED STATCHK

Maxxam ID LM6784  
Sample ID BH 2 SS4  
Matrix Soil

Collected 2011/10/31  
Shipped  
Received 2011/11/03

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	2676033	2011/11/09	2011/11/09	AZITA FAZAELI
Free (WAD) Cyanide	TECH	2674566	N/A	2011/11/09	LOUISE HARDING
Conductivity	COND	2676166	N/A	2011/11/09	NEIL DASSANAYAKE
Hexavalent Chromium in Soil by IC	IC/SPEC	2676304	N/A	2011/11/09	CHRIS LI
Acid Extr. Metals (aqua regia) by ICP/MS	ICP/MS	2676061	2011/11/09	2011/11/09	HUA REN
Moisture	BAL	2674005	N/A	2011/11/07	VALENTINA KAFTANI
pH CaCl2 EXTRACT		2674789	2011/11/08	2011/11/08	XUANHONG QIU
Sodium Adsorption Ratio (SAR)	CALC/MET	2670550	2011/11/10	2011/11/10	AUTOMATED STATCHK



Maxxam Job #: B1H3008  
Report Date: 2011/11/14

exp.  
Client Project #: BRM00601607AO  
Site Location: PROPOSED TOWNHOUSES - WATSON RD.  
Sampler Initials: LC

**Test Summary**

Maxxam ID LM6785  
Sample ID BH 8 SS2  
Matrix Soil

Collected 2011/10/31  
Shipped  
Received 2011/11/03

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	2675987	2011/11/09	2011/11/09	AZITA FAZAELI
Free (WAD) Cyanide	TECH	2674566	N/A	2011/11/09	LOUISE HARDING
Conductivity	COND	2676166	N/A	2011/11/09	NEIL DASSANAYAKE
Hexavalent Chromium in Soil by IC	IC/SPEC	2676304	N/A	2011/11/09	CHRIS LI
Acid Extr. Metals (agua regia) by ICPMS	ICP/MS	2676061	2011/11/09	2011/11/09	HUA REN
Moisture	BAL	2674005	N/A	2011/11/07	VALENTINA KAFTANI
pH CaCl2 EXTRACT		2674789	2011/11/08	2011/11/08	XUANHONG QIU
Sodium Adsorption Ratio (SAR)	CALC/MET	2670550	2011/11/10	2011/11/10	AUTOMATED STATCHK

Maxxam ID LM6786  
Sample ID BH 11 SS3  
Matrix Soil

Collected 2011/11/01  
Shipped  
Received 2011/11/03

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	2676033	2011/11/09	2011/11/09	AZITA FAZAELI
Free (WAD) Cyanide	TECH	2674566	N/A	2011/11/09	LOUISE HARDING
Conductivity	COND	2676281	N/A	2011/11/09	NEIL DASSANAYAKE
Hexavalent Chromium in Soil by IC	IC/SPEC	2676304	N/A	2011/11/09	CHRIS LI
Acid Extr. Metals (agua regia) by ICPMS	ICP/MS	2675985	2011/11/09	2011/11/09	HUA REN
Moisture	BAL	2674005	N/A	2011/11/07	VALENTINA KAFTANI
pH CaCl2 EXTRACT		2676243	2011/11/09	2011/11/09	XUANHONG QIU
Sodium Adsorption Ratio (SAR)	CALC/MET	2670550	2011/11/09	2011/11/09	AUTOMATED STATCHK

Maxxam Job #: B1H3008  
 Report Date: 2011/11/14

exp.  
 Client Project #: BRM00601607AO  
 Site Location: PROPOSED TOWNHOUSES - WATSON RD.  
 Sampler Initials: LC

### Test Summary

Maxxam ID LM6787  
 Sample ID BH 13 SS4  
 Matrix Soil

Collected 2011/11/01  
 Shipped  
 Received 2011/11/03

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	2676033	2011/11/09	2011/11/09	AZITA FAZAEI
Free (WAD) Cyanide	TECH	2674566	N/A	2011/11/09	LOUISE HARDING
Conductivity	COND	2676166	N/A	2011/11/09	NEIL DASSANAYAKE
Hexavalent Chromium in Soil by IC	IC/SPEC	2676304	N/A	2011/11/09	CHRIS LI
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	2675985	2011/11/09	2011/11/09	HUA REN
Moisture	BAL	2674005	N/A	2011/11/07	VALENTINA KAFTANI
pH CaCl2 EXTRACT		2676243	2011/11/09	2011/11/09	XUANHONG QIU
Sodium Adsorption Ratio (SAR)	CALC/MET	2670550	2011/11/10	2011/11/10	AUTOMATED STATCHK

Maxxam ID LM6788  
 Sample ID BH 14 SS2  
 Matrix Soil

Collected 2011/11/01  
 Shipped  
 Received 2011/11/03

Test Description	Instrumentation	Batch	Extracted	Analyzed	Analyst
Hot Water Extractable Boron	ICP	2676033	2011/11/09	2011/11/09	AZITA FAZAEI
Free (WAD) Cyanide	TECH	2674566	N/A	2011/11/09	LOUISE HARDING
Conductivity	COND	2676281	N/A	2011/11/09	NEIL DASSANAYAKE
Hexavalent Chromium in Soil by IC	IC/SPEC	2676304	N/A	2011/11/09	CHRIS LI
Acid Extr. Metals (aqua regia) by ICPMS	ICP/MS	2675985	2011/11/09	2011/11/09	HUA REN
Moisture	BAL	2674005	N/A	2011/11/07	VALENTINA KAFTANI
pH CaCl2 EXTRACT		2676243	2011/11/09	2011/11/09	XUANHONG QIU
Sodium Adsorption Ratio (SAR)	CALC/MET	2670550	2011/11/09	2011/11/09	AUTOMATED STATCHK

Maxxam Job #: B1H3008  
Report Date: 2011/1/14

exp.  
Client Project #: BRM00601607AO  
Site Location: PROPOSED TOWNHOUSES - WATSON RD.  
Sampler Initials: LC

**GENERAL COMMENTS**

- Sample LM6783-01: SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.
- Sample LM6784-01: SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.
- Sample LM6785-01: SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.
- Sample LM6786-01: SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.
- Sample LM6787-01: SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.
- Sample LM6788-01: SAR Analysis: Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2674005	Moisture	2011/11/07										
2674566	Free Cyanide	2011/11/09	107	75 - 125	99	75 - 125	<0.01	ug/g	0.8	NC	20	
2675985	Acid Extractable Antimony (Sb)	2011/11/09	94	75 - 125	92	75 - 125	<0.2	ug/g	NC	NC	30	
2675985	Acid Extractable Arsenic (As)	2011/11/09	97	75 - 125	94	75 - 125	<1	ug/g	NC	NC	30	
2675985	Acid Extractable Barium (Ba)	2011/11/09	NC	75 - 125	94	75 - 125	<0.5	ug/g	3.6	NC	30	
2675985	Acid Extractable Beryllium (Be)	2011/11/09	95	75 - 125	93	75 - 125	<0.2	ug/g	NC	NC	30	
2675985	Acid Extractable Boron (B)	2011/11/09	94	75 - 125	93	75 - 125	<5	ug/g	NC	NC	30	
2675985	Acid Extractable Cadmium (Cd)	2011/11/09	95	75 - 125	93	75 - 125	<0.1	ug/g	NC	NC	30	
2675985	Acid Extractable Chromium (Cr)	2011/11/09	98	75 - 125	99	75 - 125	<1	ug/g	8.2	NC	30	
2675985	Acid Extractable Cobalt (Co)	2011/11/09	94	75 - 125	94	75 - 125	<0.1	ug/g	4.8	NC	30	
2675985	Acid Extractable Copper (Cu)	2011/11/09	90	75 - 125	94	75 - 125	<0.5	ug/g	0.8	NC	30	
2675985	Acid Extractable Lead (Pb)	2011/11/09	90	75 - 125	94	75 - 125	<1	ug/g	0.6	NC	30	
2675985	Acid Extractable Molybdenum (Mo)	2011/11/09	96	75 - 125	92	75 - 125	<0.5	ug/g	NC	NC	30	
2675985	Acid Extractable Nickel (Ni)	2011/11/09	94	75 - 125	95	75 - 125	<0.5	ug/g	7.7	NC	30	
2675985	Acid Extractable Selenium (Se)	2011/11/09	95	75 - 125	93	75 - 125	<0.5	ug/g	NC	NC	30	
2675985	Acid Extractable Silver (Ag)	2011/11/09	95	75 - 125	94	75 - 125	<0.2	ug/g	NC	NC	30	
2675985	Acid Extractable Thallium (Tl)	2011/11/09	90	75 - 125	92	75 - 125	<0.05	ug/g	NC	NC	30	
2675985	Acid Extractable Uranium (U)	2011/11/09	94	75 - 125	92	75 - 125	<0.05	ug/g	8.5	NC	30	
2675985	Acid Extractable Vanadium (V)	2011/11/09	96	75 - 125	95	75 - 125	<5	ug/g	NC	NC	30	
2675985	Acid Extractable Zinc (Zn)	2011/11/09	93	75 - 125	96	75 - 125	<5	ug/g	NC	NC	30	
2675985	Acid Extractable Mercury (Hg)	2011/11/09	98	75 - 125	97	75 - 125	<0.05	ug/g	NC	NC	30	
2675987	Hot Water Ext. Boron (B)	2011/11/10					<0.05	ug/g				96 85 - 115
2676033	Hot Water Ext. Boron (B)	2011/11/09					<0.05	ug/g				100 85 - 115
2676061	Acid Extractable Antimony (Sb)	2011/11/09	95	75 - 125	98	75 - 125	<0.2	ug/g	NC	NC	30	
2676061	Acid Extractable Arsenic (As)	2011/11/09	101	75 - 125	102	75 - 125	<1	ug/g	NC	NC	30	
2676061	Acid Extractable Barium (Ba)	2011/11/09	NC	75 - 125	101	75 - 125	<0.5	ug/g	4.5	NC	30	
2676061	Acid Extractable Beryllium (Be)	2011/11/09	102	75 - 125	100	75 - 125	<0.2	ug/g	NC	NC	30	
2676061	Acid Extractable Boron (B)	2011/11/09	95	75 - 125	94	75 - 125	<5	ug/g	NC	NC	30	
2676061	Acid Extractable Cadmium (Cd)	2011/11/09	99	75 - 125	101	75 - 125	<0.1	ug/g	NC	NC	30	
2676061	Acid Extractable Chromium (Cr)	2011/11/09	107	75 - 125	108	75 - 125	<1	ug/g	5.3	NC	30	
2676061	Acid Extractable Cobalt (Co)	2011/11/09	101	75 - 125	103	75 - 125	<0.1	ug/g	3.5	NC	30	
2676061	Acid Extractable Copper (Cu)	2011/11/09	100	75 - 125	100	75 - 125	<0.5	ug/g	3.7	NC	30	
2676061	Acid Extractable Lead (Pb)	2011/11/09	101	75 - 125	103	75 - 125	<1	ug/g	3.4	NC	30	
2676061	Acid Extractable Molybdenum (Mo)	2011/11/09	99	75 - 125	99	75 - 125	<0.5	ug/g	NC	NC	30	
2676061	Acid Extractable Nickel (Ni)	2011/11/09	105	75 - 125	102	75 - 125	<0.5	ug/g	4.1	NC	30	
2676061	Acid Extractable Selenium (Se)	2011/11/09	99	75 - 125	102	75 - 125	<0.5	ug/g	NC	NC	30	
2676061	Acid Extractable Silver (Ag)	2011/11/09	100	75 - 125	102	75 - 125	<0.2	ug/g	NC	NC	30	
2676061	Acid Extractable Thallium (Tl)	2011/11/09	98	75 - 125	101	75 - 125	<0.05	ug/g	NC	NC	30	
2676061	Acid Extractable Uranium (U)	2011/11/09	101	75 - 125	103	75 - 125	<0.05	ug/g	3.6	NC	30	
2676061	Acid Extractable Vanadium (V)	2011/11/09	NC	75 - 125	102	75 - 125	<5	ug/g	4.8	NC	30	

exp.  
 Client Project #: BRM00601607AO  
 Site Location: PROPOSED TOWNHOUSES - WATSON RD.  
 Sampler Initials: LC

Maxxam Job #: B11H3008  
 Report Date: 2011/11/14

**QUALITY ASSURANCE REPORT**

QC Batch	Parameter	Date	Matrix Spike		Spiked Blank		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	Units	Value (%)	QC Limits	% Recovery	QC Limits
2676061	Acid Extractable Zinc (Zn)	2011/1/09	NC	75 - 125	104	75 - 125	<5	ug/g	1.0	30		
2676061	Acid Extractable Mercury (Hg)	2011/1/09	103	75 - 125	106	75 - 125	<0.05	ug/g				
2676166	Conductivity	2011/1/09					<0.002	mS/cm	0.4	35	103	75 - 125
2676281	Conductivity	2011/1/09					<0.002	mS/cm	1.0	35	102	75 - 125
2676304	Chromium (VI)	2011/1/09	77	75 - 125	113	75 - 125	<0.2	ug/g	NC	35	119	75 - 125

N/A = Not Applicable

RPD = Relative Percent Difference

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Spiked Blank: A blank matrix to which a known amount of the analyte has been added. Used to evaluate analyte recovery.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was not sufficiently significant to permit a reliable recovery calculation.

NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

## Validation Signature Page

Maxxam Job #: B1H3008

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The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

*Cristina Carriere*

CRISTINA CARRIERE, Scientific Services

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

**PROJECT INFORMATION:**  
 PROJECT # Ag 8899  
 BOTTLE ORDER # 25175  
 LABORATORY USE ONLY:  
 MAXIMUM JOB # 0609169 80740  
 CHAIN OF CUSTODY # 0254785-11-01  
 PROJECT MANAGER: SARA SAROOP

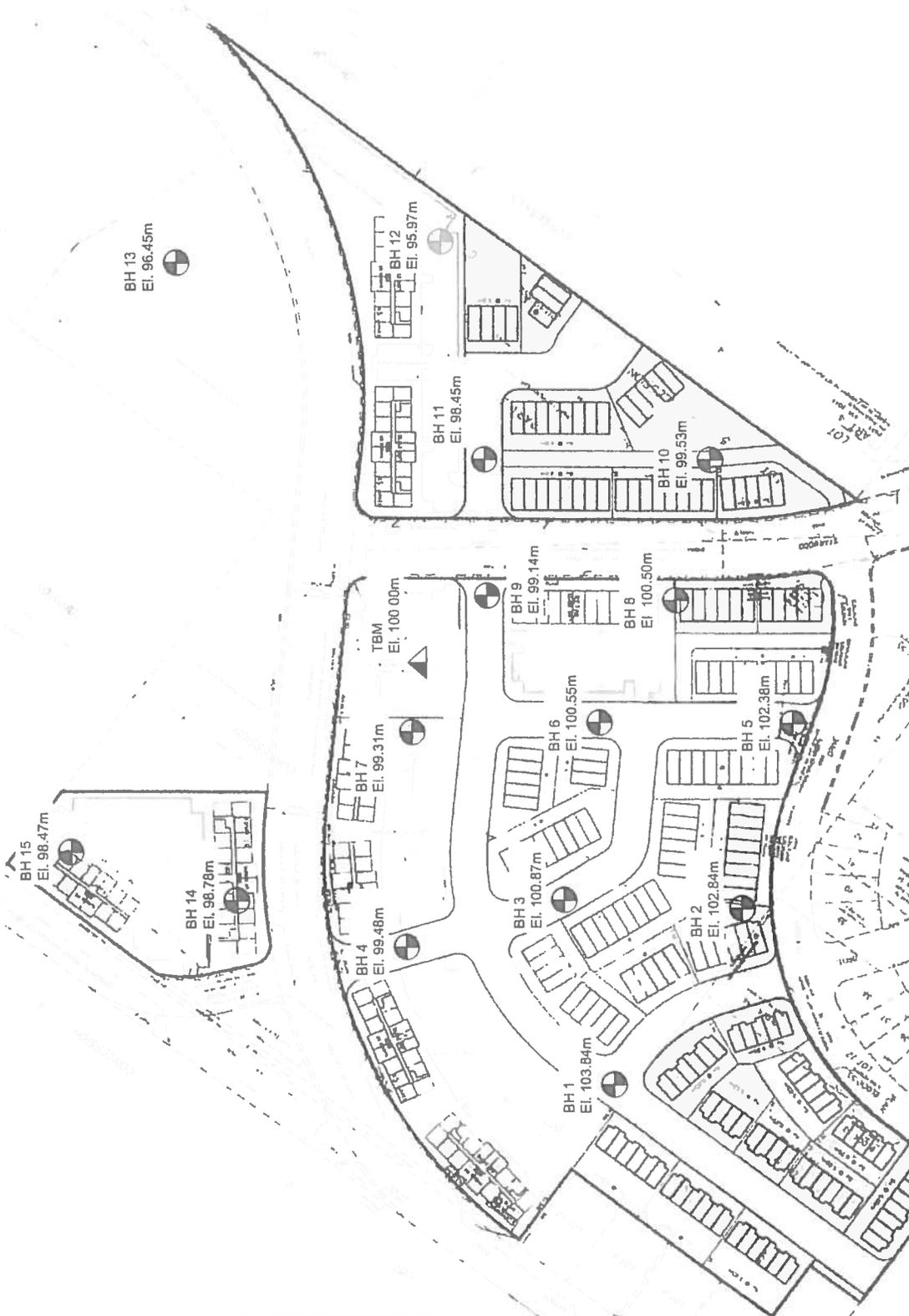
**ANALYSIS REQUESTED (Please be specific):**  
 Quotation # 0609169 80740  
 P.O. # 0609169 80740  
 Project # 0609169 80740  
 Project Name: Proposed Townhouse - 1st Flr. Rd  
 Site # 0609169 80740  
 Sampled By: Lee Chai  
 TURNAROUND TIME (TAT) REQUIRED:  Regular (Standard) TAT: # Rush TAT's  
 Standard TAT = 5-7 Working days for most tests.  
 Please note: Standard TAT for certain tests such as BOD and Dissolved Am > 5 days - contact your Project Manager by e-mail.  
 Job Specific Rush TAT (if applies to entire submission) \_\_\_\_\_  
 Data Required: \_\_\_\_\_  
 Rush Confirmation Number: \_\_\_\_\_  
 Comments: \_\_\_\_\_

**LABORATORY USE ONLY:**  
 Temperature (°C) on Receipt: 15.00  
 Time Received: 2:11 PM  
 Jars Used and Not Submitted:  Jars Used  Not Submitted  
 Custody Seal YES or NO:  YES  NO  
 Year: 2011 Month: 11 Day: 16

**REGULATORY CRITERIA**  
 MSA  P400  P450  P460  P470  P480  P490  P500  P510  P520  P530  P540  P550  P560  P570  P580  P590  P600  P610  P620  P630  P640  P650  P660  P670  P680  P690  P700  P710  P720  P730  P740  P750  P760  P770  P780  P790  P800  P810  P820  P830  P840  P850  P860  P870  P880  P890  P900  P910  P920  P930  P940  P950  P960  P970  P980  P990  P1000  P1010  P1020  P1030  P1040  P1050  P1060  P1070  P1080  P1090  P1100  P1110  P1120  P1130  P1140  P1150  P1160  P1170  P1180  P1190  P1200  P1210  P1220  P1230  P1240  P1250  P1260  P1270  P1280  P1290  P1300  P1310  P1320  P1330  P1340  P1350  P1360  P1370  P1380  P1390  P1400  P1410  P1420  P1430  P1440  P1450  P1460  P1470  P1480  P1490  P1500  P1510  P1520  P1530  P1540  P1550  P1560  P1570  P1580  P1590  P1600  P1610  P1620  P1630  P1640  P1650  P1660  P1670  P1680  P1690  P1700  P1710  P1720  P1730  P1740  P1750  P1760  P1770  P1780  P1790  P1800  P1810  P1820  P1830  P1840  P1850  P1860  P1870  P1880  P1890  P1900  P1910  P1920  P1930  P1940  P1950  P1960  P1970  P1980  P1990  P2000  P2010  P2020  P2030  P2040  P2050  P2060  P2070  P2080  P2090  P2100  P2110  P2120  P2130  P2140  P2150  P2160  P2170  P2180  P2190  P2200  P2210  P2220  P2230  P2240  P2250  P2260  P2270  P2280  P2290  P2300  P2310  P2320  P2330  P2340  P2350  P2360  P2370  P2380  P2390  P2400  P2410  P2420  P2430  P2440  P2450  P2460  P2470  P2480  P2490  P2500  P2510  P2520  P2530  P2540  P2550  P2560  P2570  P2580  P2590  P2600  P2610  P2620  P2630  P2640  P2650  P2660  P2670  P2680  P2690  P2700  P2710  P2720  P2730  P2740  P2750  P2760  P2770  P2780  P2790  P2800  P2810  P2820  P2830  P2840  P2850  P2860  P2870  P2880  P2890  P2900  P2910  P2920  P2930  P2940  P2950  P2960  P2970  P2980  P2990  P3000  P3010  P3020  P3030  P3040  P3050  P3060  P3070  P3080  P3090  P3100  P3110  P3120  P3130  P3140  P3150  P3160  P3170  P3180  P3190  P3200  P3210  P3220  P3230  P3240  P3250  P3260  P3270  P3280  P3290  P3300  P3310  P3320  P3330  P3340  P3350  P3360  P3370  P3380  P3390  P3400  P3410  P3420  P3430  P3440  P3450  P3460  P3470  P3480  P3490  P3500  P3510  P3520  P3530  P3540  P3550  P3560  P3570  P3580  P3590  P3600  P3610  P3620  P3630  P3640  P3650  P3660  P3670  P3680  P3690  P3700  P3710  P3720  P3730  P3740  P3750  P3760  P3770  P3780  P3790  P3800  P3810  P3820  P3830  P3840  P3850  P3860  P3870  P3880  P3890  P3900  P3910  P3920  P3930  P3940  P3950  P3960  P3970  P3980  P3990  P4000  P4010  P4020  P4030  P4040  P4050  P4060  P4070  P4080  P4090  P4100  P4110  P4120  P4130  P4140  P4150  P4160  P4170  P4180  P4190  P4200  P4210  P4220  P4230  P4240  P4250  P4260  P4270  P4280  P4290  P4300  P4310  P4320  P4330  P4340  P4350  P4360  P4370  P4380  P4390  P4400  P4410  P4420  P4430  P4440  P4450  P4460  P4470  P4480  P4490  P4500  P4510  P4520  P4530  P4540  P4550  P4560  P4570  P4580  P4590  P4600  P4610  P4620  P4630  P4640  P4650  P4660  P4670  P4680  P4690  P4700  P4710  P4720  P4730  P4740  P4750  P4760  P4770  P4780  P4790  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P10450  P10460  P10470  P10480  P10490  P10500  P10510  P10520  P10530  P10540  P10550  P10560  P10570  P10580  P10590  P10600  P10610  P10620  P10630  P10640  P10650  P10660  P10670  P10680  P10690  P10700  P10710  P10720  P10730  P10740  P10750  P10760  P10770  P10780  P10790  P10800  P10810  P10820  P10830  P10840  P10850  P10860  P10870  P10880

Drawings:  
Notes on Sample Description  
Borehole Location Plan  
Borehole Logs

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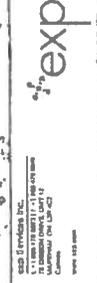
**LEGEND:**

-  BOR BORE HOLE LOCATION
-  TEM TEMPORARY BENCHMARK

PROJECT:	BRM-0001807-A0	DWN:	LC
SCALE:	-1:2000	CHD:	
DATE:	NOVEMBER 2011	DWG. No.:	1

**DRAWING TITLE:**  
 GEOTECHNICAL INVESTIGATION  
 BOREHOLE LOCATION PLAN

**PROJECT TITLE AND LOCATION:**  
 PROPOSED TOWNHOUSES  
 WATSON PARKWAY NORTH AND  
 WATSON ROAD  
 TOWN OF GUELPH, ONTARIO



**NOTES:**

1. THE EQUIPMENT AND SOIL TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED TO BE THE SAME.
2. SOIL SAMPLES WILL BE PLACED IN STORAGE FOR 3 MONTHS AND THEN DESTROYED UNLESS CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. THIS DRAWING SHOULD NOT BE ESTABLISHED FROM THE INFORMATION PROVIDED AT THE BOREHOLE LOCATIONS UNLESS SPECIFICALLY NOTED OTHERWISE.
4. THIS DRAWING WAS REPRODUCED FROM A SITE PLAN PROVIDED BY CLIENT.
5. TEMPORARY BENCHMARK (TBM): TOP OF MIT OF NEAREST LOT NORTHWEST OF DISTING LOT.
6. DISTING LOT: NEAREST LOT.

# Log of Borehole 1

Project No. BRM-00601607-A0

Drawing No. 2

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: November 1, 2011

Auger Sample

Combustible Vapour Reading

SPT (N) Value

Natural Moisture

Drill Type: CME 55 (Bombardier)

Dynamic Cone Test

Plastic and Liquid Limit

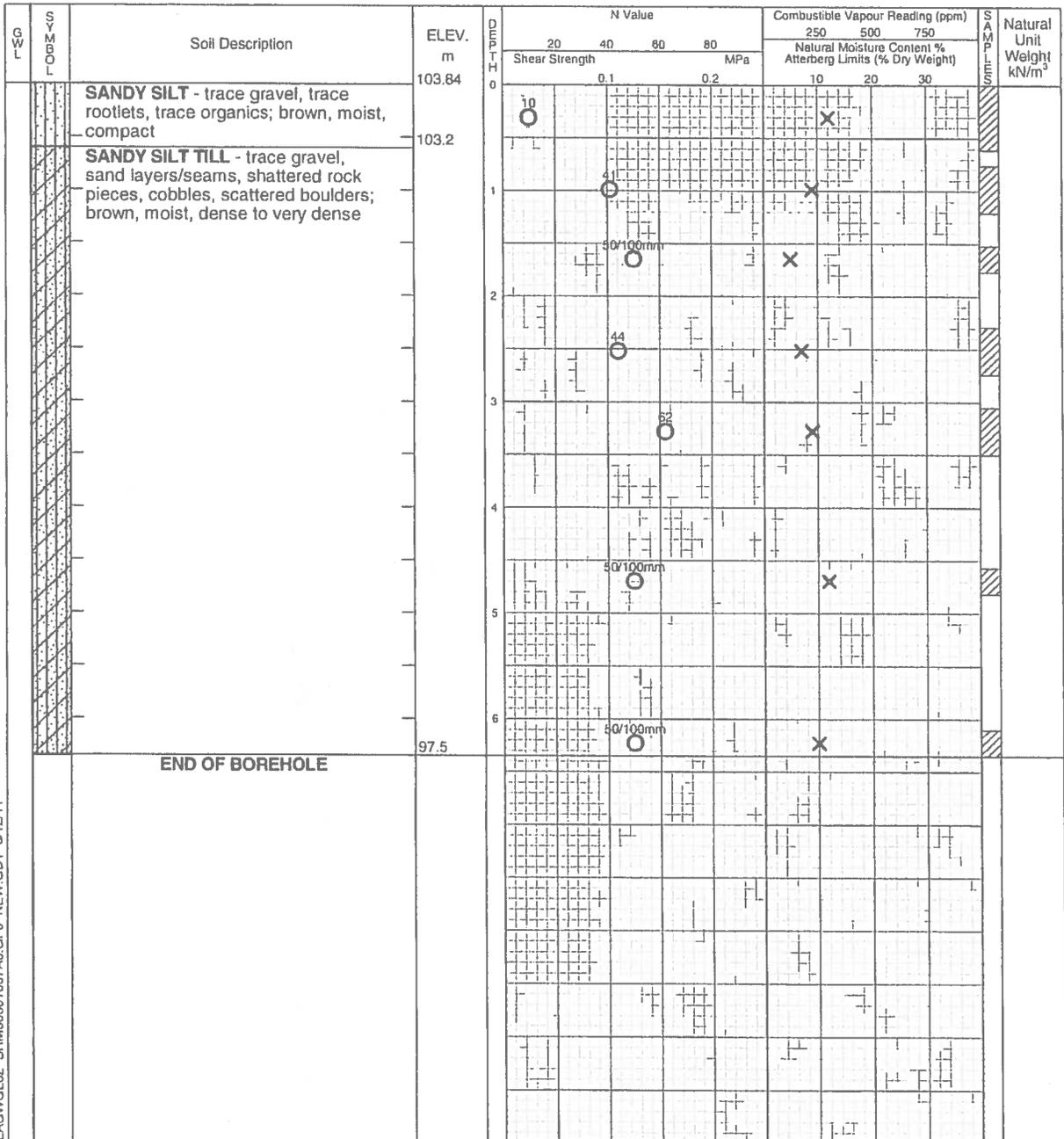
Datum: TBM = 100.00m (assumed)

Shelby Tube

Undrained Triaxial at % Strain at Failure

Field Vane Test

Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	5.89	6.25

# Log of Borehole 2

Project No. BRM-00601607-A0

Drawing No. 3

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: October 31, 2011

Auger Sample

Combustible Vapour Reading



Drill Type: CME 55 (Bombardier)

SPT (N) Value



Natural Moisture



Datum: TBM = 100.00m (assumed)

Dynamic Cone Test



Plastic and Liquid Limit



Shelby Tube



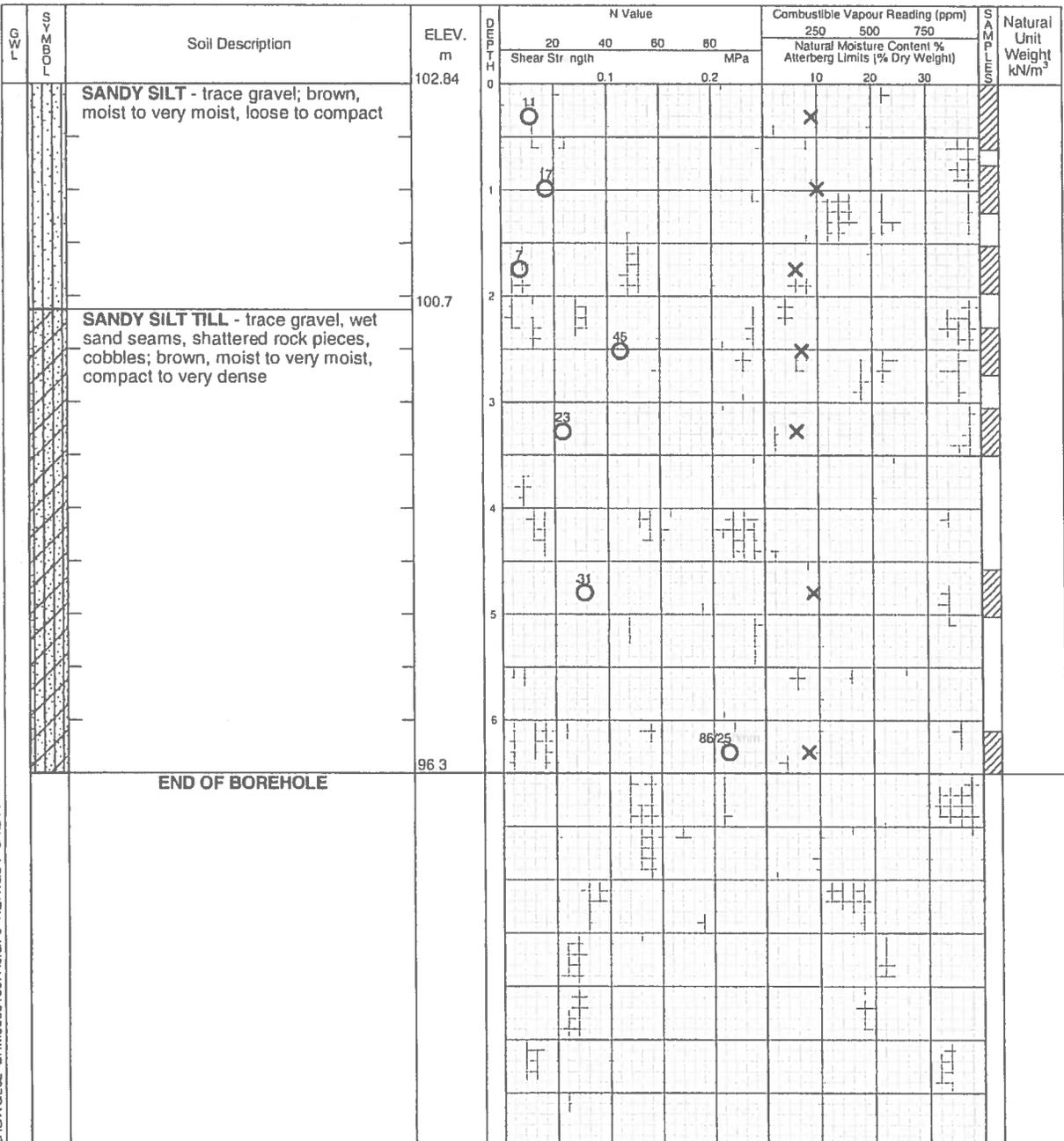
Undrained Triaxial at % Strain at Failure



Field Vane Test



Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	4.37	5.28

# Log of Borehole 3

Project No. BRM-00601607-A0

Drawing No. 4

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: October 31, 2011

Auger Sample

Combustible Vapour Reading

Drill Type: CME 55 (Bombardier)

SPT (N) Value

Natural Moisture

Datum: TBM = 100.00m (assumed)

Dynamic Cone Test

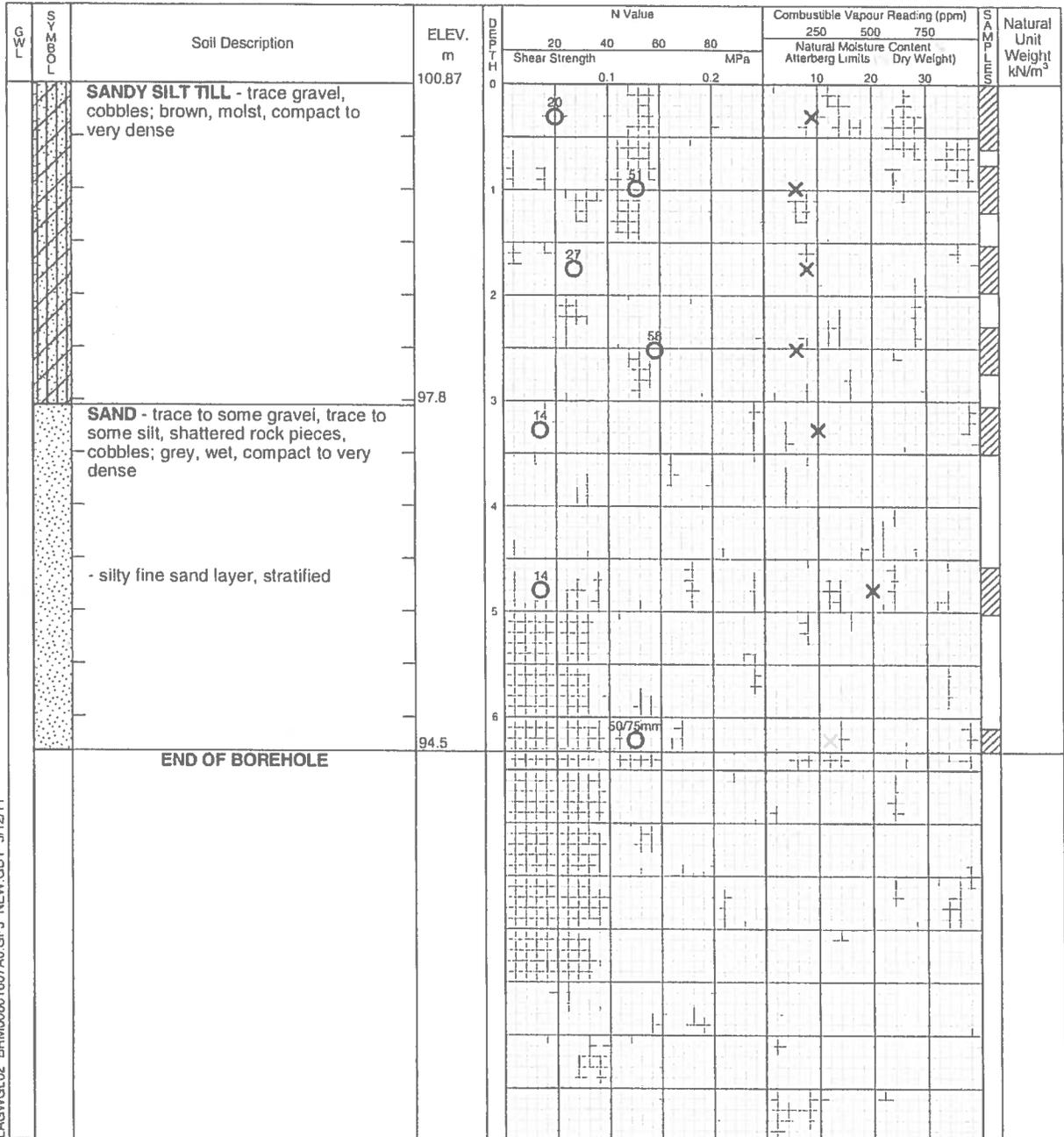
Plastic and Liquid Limit

Shelby Tube

Undrained Triaxial at % Strain at Failure

Field Vane Test

Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	2.59	3.05

# Log of Borehole 4

Project No. BRM-00601607-A0

Drawing No. 5

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: November 1, 2011

Auger Sample

Combustible Vapour Reading

SPT (N) Value

Natural Moisture

Drill Type: CME 55 (Bombardier)

Dynamic Cone Test

Plastic and Liquid Limit

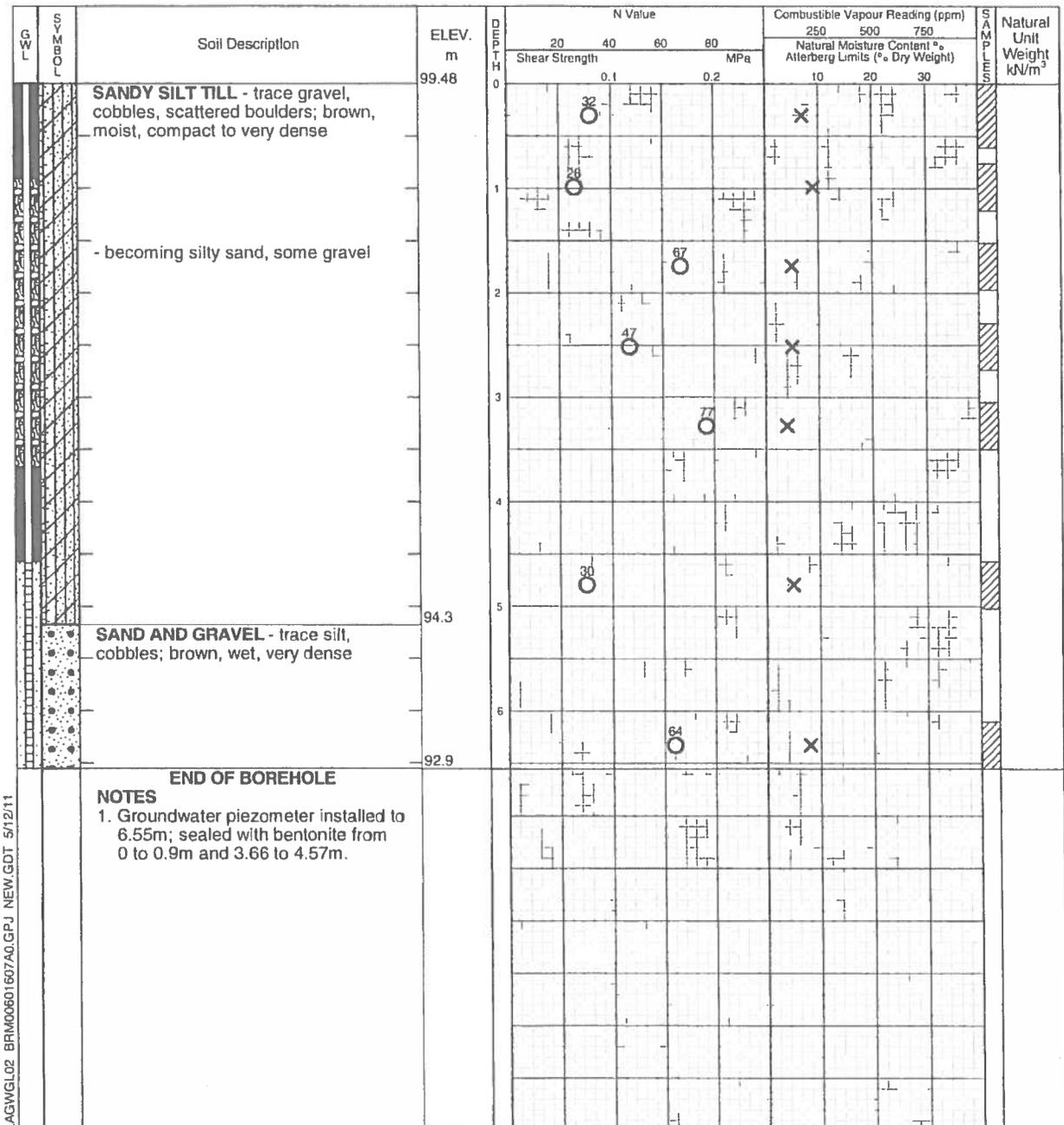
Datum: TBM = 100.00m (assumed)

Shelby Tube

Undrained Triaxial at % Strain at Failure

Field Vane Test

Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11

**END OF BOREHOLE**  
**NOTES**  
 1. Groundwater piezometer installed to 6.55m; sealed with bentonite from 0 to 0.9m and 3.66 to 4.57m.



Time	Water Level (m)	Depth to Cave (m)
On completion November 16, 2011	Dry 6.05	5.03



# Log of Borehole 6

Project No. BRM-00601607-A0

Drawing No. 7

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: October 31, 2011

Auger Sample

Combustible Vapour Reading

SPT (N) Value

Natural Moisture

Drill Type: CME 55 (Bombardier)

Dynamic Cone Test

Plastic and Liquid Lim

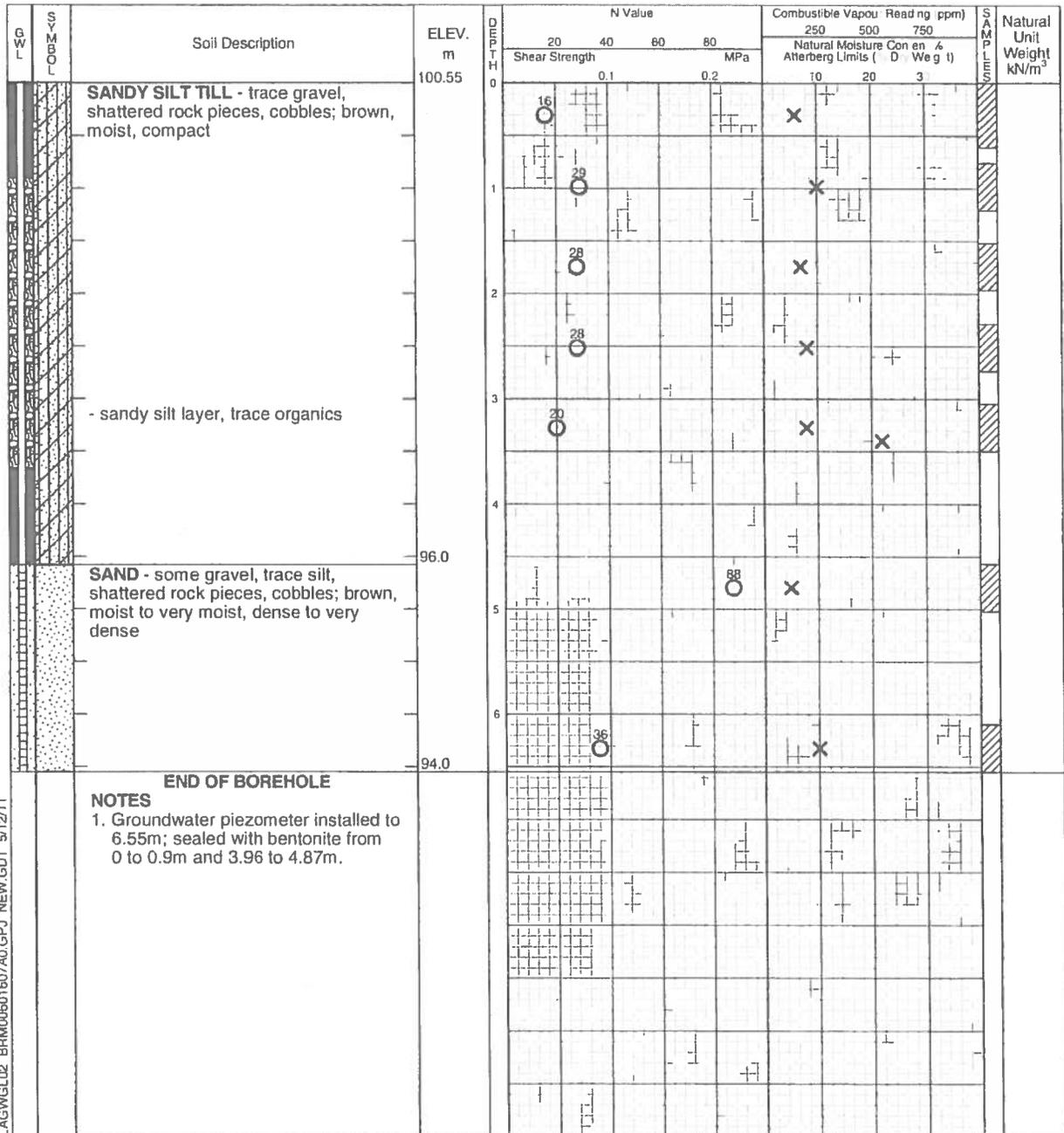
Datum: TBM = 100.00m (assumed)

Shelby Tube

Undrained Triaxial at % Strain at Failure

Field Vane Test

Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	6.52	6.55
November 16, 2011	6.10	

# Log of Borehole 7

Project No. BRM-00601607-A0

Drawing No. 8

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: October 31, 2011

Auger Sample

Combustible Vapour Reading

Drill Type: CME 55 (Bombardier)

SPT (N) Value

Natural Moisture

Datum: TBM = 100.00m (assumed)

Dynamic Cone Test

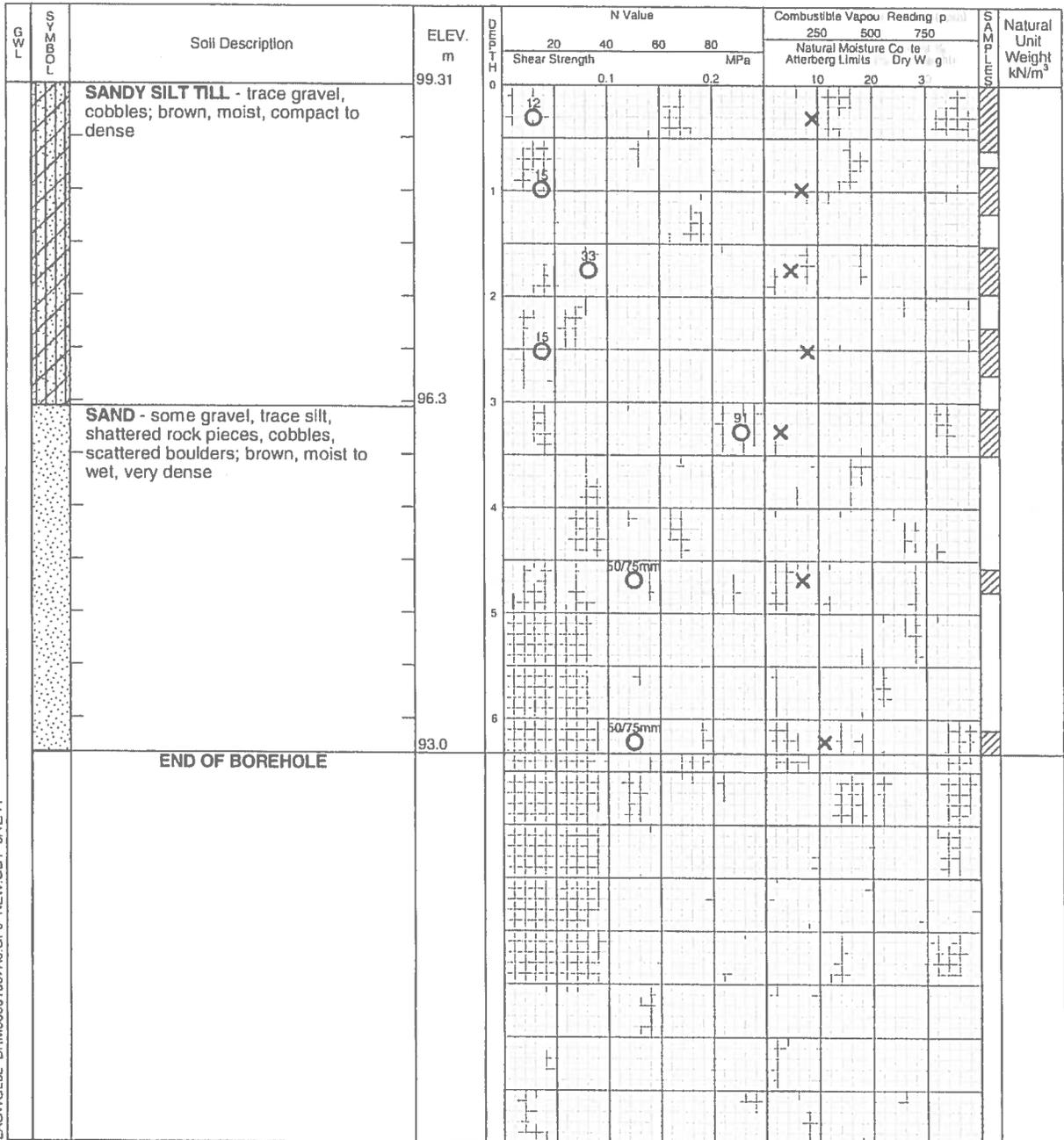
Plastic and Liquid Limits

Shelby Tube

Undrained Triaxial at % Strain at Failure

Field Vane Test

Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	5.03	5.79

# Log of Borehole 8

Project No. BRM-00601607-A0

Drawing No. 9

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: October 31, 2011

Auger Sample



Combustible Vapour Reading



Drill Type: CME 55 (Bombardier)

SPT (N) Value



Natural Moisture



Datum: TBM = 100.00m (assumed)

Dynamic Cone Test



Plastic and Liquid Limit



Shelby Tube



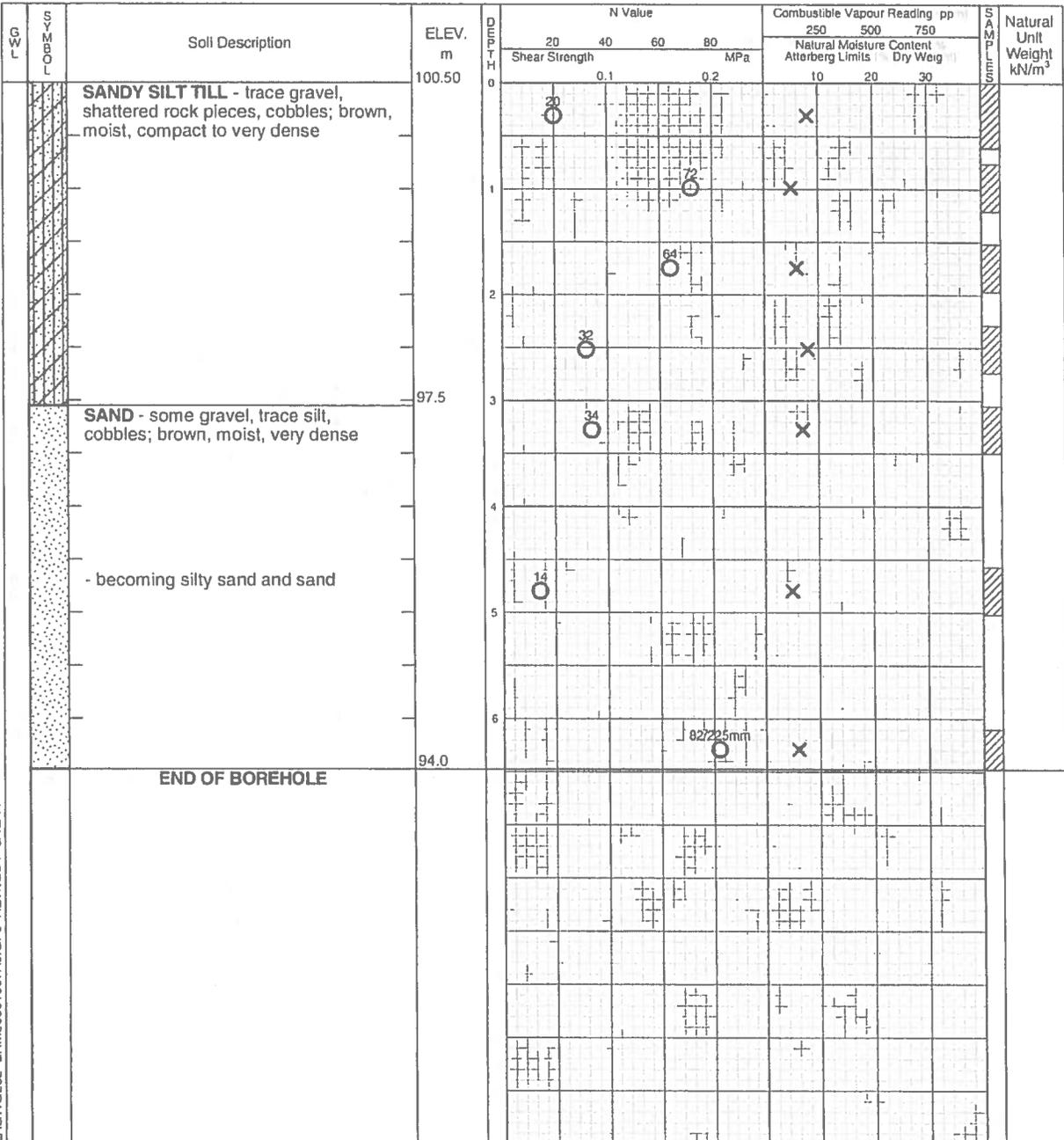
Undrained Triaxial at % Strain at Failure



Field Vane Test



Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	Dry	6.55

# Log of Borehole 9

Project No. BRM-00601607-A0

Drawing No. 10

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: October 31, 2011

Auger Sample

Combustible Vapour Reading

Drill Type: CME 55 (Bombardier)

SPT (N) Value

Natural Moisture

Datum: TBM = 100.00m (assumed)

Dynamic Cone Test

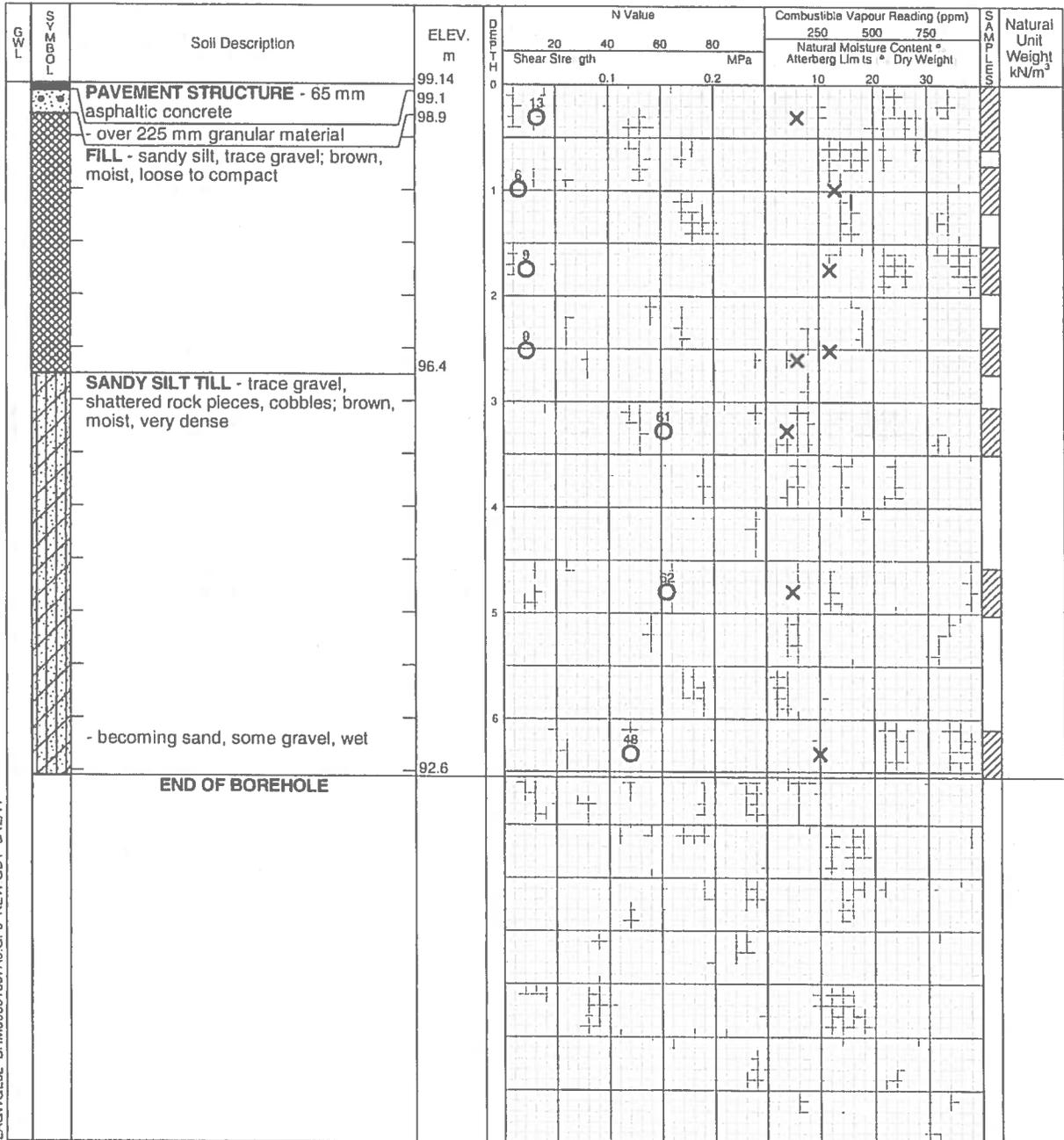
Plastic and Liquid Limit

Shelby Tube

Undrained Triaxial at % Strain at Failure

Field Vane Test

Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	5.03	5.03

# Log of Borehole 10

Project No. BRM-00601607-A0

Drawing No. 11

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: November 1, 2011

Auger Sample

Combustible Vapour Reading

SPT (N) Value

Natural Moisture

Drill Type: CME 55 (Bombardier)

Dynamic Cone Test

Plastic and Liquid Limit

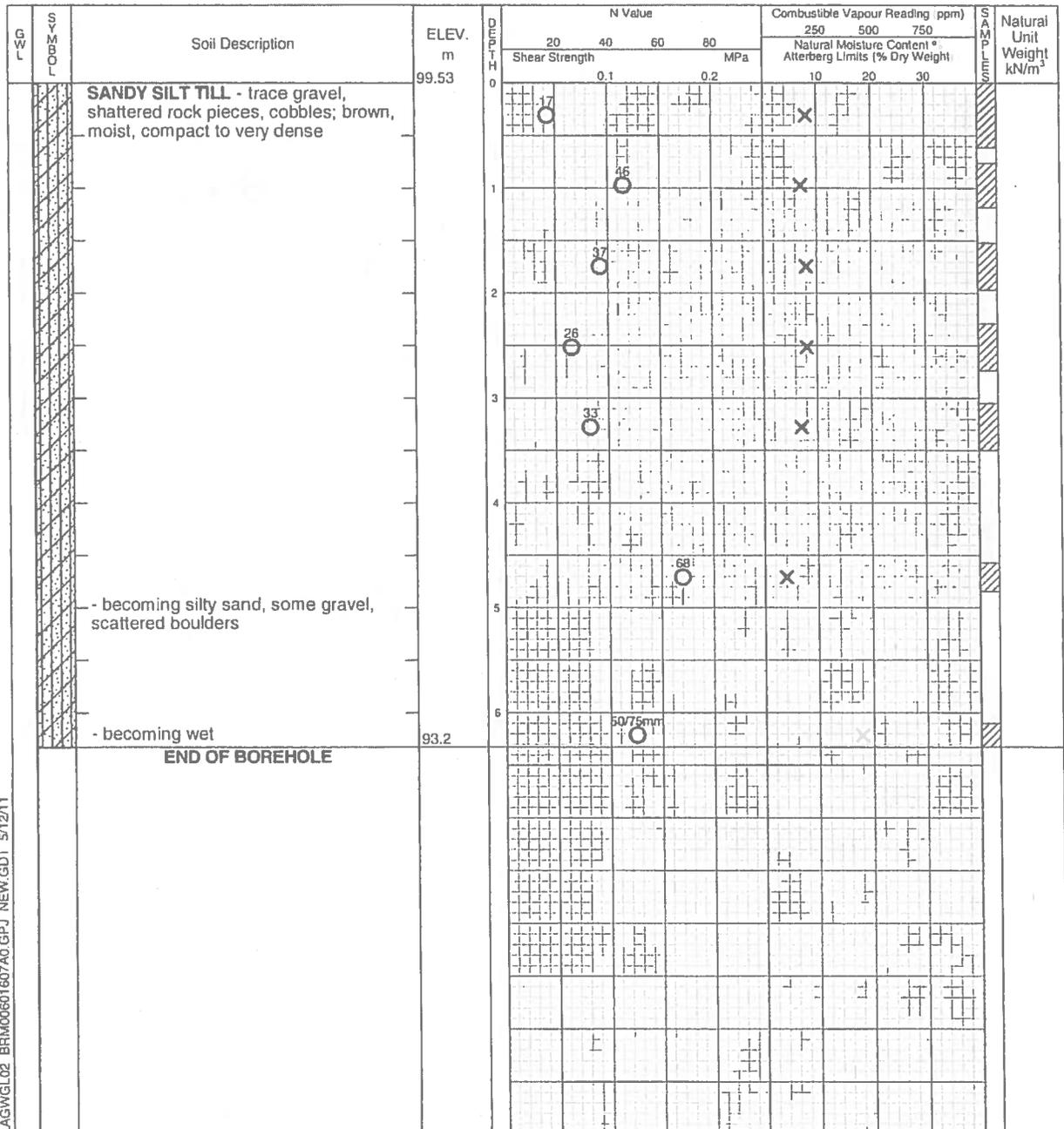
Datum: TBM = 100.00m (assumed)

Shelby Tube

Undrained Triaxial at % Strain at Failure

Field Vane Test

Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	6.05	6.20

# Log of Borehole 11

Project No. BRM-00601607-A0

Drawing No. 12

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: November 1, 2011

Auger Sample

Combustible Vapour Reading

SPT (N) Value

Natural Moisture

Drill Type: CME 55 (Bombardier)

Dynamic Cone Test

Plastic and Liquid Limit

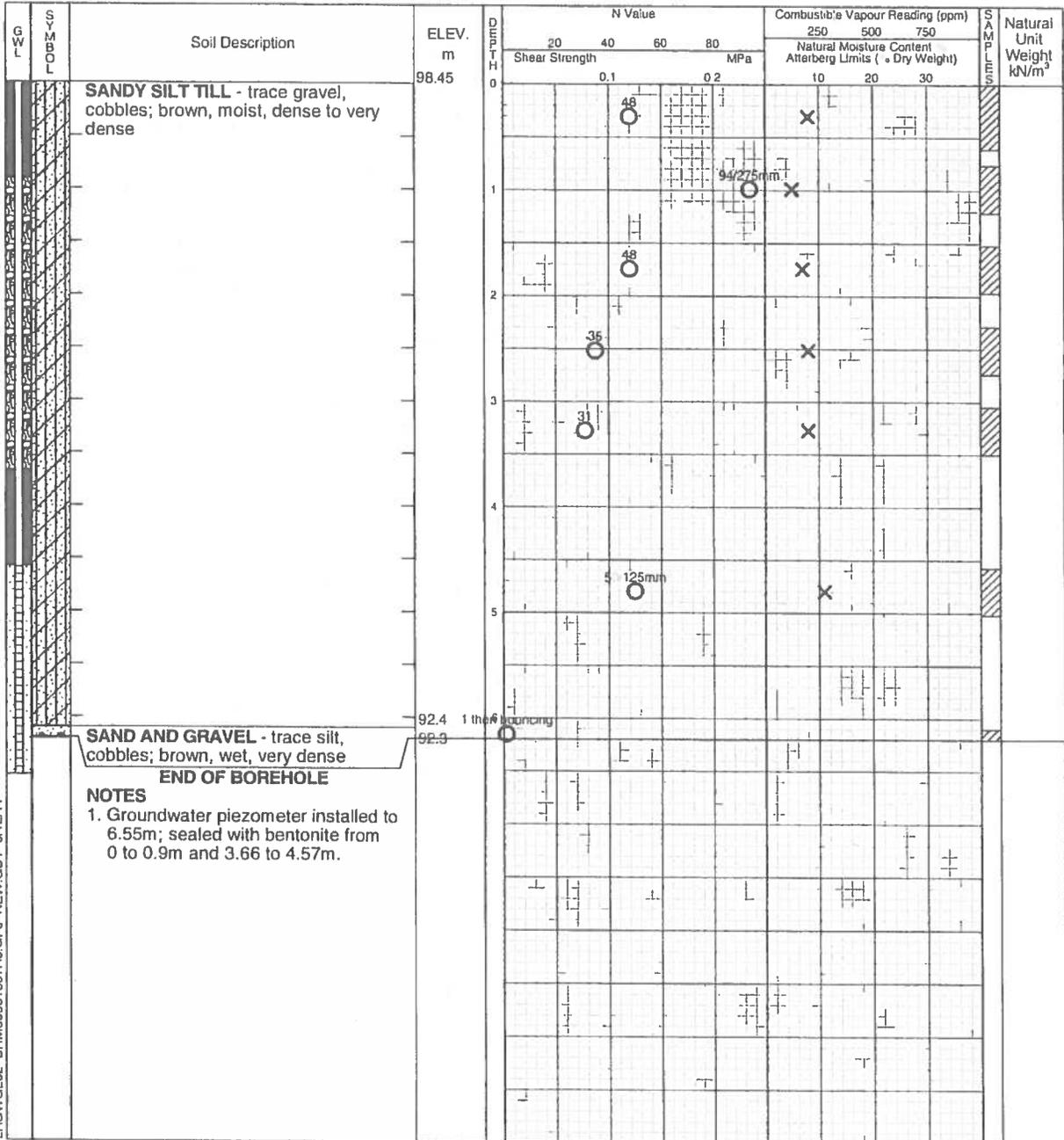
Datum: TBM = 100.00m (assumed)

Shelby Tube

Undrained Triaxial at % Strain at Failure

Field Vane Test

Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	5.03	5.41
November 16, 2011	5.83	

# Log of Borehole 12

Project No. BRM-00601607-A0

Drawing No. 13

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: November 1, 2011

Auger Sample

Combustible Vapour Reacting

Drill Type: CME 55 (Bombardier)

SPT (N) Value

Natural Moisture

Datum: TBM = 100.00m (assumed)

Dynamic Cone Test

Plastic and Liquid Limit

Shelby Tube

Undrained Triaxial at

Field Vane Test

% Strain at Failure

Penetrometer

L W L	S O B M L	Soil Description	ELEV. m	D P T H m	N Value				Combustible Vapour Reading (ppm)			S A M P L E S	Natural Unit Weight kN/m <sup>3</sup>
					Shear Strength				250	500	750		
					MPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)				
		<b>SANDY SILT TILL</b> - trace gravel, shattered rock pieces, cobbles; brown, moist, compact to very dense	95.97	0	0.1	0.2							
				1									
		- becoming silty sand, some gravel		2									
				3									
		- boulder	92.6										
		<b>END OF BOREHOLE</b>											
		<b>NOTES</b> 1. Borehole terminated upon refusal to augers due to cobbles and boulders.											

LAGWGL02 BRM00601607A0 GPJ NEW GDT 12/5/11



Time	Water Level (m)	Depth to Cave (m)
On completion	Dry	2.39

# Log of Borehole 13

Project No. BRM-00601607-A0

Drawing No. 14

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: November 1, 2011

Auger Sample

Combustible Vapour Reading

Drill Type: CME 55 (Bombardier)

SPT (N) Value

Natural Moisture

Datum: TBM = 100.00m (assumed)

Dynamic Cone Test

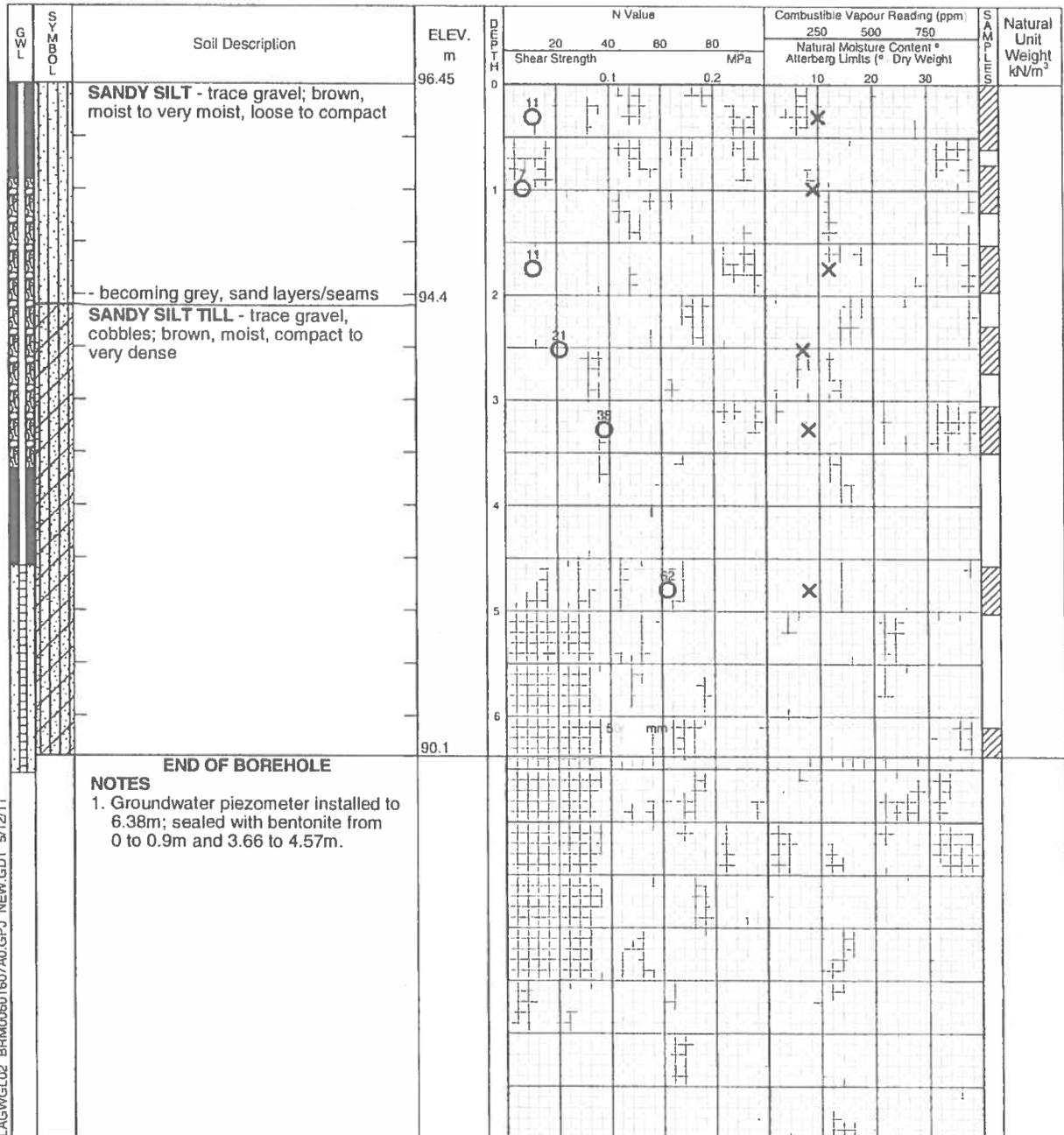
Plastic and Liquid Limit

Shelby Tube

Undrained Triaxial at % Strain at Failure

Field Vane Test

Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	5.03	5.85
November 16, 2011	5.85	

# Log of Borehole 14

Project No. BRM-00601607-A0

Drawing No. 15

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: November 1, 2011

Auger Sample



Combustible Vapour Reading



Drill Type: CME 55 (Bombardier)

SPT (N) Value



Natural Moisture



Datum: TBM = 100.00m (assumed)

Dynamic Cone Test



Plastic and Liquid Limit



Shelby Tube



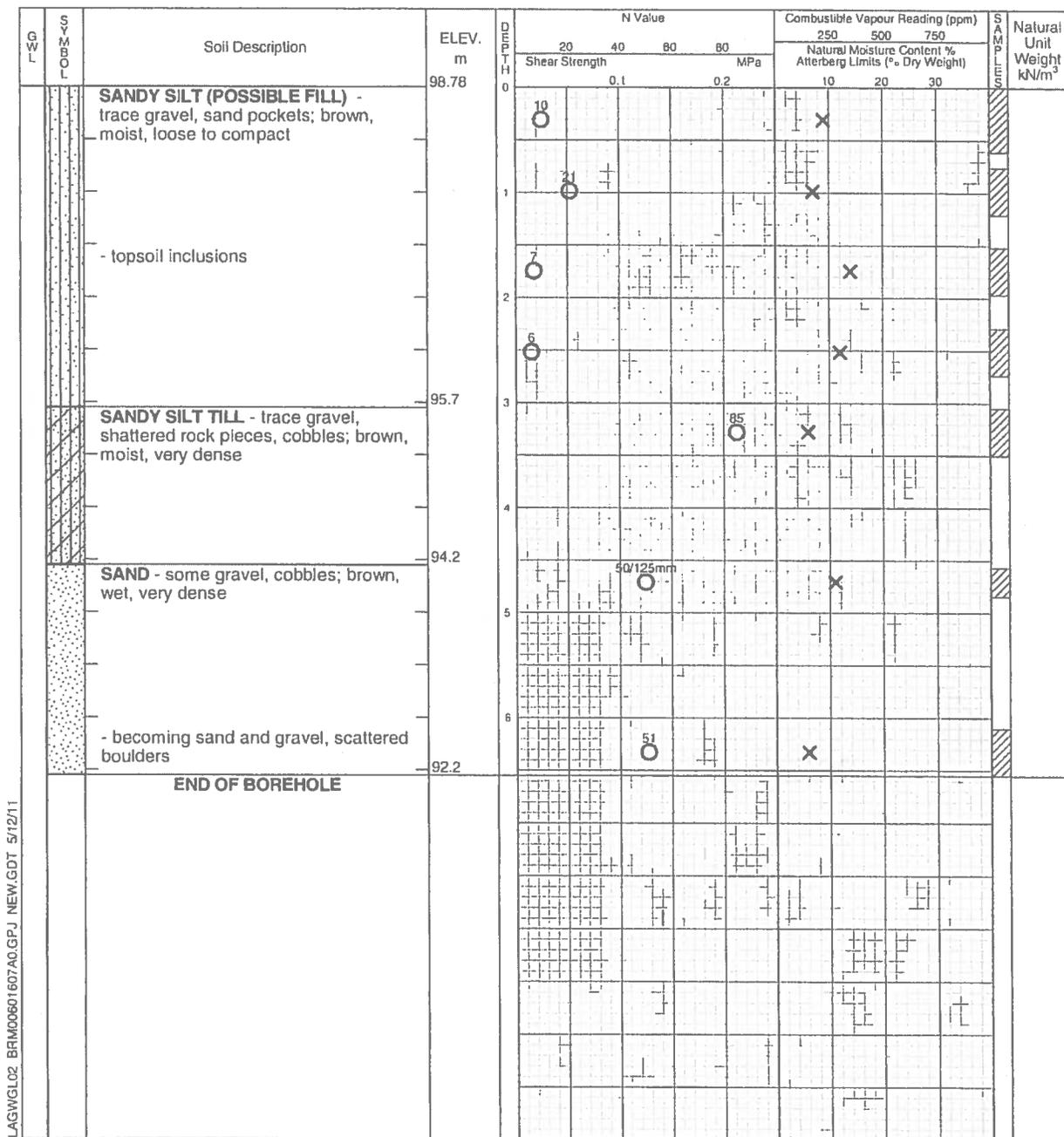
Undrained Triaxial at % Strain at Failure



Field Vane Test



Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	4.56	5.49

# Log of Borehole 15

Project No. BRM-00601607-A0

Drawing No. 16

Project: Geotechnical Investigation - Proposed Townhouse Development

Sheet No. 1 of 1

Location: Watson Parkway North and Watson Road, Town of Guelph, Ontario

Date Drilled: November 1, 2011

Auger Sample



Combustible Vapour Reading

Drill Type: CME 55 (Bombardier)

SPT (N) Value



Natural Moisture

Datum: TBM = 100.00m (assumed)

Dynamic Cone Test



Plastic and Liquid Limit



Shelby Tube



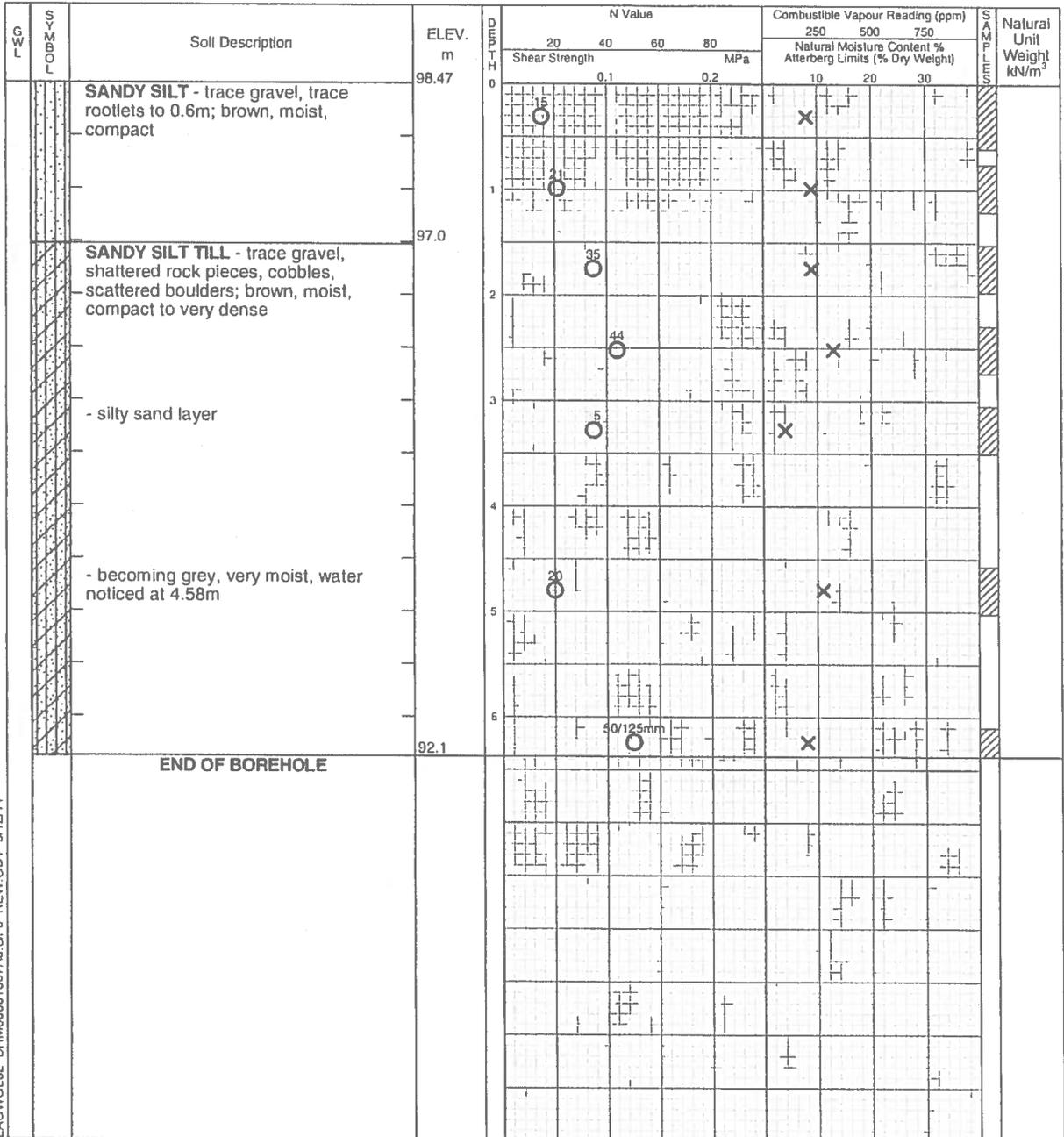
Undrained Triaxial at % Strain at Failure



Field Vane Test



Penetrometer



LAGWGL02 BRM00601607A0.GPJ NEW.GDT 5/12/11



Time	Water Level (m)	Depth to Cave (m)
On completion	4.02	5.11

**APPENDIX II**  
Hydrogeological Study Report (Gamsby and Mannerow)

**HYDROGEOLOGICAL STUDY**  
**COLETARA DEVELOPMENTS**  
**WATSON-STARWOOD NODE DEVELOPMENT**  
**CITY OF GUELPH**

**DRAFT**

**GAMSBY AND MANNEROW LIMITED**  
**CONSULTING PROFESSIONAL ENGINEERS**  
**GUELPH – OWEN SOUND – LISTOWEL – KITCHENER – EXETER**

May 2013  
Our File: 412086-1

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**DRAFT - HYDROGEOLOGICAL STUDY  
COLETARA DEVELOPMENTS  
WATSON-STARWOOD NODE DEVELOPMENT  
CITY OF GUELPH  
May 15, 2013  
Our File: 412086-1**

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## **1.0 INTRODUCTION**

The subject property is approximately 2.65 hectares and is located in the northeast quadrant of the City of Guelph. The subject property is currently vacant and is bound by Starwood Drive to the north, existing residential development and vegetated and wetland area to the west, and Watson Parkway South to the east. The site includes a temporary sediment basin that was installed at the time of the Grangehill Estates development. The site location is shown on Figure 1. The subject property is described as Part of Lot 3, Concession 3, Division 'C' in the Geographic Township of Guelph, City of Guelph, more specifically identified as Part 14 of Plan 61R-7989. The site layout is shown in Figure 2.

## **2.0 PURPOSE**

Gamsby and Mannerow Limited (G&M) has been retained by Starwood Watson Holding Inc. to conduct this Hydrogeological Study (Study). It is our understanding that this Study has been requested by the City of Guelph through the Environmental Advisory Committee (EAC) meeting of February 13, 2013 to provide comment with respect to:

*..... the potential influence of buried valleys on the movement of groundwater (i.e., Cole et al. 2009, Hydrogeology Journal 17:1411-1425) and Grand River Source Protection Area Approved Assessment Report. Potential hydrogeological impacts (i.e., to the municipal well, the natural heritage features and functions of the surface/groundwater interactions) of the proposed development should be assessed in the EIS by a Hydrogeologist.*

This Study investigates the nature of local hydrogeology and assesses the potential for water quantity or quality impacts that could be caused due to the proposed development. In particular, the study will assess the potential for impacts to the adjacent wetland and woodland (directly to the west of the subject property), the Clythe Creek system (approximately 50 to 100 m to the south), and the Clythe Municipal Well (approximately 375 m to the east) and provides mitigation measures, as required.

### 3.0 METHODOLOGY

The tasks conducted as part of the hydrogeological assessment included the following:

- Review of available geologic and hydrogeologic information for the site and surroundings (topographic and geological maps), including Cole et al. (Hydrogeology Journal 2009), and Ashworth (M.ASc Thesis, University of Guelph, May 2012);
- Review of the City of Guelph Wellhead Protection Areas (WHPAs) established through the Grand River Source Protection Area Approved Assessment Report and prescribed drinking water threats under the Clean Water Act (CWA),
- Review of topography to assess surface water flow directions and patterns.
- Site reconnaissance during spring, or “high water” conditions, to assess the surface water features and potential for groundwater discharge areas such as seeps or springs.
- The installation of three shallow piezometers and hand augering to obtain waterlevel information, soil property information, and estimate the potential for groundwater discharge adjacent to the wetland features.
- Analysis of information collected during the installation of three boreholes completed with monitoring wells in association with a geotechnical investigations for the subject property.
- Focused elevation and location survey of the piezometers and key surface water features.
- The collection of groundwater and surface water elevations during the wet period of the year to assess groundwater flow direction and potential for groundwater discharge.
- Analyses of information to assess hydraulic setting, potential for impacts, and potential mitigative measures.
- Completion of this letter report describing the findings of the investigation.

### 3.1 BACKGROUND AND AVAILABLE REPORTS

Several local reports have been completed with respect to the both the subject property and neighbouring properties. In particular, due to the recent development of the area, including the property directly to the west, several reports are available the provide information that directly relates to the subject property and the adjacent PSW and woodland area.

In addition to the available hydrogeological information available through published mapping and the Grand River Conservation Authority mapping system, the following documentation was reviewed to provide supplemental information to the report:

- *Hydrogeological Investigation, Cityview Drive Development*. Anderson GeoLogic Limited, June 2011;
- *Wetland Assessment, Part Lots 25, 31, and 32, Concession 3, Guelph Ontario*. Trow Associates Inc., February 23, 2010;
- *Geotechnical Investigation, Proposed Townhouse Development, Watson Parkway North and Watson Road*. Exp Services Inc. November 28, 2011.
- *The role of buried bedrock valleys on the development of karstic aquifers in flat-lying carbonate bedrock: insights from Guelph, Ontario, Canada*. Cole et al. Hydrogeology Journal. 2009. 17: 1411-1425.
- *Groundwater-Surface Water Interactions and Thermal Regime in Clythe Creek, Guelph, Ontario: Threats and Opportunities for Restoration*. Hailey Ashworth. M.ASc Thesis, University of Guelph, May 2012.
- the *Grand River Source Protection Areas – Approved Assessment Report*, August 2012, hereafter referred to as the GRSPA.
- *Preliminary Geotechnical Investigation, Proposed Residential Development, Part of Lots 4 & 5, Concession 3, Division C, Watson Parkway North and Starwood Drive, Guelph, Ontario*. V.A. Wood (Guelph) Incorporated. May 2013.

Additional information regarding area water levels at adjacent properties was obtained from G&M project files through authorization from property owners.

### **3.2 SHALLOW PIEZOMETER INSTALLATION AND SITE RECONNAISSANCE**

On April 17, 2013, Joanna Olesiuk, B.Sc., and Matthew Nelson, P.Eng., P.Geo., attended the site to conduct site reconnaissance and install shallow piezometers. The nature of the site topography, surface water features, and the potential groundwater discharge features were noted during the reconnaissance.

Three shallow piezometers were installed in the vicinity of the westerly property boundary and adjacent to the provincially significant wetland (PSW) which occurs on the adjacent property (refer to Figure 2). To install the piezometers, the soils were hand excavated and/or augered to the selected depths. The soil conditions and groundwater occurrence were documented. The piezometers were installed to depths of 0.8 to 1.45 m below ground surface (bgs), and completed with 0.0254 m diameter schedule 40, flush joint PVC. The screen intervals were backfilled with native material where annular space remained and finished to surface using bentonite chips. The borehole logs are enclosed in Appendix A.

### **3.3 MONITORING WELL INSTALLATION**

On April 15, 2013, three shallow boreholes were completed by London Soil Test Ltd (a licensed drilling contractor) under the direction of V.A. Wood in support of geotechnical investigations being conducted concurrently. Boreholes were completed using hollow-stem augers and split spoon samples (0.6 m in length) were collected at varying depths to assess the nature of the soils. The boreholes were completed to depths between 5.8 and 7.6 m bgs.

Monitoring wells were constructed with 0.05 m (2 inch) diameter PVC with screen lengths of either 1.5 m (5 ft) or 3.05 m (10 ft). The locations and elevations of the monitoring wells were surveyed by G&M using global position satellite (GPS) technology combined with rod and level methods. Summaries of the results of the soil conditions observed and the monitoring well installation details are provided in the Borehole Logs (Appendix A).

### **3.4 GROUNDWATER ELEVATION MEASUREMENT**

Groundwater level measurements were collected on two separate occasions following installation (i.e., April 20, 2013, April 26, 2013, and again on June 11, 2013). The April groundwater level measurements were collected in early spring and are considered to represent “high” groundwater conditions at the subject property. Groundwater elevation data is provided in Table 1.

In addition to the on-site information, waterlevel data from adjacent properties was obtained through authorization of adjacent property owners and previous available reports. This information was used to provide additional certainty regarding the inferred groundwater flow patterns.

## **4.0 SITE DESCRIPTION**

### **4.1 GENERAL SITE LAYOUT**

The proposed development is located in the northeast portion of the City of Guelph (refer to Figure 1). The site is bounded to the north by Starwood Drive to the north and the Watson Parkway to the east. To the west is undeveloped vegetated lands, including a PSW. The 30 m buffer for this wetland feature extends on to the westerly portion of the subject property (refer to Figure 2). Under existing conditions, the majority of the site is used for agricultural purposes. It is apparent that the site has been cleared and filled in association with historic development in the area.

### **4.2 PROPOSED DEVELOPMENT – CONCEPT PLAN**

It is currently proposed that the subject property be developed with five (5) multi-unit residential buildings and one (1) common amenity building and pool, along with the associated below grade and surface parking, driving and landscaped areas. Following development of the site, the ground cover will include rooftop, asphalt and landscaped areas.

The site is to be serviced via municipal storm sewer, sanitary sewer, and the municipal water system.

## **5.0 BACKGROUND REVIEW FINDINGS**

### **5.1 OVERBURDEN GEOLOGY**

The site is located in the physiographic region known as the Guelph Drumlin Field (Chapman and Putnam, 1984). The Guelph Drumlin Field occupies an area of approximately 830 square kilometres in Southern Ontario and contains approximately 300 broad, oval-shaped drumlins separated by poorly drained valleys. The till of these drumlins is described as being loamy and calcareous and having an approximate sand, clay, and silt content of 50%, 35% and 15%, respectively. The intervening low ground between drumlins is primarily occupied by alluvial deposits, organic materials and occasionally sand and gravel deposits of glaciolacustrine and glaciofluvial origin.

The subject property is located within a relatively low-lying area at the southern terminus of two drumlin features, and falls within the glacio-fluvial outwash consisting of sand and gravel.

Based on geologic mapping and interpolation from area MOE well records, the bedrock elevation is expected to be in the range of 320 m asl.

### **5.2 BEDROCK GEOLOGY**

The underlying bedrock consists of Middle Silurian age dolostone from the Guelph and Amabel Formations which tends to slope to the southwest. The Guelph Formation is inferred to underlie most of the study area and is the youngest bedrock unit in the area. The formation is composed of brown to buff, thickly-bedded crystalline dolostone which has a local thickness of over 30 m. In borehole logs Guelph formation is generally referred to as brown rock or limestone.

The Guelph formation is underlain by the Eramosa Member of the Amabel Formation. The Eramosa Member consists of finely bedded brown or black bituminous dolostone. In water-well records the unit is often described as dark brown/black rock or limestone and is sometimes difficult to differentiate from the overlying Guelph Formation.

Underneath the Eramosa Member unit is a layer known as Unsubdivided Amabel Formation, which consists of white to gray and brown dolostone. Reefal structure and fossiliferous beds are common in this unit. Within water well records, the unit is often described as blue/white/grey limestone or rock.

The Reynales Formation of the Clinton Group is reported to underlie the Amabel Formation. The formation has an upper unit of blue/grey dolostone and a lower unit which is blue/grey, thin to medium-bedded, dense dolostone with abundant bioclast material. The dolostone of the formation is likely not distinguishable from the overlying dolostone formation, while material described in well logs as blue shale is likely shale beds within the Reynales Formation.

Based on the well records and general knowledge of the Guelph Area, the bedrock system is used as the primary source of drinking water.

Based on the GRSPA, the subject property is located within a Well Head Protection Area B (WHPA-B) with a vulnerability score of 10. Based on the occurrence of several municipal wells within the City and the hydrogeologic conditions, the capture zones overlap. The subject property is located within the overall capture zone for these municipal supply wells and is approximately 400 m west of the Clythe supply.

### 5.3 TOPOGRAPHY AND DRAINAGE

The region is characterised as hummocky with drumlins and valleys. The Northeast Quadrant Report states that land elevations in the region range from about 360 metres above sea level (masl) in the vicinity of Guelph Lake to about 310 masl in the vicinity of the confluence of the Speed and Eramosa Rivers. The confluence is located approximately 4 km southwest of the subject property. Overall, the region slopes to the south with a gradient of about 3.5 m/km.

Locally the filled area of the site is generally flat and at similar grade with the abutting right-of-ways, with the exception of the lower-lying west side of the property (inferred not to have been filled). The relief is approximately 7 m from the northwest to southeast direction at an average gradient of 2%.

The Eramosa River and its tributaries Clythe/Watson Creek and Hadati Creek discharge to the Speed River along with several other unnamed tributary streams. Regionally, surface water drainage is reported to be primarily to the south and west.

The main surface water feature in the study area is Clythe Creek, which is located approximately 250 m south of the subject property, and flows in a southwesterly direction and discharges to the Eramosa River. The GRCA defined wetland to the west and vegetated areas to south appear to form a tributary to the Clythe Creek subwatershed.

### 5.4 REGIONAL HYDROGEOLOGY

Within the study area it is reported that fractured bedrock (both Guelph and Amabel Formations) forms the major aquifer and is the unit from which the City of Guelph derives much of its municipal water supply. Of the three units (Guelph/Eramosa/Amabel) capable of sustaining yields of water, the Unsubdivided Amabel Formation is thought to have the greatest potential for development as a source of municipal water supply, due to the more pronounced occurrence of fractures and cavities. Furthermore, Cole et al. (2009) show that greater production rates from the bedrock system may be attributable to the presence of greater secondary porosity features related to historic bedrock valleys, which have been filled in by more recent geologic events, (primarily glacial activity).

The till meanwhile is significantly less permeable than granular outwash deposits and the fractured bedrock, and thus behaves as an aquitard which locally retards groundwater movement relative to the two more permeable units.

Based on the local topography and surface water drainage features, the local shallow groundwater flow is inferred to be in a southerly direction, towards Clythe Creek and the Eramosa River.

Movement of groundwater through bedrock also depends primarily on the distribution and geometry of fractures, solution channels and areas of high permeability such as reefal structures and fossiliferous units. Cole et al. (2009) have delineated a historic bedrock valley that is generally oriented with the Clyde Creek in the vicinity of the site and branches northerwesterly approximately 500 to 700 m northeast of the site. Groundwater movement is believed to be generally from the northeast to the southwest within the Northeast Quadrant, with local components of flow towards the Speed River, to the west of the quadrant, and the Eramosa River, to the south of the quadrant. In the vicinity of the study area it would be expected that the regional groundwater flow would be primarily in a south-westerly direction towards the Eramosa River.

## **6.0 INVESTIGATION FINDINGS AND DISCUSSION**

### **6.1 TOPOGRAPHY AND DRAINAGE**

The site generally drains in a northwest to southeast direction at an average gradient of 2% towards the temporary sediment basin located in the southeast corner of the site. The temporary sediment basin discharges via a ditch inlet catchbasin to the existing municipal storm sewer on Watson Parkway, which outlets to the existing municipal stormwater management facility on the east side of Watson Parkway South. As part of the historic development of the property and area, a swale (or cut) feature is evident directly adjacent to the westerly property boundary. This feature prevents overland stormwater flow from migrating from the subject property towards the vegetated and GRCA defined wetland area.

### **6.2 GEOLOGIC CHARACTERIZATION**

Based on the on-site boreholes, the overburden soils were found to consist primarily of:

- Brown silty sand to gravel fill, located within the northerly and easterly portions of the property,
- Brown dense to compact silty sand with some gravel and clay, located in the north and west portion of the property,
- Brown dense cobble, gravel, and sand with some silt.

The cobble, gravel, and sand is inferred to be glacio-fluvial outwash. This relatively coarse-grained unit is expected to be interlayered with sand and silt units, with a sand and silt till unit found below the outwash at BH1 and BH2. However, in general these units are inferred to overlay the bedrock. Based on grain-size analysis and reported values for similar soils, the gravel and sand unit is estimated to have a hydraulic conductivity in the range of  $10^{-4}$  to  $10^{-5}$  m/s. The underlying sand and silt till is estimated to have a hydraulic conductivity in the range of  $10^{-7}$  to  $10^{-8}$  m/s.

The occurrence and thickness of the silty sand till overlying the outwash is expected vary across the site, with the absence of this unit at BH3. Based on grain-size analysis and reported values for similar soils, the silty sand unit is estimated to have a hydraulic conductivity in the range of  $10^{-7}$  m/s.

The occurrence and nature of the overburden soils is consistent with the reported occurrence of glacio-fluvial outwash.

### 6.3 LOCAL HYDROGEOLOGY

Shallow groundwater flow often correlates to topographical features and typically flows towards nearby lakes, streams, and wetland areas. Based on the area geology and topography, the direction of the local shallow groundwater flow at the site is inferred to be primarily southerly towards Clythe Creek.

Based on the elevations of groundwater measured in the on-site monitoring wells, the groundwater flow in the shallow overburden appears to be in a southeasterly direction, towards the stormwater management ponds, on the easterly side of Watson Parkway and Clythe Creek (refer to Figures 3 and 4). This groundwater flow direction is consistent with the topography at the site and is supported by previous available studies completed for adjacent properties.

In April 2013, the groundwater elevations were found to range from approximately 326 m asl at the northwesterly portion of the property to approximately 323.5 m asl in the southerly portion of the property.

### 6.4 PSW FEATURE

Over the majority of the property, groundwater flow does not appear to be directed to the wetland feature, which is considered to be cross-gradient to the subject property. Based on shallow piezometer installations, a component of groundwater flow from the low-lying westerly portion of the subject property towards the vegetated and PSW areas appears to exist under high watertable conditions (i.e., in Spring). The surface water and groundwater elevations associated with the wetland and buffer areas were found to range from approximately 325.8 m asl to 323.5 m asl (at a centralized low point).

No evidence of groundwater seepage or springs were evident during the site reconnaissance on April 17, 2013. The site reconnaissance was conducted during the spring since this is the time period when groundwater levels are typically under “high” conditions, and springs would typically have the greatest potential to occur. No evident surface water flows were noted with localized areas of standing water apparent in some locations. The ground cover varied from leaf-litter in woodland areas to grassed areas. The soils generally appeared to be organic and saturated.

The *Wetland Assessment, Part Lots 25,31, and 32, Concession 3, Guelph Ontario* (Trow Associates Inc., February 23, 2010), was completed in relation to development of a 15.2 ha property directly to the west of the subject, and including the PSW. This investigation utilized a series of nested piezometers to evaluate the potential for upwards gradients associated with the PSW feature, adjacent to the subject property. This report stated that:

*Based on the recent groundwater monitoring results, groundwater elevations in all wells were below the ground surface, and the vertical flow direction was downward, suggesting the wetland is fed predominantly by surface water.*

The *Hydrogeological Investigation, Cityview Drive Development* (Anderson GeoLogic Limited, June 2011) was also completed in relation to development directly to the west of the subject property. These investigations included the use of nested wells and drive-point piezometers within the PSW to evaluate the potential for upwards gradients (i.e., groundwater discharge to the wetland). The study states:

*...it is concluded that the PSW located in the northwest end of the property is fed directly by surface water runoff (including interflow, which is the near-surface flow that originates from recent runoff events and which moves short lateral distances through surficial soil layers). There is no apparent upwelling or discharge of groundwater to the PSW, although shallow groundwater undoubtedly passes beneath the wetland.*

It was shown that the areas to the west and northwest had stormwater contributions to the wetland feature and mitigative measures included three infiltration galleries with stormwater overflow to the PSW, with excess stormwater (relative to pre-development conditions) directed off-site via stormwater sewer.

Based on the site-specific data and information from previous studies, it appears that the wetland area is maintained primarily by and surface water run-off with intersection of the local shallow groundwater during the wet periods of the year. The elevation of the groundwater table, although subject to minor variation locally, is primarily dependent on the more regional catchment area, i.e. on the scale of square kilometres.

## **7.0 WELLHEAD PROTECTION - CITY PRODUCTION WELLS**

The City of Guelph's Clyde Well is located approximately 400 m east of the subject property. The subject property is located within the overall capture zone for several municipal supply wells the City. Based on the horizontal groundwater gradients observed across the subject property and downwards vertical gradients documented to the west, it is inferred that the site is primarily within an area of groundwater recharge. These sources of Municipal drinking water are protected under the Clean Water Act (2006).

### **7.1 REGULATORY SETTING**

The Clean Water Act (CWA) was established in 2006 to protect and to ensure the quality and sustainability of municipal supplies of drinking water sources within the province. A focus of the CWA is the preparation of locally developed source protection plans and vulnerability assessments which can then be used to identify *threats* to the municipal wells. Under the CWA a drinking water threat is defined as *an activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water, and includes an activity or condition that is prescribed by the regulations as a drinking water threat.*

The vulnerability assessment has been provided within the GRSPA and can be used in conjunction with the Tables for Drinking Water Threats (CWA, 2006) to determine the drinking

water threat level (low, moderate or significant) associated with specific activities. It is our understanding that the CWA requires the implementation of corrective actions to reduce or eliminate *significant threats* identified (i.e. activities considered to pose a *significant threat* may be prohibited or may require a site-specific risk management plan).

## 7.2 VULNERABILITY ASSESSMENT

Based on the GRSPA, the subject property falls within a WHPA-B (Map 8-1) with a resulting vulnerability scores assigned to the subject property of 10 (GRSPA Map 8-9).

## 7.3 LISTED POTENTIAL DRINKING WATER THREATS

The CWA framework provides *Tables for Drinking Water Threats* which outline activities and specific *circumstances* that could potentially pose a threat to drinking water sources. The assigned WHPA area and vulnerability scores are used to determine whether the threat to drinking water, as related to the prescribed activity and circumstances, is considered to be Low, Moderate or Significant. As described, the identification of a ‘Significant threat’ is considered to be unacceptable for the proposed development without the completion of a site-specific Risk Management Plan.

The following activities associated with the proposed development were identified within the *Prescribed Drinking Water Threats*:

- The application of road salt;
- The storage of snow; and
- The establishment, operation or maintenance of a system that collects, stores, transmits, treats, or disposes of sewage including:
  - Sewage system or sewage works – Discharge of untreated stormwater from a stormwater retention pond; and
  - Sewage system or sewage works – Sanitary sewers and related pipes.

### Road Salt Application

The threats level assigned to drinking water sources resulting from road salt application within a WHPA-B zone, specifically sodium chloride, are ranked based on the ‘impervious surface area mapping’, and are summarized on the following Table (CWA Table reference 88 to 95):

Impervious Surface Area (%)	Threat Level for Areas with the Vulnerability Score Outlined		
	Significant	Moderate	Low
Less than 1			8-10
Between 1 and 8		10	6-8
Between 8 and 80		8-10	6
Greater than 80	10	8	6

Based on the conceptual development plan, the impervious surface area on the subject property is expected to be in the range of 55%, well below 80%. Therefore, the drinking water threat level associated with the application of road salt will be moderate. In order to ensure that the threat level does not become Significant, it is recommended that the proposed development maintain an impervious surface area of less than 80%.

### Snow Storage

Run-off associated with areas where snow is being stored has the potential to contain sodium, chloride, and/or petroleum hydrocarbons (CWA Table reference 1445 to 1455). Considering the vulnerability scores of 10 assigned to the subject property, snow piles having a surface area of between 0.1 and 0.5 ha (0.25 and 1.24 acres) would be considered to have a low to moderate drinking water threat. Based on the layout of the proposed development, snow storage greater than 0.5 hectares would not occur on the subject property. Therefore, no significant threats are identified due to potential snow storage.

### **Sewage System and Related Works**

Due to the potential for sewage to contain various chemicals, drinking water threats related to sewage disposal from the proposed development were evaluated. According to the Stormwater Design Report, *the site will be serviced via gravity to the municipal system.*

Under the *Prescribed Drinking Water Threats*, the threat remains low to moderate for all chemicals outlined within the CWA Table 1 - *Drinking Water Threats* at flow rates of less than 10,000 m<sup>3</sup>/day. A further reduction in threat level is provided at flow rates of less than 250 m<sup>3</sup>/day of sewage. Based on the number of units proposed for the development, the sanitary sewer system from the development will not transmit greater than 250 m<sup>3</sup>/day of sewage. Therefore, no Significant threats related to the transmission of sewage, namely human waste, were identified for the proposed.

### **Stormwater Management System**

Based on the Stormwater Design Report, stormwater will primarily be directed to the municipal system, ultimately discharging the existing municipal pond.

Based on the reviewed CWA Table 1 - *Drinking Water Threats* for WHPA-B zone designation, a system that collects, stores, treats or disposes of sewage, including storm water management facilities designed to discharge storm water to land or surface water have the potential to introduce chemical threats to groundwater or surface water supplies including but not limited to aluminum, arsenic, chloride, cadmium, copper, lead among others. To evaluate the Drinking Water Threat, the following site-specific factors were utilized:

- a vulnerability score of “10”,
- the stormwater management facility lands are located within WHPA-B zone,
- the drainage area of the stormwater drainage area is less than 10 hectares,
- the stormwater (although contained on the subject property) is destined for surface water discharge.
- the predominant land use high density residential.

The Drinking Water Threat (CWA Table 1 reference number 372 to 390) remains low to moderate for all listed chemicals outlined in Table 1 associated with stormwater discharge to land or surface water. Therefore no Significant Threats were identified with respect to proposed stormwater management system for the subject property.

Based on the SWM facility which is designed to discharge to land or surface water, with a drainage area of between one and 10 ha, and the predominant land use in the area being high

density residential, the drinking water threat associated with the SWM facility is considered to be low.

#### **7.4 WELLHEAD PROTECTION SUMMARY**

Based on the vulnerability assessment and review of the potential Drinking Water Threats associated with the proposed development, no Significant Threats were identified. Under the Tables of Drinking Water Threats, the scale of the proposed residential development, the limited snow storage (of less than 0.5 hectares) and sewage transmission (of less than 250 m<sup>3</sup>/day) reduces the level of risk associated with the development.

### **8.0 IMPACT ASSESSMENT**

#### **8.1 GROUNDWATER**

Based on the current site setting and proposed development, impacts to the local groundwater resources are not expected. The continued presence of overburden soils post-development is expected to provide a level of protection to the overall groundwater resources. Further, based on residential use and the relatively limited size of the subject property, the site activities are not expected to be pose a threat to groundwater resources. As described in Section 8, no Significant Threats were identified with respect to the well protection designation.

Cole et al. (2009) identify paleo-valleys, now buried, and document a correlation between bedrock well yield and the location of the buried valleys. The increase in yield is thought to be related to paleo-karst or increased secondary porosity, which was developed when the valleys were exposed and groundwater-surface water interaction could occur, with groundwater discharge along the base of the valleys. Post-glaciation, the valleys have been buried with glacial till. The influence on bedrock groundwater flows in the area are not defined within the study, however, based on basic principles, would correlate with occurrence of secondary porosity features.

The occurrence of such secondary porosity features at depth is not mapped or known, and can be relatively erratic and unpredictable. The occurrence of the features would primarily affect groundwater flows and capture zones where connected features exist. Based on findings of the on-site investigations and review of Studies for the adjacent properties, there were no surface water features or shallow subsurface features that suggest the occurrence of karst, or the direct connection through the occurrence of a groundwater/surface water “sink”. As such, there is no evidence that the shallow groundwater flow system at the site is affected by the occurrence of a buried bedrock valley south of the subject property or the paleo-karst features that may exist at depth within the bedrock system. The occurrence of a shallow groundwater system in the overburden soils is considered to provide a level of separation and/or buffering from such features.

Post-development, it is estimated a component of groundwater recharge will be lost through stormwater collection and direction to the off-site stormwater pond. Stormwater in the pond is susceptible to infiltration and/or overflow to Clyde Creek. Consequently, stormwater that flows to the municipal stormwater pond is expected to generally maintain the overall water budget within the Clyde Creek subwatershed.

## 8.2 POTENTIAL IMPACTS DURING CONSTRUCTION

Based on the conceptual development plan, the proposed buildings are to be constructed above the “high” watertable. Some structural works (such as footings or foundations) may extend into the watertable. With respect to the construction of buildings that may penetrate below the watertable, no impacts to groundwater flow direction that would change the water budget are expected. When footings or structures penetrate the groundwater table, although very localized or minor changes to flow directions may occur, the net groundwater flux is maintained through flow around such features. This phenomenon would occur regardless of the depth of the structure for any given hydrostratigraphic unit (or hydraulically connected unit).

In essence, although the building is placed within a saturated porous media, the groundwater can continue to readily migrate both beneath and around the building. Changes to the water budget occur only when groundwater is diverted from the overall system. No infrastructure or systems that would divert groundwater away from the system is proposed as part of the development. Post-construction, no dewatering is proposed.

In the event dewatering is required to complete the proposed construction, it is recommended that the short-term taking be subject to re-introduction to the system through re-infiltration or surface flow to the exist swale along the westerly property boundary. Under this scenario, the groundwater taking would not be diverted from the system. Dewatering of over 50,000 litres per day would require a Ministry of the Environment Permit to Take Water, which would be subject to hydrogeological review and assessment of the potential for impacts related specifically to the water taking plans.

## 8.3 MITIGATION MEASURES

Although impacts to the local water resources are not anticipated due to the proposed development, it is reasonable to expect that a level of stormwater infiltration is occurring along the westerly portion of the property with in the low-lying area adjacent to the berm. Consequently, efforts to maintain overland flow with a component of infiltration in these areas is considered to provide mitigation for the maintenance of local groundwater levels adjacent to the PSW feature within the PSW buffer. As per the development concept plan, it is recommended to maintain the existing berm through the PSW buffer area with overland flow maintained.

## 9.0 CONCLUSIONS AND RECOMMENDATIONS

This Study investigates the nature of local hydrogeology and assesses the potential for water quantity or quality impacts that could be caused due to the proposed development located southwest of the intersection of Starwood Drive and the Watson Parkway. In particular, the study will assess the potential for impacts to the adjacent wetland and woodland (directly to the west of the subject property), the Clythe Creek system (approximately 50 to 100 m to the south), and the Clythe Municipal Well (approximately 375 m to the east).

Based on the findings of this investigation, the following conclusions are provided:

1. Based on geologic mapping, the overburden is reported to be located in an area of sand and gravel glacio-fluvial outwash deposits. The overburden soils were found to consist primarily of: 1) Brown silty sand to gravel fill, located within the northerly and easterly portions of the property, 2) Brown dense to compact silty sand with some gravel and clay, located in the north and west portion of the property, 3) Brown dense cobble, gravel, and sand with some silt.
2. The site generally drains in a northwest to southeast direction at an average gradient of 2% towards the temporary sediment basin located in the southeast corner of the site. The temporary sediment basin discharges via a ditch inlet catchbasin to the existing municipal storm sewer on Watson Parkway, which outlets to the existing municipal stormwater management facility on the east side of Watson Parkway South. As part of the historic development of the property and area, a swale (or cut) and berm feature is evident directly adjacent to the westerly property boundary. This feature prevents overland stormwater flow from migrating from the subject property towards the vegetated and GRCA defined wetland area.
3. The horizontal groundwater flow direction in the overburden is inferred to be in a south-easterly direction towards a municipal stormwater pond and Clythe Creek. The inferred groundwater flow direction correlates with the existing drainage patterns.
4. Based on the site-specific data and information from previous studies, it appears that the PSW west of the subject property is maintained primarily by and surface water run-off with intersection of the local shallow groundwater during the wet periods of the year. The elevation of the groundwater table, although subject to minor variation locally, is primarily dependent on the larger catchment area, i.e. on the scale of square kilometers.
5. The PSW west of the subject property is considered to be cross-gradient and does not appear to be directly influenced by stormwater or groundwater from the subject property, rather primarily influenced by lands to the northwest and westerly (not associated with the proposed development).
6. Based on the absence of surface water contributions to the PSW from the subject property under existing conditions and groundwater flows to the southeast, no hydrological impacts to the PSW or vegetated lands west of the subject property are expected due to the proposed development.
7. Based on the vulnerability assessment and review of the potential Drinking Water Threats associated with the proposed development, no Significant Threats were identified.
8. There is no evidence that the shallow groundwater flow system at the site is affected by the occurrence of a buried bedrock valley south of the subject property or the paleo-karst features that may exist at depth within the bedrock system. The occurrence of a shallow groundwater system in the overburden soils is considered to provide a level of separation and/or buffering from such features.

9. Although impacts to the local water resources are not anticipated due to the proposed development, the development concept includes for the retention of the berm along the westerly portion of the property. In this area, overland stormwater flow towards the low-lying area on the subject property would maintain a level of local recharge.

Respectfully submitted,

GAMSBY AND MANNEROW LIMITED

Per:

DRAFT

Matthew D. Nelson, M.Sc., P.Eng., P.Geo.

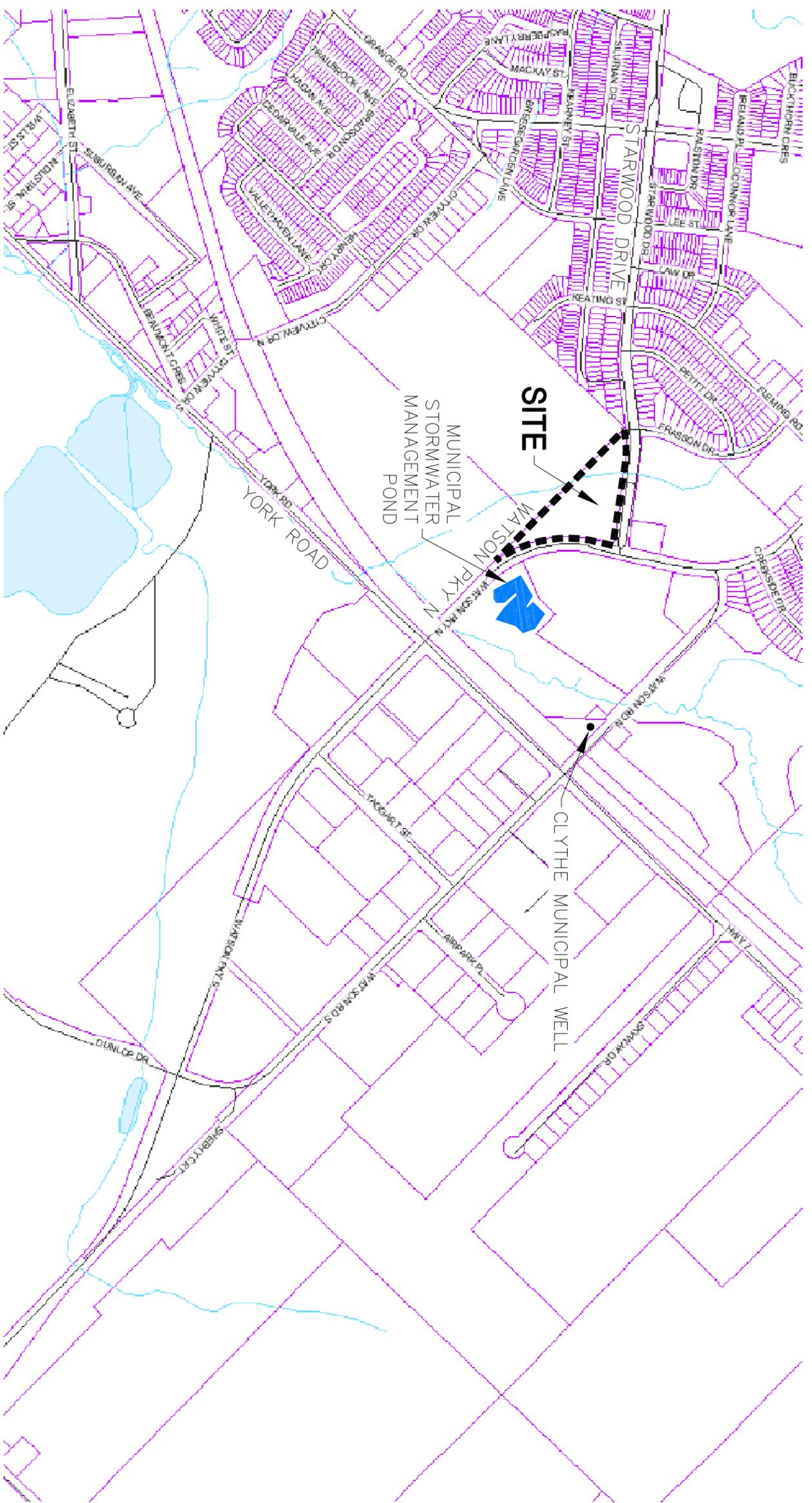
TABLE 1  
Groundwater Elevations

ID	TOC Elevation (masl)	GS Elevation (masl)	DTW (mBTOC) 20-Apr-2013	Water Elevation 20-Apr-2013	DTW (mBTOC) 26-Apr-2013	Water Elevation 26-Apr-2013	DTW (mBTOC) 11-Jun-2013	Water Elevation 11-Jun-2013
MW 1 (at Starwood)	331.273	331.186	5.91	325.36	6.04	325.24	6.35	324.92
MW2 (at Starwood/Watson)	329.367	328.231	4.88	324.49	5.05	324.32	5.37	323.99
MW3 (mid property)	328.991	327.858	4.11	324.88	4.44	324.55	4.13	324.86
PZ1	327.359	326.317	1.001	326.36	1.18	326.18	Dry	< 325.66
PZ2	325.636	324.61	1.535	324.10	Dry	< 323.91	Dry	< 323.91
PZ3	326.571	325.439	1.198	325.37	2.12	324.45	Dry	<323.99
BH109	326.847	326.24	3.145	323.70	3.41	323.44	3.85	323.00
DP2*	325.761	324.822	-	-	0.92	324.84	1.3	324.46

Monitoring location elevations determined through rod and level April 26, 2013 unless otherwise noted.

\* DP2 elevation obtained via with GPS survey equipment

**412086-1  
Proposed Townhouses  
Watson Parkway &  
Starwood Drive**



**DRAFT**

NOT TO SCALE  
JUNE 2013

**SITE LOCATION  
MAP**

**Part of Lot 5, Con. 3, Div. C  
City of Guelph  
County of Wellington**

**Figure No. 1**

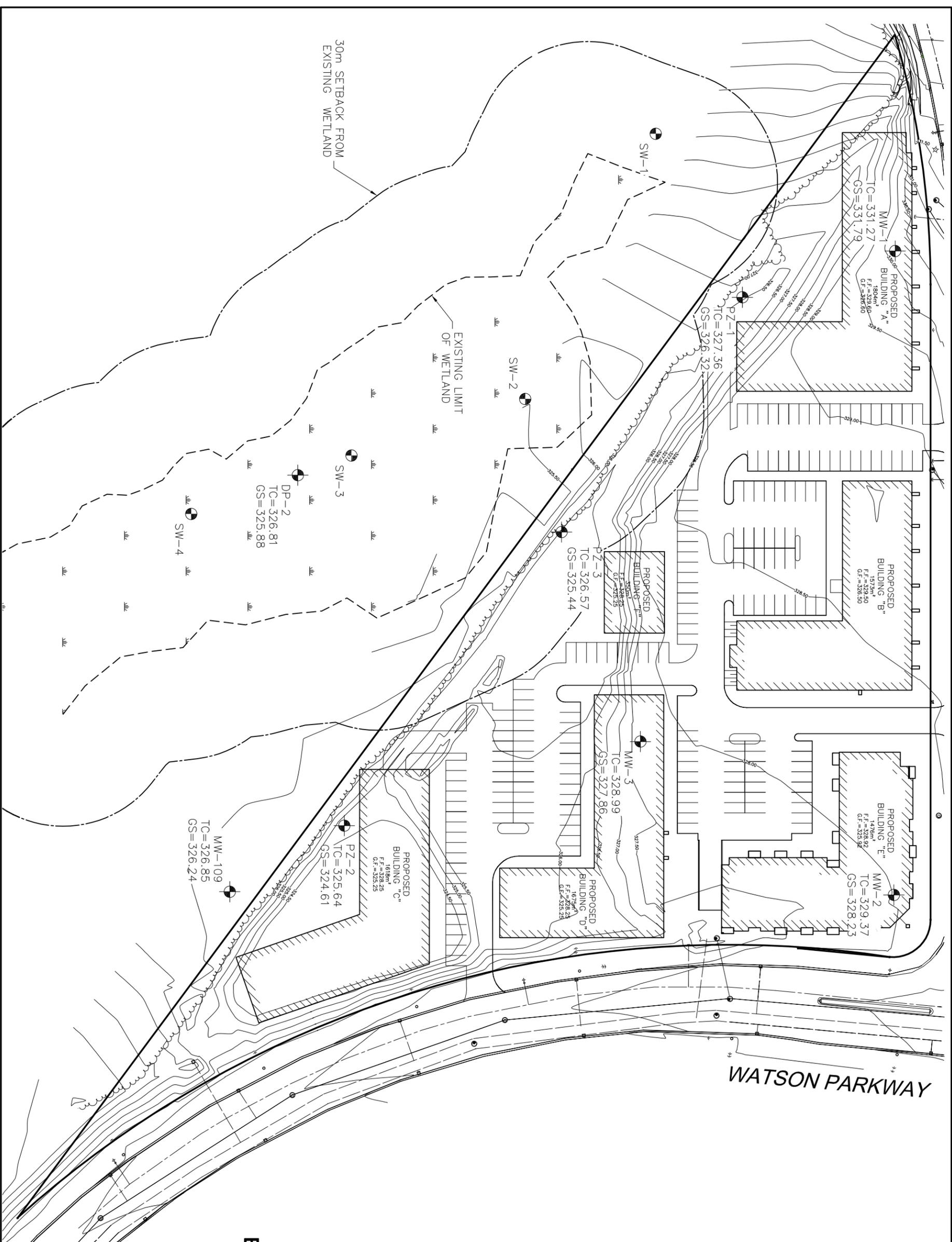


**412086-1  
Proposed Townhouses  
Watson Parkway &  
Starwood Drive**



**LEGEND**

-  MW-1 MONITORING WELL LOCATION
-  SW-1 SURFACE WATER LOCATION
-  TC TOP OF WELL CASING
-  GS GROUND SURFACE ELEVATION



**DRAFT**

SCALE 1:1,000  
JUNE 2013

**BOREHOLE & MONITORING  
WELL LOCATION PLAN**

**Part of Lot 5, Con. 3, Div. C  
City of Guelph  
County of Wellington**

**Figure No. 2**



**412086-1  
Proposed Townhouses  
Watson Parkway &  
Starwood Drive**



**LEGEND**

- MW-1 MONITORING WELL LOCATION
- SW-1 SURFACE WATER LOCATION
- TC TOP OF WELL CASING
- GS GROUND SURFACE ELEVATION
- WL WATER LEVEL (26 APRIL/13)
- SWL SURFACE WATER LEVEL (26 APRIL/13)
- 326 GROUNDWATER CONTOUR
- DIRECTION OF GROUNDWATER FLOW

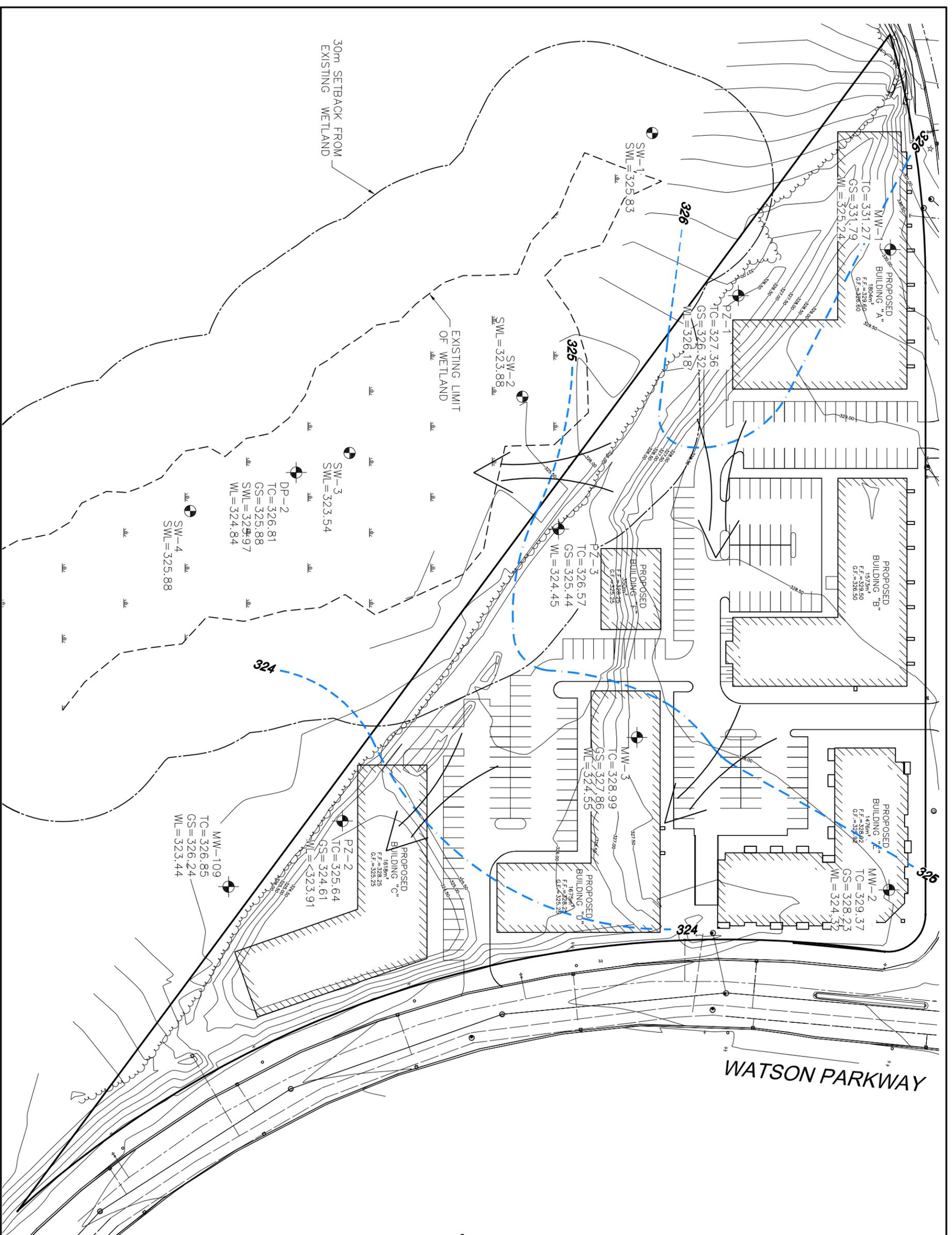
**DRAFT**

SCALE 1:1,000  
JUNE 2013

**GROUNDWATER  
CONFIGURATION  
APRIL 26, 2013**

**Part of Lot 5, Con. 3, Div. C  
City of Guelph  
County of Wellington**

**Figure No. 3**



**412086-1  
Proposed Townhouses  
Watson Parkway &  
Starwood Drive**



**LEGEND**

- MW-1 MONITORING WELL LOCATION
- SW-1 SURFACE WATER LOCATION
- TC TOP OF WELL CASING
- GS GROUND SURFACE ELEVATION
- WL WATER LEVEL (11 JUNE/13)
- SWL SURFACE WATER LEVEL (26 APRIL/13)
- 326 GROUNDWATER CONTOUR
- DIRECTION OF GROUNDWATER FLOW

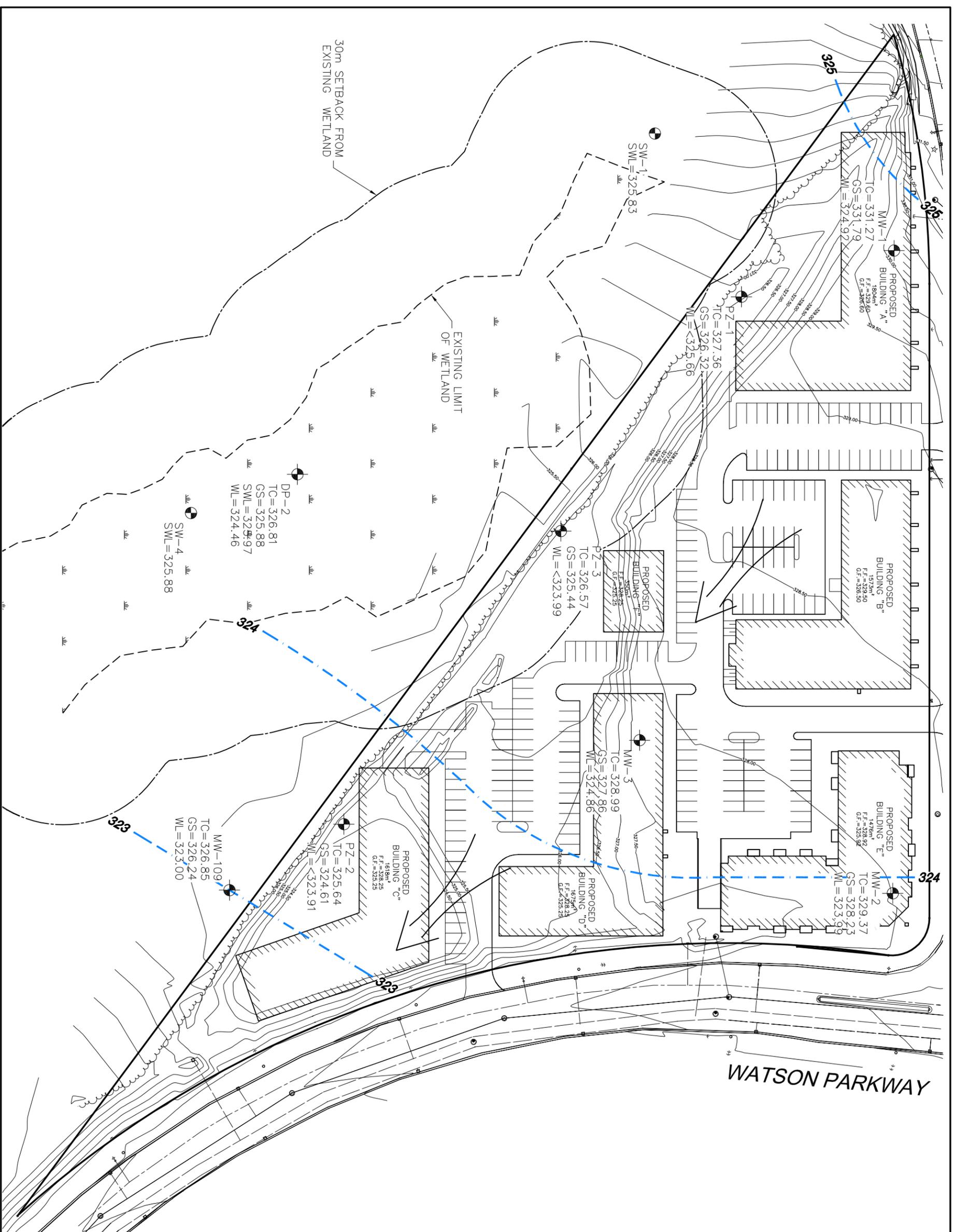
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SCALE 1:1,000  
JUNE 2013

**GROUNDWATER  
CONFIGURATION  
JUNE 11, 2013**

**Part of Lot 5, Con. 3, Div. C  
City of Guelph  
County of Wellington**

**Figure No. 4**



**HYDROGEOLOGICAL STUDY  
GUELPH LAKE SUBDIVISION  
PART OF LOT 2, CONCESSION 6, DIVISION 'C'  
CITY OF GUELPH**

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**APPENDIX "A"  
BOREHOLE LOGS**

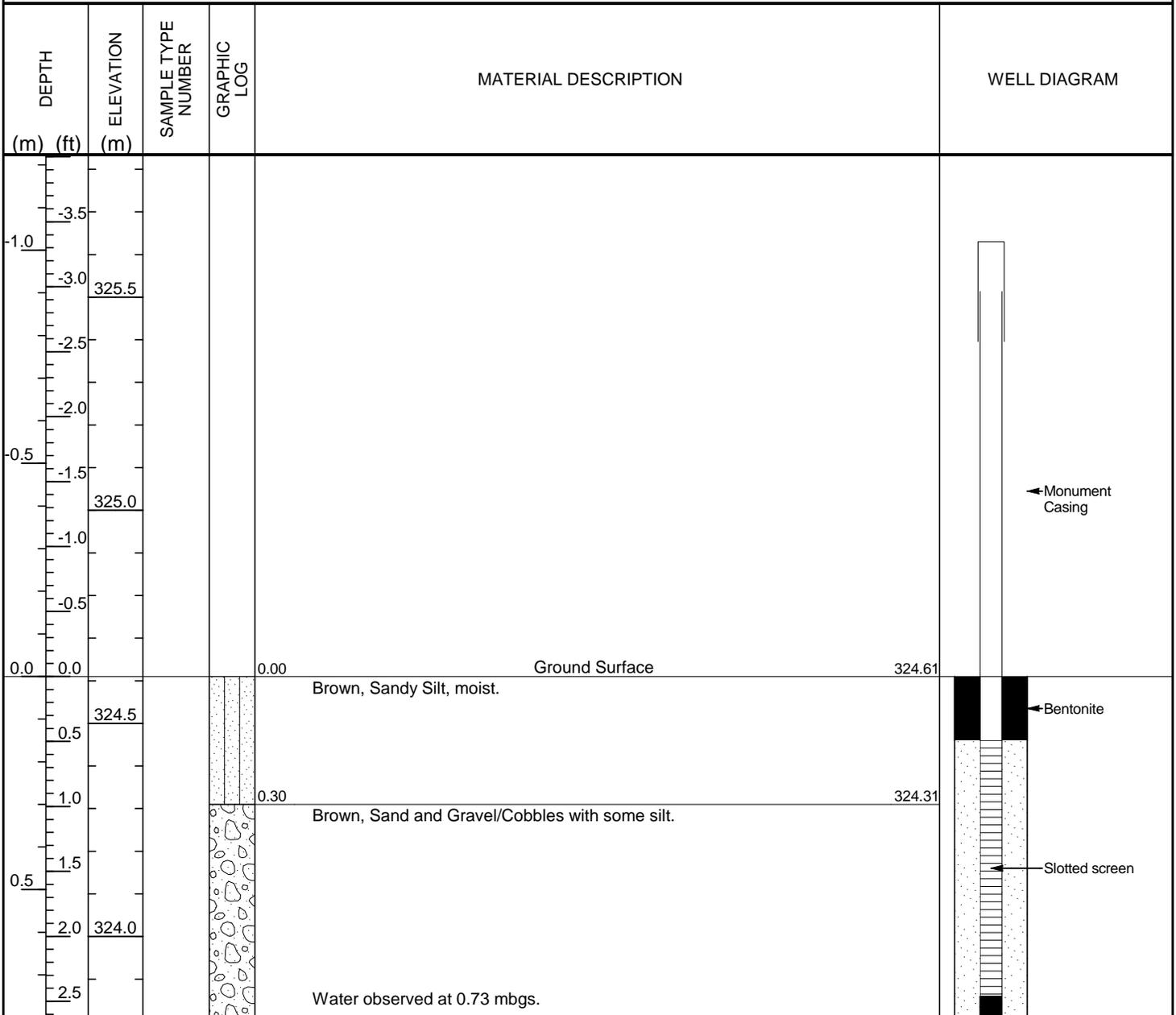
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GAMSBY AND MANNEROW LIMITED  
 people engineering environments  
 Guelph, Owen Sound, Listowel, Kitchener, Exeter  
 650 Woodlawn Road West, Guelph ON N1K 1B8  
 519-824-8150 Fax 519-824-8089 www.gamsby.com

**MONITORING WELL ID: PZ-02**

**CLIENT** Coletara Development **PROJECT NAME** Hydrogeological Study  
**PROJECT NUMBER** 412086-1 **PROJECT LOCATION** Starwood Dr. and Watson Pkwy. N., Guelph  
**DATE COMPLETED** 17/04/2013 **CONTRACTOR** Gamsby and Mannerow Ltd.  
**LOGGED BY** M. Nelson/J. Olesiuk **METHOD** Hand Auger  
**WELL CONSTRUCTION** 0.025m Ø PVC **NOTES** \_\_\_\_\_



Borehole Terminated at 0.80 m.



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 519-824-8150 Fax 519-824-8089 www.gamsby.com

**MONITORING WELL ID: PZ-01**

CLIENT Coletara Development PROJECT NAME Hydrogeological Study  
 PROJECT NUMBER 412086-1 PROJECT LOCATION Starwood Dr. and Watson Pkwy. N., Guelph  
 DATE COMPLETED 17/04/2013 CONTRACTOR Gamsby and Mannerow Ltd.  
 LOGGED BY M. Nelson/J. Olesiuk METHOD Hand Auger  
 WELL CONSTRUCTION 0.025m Ø PVC NOTES \_\_\_\_\_

DEPTH (m) (ft)	ELEVATION (m)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
-4.0	327.5				
-3.5					
-3.0					
-2.5	327.0				
-2.0					
-1.5					
-1.0					
-0.5	326.5				
0.0	0.0			0.00 Ground Surface 326.32	
0.5				0.05 Topsoil. Brown, moist. 326.27	
1.0	326.0	GB S1		Brown Sand and Gravel with silt, trace clay.  Staining of water observed at 0.2 m bgs.	
1.5					
2.0					
2.5	325.5				
3.0					

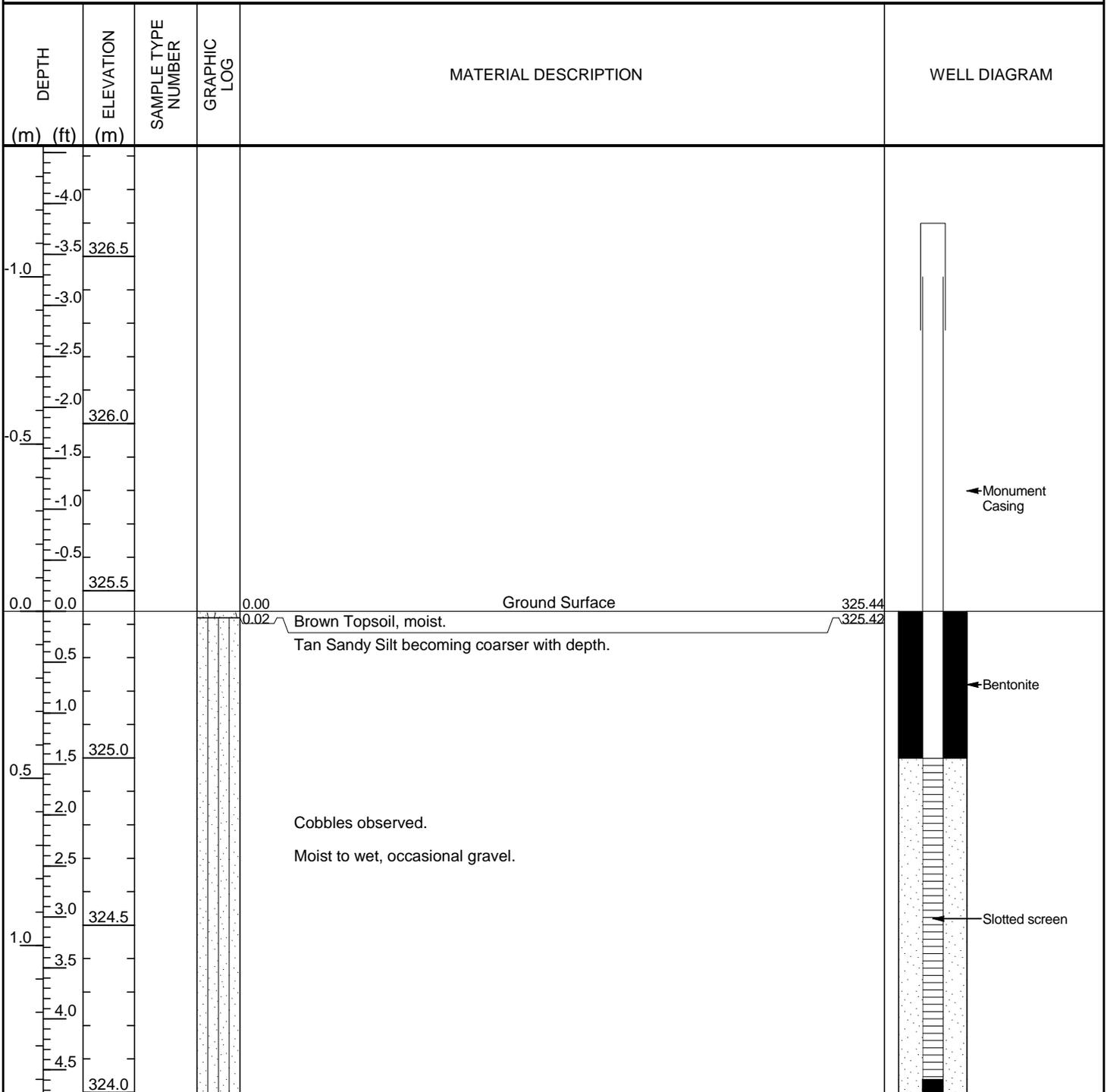
Borehole Terminated at 0.94 m.



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**MONITORING WELL ID: PZ-03**

CLIENT Coletara Development PROJECT NAME Hydrogeological Study  
 PROJECT NUMBER 412086-1 PROJECT LOCATION Starwood Dr. and Watson Pkwy. N., Guelph  
 DATE COMPLETED 17/04/2013 CONTRACTOR Gamsby and Mannerow Ltd.  
 LOGGED BY M. Nelson/J. Olesiuk METHOD Hand Auger  
 WELL CONSTRUCTION 0.025m Ø PVC NOTES \_\_\_\_\_



Borehole Terminated at 1.45 m.

REFERENCE No: G3253-3-5

**BOREHOLE No: 1**

CLIENT: Coletara Developments

**V.A. WOOD (GUELPH) INC.**  
CONSULTING GEOTECHNICAL ENGINEERS

PROJECT: Proposed Residential Development

ENCLOSURE No: 2

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3  
 PH. (519) 763-3101 FAX (519) 763-5912

LOCATION: Part of Lots 4 & 5, Conc. 3, Div. C, Guelph ON

SUPERVISOR: B.R.F.

SUBSURFACE PROFILE				SAMPLE			PENETRATION RESISTANCE	WATER CONTENT %	UNIT WEIGHT	
DEPTH (m)	DESCRIPTION	ELEVATION	SYMBOL	MONITORING WELL	NUMBER	TYPE				N-VALUE
0.0	Ground Surface	98.9								
0.2	175mm Topsoil	98.8			1	SS	13			
	brown, compact to very dense Silty Sand and Gravel FILL some clay, moist occasional cobbles (possible engineered FILL)				1	SS	63			
					2	SS	38			
					3	SS	21			
3.1		95.8			4	SS	17			
3.3	brown/grey, dense SILTY SAND trace organics moist	95.6			5	SS	34			
	brown, compact GRAVEL AND SAND some silt, wet				6	SS	15			
4.7		94.2		7	SS	50	• 50mm			
	brown, very dense SILT AND SAND TILL some clay, trace gravel			8	SS	50	• 25mm			
6.6		92.3								
	End of Borehole									

DRILLED BY: London Soil Test Ltd.

HOLE DIAMETER: 210mm

DRILL METHOD: Hollow Stem Augers

DATUM: Geodetic

DRILL DATE: April 15, 2013

SHEET: 1 of 1

REFERENCE No: G3253-3-4

**BOREHOLE No: 2**

CLIENT: Coletara Developments

**V.A. WOOD (GUELPH) INC.**  
CONSULTING GEOTECHNICAL ENGINEERS

PROJECT: Proposed Residential Development

ENCLOSURE No: 3

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3  
 PH. (519) 763-3101 FAX (519) 763-5912

LOCATION: Part of Lots 4 & 5, Conc. 3, Div. C, Guelph ON

SUPERVISOR: B.R.F.

SUBSURFACE PROFILE				SAMPLE			PENETRATION RESISTANCE	WATER CONTENT %	UNIT WEIGHT	
DEPTH (m)	DESCRIPTION	ELEVATION	SYMBOL	MONITORING WELL	NUMBER	TYPE				N-VALUE
0.0	Ground Surface	100.9								
	150mm Topsoil				1	SS	4			
	brown, loose to dense Silty Sand and Gravel FILL some clay, moist (possible engineered FILL)				1	SS	9			
					2	SS	36			
					3	SS	32			
3.0		97.9			4	SS	41			
	brown, dense to compact SILTY SAND some gravel, some clay, moist				5	SS	44			
6.1		94.8			6	SS	18			
	brown, very dense GRAVEL AND SAND some silt, wet occasional cobble				7	SS	50	φ125mm		
7.7		93.1			8	SS	23			
8.1	grey, compact SILT AND SAND TILL some clay, trace gravel, moist	92.8								
	End of Borehole									

DRILLED BY: London Soil Test Ltd.

HOLE DIAMETER: 210mm

DRILL METHOD: Hollow Stem Augers

DATUM: Geodetic

DRILL DATE: April 15, 2013

SHEET: 1 of 1

REFERENCE No: G3253-3-4

**BOREHOLE No: 3**

CLIENT: Coletara Developments

**V.A. WOOD (GUELPH) INC.**  
CONSULTING GEOTECHNICAL ENGINEERS

PROJECT: Proposed Residential Development

ENCLOSURE No: 4

405 YORK ROAD, GUELPH, ONTARIO N1E 3H3  
 PH. (519) 763-3101 FAX (519) 763-5912

LOCATION: Part of Lots 4 & 5, Conc. 3, Div. C, Guelph ON

SUPERVISOR: B.R.F.

SUBSURFACE PROFILE				SAMPLE			PENETRATION RESISTANCE	WATER CONTENT %	UNIT WEIGHT
DEPTH (m)	DESCRIPTION	ELEVATION	SYMBOL	MONITORING WELL	NUMBER	TYPE			
0.0	Ground Surface	98.5							
	100mm Topsoil				1	SS	20		
	brown, loose to very dense Silty Sand and Gravel FILL some clay, moist (possible engineered FILL)				1	SS	17		
					2	SS	4		
					3	SS	16		
3.0		95.5			4	SS	62		
	brown, compact to very dense GRAVEL AND SAND some silt, dry to saturated				5	SS	22		
					6	SS	50	125mm	
6.1		92.4		7	SS	50	25mm		
	End of Borehole								

DRILLED BY: London Soil Test Ltd.

HOLE DIAMETER: 210mm

DRILL METHOD: Hollow Stem Augers

DATUM: Geodetic

DRILL DATE: April 15, 2013

SHEET: 1 of 1

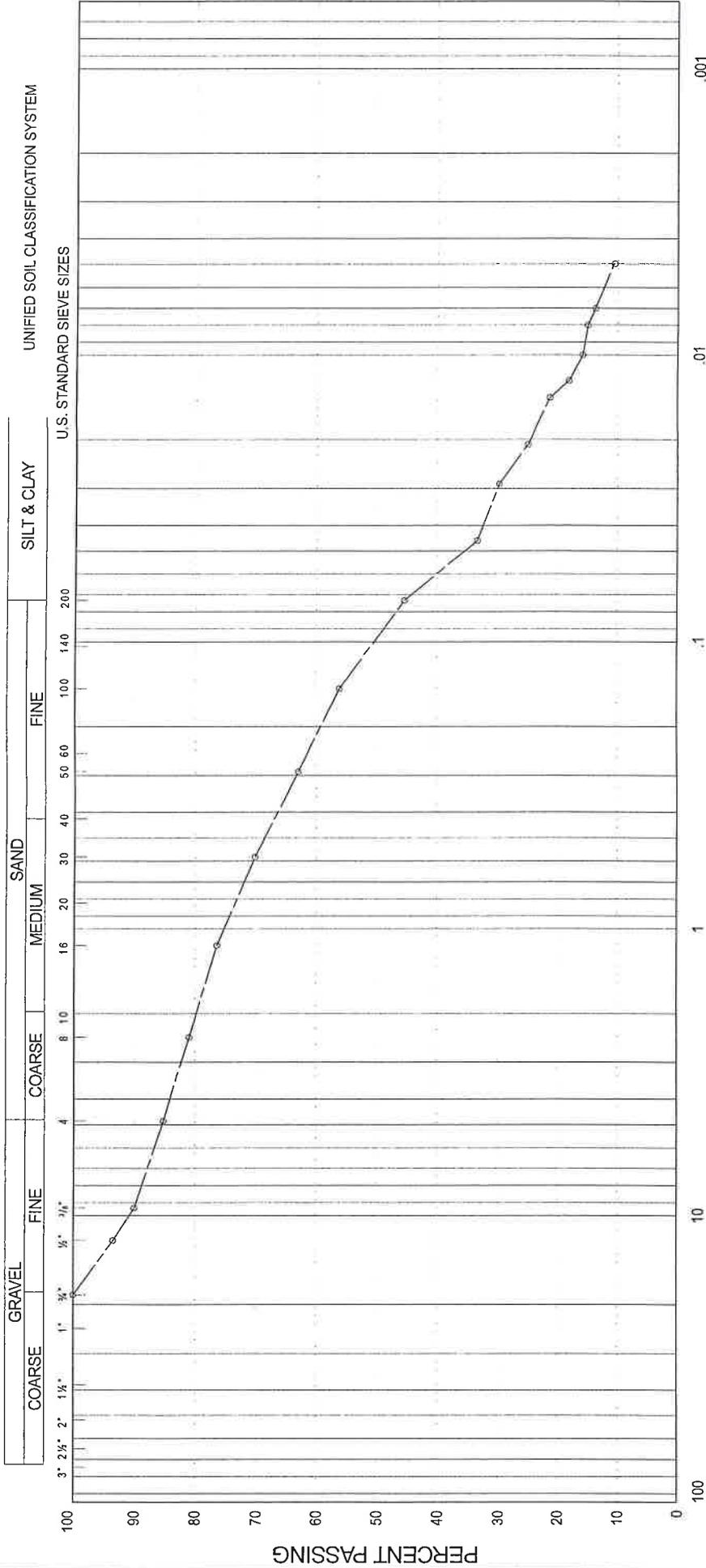


# GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G3253-3-4

UNIFIED SOIL CLASSIFICATION SYSTEM

U.S. STANDARD SIEVE SIZES



ENCLOSURE N° 6

## Grain Size in Millimeters

PLASTIC PROPERTIES  
 LIQUID LIMIT % = 15.8  
 PLASTIC LIMIT % = 13.0  
 PLASTICITY INDEX % = 2.8  
 MOISTURE CONTENT % = 11.3

PROJECT: Proposed Residential Development  
 LOCATION: Part of Lots 4 & 5, Conc. 3, Div. C, Guelph, ON  
 BOREHOLE N°: 3  
 SAMPLE N°: 3  
 DEPTH: 1.5 - 2.0m±  
 ELEVATION: 97.0 - 96.5m±

### Classification of Sample and Group Symbol:

SILTY SAND, some gravel, some clay, (SM)

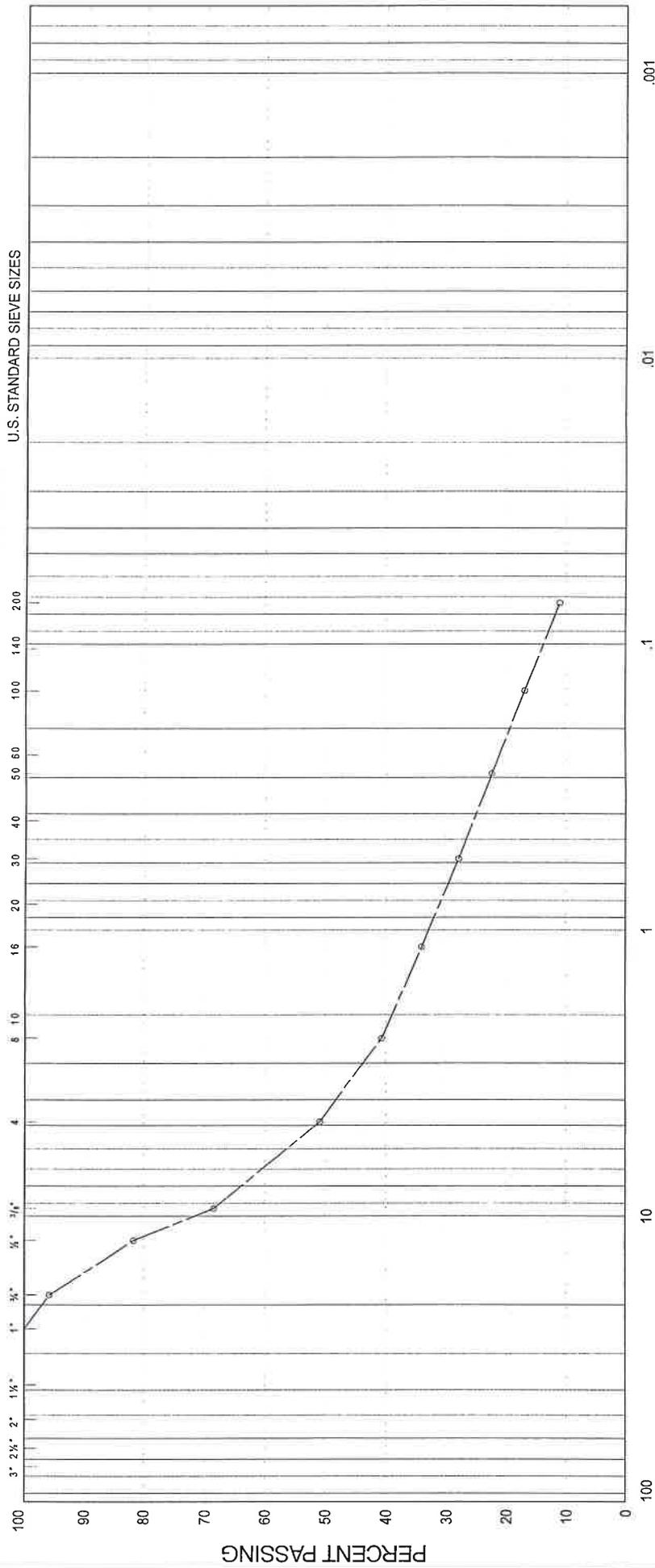


# GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G3253-3-4

UNIFIED SOIL CLASSIFICATION SYSTEM

GRAVEL		SAND			SILT & CLAY	
COARSE	FINE	COARSE	MEDIUM	FINE		
3" - 2 1/4" - 2" - 1 1/2"	3/4" - 3/8" - 3/16"	4" - 8" - 10" - 16" - 20" - 30" - 40" - 50" - 60" - 100" - 140" - 200"				



## Grain Size in Millimeters

PROJECT: Proposed Residential Development  
 LOCATION: Part of Lots 4 & 5, Conc. 3, Div C, Guelph, ON

ENCLOSURE N° 7

BOREHOLE N°: 1  
 SAMPLE N°: 7  
 DEPTH: 4.6 - 5.0m±  
 ELEVATION: 94.3 - 93.9m±

COEFFICIENT OF UNIFORMITY: 106.1  
 COEFFICIENT OF CURVATURE: 1.25

PLASTIC PROPERTIES  
 LIQUID LIMIT % =  
 PLASTIC LIMIT % =  
 PLASTICITY INDEX % =  
 MOISTURE CONTENT % = 9.5

**Classification of Sample and Group Symbol:**  
 GRAVEL AND SAND, some silt, (SW - SM)



# GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

SILT & CLAY

FINE

SAND

MEDIUM

COARSE

GRAVEL

COARSE

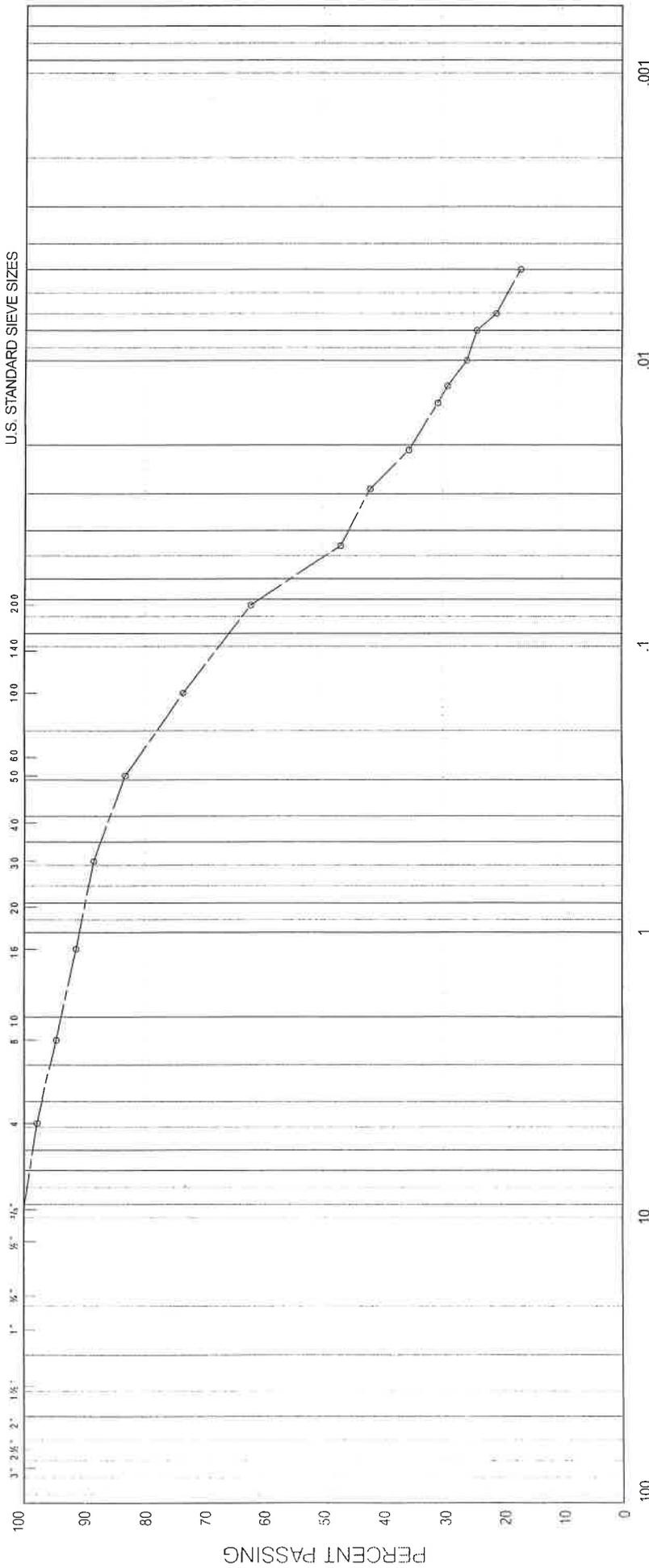
FINE

GRAVEL

COARSE

FINE

GRAVEL



## Grain Size in Millimeters

PLASTIC PROPERTIES  
 LIQUID LIMIT % = 17.4  
 PLASTIC LIMIT % = 13.2  
 PLASTICITY INDEX % = 4.2  
 MOISTURE CONTENT % = 9.5

PROJECT: Proposed Residential Development  
 LOCATION: Part of Lots 4 & 5, Conc. 3, Div. C, Guelph, ON  
 BOREHOLE N°: 2  
 SAMPLE N°: 8  
 DEPTH: 7.6 - 8.1m±  
 ELEVATION: 93.3 - 92.8m±

COEFFICIENT OF UNIFORMITY:  
 COEFFICIENT OF CURVATURE:

**Classification of Sample and Group Symbol:**  
 SILT AND SAND TILL, some clay, trace gravel (CL - ML)



**APPENDIX III**  
EIS Terms of Reference and Review Agency Comments

February 13<sup>th</sup>, 2013  
Environmental Advisory Committee

**Item 1**                      **Watson and Starwood Mixed Use Node**

**Terms of Reference for the Environmental Impact Study (EIS) – prepared by Natural Resource Solutions Inc.**

**Proposal**

There has not been a formal application submitted to date. City staff have had a pre-consultation meeting with the proponent to discuss a proposed concept plan and to outline the requirements for a complete application. It is anticipated that the application will include a Zoning By-law Amendment applications.

It was determined through pre-consultation that an EIS is required in support of a Zoning By-law Amendment as the site is within proximity to Provincially Significant Wetlands and Woodlands.

Total area of the subject property is approximately 2.56 hectares.

**Location**

The subject property is found in the southeastern quadrant of the Starwood Drive and Watson Parkway intersection (see Location Map).

**Background**

- The property is identified as a Mixed Use Node in Schedule 1 of the current Official Plan and lands adjacent to the west are designated Open Space. The site is currently zoned Specialized B.1.
- The property is identified as Community Mixed-Use Centre in Schedule 2: Land Use Plan of OPA 42. Lands adjacent to the west are identified as Significant Natural Area and Natural Area.
- The site lies within the catchment identified as S10 in the Clythe Creek Subwatershed Study.
- The site consists largely of an agricultural field. The west edge of the site includes a drainage swale directly adjacent to the neighbouring woodland, which drains to a temporary basin located in the south portion of the site.
- As identified by NRSI, the Grand River Conservation Authority mapping identifies a watercourse feature bisecting the site. The GRCA is reviewing the EIS ToR.
- A portion of the Clythe Creek Provincially Significant Wetland Complex is located on lands adjacent to the site. The PSW is surrounded by a woodland feature. Clythe Creek is found further south, flowing in a westerly direction.

**Comments**

1. Include pertinent information from the Clythe Creek Subwatershed Study as background information.
2. It is unclear what is being referred to as an inclusion along the western property boundary. Please clarify.

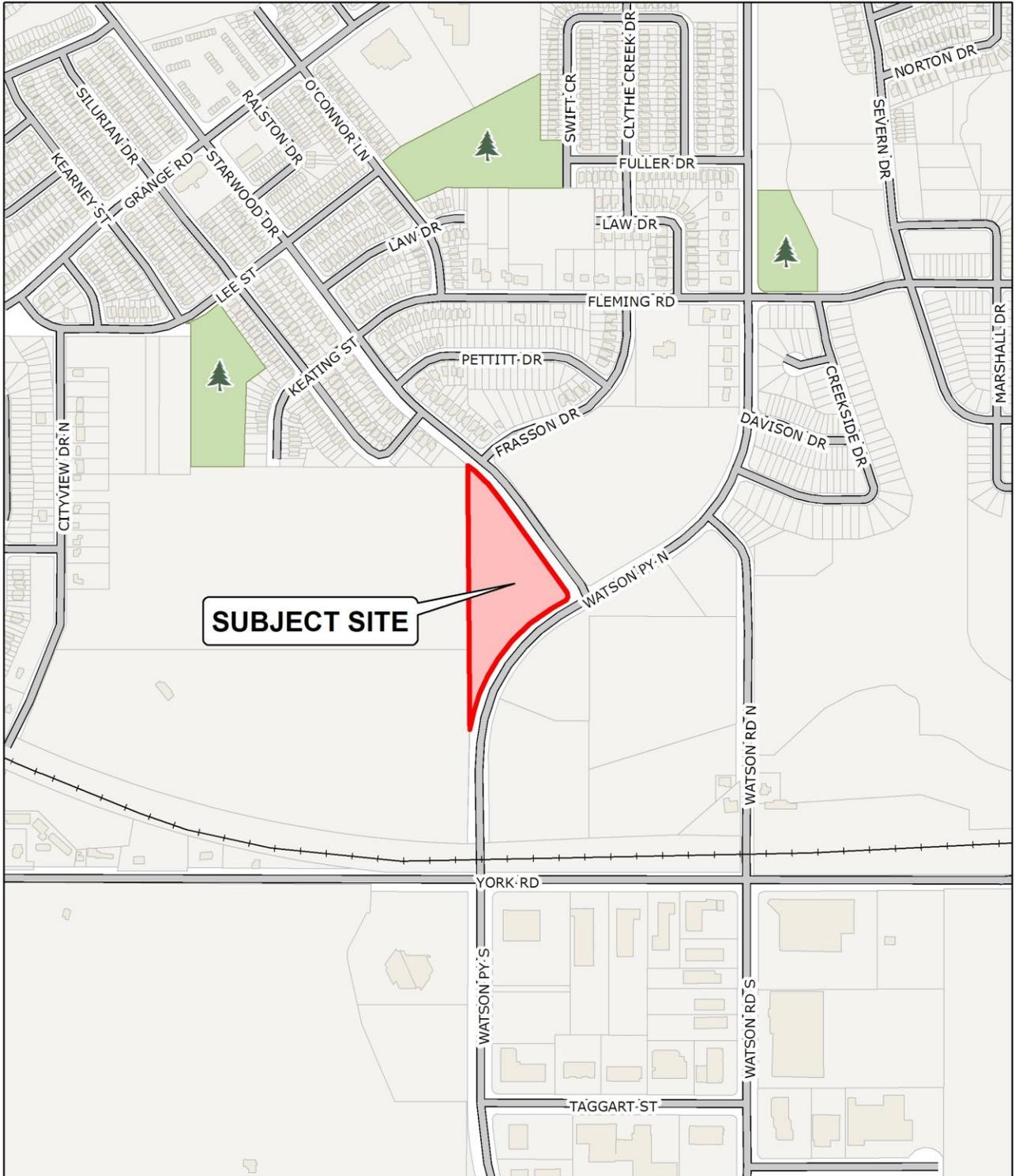
3. Under the heading “Scoped Environmental Impact Study – Study Approach”, in bullet 3, please note that mitigation measures are utilized to prevent and/or reduce impacts to natural heritage features and functions as opposed to offsetting them.
4. The drainage swale and temporary basin need to be included in the EIS. Particularly, consideration of how they contribute to the function of the surrounding natural heritage system in terms of hydrologic function.
5. Restoration and enhancement opportunities should be highlighted Component 4) in the EIS ToR.
6. The woodland boundary is to be confirmed in the field with City staff.
7. The EIS will address the appropriateness and feasibility of incorporating trails into the development. Schedule 7 of OPA 42 includes a Trail Network (see attached Figure). Furthermore, the City’s Parks Planner has identified a potential trail route, in red, on the attached Figure.
8. The EIS should consider any recommended stewardship items or activities (i.e., educational signage).

***Suggested  
Motion***

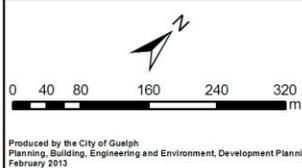
***Staff recommend that the Environmental Advisory Committee support the EIS Terms of Reference prepared by NRSI for the Watson and Starwood Mixed-Use Node with the following:***

That the EIS ToR shall be revised to the satisfaction of City Staff to include the following main items:

- a) The Clythe Creek Subwatershed Study as background information;
- b) Clarification as to what is being referred to as an inclusion;
- c) Provision for the functional assessment of the drainage swale and system.
- d) Confirmation of the woodland limit in the field by City staff;
- e) Incorporation of comments from the GRCA.
- f) An analysis of trail routes based on information provided by Parks Planning.
- g) An additional Component: Restoration, Enhancement and Stewardship Opportunities.



**SUBJECT SITE**



**Watson / Starwood Node  
 LOCATION MAP**



Figure provided by Parks Planner

# INTERNAL MEMO



DATE February 6, 2013

TO **Adele Labbe**

FROM Jyoti Pathak

DIVISION Parks Planning and Development

DEPARTMENT Community and Social Services - Parks and Recreation

**SUBJECT Watson-Starwood Proposed Residential Development  
Environmental Impact Study  
Draft TERMS OF REFERENCE**

---

Parks Planning and Development has reviewed the Draft Terms of Reference (TOR) for Scoped Environmental Impact Study (EIS) for Watson – Starwood Proposed Residential Development prepared by Natural Resource Solutions Inc for their client Coletara Development, dated January 9th, 2013 and offers the following comments:

## **1. Trail Route alignment**

- Guelph Trail Network has identified trail routes within the existing natural open space adjacent to the proposed residential development at the south west corner of Watson Parkway North and Starwood Drive.
- Ensure potential trail connections are examined through EIS to assess their environmental impact (refer to sketch on page 3 for proposed location) and recommendations are included on trail design and development aspects.
- For the subject development approximately 400 metres long, accessible, secondary trail route has been proposed along the edge of the proposed development within or outside the buffers to existing natural heritage features as appropriate. The proposed trail route will be minimum 2.5 metre wide with stonedust/ limestone screenings surfacing. Asphalt surface will be used where slope exceeds 4% limit.

## **2. Trail development:**

- The trail development will be carried out by the developer at the same time as part of the subdivision development rough grading operations and appropriate sediment and erosion control methods should be used to protect the adjacent natural features.
- The trail development should take place prior to implementation of Landscape Plans including restoration, compensation and enhancement planting within open space.

### **3. Public Education:**

- EIS should recommend provision of public education through educational/ interpretive signage at the entry points to the storm water management and open space system. Public education should address the functional use of SWM area, the environmental sensitivity of natural Heritage features and procedures residents can follow to protect and/or enhance these areas.
- Parks will review and approve the design and locations of interpretive signage which will be installed as part of the implementation of landscape plans.

### **4. Open Space enhancement and restoration Planting/ SWM Planting:**

- The EIS should recommend mitigation measures for the restoration and enhancement of open space system.

I hope the above comments are helpful. Please do not hesitate to contact me if you have further questions or concerns.

Regards

**Jyoti Pathak** OALA CSLA MCIP RPP | Parks Planner  
Parks and Recreation | **Community and Social Services**  
**City of Guelph**

T 519-822-1260 x 2431 | F 519-822-1751  
E [jyoti.pathak@guelph.ca](mailto: jyoti.pathak@guelph.ca)

**[guelph.ca](http://guelph.ca)**





February 26<sup>th</sup>, 2013

Natural Resource Solutions Inc.  
255 Labrador Drive, Unit 1  
Waterloo, Ontario N2K 4M8

ATTN: Valerie Stevenson

**Re: Scoped Terms of Reference for the Environmental Impact Study,  
Watson-Starwood Proposed Residential Development, Guelph, ON**

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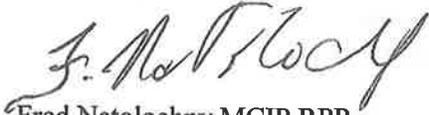
We have reviewed the Draft Terms of Reference for the Scoped Environmental Impact Study (EIS) completed by Natural Resource Solutions dated January 9<sup>th</sup>, 2013. In general the ToR should include further information and comments with regards to the potential offset impacts and/or how those potential impacts will be addressed on site. Therefore at this time GRCA recommends updating the ToR to incorporate the comments provided below. Please note that the information characterized for the surrounding area as part of previous studies is considered valid and applicable as it has been completed within 5 years of the proposed report for the subject property.

- "Scoped Environmental Impact Study" – Study Approach
  - o Under point 1), the EIS should include both information on the subject property *and adjacent area*. GRCA staff are satisfied with the comments provided in the ToR submitted that the Scoped EIS will include the existing available information from the adjacent property as a means to scope potential impacts and any required mitigation measures and monitoring off-site.
  - o Under point 3), we recommend the removal of the word "offset impacts" and replace with "address and prevent potential impacts and/or incorporate appropriate mitigation".
  - o Comments with regards to the incorporation of the adjacent area should be incorporated into points 2-4 as well.
- "Collection and Review of Background Information"
  - o The list should include the Clyde Creek Sub-Watershed Plan.
- "Aquatic Habitat"
  - o Staff have reviewed the information submitted by NRSI with regards to the potential watercourse on the subject property. The information submitted is limited to one location, therefore GRCA staff request a photo log along with GPS points of the feature location. Alternatively, GRCA staff could complete a site inspection with NRSI staff to review the location and provide further comments. The completion of this inspection with GRCA could be completed at the same time as the drip line survey, or alternatively can be completed at any time when the ground is free of snow cover.

- "Impact Analysis, Mitigation and Enhancement"
  - o This section should include Impact Analysis, Mitigation and Enhancement of existing conditions on the subject property and adjacent to the subject property.

Should you have any questions or comments please feel free to contact Nathan Garland at 519-621-2763 ext. 2236

Yours truly,



Fred Natolochny MCIP RPP  
Supervisor of Resource Planning  
Grand River Conservation Authority

FN/ng

cc: Adele Labbe, City of Guelph



# NATURAL RESOURCE SOLUTIONS INC.

Aquatic, Terrestrial and Wetland Biologists

May 29, 2013

Project 1367

Nathan Garland  
Resource Planner  
Grand River Conservation Authority  
400 Clyde Road,  
Cambridge, Ontario  
N1R 5W6

Adèle Labbé  
Environmental Planner  
City of Guelph  
1 Carden Street  
Guelph, Ontario  
N1H 3A1

Dear Mr. Garland and Ms. Labbé,

**Re: Scoped Environmental Impact Study (EIS)  
Watson-Starwood Proposed Residential Development, Guelph Ontario  
Terms of Reference**

On behalf of Natural Resource Solutions Inc. (NRSI), I am pleased to provide the following Terms of Reference (TOR) for the completion of a Scoped Environmental Impact Study (EIS) for a proposed residential development. The subject property is located at the southwest corner of Watson Parkway North and Starwood Drive in Guelph, Ontario.

This TOR addresses comments put forth by the City of Guelph's Environmental Advisory Committee (EAC) on February 13, 2013, the City of Guelph's Parks Department on February 6, 2013, as well as the Grand River Conservation Authority (GRCA) on February 26, 2013. These comments have been appended for reference.

The subject property is predominately comprised of disturbed, open lands that have historically experienced topsoil removal, and more recently fill deposits. The western property boundary borders cultural woodland that occurs off-site. A row of larger deciduous trees is found growing along the property boundary. The subject property is also located within 120m of the Clythe Creek Provincially Significant Wetland (PSW). In addition to addressing the PPS, lands regulated under the GRCA Regulation 150/06 are present within the subject property. Any development within 120m of the wetland boundary requires the preparation of a scoped EIS to demonstrate that no negative impacts to the feature will occur as a result of the proposed undertaking.

Other features within the subject property include a low (approximately 1m) berm and large partially vegetated swale that follow along the western property boundary, and a temporary sediment basin in the southern portion of the subject property.

The following draft TOR outlines the steps required to complete the scoped EIS for the proposed development within the Watson-Starwood property in accordance with *Grand*

*River Conservation Environmental Impact Study Guidelines and Submission Standards for Wetlands* (GRCA 2005) and the City of Guelph's Official Plan Amendment (OPA) 42 (currently under appeal). Please do not hesitate to contact me if you have any questions or comments regarding the content of the following proposed draft TOR.

Sincerely,  
Natural Resource Solutions Inc.

A handwritten signature in blue ink, appearing to read "Ryan Archer".

Ryan Archer  
Terrestrial and Wetland Biologist  
CC: Helmuth Strobel, Coletara Development

**Watson-Starwood Proposed Residential Development, Guelph, Ontario**  
**Scoped Environmental Impact Study**  
**Terms of Reference**  
**May 29, 2013**

**Introduction**

The subject property is located at the southwest corner of Watson Parkway North and Starwood Drive in the City of Guelph (Figure 1). Field surveys conducted on November 9, 2012 as well as May 3, 2013 by NRSI staff characterized the subject property as being predominately disturbed open lands removed of topsoil, with scattered trees along the western property boundary, which represent an old hedgerow and the eastern limit of an off-site cultural woodland.

An EIS is currently being completed by NRSI on the adjacent property at 55 & 75 Cityview Drive, which is located southwest of the subject property. The Cityview Drive EIS is being carried out in support of a proposed residential development application. NRSI was retained to undertake the EIS in 2009. NRSI biologists recently (2009-2012) characterized the property's natural features and functions; existing available information from that assessment will be utilized to its fullest extent for the purposes of this scoped EIS. A draft EIS has also recently been prepared (2012) for the property immediately south of the subject property, known as the Cityview Ridge lands, by North-South Environmental. Certain information from the Cityview Ridge draft EIS, such as vegetation community classifications, will be utilized to more fully inform characterization of the lands adjacent to the subject property.

The subject property has experienced considerable disturbance over the past decade or more. As noted above, the lands have been historically stripped of topsoil and have been used to dump fill. Natural features within the subject property are virtually absent. Scattered trees are found along the western property boundary, which represent an old hedgerow and the eastern limit of an off-site cultural woodland. Portions of the Clythe Creek PSW complex are present within 120m to the southwest. within the 55 & 75 Cityview lands (see Figure 1). And it is these perimeter and off-site features that trigger the need for an EIS. Any development within 120m of the wetland boundary requires the preparation of a scoped EIS to demonstrate that no negative impacts to natural features occur as a result of the proposed undertaking.

Other features within the subject property include a low (approximately 1m) berm and large partially vegetated swale that follow along the western property boundary and a temporary sediment basin in the southern portion of the subject property.

The GRCA and Ontario Ministry of Natural Resources (OMNR) watercourse mapping indicates that a tributary of Clythe Creek traversed the subject property. During a site visit in November 2012, NRSI aquatic biologists confirmed the absence of any aquatic habitat/watercourse features on and within 30m of the Watson-Starwood subject property. Documentation of the absence of this feature was provided by NRSI to GRCA (Nathan Garland) and the City (Adele Labbe) for review in February 2013.

**Proposed Undertaking**

Coletara Development is currently proposing to develop the subject property as residential with multi-storey apartment buildings, parking areas, stormwater management controls, and associated amenity features.

## **Scoped Environmental Impact Study – Study Approach**

The approach has been divided into four components:

- 1) Characterization of existing natural heritage features and functions within the subject property and adjacent lands (120m);
- 2) Identification of opportunities and constraints in relation to existing natural heritage features within the subject property and adjacent lands;
- 3) Impact analysis, including the identification of potential impacts from the proposed development and recommendation of mitigative measures to address potential impacts; and,
- 4) Reporting, including existing conditions characterization, identification of opportunities and constraints, impact analysis and recommended mitigation measures as well as opportunities for enhancement and restoration within the subject property.

### **Characterization of the Natural Environment**

This component of the study will focus on characterizing the natural environment features within the subject property. Information from the natural heritage assessments, hydrogeological studies, and draft EIS prepared by NRSI for the 55 & 75 Cityview Drive properties, as well as the 2012 draft EIS for the Cityview Ridge property prepared by North-South Environmental, will be used where suitable for this scoped EIS. Other features such as the grassed drainage swale and temporary sediment basin will also be characterized in relation to the site's drainage function.

Additional supporting environmental information will be provided by separate stormwater management, geotechnical, and hydrogeological reports.

### **Collection and Review of Background Information**

Existing background information on the biological features within the subject property is currently being collected and reviewed by NRSI and has assisted in guiding the study approach provided in this draft TOR. Background information sources will include the following:

- GRCA;
- OMNR, Guelph District;
- OMNR Natural Heritage Information Centre;
- City of Guelph Official Plan (2011);
- Guelph Natural Heritage Strategy (Dougan & Associates 2009);
- Clythe Creek Overview Study (Ecologistics 1998);
- Ontario Breeding Bird Atlas (Bird Studies Canada *et al.* 2006);
- Ontario Reptile and Amphibian Atlas (Ontario Nature 2013);
- Mammal Atlas of Ontario (Dobbyn 1994); and,
- Ontario Butterfly Atlas (Colin Jones *et al.* 2012).

NRSI will rely on background information, within input from the project engineers, to characterize the soils, hydrology and hydrogeological features for the subject property.

### **Field Surveys**

Based on the paucity of natural features within the subject property and the availability of extensive natural heritage data recently collected on the adjacent Cityview Drive property, proposed field surveys have been scoped to include the following:

#### *Vegetation Community Classification and Inventory*

Vegetation communities within the subject property were described and mapped on November 9, 2012 by NRSI biologists using the standard Ecological Land Classification (ELC) System for Southern Ontario (Lee *et al.* 1998, Lee 2008). Details on the vegetation communities were recorded including species composition, dominance, uncommon species or features and evidence of human impact. All species of vascular flora observed were recorded.

Vegetation communities within the adjacent Cityview property were classified and mapped using ELC. Detailed vascular flora inventories were conducted on May 13, 2009 (spring), June 23, 2009 (summer), and October 4, 2012 (fall).

No further vegetation surveys are proposed on the adjacent lands.

#### *Tree Inventory*

Trees within and adjacent to the subject property which have the potential to be impacted by the proposed development were inventoried by a Certified Arborist according to the City of Guelph's Tree Protection Policies and Guidelines, Tree By-law, with consideration of OPA 42 on March 5-6, and May 3, 2013. This included recording the following for each tree  $\geq 10\text{cm}$  Diameter at Breast Height (DBH) within 10m of the property line:

- species;
- DBH;
- crown radius (m);
- general health (good, fair, poor, very poor);
- potential for structural failure (low, medium, high);
- tree location (lot or block number); and,
- general comments (i.e. disease, aesthetic quality, development constraints, sensitivity to development).

#### *Bird Surveys*

NRSI biologists completed breeding bird surveys on the adjacent Cityview Drive property June 10 and June 23, 2009 in accordance with Ontario Breeding Bird Atlas methodology (Bird Studies Canada *et al.* 2006). Breeding bird evidence was recorded by habitat type found within the Cityview Drive property - woodland, wetland, thicket, and open field. In addition to breeding bird surveys, all birds observed within the Cityview Drive property during all field visits were documented.

Habitat of the only two bird Species at Risk (SAR) that have been recorded in the area, the least bittern (*Ixobrychus exilis*) and the red-headed woodpecker (*Melanerpes erythrocephalus*), was confirmed through surveys completed by NRSI to be absent within the subject lands.

NRSI biologists recorded incidental bird species observations during all visits to the Starwood Drive subject property. No further breeding bird surveys are proposed for the Watson-Starwood property due to the virtual absence of on-site natural features.

#### *Herpetofauna Surveys*

Two night-time amphibian call surveys were conducted using the Marsh Monitoring Program methodology (Bird Studies Canada 2009) on the adjacent Cityview Drive property. These surveys occurred on April 21, 2009 and May 22, 2009. By June 2009, no standing water was present in any of the wetlands; therefore, a third survey was deemed unnecessary due to the lack of suitable breeding habitat. Additionally, all incidental observations of amphibians during other field work were documented.

Suitable amphibian breeding habitat was not identified by NRSI staff within the Watson-Starwood property during the November 9 2012 site visit and again during the May 2, 2013 site visit.

During background data collection for the Cityview EIS, the OMNR indicated that two snake SAR, the eastern milksnake (*Lampropeltis t. triangulum*) and eastern ribbonsnake (*Thamnophis sauritus septentrionalis*), were known from the vicinity of the subject property. As such, a total of 8 snake cover boards were strategically placed throughout the Cityview Drive property on April 15 2009 to estimate snake species presence. Concurrently, NRSI biologists conducted area searches for snakes, which involved thorough visual scans of basking features and carefully checking under cover objects.

The Cityview property was also assessed for its potential to provide habitat for turtles. No suitable turtle habitat was identified within the Cityview or Watson-Starwood properties.

NRSI biologists recorded incidental herpetofauna species observations during all visits to the Starwood Drive subject property. No further herpetofauna surveys are proposed.

#### *Other Wildlife*

Area searches for butterflies, dragonflies, and damselflies occurred on June 23, 2009 within the Cityview Drive property. All observations of mammals, including direct observations, and any evidence, such as tracks, scats, dens, etc. were documented on all field visits carried out on the Cityview and Watson-Starwood properties. No species of mammal known from the subject property vicinity are considered SAR.

#### *Aquatic Habitat*

Although GRCA and OMNR watercourse mapping indicated that a tributary of Clythe Creek traverses the Watson-Starwood subject property, this feature was confirmed by NRSI staff to be absent. Site surface water drainage characteristics were documented within the subject property by NRSI during the November 9, 2012 and May 2, 2013 site visits. No further aquatic field surveys are proposed.

#### *Wetland and Woodland Boundary Delineation*

The Clythe Creek PSW boundary, located on the Cityview Drive property, was flagged in the field by NRSI and reviewed by GRCA staff (Tony Zammit) on June 8, 2009.

The limits of the canopies of trees that overlapped with the subject property was delineated and flagged by a NRSI certified arborist on March 5, 2013. This boundary was confirmed by City of Guelph staff (Adèle Labbé) on March 26, 2013.

#### *Hydrogeological Assessment*

Matthew Nelson, P.Eng., P.Geo., of Gamsby and Mannerow Limited has been retained to conduct a Hydrogeological Study for the subject property. The purpose of the assessment will be the following:

- To determine the hydrogeological setting of the site and hydraulic relationship with the identified wetland area including the importance of groundwater recharge or surface water discharge in maintaining the ecological function of the PSW;
- To determine the potential for impacts to the PSW due to the proposed development;
- To determine the potential for impacts to the groundwater resources and the Clythe municipal supply well due to the proposed development; and
- Recommend mitigative measures to prevent identified impacts (as required).

The scope of work to complete the study includes:

- Background review of existing information regarding hydrogeologic conditions, including existing available hydrogeologic and geotechnical reports for the area, geologic mapping, and groundwater studies (e.g., Cole *et al* (2009), Ashworth M.A.Sc. Thesis (2012));
- Review of the City of Guelph Wellhead Protection Areas and prescribed drinking water threats under the Clean Water Act;
- Site visit and review of topography to assess surface water flow directions, patterns, and evidence of groundwater discharge areas;
- Collection of geological and groundwater information from three (3) monitoring wells installed on-site (completed April 15, 2013);
- The installation of three (3) shallow piezometers (less than 3.0 m deep) to obtain additional soil and water level information and estimate the potential for groundwater discharge throughout in the vicinity of the wetland feature (Completed April 17, 2013);
- Water level measurement at the monitoring wells and piezometers during the wet period of the year (completed April 17 and 19, 2013); and,
- Analyses of site-specific and background information, and completion of a letter report describing the findings of the investigation.

### **Identification of Opportunities and Constraints**

The analysis of constraints will be used to identify natural features and habitats that are sensitive to disturbance. This analysis will be based on site specific history and characteristics of the subject lands, in conjunction with relevant policies that direct protection of natural feature(s). This analysis will also be used to identify areas that have been previously disturbed or impacted or contain no natural features, which are identified as areas of 'opportunity' for development. These areas may also provide potential for habitat rehabilitation or enhancement. Results of this analysis are intended to provide input to the development plan in order to avoid and reduce impacts to natural features and their ecological functions.

Identified constraints will be mapped to clearly identify feature boundaries, as well as recommended measures, such as buffers, for the protection of natural features, resulting in an ultimate development limit line.

Implications of development within or adjacent to the identified natural features based on current Policies and Regulations will be identified, including the GRCA Wetlands Policy, the City of Guelph Official Plan, City of Guelph Tree Bylaw, the City of Guelph Natural Heritage Strategy – OPA 42 (currently under appeal), and the Provincial Policy Statement (PPS).

### **Impact Analysis, Mitigation and Enhancement**

The details of the proposed undertaking, including the proposed Draft Plan, stormwater management strategy, and grading plans will be reviewed and compared to the existing conditions on the subject property and adjacent lands. Impacts will be determined based on the direct, indirect, and induced effects of the proposal.

*Direct Impacts* - associated with disruption or displacement caused by the actual proposed 'footprint' of the undertaking, such as tree removal.

*Indirect Impacts* - associated with changes in site conditions such as drainage and water quantity/quality.

*Induced Impacts* - associated with impacts after the development is constructed such as subsequent demand on the resources created by habitation/use of the area and vicinity.

Recommendations with regard to mitigation of residual impacts will also be made and opportunities for enhancement will be highlighted. A Tree Protection Plan outlining which trees are recommended to be retained or removed will be prepared by a Certified Arborist. Details about tree protection, mitigation and recommendations will be included.

The landowner and City are currently in discussions about the feasibility of recreational trails on the subject property. If required, the EIS will address the feasibility and appropriateness of incorporating a public trail into the development as indicated in comments provided by the City of Guelph Parks Department (see appended comments).

### **Reporting**

The scoped EIS report will include characterization of the existing natural features on and adjacent to the subject property, as well as a detailed impact analysis based on comparison of the proposed undertaking to these features. The report will include appendices, such as species lists and copies of the original field data sheets, and mapping of the natural features and recommended buffers on an air photo base. Opportunities for restoration and enhancement will also be discussed. In addition, opportunities for stewardship (i.e. signage) will be addressed. The report will incorporate and address recommendations provided in the Clyde Creek Overview Study (Ecologistics 1998).

The finalized report will be submitted to the City of Guelph and GRCA.

# Watson-Starwood EIS Subject Property

### Legend

- Subject Property
- 55 & 75 Cityview Lands
- Provincially Significant Wetland (PSW) & OPA 42 - Significant Natural Area



55 & 75  
CITYVIEW LANDS

Clythe Creek  
Wetland Complex

STARWOOD DR

WATSON PKY



Map Produced by Natural Resource Solutions Inc. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI. Data provided by MNR© Copyright: Queen's Printer Ontario. Imagery: First Base Solutions, 2010.

Project: 1367 Date: May 29, 2013	NAD83 - UTM Zone 17 Size: 11x17" 1:1,750
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**APPENDIX IV**

Species at Risk/Species of Conservation Concern Screening Results

Scientific Name	Common Name	SRANK <sup>1</sup>	COSEWIC <sup>2</sup>	COSSARO <sup>3</sup>	SARA	Background Source	Habitat Preference <sup>4,5,6,7</sup>	Suitable Habitats within Study Area	NRSI Observed
<b>Vascular Plants</b>									
<i>Arnoglossum plantagineum</i>	Tuberous Indian-plantain	S3	SC	SC		Normington 2013	Marl fens, wet meadows, sandy shores and moist limestone flats.	No	No
<i>Carex careyana</i>	Carey's Sedge	S2				Normington 2013	Mesic to dry-mesic hardwood forests, floodplain woods.	No	No
<i>Juglans cinerea</i>	Butternut	S3?	END	E	Schedule 1	Normington 2013	Riparian habitats and rich, moist, well-drained loams, and well-drained gravels, especially those of limestone origin.	Yes	No
<b>Birds</b>									
<i>Cardellina canadensis</i>	Canada Warbler	S4B	T	SC	Schedule 1	BSC et al. 2006	Interior forest habitats with a dense, well-developed shrub and vegetation understory; along riparian zones or wet bottomland habitat. require tracts of land which are >30ha	No	No
<i>Chaetura pelagica</i>	Chimney Swift	S4B, S4N	T	THR	Schedule 1	BSC et al. 2006	Commonly found in urban areas near buildings; nests in hollow trees, crevices of rock cliffs, chimneys; highly gregarious; feeds over open water	No	No
<i>Chordeiles minor</i>	Common Nighthawk	S4B	T	SC	Schedule 1	BSC et al. 2006	Open ground; clearings in dense forests; ploughed fields; gravel beaches or barren areas with rocky soils; open woodlands; flat gravel roofs	Yes	No
<i>Dolichonyx oryzivorus</i>	Bobolink	S4B	T	THR		BSC et al. 2006	Large, open expansive grasslands with dense ground cover; hayfields, meadows or fallow fields; marshes; requires tracts of grassland >50ha.	No	No
<i>Hirundo rustica</i>	Barn Swallow	S4B	T	THR		BSC et al. 2006	Farmlands or rural areas; cliffs, caves, rock niches; buildings or other man-made structures for nesting; open country near body of water.	Yes	Yes
<i>Ixobrychus exilis</i>	Least Bittern	S4B	THR	T	Schedule 1	BSC et al. 2006	The least bittern breeds specifically in dense marshes dominated by emergent growth such as cattails. The bittern requires large marshes with a stable water level as the nests are usually built within 10cm of open waters. This open water is also needed for the bittern to forage as it is an ambush forager (Gov't of Canada 2012) .	No	No
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	S4B	THR	SC	Schedule 1	BSC et al. 2006	Red-headed woodpecker is known as a habitat generalist that may use deciduous forests, wooded swamps, fields, or pastures, but typically requires a territory of about 4 ha in size. Red-headed woodpeckers prefer to nest in the cavities of trees that are at least 40cm diameter at breast height (dbh) (OMNR 2000).	Yes	No

Scientific Name	Common Name	SRANK <sup>1</sup>	COSEWIC <sup>2</sup>	COSSARO <sup>3</sup>	SARA	Background Source	Habitat Preference <sup>4,5,6,7</sup>	Suitable Habitats within Study Area	NRSI Observed
<i>Haliaeetus leucocephalus</i>	Bald Eagle	S2N, S4B	SC	NAR		Normington 2013	Bald eagle habitat tends to consist of large continuous areas of mature, old growth deciduous or mixed woods around large lakes or rivers (OMNR 2000; ). This species requires large (>255 ha) areas of open woodlands with tall trees for nesting, shelter, feeding as well as roosting (OMNR 2000).	No	No
<i>Icteria virens</i>	Yellow-breasted Chat	S2B	END	E	Schedule 1	Normington 2013	Yellow-breasted chat prefers dense thickets on forest edges, riparian areas or within overgrown clearings. (Gov't of Canada 2012). Yellow-breasted chats nest above the ground in bushes, vines, etc. (OMNR 2000).	No	No
<i>Sturnella magna</i>	Eastern Meadowlark	S4B	T	THR		BSC et al. 2006	Open, grassy meadows, farmland, pastures, hayfields or grasslands with elevated singing perches; cultivated land and weedy areas with trees; old orchards with adjacent, open grassy areas >10 ha in size.	No	No
<i>Vermivora chrysoptera</i>	Golden-winged Warbler	S4B	T	SC	Schedule 1	BSC et al. 2006	Early successional habitat; shrubby, grassy abandoned fields with small deciduous trees bordered by low woodland and wooded swamps; alder bogs; deciduous, damp woods; shrubby clearings in deciduous woods with saplings and grasses; brier-woodland edges; requires >10 ha	Yes	No
<b>Mammals</b>									
<i>Myotis lucifugus</i>	Little Brown Myotis	S5	E	END		Normington 2013	Uses caves, quarries, tunnels, hollow trees or buildings for roosting; winters in humid caves; maternity sites in dark warm areas such as attics and barns; feeds primarily in wetlands, forest edges.	No	No
<i>Myotis septentrionalis</i>	Northern Myotis	S3?	E	END		Normington 2013	Hibernates during winter in mines or caves; roosts in houses, manmade structures but prefers hollow trees or under loose bark.	No	No
<b>Herpetofauna</b>									
<i>Graptemys geographica</i>	Northern Map Turtle	S3	SC	SC	Schedule 1	Ontario Nature 2013; NHIC 2013	Large bodies of water with soft bottoms, and aquatic vegetation; basks on logs or rocks or on beaches and grassy edges, will bask in groups; uses soft soil or clean dry sand for nest sites; may nest at some distance from water.	No	No
<i>Chelydra serpentina serpentina</i>	Common Snapping Turtle	S3	SC	SC	Schedule 1	Ontario Nature 2013; NHIC 2013, Normington 2013	Permanent or semi-permanent fresh water; marshes, swamps or bogs; rivers and streams with soft muddybanks or bottoms. The species often uses soft soil or clean dry sand on south-facing slopes for nest sites and may nest at some distance from water.	No	No
<i>Emydoidea blandingii</i>	Blanding's Turtle (Great Lakes/St Lawrence population)	S3	T	THR	Schedule 1	Ontario Nature 2013; NHIC 2013, Normington 2012	Shallow water marshes, bogs, ponds or swamps, or coves in larger lakes with soft muddy bottoms and aquatic vegetation; basks on logs, stumps or banks; surrounding natural habitat is important in summer as they frequently move from aquatic habitat to terrestrial habitats; hibernates in bogs; not readily observed.	No	No

Scientific Name	Common Name	SRANK <sup>1</sup>	COSEWIC <sup>2</sup>	COSSARO <sup>3</sup>	SARA	Background Source	Habitat Preference <sup>4,5,6,7</sup>	Suitable Habitats within Study Area	NRSI Observed
<i>Lampropeltis t. triangulum</i>	Eastern Milksnake	S3	SC	SC	Schedule 1	Ontario Nature 2013; NHIC 2013, Normington 2013	Farmlands, meadows, hardwood or aspen stands; pine forest with brushy or woody cover; river bottoms or bog woods; hides under logs, stones, or boards or in outbuildings; often uses communal nest sites.	Yes	No
<i>Thamnophis sauritus septentrionalis</i>	Eastern Ribbonsnake (Great Lakes population)	S3	SC	SC	Schedule 1	Ontario Nature 2013; NHIC 2013, Normington 2013	Sunny grassy areas with low dense vegetation near bodies of shallow permanent quiet water; wet meadows grassy marshes or sphagnum bogs; borders of ponds, lakes or streams; hibernates in groups	Yes	No
<i>Ambystoma jeffersonianum</i>	Jefferson Salamander	S2	E	THR	Schedule 1	Normington 2013	Damp shady deciduous forest, swamps, moist pasture, lakeshores; temporary woodland pools for breeding; hides under leaf litter, stones or in decomposing logs	No	No
<i>Pseudacris triseriata</i>	Western Chorus Frog	S3	T	NAR	Schedule 1	Ontario Nature 2013; NHIC 2013	Roadside ditches or temporary ponds in fields; swamps or wet meadows; woodland or open country with cover and moisture; small ponds and temporary pools ponds and temporary pools	Yes	No
<b>Insects</b>									
<i>Pieris virginensis</i>	West Virginia White	S3	SC			Normington 2013	Moist, deciduous woodlands with toothwort ( <i>Cardamine spp.</i> )	No	No
<i>Danaus plexippus</i>	Monarch	S4	SC	SC		TEA 2012	Open areas with milkweed species ( <i>Asclepias spp.</i> ).	Yes	Yes
<i>Bombus affinis</i>	Rusty-patched Bumble Bee	S1	END	END	Schedule 1	Normington 2013	A diversity of habitats including mixed farmland, sand dunes, marshes, urban and wooded areas. Usually nests underground in abandoned rodent burrows.	No	No

<sup>1</sup>OMNR 2013, <sup>2</sup>COSEWIC 2012, <sup>3</sup>OMNR 2012b, <sup>4</sup>OMNR 2000a, <sup>5</sup>Layberry et al. 1998, <sup>6</sup>COSEWIC 2003, <sup>7</sup>COSEWIC 2010

**Legend**

S1- Critically Imperiled  
S2- Imperiled  
S3- Vulnerable  
S4- Apparently Secure  
E/END- Endangered  
T/THR- Threatened  
SC- Special Concern  
NAR- Not at Risk

**APPENDIX V**  
Significant Wildlife Habitat Screening Results

## Appendix. Significant Wildlife Habitat Screening Tables

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

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Waterfowl Stopover and Staging Areas (Terrestrial)</b>				
American Black Duck Wood Duck Green-winged Teal Blue-winged Teal Mallard Northern Pintail Northern Shoveler American Wigeon Gadwall	CUM1 CUT1 - Plus evidence of annual spring flooding from melt water or run-off within these Ecosites.	<p>Fields with sheet water during Spring (mid March to May).</p> <ul style="list-style-type: none"> <li>Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl.</li> <li>Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH.</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>Anecdotal information from the landowner, adjacent landowners or local naturalist clubs may be good information in determining occurrence.</li> <li>Reports and other information available from Conservation Authorities (CAs)</li> <li>Sites documented through waterfowl planning processes (eg. EHJV implementation plan)</li> <li>Naturalist Clubs</li> <li>Ducks Unlimited Canada</li> <li>Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area</li> </ul>	<p>Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>ccxi</sup></p> <ul style="list-style-type: none"> <li>Any mixed species aggregations of 100<sup>1</sup> or more individuals required.</li> <li>The area of the flooded field ecosite habitat plus a 100-300m radius buffer dependant on local site conditions and adjacent land use is the significant wildlife habitat<sup>cxlviii</sup>.</li> <li>Annual use of habitat is documented from information sources or field studies (annual use can be based on studies or determined by past surveys with species numbers and dates).</li> <li>SWHDSS<sup>cxlix</sup> Index #7 provides development effects and mitigation measures.</li> </ul>	<p>Suitable habitat not present within the study area</p> <p><b>Not SWH</b></p>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Waterfowl Stopover and Staging Areas (Aquatic)</b>				
Canada Goose Cackling Goose Snow Goose American Black Duck Northern Pintail Northern Shoveler American Wigeon Gadwall Green-winged Teal Blue-winged Teal Hooded Merganser Common Merganser Lesser Scaup Greater Scaup Long-tailed Duck Surf Scoter White-winged Scoter Black Scoter Ring-necked duck Common Goldeneye Bufflehead Redhead Ruddy Duck Red-breasted Merganser Brant Canvasback Ruddy Duck	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	<ul style="list-style-type: none"> <li>Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH, however a reservoir managed as a large wetland or pond/lake does qualify.</li> <li>These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water);</li> <li> <ul style="list-style-type: none"> <li><u>Information Sources</u></li> <li>Canadian Wildlife Service staff know the larger, most significant sites. Check website: <a href="http://wildspace.ec.gc.ca">http://wildspace.ec.gc.ca</a></li> <li>Naturalist clubs often are aware of staging/stopover areas.</li> <li>OMNR Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging.</li> <li>Sites documented through waterfowl planning processes (eg. EHJV implementation plan)</li> <li>Ducks Unlimited projects</li> <li>Element occurrence specification by Nature Serve: <a href="http://www.natureserve.org">http://www.natureserve.org</a></li> <li>NHIC Waterfowl Concentration Area</li> </ul> </li> </ul>	Studies carried out and verified presence of: <ul style="list-style-type: none"> <li>Aggregations of 100<sup>1</sup> or more of listed species for 7 days<sup>1</sup>, results in &gt; 700 waterfowl use days.</li> <li>Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH<sup>cxlix</sup></li> <li>The combined area of the ELC ecosites and a 100m radius area is the SWH<sup>cxlviii</sup></li> <li>Wetland area and shorelines associated with sites identified within the SWHTG<sup>cxlviii</sup> Appendix K<sup>cxlix</sup> are significant wildlife habitat.</li> <li>Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>ccxi</sup></li> <li>Annual Use of Habitat is Documented from Information Sources or Field Studies (Annual can be based on completed studies or determined from past surveys with species numbers and dates recorded).</li> <li>SWHDSS<sup>cxlix</sup> Index #7 provides development effects and mitigation measures.</li> </ul>	Deciduous swamp occurs within the adjacent Cityview Drive property within 50 m of the Starwood property.  Spring-time surveys completed within the Cityview Drive property did not result in the observation of significant numbers of waterfowl species.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Shorebird Migratory Stopover Area</b>				
Greater Yellowlegs Lesser Yellowlegs Marbled Godwit Hudsonian Godwit Black-bellied Plover American Golden-Plover Semipalmated Plover Solitary Sandpiper Spotted Sandpiper Semipalmated Sandpiper Pectoral Sandpiper White-rumped Sandpiper Baird's Sandpiper Least Sandpiper Purple Sandpiper Stilt Sandpiper Short-billed Dowitcher Red-necked Phalarope Whimbrel Ruddy Turnstone Sanderling Dunlin	BBO1 BBO2 BBS1 BBS2 BBT1 BBT2 SDO1 SDS2 SDT1 MAM1 MAM2 MAM3 MAM4 MAM5	Shorelines of lakes, rivers and wetlands, including beach areas, bars and seasonally flooded, muddy and un-vegetated shoreline habitats. Great Lakes coastal shorelines, including groynes and other forms of armour rock lakeshores, are extremely important for migratory shorebirds in May to mid-June and early July to October. Sewage treatment ponds and storm water ponds do not qualify as a SWH.  <u>Information Sources</u> <ul style="list-style-type: none"> <li>Western hemisphere shorebird reserve network.</li> <li>Canadian Wildlife Service (CWS) Ontario Shorebird Survey.</li> <li>Bird Studies Canada</li> <li>Ontario Nature</li> <li>Local birders and naturalist clubs</li> <li>NHIC Shorebird Migratory Concentration Area</li> </ul>	Studies confirming: <ul style="list-style-type: none"> <li>Presence of 3 or more of listed species and &gt; 1000<sup>1</sup> shorebird use days during spring or fall migration period. (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period)</li> <li>Whimbrel stop briefly (&lt;24hrs) during spring migration, any site with &gt;100<sup>1</sup> Whimbrel used for 3 years or more is significant.</li> <li>The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100m radius area<sup>cxlviii</sup></li> <li>Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>ccxi</sup></li> <li>SWHDSS<sup>cxlix</sup> Index #8 provides development effects and mitigation measures.</li> </ul>	Suitable habitat not present within the study area.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Raptor Wintering Area</b>				
Rough-legged Hawk Red-tailed Hawk Northern Harrier American Kestrel Snowy Owl  <b>Special Concern:</b> Short-eared Owl	Combination of ELC Community Series; need to have present one Community Series from each land class; Forest: FOD, FOM, FOC.  Upland: CUM; CUT; CUS; CUW.	The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. Raptor wintering sites need to be > 20 ha <sup>cxlviii, cxlix</sup> with a combination of forest and upland. <sup>xvi, xvii, xviii, xix, xx, xxi</sup> Least disturbed sites, idle/fallow or lightly grazed field/meadow with adjacent woodlands <sup>cxlix</sup>  <u>Information Sources:</u> <ul style="list-style-type: none"> <li>OMNR Ecologist or Biologist may be aware of locations of wintering raptors. In addition, these staff may know local naturalists that may be aware of the locations of raptor wintering habitats.</li> <li>NHIC Raptor Winter Concentration Area</li> <li>Data from Bird Studies Canada, most notably for Short-eared Owls.</li> <li>Reports and other information available from CAs.</li> </ul>	Studies confirm the use of these habitats by: <ul style="list-style-type: none"> <li>One or more Short-eared Owls or;</li> <li>At least 10 individuals and two listed spp .</li> <li>To be significant a site must be used regularly (3 in 5 years)<sup>cxlix</sup> for a minimum of 20 days by the above number of birds .</li> <li>Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>ccxi</sup></li> <li>SWHDSS<sup>cxlix</sup> Index #10 provides development effects and mitigation measures.</li> </ul>	The subject property contains open field adjacent to woodland.  However, the area of open field+ woodland is less than the required 20 ha to provide significant habitat.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Bat Hibernacula</b>				
Big Brown Bat Little Brown Myotis Eastern Pipistrelle/Tri-coloured Bat Northern Myotis Eastern Small-footed Myotis	Bat Hibernacula may be found in these ecosites: CCR1 CCR2 CCA1 CCA2 (Note: buildings are not considered to be SWH)	Hibernacula may be found in caves, mine shafts, underground foundations and Karsts. The locations of bat hibernacula are relatively poorly known.  <u>Information Sources</u> <ul style="list-style-type: none"> <li>• OMNR for possible locations and contact for local experts</li> <li>• NHIC Bat Hibernaculum/Nursery</li> <li>• Ministry of Northern Development and Mines for location of mine shafts.</li> <li>• Clubs that explore caves (eg. Sierra Club)</li> <li>• University Biology Departments with bat experts.</li> </ul>	<ul style="list-style-type: none"> <li>• All sites with confirmed hibernating bats are SWH <sup>Í</sup>.</li> <li>• The area includes 1000m radius around the entrance of the hibernaculum <sup>cxlviii, ccvii, Í</sup>.</li> <li>• Studies are to be conducted during the peak swarming period (Aug. – Sept.). Surveys should be conducted following methods outlined in the “Guideline for Wind Power Projects Potential Impacts to Bats and Bat Habitats”<sup>ccv</sup>.</li> <li>• SWHDSS<sup>cxlix</sup> Index #1 provides development effects and mitigation measures.</li> </ul>	Suitable habitat not present within the study area.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Bat Maternity Colonies</b>				
Big Brown Bat Little Brown Myotis Silver-haired Bat Northern Myotis	Maternity colonies considered SWH are found in forested Ecosites.  All ELC Ecosites in ELC Community Series: FOD FOM	Maternity colonies can be found in tree cavities, vegetation and often in buildings <sup>xxii, xxv, xxvi, xxvii, xxxi</sup> (buildings are not considered to be SWH). Maternity roosts are not found in caves and mines in Ontario <sup>xxii</sup> . <ul style="list-style-type: none"> <li>• Maternity colonies located in Mature deciduous or mixed forest stands<sup>ccix, ccx</sup> with &gt;10/ha large diameter (&gt;25cm dbh) wildlife trees<sup>ccvii</sup></li> <li>• Female Bats prefer wildlife tree (snags) in early stages of decay, class 1-3<sup>ccxiv</sup> or class 1 or 2<sup>ccxii</sup>.</li> <li>• Northern Myotis prefer contiguous tracts of older forest cover for foraging and roosting in snags and trees<sup>ccix</sup>.</li> <li>• Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred<sup>ccx</sup>.</li> </ul> <u>Information Sources</u> <ul style="list-style-type: none"> <li>• OMNR for possible locations and contact for local experts</li> <li>• University Biology Departments with bat experts.</li> </ul>	<ul style="list-style-type: none"> <li>• Maternity Colonies with confirmed use by;               <ul style="list-style-type: none"> <li>• &gt;20 Northern Myotis<sup>cxlix</sup></li> <li>• &gt;10 Big Brown Bats<sup>í</sup></li> <li>• &gt;20 Little Brown Myotis<sup>í</sup></li> <li>• &gt;5 Adult Female Silver-haired Bats<sup>í</sup></li> </ul> </li> <li>• The area of the habitat includes the entire woodland or the forest stand ELC Ecosite containing the maternity colonies<sup>í</sup>.</li> <li>• Evaluation methods for maternity colonies should be conducted following methods outlined in the "Guideline for Wind Power Projects Potential Impacts to Bats and Bat Habitats"<sup>ccv</sup>.</li> <li>• SWHDSS<sup>cxlix</sup> Index #1 provides development effects and mitigation measures.</li> </ul>	Suitable habitat is not present on the subject property.  Woodlands adjacent to the subject property do not contain a density of suitable cavity trees that would afford significance for this habitat type.  Wooded areas within the subject property are not classified as mixed or deciduous forest.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Bat Migratory Stopover Area</b>				
Hoary Bat Eastern Red Bat Silver-haired Bat	No specific ELC types.	<p>Long distance migratory bats typically migrate during late summer and early fall from summer breeding habitats throughout Ontario to southern wintering areas. Their annual fall migrations concentrate these species of bats at stopover areas. The location and characteristics of stopover habitats are generally unknown.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>• OMNR for possible locations and contact for local experts</li> <li>• University of Waterloo, Biology Department</li> </ul>	<p>Long Point (42°35'N, 80°30'E, to 42°33'N, 80°03'E) has been identified as a significant stop-over habitat for fall migrating Silver-haired Bats, due to significant increases in abundance, activity and feeding that was documented during fall migration<sup>ccxv</sup>.</p> <ul style="list-style-type: none"> <li>• The confirmation criteria and habitat areas for this SWH are still being determined.</li> <li>• SWHDSS cxlix Index #38 provides development effects and mitigation measures</li> </ul>	<p>Criteria for this SWH type have not been defined by the OMNR.</p> <p>Category not assessed.</p>

<b>Wildlife Habitat: Turtle Wintering Areas</b>				
<p>Midland Painted Turtle</p> <p><b>Special Concern:</b> Northern Map Turtle Snapping Turtle</p>	<p>Snapping and Midland Painted turtles, ELC Community Classes; SW, MA, OA and SA, ELC Community Series; FEO and BOO</p> <p>Northern Map Turtle - Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.</p>	<p>For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates.</p> <ul style="list-style-type: none"> <li>Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen. cix, cx, cxi, cxviii</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>EIS studies carried out by Conservation Authorities.</li> <li>Local naturalists and experts, as well as university herpetologists may also know where to find some of these sites.</li> <li>OMNR ecologist or biologist may be aware of locations of wintering turtles</li> <li>NHIC</li> </ul>	<ul style="list-style-type: none"> <li>Presence of 5 over-wintering Midland Painted Turtles is significant<sup>l</sup>.</li> <li>One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant<sup>l</sup>.</li> <li>The mapped ELC ecosite area with the over wintering turtles is the SWH. If the hibernation site is within a stream or river, the deep-water pool where the turtles are over wintering is the SWH.</li> <li>Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept. – Oct.) or spring (Mar. – May)<sup>cvii</sup>. Congregation of turtles is more common where wintering areas are limited and therefore significant<sup>cix, cx, cxi, cxii</sup>.</li> <li>SWHDSS<sup>cxlix</sup> Index #28 provides development effects and mitigation measures for turtle wintering habitat.</li> </ul>	<p>Deciduous and thicket swamp habitats occur adjacent to the subject property, within the Cityview Drive property.</p> <p>Suitable open water habitat is not present within these swamp features to provide significant turtle overwintering habitat.</p> <p>No turtle species were observed on-site during 2009 NRSI field surveys.</p> <p><b>Not SWH</b></p>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Snake Hibernaculum</b>				
<p><b>Snakes:</b> Eastern Gartersnake Northern Watersnake Northern Red-bellied Snake Northern Brownsnake Smooth Green Snake Northern Ring-necked Snake</p> <p><b>Special Concern:</b> Milksnake Eastern Ribbonsnake</p> <p><u>Lizard:</u> <b>Special Concern (Southern Shield population):</b> Five-lined Skink</p>	<p>For all snakes, habitat may be found in any ecosite in central Ontario other than very wet ones. Talus, Rock Barren, Crevice and Cave, and Alvar sites may be directly related to these habitats.</p> <p>Observations of congregations of snakes on sunny warm days in the spring or fall is a good indicator. The existence of rock piles or slopes, stone fences, and crumbling foundations assist in identifying candidate SWH.</p> <p>For Five-lined Skink, ELC Community Series of FOD and FOM and Ecosites: FOC1 FOC3</p>	<p>For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural locations. Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line<sup>xiv, i, ii, iii, cxii</sup>. Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells).</li> <li>Reports and other information available from CAs.</li> <li>Local naturalists and experts, as well as university herpetologists may also know where to find some of these sites.</li> <li>NHIC</li> </ul> <p>Five-lined skink prefer mixed forests with rock outcrop openings providing cover rock overlaying granite bedrock with fissures<sup>cciii</sup>.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>Reports and other information available from CAs.</li> <li>Local naturalists and experts, as well as university herpetologists may also know where to find some of these sites.</li> <li>OMNR ecologist or biologist may be aware of locations of wintering skinks</li> <li>NHIC</li> </ul>	<p>Studies confirming:</p> <ul style="list-style-type: none"> <li>Presence of snake hibernacula used by a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp.</li> <li>Congregations of a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. near potential hibernacula (eg. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct)<sup>I</sup>.</li> <li><u>Note:</u> If there are Special Concern Species present, then site is SWH</li> <li><u>Note:</u> Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population [i.e. strong hibernation site fidelity.]. Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The the feature in which the hibernacula is located plus a 30 m buffer is the SWH<sup>I</sup></li> <li>SWHDSS<sup>cxlix</sup> Index #13 provides development effects and mitigation measures for snake hibernacula.</li> <li>Presence of any active hibernaculum for skink is significant.</li> <li>SWHDSS<sup>cxlix</sup> Index #37 provides development effects and mitigation measures for five-lined skink wintering habitat.</li> </ul>	<p>Snake hibernacula may be found within the study area where there is any physical feature that allows access to subterranean areas.</p> <p><b>Candidate SWH</b></p>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Colonially – Nesting Bird Breeding Habitat (Bank and Cliff)</b>				
Bank Swallow Cliff Swallow Northern Rough-winged Swallow	<p>Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles (Bank Swallow and N. Rough-winged Swallow). Cliff faces, bridge abutments, silos, barns (Cliff Swallows).</p> <p>Habitat found in the following ecosites:            CUM1 CUT1            CUS1 BLO1            BLS1 BLT1            CLO1 CLS1            CLT1</p>	<ul style="list-style-type: none"> <li>Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area.</li> <li>Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil or aggregate stockpiles.</li> <li>Does not include a licensed/permitted Mineral Aggregate Operation.</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>Reports and other information available from CAs</li> <li>Ontario Breeding Bird Atlas<sup>ccv</sup>.</li> <li>Bird Studies Canada; <i>NatureCounts</i> <a href="http://www.birdscanada.org/birdmon/">http://www.birdscanada.org/birdmon/</a></li> <li>Naturalist clubs.</li> </ul>	<p>Studies confirming:</p> <ul style="list-style-type: none"> <li>Presence of 1 or more nesting sites with 8<sup>cxlvix</sup> or more cliff swallow pairs or 50<sup>i</sup> bank swallow and rough-winged swallow pairs during the breeding season.</li> <li>A colony identified as SWH will include a 50m radius habitat area from the peripheral nests<sup>ccvii</sup></li> <li>Field surveys to observe and count swallow nests are to be completed during the breeding season (May-June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>ccxi</sup></li> <li>SWHDSS<sup>cxlix</sup> Index #4 provides development effects and mitigation measures</li> </ul>	<p>Suitable habitat not present within the study area.</p> <p><b>Not SWH</b></p>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Colonially – Nesting Bird Breeding Habitat (Tree/Shrubs)</b>				
Great Blue Heron Black-crowned Night-Heron Great Egret Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	<ul style="list-style-type: none"> <li>Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used.</li> <li>Most nests in trees are 11 to 15 m from ground, near the top of the tree.</li> </ul> <u>Information Sources</u> <ul style="list-style-type: none"> <li>Ontario Breeding Bird Atlas<sup>ccv</sup>, colonial nest records.</li> <li>Ontario Heronry Inventory 1991 available from Bird Studies Canada or NHIC (OMNR).</li> <li>NHIC Mixed Wader Nesting Colony</li> <li>Aerial photographs can help identify large heronries.</li> <li>Reports and other information available from CAs.</li> <li>MNR District Offices.</li> <li>Local naturalist clubs.</li> </ul>	<p>Studies confirming:</p> <ul style="list-style-type: none"> <li>Presence of 5<sup>1</sup> or more active nests of Great Blue Heron.</li> <li>The edge of the colony and a minimum 300m area of habitat or extent of the Forest Ecosite containing the colony or any island &lt;15.0ha with a colony is the SWH<sup>cc</sup>. <small>ccvii</small></li> <li>Confirmation of active heronries are to be achieved through site visits conducted during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells</li> <li>SWHDSS<sup>cxlix</sup> Index #5 provides development effects and mitigation measures.</li> </ul>	<p>Suitable habitat is not present within the subject property.</p> <p>Poplar Mineral Deciduous Swamp (SWDM4-5) occurs adjacent to the subject property, within the Cityview Drive property.</p> <p>However, NRSI field surveys completed within the Cityview Drive property did not document the presence of colonial bird nesting areas.</p> <p><b>Not SWH</b></p>

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

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Migratory Butterfly Stopover Areas</b>				
Painted Lady White Admiral  <u>Special Concern</u> Monarch	Combination of ELC Community Series; need to have present one Community Series from each landclass:  <u>Field:</u> CUM            CUT CUS  <u>Forest:</u> FOC            FOD FOM            CUP  Anecdotally, a candidate sight for butterfly stopover will have a history of butterflies being observed.	A butterfly stopover area will be a minimum of 10 ha in size with a combination of field and forest habitat present, and will be located within 5 km of Lake Ontario cxlix. <ul style="list-style-type: none"> <li>The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long migration south xxxii, xxxiii, xxxiv, xxxv, xxxvi.</li> <li>The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat cxlviii, cxlix.</li> <li>Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes xxxvii, xxxviii, xxxix, xl, xli.</li> </ul> <u>Information Sources</u> <ul style="list-style-type: none"> <li>OMNR (NHIC)</li> <li>Agriculture Canada in Ottawa may have list of butterfly experts.</li> <li>Naturalist Clubs</li> <li>Toronto Entomologists Association</li> <li>Conservation Authorities</li> </ul>	Studies confirm: <ul style="list-style-type: none"> <li>The presence of Monarch Use Days (MUD) during fall migration (Aug/Oct)xliii. MUD is based on the number of days a site is used by Monarchs, multiplied by the number of individuals using the site. Numbers of butterflies can range from 100-500/dayxxxvii, significant variation can occur between years and multiple years of sampling should occur xl, xlii.</li> <li>MUD of &gt;5000 <b>or</b> &gt;3000 with the presence of Painted Ladies or White Admiral's is to be considered significant.<sup>1</sup></li> <li>SWHDSS cxlix Index #16 provides development effects and mitigation measures.</li> </ul>	The subject property is not within 5 km of Lake Ontario.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Landbird Migratory Stopover Areas</b>				
<p>All migratory songbirds.</p> <p>Canadian Wildlife Service Ontario website:  <a href="http://www.on.ec.gc.ca/wildlife_e.html">http://www.on.ec.gc.ca/wildlife_e.html</a></p> <p>All migrant raptors species:</p> <p>Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)</p>	<p>All Ecosites associated with these ELC Community Series;            FOC            FOM            FOD            SWC            SWM            SWD</p>	<p>Woodlots need to be &gt;10 ha<sup>1</sup> in size and within 5 km iv, v, vi, vii, viii, ix, x, xi, xii, xiii, xiv, xv of Lake Ontario.</p> <ul style="list-style-type: none"> <li>Woodlands &lt;2km from Lake Ontario are more significant<sup>cxlix</sup></li> <li>Sites have a variety of habitats; forest, grassland and wetland complexes<sup>cxlix</sup></li> <li>The largest sites are more significant<sup>cxlix</sup></li> <li>Woodlots and forest fragments are important habitats to migrating birds<sup>ccxviii</sup>, these features located along the shore and located within 5km of Lake Ontario are Candidate SWH<sup>cxlviii</sup>.</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>Bird Studies Canada</li> <li>Ontario Nature</li> <li>Local birders and naturalist club</li> <li>Ontario Important Bird Areas (IBA) Program</li> </ul>	<p>Studies confirm:</p> <ul style="list-style-type: none"> <li>Use of the woodlot by &gt;200 birds/day and with &gt;35 spp with at least 10 bird spp. recorded on at least 5 different survey dates<sup>1</sup>. This abundance and diversity of migrant bird species is considered above average and significant.</li> <li>Studies should be completed during spring (Apr./May) and fall (Aug/Oct) migration using standardized assessment techniques. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>ccxi</sup></li> <li>SWHDSS<sup>cxlix</sup> Index #9 provides development effects and mitigation measures.</li> </ul>	<p>The subject property is not within 5 km of Lake Ontario.</p> <p><b>Not SWH</b></p>

Wildlife Habitat: Deer Yarding Areas				
White-tailed Deer	<p>Note: OMNR to determine this habitat.</p> <p>ELC Community Series providing a thermal cover component for a deer yard would include; FOM, FOC, SWM and SWC.</p> <p>Or these ELC Ecosites; CUP2      CUP3 FOD3      CUT</p>	<ul style="list-style-type: none"> <li>Deer yarding areas or winter concentration areas (yards) are areas deer move to in response to the onset of winter snow and cold. This is a behavioural response and deer will establish traditional use areas. The yard is composed of two areas referred to as Stratum I and Stratum II. Stratum II covers the entire winter yard area and is usually a mixed or deciduous forest with plenty of browse available for food. Agricultural lands can also be included in this area. Deer move to these areas in early winter and generally, when snow depths reach 20 cm, most of the deer will have moved here. If the snow is light and fluffy, deer may continue to use this area until 30 cm snow depth. In mild winters, deer may remain in the Stratum II area the entire winter.</li> <li>The Core of a deer yard (Stratum I) is located within the Stratum II area and is critical for deer survival in areas where winters become severe. It is primarily composed of coniferous trees (pine, hemlock, cedar, spruce) with a canopy cover of more than 60%<sup>cxciv</sup>.</li> <li>OMNR determines deer yards following methods outlined in "Selected Wildlife and Habitat Features: Inventory Manual"<sup>cxcv</sup></li> <li>Woodlots with high densities of deer due to artificial feeding are not significant<sup>1</sup>.</li> </ul>	<p>No Studies Required:</p> <ul style="list-style-type: none"> <li>Snow depth and temperature are the greatest influence on deer use of winter yards. Snow depths &gt; 40cm for more than 60 days in a typically winter are minimum criteria for a deer yard to be considered as SWH.<sup>lvi, lvii, lviii, lix, lx, l</sup></li> <li>Deer Yards are mapped by OMNR District offices. Locations of Core or Stratum 1 and Stratum 2 Deer yards considered significant by OMNR will be available at local MNR offices or via Land Information Ontario (LIO).</li> <li>Field investigations that record deer tracks in winter are done to confirm use (best done from an aircraft). Preferably, this is done over a series of winters to establish the boundary of the Stratum I and Stratum II yard in an "average" winter. MNR will complete these field investigations.<sup>cxcv</sup></li> <li>If a SWH is determined for Deer Wintering Area or if a proposed development is within Stratum II yarding area then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule.</li> <li>SWHDSS<sup>cxlx</sup> Index #2 provides development effects and mitigation measures.</li> </ul>	<p>There are no OMNR records of deer overwintering habitat within the subject property, or within 120 m of the study area.</p> <p><b>Not SWH</b></p>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Deer Winter Congregation Areas</b>				
White-tailed Deer	<p>All Forested Ecosites with these ELC Community Series; FOC FOM FOD SWC SWM SWD</p> <p>Conifer plantations much smaller than 50 ha may also be used.</p>	<ul style="list-style-type: none"> <li>Woodlots will typically be &gt;100 ha in size<sup>1</sup>. Woodlots &lt;100ha may be considered as significant based on MNR studies or assessment.</li> <li>Deer movement during winter in the southern areas of Eco-region 6E are not constrained by snow depth, however deer will annually congregate in large numbers in suitable woodlands<sup>cxlviii</sup>.</li> <li>If deer are constrained by snow depth refer to the Deer Yarding Area habitat within Table 1.1 of this Schedule.</li> <li>Large woodlots &gt; 100ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1-1.5 deer/ha<sup>ccxxiv</sup>.</li> <li>Woodlots with high densities of deer due to artificial feeding are not significant<sup>1</sup>.</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>MNR District Offices.</li> <li>LIO/NRVIS</li> </ul>	<p>Studies confirm:</p> <ul style="list-style-type: none"> <li>Deer management is an MNR responsibility, deer winter congregation areas considered significant will be mapped by MNR<sup>cxlviii</sup>.</li> <li>Use of the woodlot by white-tailed deer will be determined by MNR, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNR<sup>1</sup>.</li> <li>Studies should be completed during winter (Jan/Feb) when &gt;20cm of snow is on the ground using aerial survey techniques<sup>ccxxiv</sup>, ground or road surveys, or a pellet count deer density survey<sup>ccxxv</sup>.</li> <li>SWHDSS<sup>cxlix</sup> Index #2 provides development effects and mitigation measures.</li> </ul>	<p>There are no OMNR records of deer overwintering habitat within the subject property, or within 120 m of the study area.</p> <p><b>Not SWH</b></p>

**Table 2: Characteristics of Rare Vegetation Communities in Ecoregion 6E**

Rare Vegetation Community <sup>1</sup>	Candidate SWH			Confirmed SWH	Starwood
	ELC Ecosite Code <sup>1</sup>	Habitat Description <sup>1</sup>	Detailed Information and Sources	Defining Criteria <sup>1</sup>	Assessment Details
<p><b>Cliffs and Talus Slopes</b></p> <p><u>Rationale:</u> Cliffs and Talus Slopes are extremely rare habitats in Ontario.</p>	<p>Any ELC Ecosite within Community Series:</p> <p>TAO CLO TAS CLS TAT CLT</p>	<p>A Cliff is vertical to near vertical bedrock &gt;3m in height.</p> <p>A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris</p>	<p>Most cliff and talus slopes occur along the Niagara Escarpment.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>The Niagara Escarpment Commission has detailed information on location of these habitats.</li> <li>OMNR Planner, Forester, Ecologist or Biologist</li> <li>NHIC has location information on some cliff and talus occurrences, this information is available on their website (Biodiversity Explorer).</li> <li>Local naturalist clubs</li> <li>Conservation Authorities</li> </ul>	<ul style="list-style-type: none"> <li>Confirm any ELC Vegetation Type for Cliffs or Talus Slopes<sup>lxviii</sup></li> <li>SWHDSS<sup>cxlix</sup> Index #21 provides development effects and mitigation measures.</li> </ul>	<p>Vegetation community not present within the subject property.</p> <p><b>Not SWH</b></p>

Rare Vegetation Community <sup>1</sup>	Candidate SWH			Confirmed SWH	Starwood
	ELC Ecosite Code <sup>1</sup>	Habitat Description <sup>1</sup>	Detailed Information and Sources	Defining Criteria <sup>1</sup>	Assessment Details
<p><b>Sand Barren</b></p> <p><b>Rationale:</b> Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry</p>	<p>SBO1 SBS1 SBT1</p> <p>Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always ≤ 60%.</p>	<p>Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. They have little or no soil and the underlying rock protrudes through the surface. Usually located within other types of natural habitat such as forest or savannah. Vegetation can vary from patchy and barren to tree covered but less than 60%.</p>	<p>No minimum size for sand barren area.</p> <ul style="list-style-type: none"> <li>Sand Barrens support rare species such as provincially Endangered Forked Three-awned Grass and American Badger lxxxv, lxxxvi. By extension, sand barren sites that could support these rare species (close proximity to other populations), historically or currently should be considered for higher priority conservation.</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>OMNR Planner, Forester, Ecologist or Biologist</li> <li>NHIC has location information on some sand barren occurrences, this information is available on their website (Biodiversity Explorer).</li> <li>Local naturalist clubs</li> <li>Conservation Authorities</li> </ul>	<ul style="list-style-type: none"> <li>Confirm any ELC Vegetation Type for Sand Barrens lxxviii</li> <li>Site must not be dominated by exotic or introduced species (&lt;50% vegetative cover exotics)<sup>1</sup>.</li> <li>SWHDSS<sup>cxlix</sup> Index #20 provides development effects and mitigation measures.</li> </ul>	<p>Vegetation community not present within the subject property.</p> <p><b>Not SWH</b></p>

Rare Vegetation Community <sup>1</sup>	Candidate SWH			Confirmed SWH	Starwood
	ELC Ecosite Code <sup>1</sup>	Habitat Description <sup>1</sup>	Detailed Information and Sources	Defining Criteria <sup>1</sup>	Assessment Details
<p><b>Alvar</b></p> <p><b>Rationale:</b> Alvars are extremely rare habitats in Ontario.</p>	<p>ALO1 ALS1 ALT1</p>	<p>An alvar is typically a level, mostly unfractured calcareous bedrock feature with a mosaic of rock pavements and bedrock overlain by a thin veneer of soil. The hydrology of alvars is complex, with alternating periods of inundation and drought. Vegetation cover varies from sparse lichen-moss associations to grasslands and shrublands and comprising a number of characteristic or indicator plant. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animals species. Vegetation cover varies from patchy to barren with a less than 60% tree cover<sup>lxxviii</sup>.</p>	<p>An Alvar site &gt; 0.5 ha in size<sup>lxxv</sup>. Alvar is particularly rare in ecoregion 7E where the only known sites are found in the western islands of Lake Erie.<sup>cxcix</sup></p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>• Alvars of Ontario (2000), Federation of Ontario Naturalists<sup>lxxvi</sup>.</li> <li>• Ontario Nature – Conserving Great Lakes Alvars<sup>ccviii</sup>.</li> <li>• NHIC has location information on many alvar occurrences, this information is available on their website (Biodiversity Explorer).</li> <li>• OMNR Ecologists or Biologists.</li> <li>• Local Naturalist clubs.</li> <li>• Conservation Authorities.</li> </ul>	<p>Field studies identify three or more of the Alvar indicator species<sup>lxxv</sup> listed in OMNR (2000b)<sup>cxlix</sup>. Appendix N should be present. Note: Alvar plant spp. list from Eco-region 7E should be used.</p> <ul style="list-style-type: none"> <li>• Confirm and map ELC Vegetation Type polygons for Alvars<sup>lxxviii</sup></li> <li>• Site must not be dominated by exotic or introduced species (&lt;50% vegetative cover exotics).</li> <li>• The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses<sup>lxxv</sup>.</li> <li>• SWHDSS<sup>cxlix</sup> Index #17 provides development effects and mitigation measures.</li> </ul>	<p>Vegetation community not present within the subject property.</p> <p><b>Not SWH</b></p>

Rare Vegetation Community <sup>1</sup>	Candidate SWH			Confirmed SWH	Starwood
	ELC Ecosite Code <sup>1</sup>	Habitat Description <sup>1</sup>	Detailed Information and Sources	Defining Criteria <sup>1</sup>	Assessment Details
<p><b>Old Growth Forest</b></p> <p><u>Rationale:</u> Old Growth forest stands are rare in S. Ontario</p>	<p>Forest Community Series: FOD FOC FOM</p>	<p>Old-growth forests tend to be relatively undisturbed, structurally complex, and contain a wide variety of trees and shrubs in various age classes. These habitats usually support a high diversity of wildlife species.</p>	<ul style="list-style-type: none"> <li>No minimum size to site<sup>1</sup>.</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>OMNR Forest Resource Inventory mapping</li> <li>OMNR Forester, Ecologist or Biologist.</li> <li>Local naturalist clubs</li> <li>Conservation Authorities</li> <li>Municipal forestry departments</li> </ul>	<p>Field Studies will determine:</p> <ul style="list-style-type: none"> <li>If dominant trees species of the ecosite are &gt;140 years old, then stand is Significant Wildlife Habitat<sup>cxlviii</sup>.</li> <li>The stand will have experienced no recognizable forestry activities<sup>cxlviii</sup></li> <li>Determine ELC Vegetation Type for forest stand lxxviii.</li> <li>SWHDSS<sup>cxlix</sup> Index #23 provides development effects and mitigation measures.</li> </ul>	<p>Vegetation community not present within the subject property.</p> <p><b>Not SWH</b></p>

Rare Vegetation Community <sup>1</sup>	Candidate SWH			Confirmed SWH	Starwood
	ELC Ecosite Code <sup>1</sup>	Habitat Description <sup>1</sup>	Detailed Information and Sources	Defining Criteria <sup>1</sup>	Assessment Details
<p><b>Savannah</b></p> <p><b>Rationale:</b> Savannahs are extremely rare habitats in Ontario.</p>	TPS1 TPS2 TPW1 TPW2 CUS2	<p>A Savannah is a tallgrass prairie habitat that has tree cover between 25 – 60%.</p> <p>Tallgrass Prairie (TGP) and savannah were historically common in the near-shore areas of the Great Lakes.</p> <p>In ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario). cc</p>	<p>No minimum size to site<sup>1</sup>            Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>• OMNR Forester, Ecologist or Biologist.</li> <li>• NHIC has location information on many savannah occurrences, this information is available on their website (Biodiversity Explorer).</li> <li>• Local naturalists clubs.</li> <li>• Conservation Authorities.</li> </ul>	<p>Field studies confirm one or more of the Savannah indicator species listed in<sup>lxxv</sup> Appendix N should be present<sup>1</sup>. Note: Savannah plant spp. list from Ecoregion 7E should be used</p> <ul style="list-style-type: none"> <li>• Area of the ELC Vegetaion type is the SWH lxxviii.</li> <li>• Site must not be dominated by exotic or introduced species (&lt;50% vegetative cover exotics).</li> <li>• SWHDSS<sup>cxlix</sup> Index #18 provides development effects and mitigation measures.</li> </ul>	<p>Vegetation community not present within the subject property.</p> <p><b>Not SWH</b></p>

Rare Vegetation Community <sup>1</sup>	Candidate SWH			Confirmed SWH	Starwood
	ELC Ecosite Code <sup>1</sup>	Habitat Description <sup>1</sup>	Detailed Information and Sources	Defining Criteria <sup>1</sup>	Assessment Details
<p><b>Tallgrass Prairie</b></p> <p><u>Rationale:</u> Tallgrass Prairies are extremely rare habitats in Ontario.</p>	TPO1 TPO2	<p>A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has &lt; 25% tree cover.</p> <p>Tallgrass Prairie (TGP) and savannah were historically common in the near-shore areas of the Great Lakes</p> <p>In ecoregion 7E, known Tallgrass Prairie and savannah remnants are scattered between Lake Huron and Lake Erie, near Lake St. Clair, north of and along the Lake Erie shoreline, in Brantford and in the Toronto area (north of Lake Ontario). cc</p>	<p>No minimum size to site <sup>1</sup>. Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>NHIC has location information on some tallgrass prairie occurrences, this information is available on their website (Biodiversity Explorer).</li> <li>OMNR Ecologists and Biologists.</li> <li>Local naturalists clubs.</li> <li>Conservation Authorities.</li> </ul>	<p>Field studies confirm one or more of the Prairie indicator species listed in <sup>lxxv</sup> Appendix N should be present <sup>1</sup>. Note: Prairie plant spp. list from Ecoregion 7E should be used</p> <ul style="list-style-type: none"> <li>Area of the ELC Vegetation Type is the SWH <sup>lxxviii</sup>.</li> <li>Site must not be dominated by exotic or introduced species (&lt;50% vegetative cover exotics).</li> <li>SWHDSS<sup>cxlix</sup> Index #19 provides development effects and mitigation measures.</li> </ul>	<p>Vegetation community not present within the subject property.</p> <p><b>Not SWH</b></p>

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

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

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Waterfowl Nesting Area</b>				
American Black Duck Northern Pintail Northern Shoveler Gadwall Blue-winged Teal Green-winged Teal Wood Duck Hooded Merganser Mallard	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4  <b>Note: includes adjacency to Provincially Significant Wetlands</b>	A waterfowl nesting area extends 120 m <sup>cxlix</sup> from a wetland (> 0.5 ha) or a wetland (>0.5 ha) with small wetlands (<0.5ha) within 120m or a cluster of 3 or more small (<0.5 ha) wetlands within 120 m of each individual wetland where waterfowl nesting is known to occur. <sup>cxlix</sup> <ul style="list-style-type: none"> <li>Upland areas should be at least 120m wide so that predators such as racoons, skunks, and foxes have difficulty finding nests.</li> <li>Wood Ducks and Hooded Mergansers utilize large diameter trees (&gt;40cm dbh) in woodlands for cavity nest sites.</li> </ul> <u>Information Sources</u> <ul style="list-style-type: none"> <li>Ducks Unlimited staff may know the locations of particularly productive nesting sites.</li> <li>OMNR Wetland Evaluations for indication of significant waterfowl nesting habitat.</li> <li>Reports and other information available from CAs</li> </ul>	Studies confirmed: <ul style="list-style-type: none"> <li>Presence of 3 or more nesting pairs for listed species excluding Mallards<sup>1</sup>, or;</li> <li>Presence of 10 or more nesting pairs for listed species including Mallards<sup>1</sup>.</li> <li>Any active nesting site of an American Black Duck is considered significant.</li> <li>Nesting studies should be completed during the spring breeding season (April - June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>ccxi</sup></li> <li>A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m<sup>cxlviii</sup> from the wetland and will provide enough habitat for waterfowl to successfully nest.</li> <li>SWHDSS<sup>cxlix</sup> Index #25 provides development effects and mitigation measures.</li> </ul>	Suitable habitat is not present within the subject property.  Deciduous and thicket swamp habitat is present adjacent to the subject property, within the Cityview Drive property.  However, NRSI field studies completed within the Cityview Drive property have not identified waterfowl nesting habitat.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Bald Eagle and Osprey Nesting Habitat</b>				
<p>Osprey</p> <p><b>Special Concern</b> Bald Eagle</p>	<p>ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands</p>	<p>Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water.</p> <p>Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy.</p> <p>Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms).</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>NHIC compiles all known nesting sites for Bald Eagles in Ontario.</li> <li>MNR values information (LIO/NRVIS) will list known nesting locations. Note: data from NRVIS is provided as a point and does not represent all the habitat.</li> <li>Nature Counts, Ontario Nest Records Scheme data.</li> <li>OMNR Ecologist or Biologist may be aware of locations of nesting raptors. In addition, these staff may know local naturalists that may be aware of the locations of raptor nests.</li> <li>Sustainable Forestry Licence (SFL) companies will identify additional nesting locations through field operations.</li> <li>Check the Ontario Breeding Bird Atlas<sup>ccv</sup> or Rare Breeding Birds in Ontario for species documented</li> <li>Reports and other information available from CAs.</li> </ul>	<p>Studies confirm the use of these nests by:</p> <ul style="list-style-type: none"> <li>One or more active Osprey or Bald Eagle nests in an area<sup>cxlviii</sup>.</li> <li>Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH.</li> <li>For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH<sup>ccvii</sup>, maintaining undisturbed shorelines with large trees within this area is important<sup>cxlviii</sup>.</li> <li>For a Bald Eagle the active nest and a 400-800 m radius around the nest is the SWH.<sup>cvi, ccvii</sup> Area of the habitat from 400-800m is dependant on site lines from the nest to the development and inclusion of perching and foraging habitat<sup>cvi</sup></li> <li>To be significant a site must be used annually. When found inactive, the site must be known to be inactive for <math>\geq 3</math> years or suspected of not being used for &gt;5 years before being considered not significant.<sup>ccvii</sup></li> </ul>	<p>Suitable habitat not present within the study area.</p> <p>No Ospreys or Bald Eagles were identified during previous NRSI field surveys within the Cityview Drive property.</p> <p><b>Not SWH</b></p>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
		<ul style="list-style-type: none"> <li>Local naturalists may know of other locations.</li> <li>Use maps and aerial photographs to identify forests with few roads that tend to have less human disturbance.</li> </ul>	<ul style="list-style-type: none"> <li>Observational studies to determine nest site use, perching sites and foraging areas need to be done from mid March to mid August.</li> <li>Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>ccxi</sup></li> <li>SWHDSS<sup>cxlix</sup> Index #26 provides development effects and mitigation measures</li> </ul>	
<b>Wildlife Habitat: Woodland Raptor Nesting Habitat</b>				
Northern Goshawk Cooper's Hawk Sharp-shinned Hawk Red-shouldered Hawk Barred Owl Broad-winged Hawk	May be found in all forested ELC Ecosites.  May also be found in SWC, SWM, SWD and CUP3	All natural or conifer plantation woodland/forest stands >30ha with >10ha of interior habitat <sup>lxxxviii, lxxxix, xc, xci, xciii, xciv, xcvi, cxvii, cxviii</sup> . Interior habitat determined with a 200m buffer <sup>cxlviii</sup> <ul style="list-style-type: none"> <li>Stick nests found in a variety of intermediate-aged to mature conifer, deciduous or mixed forests within tops or crotches of trees. Species such as Coopers hawk nest along forest edges sometimes on peninsulas or small off-shore islands.</li> <li>In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest.</li> </ul> <u>Information Sources</u> <ul style="list-style-type: none"> <li>OMNR Ecologist or Biologist may be aware of locations of nesting raptors.</li> <li>Sustainable Forestry Licence (SFL) companies will identify additional nesting locations through field operations.</li> </ul>	Studies confirm: <ul style="list-style-type: none"> <li>Presence of 1 or more active nests from species list is considered significant<sup>cxlviii</sup>.</li> <li>Red-shouldered Hawk and Northern Goshawk – A 400m radius around the nest or 28 ha of suitable habitat is the SWH<sup>ccvii</sup>.</li> <li>Barred Owl – A 200m radius around the nest is the SWH<sup>ccvii</sup>.</li> <li>Broad-winged Hawk and Coopers Hawk, – A 100m radius around the nest is the SWH<sup>ccvii</sup>.</li> <li>Sharp-Shinned Hawk – A 50m radius around the nest is the SWH<sup>ccvii</sup>.</li> <li>Conduct field investigations from mid-March to end of May. The use of call broadcasts can help in locating territorial</li> </ul>	Suitable habitat is not present within the subject property.  Forest and swamp communities are present within the adjacent Cityview Drive and Cityview Ridge properties.  However, wooded habitats within the adjacent properties are not large enough (<30 ha) to provide significant raptor nesting habitat.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
		<ul style="list-style-type: none"> <li>Check the Ontario Breeding Bird Atlas<sup>ccv</sup> or Rare Breeding Birds in Ontario for species documented.</li> <li>Check data from Bird Studies Canada.</li> <li>Reports and other information available from CAs.</li> <li>Use maps and aerial photographs to identify forests with few roads that tend to have less human disturbance.</li> </ul>	<p>(courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area.</p> <ul style="list-style-type: none"> <li>SWHDSS<sup>cxlix</sup> Index #27 provides development effects and mitigation measures.</li> </ul>	
<b>Wildlife Habitat: Turtle Nesting Areas</b>				
<p>Midland Painted Turtle</p> <p><u>Special Concern Species</u></p> <p>Northern Map Turtle</p> <p>Snapping Turtle</p>	<p>Exposed mineral soil (sand or gravel) areas adjacent (&lt;100m)<sup>cxiviii</sup> or within the following ELC Ecosites:</p> <p>MAM2 MAM3 MAM4 MAM5 MAM6 MAM1 MAM2 MAM3 SAS1 SAM1 SAF1 BOO1 FEO1</p>	<ul style="list-style-type: none"> <li>Best nesting habitat for turtles are close to water and away from roads and sites less prone to loss of eggs by predation from skunks, raccoons or other animals.</li> <li>For an area to function as a turtle-nesting area, it must provide sand and gravel that turtles are able to dig in and are located in open, sunny areas. Nesting areas on the sides of municipal or provincial road embankments and shoulders are not SWH.</li> <li>Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used.</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels).</li> <li>Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may</li> </ul>	<p>Studies confirm:</p> <ul style="list-style-type: none"> <li>Presence of 5 or more nesting Midland Painted Turtles<sup>1</sup></li> <li>One or more Northern Map Turtle or Snapping Turtle nesting is a SWH<sup>1</sup>.</li> <li>The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30-100m around the nesting area dependant on slope, riparian vegetation and adjacent land use is the SWH.<sup>cxlviii</sup></li> <li>Travel routes from wetland to nesting area are to be considered within the SWH.<sup>cxlix</sup></li> <li>Field investigations should be conducted in prime nesting season typically late spring to early summer.</li> <li>SWHDSS<sup>cxlix</sup> Index #28</li> </ul>	<p>Suitable habitat not present within the study area.</p> <p><b>Not SWH</b></p>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
		<p>help to find potential nesting habitat for them.</p> <ul style="list-style-type: none"> <li>• NHIC</li> <li>• Use aerial photographs and maps to narrow the search for prime nesting areas including shoreline beaches located near weedy areas of wetlands, lake and river shorelines, road embankments near turtle habitat, and stream crossings/culverts.</li> <li>• Skinks will nest under logs, in stumps or under loose rock in partially wooded areas <ul style="list-style-type: none"> <li>• Reports and other information available from CAs.</li> </ul> </li> <li>• Sightings by local Naturalist groups</li> </ul>	<p>provides development effects and mitigation measures for turtle nesting habitat.</p>	

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Seeps and Springs</b>				
Wild Turkey Ruffed Grouse Spruce Grouse White-tailed Deer Salamander spp.	Seeps/Springs are areas where ground water comes to the surface. Often they are found within headwater areas within forested habitats. Any forested Ecosite within the headwater areas of a stream could have seeps/springs.	Any forested area (with <25% meadow/field/pasture) within the headwaters of a stream or river system <sup>cxvii, cxlix</sup> . <ul style="list-style-type: none"> <li>Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species<sup>cxix, cxx, cxxi, cxxii, cxiii, cxiv</sup>.</li> </ul> <u>Information Sources</u> <ul style="list-style-type: none"> <li>Topographical Map.</li> <li>Thermography.</li> <li>Hydrological surveys conducted by CAs and MOE.</li> <li>Local naturalists and landowners may know some locations.</li> <li>Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped.</li> </ul>	Field Studies confirm: <ul style="list-style-type: none"> <li>Presence of a site with 2 or more<sup>l</sup> seeps/springs should be considered SWH.</li> <li>The area of a ELC forest ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat<sup>cxlviii</sup>.</li> <li>SWHDSS<sup>cxlix</sup> Index #30 provides development effects and mitigation measures</li> </ul>	Suitable habitat is not present within the subject property.  Previous studies within the forested areas of the adjacent Cityview Drive and Cityview Ridge properties did not document seeps or springs within 120 m of the subject property.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Amphibian Breeding Habitat (Woodland)</b>				
Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD  Breeding pools within the woodland or the shortest distance from forest habitat are more significant because they are more likely to be used due to reduced risk to migrating amphibians	<ul style="list-style-type: none"> <li>• Presence of a wetland, lake, or pond within or adjacent (within 120m) to a woodland (no minimum size).clxxxii, lxiii, lxv, lxvi, lxvii, lxviii, lxix, lxx Some small wetlands may not be mapped and may be important breeding pools for amphibians.</li> <li>• Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat cxlviii</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>• Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records</li> <li>• Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property.</li> <li>• Local OMNR Ecologist</li> <li>• OMNR wetland evaluations</li> <li>• Local field naturalist clubs</li> <li>• Canadian Wildlife Service Amphibian Road Call Survey</li> <li>• Ontario Vernal Pool Association: <a href="http://www.ontariovernalpools.org">http://www.ontariovernalpools.org</a></li> </ul>	Studies confirm; <ul style="list-style-type: none"> <li>• Presence of breeding population of 1 or more of the listed species with at least 20 individuals (adults, juveniles, eggs/larval masses) lxxi.</li> <li>• An observational study to determine breeding/larval stages will be required during the spring (Apr-June) when amphibians are concentrated around suitable breeding habitat within or near the woodland.</li> <li>• The habitat is the woodland (ELC polygons) and wetland (ELC polygons) combined. A travel corridor connecting the woodland and wetland polygons is to be included within the habitat.</li> <li>• SWHDSS cxlix Index #14 provides development effects and mitigation measures.</li> </ul>	Suitable habitat is not present within the subject property.  Deciduous swamp habitat exists within the adjacent Cityview Drive property.  However, previous NRSI field surveys within the Cityview Drive property, including amphibian call surveys, resulted in only one species being recorded.  <b>Not SWH</b>

Wildlife Species <sup>1</sup>	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes <sup>1</sup>	Habitat Criteria and Information Sources <sup>1</sup>	Defining Criteria <sup>1</sup>	Assessment Details
<b>Wildlife Habitat: Amphibian Breeding Habitat (Wetlands)</b>				
Eastern Newt American Toad Spotted Salamander Four-toed Salamander Blue-spotted Salamander Gray Treefrog Western Chorus Frog Northern Leopard Frog Pickerel Frog Green Frog Mink Frog Bullfrog	ELC Community Classes SW, MA, FE, BO, OA and SA.	<ul style="list-style-type: none"> <li>Wetlands and pools (including vernal pools) &gt;500m<sup>2</sup> (about 25m diameter)<sup>ccvii</sup> isolated from woodlands (&gt;120m), 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<sup>chxxxiv</sup>.</li> <li>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.</li> <li>Bullfrogs require permanent water bodies with abundant emergent vegetation.</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>Ontario Herpetofaunal Summary Atlas (or other similar atlases)</li> <li>Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count.</li> <li>OMNR Ecologist or Biologist may know of populations, wetland evaluations may be a good source of information..</li> <li>Use maps or aerial photography to locate marsh habitat.</li> <li>Reports and other information available from CAs.</li> </ul>	Studies confirm: <ul style="list-style-type: none"> <li>Presence of breeding population of 1 or more of the listed salamander species or 3 or more of the listed frog or toad species and with at least 20 breeding individuals (adults, juveniles, eggs/larval masses)<sup>lxxi, lxxiii</sup> <b>or</b>;</li> <li>Wetland with confirmed breeding Bullfrogs are significant<sup>l</sup>.</li> <li>The ELC ecosite wetland area and the shoreline are the SWH.</li> <li>Surveys to confirm breeding to be completed during spring (Apr to June) when amphibians are migrating, calling and breeding within the wetland habitats.</li> <li>If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule.</li> <li>SWHDSS<sup>cxlix</sup> Index #15 provides development effects and mitigation measures.</li> </ul>	Suitable habitat not present within the study area.  <b>Not SWH</b>

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

Wildlife Species	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
<b>Wildlife Habitat: Marsh Bird Breeding Habitat</b>				
American Bittern Virginia Rail Sora Common Moorhen American Coot Pied-billed Grebe Marsh Wren Sedge Wren Common Loon Sandhill Crane Green Heron Trumpeter Swan  <b>Special Concern:</b> Black Tern Yellow Rail	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1 BOO1  For Green Heron: All SW, MA and CUM1 sites.	<ul style="list-style-type: none"> <li>Nesting occurs in wetlands.</li> <li>All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present <sup>ccxiv</sup>.</li> <li>For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water.</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>Contact OMNR, wetland evaluations are a good source of information.</li> <li>Local naturalist clubs</li> <li>NHIC Records.</li> <li>Reports and other information available from CAs.</li> <li>Ontario Breeding Bird Atlas <sup>ccv</sup>.</li> </ul>	Studies confirm: <ul style="list-style-type: none"> <li>Presence of 5 or more nesting pairs of Sedge Wren or Marsh Wren or <b>or</b> 1 pair of Sandhill Cranes; <b>or</b> breeding by any combination of 5 or more of the listed species <sup>í</sup>.</li> <li>Note: any wetland with breeding of 1 or more Black Terns, Trumpeter Swan, Green Heron or Yellow Rail is SWH <sup>í</sup>.</li> <li>Area of the ELC ecosite is the SWH.</li> <li>Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats.</li> <li>Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" <sup>ccxi</sup></li> <li>SWHDSS <sup>cxlix</sup> Index #35 provides development effects and mitigation measures</li> </ul>	Suitable habitat not present within the study area.  <b>Not SWH</b>

Wildlife Species	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
<b>Wildlife Habitat: Woodland Area-Sensitive Bird Breeding Habitat Wildlife</b>				
Yellow-bellied Sapsucker Red-breasted Nuthatch Veery Blue-headed Vireo Northern Parula Black-throated Green Warbler Blackburnian Warbler Black-throated Blue Warbler Ovenbird Scarlet Tanager Winter Wren  <u>Special Concern:</u> Cerulean Warbler Canada Warbler	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	<ul style="list-style-type: none"> <li>Habitats where interior forest breeding birds are breeding, typically large mature (&gt;60 yrs old) forest stands or woodlots &gt;30 ha. cv, cxxxi, cxxxii, cxxxiii, cxxxiv, cxxxv, cxxxvi, cxxxvii, cxxxviii, cxxxix, cxl, cxli, cxlii, cxliii, cxliv, cxlv, cxlvi, cl, cli, clii, cliii, cliv, clv, clvi, clvii, clviii, clix,</li> <li>Interior forest habitat is at least 200 m from forest edge habitat. clxiv</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>Ask local birders for local forests that support abundant and species-rich populations of area-sensitive species.</li> <li>Canadian Wildlife Service (CWS) for the location of forest bird monitoring sites and names of volunteers who might assist the planning authority in locating important areas.</li> <li>Bird Studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to determine what forests were of greatest value to interior species</li> <li>Reports and other information available from CAs.</li> </ul>	Studies confirm: <ul style="list-style-type: none"> <li>Presence of nesting or breeding pairs of 3 or more of the listed wildlife species. Í</li> <li><u>Note:</u> any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH.Í</li> <li>Conduct field investigations in spring and early summer when birds are singing and defending their territories.</li> <li>Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>WCCxi</sup></li> <li>SWHDSS cxlix Index #34 provides development effects and mitigation measures.</li> </ul>	Suitable habitat is not present within the subject property.  Deciduous swamp occurs within the adjacent Cityview Drive property. However, the area of this habitat is too small (<30ha) to support significant area-sensitive breeding bird habitat.  <b>Not SWH</b>

Wildlife Species	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
<b>Wildlife Habitat: Open Country Bird Breeding Habitat</b>				
Upland Sandpiper Grasshopper Sparrow Vesper Sparrow Northern Harrier Savannah Sparrow  <b>Special Concern</b> Short-eared Owl	CUM1 CUM2	<p>Large grassland areas (includes natural and cultural fields and meadows) &gt;30 ha <sup>clx, clxi, clxii, clxiii, clxiv, clxv, clxvi, clxvii, clxviii, clxix</sup>. Grasslands not Class 1 or 2 agricultural lands, and not being actively used for farming (i.e. no row cropping or intensive hay or livestock pasturing in the last 5 years) <sup>í</sup>.</p> <p>Grassland sites considered significant should have a history of longevity, either abandoned fields, mature hayfields and pasturelands that are at least 5 years or older.</p> <p>The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>• Use Agricultural land classification maps with aerial photographs to determine the potential grasslands that might be candidate sites.</li> <li>• Ask local birders for location of grasslands that support abundant and species rich populations of area-sensitive species.</li> <li>• Ontario Breeding Bird Atlas <sup>ccv</sup></li> <li>• Reports and other information available from CAs.</li> </ul>	Field Studies confirm: <ul style="list-style-type: none"> <li>• Presence of nesting or breeding of 2 or more of the listed species.<sup>í</sup></li> <li>• A field with 1 or more breeding Short-eared Owls is to be considered SWH.</li> <li>• The area of SWH is the contiguous ELC ecosite field areas.</li> <li>• Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories.</li> <li>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"<sup>nccxi</sup></li> <li>• SWHDSS <sup>cxlix</sup> Index #32 provides development effects and mitigation measures</li> </ul>	Suitable habitat not present within the study area.  <b>Not SWH</b>

Wildlife Species	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
<b>Wildlife Habitat: Shrub/Early Successional Bird Breeding Habitat</b>				
<p><u>Indicator Spp.</u> Brown Thrasher Clay-coloured Sparrow</p> <p><u>Common Spp.</u> Field Sparrow Black-billed Cuckoo Eastern Towhee Willow Flycatcher</p> <p><b>Special Concern:</b> Yellow-breasted Chat Golden-winged Warbler</p>	<p>CUT1 CUT2 CUS1 CUS2 CUW1 CUW2</p> <p>Patches of shrub ecosites can be complexed into a larger habitat for some bird species</p>	<p>Large field areas succeeding to shrub and thicket habitats &gt;10ha<sup>clxiv</sup> in size. Shrub land or early successional fields, not class 1 or 2 agricultural lands, not being actively used for farming (i.e. no row-cropping, haying or live-stock pasturing in the last 5 years) <sup>1</sup>.</p> <p>Shrub thicket habitats (&gt;10 ha) are most likely to support and sustain a diversity of these species <sup>clxxiii</sup>.</p> <p>Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands.</p> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>• Use agricultural land classification maps and recent aerial photographs to determine the amount of potential shrub and thicket habitats.</li> <li>• Ask local birders for location of shrub and thicket habitats that support abundant and species rich populations of area-sensitive species.</li> <li>• Ontario Breeding Bird Atlas <sup>ccv</sup></li> <li>• Reports and other information available from CAs.</li> </ul>	<p>Field Studies confirm:</p> <ul style="list-style-type: none"> <li>• Presence of nesting or breeding of 1 of the indicator species and at least 2 of the common species. <sup>1</sup></li> <li>• A field with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat. <sup>1</sup></li> <li>• The area of the SWH is the contiguous ELC ecosite field/thicket area.</li> <li>• Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories</li> <li>• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" <sup>cccxi</sup></li> <li>• SWHDSS <sup>cxlix</sup> Index #33 provides development effects and mitigation measures.</li> </ul>	<p>Suitable habitat not present within the study area.</p> <p><b>Not SWH</b></p>

Wildlife Species	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
<b>Wildlife Habitat: Terrestrial Crayfish</b>				
Chimney or Digger Crayfish; ( <i>Fallicambarus fodiens</i> )  Devil Crawfish or Meadow Crayfish; ( <i>Cambarus Diogenes</i> )	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3	Meadow and edges of shallow marshes (no minimum size) identified should be surveyed for terrestrial crayfish. <ul style="list-style-type: none"> <li>Constructs burrows in marshes, mudflats, meadows, the ground can't be too moist. Can often be found far from water.</li> <li>Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed.</li> </ul> <u>Information Sources</u> <ul style="list-style-type: none"> <li>Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998</li> </ul>	Studies Confirm: <ul style="list-style-type: none"> <li>Presence of 1 or more individuals of species listed or their chimneys (burrows) in suitable marsh meadow or terrestrial sites<sup>cci</sup></li> <li>Area of ELC Ecosite polygon is the SWH</li> <li>Surveys should be done during adult breeding season (April to late June) and in late summer-early August in nearby temporary or permanent water for juveniles. Note the presence of burrows or chimneys are often the only indicator of presence, observance or collection of individuals is very difficult<sup>cci</sup></li> </ul> SWHDSS cxlix Index #36 provides development effects and mitigation measures.	Suitable habitat not present within the study area.  <b>Not SWH</b>

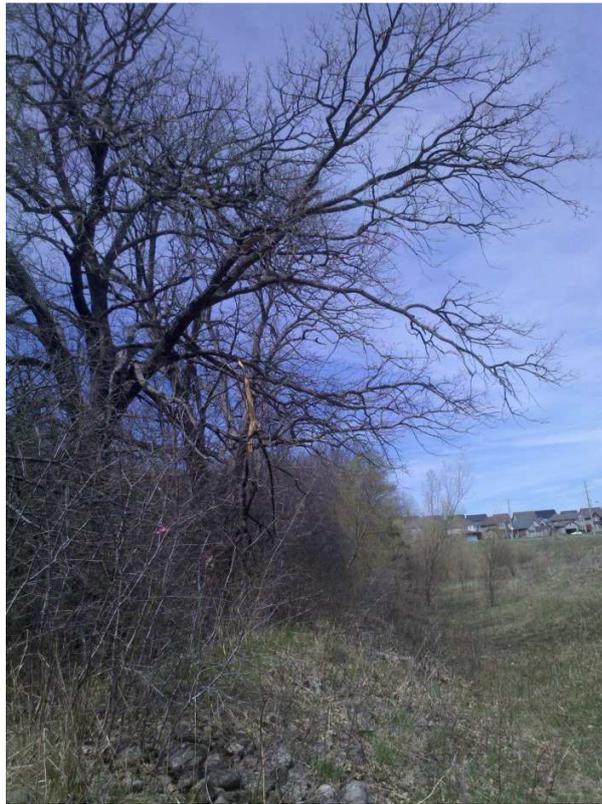
**Table 5. Characteristics of Animal Movement Corridors for Ecoregion 6E**

Wildlife Species	Candidate SWH		Confirmed SWH	Starwood
ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details	
<b>Wildlife Habitat: Amphibian Movement Corridors</b>				
Eastern Newt Blue-spotted Salamander Spotted Salamander Gray Treefrog Spring Peeper Western Chorus Frog Wood Frog	Corridors may be found in all ecosites associated with water. <ul style="list-style-type: none"> <li>Corridors will be determined based on identifying the significant breeding habitat for these species in Table 1.1</li> </ul>	Movement corridors between breeding habitat and summer habitat <sup>clxxiv, clxxv, clxxvi, clxxvii, clxxviii, clxxix, clxxx, clxxxi</sup> .  Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 ( <b>Amphibian Breeding Habitat –Wetland</b> ) of this Schedule 1.  <u>Information Sources</u> <ul style="list-style-type: none"> <li>MNR District Office.</li> <li>NHIC.</li> <li>Reports and other information available from CAs.</li> <li>Naturalist Clubs.</li> </ul>	<ul style="list-style-type: none"> <li>Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites.</li> <li>Corridors should consist of native vegetation, roadless area, no gaps such as fields, waterways or bodies, and undeveloped areas are most significant <sup>cxlix</sup></li> <li>Corridors should be at least 200m wide <sup>cxlix</sup> with gaps &lt;20m <sup>cxlix</sup> and if following riparian area with at least 15m of vegetation on both sides of waterway <sup>cxlix</sup>. Shorter corridors are more significant than longer corridors, however amphibians must be able to get to and from their summer and breeding habitat <sup>cxlix</sup>.</li> <li>SWHDSS <sup>cxlix</sup> Index #40 provides development effects and mitigation measures</li> </ul>	The study area does not provide significant amphibian breeding habitat.  <b>Not SWH</b>

Wildlife Species	Candidate SWH		Confirmed SWH	Starwood
	ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria	Assessment Details
<b>Wildlife Habitat: Deer Movement Corridors</b>				
White-tailed Deer	<p>Corridors may be found in all forested ecosites.</p> <p>A Project Proposal in Stratum II Deer Wintering Area has potential to contain corridors.</p>	<p>Movement corridor must be determined when <b>Deer Wintering Habitat</b> is confirmed as SWH from Table 1.1 from Table 1.2.2 of this schedule. <sup>1</sup></p> <ul style="list-style-type: none"> <li>A deer wintering habitat identified by the OMNR as SWH in Table 1.1 of this Schedule will have corridors that the deer use during fall migration and spring dispersion <sup>cxvii, cxviii, cxlix, cxci</sup>.</li> <li>Corridors typically follow riparian areas, woodlots, areas of physical geography (ravines, or ridges).</li> </ul> <p><u>Information Sources</u></p> <ul style="list-style-type: none"> <li>MNR District Office.</li> <li>NHIC.</li> <li>Reports and other information available from CAs.</li> <li>Naturalist Clubs.</li> </ul>	<ul style="list-style-type: none"> <li>Studies must be conducted at the time of year when deer are migrating or moving to and from winter concentration areas .</li> <li>Corridors that lead to a deer wintering yard should be unbroken by roads and residential areas.</li> <li>Corridors should be at least 200m wide <sup>cxlix</sup> with gaps &lt;20m <sup>cxlix</sup> and if following riparian area with at least 15m of vegetation on both sides of waterway <sup>cxlix</sup>.</li> <li>Shorter corridors are more significant than longer corridors, <sup>cxlix</sup>.</li> <li>SWHDSS <sup>cxlix</sup> Index #39 provides development effects and mitigation measures</li> </ul>	<p>The study area does not provide significant deer overwintering habitat.</p> <p><b>Not SWH</b></p>

**APPENDIX VI**  
Tree Protection Plan

# Watson - Starwood Drive, Guelph Ontario Tree Protection Plan



**Prepared for:**  
Coletara Development  
966 Pantera Drive, Suite 22  
Mississauga, Ontario  
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Project No. 1367

Date: November 06, 2013



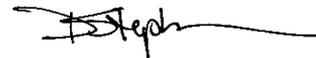
**NATURAL RESOURCE SOLUTIONS INC.**  
Aquatic, Terrestrial and Wetland Biologists

**Watson - Starwood Drive, Guelph Ontario  
Tree Protection Plan**

**Project Team:**

<b>Staff</b>	<b>Role</b>
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Kaitlin Boddaert	GIS Technician

Report submitted on November 6, 2013



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David Stephenson, Project Manager

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## 1.0 Introduction

Natural Resource Solutions Inc. (NRSI) was retained by Coletara Development to undertake a Tree Protection Plan (TPP) for a proposed residential development at Starwood Drive in the City of Guelph (herein, the City). The landowner is proposing to develop the Watson - Starwood Drive property with condominium buildings, a common amenity building, associated above- and below-ground parking, roadways, and landscaped areas. The landowner also proposes to construct four single-detached residential lots within a triangular parcel at the north end of the subject property.

The subject property contains few existing natural features, being dominated by disturbed, open lands that have historically experienced topsoil removal, and more recently fill deposits. The western property boundary borders cultural woodland that occurs off-site. A row of larger deciduous trees is found growing along the west boundary of the main (large) subject property parcel. A few trees are also found along the Watson Parkway South right-of-way, in the southern corner of the property, and in the triangular northwest parcel.

The reader is referred to the Environmental Impact Study (EIS) completed by Natural Resource Solutions Inc. (NRSI) in November 2013 (a).

The Tree Protection Plan was conducted in accordance with City of Guelph By-law (2010) -19058. This by-law states that if an owner wishes to destroy or injure a tree and if none of the exemptions set out in this by-law are applicable, then the owner shall submit the information required in Part 5 of the by-law. Within the By-law, a regulated tree is defined as

*“a specimen of any species of deciduous or coniferous growing woody perennial plant, supported by a single root system, which has reached, or could have reached a height at least 4.5m from the ground at physiological maturity, is located on a lot that is greater than 0.2 hectares (0.5 acres) in size and has a DBH of 10cm”.*

The City of Guelph's Official Plan Amendment Number 42: Natural Heritage System (July 2010b – currently under appeal) also requires that a Tree Inventory and Preservation Plan be required for the replacement of all healthy indigenous trees measuring over 10cm DBH. Although OPA 42 is currently under appeal, the tree inventory was conducted to satisfy relevant policies.

Section 6.2.5 Tree Inventory and Tree Preservation Plan within OPA 42 notes:

1. *“Tree Inventory and Tree Preservation Plans shall as a minimum include:*
  - i) *A Tree Inventory measuring all trees over 10cm diameter at breast height (dbh), including the size, species composition and health, and indigenous shrubs in accordance with the City's tree inventory guidelines,*
  - ii) *A Tree Preservation Plan identifying healthy indigenous and non-invasive trees to be protected, including those that may be transplanted (e.g. small specimens),*
  - iii) *The protective measures required for tree protection during construction, and*
  - iv) *Measures for avoiding disturbance to any breeding birds during construction”*

This report summarizes the following:

- findings of the tree inventory;
- assessment of existing health and/or structural integrity of inventoried trees;
- tree retention analysis based on details of the proposed development;
- protection measures for trees to be retained; and,
- recommended mitigation and compensation measures.

A TPP for the adjacent property to the west was prepared for 55 & 75 Cityview Drive property coincident with this work (NRSI 2013b), and as such shared trees and trees within 5 to 10m of the property boundary are considered in both studies.

## 2.0 Tree Inventory and Methodology

A comprehensive inventory of all trees  $\geq 10\text{cm}$  in Diameter at Breast Height (DBH) on the subject property, as well as trees growing off-site that have canopies overlapping with the property was completed by NRSI Certified Arborists on March 5 and 6, and May 3, 2013 (see Appendix I for inventory results). An inventory specific to the triangular northwest parcel was completed on October 31, 2013. A number of trees in the area had previously been tagged. Trees tagged as # 2, 3 and 1778 were used in those cases (see Figure 1 and Appendix I). Otherwise, each on-site tree was tagged with a pre-numbered aluminum forestry tag, and the following information was recorded for each:

- species;
- Diameter at Breast Height measurement (DBH);
- crown radius (metres);
- general health (excellent, good, fair, poor, very poor);
- potential for structural failure (low, medium, high);
- tree location (lot or block number); and,
- general comments (i.e. disease, aesthetic quality, development constraints, sensitivity to development).

The general health and potential for failure of each tree was assessed based on the criteria outlined in Table 1. Figure 1 shows the location of the inventoried trees in relation to the proposed grading plan, lot and road layout as prepared by Gamsby and Mannerow Engineers (July, 2013). The completed tree inventory mapping, with associated tree condition data, was compared to the layout of the proposed site development layout and grading plan to assess the best opportunities for tree retention. A digital drawing of the proposed residential lot layout was not available for mapping purposes at the time of report preparation and is therefore not shown on Figure 1.

As part of the tree health assessment, NRSI biologists who are trained and experienced in the OMNR bat habitat assessment protocol visually scanned all trees  $\geq 10\text{cm}$  dbh for the presence of cavities that may provide bat maternity colony habitat. Although the OMNR's guidance document; *Bats and Bat Habitats: Guidelines for Wind Power Projects, July 2011* (OMNR 2011) specifies trees  $\geq 25\text{cm}$  dbh, all trees  $\geq 10\text{cm}$  dbh were

*Projects, July 2011* (OMNR 2011) specifies trees  $\geq 25\text{cm}$  dbh, all trees  $\geq 10\text{cm}$  dbh were scanned for cavities as a means of thoroughly searching for any potential habitat for bats.

**Table 1. Tree Assessment Criteria**

<b>Assessment Criteria</b>	<b>Definition<sup>1</sup></b>
<b>Health Rating*</b>	
Excellent	Represents a tree in near perfect form, health, and vigor. This tree would exhibit no deadwood, no decline, and no visible defects.
Good	Represents a tree ranging from a generally healthy tree to a near perfect tree in terms of health, vigor and structure. This tree exhibits a complete, balanced crown structure with little to no deadwood and minimal defects as well as a properly formed root flare.
Fair	Represents a tree with minor health, balance or structural issues with minimal to moderate deadwood. Branching structure shows signs of included bark or minor rot within the branch connections or trunk wood. The root flare shows minimal signs of mechanical injury, decay, poor callusing, or girdling roots. Trees in the category require minor remedial actions to improve the vigor and structure of the tree.
Poor	Represents a tree that exhibits a poor vigor, reduced crown size (<30% of crown typical of species caused by overcrowding or decline), extreme crown unbalance, or extensive rot in the branching and trunk wood. Fungus could be seen from these rotting areas, suggesting further decay. These trees have extensive crown die back with a large amount of deadwood, and possibly dead sections. These weakened areas can lead to a potential failure of tree sections. Rooting zones show signs of extensive root decay or damage (fruiting bodies or mechanical damage) or girdling roots. Trees in this category require more extensive actions to prevent failure. A tree identified as poor would be a candidate for removal in the near future.
Very Poor	Represents a tree that exhibits major health and structural defects. Quite often the defects or diseases affecting this tree will be fatal. Large quantities of fungus, large dead sections with possible cavities and bark falling off all are signs that a tree is in a major state of decline and would be identified as very poor. These trees have a high potential for structural failure. These trees should be identified for removal.
<b>Potential for Structural Failure Rating*</b>	
Low	Trees that show good vigor and structure and show little to no signs of decline or structural issues.
Medium	Trees with some structural issues that are forming which could lead to failure if not addressed and properly treated (i.e. pruned). Symptoms of these structural issues include cavity openings/stem damage <30% of the circumference of the tree, poor branching union within the scaffold branches (signs of canker or decay within branch union), signs of historic branch failure throughout the crown, or advanced signs of included bark within the branch unions throughout the tree (water staining, tight angled branch unions, noticeable gap in branch union).
High	Trees with a large number of structural issues (i.e. poor branch union, decay) which could lead to the failure of large scaffold branches or major sections. Major defects include: large cavities within stem or branch wood, historic crown damage of the majority of the canopy, extensive lean due to recent or historic root damage/decay, or large dead crown limbs with fruiting bodies present. If trees identified as a High Risk for Structural Failure are located within striking distance of a target (high traffic place, person, or high value thing), the tree should be identified for removal as soon as possible.

\* Trees which are located within dense groupings are evaluated as individual specimens. Trees within these stands quite often have a reduced crown size (<30% of crown typical of species), off balanced crowns, and prioritized upward growth (i.e. low trunk taper and few lateral branches). As such, these trees would be considered to have poor vigour. As well, these trees pose a high risk for structural failure when newly exposed edges or individual trees are isolated through removal of surrounding trees. This is often the case with overstocked plantations. Individual trees which meet the above criteria will be identified as poor or high potential for structural failure.

<sup>1</sup>Dunster, J. 2009

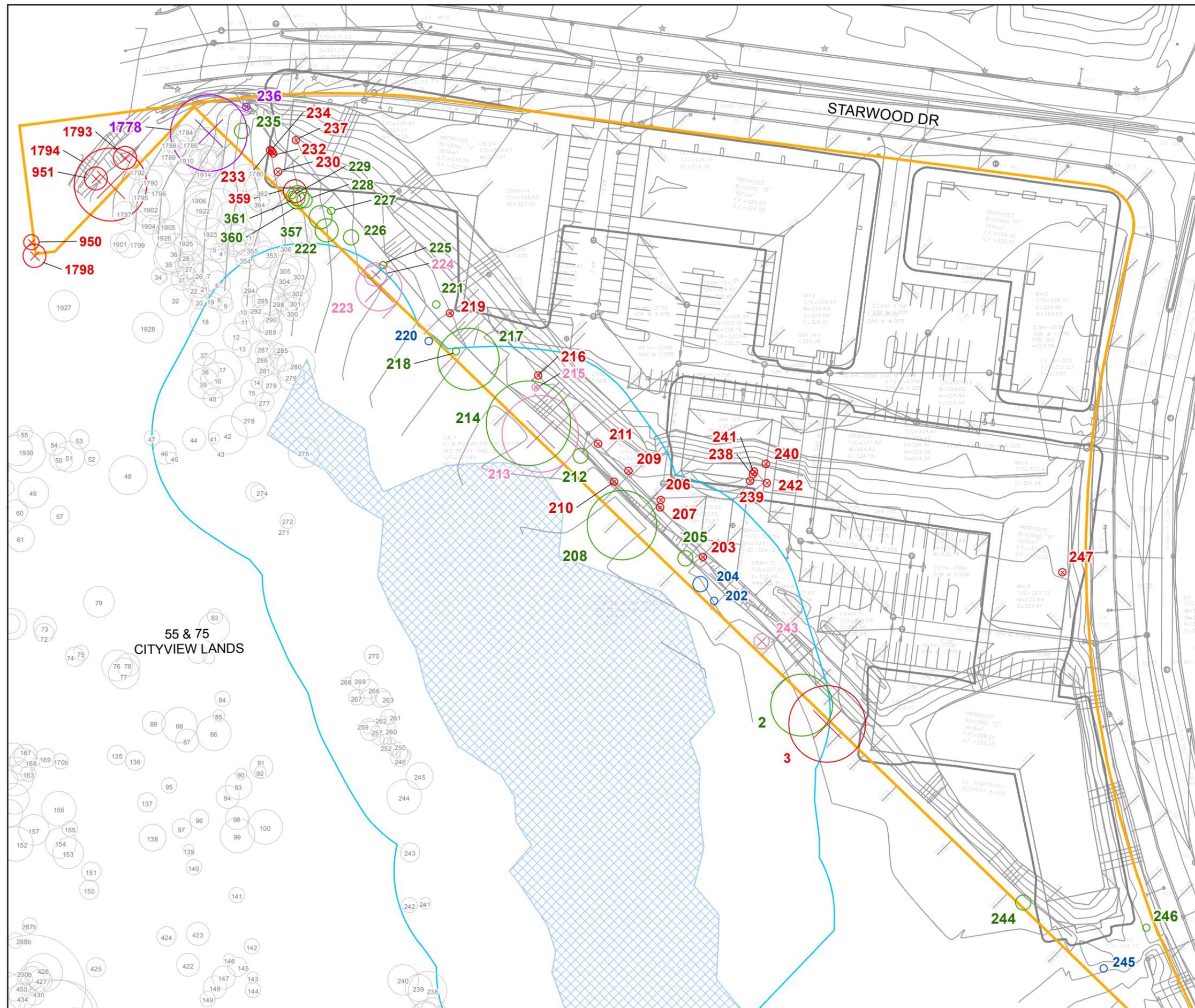


Figure 1

# Watson-Starwood

## Tree Inventory and Preservation Plan

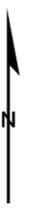
### Legend

- Subject Property
- ⊗ Tree to be removed due to layout & grading (scaled to crown)
- ⊗ Tree to be removed due to 55&75 Cityview Drive grading (scaled to crown)
- ⊗ Tree in poor/very poor condition to be removed due to hazard (scaled to crown)
- ⊗ Tree in poor condition to be retained and monitored (scaled to crown)
- ⊗ Tree to be retained (scaled to crown)
- 55 & 75 Cityview Tree Inventory
- Development Layout
- Excavation Limit
- Provincially Significant Wetland Buffer (30m)
- Provincially Significant Wetland (PSW) & OPA 42 - Significant Natural



Map Produced by Natural Resource Solutions Inc. This map is proprietary and confidential and must not be duplicated or distributed by any means without express written permission of NRSI. Data provided by MNR© Copyright: Queen's Printer Ontario.

Project: 1367 Date: November 7, 2013	NAD83 - UTM Zone 17 Size: 11x17" 1:1,000
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### 3.0 Summary of Tree Inventory

In total, 57 trees were inventoried, of which 46 (80.7%) are native species and 11 (19.3%) are non-native. Nine tree species were identified. A complete list of trees inventoried is provided in Appendix I and tree locations within the subject property are shown on Figure 1. The majority of the trees inventoried are located along the western boundary of the main subject property parcel, including many that are growing on the boundary (see Photo 1 in Appendix III). Figure 1 also identifies trees off-site, to the west that were inventoried as part of the 55 & 75 Cityview Drive project (NRSI 2013b). With the exception of Tree #1778, the characteristics of those trees are not included in this report. The reader is referred to the TPP associated with the 55 & 75 Cityview Drive (NRSI 2013b) for additional details.

Table 2 provides a list of trees inventoried, whether they are native or non-native and their overall condition.

**Table 2. Summary of Inventoried Trees**

Common Name	Scientific Name	Good	Fair	Poor	Very Poor	Total
<b>Native Species</b>						
American Basswood	<i>Tilia americana</i>		2	1		3
Balsam Poplar	<i>Populus balsamifera</i>	9	11			20
Bur Oak	<i>Quercus macrocarpa</i>	1	5	1	1	8
Trembling Aspen	<i>Populus tremuloides</i>	2				2
Peach-leaved Willow	<i>Salix amygdaloides</i>	1				1
Willows	<i>Salix</i> ssp.	7	3			10
Poplar	<i>Populus</i> sp.	1				1
<b>Total</b>		<b>21</b>	<b>21</b>	<b>2</b>	<b>1</b>	<b>45</b>
<b>Non-Native Species</b>						
Manitoba Maple	<i>Acer negundo</i>		6	4		10
Siberian Elm	<i>Ulmus pumila</i>		1			1
White Willow	<i>Salix alba</i>	1				1
<b>Total</b>		<b>1</b>	<b>7</b>	<b>4</b>		<b>12</b>
<b>Overall Total</b>		<b>22</b>	<b>28</b>	<b>6</b>	<b>1</b>	<b>57</b>

Table 3 provides a summary of the overall condition of trees inventoried within the subject property, along with their structural failure rating. A large proportion of trees were found to be in fair to good condition.

**Table 3. Overall Condition of Trees Inventoried**

<b>Structural Failure Rating</b>	<b>Overall Condition</b>				<b>Total</b>
	<b>Good</b>	<b>Fair</b>	<b>Poor</b>	<b>Very Poor</b>	
Low	20	14	1		35
Medium	1	13	3		17
High	1	1	2	1	5
<b>Total</b>	<b>22</b>	<b>28</b>	<b>6</b>	<b>1</b>	<b>57</b>

As discussed in the Watson – Starwood EIS (NRSI 2013a), the large trees (predominantly bur oaks) are growing on the west property boundary. There is an old rock fenceline in this location (see Photos 2 – 4 in Appendix III). Approximately 5m in from the property boundary is a berm approximately 1 to 1.5m in height bordered by an excavated ditch (see Photos 2 and 3 in Appendix III). All of the lands to the east of the berm have been historically stripped of topsoil and in many locations fill has been placed. Based on this history, the root zones of the larger trees along the western property boundary do not extend beyond the berm.

The berm does not extend the full length of the western property boundary. In the southern portion of the site, the subject lands are considerably lower than neighbouring lands to the west as a result of the historic topsoil removal.

#### 4.0 Tree Removal and Retention Analysis

Tree removal and retention was based on two considerations:

1. Trees identified as having a high potential for structural failure or poor condition. The removal of these trees would be recommended for safety etc., especially if they are located within striking distance of a component of the proposed development, or existing off-site sidewalks, roads or buildings. They would be given a rating of high potential for structural failure. For the purpose of this report, trees which fall into this category are identified for removal.
2. Trees that require removal based on the extent of proposed site grading. This was determined by comparing the location of the trees to the location of the components of the development proposal as shown on Figure 2. As described in Section 2.0, a digital copy of the proposed residential lot development could not be overlaid onto tree inventory mapping for the north property triangular parcel. However, it was assumed that the entirety of this land parcel would be graded for development.

Of the 57 trees inventoried, 9 were identified as being in poor or very poor condition, and/or high risk of structural failure. All of these trees are in locations where they could otherwise be retained. Of these 9 trees, 5 have a high risk of structural failure; 3 of which are small to medium in size (1 willow, 2 Manitoba maples), with 2 large bur oaks. Despite the fact that the locations of these 5 trees could allow their retention, since they are located close to the amenity areas in the plan, they are recommended for removal. Two large bur oaks (Tree #213 and #223), one poplar sp. (Tree #950) and one peach-leaved willow (*Salix amygdaloides*) (Tree #1798) are shared trees (i.e., straddle the boundary with the adjacent 55 & 75 Cityview Drive property); removal of these trees will therefore require the permission of the adjacent property landowner.

The remaining 4 trees that are in poor condition, but not high risk, are recommended for retention and monitoring.

Trees that would require removal due to grading were reviewed in terms of their health and feasibility of relocation. As part of the analysis, the approximate extent of the

excavation required for the underground parking was also considered (see Figure 1). Twenty-eight of the inventoried trees are anticipated to be removed based on the extent of the proposed site grading and/or excavation. Of these trees, all are in fair to good condition with medium to low risk of structural failure (see Appendix I). A majority of these trees are <15cm DBH, with only 3 willows (*Salix ssp.*), 1 balsam poplar (*Populus balsamifera*), 1 Manitoba maple (*Acer negundo*) and 1 bur oak (*Quercus macrocarpa* – discussed below) >15cm.

Five additional trees are proposed for removal due to safety; 2 large bur oaks (53 and 95cm DBH), 1 willow ssp. (16cm DBH) and 2 Manitoba maples (26 and 19cm DBH). Many of these trees are situated on fill that has been deposited on-site and consist of pioneer tree species. Refer to Appendix I.

One large bur oak (Tree #3; 60cm DBH) is located close to proposed building 'C' and the extent of excavation required for the underground parking, as well as the ramp that overlaps considerably with the dripline of the tree (see Figure 1). Little impact to the roots of this tree from excavation are anticipated as they do not currently extend beyond the berm. However, due to the proximity of this tree to the proposed excavation it is recommended that this tree be removed. This tree is a shared tree and removal of will require the permission of the adjacent property landowner.

No additional off-site trees will be affected by the Watson – Starwood Drive development.

Preliminary plans for neighbouring lands include development adjacent to the west property boundary in the northern as well as the southern corners of the subject property. Refer to the TPP prepared for the 55 & 75 Cityview Drive property (NRSI 2013b). Two trees (Tree #1778 and #236) will require removal as a result of development on the neighbouring 55 & 75 Cityview Drive property. The location of tree protection fencing on-site as shown on Figure 2 has taken into account proposed tree removal in the northern portion of the western boundary.

Figure 2

# Watson-Starwood Tree Protection Plan

## Legend

- Subject Property
- Tree in poor condition to be retained and monitored (scaled to crown)
- Tree to be retained (scaled to crown)
- Development Layout
- Development Limit (10m)
- Development Setback (5m)
- Excavation Limit
- Provincially Significant Wetland Buffer (30m)
- Provincially Significant Wetland (PSW) & OPA 42 - Significant Natural



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Project: 1367 Date: November 7, 2013	NAD83 - UTM Zone 17 Size: 11x17" 1:1,000
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## 5.0 Tree Compensation Plan

Section 5 (h) in the City's tree by-law (2010)-19058 states that *"where three or more trees are proposed for Destruction or Injuring, and where the Inspector so requires, a Landscaping, Replanting and Replacement Plan"* is required. Overall compensation for tree loss is a requirement of the City's by-law which notes that *"each tree Destroyed or Injured be replaced with one or more replacements trees to be planted and maintained to the satisfaction of the Inspector in accordance with the Landscaping, Replanting and Replacement Plans approved by the Inspector"* [Section 7 (b)].

A 1:1 or greater replacement plan is required for trees removed or injured in the City's by-law; however, from discussions with the City's Environmental Planner (Adèle Labbé) and from experience on other projects throughout the City, a compensation ratio of 3:1 is preferred by the City to be applied to all trees removed that are native or non-native and in excellent to fair condition.

According to City of Guelph Tree By-law Number (2010)-19058, trees exempt from compensation must have the following site specific criteria:

- *"A tree having no living tissue, having 70% or more of its crown dead, or being infected by a lethal pathogen, fungus or insect (including the Emerald Ash Borer or the Asian Longhorned Beetle), and where required, a certificate issued by an Arborist, confirming this justification for Destruction or Injuring, has been submitted to an Inspector" [Part 4, section (a)],*
- *"A tree which is Hazardous, and where required, a certificate issued by an Arborist, confirming this justification for Destruction or Injuring, has been submitted to an Inspector" [Part 4, section (b)]*
- *"A specimen of Rhamnus cathartica (common buckthorn), Rhamnus frangula (European or glossy buckthorn), Alnus glutinosa (black alder), Elaeagnus umbellata (autumn olive), or Morus alba (white mulberry)" [Part 4, section (g)],*
- *"A fruit tree that is capable of producing fruit for human consumption" [Part 4, section (h)].*

Thirty-one trees will require removal due to the proposed Watson – Starwood Drive development. This includes trees requiring removal due to safety concerns (poor condition and/or high potential for structural failure) and the proposed grading and/or excavation for the underground parking. However, this total does not include the 2 trees that are proposed to be removed as a result of the neighbouring 55 & 75 Cityview Drive development (Tree #1778 and #236). Trees proposed for removal that have a high risk of structural failure and/or are in poor to very poor condition are exempt pursuant to Section 4 of the City’s tree by-law and do not require compensation.

There are 28 native and non-native trees in good to fair condition proposed for removal. With application of a 3:1 ratio that is recommended by the City for native and non-native trees in good to fair condition, there will be 84 compensation plantings required. Table 4 provides a summary of the trees inventoried, total number proposed for removal and the proposed compensation plan.

**Table 4. Summary of Trees to be Removed and Recommended Compensation Plan**

<b>Tree Inventory</b>	<b>Total</b>
Total number of trees inventoried	57
→ Non-native trees to be removed	3
→ Native trees to be removed	28
Total number of trees proposed to be removed	31
<b>Tree Compensation</b>	
Native/Non-native trees in poor to very poor condition and/or high structural failure (exempt from compensation)	3
Native/Non-native trees in good to fair condition to be removed	28
<b>3:1 Compensation for native/non-native trees in good to fair condition</b>	<b>84</b>

Detailed landscaping plans will be required for the property at the Environmental Implementation Report (EIR) stage or Site Plan Stage; however, it is anticipated that compensation plantings can be provided within the 10m distance from the western property boundary as identified in the EIS (NRSI 2013a), as well as any street tree plantings required by the City of Guelph through the Site Plan Approval Stage. The EIS (NRSI 2013a) recommends naturalization of the lands within the 10m distance from the western property boundary which will not only provide space for compensation plantings but provide opportunities for naturalization and active restoration. A majority of the trees proposed for removal are very small (most <15cm DBH) and are comprised of pioneer species that would provide poor long-term tree canopy. To achieve restoration goals set out in the EIS (NRSI 2013a) it is recommended that the final compensation strategy,

including appropriate species and potential use of trees and shrubs, be negotiated with the City of Guelph prior to the development of landscaping plans.

## **6.0 Tree Protection Measures and Recommended Mitigation**

### **6.1 Trees to be Retained**

The Watson – Starwood EIS (NRSI 2013a) discusses in detail a recommendation to use the existing berm and grades along the 5m zone between the property boundary and berm as a ‘no touch’ area. No grading will occur in this zone, and as such no disruption of the root zones currently found in this zone will be impacted. As shown on Figure 2, between 5m and 10m some grading is proposed, but no structures, pavement, etc. will occur. The resulting grades are anticipated to more closely resemble the grades on-site prior to the topsoil stripping and filling.

The proposed development limit allows for the retention of many of the trees along the western property boundary.

### **6.2 Prior to Construction**

A combined sediment and erosion control fencing (i.e. silt fence) and temporary tree protection fence is recommended where trees are situated adjacent to the limit of disturbance. This tree protection fencing is to take the form of 1200mm high heavy-duty paige-wire fencing. The temporary tree protection fencing is to be installed and maintained by the Developer. Prior to works commencing on-site, fence installation and location is to be inspected by a Certified Arborist and/or the on-site Environmental Inspector. It is recommended that signage indicating the purpose of the protection fencing be attached to the fencing every 100-150m. Recommended fencing locations are shown on Figure 2.

A number of trees that are located in areas that also contain trees to be retained are recommended for removal due to their high risk of structural failure. As such, prior to installation of the tree protection fence, these safety hazard trees will need to be removed. The trees should be clearly marked for removal by a Certified Arborist. The trees should then be felled and removed with minimal disturbance to neighbouring trees, with a follow-up inspection conducted by a Certified Arborist to ensure no damage was incurred to adjacent trees.

In order to achieve grading within the 5 to 10m zone, the tree protection fencing (and associated silt fencing) is recommended to be installed at the 5m line. Although this is within the dripline, there will be no disruption of root zones or overhead branches. Once this grading is completed, the area should be reviewed by a Certified Arborist and the feasibility and effectiveness of moving the fence out to the 10m line should be determined (construction sequencing has not been detailed at the time of preparing this report, as such final grading may occur later in the construction sequence making the fence relocation less effective).

The Tree Protection Plan is to be reviewed and approved by the City of Guelph. Upon approval of the Tree Protection Plan, and prior to any on-site works (i.e. rough grading, tree removal), a qualified environmental consultant is to submit written verification to the City that all of the recommended tree protection measures have been installed in accordance with the Tree Protection Plan.

### 6.3 During Construction

Temporary tree protection fencing is to be maintained by the Developer during the entire construction period to ensure that trees being retained and their root systems are protected. Any minimal damage (i.e. damage to limbs or roots) to trees to be retained during construction must be pruned using proper arboricultural techniques. Should any of the trees intended to be retained be seriously damaged or die as a result of construction activities, the owner will remove and replace the tree at their own expense at a ratio agreed upon with the City of Guelph. Replacement species are to be reviewed by a Certified Ontario Landscape Architect (OLA) or Certified Arborist. Watering and pruning of newly planted trees will be carried out by the owner/contractor as required during the warranty period (approximately 2 years).

### 6.4 Post-Construction

As trees being retained are generally situated along the edge of the property, it is recommended that the temporary tree protection fencing be removed once construction activities are complete and associated grounds are stabilized with a vegetative cover (i.e. sod, landscaping) to the satisfaction of the Environmental Inspector or qualified other.

## 6.5 Mitigation

The recommendations provided below are aimed at protecting retained trees. Species used for replacement/enhancement plantings, with the potential exception of street trees, should be native to Wellington County and not include any species that are listed as introduced, or locally, provincially or federally significant. The use of hardy species will ensure successful early establishment and minimize the potential for invasive species proliferation. For street tree plantings, the use of non-native species that are sometimes more tolerant of urban conditions (i.e. salt and drought tolerant) may be suitable as long as they do not include invasive species such as Norway maple (*Acer platanoides*).

At the detailed design stage, it is recommended that the following criteria be followed during the development of proposed planting plans:

- plantings along the western edge of the property are to be limited to native, non-invasive tree and shrub species indigenous to Wellington County that complement the surrounding natural features;
- tree species to be situated in close proximity to roads should be salt tolerant;
- avoid ash species due to the risk of the emerald ash borer (*Agilus planipennis*);
- avoid 'messy trees', such as fruiting trees or poplars (*Populus* spp.) where plantings occur in close proximity to driveways and roadways;
- all plant material is to conform to the latest edition of the *Canadian Nursery Trades Association Specifications and Standards*;
- plantings installed as per specifications outlined in planting plans prepared by an OLA or Certified Arborist (e.g. place a minimum of 10cm of shredded pine-bark mulch or equivalent around all planted material);
- spacing of plant material should account for the ultimate size and form of the selected species and also the purpose of the planting, whether it be for screening, shade, naturalizing, rehabilitation, etc.;
- special attention to location and height of trees in proximity to utilities; and,
- ensure that there is sufficient soil volume for all plantings.

## 7.0 References

- City of Guelph. 2010a. The Official Plan of The City of Guelph By-law Number (2010)-19058.
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- Ontario Ministry of Natural Resources (OMNR). 2011. Bats and Bat Habitats: Guidelines for Wind Power Projects. First edition. July, 2011.

**APPENDIX I**  
**Watson - Starwood Drive - Tree Inventory Data**

**Appendix I. Watson - Starwood Drive Tree Inventory**

Tag #	Common Name	Scientific Name	Native/Non-native	DBH (cm)	Stem Count	Crown Radius (m)	Potential for Structural Failure	Overall Condition	Proposed Action	Rationale for Removal
2	Bur Oak	<i>Quercus macrocarpa</i>	Native	56.00	2	10.00	Medium	Fair	Retain	
3	Bur Oak	<i>Quercus macrocarpa</i>	Native	60.00	1	10.00	Low	Fair	Remove	Parking Garage Grading
202	Manitoba Maple	<i>Acer negundo</i>	Non-native	11.00	1	1.00	Medium	Poor	Retain & Monitor	
203	Willow spp.	<i>Salix spp.</i>	Native	12.00	2	1.00	Low	Good	Remove	Grading
204	Manitoba Maple	<i>Acer negundo</i>	Non-native	24.00	1	2.00	Medium	Poor	Retain & Monitor	
205	Manitoba Maple	<i>Acer negundo</i>	Non-native	20.00	1	2.00	Medium	Fair	Retain	
206	Willow spp.	<i>Salix spp.</i>	Native	10.00	1	1.00	Low	Good	Remove	Grading
207	Balsam Poplar	<i>Populus balsamifera</i>	Native	13.00	1	1.00	Low	Good	Remove	Grading
208	Siberian Elm	<i>Ulmus pumila</i>	Non-native	60.00	1	9.00	Low	Fair	Retain	
209	Willow spp.	<i>Salix spp.</i>	Native	12.00	1	1.00	Low	Good	Remove	Grading
210	Willow spp.	<i>Salix spp.</i>	Native	18.00	1	1.00	Low	Fair	Remove	Grading
211	Balsam Poplar	<i>Populus balsamifera</i>	Native	14.00	1	1.00	Low	Good	Remove	Grading
212	Manitoba Maple	<i>Acer negundo</i>	Non-native	15.00	1	2.00	Medium	Fair	Retain	
213	Bur Oak	<i>Quercus macrocarpa</i>	Native	53.00	2	10.00	High	Poor	Remove	Safety
214	Bur Oak	<i>Quercus macrocarpa</i>	Native	114.00	1	11.00	Medium	Fair	Retain	
215	Willow spp.	<i>Salix spp.</i>	Native	16.00	1	1.00	High	Good	Remove	Safety
216	Balsam Poplar	<i>Populus balsamifera</i>	Native	15.00	1	1.00	Low	Good	Remove	Grading
217	Bur Oak	<i>Quercus macrocarpa</i>	Native	75.00	1	8.00	Medium	Fair	Retain	
218	American Basswood	<i>Tilia Americana</i>	Native	16.00	1	1.00	Low	Fair	Retain	
219	Willow spp.	<i>Salix spp.</i>	Native	11.00	2	1.00	Low	Good	Remove	Grading
220	American Basswood	<i>Tilia Americana</i>	Native	21.00	1	1.00	Medium	Poor	Retain & Monitor	
221	Balsam Poplar	<i>Populus balsamifera</i>	Native	11.00	1	1.00	Low	Good	Retain	
222	Balsam Poplar	<i>Populus balsamifera</i>	Native	32.00	1	3.00	Low	Fair	Retain	
223	Bur Oak	<i>Quercus macrocarpa</i>	Native	95.00	1	6.00	High	Very Poor	Remove	Safety
224	Manitoba Maple	<i>Acer negundo</i>	Non-native	26.00	1	3.00	High	Poor	Remove	Safety
225	Balsam Poplar	<i>Populus balsamifera</i>	Native	12.00	1	1.00	Low	Fair	Retain	
226	Balsam Poplar	<i>Populus balsamifera</i>	Native	15.00	3	2.00	Low	Fair	Retain	
227	Balsam Poplar	<i>Populus balsamifera</i>	Native	15.00	1	1.00	Low	Good	Retain	
228	Balsam Poplar	<i>Populus balsamifera</i>	Native	16.00	1	2.00	Medium	Fair	Retain	
229	Manitoba Maple	<i>Acer negundo</i>	Non-native	15.00	1	1.00	Low	Fair	Retain	

**Appendix I. Watson - Starwood Drive Tree Inventory**

Tag #	Common Name	Scientific Name	Native/Non-native	DBH (cm)	Stem Count	Crown Radius (m)	Potential for Structural Failure	Overall Condition	Proposed Action	Rationale for Removal
230	Balsam Poplar	<i>Populus balsamifera</i>	Native	11.00	1	1.00	Low	Good	Remove	Grading
232	Balsam Poplar	<i>Populus balsamifera</i>	Native	12.00	2	1.00	Low	Fair	Remove	Grading
233	Balsam Poplar	<i>Populus balsamifera</i>	Native	10.00	1	1.00	Low	Good	Remove	Grading
234	Balsam Poplar	<i>Populus balsamifera</i>	Native	10.00	1	1.00	Low	Good	Remove	Grading
235	Manitoba Maple	<i>Acer negundo</i>	Non-native	12.00	3	2.00	Medium	Fair	Retain	
236	Trembling Aspen	<i>Populus tremuloides</i>	Native	11.00	1	1.00	Low	Good	Remove	Cityview Drive Grading
237	Balsam Poplar	<i>Populus balsamifera</i>	Native	11.00	1	0.00	Low	Fair	Remove	Grading
238	Willow spp.	<i>Salix spp.</i>	Native	19.00	1	1.00	Low	Good	Remove	Grading
239	Willow spp.	<i>Salix spp.</i>	Native	12.00	2	1.00	Low	Fair	Remove	Grading
240	Balsam Poplar	<i>Populus balsamifera</i>	Native	14.00	1	1.00	Low	Good	Remove	Grading
241	Willow spp.	<i>Salix spp.</i>	Native	11.00	2	1.00	Low	Good	Remove	Grading
242	Willow spp.	<i>Salix spp.</i>	Native	10.00	3	1.00	Low	Fair	Remove	Grading
243	Manitoba Maple	<i>Acer negundo</i>	Non-native	19.00	1	2.00	High	Fair	Remove	Safety/Grading
244	Bur Oak	<i>Quercus macrocarpa</i>	Native	22.00	1	2.00	Low	Good	Retain	
245	Manitoba Maple	<i>Acer negundo</i>	Non-native	11.00	1	1.00	Low	Poor	Retain & Monitor	
246	Balsam Poplar	<i>Populus balsamifera</i>	Native	13.00	2	1.00	Low	Fair	Retain	
247	Balsam Poplar	<i>Populus balsamifera</i>	Native	13.00	1	1.00	Medium	Fair	Remove	Grading
357	Balsam Poplar	<i>Populus balsamifera</i>	Native	35.00	1	3.00	Medium	Fair	Retain	
359	American Basswood	<i>Tilia Americana</i>	Native	20.00	1	3.00	Low	Fair	Remove	Grading
360	Balsam Poplar	<i>Populus balsamifera</i>	Native	30.00	1	3.00	Medium	Fair	Retain	
361	Balsam Poplar	<i>Populus balsamifera</i>	Native	25.00	1	2.00	Medium	Fair	Retain	
950	Poplar sp.	<i>Populus sp.</i>	Native	12.80	1	2.00	Low	Good	Remove	Grading
951	Manitoba Maple	<i>Acer negundo</i>	Native	19.60	1	3.00	Medium	Fair	Remove	Grading
1778	Bur Oak	<i>Quercus macrocarpa</i>	Native	71.00	1	8.00	Medium	Fair	Remove	Cityview Drive Grading
1793	Trembling Aspen	<i>Populus tremuloides</i>	Native	12.60	1	3.00	Low	Good	Remove	Grading
1794	White Willow	<i>Salix alba</i>	Non-native	89.40	2	9.50	Medium	Good	Remove	Grading
1798	Peach-leaved Willow	<i>Salix amygdaloides</i>	Native	13.30	1	3.00	Low	Good	Remove	Grading

 Trees Located Within 55 & 75 Cityview Drive Property

**APPENDIX II**  
**Site Photos**

### Appendix III. Watson – Starwood Drive Site Photos



**Photo 1.** Western portion of subject property showing fill on right, treeline on left with portion of intervening ditch visible near left side of photograph (looking north, March 2013).



**Photo 2.** Berm and ditch along the west property boundary, showing base of large bur oak on property boundary (looking south, March 2013)



**Photo 3.** Berm and ditch along the west property boundary, showing large bur oak on property boundary and growth of shrubs (looking north, May 2013)



**Photo 4.** Western property boundary showing western side of berm as well as trees growing along property boundary (looking southwest, May 2013).

**APPENDIX VII**  
Watercourse Investigation Documentation

# Watson-Starwood EIS

## Video & Photo Locations

### Legend

- Subject Property
- 55 & 75 Cityview Lands
- Provincially Significant Wetland (PSW) & OPA 42 - Significant Natural Area
- Provincially Significant Wetland Buffer (30m)
- Watercourse (GRCA)
- 360° Video Location
- # 1** Picture Number
- Picture Location (with direction picture was taken)



55 & 75  
CITYVIEWLANDS

STARWOOD DR

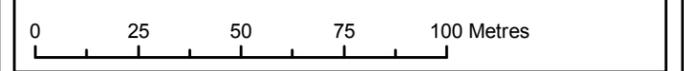
WATSON PKY/W



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 Aquatic, Terrestrial and Wetland Biologists

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Project: 1367 Date: April 3, 2013	NAD83 - UTM Zone 17 Size: 11x17" 1:1,750
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**Pic 1: November 9, 2012**



**PIC 2: November 9, 2012**



PIC 3: November 9, 2012



PIC 4: November 9, 2012

**APPENDIX VIII**  
Photographs of Berm

**Appendix VIII: Photographs of the Subject Property Berm**



**Photo 1.**



**Photo 2.**



**Photo 3.**



**Photo 4.**

**APPENDIX IX**  
Vascular Flora Species List



**APPENDIX X**  
Bird Species List

Appendix VII. Bird Species Recorded From the Study Area

Scientific Name	Common Name	SRANK	COSSARO	COSEWIC	SARA Schedule	Grand River Watershed Conservation Priority	Wellington County Significant Breeding Bird	OBBA 17NJ62	NRSI Observed
<b>DUCKS, GEESE &amp; SWANS</b>									
<i>Branta canadensis</i>	Canada Goose	S5						AE	
<i>Aix sponsa</i>	Wood Duck	S5						FY	
<i>Anas platyrhynchos</i>	Mallard	S5						FY	
<i>Mergus merganser</i>	Common Merganser	S5B, S5N					√	FY	
<b>PARTRIDGES, GROUSE &amp; TURKEYS</b>									
<i>Bonasa umbellus</i>	Ruffed Grouse	S4				√		T	
<i>Meleagris gallopavo</i>	Wild Turkey	S5						H	
<b>LOONS</b>									
<i>Gavia immer</i>	Common Loon	S5B, S5N	NAR	NAR		√	√	H	
<b>GREBES</b>									
<i>Podilymbus podiceps</i>	Pied-billed Grebe	S4B, S4N				√	√	CF	
<b>HERONS &amp; BITTERNS</b>									
<i>Ixobrychus exilis</i>	Least Bittern	S4B	THR	T	Schedule 1	√	√	S	
<i>Ardea herodias</i>	Great Blue Heron	S4B					**	V	
<i>Butorides virescens</i>	Green Heron	S4B				√	**	FY	
<b>VULTURES</b>									
<i>Cathartes aura</i>	Turkey Vulture	S5B				√	√	H	
<b>HAWKS, KITES &amp; EAGLES</b>									
<i>Pandion haliaetus</i>	Osprey	S5B				√	√	NY	
<i>Circus cyaneus</i>	Northern Harrier	S4B	NAR	NAR		√	√*	H	
<i>Accipiter striatus</i>	Sharp-shinned Hawk	S5	NAR			√	√*	A	
<i>Accipiter cooperii</i>	Cooper's Hawk	S4	NAR	NAR		√	√*	CF	
<i>Buteo platypterus</i>	Broad-winged Hawk	S5B				√	√	H	
<i>Buteo jamaicensis</i>	Red-tailed Hawk	S5	NAR	NAR				AE	
<b>CARACARAS &amp; FALCONS</b>									
<i>Falco sparverius</i>	American Kestrel	S4				√	√*	H	
<b>RAILS, GALLINULES &amp; COOTS</b>									
<i>Rallus limicola</i>	Virginia Rail	S5B				√		A	
<i>Porzana carolina</i>	Sora	S4B				√	√	T	
<b>PLOVERS</b>									
<i>Charadrius vociferus</i>	Killdeer	S5B, S5N						FY	
<b>SANDPIPERS &amp; PHALAROPES</b>									
<i>Actitis macularia</i>	Spotted Sandpiper	S5				√		FY	
<i>Scolopax minor</i>	American Woodcock	S4B				√		D	
<b>PIGEONS &amp; DOVES</b>									
<i>Columba livia</i>	Rock Pigeon	SNA						NY	
<i>Zenaida macroura</i>	Mourning Dove	S5						FY	
<b>CUCKOOS &amp; ANIS</b>									
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	S5B				√	√*	H	
<b>TYPICAL OWLS</b>									
<i>Megascops asio</i>	Eastern Screech-Owl	S4	NAR	NAR				FY	
<i>Bubo virginianus</i>	Great Horned Owl	S4						NY	
<i>Asio otus</i>	Long-eared Owl	S4				√	√	FY	
<b>SWIFTS</b>									
<i>Chaetura pelagica</i>	Chimney Swift	S4B, S4N	THR	T	Schedule 1		√	T	
<b>HUMMINGBIRDS</b>									
<i>Archilochus colubris</i>	Ruby-throated Hummingbird	S5B				√		D	
<b>KINGFISHERS</b>									
<i>Megaceryle alcyon</i>	Belted Kingfisher	S4B					√	CF	
<b>WOODPECKERS</b>									
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	S4B	SC	T	Schedule 1	√	√	H	
<i>Picoides pubescens</i>	Downy Woodpecker	S5						FY	
<i>Picoides villosus</i>	Hairy Woodpecker	S5					√*	FY	
<i>Colaptes auratus</i>	Northern Flicker	S4B					√*	NY	
<i>Dryocopus pileatus</i>	Pileated Woodpecker	S5				√	√*	N	

Scientific Name	Common Name	SRANK	COSSARO	COSEWIC	SARA Schedule	Grand River Watershed Conservation Priority	Wellington County Significant Breeding Bird	OBBA 17NJ62	NRSI Observed
	<b>TYRANT FLYCATCHERS</b>								
<i>Contopus virens</i>	Eastern Wood-Pewee	S4B					√	T	
<i>Empidonax alnorum</i>	Alder Flycatcher	S5B				√		T	
<i>Empidonax traillii</i>	Willow Flycatcher	S5B					√	S	
<i>Empidonax minimus</i>	Least Flycatcher	S4B				√	√	T	
<i>Sayornis phoebe</i>	Eastern Phoebe	S5B				√		NE	
<i>Myiarchus crinitus</i>	Great Crested Flycatcher	S4B						CF	
<i>Tyrannus tyrannus</i>	Eastern Kingbird	S4B				√	√*	FY	
	<b>VIREOS</b>								
<i>Vireo gilvus</i>	Warbling Vireo	S5B						FY	
<i>Vireo olivaceus</i>	Red-eyed Vireo	S5B						CF	
	<b>CROWS &amp; JAYS</b>								
<i>Cyanocitta cristata</i>	Blue Jay	S5						FY	
<i>Corvus brachyrhynchos</i>	American Crow	S5B						CF	X
<i>Corvus corax</i>	Common Raven	S5					√	H	
	<b>LARKS</b>								
<i>Eremophila alpestris</i>	Horned Lark	S5B				√		T	X
	<b>SWALLOWS</b>								
<i>Tachycineta bicolor</i>	Tree Swallow	S4B						NY	
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow	S4B				√		NY	
<i>Riparia riparia</i>	Bank Swallow	S4B				√	ificant in nesting c	NY	
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow	S4B				√	ificant in nesting	NE	
<i>Hirundo rustica</i>	Barn Swallow	S4B	THR	T		√		FY	
	<b>CHICKADEES &amp; TITMICE</b>								
<i>Poecile atricapillus</i>	Black-capped Chickadee	S5				√		NE	X
	<b>NUTHATCHES</b>								
<i>Sitta canadensis</i>	Red-breasted Nuthatch	S5				√	√*	FY	
<i>Sitta carolinensis</i>	White-breasted Nuthatch	S5						AE	
	<b>CREEPERS</b>								
<i>Certhia americana</i>	Brown Creeper	S5B				√	√*	CF	
	<b>WRENS</b>								
<i>Thryothorus ludovicianus</i>	Carolina Wren	S4				√	√	NY	
<i>Troglodytes aedon</i>	House Wren	S5B						AE	
<i>Troglodytes hiemalis</i>	Winter Wren	S5B					√*	T	
<i>Cistothorus palustris</i>	Marsh Wren	S4B				√	√	S	
	<b>THRUSHES</b>								
<i>Sialia sialis</i>	Eastern Bluebird	S5B	NAR	NAR		√		NY	
<i>Catharus fuscescens</i>	Veery	S4B				√	√*	T	
<i>Hylocichla mustelina</i>	Wood Thrush	S4B					√*	T	
<i>Turdus migratorius</i>	American Robin	S5B						NY	
	<b>MOCKINGBIRDS &amp; THRASHERS</b>								
<i>Dumetella carolinensis</i>	Gray Catbird	S4B				√		A	
<i>Toxostoma rufum</i>	Brown Thrasher	S4B				√	√	CF	
<i>Sturnus vulgaris</i>	European Starling	SNA						NY	
	<b>WAXWINGS</b>								
<i>Bombycilla cedrorum</i>	Cedar Waxwing	S5B						NB	

Scientific Name	Common Name	SRANK	COSSARO	COSEWIC	SARA Schedule	Grand River Watershed Conservation Priority	Wellington County Significant Breeding Bird	OBBA 17NJ62	NRSI Observed
<b>WOOD-WARBLERS</b>									
<i>Seiurus aurocapillus</i>	Ovenbird	S4B				√	√*	CF	
<i>Parkesia noveboracensis</i>	Northern Waterthrush	S5B				√		CF	
<i>Vermivora cyanoptera</i>	Blue-winged Warbler	S4B				√	√	S	
<i>Mniotilta varia</i>	Black-and-white Warbler	S5B				√	√*	NY	
<i>Oreothlypis ruficapilla</i>	Nashville Warbler	S5B				√		T	
<i>Geothlypis philadelphia</i>	Mourning Warbler	S4B				√		T	
<i>Geothlypis trichas</i>	Common Yellowthroat	S5B						AE	
<i>Setophaga ruticilla</i>	American Redstart	S5B				√	√*	T	
<i>Setophaga magnolia</i>	Magnolia Warbler	S5B				√	√	S	
<i>Setophaga fusca</i>	Blackburnian Warbler	S5B				√	√	S	
<i>Setophaga petechia</i>	Yellow Warbler	S5B						CF	
<i>Setophaga pensylvanica</i>	Chestnut-sided Warbler	S5B				√		S	
<i>Setophaga pinus</i>	Pine Warbler	S5B				√	√*	T	
<i>Setophaga coronata</i>	Yellow-rumped Warbler	S5B				√		T	
<i>Setophaga virens</i>	Black-throated Green Warbler	S5B				√	√	T	
<b>SPARROWS</b>									
<i>Pipilo erythrophthalmus</i>	Eastern Towhee	S4B				√	√*	NB	
<i>Spizella passerina</i>	Chipping Sparrow	S5B						FY	
<i>Spizella pallida</i>	Clay-colored Sparrow	S4B				√	√	CF	
<i>Spizella pusilla</i>	Field Sparrow	S4B				√	√*	FY	
<i>Passerculus sandwichensis</i>	Savannah Sparrow	S4B				√	√*	NE	
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	S4B				√	√	P	
<i>Melospiza melodia</i>	Song Sparrow	S5B						NY	
<i>Melospiza georgiana</i>	Swamp Sparrow	S5B				√		CF	
<i>Zonotrichia albicollis</i>	White-throated Sparrow	S5B				√		T	
<b>CARDINALS &amp; ALLIES</b>									
<i>Piranga olivacea</i>	Scarlet Tanager	S4B				√	√	S	
<i>Cardinalis cardinalis</i>	Northern Cardinal	S5						FY	X
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	S4B					√*	T	
<i>Passerina cyanea</i>	Indigo Bunting	S4B						T	
<b>BLACKBIRDS</b>									
<i>Dolichonyx oryzivorus</i>	Bobolink	S4B	THR	T	No Schedule	√	√*	T	
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	S4						NY	
<i>Sturnella magna</i>	Eastern Meadowlark	S4B	THR	T		√	√*	T	
<i>Quiscalus quiscula</i>	Common Grackle	S5B						CF	
<i>Molothrus ater</i>	Brown-headed Cowbird	S4B						NY	
<i>Icterus galbula</i>	Baltimore Oriole	S4B					√*	FY	
<b>FINCHES</b>									
<i>Haemorhous purpureus</i>	Purple Finch	S4B				√		FY	
<i>Haemorhous mexicanus</i>	House Finch	SNA						FY	
<i>Spinus pinus</i>	Pine Siskin	S4B						T	
<i>Spinus tristis</i>	American Goldfinch	S5B				√		FY	X
<b>OLD WORLD SPARROWS</b>									
<i>Passer domesticus</i>	House Sparrow	SNA						T	

**Legend****SRANK**

S4 Apparently Secure  
S5 Secure  
SNA Rank not Applicable  
B Breeding Population  
N Non-breeding Population

**COSEWIC, COSSARO Codes**

E, END Endangered  
T, THR Threatened  
SC Special Concern  
NAR Not at Risk

**Breeding Evidence Codes**Observed

X Species observed in its breeding season with no evidence of breeding

Possible

H Species observed in its breeding season in suitable nesting habitat  
S Singing male present or breeding calls heard in breeding season in suitable nesting habitat

Probable

P Pair observed in their breeding season in suitable nesting habitat  
T Permanent territory presumed through registration of territorial song on at least 2 days, one week or more apart at the same place  
D Courtship or display between a male and female or 2 males including courtship feeding and copulation  
V Visiting probable nest site  
A Agitated behaviour or anxiety calls of an adult  
B Brood patch on adult female or cloacal protuberance on adult male  
N Nest building or excavation of nest site

Confirmed

DD Distraction display or injury feigning  
NU Used nest or egg shell found (occupied/laid this season)  
FY Recently fledged young or downy young  
AE Adults leaving or entering nest site in circumstances indicating occupied nest  
FS Adult carrying faecal sac  
CF Adult carrying food for young  
NE Nest containing eggs  
NY Nest with young seen or heard

**APPENDIX XI**  
Herpetofauna Species List

**Appendix VIII. Reptiles and Amphibians Recorded From the Study Area**

Scientific Name	Common Name	SRANK	COSSARO	COSEWIC	SARA Schedule	Ontario Herp Atlas	NRSI Observed
<b>Turtles</b>							
<i>Chelydra serpentina serpentina</i>	Common Snapping Turtle	S3	SC	SC	Schedule 1	X	
<i>Chrysemys picta marginata</i>	Midland Painted Turtle	S5				X	
<i>Clemmys guttata</i>	Spotted Turtle	S3	END	E	Schedule 1	?	
<i>Glyptemys insculpta</i>	Wood Turtle	S2	END	T	Schedule 1	?	
<i>Emydoidea blandingii</i>	Blanding's Turtle ( <i>Great Lakes/St Lawrence population</i> )	S3	THR	T	Schedule 1	X	
<b>Snakes</b>							
<i>Lampropeltis t. triangulum</i>	Eastern Milksnake	S3	SC	SC	Schedule 1	X	
<i>Ophiodys vernalis</i>	Smooth Greensnake	S4				X	
<i>Nerodia sipedon sipedon</i>	Northern Watersnake	S5	NAR	NAR		X	
<i>Storeria dekayi dekayi</i>	Northern (DeKay's) Brownsnake	S5	NAR	NAR		X	
<i>Storeria occipitomaculata occipitomaculata</i>	Northern Red-bellied Snake	S5				X	
<i>Storeria occipitomaculata pahasapae</i>	Black Hills Red-bellied Snake	SU				X	
<i>Thamnophis sirtalis sirtalis</i>	Eastern Gartersnake	S5				X	
<b>Salamanders</b>							
<i>Notopthalmus viridescens viridescens</i>	Red-spotted Newt	S5				X	
<b>Toads and Frogs</b>							
<i>Bufo americanus</i>	American Toad	S5				X	
<i>Hyla versicolor</i>	Tetraploid Gray Treefrog	S5				X	
<i>Pseudacris triseriata pop. 2 (Gr. Lakes/St. Lawrence -</i>	Western Chorus Frog	S3	NAR	T	Schedule 1	X	
<i>Pseudacris crucifer crucifer</i>	Northern Spring Peeper	S5				X	
<i>Rana catesbeiana</i>	Bullfrog	S4				X	
<i>Rana clamitans melanota</i>	Green Frog	S5				X	
<i>Rana palustris</i>	Pickerel Frog	S4	NAR	NAR		X	
<i>Rana pipiens</i>	Northern Leopard Frog	S5	NAR	NAR		X	
<i>Rana septentrionalis</i>	Mink Frog	S5				?	
<i>Rana sylvatica</i>	Wood Frog	S5				X	

**Legend**

**SRANK**

S2 Imperiled  
 S3 Vulnerable  
 S4 Apparently Secure  
 S5 Secure  
 SU Unrankable

**COSEWIC, COSSARO Codes**

T/THR - Threatened  
 SC - Special Concern  
 NAR - Not at risk

**APPENDIX XII**  
Mammal Species List

**Appendix IX. Mammals Recorded From the Study Area**

Scientific Name	Common Name	SRANK	COSEWIC	COSSARO	SARA Schedule	Ontario Mammal Atlas	NRSI Observed
<i>Blarina brevicauda</i>	Northern Short-tailed Shrew	S5				X	
<i>Canis latrans</i>	Coyote	S5				x	
<i>Castor canadensis</i>	Beaver	S5				X	
<i>Condylura cristata</i>	Star-nosed Mole	S5				X	
<i>Didelphis virginiana</i>	Virginia Opossum	S4				X	
<i>Eptesicus fuscus</i>	Big Brown Bat	S5				X	
<i>Erethizon dorsatum</i>	Porcupine	S5				X	
<i>Lasionycteris noctivagans</i>	Silver-haired Bat	S4				X	
<i>Lasiurus borealis</i>	Red Bat	S4				X	
<i>Lasiurus cinereus</i>	Hoary Bat	S4				X	
<i>Lepus europaeus</i>	European Hare	SE				X	
<i>Marmota monax</i>	Woodchuck	S5				X	
<i>Mephitis mephitis</i>	Striped Skunk	S5				X	
<i>Microtus pennsylvanicus</i>	Meadow Vole	S5				X	
<i>Mus musculus</i>	House Mouse	SE				X	
<i>Mustela erminea</i>	Ermine	S5				X	
<i>Mustela frenata</i>	Long-tailed Weasel	S4				X	
<i>Mustela vison</i>	Mink	S5				X	
<i>Myotis lucifuga</i>	Little Brown Bat	S5	E			X	
<i>Napeozapus insignis</i>	Woodland Jumping Mouse	S5				X	
<i>Odocoileus virginianus</i>	White-tailed Deer	S5				X	X
<i>Ondatra zibethicus</i>	Muskrat	S5				X	
<i>Parascalops breweri</i>	Hairy-tailed Mole	S4				X	
<i>Peromyscus leucopus</i>	White-footed Mouse	S5				X	
<i>Procyon lotor</i>	Raccoon	S5				X	
<i>Rattus norvegicus</i>	Norway Rat	SE				X	
<i>Sciurus carolinensis</i>	Gray Squirrel Black Morph	S5				X	
<i>Sciurus carolinensis</i>	Gray Squirrel Gray Morph	S5				X	
<i>Sorex cinereus</i>	Masked (Common) Shrew	S5				X	
<i>Sylvilagus floridanus</i>	Eastern Cottontail	S5				X	X
<i>Tamias striatus</i>	Eastern Chipmunk	S5				X	
<i>Tamiasciurus hudsonicus</i>	Red Squirrel	S5				X	
<i>Vulpes vulpes</i>	Red Fox	S5				X	
<i>Zapus hudsonius</i>	Meadow Jumping Mouse	S5				X	

Legend
<b>SRANK</b>
S4 Apparently Secure
S5 Secure
SE Exotic Species
<b>COSEWIC, SARA Codes</b>
E, END Endangered

**APPENDIX XIII**  
Butterfly and Odonata Species List

Appendix XIII. Butterfly Species Recorded From the Study Area

Scientific Name	Common Name	SRANK	COSSARO	COSEWIC	Butterfly Atlas	Regionally Significant	NRSI Observation
<b>Hesperiidae</b>							
<i>Carterocephalus palaemon</i>	Arctic Skipper	S5			X		
<i>Euphyes conspicua</i>	Black Dash	S3S4			X	X	
<i>Poanes viator</i>	Broad-winged Skipper	S4			X		
<i>Erynnis Lucilius</i>	Columbine Duskywing	S4			X		
<i>Pholisora catullus</i>	Common Sootywing	S3S4			X	X	
<i>Polites origenes</i>	Cross Line Skipper	S4			X		
<i>Anatrytone logan</i>	Delaware Skipper	S3S4			X	X	
<i>Euphyes dion</i>	Dion Skipper	S3S4			X	X	
<i>Erynnis icelus</i>	Dreamy Duskywing	S5			X		
<i>Euphyes vestris</i>	Dun Skipper	S5			X		
<i>Thymelicus lineola</i>	European Skipper	SE			X		
<i>Poanes hobomok</i>	Hobomok Skipper	S5			X		
<i>Erynnis juvenalis</i>	Juvenal's Duskywing	S5			X		
<i>Ancyloxypha numitor</i>	Least Skipper	S5			X		
<i>Hesperia leonardus</i>	Leonards Skipper	S4			X		
<i>Polites mystic</i>	Long Dash Skipper	S5			X		
<i>Wallengrenia egeremet</i>	Northern Broken Dash	S5			X		
<i>Thorybes pylades</i>	Northern Cloudy Wing	S5			X		
<i>Polites peckius</i>	Peck's Skipper	S5			X		
<i>Amblyscirtes vialis</i>	Roadside Skipper	S4			X		
<i>Epargyreus clarus</i>	Silver Spotted Skipper	S4			X		
<i>Polites themistocles</i>	Tawny Edged Skipper	S5			X		
<b>Papilionidae</b>							
<i>Papilio polyxenes</i>	Black Swallowtail	S5			X		
<i>Papilio glaucus</i>	Eastern Tiger Swallowtail	S4S5			X		
<b>Pieridae</b>							
<i>Pieris rapae</i>	Cabbage White	SE			X		
<i>Colias philodice</i>	Common (clouded) Sulphur	S5			X		
<i>Colias eurytheme</i>	Orange Sulphur	S5			X		
<b>Lycaenidae</b>							
<i>Satyrium acadicum</i>	Acadian Hairstreak	S4			X		
<i>Lycaeana phlaeas</i>	American Copper	S4			X		
<i>Satyrium calanus</i>	Banded Hairstreak	S4			X		
<i>Lycaena hyllus</i>	Bronze Copper	S5			X		
<i>Harkenclenus titus</i>	Coral Hairstreak	S4			X		
<i>Callophrys niphon</i>	Eastern Pine Elfin	S5			X		
<i>Everes comyntas</i>	Eastern Tailed Blue	S5			X		
<i>Glaucopsyche lygdamus</i>	Silvery Blue	S5			X		
<i>Celastrina ladon</i>	Spring Azure	S5			X		
<i>Satyrium liparops</i>	Striped Hairstreak	S5			X		
<i>Celastrina neglecta</i>	Summer Azure	S5			X		
<b>Nymphalidae</b>							
<i>Vanessa virginiensis</i>	American Painted Lady	S5			X		
<i>Speyeria aphrodite</i>	Aphrodite Fritillary	S5			X		
<i>Satyrodes appalachia</i>	Appalachian Eyed Brown	S4			X		
<i>Speyeria atlantis</i>	Atlantis Fritillary	S5			X		
<i>Cercyonis pegala</i>	Common Wood Nymph	S5			X		
<i>Nymphalis vaualbum</i>	Compton Tortoiseshell	S5			X		
<i>Polygonia comma</i>	Eastern comma	S5			X		
<i>Satyrodes eurydice</i>	Eyed Brown	S5			X		
<i>Speyeria cybele</i>	Great Spangled Fritillary	S5			X		
<i>Polygonia progne</i>	Grey Comma	S5			X		
<i>Coenonympha tullia inornata</i>	Inornate Ringlet				X		
<i>Megisto cymela</i>	Little Wood-Satyr	S5			X		
<i>Boloria bellona</i>	Meadow Fritillary	S5			X		
<i>Nymphalis milberti</i>	Milbert's Tortoiseshell	S5			X		
<i>Danaus plexippus</i>	Monarch	S4	SC	SC	X	X	
<i>Nymphalis antiopa</i>	Mourning Cloak	S5			X		
<i>Phyciodes pascoensis</i>	Northern Crescent	S5			X		
<i>Enodia anthedon</i>	Northern Pearly-Eye	S4			X		
<i>Vanessa cardui</i>	Painted Lady	SZB			X		
<i>Phyciodes tharos</i>	Pearl Crescent	S4			X		
<i>Polygonia interrogatoris</i>	Question Mark	S5			X		
<i>Vanessa atalanta</i>	Red Admiral	SZB			X		
<i>Boloria selene</i>	Silver Bordered Fritillary	S5			X		
<i>Chlosyne nycteis</i>	Silvery Checkerspot	S4S5			X		
<i>Limenitis archippus</i>	The Viceroy	S5			X		
<i>Limenitis arthemis arthemis</i>	White Admiral/Banded Purple	S5			X		

**Legend**

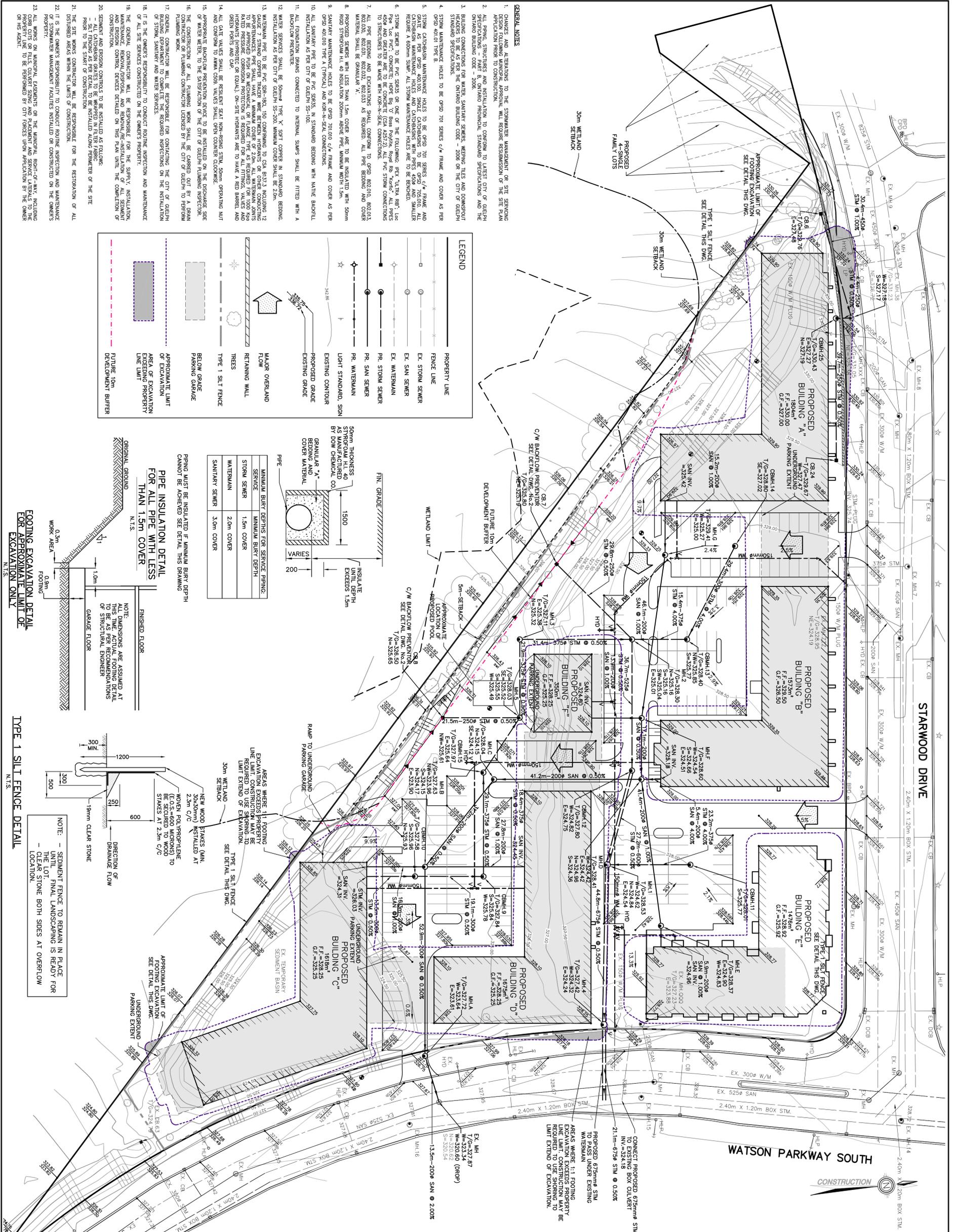
**SRANK**

S3 Vulnerable  
 S4 Apparently Secure  
 S5 Secure  
 S#S# Range Rank (e.g., S2S3) indicates range of uncertainty  
 SE Exotic Species  
 SZB Breeding migrants/Variants

**COSEWIC, COSSARO Codes**

SC Special Concern

**APPENDIX XIV**  
Grading Plan (Gamsby and Mannerow)



**STARWOOD DRIVE**

**WATSON PARKWAY SOUTH**

**CITY OF GUELPH KEY PLAN**

**NOTES:**

- TOPOGRAPHIC SURVEY PROVIDED BY STANTIC CONSULTING LIMITED DATED NOVEMBER 29, 2012
- PROPOSED SITE LAYOUT PROVIDED BY MICHAEL SPAZZINI ARCHITECT INC. DATED JULY 12, 2013
- EX INFRASTRUCTURE INFORMATION ON STARWOOD DRIVE 99-07 DRAWING NO. R 118, DATED OCTOBER 28, 1998
- EX INFRASTRUCTURE INFORMATION ON STARWOOD DRIVE 99-07 DRAWING NO. R 118, DATED OCTOBER 28, 1998
- WETLAND LIMITS AND DEVELOPMENT SETBACKS PROVIDED BY NATURAL RESOURCE SOLUTIONS INC. DATED JULY 10, 2013.

**BENCH MARKS:**

ON S.E. SIDE OF BOX CULVERT ON STARWOOD, WEST OF CHESTERTON, ON NORTH SIDE ELEVATION=341.219m

**GENERAL PLAN**

**STARWOOD DRIVE**

**CITY OF GUELPH**

**COLETTARA DEVELOPMENT**

**Gamsdy and Mannerow ENGINEERS**

**339 TRILLIUM DRIVE, UNIT D KITCHENER ONTARIO N2E 3J2 TEL: 519-763-6440 WWW.GAMSDY.COM**

**LICENSED PROFESSIONAL ENGINEER A.E. KROETSCH 100072069**

**REVISION FOR APPROVAL**

NO.	DATE	REVISION DESCRIPTION	CHKD	A.E.K.
1	11/06/13	ISSUED FOR APPROVAL		

**DESIGNED BY: A.E.K.**

**APPROVED BY: PROJECT NO.: 4120965**

**SCALE: DATE: 11-5-00**

**DRAWING NO.: 1**

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