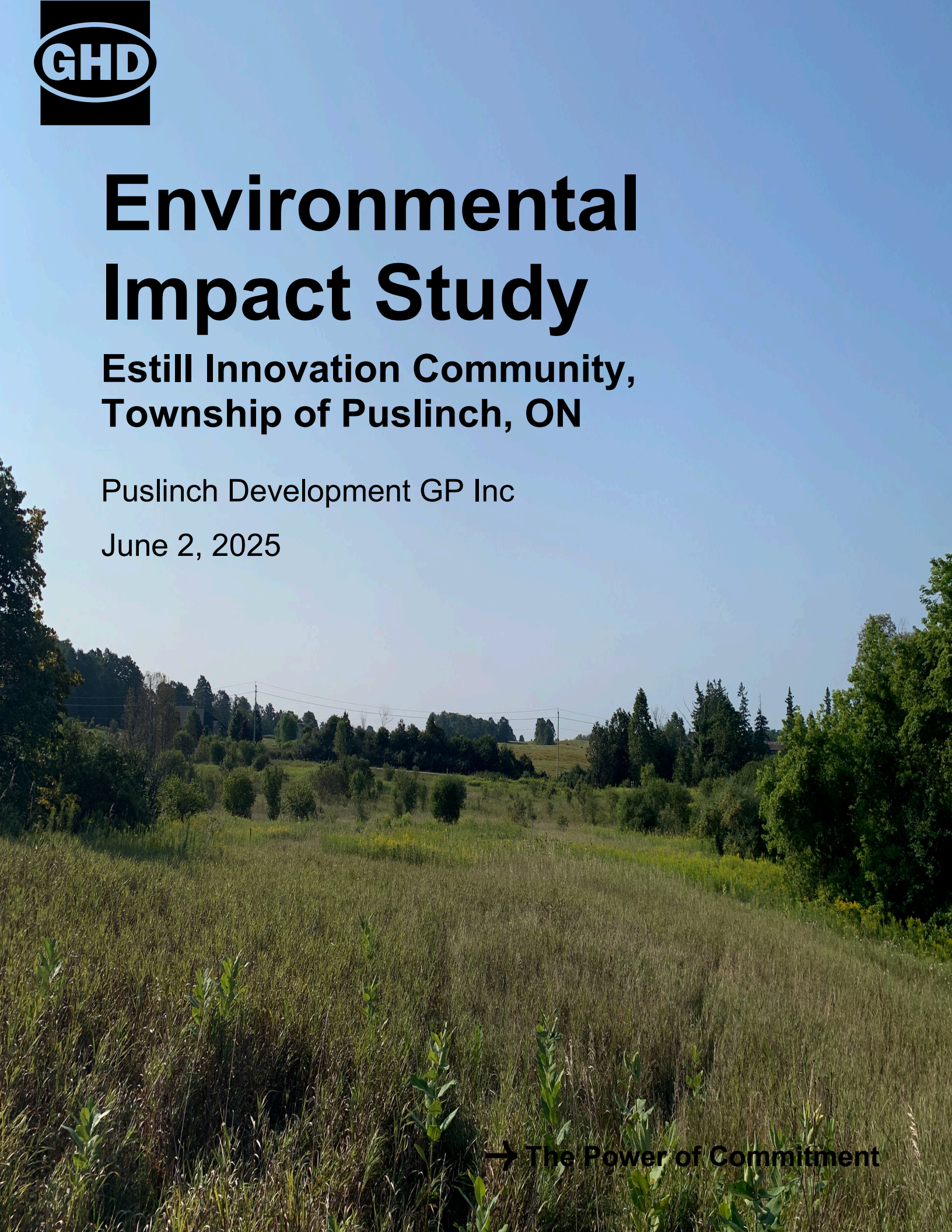

Environmental Impact Study

Estill Innovation Community, Township of Puslinch, ON

Puslinch Development GP Inc

June 2, 2025

→ The Power of Commitment

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A	Keenan Shelly Simon Chute Jason Caldwell Mariann Lobbezoo	Amy Douglas Nicole Charlton	On File	Peter Zytner	On File	31/01/25
S4	0	Keenan Shelly Simon Chute Jason Caldwell Mariann Lobbezoo	Amy Douglas Nicole Charlton	[redacted]	Peter Zytner	[redacted]	07/02/25
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Executive Summary

GHD Limited (GHD) was retained by Puslinch Development GP Inc (Client) to complete an Environmental Impact Study (EIS) for the Estill Innovation Community (Project) located at 4631 Side Road 20 North, in the Township of Puslinch (Township), Ontario (Site).

The Site is approximately 25.47 hectares (62.94 acres) in size and comprises a former residential dwelling, a shed, and a former barn structure. The purpose of the EIS is to document existing natural heritage features and functions on and adjacent to the Site, consider potential impacts resulting from the proposed development, and provide recommendations on mitigation measures to minimize potential impacts. This EIS was completed in accordance with comments received from the Township of Puslinch and County of Wellington in response to the Development Pre-consultation Request, Grand River Conservation Authority (GRCA) EIS Guidelines, and the Terms of Reference (TOR).

The Site Plan dated February 7, 2025, includes five buildings (three industrial, one gym, and one daycare), 894 car parking spaces (including 26 barrier free parking spaces), trailer parking spaces, short term bike spaces, a trail network, a septic field, and a stormwater management pond.

The ecological land classification for the site identified six vegetation communities through field investigations conducted in 2022 and 2024. These communities included Willow Mineral Deciduous Swamp (SWD4-1), Submerged Shallow Aquatic (SAS), Dry – Moist Old Field Meadow (CUM1-1), Mineral Cultural Thicket (CUT1), Active Agriculture (OAG), and Hedgerow (Hedge). Flora inventories identified a total of 106 vascular plant species, with varying proportions of native and non-native species across the different communities. No plant species at risk (SAR), plant species of conservation concern (SCC), or locally rare plant species were identified during the investigations.

Amphibian call count surveys, breeding bird surveys, tree inventory, significant wildlife habitat (SWH) assessment, and bat maternity roost surveys and acoustic analysis were completed as per the TOR. These surveys produced the evidence of two SAR on-Site: eastern meadowlark (*Sturnella magna*) and barn swallow (*Hirundo rustica*). It was also determined there is one candidate SWH feature on-Site for barn swallow (buildings) but no evidence of nesting, therefore no confirmation of use. Surveys to confirm presence or absence of nesting on these structures are recommended if demolition does not occur prior to the next breeding season.

A Provincially Significant Wetland (PSW) is present within the southern portion of the Site; this area was flagged by GHD ecologists and later field verified with GRCA ecologists during 2023. Due to the relevant legislation brought forward in this report, this PSW and surrounding 30 m were not included in the developable area.

Impacts to vegetation, wildlife and wildlife habitat, aquatic resources, surface water, and groundwater were considered during impact assessment and mitigation. Though the proposed development includes a large developable area, the vast majority of said area is within currently disturbed / cultural habitats such as OAG, Hedge, and CUM1-1, which limits the natural heritage impacts associated with the development. Mitigation measures have been included to offset potential unavoidable impacts to natural heritage features on-Site, such as revegetating disturbed areas in a timely manner post-construction, adhering to species timing windows, and ensuring development does not encroach on the 30 m PSW buffer.

It has been determined that this project will be in in conformity with all relevant policy and legislation, assuming all relevant impact and mitigation measures are adhered to.

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1. Introduction

1.1 Background

GHD Limited (GHD) was retained by Puslinch Development GP Inc (Client) to complete a scoped Environmental Impact Study (EIS) for the Estill Innovation Community (Project) located at 4631 Side Road 20 North, in the Township of Puslinch (Township), Ontario (Site). The Site is approximately 25.47 hectares (ha; 62.94 acres) in size and comprises a former residential dwelling, a shed, and a former barn structure. The Study Area includes the Site and a 120 metre (m) buffer.

A Due Diligence assessment was completed in 2022 flagging any potential natural heritage features. The purpose of this EIS is to document existing natural heritage features and functions on and adjacent to the Site, consider potential impacts resulting from the proposed development, and provide recommendations on mitigation measures to minimize potential impacts. This EIS built upon the Due Diligence assessment and was completed in accordance with comments received from the Township of Puslinch and County of Wellington in response to the Development Pre-consultation Request (August 21, 2023), Grand River Conservation Authority (GRCA) EIS Guidelines (GRCA 2005), and the Terms of Reference (TOR; **Appendix A**).

The draft TOR was submitted to the GRCA on August 29, 2023, and to the Township on October 16, 2023, to confirm the policy framework, study objectives, timing and process, and site-specific study requirements for the EIS. The revised TOR was issued on January 15, 2024 with revisions based on received agency comments. The final TOR was submitted to the relevant agencies on February 6, 2024.

1.2 Scope and limitations

*This report has been prepared by GHD for Puslinch Development GP Inc and may only be used and relied on by the Puslinch Development GP Inc for the purpose agreed between GHD and the Puslinch Development GP Inc as set out in **Section 1.1** of this report.*

GHD otherwise disclaims responsibility to any person other than Puslinch Development GP Inc arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

2. Policy Framework

The following sections outline the legislation, policies, and regulations relevant to natural heritage features and functions applicable to the Study Area.

2.1 Federal Legislation

2.1.1 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (MBCA; 1994) and *Migratory Birds Regulations* (MBR; 2022) protect most species of migratory birds and their nests and eggs. Under the MBR it is now prohibited to damage, destroy, disturb or remove migratory bird nests when they contain a live bird or viable egg and prohibit the deposit of harmful substances in waters and areas frequented by them. For 18 species of migratory birds identified on Schedule 1, the MBR provide year-round nest protection until they can be deemed abandoned. The Schedule includes certain migratory birds who either re-use their own nests from one year to the next (colonial species), or whose nests are commonly re-used by other species of migratory bird species. If the nest of a Schedule 1 species has not been occupied by a migratory bird for the entirety of the waiting time indicated in the MBR, it is considered to be abandoned, and to no longer have high conservation value for migratory birds.

If you are not able to wait the designated period to destroy or relocate a nest of a species listed on Schedule 1 or need to destroy or relocate a nest of another species of migratory bird when it contains a live bird or viable egg, and have taken appropriate mitigation, a permit may be available. The MBR continue to allow for the issuance of Damage and Danger as well as Scientific permits, which may apply in specific limited situations.

Environment and Climate Change Canada (ECCC; 2023) implements policies and guidelines to protect migratory birds, and guidance on the Environment Canada website is provided to help to minimize the risk of detrimental effects to migratory birds and to achieve compliance with the law. Compliance with the MBCA and MBR is best achieved through a due diligence approach based on a site-specific analysis in consideration of the avoidance guidelines on the ECCC website, such as the implementation of timing restrictions to ensure migratory birds and their young have left an area before it is disturbed due to construction or prior to vegetation removal.

The Study Area has been identified to be within Zone C2 (ECCC 2018) and as such this area of southern Ontario typically has migratory birds nesting between April 1 to August 31 of each year.

2.1.2 Species at Risk Act

The *Species at Risk Act* (SARA; 2002) incorporates a number of prohibitions to protect individuals of listed Threatened (THR), Endangered (END), or Extirpated (EXT) Species at Risk (SAR) – as designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Per Section 34, Section 58 and Section 61, these prohibitions apply to aquatic species and migratory birds protected by the MBCA on all lands, and any other listed wildlife species when on federal lands, or any lands if recommended by the Minister of the ECCC to the Governor in Council.

2.1.3 Fisheries Act

Fish and fish habitat are protected under the federal *Fisheries Act* (FA; 1985) which is managed by the Fisheries and Oceans, Canada (DFO). The FA was last amended on August 28, 2019. The protection provisions of the FA apply to all fish and fish habitat throughout Canada and the Act sets out authorities for the regulation of works, undertakings or activities that risk harming fish and fish habitat. Specifically, the protection provisions include two core prohibitions. One is against persons carrying on works, undertakings or activities that result in the “death of fish by means other than fishing” (subsection 34.4[1]), and the other is “harmful alteration, disruption or destruction of fish habitat” (subsection 35[1]; also referred to as “HADD”). The protection provisions are applied in conjunction with other applicable federal laws and regulations related to aquatic ecosystems, including the SARA.

Fish habitat is defined in subsection 2(1) of the FA to include all waters frequented by fish and any other areas upon which fish depend directly or indirectly to carry out their life processes. The types of areas that can directly or indirectly support life processes include, but are not limited to, spawning grounds and nursery, rearing, food supply and migration areas. Under subsection 35(1) a person may carry on such works, undertakings or activities without contravening this prohibition, provided that they are carried on under the authority of one of the exceptions listed in subsection 35(2), and in accordance with the requirements of the appropriate exception. In most cases, this exception

would be Ministerial authorizations granted to proponents in accordance with the Authorizations Concerning Fish and Fish Habitat Protection Regulations under the Fisheries Act.

Proponents are responsible for planning and implementing works, undertakings or activities in a manner that avoids harmful impacts, specifically the death of fish and HADD. Where proponents believe that their work, undertaking or activity will result in harmful impacts to fish and fish habitat, DFO will work with proponents to assess the risk of their proposed work, undertaking or activity resulting in the death of fish or HADD of fish habitat and provide advice and guidance on how to comply with the FA.

2.2 Provincial Legislation, Policies and Guidelines

2.2.1 Endangered Species Act

The provincial *Endangered Species Act* (ESA; 2007) provides protection for provincial SAR and their habitats in Ontario. Species are classified into one of four levels of risk (Extirpated [EXT], Endangered [END], Threatened [THR], Special Concern [SC]) through science-based assessment via the Committee on the Status of Species at Risk in Ontario (COSSARO). Species classified as THR or END on the Species at Risk in Ontario (SARO) list are afforded protection under the ESA.

Protection under the ESA prohibits the "*killing, harming, harassing, possessing, buying, selling, trading, leasing or transporting species listed as THR, END or EXT*". The ESA also includes preparation of recovery strategies for species ranked as THR or END, and management plans for those ranked as SC.

Protection for SAR and their habitats are provided under the ESA by restricting activities that may affect them. Where a proposed activity will impact protected species or habitat, changes to timing, location and methods of the proposed activity should be considered, wherever feasible, to avoid impacts to SAR. Where impacts cannot be avoided or mitigated, a permit or authorization process can be entered into. The Ministry of Environment, Conservation and Parks (MECP) administers the ESA.

2.2.2 Invasive Species Act

The provincial *Invasive Species Act* (ISA; 2015) sets out rules to prevent and control the spread of invasive species. Species regulated under the ISA pose a risk to Ontario's natural environment and are divided into two classes: prohibited and restricted. It is illegal to import, possess, deposit, release, transport, breed, grow, buy, sell, lease or trade prohibited invasive species, and it is illegal to import, deposit, release, breed, grow, buy, sell, lease or trade restricted invasive species. The ISA is administered by the Ministry of Natural Resources[1] (MNR).

2.2.3 Conservation Authorities Act

The purpose of the *Conservation Authorities Act* (CAA; Government of Ontario 1990) is to provide for the organization and delivery of programs and services that further the management of natural resources and hazards in watersheds in Ontario. Conservation Authorities are governed by the CAA which is administered by the MECP.

Section 28 of the CAA prohibits interference with watercourses and wetlands and development in areas within the jurisdiction of the Conservation Authority. Section 28.1 provides that a permit to carry out prohibited activities can be granted by the Authority if the following conditions are met:

1. the activity is not likely to affect the control of flooding, erosion, dynamic beaches or unstable soil or bedrock;
2. the activity is not likely to create conditions or circumstances that, in the event of a natural hazard, might jeopardize the health or safety of persons or result in the damage or destruction of property; and
3. any other requirements that may be prescribed by the regulations are met.

[1] The Ministry of Natural Resources and Forestry (MNRF) reverted to the naming convention of Ministry of Natural Resources (MNR) in 2024.

Ontario Regulation (O. Reg) *41/24 - Prohibited Activities, Exemptions and Permits* under the CAA defines the Regulation Limits for each Conservation Authority, implementation requirements, and procedural requirements for permitting.

2.2.3.1 Grand River Conservation Authority

The Grand River Conservation Authority (GRCA) is responsible for implementing the CAA, including Section 28, and *O. Reg. 41/24 – Prohibited Activities, Exemptions and Permits*[2].

The Site contains GRCA Regulated area and as such any development or alteration within these areas or within 30 m of these areas would require prior written approval and a permit from the GRCA. The wetlands located on Site are part of the Cranberry Oil Well Bog Wetland Complex, a Provincially Significant Wetland (PSW), and are within the regulation limit of the GRCA, as are the wetlands of the surrounding lands. As such, the development plan has been adjusted to avoid the PSW and its 30 m buffer to avoid disturbing GRCA regulated area and therefore remove the requirement for consultation and a permit from the GRCA.

2.2.4 Provincial Planning Statement

The *Provincial Planning Statement* (PPS), which took effect October 20, 2024, is a consolidated statement of the Ontario Ministry of Municipal Affairs and Housing's (MMAH) policies on land use planning (MMAH 2024). The PPS 2024 is a streamlined land use planning policy framework that replaces the Provincial Policy Statement (MMAH 2020a) and A Place to Grow: Growth Plan for the Greater Golden Horseshoe (MMAH 2020b) while building upon housing-supportive policies from both documents. The PPS 2024 is issued under Section 3 of the *Planning Act* and all decisions affecting land use planning matters 'shall be consistent with' the PPS 2024 (MMAH 2024). Municipalities use the PPS 2024 to develop their official plans and to guide and inform decisions on other planning matters.

The Study Area is located within Ecoregion 6E. Policy Section 4.1 of the PPS 2024 outlines policies for Natural Heritage, and portions relevant to this project include:

1. Natural features and areas shall be protected for the long term.
2. The diversity and connectivity of natural features in an area, and the long-term *ecological function* and biodiversity *of natural heritage systems*, should be maintained, restored or, where possible, improved, recognizing linkages between and among *natural heritage features and areas*, *surface water features* and *ground water features.*
3. *Natural heritage systems* shall be identified in Ecoregions 6E & 7E, recognizing that *natural heritage systems* will vary in size and form in *settlement areas, rural areas,* and *prime agricultural areas.*
4. *Development and site alteration* shall not be permitted in:
    a. *significant wetlands* in Ecoregions 5E, 6E and 7E; and
    b. significant coastal wetlands.
5. Development and site alteration shall not be permitted in:
    a. significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E;
    b. *significant woodlands* in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);
    c. *significant valleylands* in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);
    d. significant wildlife habitat;
    e. significant areas of natural and scientific interest; and
    f. coastal wetlands in Ecoregions 5E, 6E and 7E1 that are not subject to policy 4.1.4.b),

    unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

[2] As of April 1, 2024, *O. Reg. 41/24 – Prohibited Activities, Exemptions and Permits* superseded *O. Reg. 150/06 – Development, Interference with Wetlands and Alterations to Shorelines and Watercourses.*

6. Development and site alteration shall not be permitted in fish habitat except in accordance with provincial and federal requirements.
7. Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.
8. Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 4.1.4, 4.1.5, and 4.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

2.3 Municipal Legislation, Policies and Guidelines

2.3.1 County of Wellington Official Plan

The County of Wellington (County) Official Plan (OP; as updated June 1, 2022) includes policies related to the natural environment through the conservation and enhancement of the County's sensitive natural areas and native biodiversity, and the promotion of informed stewardship. The Greenlands System includes:

– Wetlands
– Environmentally sensitive areas
– Streams and valley lands
– Ponds, lakes and reservoirs
– Areas of natural and scientific interest
– Woodlands
– Fish and wildlife habitat
– Flood plains and hazardous lands
– Threatened or endangered species

Within the Greenlands System certain areas have greater sensitivity or significance. These areas have additional policies and protections, are identified in the Core Greenlands designations and include:

– PSWs
– All other wetlands
– Habitat of endangered or threatened species and fish habitat
– Hazardous lands

The OP Schedule B7 Puslinch map designates the Site as part of the PA7-1 Regionally Significant Economic Development Study Area. This area is intended to "*service the Township by providing locations for economic activity and employment opportunities. This area is the predominant location for business and industry in the Township, but does not preclude the establishment of small-scale activities outside of concentrations elsewhere in the Township."*

According to the OP Schedule A7 Puslinch map, the Site contains Core Greenlands, Secondary Agricultural, and Rural Employment areas. Section 5.4.1 of the OP states "*All wetlands in the County of Wellington are included in the Core Greenlands. Development and site alteration will not be permitted in wetlands which are considered provincially significant.*" The Core Greenlands present on Site is a section of the Cranberry Oil Well Bog Wetland Complex (PSW) within the southern portion.

Section 5.6.2 of the OP states that *"Where development is proposed in the Greenland system or on adjacent lands, the County or local municipality shall require the developer to:*

a) identify the nature of the features potentially impacted by the development;

b) prepare, where required, an environmental impact assessment to ensure that the requirements of this Plan will be met, and consider enhancement of the natural area where appropriate and reasonable.

c) address any other relevant requirements set out in Section 4.6.3 Environmental Impact Assessment.

No development will be approved unless the County is satisfied that the Greenland and Environmental Impact Assessment policies are met."

Section 6.5.3 of the OP states that "*Permitted uses and activities in Secondary Agricultural Areas may include:*

a) all uses allowed in the Prime Agricultural Area;

b) small scale commercial, industrial and institutional uses;

c) public service facilities"

The proposed development may not be considered "small-scale". Section 6.5.5 states "*…large scale proposals or proposals involving more than one lot will require an official plan amendment."*

Section 6.8.1 of the OP also states that "*In all cases, rural employment areas will be used by "dry" industrial and limited commercial uses which do not use significant amounts of water in their operation and which do not produce significant amounts of effluent, consistent with rural servicing levels which rely on private water and sewage systems."*

Although the Wellington County Draft Natural Heritage System mapping is not part of the OP, it was created to help inform future policy and stewardship initiatives. The Draft Natural Heritage System mapping identifies *enhancement linkages* within the Site (GRCA 2018). These are considered *Stewardship Components* and are identified as areas with the potential to connect and enhance the overall ecological and hydrological health of the existing features and the Natural Heritage System. *Enhancement Linkages* are areas where voluntary stewardship activities can improve local linkages.

Consideration should be given to the planning criteria and requirements for the Site under these OP designations, and ecological studies are required to determine impacts form the proposed development on *Core Greenlands*.

2.3.2 Township of Puslinch Official Plan

The Township operates under the County OP, which gives direction over the next 20 years to the physical development of the County, its local municipalities such as Puslinch, and the to the long term protection of the County resources. Applicable policies from the County OP are previously discussed in **Section 2.3.1**.

2.3.3 Township of Puslinch Zoning By-Law

Under Section 34 of the Planning Act, the Township Zoning By-Law regulates the use of land and the character, location and use of buildings and structures within the Township. By-Law No. 023-18 and Township Comprehensive Zoning Map identifies the Site as Agricultural and Natural Environment. Schedule A and Schedule B-1 (Environmental Protection Overlap) further designates the Natural Environment portion of the Site (the wetland) as Environmental Protection.

The Environmental Protection Overlay of the Puslinch Zoning By-Law corresponds to the Greenlands designation in the County OP. The purpose of this designation is to identify that a physical feature is present that may require further review or permissions prior to development approvals. The Township Zoning By-Law states that when the Greenlands feature is within a CA regulated area, as is the case with the wetland on-Site, the written approval from the applicable CA is required prior to the development of a building or structure.

3. Study Approach and Methodology

Information pertaining to natural heritage resources within the Study Area was obtained through a review of available background studies, databases, and field investigations.

3.1 Background Review

Available secondary source information was obtained and reviewed to compile known natural heritage information for the Study Area. The sources reviewed are outlined in **Table 3.1**.

Table 3.1 Secondary Source Information Reviewed

Source	Information Reviewed
Government of Canada	The Atlas of Canada - Toporama
Ministry of the Environment, Conservation and Parks (MECP)	SAR records for the Study Area
Ministry of Natural Resources (MNR)	Natural Heritage Features data layers from Land Information Ontario (LIO) and the Natural Heritage Information Centre (NHIC) database Aquatic Resource Area (ARA) data
Grand River Conservation Authority (GRCA)	Applicable regulations and policies Regulated Areas Natural heritage data and species records for Study Area
Fisheries and Oceans Canada (DFO)	Aquatic SAR Maps
County of Wellington Official Plan	Land Use Designations and Natural Heritage Systems Mapping Environmental Management Guidelines Applicable By-Laws
Township of Puslinch Zoning	Applicable Zoning By-Laws and mapping
Provincial Policy Statement	Natural Heritage Policies
Ontario Reptile and Amphibian Atlas	Species records for the Site
Ontario Breeding Bird Atlas	Breeding bird data for the Site
Ontario Butterfly Atlas	Species records for the Site
Atlas of the Mammals of Ontario	Checked for records of rare mammals in the Study Area
Bat Conservation International	Referenced range maps in species profiles for the four listed bat species that occur in Ontario
Distribution and Status of the Vascular Plants of Southwestern Ontario (Oldham 1993)	Species records and rarity within local landscape.
Local Status Wellington Dufferin (Riley 1989)	Species records and rarity within local landscape.
E-Bird	Species record for SAR or Locally Rare
iNaturalist	Species record for SAR or Locally Rare

3.2 Agency Consultation

Consultation has been ongoing with the GRCA, MECP, MNR, and the Township to determine natural heritage considerations for the Study Area and to confirm permitting requirements for the proposed works. All email communications are presented in **Appendix B.**

3.2.1 Grand River Conservation Authority

Consultation with the GRCA commenced on October 19, 2023, to seek information on natural heritage, wetland evaluation reports, and general wildlife or aquatic information. They informed that no watercourses, fish habitat features, Area of Natural and Scientific Interest (ANSI)'s, nor wildlife habitat values were present on the site. They also identified some species of concern within close proximity the site, outlined hydrological information, and confirmed the

presence of the Cranberry Oil Well Bog (PSW) on-Site. The GRCA recommended reaching out to the MNR regarding further PSW evaluation information.

The GRCA was also consulted to confirm the wetland boundary on site, which was delineated in the field on September 8, 2023. See **Section 3.4.8** and **4.4** for details.

The draft TOR was submitted to the GRCA on August 29, 2023, for comments. The GRCA made recommendations to properly delineate the wetland boundary and setbacks on Site plan/construction drawings, as well as provided recommendations on how to comprehensively assess hydrologic impacts. The finalized TOR with integrated comments was submitted to the GRCA on February 6, 2024. The finalised TOR is presented in **Appendix A**.

3.2.2 Ministry of Environment, Conservation and Parks

Consultation with the MECP began on October 16, 2023. The MECP provided a guide for SAR screening, outlined the processes required for exemption or authorization under the ESA, and outlined situations in which an Information Gathering Form (IGF) is necessary.

3.2.3 Ministry of Natural Resources

Consultation with the MNR began on October 16, 2023, to request any additional information on natural heritage features present on-Site. The MNR confirmed the presence of the Cranberry Oil Well Bog Wetland Complex (PSW) within the Site limits. They also provided the Provincial Evaluation of the Cranberry Oil Well Bog, which was completed on January 1, 2003.

3.2.4 Township of Puslinch

Consultation with the Township commenced on October 16, 2023. Following integration of comments from the GRCA, the draft TOR was submitted to the Township for review. On November 3, 2023, the Township provided their ecology consultant's, Aboud & Associates Inc., peer review of the TOR. The peer review included comments on policy considerations, SAR occurrences, Significant Wildlife Habitat (SWH) considerations, and ecology survey recommendations. The finalized TOR was submitted to the Township on February 6, 2024. The finalised TOR is presented in **Appendix A**.

3.3 Screening for Species at Risk

Species at Risk (SAR) in Ontario may be protected by provincial and/or federal SAR legislation. The applicable acts are the provincial ESA and federal SARA. A list of SAR with potential to occur on or adjacent to the Study Area was compiled from the background review and agency consultation, and is presented in **Appendix C**. Records from the past 20 years were included in the background review (historical records older than 20 years were not). Following the field investigation, further evaluation was completed for SAR probability of occurrence based on the observed habitat characteristics.

3.4 Field Survey Methodology

GHD ecologists completed field investigations to inventory the flora and fauna of the Site (**Table 3.2**). Preliminary field surveys were conducted in 2022 as part of the Due Diligence assessment. Supplemental and additional field surveys were conducted in 2023 and 2024 for the EIS, as established in the TOR.

Table 3.2 Summary of Field Surveys Completed

Field Investigation	Dates	Temperature (°C)	Wind (Beaufort Scale)	Precipitation	GHD Staff
Site reconnaissance	May 19, 2022	10	1	None	J. Caldwell
ELC and flora inventory	August 17, 2023 May 13, 2024 August 26, 2024	24-2618-24 27-29	2-3 3 2	None None None	J. Caldwell, K. Shelly
Calling amphibian monitoring	May 25, 2022 June 16, 2022 April 10, 2024 April 30, 2024 June 18, 2024	13 21-22 10 12 25	4 0-1 2 1 1	None None None None None	A. Douglas, Z. Kelly, S. Sadiora, K. Shelly, M. Lobbezoo, J. de Vuyst
Breeding bird surveys	June 2, 2022 June 16, 2022 July 4, 2024	10 23-30 18	2 3 1	None None None	J. Caldwell M. Lobbezoo
Tree inventory	May 3, 2024 November 20, 2024 January 10, 2025	9-15 7-9 -10 _ -4	2 3 3	Rain None None	J. Caldwell, M. Lobbezoo
Bat maternity roost surveys (leaf-off)	May 3, 2024 November 20, 2024 January 10, 2025	9-15 7-9 -10 _ -4	2 3 3	Rain None None	J. Caldwell, M. Lobbezoo
Provisional bat acoustic surveys	May 31 – June 11, 2024	-	-	-	J. Caldwell
Wetland staking	August 17, 2023	17-25	3-4	None	J. Caldwell, K. Shelly
Wetland delineation with GRCA	September 8, 2023	13-17	2-3	None	L. Lawlor, J. Caldwell
SAR habitat assessment	Collected during each Site visits	-	-	-	All Staff
Incidental species observations	Collected during each Site visit	-	-	-	All Staff

3.4.1 Vegetation Communities and Flora

Vegetation communities were initially mapped and described on June 16, 2022, following the Ecological Land Classification (ELC) System for Southern Ontario (Lee et al. 1998). Information collected included dominant species cover, community structure, presence of indicator species, and other notable features. Representative soil sampling with a hand auger was completed to confirm community soil conditions and appropriate classifications.

Two additional botanical surveys were completed on May 13 and August 26, 2024, to supplement those conducted for the Due Diligence. These were completed in conjunction with ELC by walking the Site and recording species observed. A comprehensive species list was compiled, and species status was assessed at the provincial and local levels for Wellington County.

3.4.1.1 Tree Inventory

Tree inventory data was collected by a GHD International Society of Arboriculture (ISA) Certified Arborist on May 3 and November 20, 2024, and January 10, 2025. All trees observed had their physical characteristics and GPS location recorded.

The assessment was completed during leaf-off (May 3, 2024, November 20, 2024, and January 10, 2025) conditions. The area inventoried included all potential work areas and trees with a dripline within 6 m of these potential work areas (i.e., trees with the potential to be impacted). In general, the tree inventory was limited to trees with a trunk diameter at breast height (DBH) greater than 10 centimetres (cm).

Inventoried trees were tagged with a metal ID tag for clear field identification. Tree inventory data collected by GHD included tree species, DBH, height, and estimated dripline radius. Each tree was assessed, assigned a condition rating (based on trunk integrity, canopy vitality, and canopy structure), and assigned an overall health rating (i.e., healthy, fair, poor, decline, or dead) based on the condition ratings and overall appearance of the tree. The DBH of inventoried trees was typically measured at 1.37 m above grade, except for trees with branch unions, large lateral branches, or deformities that would result in an unrepresentative DBH measurement if recorded at 1.37 m above grade.

The assessment of trunk integrity included observations of trunk lean, cracks/splits/seams, presence of cavities or decay, presence of multiple stems, the presence of mechanical damage to the trunk or roots, and the presence of girdling roots. The assessment of canopy vitality included observation of the vigour and health of the canopy. Crown health and budding features were used as the primary indicator of crown vigour for deciduous trees. Bud density, wound callousing, twig elongation, twig dieback, epicormic growth, and the presence of pests and pathogens were also used as indicators of canopy vitality. Crown structure observations included the overall structural quality of the crown. Observations included the presence of codominant leaders, multiple branch connection points, epicormic growth, deadwood, and broken branches.

3.4.2 Amphibian Surveys

Calling amphibian surveys were conducted according to the Marsh Monitoring Protocol (BSC 2009) and were carried out at two stations in 2022 (May 25 and June 16); one by the wetland on-Site, and one near the forested area along the western boundary of the Site, within the Study Area (**Figure 2**). Three additional calling amphibian surveys were conducted in 2024 (April 10, April 30 and June 18) and included investigation for potential migration pathways between the Site and wetland to the west of Sideroad 20. Surveys were conducted between a half hour after sunset and midnight. At each station, experienced surveyors waited for 2 minutes in silence before starting the survey, then listened for frog and toad calls for a period of 3 minutes. During the survey, any frogs or toads heard calling were documented and a measure of 1, 2, or 3 for the abundance of each species within 50 m of the survey point, 50 – 100 m of the survey point, or greater than 100 m of the survey point was applied.

3.4.3 Bird Surveys

Breeding Bird Surveys (BBS) were conducted between 5:00 am and 10:00 am during the breeding bird season when most birds are in their territories engaged in breeding activities. Surveys occurred within the timeframe of half an hour before sunrise and the 5 hours following, in accordance with the Ontario Breeding Bird Atlas Survey protocols (Cadman et al. 2007). A point count methodology was utilized, where a point count location was surveyed for 5-minutes and all the species seen and heard were recorded. Breeding evidence was recorded to determine if the species was a possible, probable, or confirmed breeder following protocols of the Ontario Breeding Bird Atlas (Cadman et al. 2007). Incidental species observations, including those of birds, were also collected on all Site visits.

Two rounds of BBS were completed in 2022 (June 2 and June 13); a third was not completed at that time as eastern meadowlark (*Sturnella magna*; provincially and federally THR) were confirmed. An additional grassland BBS was completed on July 4, 2024, at the request of the Township,. Three breeding bird observation stations (BBS1, BBS2, and BBS3) were established to represent the dominant habitat types on-Site (**Figure 2**). Notably, the BBS2 station

captured the Moist Old Field Meadow community that exhibits suitable habitat for eastern meadowlark. Incidental species observations were also collected on all Site visits.

3.4.4 Reptile Surveys

No species-specific targeted reptile surveys were undertaken for the Site since the wetland does not retain water depths suitable for reptile overwintering. Additionally, the on-Site wetland and surrounding 30 m buffer is being retained during development. The 30 m buffer around the wetland consist of a deciduous willow swamp and exhibits the most suitable habitat for reptiles. Incidental observations of reptiles and evidence of reptile habitat were recorded by staff during all field visits to the Site.

3.4.5 Mammal Surveys

There are seven species of bats in Ontario that have been listed as END provincially, including the little brown myotis (*Myotis lucifugus*; END federally), eastern small-footed myotis (*Myotis leibii*; not assessed federally), northern myotis (*Myotis septentrionalis*; END federally), tri-colored bat (*Perimyotis subflavus*; END federally), eastern red bat (*Lasiurus borealis;* note listed federally), silver-haired bat (*Lasionycteris noctivagans*; not listed federally), and hoary bat (*Lasiurus cinereus;* not listed federally). These receive species and general habitat protection under the ESA.

Many of the seven SAR bats in Ontario have different roosting habitat characteristics. Little brown myotis, northern myotis, and silver-haired bats roost in tree cavities, crevices, and under loose exfoliating bark in wooded areas located near water. Deciduous species with decay characteristics are often ideal for roost sites, however, coniferous species may be used depending on roost-tree characteristics such as tree size, height, roost aspect, and cavity temperature (COSEWIC 2023). The tri-colored bat most often roosts in foliage (both dead and alive) within or below the canopy. Often, oak species (*Quercus spp.)* are utilized for roosting because the leaves are retained longer in the fall season; however, maple species (*Acer spp*.) are also used. Eastern red bats and hoary bats may use both deciduous and coniferous forests of any age class, though they may avoid coniferous species when suitable deciduous species are present. As well, they tend to prefer large diameter and tall trees, reaching or exceeding the surrounding canopy. Eastern small-footed myotis roost in sunny, cave, karst, and rocky open habitats, such as along talus slopes or within rock crevices, and occasionally in buildings (Humphrey 2017). The location of suitable bat maternity roosting habitat, including snags, was identified following the modified methodology of the *MECP Bats & Treed Habitat – Maternity Roost Surveys* protocol (MECP 2022). This scoped assessment provided the likelihood that appropriate habitat for SAR bats was present; however, it did not confirm the presence or absence of any bat species.

No other species-specific targeted mammal surveys were undertaken for the Site; however incidental observations of mammals and evidence of mammal habitat utilization (i.e., tracks, scat, hair, dens, etc.) were recorded by staff during all field visits to the Site.

3.4.5.1 Bat Habitat Surveys

On May 3, 2024, November 20, 2024, and January 10, 2025, GHD conducted leaf-off snag tree surveys following *MECP 2022 guidance*. Identifying suitable roost trees for little brown myotis, northern myotis, and silver-haired bats included recording the location of all snags that exhibit appropriate attributes including cavities, loose bark, cracks, or knot holes. Suitable roost trees for tri-colored bats, hoary bats, and eastern red bats include oak trees greater than 10 cm diameter at breast height (DBH), maple trees greater than 10 cm DBH if the tree includes dead/dying leaf clusters, and any tree greater than 25 cm DBH. All snag or cavity trees observed were provided a unique code for identification and trees suitable for bats can be seen on **Figure 2**. Suitable roosting features for eastern small-footed myotis such as rockpiles were surveyed for and recorded during all site investigations.

3.4.5.2 Bat Acoustic Surveys

GHD installed a single stationary acoustic monitoring device (bat detector, ID: WATS06) at one location near Tree 119 on Site (**Figure 2**). Acoustic monitoring was conducted from May 31 to June 11, 2024, which satisfied the minimum of 10 nights during the maternity roosting period (according to protocol). The bat detector was deployed

where potentially suitable roosting habitat of SAR bats was most likely to occur within the Site as noted by the presence of cavity trees and karst features.

The bat detector (SM4BAT+ model from Wildlife Acoustics) was set to record nightly from 30 minutes before sunset to 30 minutes after sunrise. The bat detector was set to record wave files of up to 15 seconds in duration any time a sound in the frequencies typically emitted by bats was detected.

A three-step process was utilized to analyze acoustic data to achieve the highest confidence in classification:

1. The recorded ultrasonic data was analyzed in Sonobat 4 using the SonoVet and SonoBatch North northeastern US and Southern Ontario classifier to assign species identifications to each file. The period of deployment [May 31 – June 11, 2024 (11 nights)] was selected as an appropriate range of nights for call analysis (minimum of ten nights is required under existing protocols) based on observations of suitable weather during the majority of that period.
2. The SAR bat calls identified by the program were manually verified by a qualified ecologist. Manual vetting occurs to confirm the patterns are consistent with the typical characteristics of a call for each species. Manual vetting and confirmation of the call characteristics was undertaken for each SAR species recorded.
3. Where a recorded call was not consistent with the known typical characteristics of a bat species, or the recording was outside of the software's classification confidence range, the analyser classified the call as high frequency (HiF), low frequency (LoF), or as "No ID". No ID recordings can result from background noise such as vehicles, rustling plants, other wildlife, incomplete recordings, or calls which are outside of the range of the microphone. An extensive review of the No ID files was conducted to verify if calls could be identified as SAR bats.

3.4.6 Insect Surveys

Insect species encountered on Site during all field surveys were recorded incidentally. No targeted surveys were conducted.

3.4.7 Incidental Wildlife

All survey visits recorded incidental observations of mammals, reptiles, insects and other wildlife as well as evidence of habitat utilization (i.e., browse, tracks, trails, scat, burrows, remains, nests, vocalizations, etc.). Searches for chimney crayfish were also conducted during Site visits and involved walking around the perimeter of wetland communities and drainage features on Site looking for chimney burrows. During the terrestrial field investigation, a visual encounter survey was conducted for any significant species of reptiles or amphibians in brush piles, lumber, and deadfall within the Site.

3.4.8 Aquatic Resource Surveys

No aquatic habitat surveys were conducted on-Site as the wetland did not contain water continually throughout the year and was therefore not considered to be fish habitat. The GRCA also confirmed that no watercourses or fish habitat features were present on-Site.

3.4.9 Wetland Staking and Delineation

The Site includes a wetland of approximately 3,650 m^2 located in the southern portion of the property. This wetland is part of the provincially significant Cranberry Oil Well Bog Wetland Complex. In advance of conducting the wetland delineation with the GRCA, GHD ecologists certified under the Ontario Wetland Evaluation System (OWES) (Ontario 2014) flagged the wetland boundary on August 17, 2023. This wetland was then delineated with GRCA ecologists on September 8, 2023.

3.4.10 Significant Wildlife Habitat

Prior to the field surveys, a candidate list of SWH features were determined based on the Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (MNRF 2015; **Appendix D**). During field surveys, GHD ecologists looked for evidence of those candidate SWH features (i.e., to determine presence/absence) and any other candidate SWH features not anticipated by the initial candidate screening. Upon compiling field data, further consideration was given candidate SWH classification.

3.4.11 Species at Risk and Species of Conservation Concern

Assessments for potential SAR and SCC habitat was conducted during all Site visits by GHD ecologists.

For the purposes of this report, SAR include those species listed under the ESA as END or THR, or as END or THR under SARA and are an aquatic species or MBCA-protected migratory bird.

As defined by the Natural Heritage Reference Manual (NHRM) (OMNR 2010), SCC are species that are rare or are substantially declining, listed as SC on the SARO (MNRF 2023), with a S-Rank of S1 to S3, and species identified as nationally END or THR by COSEWIC, which are not protected in regulation under the ESA. Although SCC are not afforded protection under the ESA, their habitat may be considered SWH under the PPS.

Natural areas were also assessed for their potential to provide habitat for those SAR and SCC identified during background review, agency SAR data requests, and habitat analysis. This included surveys of any avian SAR nesting activity within the grassland habitat.

4. Existing Conditions

4.1 Physical Environment

4.1.1 Topography

The Site is located within the Horseshoe Moraines physiographic region, specifically located on a till moraine. The bedrock geology is comprised of sandstone, shale, dolostone, and siltstone (Ministry of Mines 2022). The Site is generally flat, with a slight decline to the southeast characterized by elevation changes from 343 – 339 m (Canada 2024). This majority of the Site is actively used for agricultural, with collections of meadow and thicket communities present in the north and southeast corners. There is also a small seasonal pond present in the southern portion of the Site, which is bordered by a deciduous swamp. This pond and swamp is part of the provincially significant Cranberry Oil Well Bog Wetland Complex. Adjacent lands to the Site include active agriculture, residential, deciduous woodlands, and industrial.

4.1.2 Hydrogeology

An assessment undertaken at the Site to characterize the current geological and hydrogeological conditions included:

1. Assess current groundwater conditions and quantify existing and potential impacts to the local groundwater regime (quality and quantity).
2. Evaluate whether the current groundwater conditions will be impacted by the proposed development.
3. Estimate the quantity of water taking for the proposed development concept.
4. Determine the need for and options for groundwater control during construction and long-term and determine the need for and nature of any mitigation measures.
5. Address requirements related to stormwater management consideration which is part of a standalone document.

GHD's *Hydrogeological Assessment Report* (GHD 2025a) is provided in **Appendix E**.

4.1.3 Surface Water

Surface water and shallow groundwater investigations were conducted within the wetland on-Site by GHD. Detailed results are prepared under a separate cover: *Surface Water Monitoring Assessment – Puslinch Development Limited Partnership Innovation Community* (GHD 2025b), and included as **Appendix F**. Detailed water balance results are prepared under separate cover: *Technical Memorandum – Preliminary Site-Specific and Feature-Based Water Balance Assessment* (GHD 2025c), and included as **Appendix G.** Results are discussed in **Section 7.3**.

One surface water monitoring station (SW1/MP1) was established to assess surface water and shallow groundwater interactions, while field monitoring events were conducted each month between May and November 2024 to collect manual water levels. Analysis was conducted for water level and water temperature data collected from April 26, 2024, to November 26, 2024. Overall, there was no defined inlet or outlet flow path or active flow observed within the wetland.

Surface water was observed at SW1/MP1 from April to August 2024; however, the wetland area was observed to be partially dry during the September 2024 monitoring event, and entirely dry during the October and November 2024 monitoring events. Surface water level responses to precipitation events were observed at SW1/MP1, especially after large precipitation events. The interaction between the shallow groundwater and surface water over the monitoring periods indicates that a gaining wetland is present, meaning shallow groundwater is discharging into the wetland. As well, no surface runoff was observed leaving the wetland, and water loss was instead from evaporation and transpiration.

In general, surface water and shallow ground water temperatures within the wetland were observed to follow the ambient air temperature, with very slow response time to warming and cooling conditions observed in shallow ground water.

4.2 Vegetation Communities and Flora

4.2.1 Ecological Land Classification

The six vegetation communities were identified on Site during field investigations on June 16, 2022, May 13, 2024, and August 26, 2024 (**Figure 2**). A photographic log of the Site conditions is presented in **Appendix H**.

SWD4-1: Willow Mineral Deciduous Swamp

This community was observed in the southern half of the Site. The community was dominated by black willows (*Salix nigra*) with a subcanopy of silver maple (*Acer saccharinum*), and an understory of red-osier dogwood (*Cornus sericea*), sensitive fern (*Onoclea sensibilis*), and invasive Tatarian honeysuckle (*Lonicera tatarica*).

SAS: Submerged Shallow Aquatic

This wetland community was observed in the southern half of the Site. Species composition includes water plantain (*Alisma* sp.), fowl mannagrass (*Glyceria striata*), enchanter's nightshade (*Circaea lutetiana*) and tufted loosestrife (*Lysimachia thyrsiflora*) on the bordering edges of the SWD4-1.

CUM1-1: Dry – Moist Old Field Meadow

This community was observed in the southeastern portion of the Site. The community was dominated by smooth brome (*Bromus inermis*), perennial rye-grass (*Lolium perenne*), orchard grasses (*Dactylis glomerata*), and other unidentified grasses (*Poaceae ssp.*).

CUT1: Mineral Cultural Thicket

This community was observed in multiple locations of the Site. The communities located in the northern section consisted of primarily of staghorn sumac (*Rhus typhina*), European buckthorn (*Rhamnus cathartica*) and apple tree (*Malus pumila*). Other species identified in lower amounts include Manitoba maple (*Acer negundo*), riverbank grape (*Vitis riparia*), black walnut (*Juglans nigra*), trout lily (*Erythronium americanum*), bur oak (*Quercus macrocarpa*), balsam poplar (*Populus balsamifera*), common lilac (*Syringa sp.*), honey locust (*Gleditsia triacanthos*), American

basswood (*Tilia americana*), common mullein (*Verbascum thapsus*), smooth bedstraw (*Gallium molugo*), common milkweed (*Asclepias syriaca*), wild carrot (*Daucus carota*), Norway maple (*Acer platanoides*), garlic mustard (*Alliaria petiolata*), American elm (*Ulmus americana*), wild cucumber (*Echinosystis lobata*), red-osier dogwood, black willow, and white spruce (*Picea glauca*).

The CUT1 located in the southern limit consisted of unidentified grasses (Poaceae *ssp.*) undergrowth with cluster of shrubs. These included the invasive species European buckthorn and Tartarian honeysuckle.

OAG: Active Agriculture

This community was observed in the north and central portions of the Site and is actively managed. The species composition primarily consisted of planted winter wheat (*Triticum aestivum*) in 2022 and soybeans (*Glycine max*) in 2024.

Hedge: Hedgerow

This community was observed along the boundary of the Site as well as between OAG communities which span much of the central portion of the Site. This community generally consisted of either tree species such as Manitoba maple, Norway maple, black walnut, and honey locust, or herbaceous ruderal species present adjacent the OAG communities such as wild chicory (*Cichorium intybus*), wild carrot, Canada thistle (*Cirsium arvense*), and common ragweed (*Ambrosia artemisiifolia*).

4.2.2 Flora Inventory

Flora inventories were conducted on June 16, 2022, May 13, 2024, and August 26, 2024, in which a total of 106 vascular plant species were detected. A full list of the vegetation recorded during the surveys is provided in **Appendix I**.

SWD4-1: Willow Mineral Deciduous Swamp

In the SWD4-1 community 26 vascular plants were identified to species level during field investigations. Of the species identified, 18 (69 percent) are native and eight (31 percent) are non-native. Of the native species, 16 (89 percent) have an S-Rank of ‘S5’, indicating they are ‘secure’ in the province and two (11 percent) have an S-Rank of ‘S4’, indicating they are ‘apparently secure’ in the province.

Of the 18 native species identified in the SWD4-1 community, all 18 species have Coefficient of Conservatism (CC) values of 0-6, indicating they are tolerant to moderately tolerant of disturbance. No SAR, SCC, or locally rare species were identified during the field investigations.

SAS: Submerged Shallow Aquatic

In the SAS community nine vascular plants were identified to species level during field investigations. Of the species identified, seven (78 percent) are native and two (22 percent) are non-native. Of the native species, all seven (100 percent) have an S-Rank of ‘S5’, indicating they are ‘secure’ in the province.

Of the seven native species identified in the SAS community, six species have Coefficient of Conservatism (CC) values of 0-6, indicating they are tolerant to moderately tolerant of disturbance. Tufted yellow loosestrife (*Lysimachia thyrsiflora*) is the only species to possess a ranking of 7-9 which indicates it has a low tolerance for disturbance. No SAR, SCC, or locally rare species were identified during the field investigations.

CUM1-1: Dry – Moist Old Field Meadow

In the CUM1-1 community 28 vascular plants were identified to species level during field investigations. Of the species identified, nine (32 percent) are native and 19 (68 percent) are non-native. Of the native species, all nine (100 percent) have an S-Rank of ‘S5’, indicating they are ‘secure’ in the province.

Of the nine native species identified in the CUM1-1 community, all nine species have Coefficient of Conservatism (CC) values of 0-6, indicating they are tolerant to moderately tolerant of disturbance. No SAR, SCC, or locally rare species were identified during the field investigations.

CUT1: Mineral Cultural Thicket

In the CUT1 community 50 vascular plants were identified to species level during field investigations. Of the species identified, 26 (52 percent) are native and 24 (48 percent) are non-native. Of the native species, 24 (92 percent) have an S-Rank of 'S5', indicating they are 'secure' in the province and two (8 percent) have an S-Rank of 'S4', indicating they are 'apparently secure' in the province.

Of the 26 native species identified in the CUT1 community, 25 species have Coefficient of Conservatism (CC) values of 0-6, indicating they are tolerant to moderately tolerant of disturbance. Red pine (*Pinus resinosa*) is the only species to possess a ranking of 7-9 which indicates it has a low tolerance for disturbance. No SAR, SCC, or locally rare species were identified during the field investigations.

OAG: Active Agriculture

In the OAG community two vascular plants were identified to species level during field investigations. Of the species identified, zero (0 percent) are native and two (100 percent) are non-native. No SAR, SCC, or locally rare species were identified during the field investigations.

Hedge: Hedgerow

In the Hedge community 47 vascular plants were identified to species level during field investigations. Of the species identified, 17 (36 percent) are native and 30 (64 percent) are non-native. Of the native species, 14 (82 percent) have an S-Rank of 'S5', indicating they are 'secure' in the province; one (6 percent) has an S-Rank of 'S4', indicating it is 'apparently secure' in the province; one (6 percent) has an S-Rank of 'S4?', indicating it is 'apparently secure' in the province but there is uncertainty in this assigned rank; and 1 (6 percent) has an S-Rank of 'S2?', indicating it is 'imperilled' in the province but there is uncertainty in this assigned rank. Honey locust is the species present in this community with an S-Rank of 'S2?'; however, this species is commonly planted outside of its natural range and is a common urban tree.

Of the 17 native species identified in the Hedge community, all 17 species have Coefficient of Conservatism (CC) values of 0-6, indicating they are tolerant to moderately tolerant of disturbance. No SAR, SCC, or locally rare species were identified during the field investigations.

4.2.3 Tree Inventory

A total of 292 trees were inventoried on Site. All of these trees that were observed had their physical characteristics and GPS location recorded. The tree inventory and results are presented in the *Arborist Report* (GHD 2025d; **Appendix J**).

4.3 Wildlife and Wildlife Habitat

4.3.1 Amphibians

Surveys were carried out at two stations in proximity to Site and nearby wetlands (**Figure 2**). Station AMP01 was located in close proximity to the mapped wetland; station AMP02 was located to the north, along the western boundary of the Site. Three additional calling amphibian surveys were conducted in 2024 at the same survey stations and included investigation for potential migration pathways between the Site and wetland to the west of Sideroad 20.

The initial survey was conducted on May 25, 2022. The weather conditions were 13.0 degrees Celsius (°C), with a moderate breeze, and 50-60 percent cloud cover. There was no precipitation while surveying, but the grass was damp at both stations from earlier rainfall. The second survey was conducted on June 16, 2022; weather conditions were 21.0 – 22.6°C, with a slight breeze, no precipitation, and 50 percent cloud cover. The results of the survey are provided in **Table 4.1**.

Table 4.1 2022 amphibian calling survey results

Species	Survey Point AMP01		Survey Point AMP02	
	25-May-2022	16-Jun-2022	25-May-2022	16-Jun-2022
Gray treefrog (*Hyla versicolor*)	A-3 (FC)*	A-3 (FC)*	-	-
Spring peeper (*Pseudacris crucifer*)	-	A-1 (2)	-	-

Notes:

Format of table is "Species detected: Distance Code – Call Level (Abundance)"

Distance: A: Within 50 m of the survey point; B: 50 - 100 m of the survey point; C: Greater than 100 m of the survey point.

Call level: 1: Calls not simultaneous, number of individuals can be accurately counted; 2: Some calls simultaneous, number of individuals can be reliably estimated; 3: Full chorus, calls continuous and overlapping, number of individuals cannot be reliably estimated.

Abundance: Numbers in parentheses indicate estimated abundance of species; FC: full chorus (cannot be estimated).

* One group observed on each side of the survey area (i.e., two groups of that distance/call level/abundance within survey area).

It should be noted that only two of the required three surveys denoted in the Marsh Monitoring Protocol (BSC 2009) were completed due to the timing of project initiation. This resulted in missing the first survey targeting early spring, cooler temperatures. Early breeding species such as western chorus frog (*Pseudacris triseriata*) and wood frog (*Lithobates sylvaticus*), may be present on Site, but were not identified during the two surveys conducted in 2022.

Three additional calling amphibian surveys were conducted in 2024 to supplement the surveys completed in 2022, and to further investigate potential migration pathways between the Site and wetland to the west of Sideroad 20. The initial survey was conducted on April 10, 2024. The weather conditions were 10.0°C, with a slight breeze, no precipitation, and 50 percent cloud cover. The second survey was conducted on April 30, 2024; weather conditions were 11.9°C, with light air movement, no precipitation, and 70 percent cloud cover. The third survey was conducted on June 18, 2024; the weather conditions were 25.0°C, with light air movement, no precipitation, and 20 percent cloud cover. The results of the survey are provided in **Table 4.2.**

Table 4.2 2024 amphibian calling survey results

Species	Survey Point AMP01			Survey Point AMP02		
	10-Apr-2024	30-Apr-2024	18-Jun-2024	10-Apr-2024	30-Apr-2024	18-Jun-2024
American toad (*Anaxyrus americanus*)	-	B-1 (2)	-	-	-	-
Gray treefrog (*Hyla versicolor*)	-	A-1 (2)	-	-	-	-
Northern leopard frog (*Lithobates pipiens*)	A-1 (1)*	A-1 (1)	-	-	-	-
Spring peeper (*Pseudacris crucifer*)	A-2 (1) A-3 (FC)*	A-1 (2) B-1 (2) B-2 (3)	-	A-3 (FC)**	-	-
Wood frog (*Lithobates sylvaticus*)	B-1 (1)	-	-	-	-	-

Notes:

Species	Survey Point AMP01			Survey Point AMP02		
	10-Apr-2024	30-Apr-2024	18-Jun-2024	10-Apr-2024	30-Apr-2024	18-Jun-2024
Format of table is “Species detected: Distance Code – Call Level (Abundance)”						
Distance: A: Within 50 m of the survey point; B: 50 - 100 m of the survey point; C: Greater than 100 m of the survey point.						
Call level: 1: Calls not simultaneous, number of individuals can be accurately counted; 2: Some calls simultaneous, number of individuals can be reliably estimated; 3: Full chorus, calls continuous and overlapping, number of individuals cannot be reliably estimated.						
Abundance: Numbers in parentheses indicate estimated abundance of species; FC: full chorus (cannot be estimated).						
* One group observed on each side of the survey area (i.e., two groups of that distance/call level/abundance within survey area).						
** Group observed very far away from survey point AMP02; likely originating from AMP01.						

4.3.2 Birds

Three breeding bird observation stations were established within the Site (**Figure 2**). In 2022, two rounds of BBS were conducted: on June 2, 2022, during light winds, no cloud cover, and a temperature of 10.0°C, and on June 16, 2022, during light winds, 30 percent cloud cover, and 18.0°C. A total of 23 species were observed during the surveys, including one SAR. Eastern meadowlark (*Sturnella magna*; provincially and federally THR) was detected on June 2 and 16, 2022 and is discussed further in **Section 4.5**. Eastern meadowlark was also observed incidentally during 2024 tree inventory.

On July 4, 2024, an additional BBS survey was conducted during light winds, 30 percent cloud cover, and temperatures of 18.0 – 20.0°C. A total of 24 species were observed during the survey, including one SAR. Barn swallow (*Hirundo rustica*; provincially SC; federally THR) was detected on July 4, 2024, and is discussed further in **Section 4.5**.

Complete results of the breeding bird surveys are presented as **Appendix K**.

4.3.3 Mammals

4.3.3.1 Bat Habitat Surveys

The location of suitable bat maternity roosting habitat, including snags, was identified following a modified methodology of the *MECP Bats & Treed Habitat – Maternity Roost Surveys* protocol (MECP 2022).

Table 4.3 Bat Maternity Roost Survey Results

Cavity Tree ID	Tree Inventory Number	Tree Species	Size (DBH)	Characteristics	Proposed Action
CT1	N/A*	Unknown	40	No bark remaining. Large crack is not sheltered and is likely not suitable for bats	**Remove**
CT2	38	*Malus* sp.	33	10 cm wide opening at bottom hole, length of 1 m, opening at top is around 8 cm wide. May be suitable for bats	**Remove**
CT3	119	Sugar maple	94	Straw like cavity at 2 m which goes up at least 4m the trunk, suitable for bats	**Remove**
CT4	152	Basswood	24.2	Cavity not suitable for bats due to limited protection from weather. Decay class is very low and likely not suitable to be used by bats	**Remove**

Cavity Tree ID	Tree Inventory Number	Tree Species	Size (DBH)	Characteristics	Proposed Action
CT5	172	Basswood	51.2	Cavity 12 cm wide 20 cm long, 5.5 m from ground, Decay class 1. May be suitable for bats	**Remove**
CT6	174	Sugar maple	110	Cavity 3.5m from the ground, 6 cm wide and goes up the trunk interior (unable to discern the distance). Cavity is not sheltered and is likely not suitable for bats	**Remove**
CT7	610	Sugar Maple	64	Offers suitable nesting habitat for birds, not suitable for bats	**Remove**
CT8	N/A**	Unknown	30	Cavity in snag 6-7m from the ground, ideal for birds, depth not suitable for bats	**Preserve**
CT9	114	Sugar Maple	84.1	Large furrow down main trunk not suitable for bats	**Remove**
CT10	N/A*	Basswood	NA*	Cavity not suitable for bats due to limited protection from weather. Decay class is very low and likely not suitable to be used by bats	**Remove**
Notes:					
* Snag was not tagged as part of the Tree Inventory ** Tree not tagged as it is within PSW buffer and is within the vegetation protection zone (VPZ)					

4.3.3.2 Bat Acoustic Surveys

Acoustic surveys were completed using an SM4BAT+ bat detector from Wildlife Acoustics that was deployed from June 1 to June 11, 2024. The location of detector deployment was near Tree 119 and can be found on **Figure 2**. Data recorded by the bat detectors were analyzed by an individual trained in the specialized software. The bat calls recorded during the survey are presented in **Table 3.4**. Complete bat acoustic monitoring results by nightly recording are presented in **Appendix L**. A total of five bat species were recorded; allof which are classified as Endangered under SARA and/or ESA Eastern red bat, hoary bat, and silver-haired bat were recommended by COSEWIC as END in May 2023, but not yet on Schedule 1 (SARA) as of January 2025

Table 4.4 Bat Acoustic Survey Results

Species/Classification	SARA	ESA	Total Number of Vetted Calls	% of Total Vetted Calls
High Frequency (HiF)	N/A	N/A	5	2.5%
Eastern red bat (*Lasiurus borealis*)	END*	END	1	0.5%
Hoary bat (*Lasiurus cinereus*)	END*	END	9	4.4%
Silver-haired bat (*Lasionycteris noctivagans*)	END*	END	23	11.3%
Low Frequency (LoF)	N/A	N/A	79	38.7%
Eastern small-footed myotis (*Myotis leibii*)	—	END	12	5.9%

Species/Classification	SARA	ESA	Total Number of Vetted Calls	% of Total Vetted Calls
Little brown myotis (*Myotis lucifugus*)	END	END	5	2.5%
*Myotis sp**	END	END	27	13.2%
TOTAL	N/A	N/A	204	100%
Notes				
SARA: *Species at Risk Act* (END: Endangered) ESA: *Endangered Species Act* (END: Endangered) *: Recommended by COSEWIC in May 2023, but not on list as of January 2025. —: Not assessed *Myotis sp.**: Identified as a *Myotis sp*. (possible little brown myotis, northern myotis or tri-colored bat), but cannot make determination. These species are listed as END under the SARA and ESA. N/A: Not applicable				

Station 1 recorded a total of 204 separate calls, with 120 of these calls being identified to genus or species; the remaining 84 calls were classified as low frequency or high frequency due to a lack of identification characteristics. Contributing factors to the unidentifiable calls may include vehicles, weather (wind or rain), indistinguishability of calls at certain frequencies, and/or non-bat species such as insects and other small mammals (mice).

A time of night analysis was conducted for all recorded bat calls and is included as **Appendix M**. It was determined that there was a slight increase in call count during the first hour of sunset recordings (i.e. half an hour before sunset to half an hour after sunset). This increase may be indicative of roosting activity in the general local landscape but does not provide evidence to indicate there is a likely roost on site.

4.3.4 Incidental Wildlife

Incidental wildlife observed within the Site during the field investigation are listed in **Table 3.5**. Unidentified mammal burrows were observed during Site visits, and a small unidentified mammal was observed fleeing the area during the May 2022 amphibian survey. A fox carcass was observed in the north end of the Site.

Table 4.5 Wildlife observed within the Site

Species		S-Rank	SARA	ESA
Common Name	**Scientific Name**			
American robin	*Turdus migratorius*	S5B		
Eastern chipmunk	*Tamias striatus*	S5		
Eastern meadowlark	*Sturnella magna*	S4B	THR	THR
Fireflies (Glow-worms)	*Lampyridae sp.*	SNR		
Killdeer	*Charadrius vociferus*	S5B, S5N		
Turkey vulture	*Carthartes aura*	S5B		
Notes:				
SARA: *Species at Risk Act* (THR: Threatened) ESA: *Endangered Species Act* (THR: Threatened) S-Rank (Sub-national Rank): S4: Common in Ontario: apparently secure, usually more than 100 occurrences S5: Very common in Ontario, demonstrably secure B: Breeding confirmed SNR: Species Not Ranked				

4.4 Wetland Staking and Delineation

GHD ecologists certified under OWES flagged the wetland boundary on August 17, 2023, followed by a delineation with GRCA ecologists on September 8, 2023. The wetland is presented on **Figure 2**. This wetland was observed to be partially dry during the September 2024 surface water monitoring event, and entirely dry during the October and November 2024 surface water monitoring events.

A wetland evaluation of the provincially significant Cranberry Oil Well Bog Wetland Complex dated January 1, 2003, under the 3rd edition (provided by the MNR on October 16, 2023) details wetland specifics and scoring for the entire complex. In said evaluation, the presence of significant animal species such as the southern flying squirrel (*Glaucomys volans*), red-shouldered hawk (*Buteo lineatus*), and great egret (*Ardea alba*) are noted within the wetland complex, though these species were not recorded on-Site during field investigations. A significant plant species, white-fringed orchid (*Platanthera blephariglottis*), was similarly noted as present within the wetland complex though not observed on-Site during field investigations. It is anticipated these species are associated with the other wetlands within the complex or are no longer present.

4.5 Species at Risk

GHD evaluated the potential for SAR within the Site through a combination of secondary source review, agency consultation, and field investigations. Twenty nine (29) SAR with the potential to occur at the Site was developed from review of these sources. The full SAR screening, including species habitat requirements and probability of occurrence on-Site, is provided as **Appendix C**.

Of the 29 SAR/SCC identified with the potential to occur at the Site, 13 are ranked as Special Concern under the ESA, or are only listed under SARA *and* are not aquatic species or birds. Therefore, these species are not afforded formal protection and are discussed in **Section 4.6**.

Of the 16 SAR that are ranked as END or THR by the ESA, and therefore afforded protection, eight species were considered to have a low probability of occurrence because there is limited or no habitat available for them, and/or they were not identified during species-specific studies. The remaining eight species that are afforded protection were ranked as having a moderate or high probability to occur on-Site or were observed on-Site:

- Bobolink (*Dolichonyx oryzivorus*) is designated as THR both provincially and federally, is protected under the MBCA, and has a moderate likelihood of occurrence within the Study Area. This species was not observed during any field investigations.
- Eastern meadowlark is designated as THR both provincially and federally and is protected under the MBCA. The species was confirmed on-Site at BBS2 and BBS3 during the BBS on June 2 and June 16, 2022.
- Eastern small-footed myotis is designated as END provincially but is not listed federally, and was confirmed on-Site through acoustic monitoring surveys.
- Little brown myotis is listed as END both provincially and federally and was confirmed on-Site through acoustic monitoring surveys.
- Northern myotis is listed as END both provincially and federally and has a moderate likelihood of occurrence within the Study Area, but was not detected during acoustic monitoring surveys.
- Eastern red bat (*Lasiurus borealis*) is listed as END provincially (recommended by COSEWIC for federal END listing in May 2023, but not on list as of January 2025) and was confirmed on-Site through acoustic monitoring surveys.
- Hoary bat (*Lasiurus cinereus*) is listed as END provincially (recommended by COSEWIC for federal END listing in May 2023, but not on list as of January 2025) was confirmed on-Site through acoustic monitoring surveys.
- Silver-haired bat (*Lasionycteris noctivagans*) is listed as END provincially (recommended by COSEWIC for federal END listing in May 2023, but not on list as of January 2025) was confirmed on-Site through acoustic monitoring surveys.

4.6 Species of Conservation Concern

One species considered SCC was ranked as having a moderate or high probability to occur on-Site and was observed on-Site:

– Barn swallow is designated as SC provincially and THR federally and is protected under the MBCA. This species was confirmed within the Study Area during the BBS on July 4, 2024, and suitable habitat is present on-Site.

The full SAR screening, including species habitat requirements and probability of occurrence on-Site, is provided as **Appendix C**.

5. Significant Natural Heritage Features

Significant natural heritage features include those listed in the PPS (2024), NHRM (MNR 2000), SWH Technical Guide (MNR 2000), and the SWH Criteria Schedules for Ecoregion 6E (MNRF 2015). Reference was also obtained from the natural heritage system from the County OP. The findings of the site investigations were cross-referenced with the criteria provided in these documents in order to identify the presence of or potential presence of significant natural heritage features.

5.1 Woodlands

No woodlands are present on the Site. The SWD is not considered a woodland since it consists of a narrow strip of trees around the SAS.

5.2 Wetlands

One wetland the provincially significant Cranberry Oil Well Bog Wetland Complex) is located on Site. This wetland was delineated with GHD and the GRCA on September 8, 2023 (**Figure 2**). This area is accounted for and will be maintained according to current design drawings.

No other wetlands were identified within the Study Area as confirmed by background sources (Land Information Ontario) and field verification.

5.3 Significant Wildlife Habitat

The assessment of SWH follows the guidelines in the NHRM (OMNR 2010), and criteria from the SWH Criterion Schedule for Ecoregion 6E (MNRF 2015), with support from the SWH Technical Guide (OMNR 2000) as appropriate. There are four categories of SWH:

– Seasonal Concentration Areas of Animals
– Rare Vegetation Communities or Specialized Habitat for Wildlife
– Habitat for Species of Conservation Concern
– Animal Movement Corridors

GHD analyzed the information collected from the ecological communities on-Site using the criteria for Significant Wildlife Habitat in Ecoregion 6E and identified one potential SWH classification within the Site:

– Special Concern and Rare Wildlife Species

Details of this assessment are included in **Table 5.1**.

All others were ruled out due to lack of suitable habitat meeting significance criteria and/or absence of significant species.

Table 5.1 Significant Wildlife Habitat – Candidate and Confirmed as identified within the Significant Wildlife Habitat Technical Guide 6E

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Habitat found on-Site	SWH Analysis / Rationale
		ELC Ecosite	Habitat Criteria and Information Sources	Defining Criteria		
Special Concern and Rare Wildlife Species *Rationale: These species are quite rare or have experienced significant population declines in Ontario*	*All Special Concern and Provincially rare (S1-S3, SH) plant and animal species. Lists of these species are tracked by the Natural Heritage Information Centre.*	*All plant and animal element occurrences (EO) within a 1 or 10km grid.* *Older element occurrences were recorded prior to GPS being available, therefore location information may lack accuracy.*	*When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites lxxviii Information Sources • Natural Heritage Information Centre (NHIC) will have Special Concern and Provincially Rare (S1-S3, SH) species lists with element occurrences data. • NHIC Website "Get Information": http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas • Expert advice should be sought as many of the rare spp. Have little information available about their requirements*	*Studies Confirm:* *Assessment/inventory of the Site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable.* *The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat.* *SWHMiST [cxlix] Index #37 provides development effects and mitigation measures*	*Buildings*	**Candidate:** Potentially suitable habitat for barn swallow nesting is present in the buildings on site. No evidence of nesting was observed during field studies. This should be confirmed should another breeding season occur prior to development.

5.4 Species at Risk

Twenty-nine (29) SAR were identified through background review as having potential to occur within the Study Area. Of these 29 SAR with the potential to occur within the Study Area, 13 are listed as END or THR under the ESA. Eight of these species have a moderate or high likelihood of occurrence within the Study Area, with six species being confirmed on-Site including:

– Eastern meadowlark
– Eastern small-footed myotis
– Little brown myotis
– Eastern red bat
– Hoary bat
– Silver-haired bat

5.5 Species of Conservation Concern

These species do not receive formal protection under the ESA or the SARA; however, populations and habitats of species listed as SC under the ESA may be considered SWH. Onespecies considered SCC (barn swallow) was confirmed on-Site.Additionally. candidate SWH for barn swallowwas noted on-site and is discussed in **Section 5.3**.

6. Description of Development

The proposed development is located on 4631 Side Road 20 North, in the Township of Puslinch, Ontario. The Site Plan dated February7, 2025, illustrates the proposed Site plan footprint and is shown in **Appendix N.** This plan includes five buildings (three industrial, one gym, and one daycare), 894 car parking spaces (including 26 barrier free parking spaces), trailer parking spaces, short term bike spaces, a trail network, a septic field, and a stormwater management pond. The proposed limit of disturbance for the Site is presented on **Figure 3**.

7. Impact Assessment and Mitigation

An impact analysis is a process that considers direct and indirect impacts at both short-term and long-term timelines. This is achieved through characterizing the existing natural environment (**Section 4**) and cross referencing the significant natural heritage features or functions to the proposed development (**Section 5**). Once the potential impacts have been identified, the analysis provides recommended mitigation measures to address identified impacts (including avoidance, enhancement, restoration, and compensation opportunities).

7.1 Vegetation and Wetlands

7.1.1 Potential Impacts

Vegetation would be directly impacted through permanent loss due to construction activities and would be restricted to the footprint of the developments and associated parking lots. This includes removal of approximately 6.14 ha of CUM1-1, 3.29 ha of CUT1, 0.73 ha of Hedge, and 13.03 ha of OAG which totals to 23.2 ha of disturbance.

The southern portion of the Site has been mapped and field verified by the GRCA to contain a PSW (Cranberry Oil Well Bog Wetland Complex). The proposed development does not encroach into the PSW and therefore will not result in a direct impact through community removal (**Figure 2**; **Appendix N**).

Natural communities that could be indirectly affected by the proposed development include the SWD4-1 and SAS communities in the southern portion of the Site. Indirect impacts may include construction phase impacts such as spills or sedimentation if mitigation measures are not followed.

7.1.2 Mitigation

A 30 m protective buffer (Vegetation Protection Zone; VPZ) from the GRCA verified wetland has been recommended to further mitigate any potential impacts to this wetland feature and to the SWD4-1 and SAS communities. Encroachment into the VPZ is not anticipated within the proposed Site plan. The GRCA may also provide recommendations for post-development monitoring programs, where required.

Potential impacts to the wetland as a result of siltation and temporary altered flow from grading works during construction can be mitigated through installation and maintenance of heavy-duty erosion and sediment controls, such as large diameter siltsoxx. Temporary erosion and sediment control (ESC) measures and a stormwater management plan should be implemented to provide short- and long-term controls, respectively. The temporary ESC measures are intended to provide controls for the construction period until the long-term stormwater management measures are in place and fully functional and until exposed areas have established vegetative cover. The temporary ESC measures proposed include the following:

– Implement construction Best Management Practices when handling material to minimize siltation and erosion potential.
– Vegetate disturbed areas with native seeds and plants as soon as practical to reduce erosion potential.
– Installation and maintenance of enhanced erosion and sediment controls. Enhanced heavy duty silt fence with geo-textile-wrapped straw bales or biodegradable coir logs, or large diameter siltsoxx should be included as part of the erosion and sediment control protection measures around the retained wetland.
– Construction phase vehicle fuelling, storage, and maintenance should occur off-site.
– All vehicles and construction machinery are cleaned and maintained as per *Clean Equipment Protocol for Industry* (Halloran et al. 2013) prior to arrival on-site and prior to departing site to prevent the introduction of pollutants or invasive species.
– ESC measures should be kept in place and be routinely inspected, modified as required, and maintained during the construction and vegetation establishment period.
– Areas disturbed by construction should be restored using native vegetation to provide a natural buffer from the development ultimately enhancing the connectivity in the landscape. Planting plans should be reviewed by a qualified ecologist to confirm suitability of species used on Site.

Measures to mitigate impacts to vegetation include the following:

– A qualified ecologist is recommended to be present on-Site during project start-up to participate in the clear delineation of the construction area and flag any high sensitivity areas for avoidance. Staging areas should be kept to a minimum to reduce unnecessary vegetation clearing and situated in existing disturbed areas.
– Site preparation/vegetation clearing to occur outside of the breeding bird window (April 1 to August 31).
– Post-construction planting and landscaping efforts will be timely and include native trees, shrubs, and herbaceous species. This minimizes bare soils and prevents the establishment/spread of invasive plant species.
– An invasive species management plan is recommended to be established to endeavour revegetated areas maintain an appropriate native species composition.
– An *Arborist Report* (GHD 2025d) has been prepared to determine compensation planting required and to identify appropriate measures to protect trees which will be retained.

– The stormwater management plan is recommended to include measures to mitigate impacts to hydrology (i.e., prevent downslope erosion) and maintain water quality.

7.2 Wildlife and Wildlife Habitat

7.2.1 Potential Impacts

Indirect impacts such as equipment noise during construction will likely deter and interrupt wildlife such as small mammals, birds, amphibians, and reptiles. Removal of vegetation may decrease the available nesting habitat for breeding birds and available cover for other wildlife. Proposed design elements may pose threats to bird activity and may increase the probability of window strikes and bird mortalities on-Site.

One provincially THR species, eastern meadowlark, was documented as a probable breeder on-Site. Works associated with the proposed development have the potential to limit habitat and disturb breeding habitat for this species on-Site.

Bat maternity colonies (including for SAR bats) are also a habitat consideration due to the known presence of bats in the area and documented suitable bat trees (**Figure 2**). Surveys to detect the presence of protected bat species were completed and showed that silver-haired bat, hoary bat, and myotis species (including little brown myotis and eastern small-footed myotis) were present within the Site. Given the number of high-quality snags, it is possible that one of these protected species would utilize one or more of these trees for maternity roosting. However, based on the acoustic timing analysis, the data is not sufficient to confirm maternity roosting within candidate cavity trees in the Study Area.

Candidate SWH for SC and rare wildlife species including barn swallow. Barn swallow were not observed using the existing buildings on-Site for nesting during field investigations in 2022-2024. Works associated with the proposed development have the potential to limit nesting habitat for this species on-Site.

7.2.2 Mitigation

The following mitigation measures are recommended to be implemented where relevant to minimize potential impacts to wildlife and wildlife habitat during construction activities:

– Isolate the work area during construction with well-maintained erosion and sediment control measures.
– Wildlife incidentally encountered during construction activities should not be harmed or harassed and should be allowed to move away passively, where possible. Construction traffic and Site contractors should be advised to stop or pause work to allow any encountered wildlife to move passively out of the construction area. A qualified ecologist should be consulted when wildlife does not exit the work area on its own accord to determine if capture and relocation is feasible.
– Clearing, grubbing, and tree removal works should be conducted in a manner to avoid nesting birds, maternity roosting bats, and other wildlife. Vegetation removal should not take place:
    - during the breeding bird nesting season of April 1 to August 31.
    - during the bat maternity season of April 1 to September 30.
– Further mitigation for SAR bats should be developed in advance of construction in consultation with the MECP to avoid contravention of the ESA. It is recommended that Information Gathering Forms are submitted to the MECP to document potential SAR roosting habitat prior to tree removals. Mitigation measures may include a bat box at the limit of the development and woodland area to accommodate for potential bat roost use of the surveyed suitable bat tree that will be removed as part of the proposed development.
– To mitigate the potential impacts to bird activity following construction, new developments are recommended to be constructed according to the Bird Friendly City (City of Hamilton 2024) guidelines to reduce light pollution and make glass less dangerous for birds.

7.3 Groundwater and Surface Water

7.3.1 Potential Impacts

The works associated with the proposed development have the potential for impacts to groundwater through infiltration of contaminants.

Potential impacts to surface water may be due to contaminated runoff and increased sediment. The works associated with the proposed development are not anticipated to be in proximity to the surface water feature (SAS; provincially significant Cranberry Oil Well Bog Wetland Complex). As there are no in-water works anticipated, any potential disturbance is anticipated to be temporary and indirect in nature during construction and would consist of potential impacts to surface water quality from sedimentation or contamination.

7.3.2 Water Balance

Site-specific and feature-based water balance analyses were completed to characterize the impact of the proposed development on groundwater recharge and the on-Site wetland feature in comparison to pre-development conditions, respectively, and to recommend Low Impact Development (LID) control measures to meet pre-development condition infiltration volumes. Detailed results are provided in **Appendix G.**

The assessments included a sub catchment delineation, monthly water balance calculations, and a comparison of predicted infiltration and runoff volumes under pre- and post-development conditions.

Through investigations, a Site-wide infiltration deficit was identified under post-development (uncontrolled) conditions. As such, it was recommended to use LID control measures to capture and infiltrate anticipated increased runoff generated from the proposed industrial and community building rooftops, and outlet treated stormwater to the on-Site wetland. To maintain appropriate water levels and hydroperiod in the on-Site wetland, an overflow structure will be built from the on-Site wetland to the municipal storm-sewer at an appropriate elevation. Details will be developed and confirmed at the Site Plan Application stage.

7.3.3 Other Mitigation

The following mitigation measures are recommended to be implemented where relevant, in order to minimize potential impacts to groundwater and surface water during construction activities:

– The Contractor should implement the erosion and sediment control measures identified in the contract, specifically in OPSS 805 (and 182), and all associated contract drawings.
– All construction-related activities should be controlled so as to prevent entry of any petroleum products, debris or other potential contaminants/deleterious substances (in addition to sediment as outlined above), to the waterbody as outlined in OPSS 805 and in accordance with a Spills Prevention and Emergency Response Plan. The Plan, as well as appropriate emergency response materials, should be kept on site throughout construction and employees made aware of its requirements and response protocols.
– Any temporarily stockpiled soil, debris or other excess materials, and any construction-related materials, should be properly contained (e.g., inside silt fencing) in areas separated at least 30 m from the waterbody in accordance with OPSS 180. Construction materials, excess materials, and debris should be removed and appropriately disposed of following construction.
– No equipment or personnel shall ford or otherwise enter the waterbody.

To accommodate for the anticipated increased runoff during construction, an overflow structure within the on-Site wetland to convey stormwater south to Concession Road 4 will be incorporated during detailed design. The proposed development will adhere to the 30 m VPZ from the on-Site wetland (**Figure 3**, **Appendix N**). Groundwater and surface water inputs to the natural features of the Site (i.e., provincially significant Cranberry Oil Well Bog Wetland Complex) will be maintained in a post-development state.

8. Policy and Legislative Compliance

The following section describes how the proposed development will be in conformance with the relevant federal, provincial and other regulatory legislation, policies, OP's and OP amendments that are applicable and relevant to the Study Area. This assessment of compliance was completed to support the information GHD has been provided.

Table 8.1 Policy Compliance

Applicable Legislation/Policy	Summary of Findings	Policy Compliance
Migratory Bird Convention Act	No migratory birds protected by the MBCA should be impacted as a result of the proposed development. Timing windows to avoid nests and vegetation clearing during the nesting season (April 1 – August 31) will be implemented and adhered to.	Yes
Species at Risk Act	The lands are not federally owned and are not lands recommended by the Minister of the ECCC to the Governor in Council. No federally listed species, aquatic species, or migratory birds protected by the MBCA are anticipated to be impacted as a result of the proposed development as discussed in **Section 6** of this report.	Yes
Fisheries Act	As there is no potential fish habitat on-Site, the Fisheries Act is not applicable to this Site.	N/A
Endangered Species Act	One provincially THR species was observed on-Site, eastern meadowlark. This species was observed displaying evidence of probable breeding on-Site in 2022 and was incidentally observed in 2024. Mitigation measures outlined in **Section 7.2** will limit impacts of the proposed development on breeding habitat for this species. Furthermore, the applicable permit/registration process under the ESA will be adhered to. Provincially END bat species (including eastern small-footed myotis, little brown myotis, eastern red bat, hoary bat, silver-haired bat) were detected on-Site through acoustic monitoring. Mitigation measures, including limiting construction to outside the timing window for bat maternity roosting (April 1 to September 30) outlined in **Section 7.2** will limit impacts to END bat species. Furthermore, consultation with MECP will be carried out to clarify further requirements under the ESA.	Yes
Invasive Species Act	A limited number of invasive species were identified within the Site Limits; however, recommendations in **Section 7.1** will reduce the impacts of invasive species on-Site.	Yes
Grand River Conservation Authority Regulation 41/24	Portions of the Site fall within the GRCA regulation limit and GRCA has confirmed a permit would be required for work within these regulated areas. As such, the Site Plan has been adjusted to avoid GRCA regulated areas and therefore no permit from the GRCA is anticipated to be required.	Yes
Provincial Planning Statement	A 30 m VPZ is to be established around the PSW on-Site to limit development encroachment on this feature. **Section 7** demonstrates that no negative impacts on the PSW are anticipated as a result of the proposed development. Candidate SWH for Special Concern and Rare Wildlife Species was identified on-Site .for barn swallow. It is recommended if another breeding season occurs prior to building demolition that any evidence of nesting of barn swallow on the building be screened and a compensation structure erected if nests are found.	Yes
County of Wellington Official Plan	Core Greenlands and adjacent lands were identified within the Site and Study Area. A 30 m VPZ has been applied (and respected by the Site Plan) to the Core Greenlands (wetlands) on-Site. Section 4.6.3 of the County OP outlines how environmental impact assessments are to be used to evaluate the impacts a proposed development may have on the natural environment and the means by which negative impacts may be reduced or eliminated. As the proposed development encroaches on Core Greenlands and adjacent lands, an EIS is required. The findings of this EIS provide rationale that the limited encroachment to Core Greenlands and adjacent lands complies with the OP.	Yes

Applicable Legislation/Policy	Summary of Findings	Policy Compliance
Township of Puslinch Official Plan	The Township OP operates under the County OP, ceding direction and protection of county resources to the policies within the County OP. As the findings of this EIS comply with the County OP, they also comply with the Township OP.	Yes
Township of Puslinch Zoning By-Law	Required approval from the GRCA for development encroaching into the GRCA regulated area (Core Greenlands, wetland on-Site) has been recommended. In doing so, the proposed development is compliant with the Township Zoning By-Law.	Yes

9. Conclusions

The Site comprises agricultural fields along with vacant sheds, remnants of a former residential dwelling, and barn structure. Mapped Site features include the provincially significant Cranberry Oil Well Bog Complex, GRCA regulation limit, and Provincial Natural Heritage System Area. GHD has reviewed existing natural heritage data and supplemented those findings with field investigations to determine the Natural Heritage Features or Functions of both the Site and adjacent lands. Key features include wetlands and woodlands. A 30 m VPZ has been utilized to support protection of the wetland. The proposed development footprint plans to develop approximately 23.2 ha of land, while maintaining the integrity and ecological function of the PSW present on-Site.

Amphibian call count surveys, breeding bird surveys, tree inventory, SWH assessment, and bat maternity roost surveys and acoustic analysis were completed as part of this EIS. These surveys produced evidence of two SAR on-Site: eastern meadowlark and barn swallow. It was determined there is candidate SWH feature on-Site for barn swallow (buildings) but no evidence of nesting, therefore no confirmation of use. Surveys to confirm presence or absence of nesting on these structures are recommended if demolition does not occur prior to the next breeding season.The confirmed presence of eastern meadowlark with evidence of breeding will warrant activity registration under the ESA for alteration or removal of the southeast grassland habitat. MECP will also be consulted through an IGF to confirm permitting or mitigation requirements for bats.

A certified arborist has prepared an *Arborist Report* to determine compensation planting required and identifies appropriate measures to protect trees that are to be retained (GHD 2025d). Compensation plantings are to provide a no net loss option and the opportunity to enhance the environment on-Site. Identification of and implementation of various timing, planting, and enhancement measures may reasonably be expected to mitigate the loss of natural heritage function from the potential higher density redevelopment of these lands.

This EIS has been prepared for review by the Township, County, and GRCA for approval in advance of any significant activities on-Site. It is GHD's opinion that the proposed development will not result in notable impacts to the natural environment, including associated species, features, or functions. This is primarily because construction activities are largely confined to lands currently used for agriculture and mitigation measures have been developed to reduce potential impacts of construction and the ultimate building configuration.

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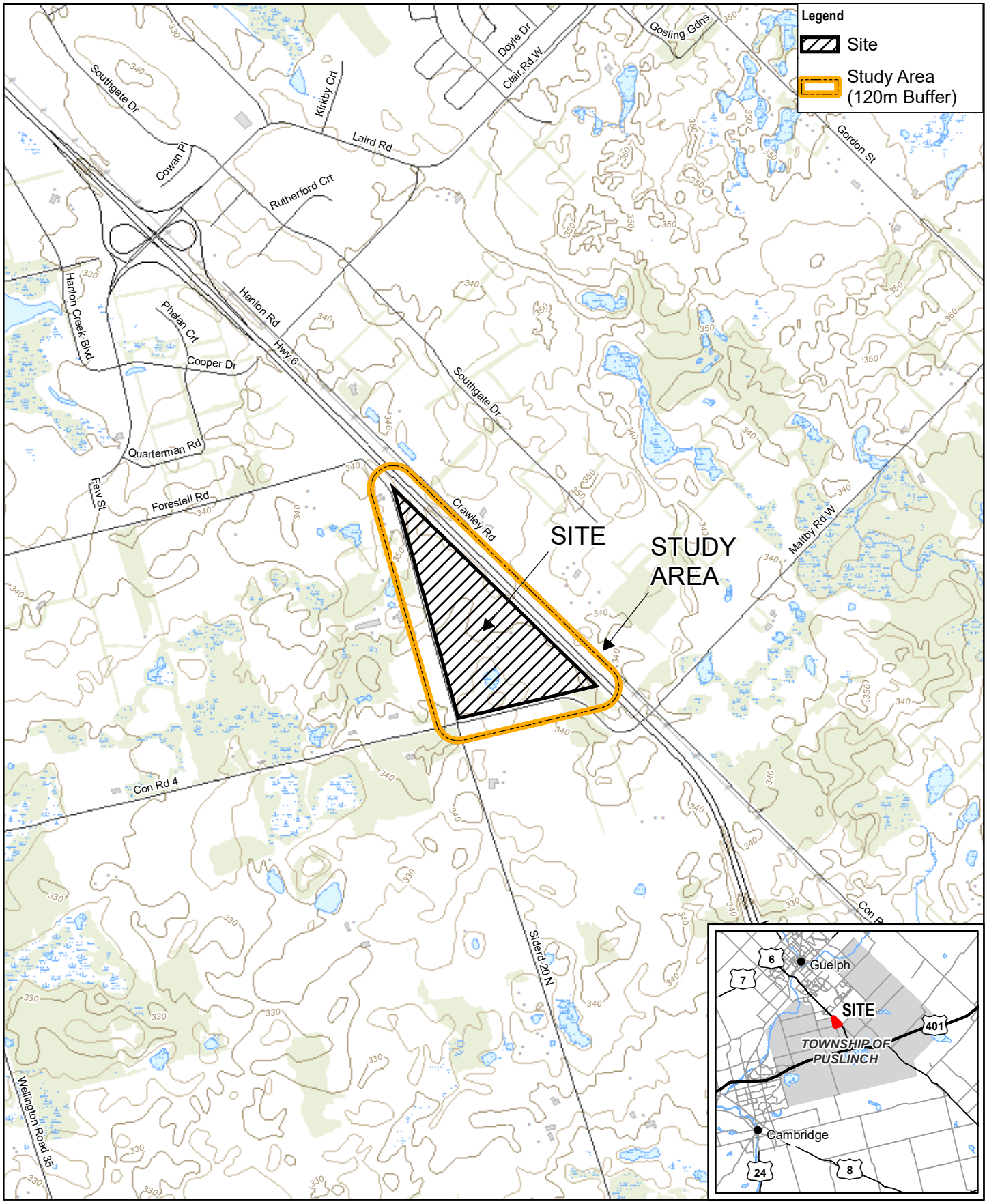
Figures



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Grid: NAD 1983 UTM Zone 17N

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GHD

PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH, PUSLINCH, ON
ENVIRONMENTAL IMPACT STUDY ESTILL INNOVATION COMMUNITY

SITE LOCATION MAP

Project No. **12618927**
Revision No. **-**
Date **Jan 28, 2025**

FIGURE 1

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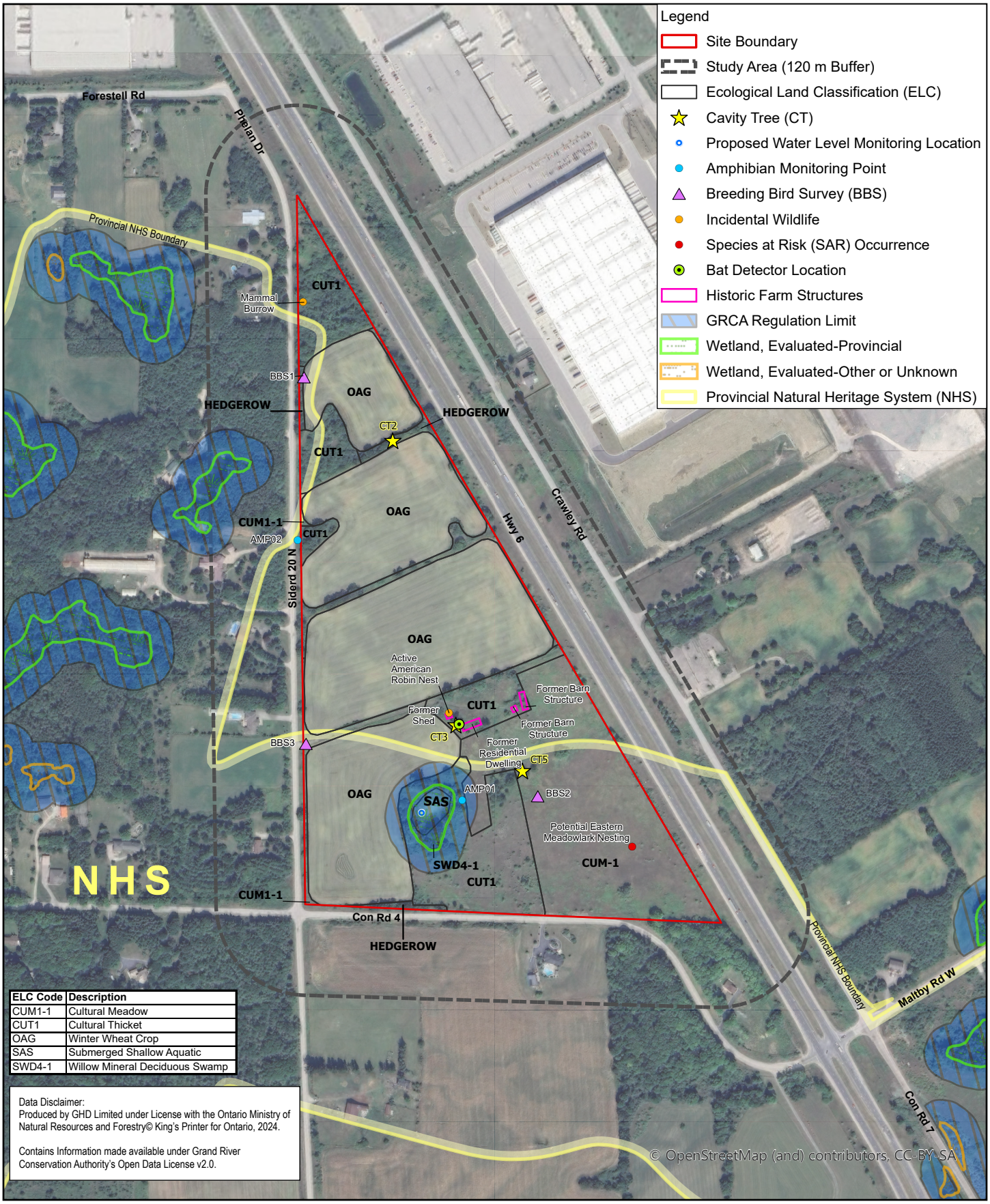
Data source: MNDMNRF NRVIS, 2021. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry. © King's Printer 2025.



ELC Code	Description
CUM1-1	Cultural Meadow
CUT1	Cultural Thicket
OAG	Winter Wheat Crop
SAS	Submerged Shallow Aquatic
SWD4-1	Willow Mineral Deciduous Swamp

Data Disclaimer:
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Contains Information made available under Grand River Conservation Authority's Open Data License v2.0.

Paper Size ANSI A

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

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GHD

PUSLINCH DEVELOPMENT GP INC
4631 SIDEROAD 20 NORTH, PUSLINCH, ON
ENVIRONMENTAL IMPACT STUDY ESTILL INNOVATION COMMUNITY

EXISTING CONDITIONS

Project No. **12618927**
Revision No.
Date **Jan 28, 2025**

FIGURE 2

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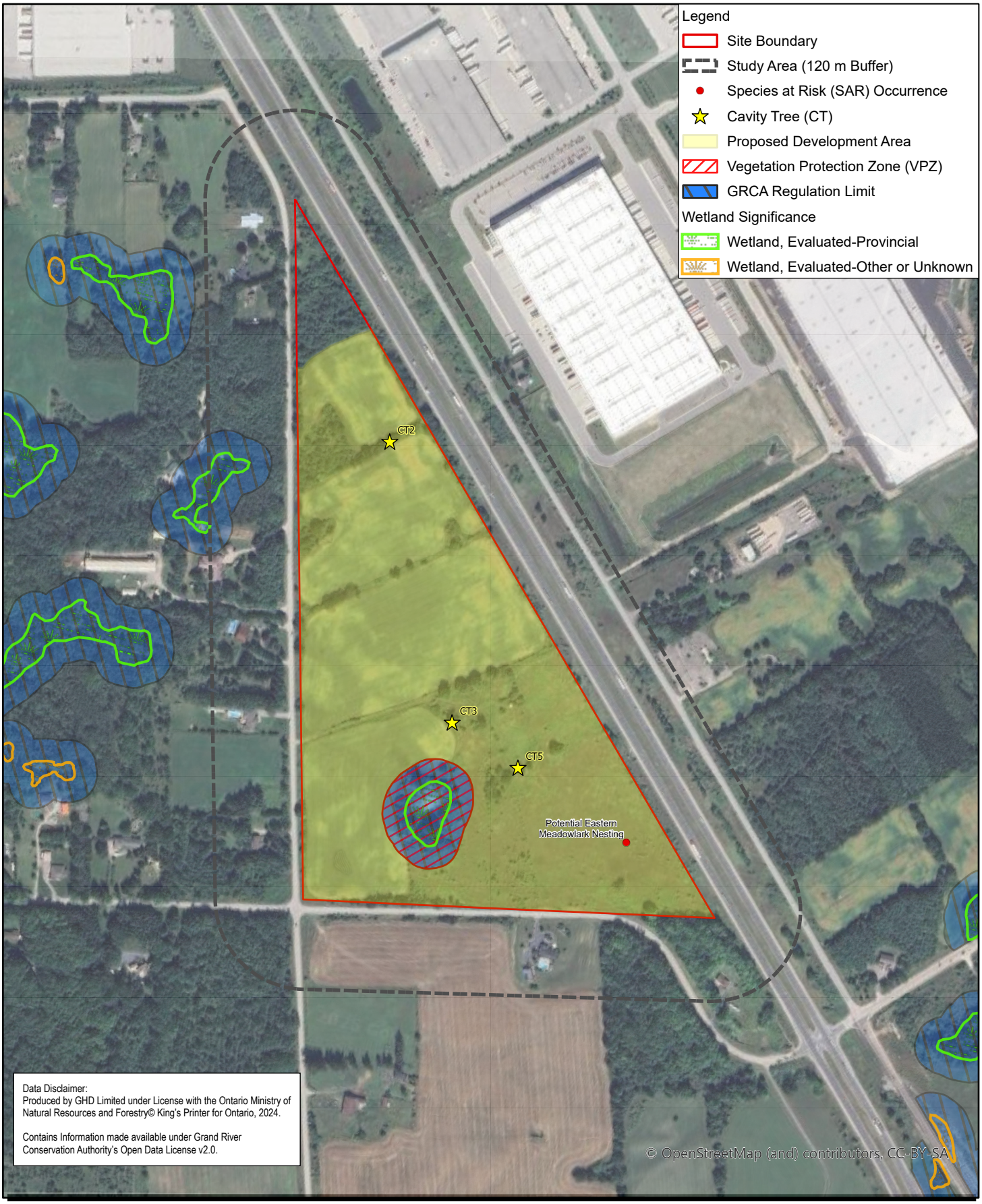

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PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH, PUSLINCH, ON
ENVIRONMENTAL IMPACT STUDY
ESTILL INNOVATION COMMUNITY

PROPOSED DEVELOPMENT AREA AND MITIGATION MEASURES

Project No. **12618927**
Revision No.
Date **Jan 30, 2025**

FIGURE 3

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Appendices

Appendix A

EIS Terms of Reference

Memorandum

06 February 2024

To	Chris Lorenz / Richard Baxter, GRCA Lynne Banks, Township of Puslinch		
Copy to	Jim Estill / Lynda Murray, Danby Products Limited Peter Zytner / Jason Haelzle, GHD		
From	Amy Douglas / Laura Lawlor / Sean Andreou / Sarah Andrew, GHD	**Tel**	+1 519 884 0510
Subject	Environmental Impact Study Terms of Reference, Estill Innovation Community, Township of Puslinch, ON	**Project no.**	12618927-MEM-1

Introduction

This document has been prepared to establish the Terms of Reference (TOR) for a scoped Environmental Impact Study (EIS) for the Site located at 4631 Sideroad 20 North, in the Township of Puslinch, Ontario (Site). This TOR outlines the ecological assessment and associated hydrogeological and surface water assessments in support of the proposed Project.

The Site is approximately 25.5 hectares (63 acres) in size and comprises a former residential dwelling, a shed, and a former barn structure. For the purposes of this TOR and EIS, the Study Area includes the Site and a 120 metre (m) buffer. Natural Heritage Due Diligence (DD) was completed in June 2022 (**Attachment 1**) prior to the client purchasing the property. This TOR has been completed subject to the following:

– Direct consultation (virtual meeting) with the GRCA (August 9 and 29, 2023).
– Comments received via email from the Township of Puslinch (Township) and County of Wellington (County) in response to the Pre-consultation Request (August 21, 2023).
– Comments received via email from the GRCA in response to the draft TOR (September 6, 2023).
– Comments received via email from Aboud & Associates Inc. (via the Township) in response to the draft TOR (November 1, 2023).
– Grand River Conservation Authority (GRCA) EIS Guidelines.

Task 1. Background Review

A preliminary background review was completed during DD and included a search of publicly available secondary source material. Through the completion of the components outlined in the TOR, the background review will be finalised, and agency consultation will occur. Resources accessed will include the Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC) and Land Information Ontario (LIO) databases, GRCA mapping and data, various Ontario wildlife atlases (butterfly, mammals, breeding birds, reptiles and amphibians, etc.), official plan mapping, consultation with Ministry of Environment,

Conservation and Parks (MECP) to request any Species at Risk (SAR) records or natural heritage information, soils and groundwater maps and reports including MECP water well records.

The review of secondary source material will focus on records of significant natural areas and species that could be protected under the *Endangered Species Act* (ESA) or the *Species at Risk Act* (SARA). Elaborating on findings from DD, GHD will further develop the list of SAR with potential to occur on the Site, which will be augmented with field studies described under **Task 3**. The following policies and plans will be consulted for the EIS:

- *Migratory Birds Convention Act*
- *Species at Risk Act*
- *Fisheries Act*
- *Endangered Species Act*
- *Invasive Species Act*
- *Conservation Authorities Act*
  - Grand River Conservation Authority
- Provincial Policy Statement
  - Including Significant Wildlife Habitat (SWH)
- County of Wellington Official Plan
- Growth Plan for the Greater Golden Horseshoe
- Township of Puslinch Official Plan
- Township of Puslinch Zoning

Task 2. Agency Consultation

Grand River Conservation Authority

An initial conference call was carried out with GRCA staff to confirm all parties were understanding of the nature of the proposed works and discuss any comments related to this TOR. It should be noted that the following field surveys had already been completed for this Site with their findings detailed in the DD (**Attachment 1**):

- Ecological Land Classification (ELC) southern Ontario and botanical inventory (June 2022).
- Two rounds of amphibian call count surveys (May and June 2022). Due to the project being awarded later in the season, only two amphibian surveys were completed in accordance with the Marsh Monitoring Protocol (BSC 2009).
- Two rounds of breeding bird surveys (June 2022) in accordance with Ontario Breeding Bird Atlas protocol (Cadman et al. 2007).
- Incidental wildlife recorded during every Site visit.

The Site includes a wetland of approximately 3,650 square metres located in the southern portion of the property. This wetland is part of the provincially significant Cranberry Oil Well Bog Wetland Complex. In advance of conducting the wetland delineation with the GRCA, GHD ecologists certified under the Ontario Wetland Evaluation System (OWES) flagged the wetland boundary on August 17, 2023. This wetland was delineated with GRCA ecologists on September 8, 2023.

Township of Woolwich and County of Wellington

A Pre-consultation Summary was completed by the Township in 2022 and included comments from their ecological peer reviewer, Aboud & Associates Inc., and the County. This was provided to GHD in August 2023 regarding the conformity to applicable legislation.

The Township of Puslinch (and Aboud & Associates Inc.) provided comments on the draft TOR and identified potential knowledge gaps in the completed surveys. These comments have been incorporated in the following sections.

Task 3: Ecological Field Studies

Additional ecological works were confirmed through consultation with the Township of Puslinch (and Aboud & Associates Inc.), as the GRCA were only able to comment on ecological surveys pertaining to the function of the wetland. These surveys, to be conducted and reported in the EIS, include:

- Bat maternity roost surveys conducted during leaf-off in 2024 to determine potential presence of SAR bats.
- Three amphibian call count surveys from April – June 2024 (weather dependent). Will include investigation for potential migration pathways between the Site and the wetland to the west of Sideroad 20 North.
- Tree inventory during leaf-on (2024) and arborist report to provide key health and species data.
- Provisional bat acoustic surveys to be completed in June 2024 to quantify presence of SAR bat species on Site, only to be completed if the previous bat maternity roost surveys indicate suitable roosts to be present.
- One spring and one late-summer 2024 full botanical inventory to compliment the preliminary inventory conducted during DD (June 2022).
- SAR habitat assessment to evaluate if habitat for SAR is present on Site and the probability of species occurrence (including SWH screening and field verification, as needed).
- Grassland bird surveys following eastern meadowlark (*Sturnella magna*; OMNR 2013) and bobolink (*Dolichonyx oryzivorus;* MNRF 2011) methodology within grassland/meadow habitat present on site. Two rounds of breeding bird surveys were completed in 2022; a third was not completed at that time as eastern meadowlark were confirmed. To satisfy the comments from the Township on the draft TOR, one additional grassland breeding bird survey, including transects, will be completed between May 28 and July 7, 2024.

While the Site features a wetland included in the provincially significant Cranberry Oil Well Bog Wetland Complex, the wetland was confirmed to be dry on November 20, 2023. Therefore, the on-Site wetland does not provide suitable turtle overwintering habitat and turtle overwintering surveys will not be conducted.

No targeted field surveys of the 120 m beyond the Site are included in this scope. Field observations for the balance of Study Area beyond the Site limits will be completed from public lands (e.g. public road access only). These will compliment the desktop analysis of features within the broader Study Area.

Task 4: Soils and Groundwater

Available soils and groundwater information, including MECP water well records and geological mapping will be reviewed as part of the background review process. In addition, the following work activities will be completed to determine shallow soil and groundwater conditions:

- Seven groundwater monitoring wells will be installed to depths of up to 10 mBGS during the concurrent geotechnical investigation.
- Hydraulic testing – single well response tests at each monitoring well.
- Groundwater Sample Collection – samples will be collected from two monitoring wells and analyzed for sewer use discharge criteria and selected Provincial Water Quality Objectives.
- Groundwater level monitoring – groundwater levels will be monitored monthly for a 12-month period. Electronic dataloggers will be installed in three wells to record continuous groundwater level data.
- Infiltration testing – the infiltration capacity of the native soils will be tested at six locations using the Guelph Permeameter method – information used for water balance and future septic bed assessment.

– Hydrogeological Assessment report – prepared with sufficient detail to support the planning process and the secure water taking approvals (PTTW or EASR) for construction.

Task 5: Surface Water Assessment

The following surface water monitoring is proposed to understand the interaction between groundwater and the surface water features identified during due diligence conducted during 2022. A total of one (1) wetland surface water monitoring location and one (1) mini-piezometer are proposed as part of the surface water monitoring within the wetland on Site, as presented on **Figure 1**. The surface water monitoring will cover a period of 12 months to capture seasonal conditions.

As part of the surface water monitoring, the following work activities will be completed:

– Install a continuous water level and temperature logger within the wetland in spring 2024. The continuous water level and temperature logger will be set to record surface water levels at a 15-minute interval. The proposed monitoring location is shown on **Figure 1**.
– Install one mini-piezometer equipped with a continuous water level and temperature logger within the wetland in spring 2024. The logger will be set to record shallow groundwater levels at a 15-minute interval to determine surface water/groundwater interaction.
– Survey top of T-bar and substrate at the logger location to determine elevations.
– Download loggers monthly and collect manual water level measurements for a minimum of one year following installation.
– Remove loggers at the end of the monitoring period.
– Prepare a surface water assessment report to summarize the field observations and support the ecological and hydrogeological investigations.

Task 6: Feature-Based Water Balance

The following feature-based water balance assessment is proposed to characterize the hydroperiods of the on-Site wetland feature to support the hydrogeological assessment and the impact assessment as part of the EIS. As part of the feature-based water balance assessment, the following work activities will be completed:

– Complete a preliminary desktop feature-based water balance on a monthly scale for the on-Site wetland feature for two (2) scenarios: existing condition and post-development uncontrolled condition (i.e., without stormwater management [SWM] controls).
– Communications with SWM designer regarding the SWM design and incorporation of low impact development features, if applicable.
– Upon finalization of the SWM design, complete a final desktop feature-based water balance on a monthly scale for the on-Site wetland feature for one (1) scenario: post-development controlled condition (i.e., with SWM controls).
– Summarize findings in a report.

Task 7: Analysis and Reporting

The purpose of the EIS will be to establish the appropriate development limit required for the protection of any significant natural features. The EIS will be prepared in accordance with GRCA and Township of Puslinch EIS

guidelines and will incorporate results of the ecological, hydrogeological, and surface water investigations as they relate to the natural features on the Site.

In addition, the report will address GRCA's consolidated policies issued under Regulation 150/06, as applicable. The EIS will identify how the proposed development complies with applicable policies, recommend mitigation measures and enhancement opportunities based on policy requirements, and will aim to demonstrate how the proposed development will have no negative impact to natural heritage features or their ecological function.

Closing

This TOR has been scoped based on our current knowledge of the existing conditions in the Site and proposed works. We are proceeding with the work plan described above and request any comments, which would alter the scope of work outlined above be provided to us in a timely manner.

Regards,
GHD Limited

[redacted]

Amy Douglas
Ecologist

[redacted]

Laura Lawlor
Senior Ecologist

References

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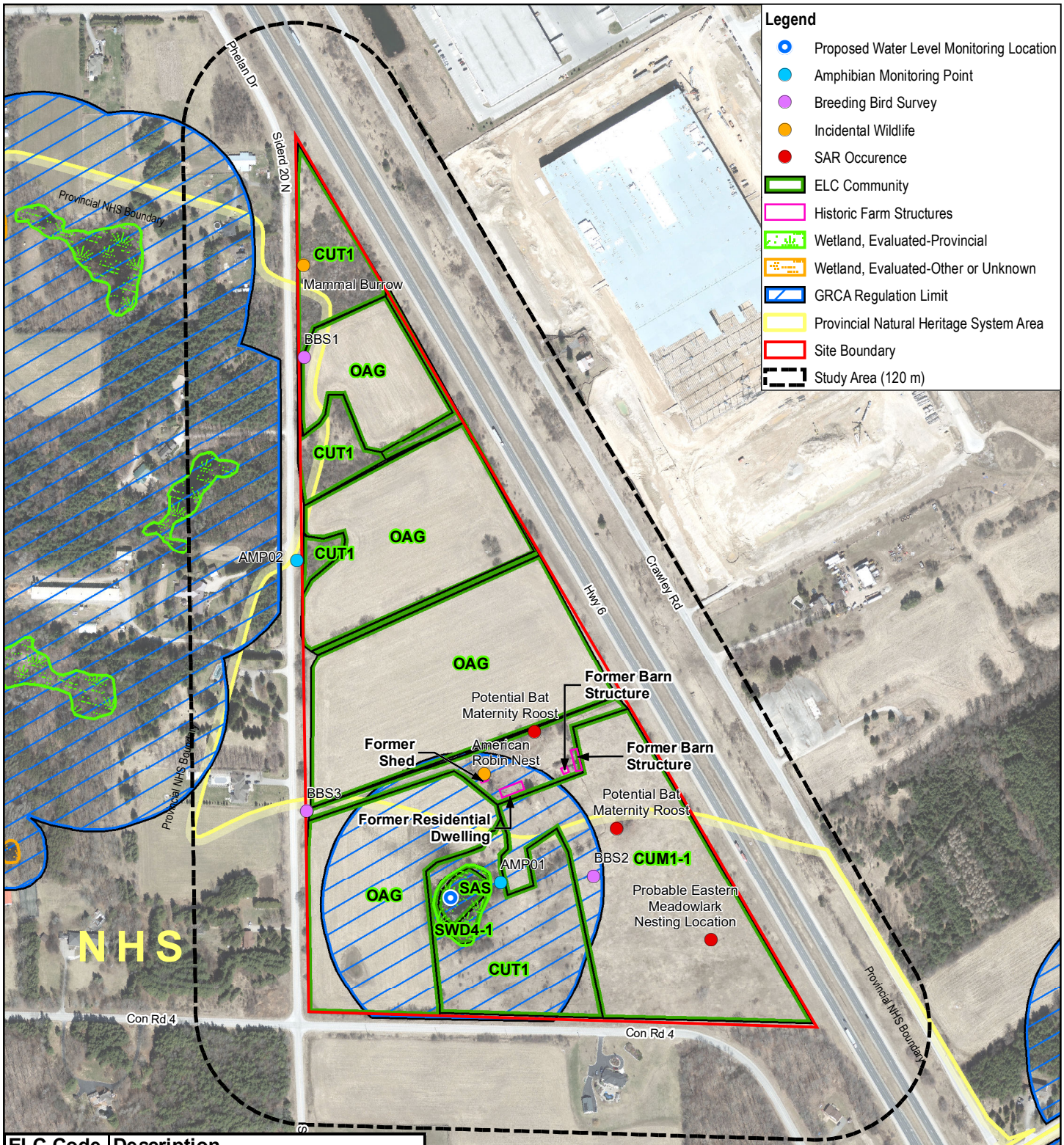
Figures



ELC Code	Description
CUM1-1	Cultural Meadow
CUT1	Cultural Thicket
OAG	Winter Wheat Crop
SAS	Submerged Shallow Aquatic
SWD4-1	Willow Mineral Deciduous Swamp

Data Disclaimer

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Contains Information made available under Grand River Conservation Authority's Open

Paper Size ANSI A

0 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

DANBY PRODUCTS LIMITED
4631 SIDEROAD 20 NORTH, PUSLINCH, ON
TERMS OF REFERENCE

Project No. **12618927**
Revision No.
Date **Nov 14, 2023**

NATURAL HERITAGE

FIGURE 1

Data source: GRCA Open Data Catalog. MNRF NRVIS, 2018.2023. Image: © County of Wellington, 2020.

Attachments

Attachment 1

Natural Heritage Due Diligence

455 Phillip Street, Unit 100A
Waterloo, Ontario N2L 3X2
Canada
www.ghd.com

Our ref: 12581351

June 30, 2022

Mr. Jim Estill
Danby Products Limited
5070 White Law Road
Guelph, Ontario
N1H 6Z9

Estill Innovation Community - Natural Heritage Due Diligence – Intersection of Concession Road 4 and Side Road 20 in Puslinch, Ontario

Dear Mr. Estill,

1. Introduction

GHD Limited (GHD) was retained by Danby Products Limited (Danby) to complete a Natural Heritage Due Diligence Evaluation for the property located in the northeast quadrant of the intersection of Concession Road 4 and Side Road 20 in Puslinch, Ontario (Site).

The Site is approximately 25.5 hectares (63 acres) in size and comprises a former residential dwelling, a shed, and a former barn structure. A Site reconnaissance was completed on May 19, 2022, to provide a preliminary characterization of the Site and natural heritage features associated with it. Based on the seasonal nature of other natural heritage surveys, select wildlife surveys were also completed in May and June 2022 to further characterize the Site features and habitats. GHD understands that the information provided in this letter will inform Danby as to natural heritage considerations should they advance with purchase of the Site.

2. Natural Heritage Characterization

2.1 Background Review

A review of the Natural Heritage Information Centre (NHIC), Ontario Breeding Bird Atlas (OBBA), Ontario insects (Butterflies) and Ontario Reptile and Amphibian Atlas was completed by GHD. A complete screening for Specis at Risk (SAR) identified with the potential to occur within the Site is provided in **Attachment 1**. These SAR are classified into one of four levels of risk (Extirpated [EXT], Endangered [END], Threatened [THR], Special Concern [SC]) under the provincial *Endangered Species Act* (ESA) and the federal *Species at Risk Act* (SARA) (discussed further in **Section 3**).

The background review identified the presence of a wetland on Site that is included in the provincially significant wetland, Cranberry Oil Well Bog Complex.

Correspondence with the Ministry of the Environment, Conservation, and Parks (MECP), the Ministry of Northern Development, Mines, Natural Resources and Forestry (NRF), and the Grand River Conservation Authority (GRCA) have not been completed at this time.

2.2 Ecological Land Classification

The five vegetation communities were identified on Site (**Figure 1**). A photographic log of the Site conditions is presented in **Attachment 2**.

SWD4-1: Willow Mineral Deciduous Swamp

This community was observed in the southern half of the Site. The community was dominated by black willows (*Salix nigra*) with a subcanopy consisting of silver maple (*Acer saccharinum*), and an understory consisting of red-osier dogwood (*Cornus sericea*), sensitive fern (*Onoclea sensibilis*), and Tatarian honeysuckle (*Lonicera tatarica*).

SAS: Submerged Shallow Aquatic

This wetland community was observed in the southern half of the Site. Species composition includes water plantain (*Alisma* sp.), fowl mannagrass (*Glyceria striata*), enchanter's nightshade (*Circaea lutetiana*) and tufted loosestrife (*Lysimachia thyrsiflora*) or the bordering edges of the SWD4-1.

CUM1-1: Cultural Meadow

This community was observed in the southeastern portion of the Site. The community was dominated by smooth brome (*Bromus inermis*), perennial rye-grass (*Lolium perenne*), orchard grasses (*Dactylis glomerata)* and other unidentified grasses (*Poaceae ssp.*). This community was the location where the eastern meadowlark (*Sturnella magna*) was observed probable breeding.

CUT1: Cultural Thicket

This community was observed in multiple locations the northern half of the Site, as well as the southeastern portion of the Site. The communities located in the northern section consisted of primarily of staghorn sumac (*Rhus typhina*), European buckthorn (*Rhamnus cathartica*) and apple tree (*Malus pumila*). Other species identified in lower amounts include Manitoba maple (*Acer negundo*), riverbank grape (*Vitis riparia*), black walnut (*Juglans nigra*), trout lily (*Erythronium americanum*), bur oak (*Quercus macrocarpa*), balsam poplar (*Populus balsamifera*), common lilac (*Syringa sp.*), honey locust (*Gleditsia triacanthos*), American basswood (*Tilia americana*), common mullein (*Verbascum thapsus*), smooth bedstraw (*Cruciata laevipes*), common milkweed (*Asclepias syriaca*), Queen Anne's lace (*Daucus carota*), Norway maple (*Acer platanoides*), garlic mustard (*Alliaria petiolata*), American elm (*Ulmus americana*), wild cucumber (*Cucumis anguria*), red-osier dogwood, black willow, and white spruce (*Picea glauca*).

The CUT1 located in the southern limit consisted of unidentified grasses (*Poaceae ssp.*) undergrowth with cluster of shrubs. These included the invasive species European buckthorn and Tartarian honeysuckle.

OAG: Winter Wheat Crop

This community was observed in the north and central portions of the Site and is actively managed. The species composition primarily consisted of planted winter wheat (*Triticum aestivum*).

2.3 Flora

A high-level floristic investigation identified 48 species within the Site. From the available records that have an S-Rank[1], 26 species have been assessed as S5, indicating they are 'secure' in the province, five are assessed as S4 indicating is it 'apparently secure' in the province. A total of 17 species are identified as not assessed yet.

[1] Provincial (or Subnational) ranks are used by the Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks but consider only those factors within the political boundaries of Ontario.

No flora SAR were identified during the field surveys.

2.4 Calling Amphibian Monitoring

Amphibian calling surveys were conducted according to the Marsh Monitoring Protocol (BSC 2009) and were carried out at two stations in proximity to Site and nearby wetlands (**Figure 1)**. Station AMP01 was located in close proximity to the mapped wetland; station AMP02 was located to the north.

All surveys commenced a half hour after sunset and consisted of listening at each station for three minutes after two minutes of silence. During the survey, the ecologists documented any frogs or toads heard calling and a measure of 1, 2 or 3 for the abundance of each species within 50 metres (m) of the survey point, 50 – 100 m of the survey point, or greater than 100 m of the survey point.

The initial survey was conducted on May 25, 2022. The weather conditions were 13˚C, with a moderate breeze and 50-60% cloud cover. There was no precipitation while surveying, but the grass was damp at both stations from earlier rainfall. The second survey was conducted on June 16, 2022; weather conditions were 21 – 22.6˚C, with a slight breeze, no precipitation and 50% cloud cover. The results of the survey are provided in **Table 2.1**.

Table 1 2022 amphibian calling survey results

Species	Survey Point AMP01		Survey Point AMP02	
	25-May-2022	16-Jun-2022	25-May-2022	16-Jun-2022
Gray treefrog (*Hyla versicolor*)	A-3 (FC)*	A-3 (FC)*	-	-
Spring peeper (*Pseudacris crucifer*)	-	A-1 (2)	-	-

Notes:

Distance:

A: Within 50 m of the survey point; B: 50 - 100 m of the survey point; C: Greater than 100 m of the survey point.

Call level:

1: Calls not simultaneous, number of individuals can be accurately counted; 2: Some calls simultaneous, number of individuals can be reliably estimated; 3: Full chorus, calls continuous and overlapping, number of individuals cannot be reliably estimated.

Abundance:

Numbers in parentheses indicate estimated abundance of species; FC: full chorus (cannot be estimated).

* One group observed on each side of the survey area (i.e., two groups of that distance/call level/abundance within survey area)

It should be noted that only two of the required three surveys denoted in the Marsh Monitoring Protocol (BSC 2009) were completed due to the timing of project initiation. This resulted in missing the first survey targeting early spring, cooler temperatures. Early breeding species such as western chorus frog (*Pseudacris triseriata*) and wood frog (*Lithobates sylvaticus*), may be present on Site, but were not identified during the two surveys conducted.

2.5 Breeding Bird Surveys

Three breeding bird observation stations were established within the Site (**Figure 1**). Point count locations were situated to ensure representation of the predominant habitat types within the Study Area. Incidental species observations, including those of birds, were also collected on all Site visits. Breeding bird surveys were conducted between 5:00 am and 10:00 am during the breeding bird season when most birds are in their territories engaged in breeding activities, in accordance with industry standard protocols. A point count methodology was utilized, where a point count location was surveyed for 5-minutes and all species seen and

heard were recorded. Breeding evidence was recorded to determine if the species was a possible, probable, or confirmed breeder following protocols of the Ontario Breeding Bird Atlas (Cadman et al. 2007).

The stations were surveyed on June 2, 2022, during light winds, no cloud cover, and a temperature of 10 ºC, and on June 16, 2022, during light winds, 30% cloud cover, and 18 ºC. A total of 23 species were observed during the surveys, including one SAR. Eastern meadowlark (*Sturnella magna* [THR]), was detected on June 2 and 16, 2022 and are discussed further in **Section 2.7**. Complete results of the breeding bird surveys are presented as **Attachment 4**.

2.6 Wildlife

Incidental wildlife observed within the Site during the field investigation are listed in **Table 2.2**. One SAR species, eastern meadowlark (*Sturnella magna*), was identified and is discussed further in **Section 2.7**. Unidentified mammal burrows were observed during Site visits, and a small unidentified mammal was observed fleeing the area during the May amphibian survey. A fox carcass was observed in the north end of the Site.

Table 2 Wildlife observed within the Site

Species		S-Rank	ESA	SARA
Common Name	**Scientific Name**			
American robin	*Turdus migratorius*	S5B		
Eastern chipmunk	*Tamias striatus*	S5		
Eastern meadowlark	*Sturnella magna*	S4B	THR	THR
Fireflies (Glow-worms)	*Lampyridae sp.*	SNR		
Killdeer	*Charadrius vociferus*	S5B, S5N		
Turkey vulture	*Carthartes aura*	S5B		

Notes:

SARA: *Species at Risk Act* (THR: Threatened)
ESA: *Endangered Species Act* (THR: Threatened)
S-Rank (Sub-national Rank):
S4: Common in Ontario: apparently secure, usually more than 100 occurrences
S5: Very common in Ontario, demonstrably secure
B: Breeding confirmed
SNR: Species Not Ranked

2.7 Species at Risk

The background review identified 29 SAR species with the potential to occur within the Site and adjacent areas (**Attachment 1**). Thirteen of these species are considered to have a moderate or high likelihood of occurring within the Site.

END species with a moderate potential to occur within the Site include SAR bats (little brown myotis, *Myotis lucifugus*; tri-colored bat, *Perimyotis subflavus*; northern myotis, *Myotis septentrionalis*) and butternut (*Juglans cinerea*). Potential SAR bats habitat are associated with the abandoned buildings and potential tree cavities identified on **Figure 1**. No butternuts were observed during surveys.

Eastern meadowlark (THR) was observed on Site and in suitable habitat as a breeding pair during breeding bird surveys. Other THR species with a moderate potential to occur within the Site include barn swallow (*Hirundo rustica*) and bobolink (*Dolichonyx oryzivorus*).

SC species such as monarch (*Danaus plexippus*), common nighthawk (*Chordeiles minor*), grasshopper sparrow (*Ammodramus savannarum pratensis*), and eastern ribbonsnake (*Thamnophis sauritus*), may use the Site pending suitability of the habitat. However, targeted surveys would be requited to confirm their presence.

Two species (Midland painted turtle, *Chrysemys picta marginata* and milksnake, *Lampropeltis triangulum*) are yet to be assessed and not at risk, respectively, under the ESA; but are currently listed as SC under the SARA.

3. Policies and Plans

The following sections outline the legislation, policies, and regulations relevant to natural heritage features and functions applicable to the Study Area.

3.1 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (MBCA) and *Migratory Birds Regulations* (MBR) protect most species of migratory birds and their nests and eggs. General prohibitions under the MBCA and MBR protect migratory birds, their nests and eggs and prohibit the deposit of harmful substances in waters or areas frequented by them. The MBR includes an additional prohibition against incidental take, defined by Environment and Climate Change Canada (ECCC; 2021) as "*the inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs*". ECCC implements policies and guidelines to protect migratory birds, and guidance on the Environment Canada website is provided to help to minimize the risk of detrimental effects to migratory birds.

3.2 Fisheries Act

Fish and fish habitat is protected under the *Fisheries Act*, which is managed by the Fisheries and Oceans Canada (DFO). The Act and associated guidelines include protections for fish and fish habitat in the form of standards, codes of practice, and guidelines for projects in and near water. DFO works to provide guidance on how to avoid and mitigate impacts to fish and fish habitat and comply with the *Fisheries Act* to avoid causing the death of a fish or harmful alteration, disruption or destruction (HADD) of fish habitat from your work, undertaking or activity. No watercourses or fish habitat were identified on Site; as such, no consideration under the *Fisheries Act* is anticipated.

3.3 Endangered Species Act

The provincial *Endangered Species Act* (ESA) provides protection for provincial Species at Risk (SAR) and their habitats in Ontario. Species are classified into one of four levels of risk (Extirpated [EXT], Endangered [END], Threatened [THR], Special Concern [SC]) through science-based assessment via the Committee on the Status of Species at Risk in Ontario (COSSARO). Species classified as THR or END on the Species at Risk in Ontario (SARO) list are afforded protection under the ESA.

Protection under the ESA prohibits the "*killing, harming, harassing, possessing, buying, selling, trading, leasing or transporting species listed as THR, END or EXT*". The ESA also includes preparation of recovery strategies for species ranked as THR or END, and management plans for those ranked as SC.

Protection for SAR and their habitats are provided under the ESA by restricting activities that may affect them. Where a proposed activity will impact protected species or habitat, changes to timing, location and methods of the proposed activity should be considered, wherever feasible, to avoid impacts to SAR. Where impacts cannot be avoided or mitigated, a permit or authorization process can be entered into. The MECP administers the ESA. The confirmed presence of eastern meadowlark and potential presence of SAR bats will warrant activity registration or a permit under the ESA.

3.4 Invasive Species Act

The provincial *Invasive Species Act* (ISA) sets out rules to prevent and control the spread of invasive species. Species regulated under the ISA pose a risk to Ontario's natural environment and are divided into two classes: prohibited and restricted. It is illegal to import, possess, deposit, release, transport, breed, grow, buy, sell, lease or trade prohibited invasive species, and it is illegal to import, deposit, release, breed, grow, buy, sell, lease or trade restricted invasive species. The ISA is administered by the NRF.

3.5 Conservation Authorities Act

The purpose of the *Conservation Authorities Act* (CAA) is to provide for the organization and delivery of programs and services that further the conservation, restoration, development and management of natural resources in watersheds in Ontario. Conservation authorities are governed by the CAA which is administered by the MECP.

3.5.1 Grand River Conservation Authority

The GRCA is responsible for implementing the CAA, including Section 28(1), and O. Reg 150/06 – Regulations of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses. The wetlands located on Site are part of the Cranberry Oil Well Bog Complex and are within the regulation limit of the GRCA, as are the wetlands of the surrounding lands. As such, a permit will be required from GRCA to proceed with any development within 120 m of the Site wetland.

3.6 Provincial Policy Statement

The Provincial Policy Statement (PPS), enacted May 1, 2020, is the statement of the Ontario government's policies on land use planning. It applies province-wide (in the province of Ontario) and provides provincial policy direction on land use planning. Municipalities use the PPS to develop their official plans and to guide and inform decisions on other planning matters. The PPS is issued under Section 3 of the Planning Act and all decisions affecting land use planning matters `shall be consistent with' the Provincial Policy Statement (MMAH, 2020).

The Site is located within Ecoregion 6E. Portions of Sections 2.1.4, 2.1.5, 2.1.7 and 2.1.8 of the PPS relevant to this project include:

2.1.4 Development and site alteration shall not be permitted in:

a) significant wetlands in Ecoregions 5E, 6E and 7E

2.1.5 Development and site alteration shall not be permitted in:

a) significant wetlands in the Canadian Shield north of Ecoregions 5E, 6E and 7E;

b) significant woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Marys River);

d) significant wildlife habitat;

2.1.7 Development and site alteration shall not be permitted in habitat of endangered species and threatened species, except in accordance with provincial and federal requirements.

2.1.8 Development and site alteration shall not be permitted on adjacent lands to the natural heritage features and areas identified in policies 2.1.4, 2.1.5, and 2.1.6 unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or on their ecological functions.

The Natural Heritage Reference Manual (OMNR 2010) provides guidance for implementation of the natural heritage considerations associated with the PPS. This guidance document addresses the considerations for evaluation of significance of natural features. When one or more of the criteria for Significance of a particular attribute are satisfied, the feature should be considered Significant. Municipal official plans are required to implement these PPS policies in their policies pertaining to natural heritage features.

In the Provincial Policy Statement (2020) wildlife habitat is defined as, "*… areas of the natural environment where plants, animals, and other organisms live, and find adequate amounts of food, water, shelter and space needed to sustain their populations*." These documents also state, "*specific wildlife habitats of concern may include areas where the species concentrate at a vulnerable point in their annual or life cycle; and areas which are important to migratory and non-migratory species*."

Significant wildlife habitat (SWH) often occurs within other natural heritage features and areas covered by Policy 2.1 of the Provincial Policy statement (e.g., significant wetlands). Therefore, it has been suggested that identification and evaluation of significant wildlife habitat is best undertaken after other natural heritage features have been identified (Natural Heritage Reference Manual, 2010).

GHD analysed the Site information using the criteria for Significant Wildlife Habitat in Ecoregion 6E (2015) and identified that candidate SWH may be present on Site as Habitats of Species of Conservation Concern, Bat Maternity Colonies, Reptile Hibernaculum, and Amphibian Breeding Habitat (Wetlands). Further analyses of these candidate designations will be required to confirm presence or determine absence of SWH on Site.

3.7 County of Wellington Official Plan

The County of Wellington (County) Official Plan (OP; as updated June 1, 2022) includes policies related to the natural environment through the conservation and enhancement of the County's sensitive natural areas and native biodiversity, and the promotion of informed stewardship. The Greenlands System includes:

– Wetlands
– Environmentally sensitive areas
– Streams and valley lands
– Ponds, lakes and reservoirs
– Areas of natural and scientific interest
– Woodlands
– Fish and wildlife habitat
– Flood plains and hazardous lands
– Threatened or endangered species

Within the Greenlands System certain areas have greater sensitivity or significance. These areas have additional policies and protections, are identified in the Core Greenlands designations and include:

– Provincially Significant Wetlands
– All other wetlands
– Habitat of endangered or threatened species and fish habitat
– Hazardous lands

According to the OP Schedule A7 Puslinch map, the Site contains Core Greenlands, Secondary Agricultural, and Rural Employment areas. Section 5.4.1 of the OP states "*All wetlands in the County of Wellington are included in the Core Greenlands. Development and site alteration will not be permitted in wetlands which are considered provincially significant.*" The Core Greenlands present on Site are part of the Cranberry Oil Well Bog Complex (PSW). Consideration should be given to the planning criteria and requirements for the Site under this designation.

3.8 Growth Plan for the Greater Golden Horseshoe

A Place to Grow: Growth Plan for the Greater Golden Horseshoe (Growth Plan), came into effect on May 16, 2020, replacing the Growth Plan for the Greater Golden Horseshoe, 2017 (MMAH, 2017). The recent revisions include minor changes to the natural heritage system policies and removing the provincial NHS mapping layers.

The 2020 Growth Plan for the Greater Golden Horseshoe is a long-term plan that works with the Greenbelt Plan, the Oak Ridges Moraine Conservation Plan, and the Niagara Escarpment Plan to provide a framework for growth management in the region (MMAH, 2019).

According to the OP Schedule A7, the Site is located outside of a settlement area. Further evaluation of how the Growth Plan applies to this Site is provided in the draft Planning Review letter (GHD, 2022). Development within the Natural Heritage System in a non-settlement area (Section 4.2.2.3):

a. *new development or site alteration will demonstrate that:*
    i. *there are no negative impacts on key natural heritage features or key hydrologic features or their functions;*
    ii. *connectivity along the system and between key natural heritage features and key hydrologic features located within 240 metres of each other will be maintained or, where possible, enhanced for the movement of native plants and animals across the landscape;*
    iii. *the removal of other natural features not identified as key natural heritage features and key hydrologic features is avoided, where possible. Such features should be incorporated into the planning and design of the proposed use wherever possible;*
    iv. *except for uses described in and governed by the policies in subsection 4.2.8, the disturbed area, including any buildings and structures, will not exceed 25% of the total developable area, and the impervious surface will not exceed 10% of the total developable area;*
    v. *with respect to golf courses, the disturbed area will not exceed 40% of the total developable area; and*
    vi. *at least 30% of the total developable area will remain or be returned to natural self-sustaining vegetation, except where specified in accordance with the policies in subsection 4.2.8; and*
b. *the full range of existing and new agricultural uses, agriculture related uses, on-farm diversified uses, and normal farm practices are permitted. However, new buildings or structures for agricultural uses, agriculture-related uses, or on-farm diversified uses are not subject to policy 4.2.2.3 a), but are subject to the policies in subsections 4.2.3 and 4.2.4.*

Section 4.2.2 of the Growth Plan references the provincial Natural Heritage System mapping prepared by the Province in 2017. Policy 4.2.2.1 states *"A Natural Heritage System for the Growth Plan has been mapped by the Province to support a comprehensive, integrated, and long-term approach to planning for the protection of the region's natural heritage and biodiversity. The Natural Heritage System for the Growth Plan excludes lands within settlement area boundaries that were approved and in effect as of July 1, 2017."* Policy 4.2.2.2 adds *"Municipalities will incorporate the Natural Heritage System for the Growth Plan as an overlay in official plans, and will apply appropriate policies to maintain, restore, or enhance the diversity and connectivity of the system and the long-term ecological or hydrologic functions of the features and areas as set out in the policies in this subsection and the policies in subsections 4.2.3 and 4.2.4."*

While the subject property is not currently designated Natural Heritage in the County OP, the southern portion of the subject property and a small section in the northwest, has been identified and mapped as part of the Provincial Natural Heritage System by the Province.

Growth Plan policy 4.2.2.4 provides additional clarity and reads *"Provincial mapping of the Natural Heritage System for the Growth Plan does not apply until it has been implemented in the applicable upper- or single-tier official plan. Until that time, the policies in this Plan that refer to the Natural Heritage System for the Growth Plan will apply outside settlement areas to the natural heritage systems identified in official plans that were approved and in effect as of July 1, 2017."* Policy 4.2.2.5 adds *"Upper- and single-tier municipalities may refine provincial mapping of the Natural Heritage System for the Growth Plan at the time of initial implementation in their official plans. For upper-tier municipalities, the initial implementation of provincial mapping may be done separately for each lower-tier municipality. After the Natural Heritage System for the Growth Plan has been implemented in official plans, further refinements may only occur through a municipal comprehensive review."*

The Provincial Natural Heritage System mapping itself does not re-designate land within upper-tier official plans such as Wellington County. Applicable to the subject property, the 'Secondary Agricultural' and 'Rural Employment' designations in the County OP still apply. The County commenced its Municipal Comprehensive Review (MCR) in 2019 with an objective to implement relevant provincial plans and policies, including the Provincial Natural Heritage System mapping and the Growth Plan. Based on recent discussions with County staff (outlined in the Planning Review Letter, GHD 2022), it is not anticipated that the subject property would be re-designated to Natural Heritage as part of the County OP Review (MCR) process. However, it is

recommended that the implementation of the Provincial Natural Heritage System mapping through the County MCR process is monitored as applicable to the subject property with an objective for the County to 'refine' the Provincial mapping and exclude the subject property from any future Natural Heritage System in the updated County OP.

4. Summary

The Site comprises agricultural fields along with vacant sheds and barn structure. Mapped Site features include the Cranberry Oil Well Bog Complex provincially significant wetland, GRCA regulation limit, and Provincial Natural Heritage System Area.

It is noted in the County OP that "*Development and site alteration will not be permitted in wetlands which are considered provincially significant"*, which includes the wetland in the southern portion of the Site. Discussions related to this, and to the potential implementation of the Provincial Natural Heritage System Area within the revised County OP is recommended to be conducted with County staff. It is also recommended that the Planning Review letter (GHD, 2022) be consulted for a full scope of potential policy considerations.

Candidate SWH of Habitats of Species of Conservation Concern, Bat Maternity Colonies, Reptile Hibernaculum, and Amphibian Breeding Habitat (Wetlands) were identified. Further analyses of these candidate designations will be required to confirm presence or determine absence of SWH on Site.

The confirmed presence of SAR eastern meadowlark with evidence of breeding will required warrant activity registration under the ESA for alteration or removal of the southeast grassland habitat. Additional in-season surveys to characterize the potential use of the Site and structures by SAR bats will required to inform if and which ESA approval mechanism is applicable. These surveys will further inform if SWH for 'Habitat of Species of Conservation Concern' are present on Site.

Identification of and implementation of various timing, planting and enhancement measures may reasonably be expected to mitigate the loss of natural heritage function from the potential higher density redevelopment of these lands.

Regards,



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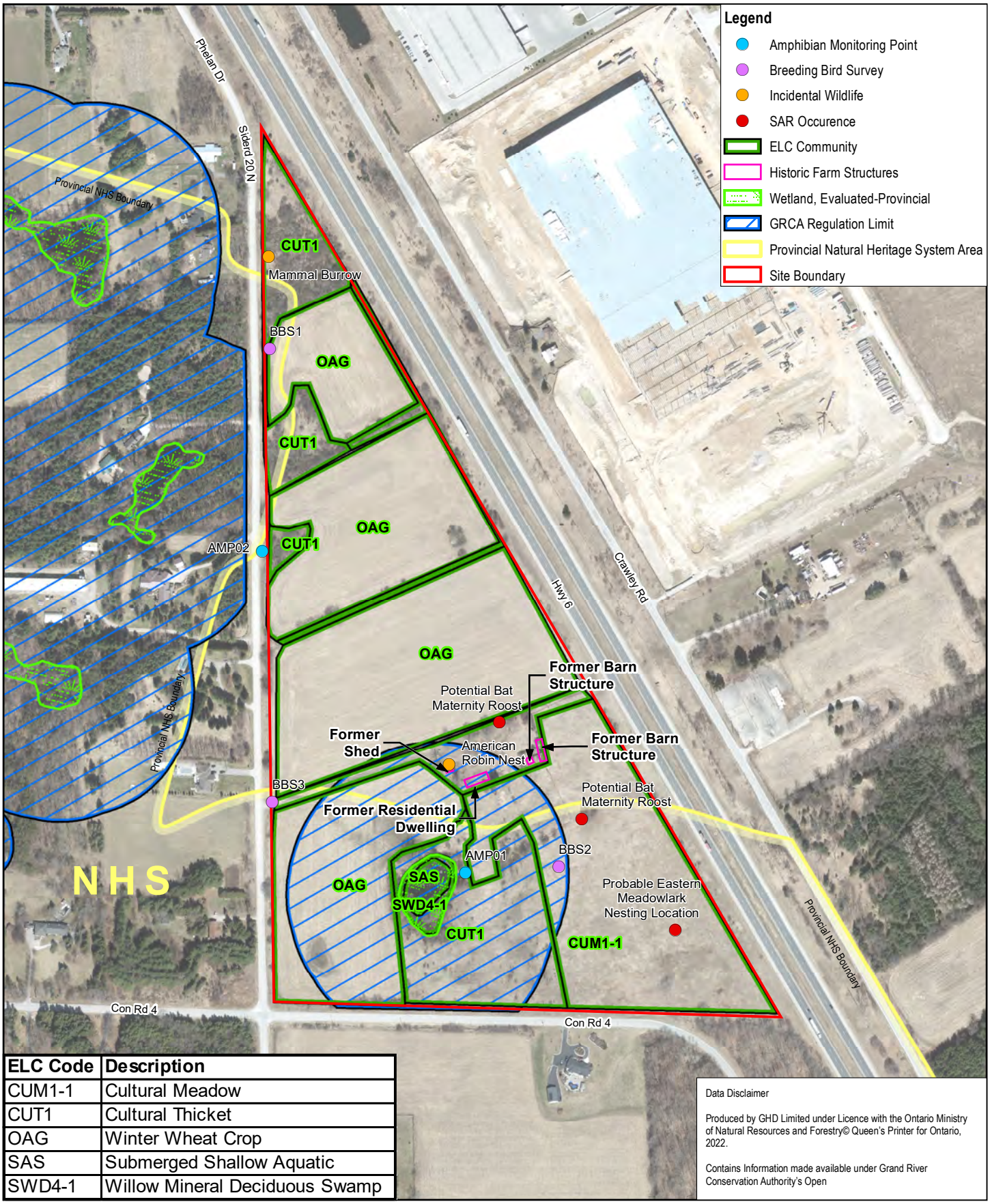

ELC Code	Description
CUM1-1	Cultural Meadow
CUT1	Cultural Thicket
OAG	Winter Wheat Crop
SAS	Submerged Shallow Aquatic
SWD4-1	Willow Mineral Deciduous Swamp

Data Disclaimer

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Contains Information made available under Grand River Conservation Authority's Open

Paper Size ANSI A

0 30 60 90 120

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

DANBY PRODUCTS LIMITED
4631 SIDEROAD 20 NORTH, PUSLINCH, ON
PHASE I ENVIRONMENTAL SITE ASSESSMENT

Project No. **12581351**
Revision No.
Date **Jun 29, 2022**

NATURAL HERITAGE

FIGURE 1

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Print date: 29 Jun 2022 - 19:49

Data source: GRCA Open Data Catalog. MNRF NRVIS, 2018.2022. Image: © County of Wellington, 2020.

Attachments

Attachment 1

Species at Risk Screening

Attachment 1
Species at Risk Screening
Estill Innovation Community - Guelph
12581351

Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence on Site
Amphibians					
Jefferson salamander	*Ambystoma jeffersonianum*	END	END	In Ontario, Jefferson salamander is found only in southern Ontario, along southern portions of the Niagara Escarpment and western portions of the Oak Ridges Moraine. Jefferson salamander prefers moist, well-drained deciduous and mixed forests with a closed canopy. It overwinters underground in mammal burrows and rock fissures, and moves to vernal pools and ephemeral wetlands in the early spring to breed. Breeding ponds are typically located in or near to forested habitats, and contain submerged debris (i.e. sticks, vegetation) for egg attachment sites. Ephemeral breeding pools need to have water until at least mid-summer (mid to late July) (Jefferson Salamander Recovery Team 2010).	Low likelihood of occurrence as no suitable habitat present on Site.
Insects					
American burying beetle	*Nicrophorus americanus*	EXP	EXP	In Ontario, most occurrences of the American burying beetle are reported in the Mixedwood Plains Ecozone (southern Ontario). This terrestrial species is associated with mature, moderately moist forest habitats with an open understory. Well-drained soils that are not easily crumbled nor composed primarily of sand are preferred (COSEWIC 2011).	Low likelihood of occurrence as no suitable habitat present on Site.
Monarch	*Danaus plexippus*	SC	SC	In Ontario, monarch is found throughout the northern and southern regions of the province. This butterfly is found wherever there are milkweed (*Asclepias* spp.) plants for its caterpillars and wildflowers that supply a nectar source for adults. It is often found on abandoned farmland, meadows, open wetlands, prairies and roadsides, but also in city gardens and parks. Important staging areas during migration occur along the north shores of the Great Lakes (COSEWIC 2010).	Moderate likelihood of occurrence due to suitable habitat present on Site.
Birds					
Bank swallow	*Riparia riparia*	THR	THR	In Ontario, the bank swallow breeds in a variety of natural and anthropogenic habitats, including lake bluffs, stream and river banks, sand and gravel pits, and roadcuts. Nests are built in a vertical or near-vertical bank. Breeding sites are typically located near open foraging sites such as rivers, lakes, grasslands, agricultural fields, wetlands and riparian woods. Forested areas are generally avoided (Garrison 1999).	Low likelihood of occurrence as no suitable habitat present on Site.

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Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence on Site
Barn swallow	*Hirundo rustica*	THR	THR	In Ontario, barn swallow breeds in areas that contain a suitable nesting structure, open areas for foraging, and a body of water. This species nests in human made structures including barns, buildings, sheds, bridges, and culverts. Preferred foraging habitat includes grassy fields, pastures, agricultural cropland, lake and river shorelines, cleared right-of-ways, and wetlands (COSEWIC 2011). Mud nests are fastened to vertical walls or built on a ledge underneath an overhang. Suitable nests from previous years are reused (Brown and Brown 1999).	Moderate likelihood of occurrence due to suitable habitat present on Site.
Bobolink	*Dolichonyx oryzivorus*	THR	THR	In Ontario, bobolink breeds in grasslands or graminoid dominated hayfields with tall vegetation (Gabhauer 2007). Bobolink prefers grassland habitat with a forb component and a moderate litter layer. They have low tolerance for presence of woody vegetation and are sensitive to frequent mowing within the breeding season. They are most abundant in established, but regularly maintained, hayfields, but also breed in lightly grazed pastures, old or fallow fields, cultural meadows and newly planted hayfields. Their nest is woven from grasses and forbs. It is built on the ground, in dense vegetation, usually under the cover of one or more forbs (Martin and Gavin 1995).	Moderate likelihood of occurrence due to suitable habitat present on Site.
Canada warbler	*Cardellina canadensis*	THR	SC	In Ontario, breeding habitat for Canada warbler consists of moist mixed forests with a well-developed shrubby understory. This includes low-lying areas such as cedar and alder swamps, and riparian thickets (McLaren 2007). It is also found in densely vegetated regenerating forest openings. Suitable habitat often contains a developed moss layer and an uneven forest floor. Nests are well concealed on or near the ground in dense shrub or fern cover, often in stumps, fallen logs, overhanging stream banks or mossy hummocks (Reitsma et al. 2010).	Low likelihood of occurrence as no suitable habitat present on Site.
Chimney swift	*Chaetura pelagica*	THR	THR	In Ontario, chimney swift breeding habitat is varied and includes urban, suburban, rural and wooded sites. They are most commonly associated with towns and cities with large concentrations of chimneys. Preferred nesting sites are dark, sheltered spots with a vertical surface to which the bird can grip. Unused chimneys are the primary nesting and roosting structure, but other anthropogenic structures and large diameter cavity trees are also used (COSEWIC 2007).	Low likelihood of occurrence as no suitable habitat present on Site.

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Species at Risk Screening
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Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence on Site
Common nighthawk	*Chordeiles minor*	THR	SC	These aerial foragers require areas with large open habitat. This includes farmland, open woodlands, clearcuts, burns, rock outcrops, alvars, bog ferns, prairies, gravel pits and gravel rooftops in cities (Sandilands 2007).	Moderate likelihood of occurrence due to suitable habitat present on Site.
Eastern meadowlark	*Sturnella magna*	THR	THR	In Ontario, the eastern meadowlark breeds in pastures, hayfields, meadows and old fields. Eastern meadowlark prefers moderately tall grasslands with abundant litter cover, high grass proportion, and a forb component (Hull 2003). They prefer well drained sites or slopes, and sites with different cover layers (Roseberry and Klimstra 1970)	High likelihood of occurrence, was observed on Site during breeding bird surveys.
Eastern wood-pewee	*Contopus virens*	SC	SC	The eastern wood-pewee inhabits a wide variety of wooded upland and lowland habitats but is most commonly associated with the mid-canopy of forest clearings, and edge habitat in deciduous and mixed forests. It also occurs in anthropogenic habitats that provide an open forested aspect such as parks and suburban neighborhoods. It prefers intermediate-age mature forest stands with little understory vegetation (COSEWIC 2012).	Low likelihood of occurrence as no suitable habitat present on Site.
Golden-winged warbler	*Vermivora chrysoptera*	THR	SC	In Ontario, golden-winged warbler breeds in regenerating scrub habitat with dense ground cover and a patchwork of shrubs, usually surrounded by forest. Their preferred habitat is characteristic of a successional landscape associated with natural or anthropogenic disturbance such as right-of-ways, and field edges or openings resulting from logging or burning. The nest of the golden-winged warbler is built on the ground at the base of a shrub or leafy plant, often at the shaded edge of the forest or at the edge of a forest opening (Confer et al. 2011).	Low likelihood of occurrence as no suitable habitat present on Site.
Grasshopper sparrow pratensis subspecies	*Ammodramus savannarum (pratensis subspecies)*	SC	SC	In Ontario, grasshopper sparrow is found in medium to large grasslands with low herbaceous cover and few shrubs. It also uses a wide variety of agricultural fields, including cereal crops and pastures. Close-grazed pastures and limestone plains (e.g. Carden and Napanee Plains) support highest density of this bird in the province (COSEWIC 2013).	Moderate likelihood of occurrence due to suitable habitat present on Site.

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Species at Risk Screening
Estill Innovation Community - Guelph
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Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence on Site
Henslow's sparrow	*Ammodramus henslowii*	END	END	In Ontario, Henslow's sparrow breeds in large grasslands with low disturbance, such as lightly grazed and ungrazed pastures, fallow hayfields, grassy swales in open farmland, and wet meadows. Preferred habitat contains tall, dense grass cover, typically over 30 cm high, with a high percentage of ground cover, and a thick mat of dead plant material. Henslow's sparrow generally avoids areas with emergent woody shrubs or trees, and fence lines. Areas of standing water or ephemerally wet patches appear to be important. This species breeds more frequently in patches of habitat greater than 30 ha and preferably greater than 100 ha (COSEWIC 2011).	Low likelihood of occurrence as no suitable habitat present on Site.
Least bittern	*Ixobrychus exilis*	THR	THR	In Ontario, the least bittern breeds in marshes, usually greater than 5 ha, with emergent vegetation, relatively stable water levels and areas of open water. Preferred habitat has water less than 1 m deep (usually 10 – 50 cm). Nests are built in tall stands of dense emergent or woody vegetation (Woodliffe 2007). Clarity of water is important as siltation, turbidity, or excessive eutrophication hinders foraging efficiency (COSEWIC 2009).	Low likelihood of occurrence as no suitable habitat present on Site.
Northern bobwhite	*Colinus virginianus*	END	END	In Ontario, the northern bobwhite breeds in early successional habitats. This species requires a combination of three habitat types: woody cover, cropland and grassland. Croplands provide foraging habitat, grassland and fields are used for nesting, and dense brush provides both winter forage and year round cover. These birds nest on the ground in a shallow depression lined with grasses and other dead vegetation (Brennan 1999). The distribution of native populations are restricted to southwestern Ontario (ECCC, 2018).	Low likelihood of occurrence as no suitable habitat present on Site.
Red-headed woodpecker	*Melanerpes erythrocephalus*	THR	SC	In Ontario, the red-headed woodpecker breeds in open, deciduous woodlands or woodland edges and are often found in parks, cemeteries, golf courses, orchards and savannahs (Woodliffe 2007). They may also breed in forest clearings or open agricultural areas provided that large trees are available for nesting. They prefer forests with little or no understory vegetation. They are often associated with beech or oak forests, beaver ponds and swamp forests where snags are numerous. Nests are excavated in the trunks of large dead trees (Smith et al. 2000).	Low likelihood of occurrence as no suitable habitat present on Site.

Attachment 1
Species at Risk Screening
Estill Innovation Community - Guelph
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Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence on Site
Wood thrush	*Hylocichla mustelina*	THR	SC	In Ontario, wood thrush breeds in moist, deciduous hardwood or mixed stands that are often previously disturbed, with a dense deciduous undergrowth and with tall trees for singing perches. This species selects nesting sites with the following characteristics: lower elevations with trees less than16 m in height, a closed canopy cover (>70 %), a high variety of deciduous tree species, moderate subcanopy and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter (COSEWIC 2012).	Low likelihood of occurrence as no suitable habitat present on Site.
Mammals					
Eastern small-footed myotis	Myotis leibii	—	END	This species is not known to roost within trees, but there is very little known about its roosting habits. The species generally roosts on the ground under rocks, in rock crevices, talus slopes, or rock piles, and occasionally inhabits buildings. Areas near the entrances of caves or abandoned mines may be used for hibernaculum, where the conditions are drafty with low humidity, and may be subfreezing (Humphrey 2017).	Low likelihood of occurrence as no suitable habitat present on Site.
Little brown myotis	*Myotis lucifugus*	END	END	In Ontario, this species range is extensive and covers much of the province. It will roost in both natural and man-made structures. They require a number of large dead trees, in specific stages of decay and that project above the canopy in relatively open areas (Lacki, 2007). May form nursery colonies in the attics of buildings within 1 km of water. Caves or abandoned mines may be used for hibernaculum, but high humidity and stable above freezing temperatures are required.	Moderate likelihood of occurrence due to suitable habitat present on Site.
Tri-colored bat	*Perimyotis subflavus*	END	END	In Ontario, tri-colored bat may roost in foliage, in clumps of old leaves, hanging moss or squirrel nests. They are occasionally found in buildings although there are no records of this in Canada (Poissant et al, 2010). They typically feed over aquatic areas with an affinity to large-bodied water and will likely roost in close proximity to these. Hibernation sites are found deep within caves or mines in areas of relatively warm temperatures. These bats have strong roost fidelity to their winter hibernation sites and may choose the exact same spot in a cave or mine from year to year.	Moderate likelihood of occurrence due to suitable habitat present on Site.

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Species at Risk Screening
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Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence on Site
Northern myotis	*Myotis septentrionalis*	END	END	In Ontario, this species range is extensive and covers much of the province. It will usually roost in hollows, crevices, and under loose bark of mature trees. Roosts may be established in the main trunk or a large branch of either living or dead trees. Caves or abandoned mines may be used for hibernaculum, but high humidity and stable above freezing temperatures are required (COSSARO 2012).	Moderate likelihood of occurrence due to suitable habitat present on Site.
Reptiles					
Blanding's turtle - Great Lakes/St.Lawrence population	*Emydoidea blandingii*	THR	THR	In Ontario, Blanding's turtle will use a range of aquatic habitats, but favor those with shallow, standing or slow-moving water, rich nutrient levels, organic substrates and abundant aquatic vegetation. They will use rivers, but prefer slow-moving currents and are likely only transients in this type of habitat. This species is known to travel great distances over land in the spring in order to reach nesting sites, which can include dry conifer or mixed forests, partially vegetated fields, and roadsides. Suitable nesting substrates include organic soils, sands, gravel and cobble. They hibernate underwater and infrequently under debris close to water bodies (COSEWIC 2005).	Low likelihood of occurrence as no suitable habitat present on Site.
Eastern ribbonsnake - (Great Lakes population)	*Thamnophis sauritus*	SC	SC	In Ontario, eastern ribbonsnake is semi-aquatic, and is rarely found far from shallow ponds, marshes, bogs, streams or swamps bordered by dense vegetation. They prefer sunny locations and bask in low shrub branches. Hibernation occurs in mammal burrows, rock fissures or even ant mounds (COSEWIC 2012).	Moderate likelihood of occurrence due to suitable habitat present on Site.
Midland painted turtle	*Chrysemys picta marginata*	SC	To be assessed	Painted Turtles occupy slow moving, relatively shallow and well-vegetated wetlands (e.g., swamps, marshes, ponds, fens, bogs, and oxbows) and water bodies (e.g., lakes, rivers, creeks, and streams) with abundant basking sites and organic substrate. The species is semi-tolerant of human-altered landscapes and may occasionally be found occupying urban ponds and lands subject to anthropogenic disturbance (e.g., farm ponds, impoundments, water treatment facilities) (COSEWIC 2018).	Moderate likelihood of occurrence due to suitable habitat present on Site.
Milksnake	*Lampropeltis triangulum*	SC	NAR	In Ontario, milksnake uses a wide range of habitats including prairies, pastures, hayfields, wetlands and various forest types, and is well-known in rural areas where it frequents older buildings. Proximity to water and cover enhances habitat suitability. Hibernation takes place in mammal burrows, hollow logs, gravel or soil banks, and old foundations (COSEWIC 2014).	Moderate likelihood of occurrence due to suitable habitat present on Site.

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Species at Risk Screening
Estill Innovation Community - Guelph
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Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence on Site
Northern map turtle	*Graptemys geographica*	SC	SC	In Ontario, the northern map turtle prefers large waterbodies with slow-moving currents, soft substrates, and abundant aquatic vegetation. Ideal stretches of shoreline contain suitable basking sites, such as rocks and logs. Along Lakes Erie and Ontario, this species occurs in marsh habitat and undeveloped shorelines. It is also found in small to large rivers with slow to moderate flow. Hibernation takes place in soft substrates under deep water (COSEWIC 2012).	Low likelihood of occurrence as no suitable habitat present on Site.
Snapping turtle	*Chelydra serpentina*	SC	SC	In Ontario, snapping turtle utilizes a wide range of waterbodies, but shows preference for areas with shallow, slow-moving water, soft substrates and dense aquatic vegetation. Hibernation takes place in soft substrates under water. Nesting sites consist of sand or gravel banks along waterways or roadways (COSEWIC 2008).	Low likelihood of occurrence as no suitable habitat present on Site.
Vascular Plants					
Butternut	*Juglans cinerea*	END	END	In Ontario, butternut is found along stream banks, on wooded valley slopes, and in deciduous and mixed forests. It is commonly associated with beech, maple, oak and hickory (Voss and Reznicek 2012). Butternut prefers moist, fertile, well-drained soils, but can also be found in rocky limestone soils. This species is shade intolerant (Farrar 1995).	Moderate likelihood of occurrence due to suitable habitat present on Site.

1 *Species at Risk Act* (SARA), 2002. Schedule 1; Part 1 (Extirpated), Part 2 (Endangered), Part 3 (Threatened), Part 4 (Special Concern)
2 *Endangered Species Act* (ESA), 2007. Schedule 1 (Extirpated - EXP), Schedule 2 (Endangered - END), Schedule 3 (Threatened - THR), Schedule 4 (Special Concern - SC)

Attachment 2

Photographic Log



Photo 1 Interface between the CUT1 and OAG communities; looking east.



Photo 2 Abandoned shed structures on Site surrounded by grasses and shrubs.

Photographic Log



Photo 3 Photo of the barn structures that remains on Site. No bird nests evident.



Photo 4 CUM1-1 meadow in the south portion of the Site; looking north.



Photo 5 Looking across the Site OAG community, toward the southwest.



Photo 6 View of CUM1-1 field in the approximate location where the eastern meadowlark was observed calling on June 2, 2022; looking south. European buckthorn shrubs can be seen on right side of image.



Photo 7 SAS wetland community and the surrounding SWD4-1 community.



Photo 8 Pictured is one of the isolated CUT1 that is present along the west side of the Site near Side Road 20.

Attachment 3

Vascular Plant List

Attachment 3
Preliminary Plant List
Estill Innovation Community - Guelph
12581351

Scientific Name	Common Name	Coefficient of Conservatism (CC)	Wetness Index	Weediness Index	Provincial Status (S-Rank)	ESA Status	SARA Status	Local Status Wellington Dufferin Riley 1989
Onocleaceae	**Sensitive Fern Family**							
Onoclea sensibilis	Sensitive Fern	4	-3		S5			X
Pinaceae	**Pine Family**							
Picea glauca	White Spruce	6	3		S5			X
Anacardiaceae	**Cashew Family**							
Rhus typhina	Staghorn Sumac	1	5		S5			X
Apiaceae	**Carrot Family**							
Daucus carota	Wild Carrot		5	-2	SNA			X
Apocynaceae	**Milkweed Family**							
Asclepias syriaca	Common Milkweed	0	5		S5			X
Asteraceae	**Aster Family**							
Achillea millefolium	Common Yarrow		3	-1	SNA			X
Ambrosia artemisiifolia	Common Ragweed	0	3		S5			X
Hieracium vulgatum	Common Hawkweed		5	-1	SNA			X
Solidago altissima var. altissima	Tall Goldenrod	1	3		S5			X
Solidago canadensis	Canada Goldenrod	1	3		S5			X
Boraginaceae	**Borage Family**							
Echium vulgare	Common Viper's Bugloss		5	-2	SNA			X
Brassicaceae	**Mustard Family**							
Alliaria petiolata	Garlic Mustard		0	-3	SNA			
Caprifoliaceae	**Honeysuckle Family**							
Lonicera canadensis	Canada Fly Honeysuckle	6	3		S5			X
Lonicera tatarica	Tartarian Honeysuckle		3	-3	SNA			X
Cornaceae	**Dogwood Family**							
Cornus stolonifera	Red-Osier Dogwood	2	-3		S5			X
Cucurbitaceae	**Gourd Family**							
Echinocystis lobata	Wild Cucumber	3	-2		S5			X
Desmodium canadense	Canada Tick-Trefoil	5	1		S4			X
Fagaceae	**Beech Family**							
Quercus macrocarpa	Burr Oak	5	1		S5			X
Juglandaceae	**Walnut Family**							
Juglans nigra	Black Walnut	5	3		S4?			X
Malvaceae	**Mallow Family**							
Tilia americana	Basswood	4	3		S5			X
Oleaceae	**Olive Family**							
Fraxinus americana	White Ash	4	3		S4			X
Syringa vulgaris	Common Lilac		5	-2	SNA			X
Onagraceae	**Evening-Primrose Family**							
Circaea canadensis ssp. canadensis	Canada Enchanter's Nightshade	3	3		S5			X
Plantaginaceae	**Plantain Family**							
Plantago lanceolata	English Plantain		3	-1	SNA			X
Plantago major	Common Plantain		3	-1	SNA			X
Primulaceae	**Primrose Family**							
Lysimachia thyrsiflora	Tufted Yellow Loosestrife	7	-5		S5			X
Rhamnaceae	**Buckthorn Family**							
Frangula alnus	Glossy Buckthorn		0	-3	SNA			X
Rosaceae	**Rose Family**							
Geum laciniatum	Rough Avens	4	-3		S4			X
Geum urbanum	Wood Avens		5	-1	SNA			
Malus pumila	Common Apple		5	-1	SNA			X

Attachment 3
Preliminary Plant List
Estill Innovation Community - Guelph
12581351

Prunus virginiana var. virginiana	Chokecherry	2	1		S5			X
Rubus idaeus ssp. strigosus	North American Red Raspberry	0	-2		S5			X
Galium mollugo	Smooth Bedstraw		5	-2	SNA			X
Salicaceae	**Willow Family**							
Populus balsamifera	Balsam Poplar	4	-3		S5			X
Populus tremuloides	Trembling Aspen	2	0		S5			X
Salix nigra	Black Willow	6	-5		S4			
Sapindaceae	**Maple Family**							
Acer negundo	Manitoba Maple	0	-2		S5			X
Acer platanoides	Norway Maple		5	-3	SNA			X
Acer saccharinum	Silver Maple	5	-3		S5			X
Acer saccharum	Sugar Maple	4	3		S5			X
Ulmaceae	**Elm Family**							
Ulmus americana	White Elm	3	-2		S5			X
Vitaceae	**Grape Family**							
Vitis riparia	Riverbank Grape	0	-2		S5			X
Liliaceae	**Lily Family**							
Erythronium americanum ssp. americanum	Yellow Trout Lily	5	5		S5			X
Poaceae	**Grass Family**							
Bromus inermis	Smooth Brome		5	-3	SNA			X
Dactylis glomerata	Orchard Grass		3	-1	SNA			X
Glyceria striata	Fowl Mannagrass	3	-5		S5			X
Phalaris arundinacea var. arundinacea	Reed Canary Grass	0	-3		S5			X
Phleum pratense ssp. pratense	Common Timothy		3	-1	SNA			X

Notes

Co-efficient of Conservatism, Wetness & Weediness

Oldham, M.J., W.D. Bakowsky and D.A. Sutherland. 1995. Floristic quality assessment for southern Ontario. OMNR, Natural Heritage Information Centre, Peterborough. 68 pp.

Co-efficient of Conservatism: This value, ranging from 0 (low) to 10 (high), is based on a species tolerance of disturbance and fidelity to a specific habitat integrity.

Weediness Index: This value, ranging from -1 (low) to -3 (high) quantifies the potential invasiveness of non-native plants. In combination with the percentage of non-native plants, it can be used as an indicator of disturbance

Wetness Index: This value, ranging from -5 (obligate wetland) to 5 (upland) provides the probability of a species occurring in wetland or upland habitats

FACW (Facultative Wetland): usually occurs in wetlands, but occasionally found in non-wetlands (estimated 67-99% probability)
FAC (Facultative): equally likely to occur in wetlands or non-wetlands (estimated 34-66% probability)
FACU (Facultative Upland): occasionally occurs in wetlands, but usually occurs in non-wetlands (estimated 1-33% probability)
UPL (Upland): occurs almost never in wetlands under natural conditions (estimated <1% probability)
Further refinement of the Facultative categories are denoted by a "+" or "-" to express exaggerated tendencies for those species. The "+" denotes a greater estimated probability occurring in wetlands than species in the general indicator category, but a lesser probability than species occurring in the next higher category. The "-" denotes a lesser estimated probability of occurring in wetlands than species in the general indicator category, but a greater probability than species occurring in the next lower general category.

Each wetland category has been assigned a numerical value to facilitate the quantification of the wetness index. The wetland categories and their corresponding values are as follows:
OBL : -5
FACW+: -4
FACW: -3
FACW-: -2
FAC+: -1
FAC: 0
FAC-: 1
FACU+: 2
FACU: 3
FACU-: 4
UPL: 5

Provincial Status S Rank

Natural Heritage Information Centre (NHIC). (2020) Provincial status of plants, wildlife and vegetation communities database. http://www.mnr.gov.on.ca/MNR/nhic/nhic.html. OMNR, Peterborough.

Provincial ranks are used by the NHIC to set protection priorities for rare species and natural communities. Provincial ranks are used by the NHIC to set protection priorities for rare species and natural communities. These rankings are based on the total number of extant Ontario populations and the degree to which they are potentially or actively threatened with destruction. These ranks are not legal designations. S4 and S5 species are generally uncommon to common in the province. Species ranked S1-S3 are considered to be rare in Ontario.

S4: Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.

S5: Secure - Common, widespread, and abundant in the nation or state/province.

SH: Possibly Extirpated (Historical)—Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.

SNA: Unranked — Status not assigned.

"**?**" following a rank indicates uncertainty about the assigned rank.

Q: Questionable taxonomy —Taxonomic distinctiveness of this entity is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation status.

ESA Status

Endangered Species Act (ESA), 2007. Extirpated - EXP, Endangered - END, Threatened - THR, Special Concern - SC

SARA Status

Species at Risk Act (SARA), 2002. Extirpated - EXP, Endangered - END, Threatened - THR, Special Concern - SC

Attachment 4

Breeding Bird Survey Results

Attachment 4
Breeding Bird Survey Results
Estill Innovation Community - Guelph
12581351

Species		Species at Risk Ontario (SARO)	Species at Risk Act (SARA)	June 2, 2022	June 16, 2022
Common Name	**Scientific Name**				
BBS 1					
American goldfinch	*Spinus tristis*			P:S	P:S
American robin	*Turdus migratorius*			O:X	P:S
Black-capped chickadee	*Poecile atricapillus*			P:S	
Common grackle	*Quiscalus quiscula*			PR:P	P:H
European starling	*Sturnus vulgaris*			P:H	PR:P
Field sparrow	*Spizella pusilla*				P:S
Indigo bunting	*Passerina cyanea*				P:S
Northern cardinal	*Cardinalis cardinalis*			P:S	P:S
Northern flicker	*Colaptes auratus*			P:S	
Red-winged blackbird	*Agelaius phoeniceus*			O:X	
Song sparrow	*Melospiza melodia*			P:S	P:S
Turkey vulture	*Cathartes aura*			O:X	
BBS 2					
American goldfinch	*Spinus tristis*			O:X	O:X
American robin	*Turdus migratorius*			O:X	P:S
Balitmore oriole	*Icterus galbula*			P:S	P:S
Common yellowthroat	*Geothlypis trichas*			P:S	
Eastern kingbird	*Tyrannus tyrannus*			P:S	P:S
Eastern meadowlark	***Sturnella magna***	**THR**	**THR**	**P:S**	**PR:A**
European starling	*Sturnus vulgaris*			PR:P	
Gray catbird	*Dumetella carolinensis*			P:S	P:S
Mallard	*Anas platyrhynchos*			PR:V	
Red-winged blackbird	*Agelaius phoeniceus*			PR:P	
Song sparrow	*Melospiza melodia*			P:S	
Tree swallow	*Tachycineta bicolor*			O:X	
Turkey vulture	*Cathartes aura*			O:X	
BBS 3					
American crow	*Corvus brachyrhynchos*			O:X	
American goldfinch	*Spinus tristis*			O:X	P:H
American robin	*Turdus migratorius*			P:S	PR:V
Baltimore oriole	*Icterus galbula*				P:S
Brown-headed cowbird	*Molothrus ater*			O:X	
Eastern meadowlark	***Sturnella magna***	**THR**	**THR**	**P:H**	
European starling	*Sturnus vulgaris*			O:X	P:H
Gray catbird	*Dumetella carolinensis*			P:S	
Indigo bunting	*Passerina cyanea*			P:S	P:S
Red-winged blackbird	*Agelaius phoeniceus*			O:X	
Savannah sparrow	*Passerculus sandwichensis*			P:S	
Turkey vulture	*Cathartes aura*			O:X	O:X

Notes:

All species listed were observed within the Study Area unless otherwise noted, if species listed are not documented in a point count they were incidentally observed during other field investigations.

All species listed were identified by song/vocalizations unless otherwise noted.

O: Species observed ('X': observed during breeding season but no evidence of breeding)

P: Possible breeding ('S': singing male present; 'H': species observed in breeding season in suitable nesting habitat)

PR: Probable breeding ('P': Pair observed; 'T': Permanent territory presumed through territorial behaviour on both visits; 'D': Courtship or display; 'V': visiting probable nest site; 'A': Agitated behaviour or anxiety calls of an adult; 'B': Brood Patch; 'N': Nest-building)

C: Confirmed breeding ('DD': Distraction display; 'NU': Used nest or eggshells found; 'FY': Recently fledged young; 'AE': Adult leaving or entering nest site; 'FS': Adult carrying fecal sac; 'CF': adult carrying food for young; 'NE': Nest with eggs; 'NY': Nest with young)

Capital letters: Observed within standardized bird survey time

Lower case: Observed outside of standardized bird survey time

*: Observed outside the Study Area

Endangered Species Act (ESA), 2007. Species at Risk in Ontario (SARO) List, 2007 (O.Reg 230/08); Schedule 1 (Extirpated - EXP), Schedule 2 *Species at Risk Act (SARA), 2002. Extirpated - EXP, Endangered - END, Threatened - THR, Special Concern - SC*

Appendix B

Agency Correspondence

Amy Douglas

From: Chris Lorenz <clorenz@grandriver.ca>
Sent: Thursday, October 19, 2023 2:22 PM
To: Amy Douglas
Cc: Simon Chute; Keenan Shelly; Jason Caldwell; Richard Baxter
Subject: RE: Natural Heritage Information Request - Puslinch

Some people who received this message don't often get email from clorenz@grandriver.ca. Learn why this is important

Good afternoon Amy,

Please find background information for the subject property below. We recommend contacting the MNRF for PSW evaluation information.

Thanks Amy. Please let me know if you have any questions,

Chris

1. There are no watercourses or fish habitat features on or adjacent to the site.
2. Species of concern with records nearby include:
    - Eastern Meadowlark (*Sturnella magna*)
    - Bobolink (*Dolichonyx oryzivorus*)
    - Snapping Turtle (*Chelydra serpentina*)
    - Midland Painted Turtle (*Chrysemys picta marginata*)
3. A unit of the Cranberry Oil Well Bog Provincially Significant Wetland (PSW) Complex is located in the south end of the property.
4. No ANSIs within 120 m of study area.
5. No mapped wildlife habitat values within 120 m of the study area.
6. Majority of the property provides a high groundwater recharge function.
7. The site has a moderately high water table.

Chris Lorenz, M.Sc.
Resource Planner
Grand River Conservation Authority
519-621-2763 ext. 2236

From: Amy Douglas <Amy.Douglas@ghd.com>
Sent: Monday, October 16, 2023 8:25 AM
To: Chris Lorenz <clorenz@grandriver.ca>; Richard Baxter <rbaxter@grandriver.ca>
Cc: Simon Chute <Simon.Chute@ghd.com>; Keenan Shelly <Keenan.Shelly@ghd.com>; Jason Caldwell <Jason.Caldwell@ghd.com>
Subject: Natural Heritage Information Request - Puslinch

Good morning Chris and Richard,
Hope this email finds you both well.
Sending through our standard background information request for the proposed Estill Innovation Community. Please pass on to the appropriate people as needed.

GHD has been retained by Danby Products Limited to complete a scoped Environmental Impact Study for their property located in the northeast quadrant of the intersection of Concession Road 4 and Side Road 20 in the Township of Puslinch, Ontario. The property is approximately 25.5 hectares (63 acres) in size and comprises a former residential dwelling, a shed, and a former barn structure. Due diligence was completed by GHD during 2022 and

provided preliminary characterization of the Site and natural heritage features associated with it. Danby has since purchased the Site, now requiring the completion of a scoped EIS. Please find mapping of the Study Area below.



In support of this project, GHD will be conducting natural environment assessments within the Study Area. A background review of publicly available information pertaining to natural heritage features present within the Study Area has been completed. We have identified records for the following features within the vicinity of our Study Area:

- Cranberry Oil Well Bog Wetland Complex

We are seeking any additional natural heritage information, wetland evaluation reports, and general wildlife or aquatic information/studies that GRCA has available to complete our assessments.

Please let us know if you have any questions or require further information. We look forward to your response to our request.

Thank you,

Amy Douglas
[she/her]

M.Sc.
Team Lead (Natural Resources Waterloo)
Ecologist / Project Manager

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Amy Douglas

From: Amy Douglas
Sent: Tuesday, February 6, 2024 12:19 PM
To: Richard Baxter; Chris Lorenz; Lynne Banks
Cc: Peter Zytner; Jason Haelzle; Jim Estill; Lynda Murray; Rob Wigood
Subject: Estill Innovation Community - Final TOR
Attachments: 12618927-MEM-1-TOR Estill Innovation Community Puslinch.pdf

Good afternoon Lynne, Richard, and Chris,
Please find attached our finalised Environmental Impact Study Terms of Reference for the Estill Innovation Community for your records.
Thank you for your comments.

Amy Douglas
[she/her]

M.Sc.
Team Lead (Natural Resources Waterloo)
Ecologist / Project Manager

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Amy Douglas

From: Chris Lorenz <clorenz@grandriver.ca>
Sent: Wednesday, September 6, 2023 10:46 AM
To: Amy Douglas
Cc: Laura Lawlor; Sarah Andrew; Sean Andreou; Peter Zytner; Jason Haelzle; jestill@danby.com
Subject: RE: Estill Innovation Community - Draft TOR

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Good morning Amy,

GRCA offer the following comments for the submitted TOR:

1. Distances from the proposed limit of development to the confirmed wetland boundary, as well as setbacks, should be included on site plan/construction drawings at detailed design. It should be indicated that these wetland boundaries have been confirmed by GRCA staff, and on which date.
2. Assessment of hydrologic impacts should include a water balance study for the wetland feature present. Water balance study protocols, hydroperiod resolution (e.g. monthly), and proposed mitigations should be scoped to the sensitivity of the wetland and the scale of the development's potential impacts to site perviousness. Discussion of proposed stormwater management as it relates to the water balance of the wetland should be integrated into the EIS appropriately. Additionally, potential impacts that site grading, construction and dewatering activities may have on groundwater and surface flow towards the adjacent wetland should be assessed.
3. The finalized Terms of Reference should be included in the Appendices of the EIS.

Thanks Amy. If you have any questions, please let me know.

Chris

Chris Lorenz, M.Sc.
Resource Planner
Grand River Conservation Authority
519-621-2763 ext. 2236

From: Amy Douglas <Amy.Douglas@ghd.com>
Sent: Tuesday, August 29, 2023 11:55 AM
To: Chris Lorenz <clorenz@grandriver.ca>; Richard Baxter <rbaxter@grandriver.ca>
Cc: Laura Lawlor <Laura.Lawlor@ghd.com>; Sarah Andrew <Sarah.Andrew@ghd.com>; Sean Andreou <Sean.Andreou@ghd.com>; Peter Zytner <Peter.Zytner@ghd.com>; Jason Haelzle <Jason.Haelzle@ghd.com>; jestill@danby.com
Subject: Estill Innovation Community - Draft TOR

Hi Chris and Richard,
Apologies for the delay in getting this draft Terms of Reference out for your review prior to this afternoon's discussion.

Looking forward to discussing at 1pm.

Amy Douglas
[she/her]

M.Sc.
Natural Resources Team Lead (Waterloo)
Ecologist / Project Manager

Please note I am on vacation from September 14 - 25.
I will be working reduced hours from September 26 to October 6.

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Amy Douglas

From: Species at Risk (MECP) <SAROntario@ontario.ca>
Sent: Monday, October 16, 2023 4:44 PM
To: Amy Douglas; Species at Risk (MECP)
Cc: Keenan Shelly; Simon Chute; Jason Caldwell
Subject: RE: SAR Information Request - Puslinch
Attachments: DRAFT-Clients Guide to SAR Screening-May 2019.pdf

Hello Amy,

Thank you for your submission to the Ministry of the Environment, Conservation and Parks (MECP) about species at risk (SAR).

MECP is responsible for the administration of the *Endangered Species Act, 2007* (ESA) (Endangered Species Act, 2007, S.O. 2007, c. 6 (ontario.ca)). The ESA provides for the protection and recovery of species on the Species at Risk in Ontario (SARO) List (O. Reg. 230/08: SPECIES AT RISK IN ONTARIO LIST). The ESA includes prohibitions against killing, harming, harassing, capturing or taking a living member of a species listed as extirpated, endangered, or threatened on the SARO List (section 9) and against damaging or destroying the habitat of a species listed as endangered or threatened on the SARO List (section 10), without an exemption or authorization.

Seeking an ESA authorization or exemption is a proponent-led process. **This means that the person carrying out an activity is responsible for determining whether SAR and their habitat are present on or around the site of the activity, and ultimately ensuring their actions do not contravene the ESA**.

For information about assessing which SAR may be present on or in the area of your site, please refer to the MECP's draft "Client's Guide to Screening for Species at Risk" (attached).

You may proceed with the screening on your own or you may wish to consider hiring a qualified professional to perform a screening on your behalf. MECP recommends that the services of a professional environmental consultant be retained to assist in the completion of a screening, field assessments and surveys. An environmental consultant will be able to provide advice and direction on the type of surveys that should be performed and will be able to interpret the results of any surveys carried out.

If after carrying out a thorough SAR screening, including any field assessments and surveys that might be necessary, there is **no evidence of SAR or SAR habitat located on or adjacent to the site of your activity** and your activity will therefore not cause any prohibited impacts, an exemption or authorization under the ESA would not be necessary to proceed. The ministry strongly recommends that you document your SAR screening and assessment and rationale for avoiding prohibited impacts for future reference if needed. Proponents are responsible for ensuring their actions do not contravene the ESA.

If there IS evidence of species a risk and/or habitat on or around the location of your activity, the ministry recommends that you carry out the work necessary to prepare an Information Gathering Form (IGF). This includes consideration of all the elements in your SAR screening data collection and further levels of assessment of impacts and potential to minimize adverse effects.

After considering all the data and information in the IGF, if you have determined that the activity can be carried out in such a way that you WILL NOT have adverse impacts prohibited by sections

9 and/or 10 of the ESA, an exemption or authorization under the ESA would not be necessary to proceed if the activity is carried out in that way. Again, proponents are responsible for ensuring their actions do not contravene the ESA.

If after considering all the data and information in the IGF you have determined that the proposed activities COULD POTENTIALLY have adverse impacts prohibited by sections 9 and/or 10 of the ESA, an exemption or authorization may likely be required before you proceed. If there is no applicable exemption in regulations under the ESA, submit the IGF to the ministry at SAROntario@ontario.ca to seek a permit or agreement. Please visit How to get an Endangered Species Act permit or authorization | ontario.ca to obtain information on how to get an ESA permit or authorization.

Please consider in your project planning that it takes an average of 12-15 months from the submission of a complete IGF to a decision about a permit, if one is needed. This considers the time required to conduct the technical review of the application as well as to carry out public and Indigenous consultation, along with factors such as project complexity, seasonal nature of field survey and data collection required, volume of applications and quality of submissions. It is recommended that proponents submit a complete IGF well in advance of the activity's proposed start date. Failure to submit a complete and accurate IGF with supporting rationale and not allowing adequate time for review and the issuance of any required authorizations could result in delays to the activity's anticipated start date.

Thank you,

Species at Risk Branch

From: Amy Douglas <Amy.Douglas@ghd.com>
Sent: October 16, 2023 8:25 AM
To: Species at Risk (MECP) <SAROntario@ontario.ca>
Cc: Keenan Shelly <Keenan.Shelly@ghd.com>; Simon Chute <Simon.Chute@ghd.com>; Jason Caldwell <Jason.Caldwell@ghd.com>
Subject: SAR Information Request - Puslinch

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Good morning,

GHD has been retained by Danby Products Limited to complete a scoped Environmental Impact Study for their property located in the northeast quadrant of the intersection of Concession Road 4 and Side Road 20 in the Township of Puslinch, Ontario. The property is approximately 25.5 hectares (63 acres) in size and comprises a former residential dwelling, a shed, and a former barn structure. Due diligence was completed by GHD during 2022 and provided preliminary characterization of the Site and natural heritage features associated with it. Danby has since purchased the Site, now requiring the completion of a scoped EIS. Please find mapping of the Study Area below.



In support of this project, GHD will be conducting natural environment assessments within the Study Area. A background review of publicly available information pertaining to Species at Risk (SAR) occurrences has been completed and we have identified records for the following SAR within the vicinity of our Study Area:

- Western chorus frog (Great Lakes St. Lawrence/Canadian Shield Population)
- American burying beetle
- Monarch
- Bank swallow
- Bobolink
- Eastern meadowlark
- Eastern wood-pewee
- Grasshopper sparrow (pratensis subspecies)
- Wood thrush
- Eastern red bat
- Eastern small-footed myotis
- Hoary bat
- Little brown myotis
- Northern myotis
- Silver-haired bat
- Tri-colored bat
- Eastern milksnake
- Eastern ribbonsnake (Great Lakes population)
- Midland painted turtle

- Snapping turtle
- Butternut

We are seeking any additional SAR information that MECP has available to complete our assessments.

Please let us know if you have any questions or require further information. We look forward to your response to our request.

Thank you,

Amy Douglas
[she/her]

M.Sc.
Team Lead (Natural Resources Waterloo)
Ecologist / Project Manager

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Amy Douglas

From: Amy Douglas
Sent: Monday, October 16, 2023 2:38 PM
To: Denyes, David (MNRF)
Cc: Scientific Collection Permits Guelph (MNRF); Jason Caldwell; Keenan Shelly; Simon Chute
Subject: RE: Natural Heritage Information Request - Puslinch
Attachments: Cranberry Oil Well Bog.pdf

Hi David,
Thank you very much for your prompt reply and for the wetland evaluation. We have also reached out to the MECP and the GRCA for information.
Have a wonderful day!

Amy Douglas
[she/her]

M.Sc.
Team Lead (Natural Resources Waterloo)
Ecologist / Project Manager

Please note I am on vacation October 19-20, 2023.

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From: Denyes, David (MNRF) <David.Denyes@ontario.ca>
Sent: Monday, October 16, 2023 2:35 PM
To: Amy Douglas <Amy.Douglas@ghd.com>
Cc: Scientific Collection Permits Guelph (MNRF) <scp.guelph@ontario.ca>
Subject: RE: Natural Heritage Information Request - Puslinch

Hello Amy,

Thank you for your request for information on natural heritage features.

Absence or lack of information for a given geographic area does not necessarily mean the absence of natural heritage features. Many areas in Ontario have never been surveyed and new plant and animal species records are still being discovered for many localities. In addition, new species may be listed and new natural heritage features may be defined over time. For these reasons, the Ministry cannot provide a definitive statement on the presence, absence or condition of natural heritage features in all parts of Ontario.

At this time, the Ministry has the following information for your project location.

1. Provincially Significant Cranberry Oil Well Bog Wetland Complex (evaluation attached)

Species at Risk information is available through the Ministry of Environment, Conservation & Parks (MECP) – Please contact MECP at SAROntario@ontario.ca

Thank you.

David

David Denyes
Management Biologist
Ministry of Natural Resources and Forestry
Vineland Field Office
4890 Victoria Avenue North
Vineland Station ON, L0R 2E0
Tel: (289) 241-6872
david.denyes@ontario.ca

From: Amy Douglas <Amy.Douglas@ghd.com>
Sent: October 16, 2023 8:24 AM
To: Scientific Collection Permits Guelph (MNRF) <scp.guelph@ontario.ca>
Cc: Keenan Shelly <Keenan.Shelly@ghd.com>; Jason Caldwell <Jason.Caldwell@ghd.com>; Simon Chute <Simon.Chute@ghd.com>
Subject: Natural Heritage Information Request - Puslinch

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Good morning,

GHD has been retained by Danby Products Limited to complete a scoped Environmental Impact Study for their property located in the northeast quadrant of the intersection of Concession Road 4 and Side Road 20 in the Township of Puslinch, Ontario. The property is approximately 25.5 hectares (63 acres) in size and comprises a former residential dwelling, a shed, and a former barn structure. Due diligence was completed by GHD during 2022 and provided preliminary characterization of the Site and natural heritage features associated with it. Danby has since purchased the Site, now requiring the completion of a scoped EIS. Please find mapping of the Study Area below.



In support of this project, GHD will be conducting natural environment assessments within the Study Area. Please note, as there are no watercourses in the area (just one isolated wetland) no fish or fish habitat assessments are proposed to be completed.

Additionally, we are seeking any additional natural heritage information beyond what has already been compiled through our background review to support our terrestrial natural environment investigations.
We have identified records for the following features within the vicinity of our Study Area through publicly available databases:

- Cranberry Oil Well Bog Wetland Complex

We are seeking any additional natural heritage information, wetland evaluation reports, and general wildlife or aquatic information/studies that MNRF has available to complete our assessments.

Please let us know if you have any questions or require further information. We look forward to your response to our request.

Thank you,

Amy Douglas
[she/her]

M.Sc.
Team Lead (Natural Resources Waterloo)
Ecologist / Project Manager

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Amy Douglas

From: Amy Douglas
Sent: Tuesday, February 6, 2024 12:19 PM
To: Richard Baxter; Chris Lorenz; Lynne Banks
Cc: Peter Zytner; Jason Haelzle; Jim Estill; Lynda Murray; Rob Wigood
Subject: Estill Innovation Community - Final TOR
Attachments: 12618927-MEM-1-TOR Estill Innovation Community Puslinch.pdf

Good afternoon Lynne, Richard, and Chris,
Please find attached our finalised Environmental Impact Study Terms of Reference for the Estill Innovation Community for your records.
Thank you for your comments.

Amy Douglas
[she/her]

M.Sc.
Team Lead (Natural Resources Waterloo)
Ecologist / Project Manager

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Amy Douglas

From: Amy Douglas
Sent: Monday, November 13, 2023 10:38 AM
To: Cheryl-Anne Ross
Cc: Laura Lawlor; Jason Caldwell; Lynne Banks
Subject: RE: Estill Innovation Community Draft Terms of Reference for Review

Perfect, thanks Cheryl-Anne!
Appreciate the clarification.

Amy Douglas
[she/her]

M.Sc.
Team Lead (Natural Resources Waterloo)
Ecologist / Project Manager

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From: Cheryl-Anne Ross <Cheryl@aboudtng.com>
Sent: Monday, November 13, 2023 9:22 AM
To: Amy Douglas <Amy.Douglas@ghd.com>
Cc: Laura Lawlor <Laura.Lawlor@ghd.com>; Jason Caldwell <Jason.Caldwell@ghd.com>; Lynne Banks <lbanks@puslinch.ca>
Subject: RE: Estill Innovation Community Draft Terms of Reference for Review

Hi Amy,

The appended report identified the Flora survey as a high-level survey, and did not identify the date when it took place. As a result, I've recommended a two season botanical study. If the first survey was conducted in June, and it was comprehensive, than a second botanical study in late summer is acceptable to capture wetland and grassland flora.

Hope that helps answer your question.

Regards,

Cheryl-Anne Ross B.Sc. F.W.T. (she/her/hers)
Ecology Lead. Wildlife Ecologist
MNRF Certified Ecological Land Classification
MNRF Certified Ontario Wetland Evaluation System
ABOUD & ASSOCIATES INC. 3-5 Edinburgh Road South . Guelph . Ontario . N1H 5N8
T : 519-822-6839 x 321 C : 226.789.9294 . www.aboudtng.com .cheryl@aboudtng.com

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From: Amy Douglas <Amy.Douglas@ghd.com>
Sent: Friday, November 10, 2023 4:28 PM
To: Cheryl-Anne Ross <Cheryl@aboudtng.com>
Cc: Laura Lawlor <Laura.Lawlor@ghd.com>; Jason Caldwell <Jason.Caldwell@ghd.com>
Subject: RE: Estill Innovation Community Draft Terms of Reference for Review

Caution. Outside Sender

Hi Cheryl,
Lynne Banks from the Township of Puslinch forwarded me your contact information to clarify a comment on the Estill Innovation Community Draft TOR (attached) that Aboud & Associates recently reviewed.

We're looking to clarify this point on Task 3:
In addition to the studies listed in the ToR, which are all required, please complete the following:
• A minimum two season fulsome botanical survey is required. due to the presence of wetland and grassland habitat on site, it is recommended that a ***summer and fall*** *botanical are completed.*

Is this requesting summer and fall surveys to be conducted in addition to the spring (June 2022) survey previously conducted? Or should this be "spring and summer botanical"?

Thanks for your help, happy to discuss via phone if easier.
Have a wonderful weekend!

Amy Douglas
[she/her]

M.Sc.
Team Lead (Natural Resources Waterloo)
Ecologist / Project Manager

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Amy Douglas

From: Lynne Banks <lbanks@puslinch.ca>
Sent: Friday, November 3, 2023 2:47 PM
To: Amy Douglas
Cc: Jason Haelzle; Peter Zytner; Sarah Andrew; Sean Andreou; Laura Lawlor; Jim Estill; Lynda Murray
Subject: RE: Estill Innovation Community Draft Terms of Reference for Review
Attachments: AA21-049-011 4631 Sideroad 20N AA Terms of Reference review 01-11-2023.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Some people who received this message don't often get email from lbanks@puslinch.ca. Learn why this is important

Hi Amy - Attached please find the Township's ecology consultant's peer review for the TOR for the EIS re that above.

Regards –

Lynne

Lynne Banks
Development and Legislative Coordinator
Township of Puslinch
7404 Wellington Rd 34, Puslinch ON N0B 2J0
519-763-1226 ext. 226 Fax 519-736-5846 www.puslinch.ca

From: Amy Douglas <Amy.Douglas@ghd.com>
Sent: Monday, October 16, 2023 3:05 PM
To: Lynne Banks <lbanks@puslinch.ca>
Cc: Jason Haelzle <Jason.Haelzle@ghd.com>; Peter Zytner <Peter.Zytner@ghd.com>; Sarah Andrew <Sarah.Andrew@ghd.com>; Sean Andreou <Sean.Andreou@ghd.com>; Laura Lawlor <Laura.Lawlor@ghd.com>; Jim Estill <JEstill@danby.com>; Lynda Murray <lMurray@danby.com>
Subject: Estill Innovation Community Draft Terms of Reference for Review

Good afternoon Lynne,
Sending through the Estill Innovation Community draft Terms of Reference (TOR) for the Township's review.
Please note, this TOR has been reviewed by the Grand River Conservation Authority (GRCA) and has been updated accordingly. They have no additional requirements.

Should you/your team like to discuss, please let us know and we will set up a meeting.

Thanks in advance,
Amy

Amy Douglas
[she/her]

M.Sc.
Team Lead (Natural Resources Waterloo)
Ecologist / Project Manager

Please note I am on vacation October 19-20, 2023.

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Appendix C

Species at Risk Screening

Appendix C
SAR Screening
Scoped Environmental Impact Study
Estill Innovation Community - 12618927

Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence within Study Area
Amphibians					
Western chorus frog (Great Lakes St. Lawrence/Canadian Shield Population)	*Pseudacris triseriata*	THR	—	In Ontario, habitat of this amphibian species typically consists of marshes or wooded wetlands, particularly those with dense shrub layers and grasses, as this species is a poor climber. They will breed in almost any fishless pond including roadside ditches, gravel pits and flooded swales in meadows. This species hibernates in terrestrial habitats under rocks, dead trees or leaves, in loose soil or in animal burrows. During hibernation, this species is tolerant of flooding (Environment Canada 2015).	Low - Suitable habitat present within the Study Area however species not observed during amphibian call count surveys.
Arthropods					
Monarch	*Danaus plexippus*	END	SC	In Ontario, monarch is found throughout the northern and southern regions of the province. This butterfly is found wherever there are milkweed (*Asclepias* spp.) plants for its caterpillars and wildflowers that supply a nectar source for adults. It is often found on abandoned farmland, meadows, open wetlands, prairies and roadsides, but also in city gardens and parks. Important staging areas during migration occur along the north shores of the Great Lakes (COSEWIC 2010).	Low - Monarch was not observed within the Study Area between 2022-2024.
Birds					
Bank swallow	*Riparia riparia*	THR	THR	In Ontario, the bank swallow breeds in a variety of natural and anthropogenic habitats, including lake bluffs, stream and river banks, sand and gravel pits, and roadcuts. Nests are built in a vertical or near-vertical bank. Breeding sites are typically located near open foraging sites such as rivers, lakes, grasslands, agricultural fields, wetlands and riparian woods. Forested areas are generally avoided (Garrison 1999).	Low - No suitable habitat present within the Study Area.
Barn swallow	*Hirundo rustica*	THR	SC	In Ontario, barn swallow breeds in areas that contain a suitable nesting structure, open areas for foraging, and a body of water. This species nests in human made structures including barns, buildings, sheds, bridges, and culverts. Preferred foraging habitat includes grassy fields, pastures, agricultural cropland, lake and river shorelines, cleared right-of-ways, and wetlands (COSEWIC 2011). Mud nests are fastened to vertical walls or built on a ledge underneath an overhang. Suitable nests from previous years are reused (Brown and Brown 1999).	**Confirmed** - Suitable habitat present within the Study Area including open foraging areas and human made structures. Species was observed within the Study Area during breeding bird surveys.
Bobolink	*Dolichonyx oryzivorus*	THR	THR	In Ontario, bobolink breeds in grasslands or graminoid dominated hayfields with tall vegetation (Gabhauer 2007). Bobolink prefers grassland habitat with a forb component and a moderate litter layer. They have low tolerance for presence of woody vegetation and are sensitive to frequent mowing within the breeding season. They are most abundant in established, but regularly maintained, hayfields, but also breed in lightly grazed pastures, old or fallow fields, cultural meadows and newly planted hayfields. Their nest is woven from grasses and forbs. It is built on the ground, in dense vegetation, usually under the cover of one or more forbs (Martin and Gavin 1995).	Moderate - Suitable grassland / cultural meadow habitat present within the Study Area.

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Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence within Study Area
Canada warbler	*Cardellina canadensis*	THR	SC	In Ontario, breeding habitat for Canada warbler consists of moist mixed forests with a well-developed shrubby understory. This includes low-lying areas such as cedar and alder swamps, and riparian thickets (McLaren 2007). It is also found in densely vegetated regenerating forest openings. Suitable habitat often contains a developed moss layer and an uneven forest floor. Nests are well concealed on or near the ground in dense shrub or fern cover, often in stumps, fallen logs, overhanging stream banks or mossy hummocks (Reitsma et al. 2010).	Low - No suitable habitat present within the Study Area.
Chimney swift	*Chaetura pelagica*	THR	THR	In Ontario, chimney swift breeding habitat is varied and includes urban, suburban, rural and wooded sites. They are most commonly associated with towns and cities with large concentrations of chimneys. Preferred nesting sites are dark, sheltered spots with a vertical surface to which the bird can grip. Unused chimneys are the primary nesting and roosting structure, but other anthropogenic structures and large diameter cavity trees are also used (COSEWIC 2007).	Low - No suitable habitat present within the Study Area.
Common nighthawk	*Chordeiles minor*	THR	SC	These aerial foragers require areas with large open habitat. This includes farmland, open woodlands, clearcuts, burns, rock outcrops, alvars, bog ferns, prairies, gravel pits and gravel rooftops in cities (Sandilands 2007)	Low - Suitable farmland and cultural meadow habitat present within the Study Area, however, species was not observed during BBS.
Eastern meadowlark	*Sturnella magna*	THR	THR	In Ontario, the eastern meadowlark breeds in pastures, hayfields, meadows and old fields. Eastern meadowlark prefers moderately tall grasslands with abundant litter cover, high grass proportion, and a forb component (Hull 2003). They prefer well drained sites or slopes, and sites with different cover layers (Roseberry and Klimstra 1970).	**Confirmed** - Suitable farmland and cultural meadow habitat present within the Study Area. Species was observed within the Study Area during breeding bird surveys.
Eastern wood-pewee	*Contopus virens*	SC	SC	The eastern wood-pewee inhabits a wide variety of wooded upland and lowland habitats but is most commonly associated with the mid-canopy of forest clearings, and edge habitat in deciduous and mixed forests. It also occurs in anthropogenic habitats that provide an open forested aspect such as parks and suburban neighborhoods. It prefers intermediate-age mature forest stands with little understory vegetation (COSEWIC 2012).	Low - No suitable habitat present within the Study Area.
Golden-winged warbler	*Vermivora chrysoptera*	THR	SC	In Ontario, golden-winged warbler breeds in regenerating scrub habitat with dense ground cover and a patchwork of shrubs, usually surrounded by forest. Their preferred habitat is characteristic of a successional landscape associated with natural or anthropogenic disturbance such as right-of-ways, and field edges or openings resulting from logging or burning. The nest of the golden-winged warbler is built on the ground at the base of a shrub or leafy plant, often at the shaded edge of the forest or at the edge of a forest opening (Confer et al. 2011).	Low - No suitable habitat present within the Study Area.
Grasshopper sparrow (pratensis subspecies)	*Ammodramus savannarum pratensis*	SC	SC	In Ontario, grasshopper sparrow is found in medium to large grasslands with low herbaceous cover and few shrubs. It also uses a wide variety of agricultural fields, including cereal crops and pastures. Close-grazed pastures and limestone plains (e.g. Carden and Napanee Plains) support highest density of this bird in the province (COSEWIC 2013).	Low - Suitable farmland and cultural meadow habitat present within the Study Area, however, species was not observed during BBS.

Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence within Study Area
Henslow's sparrow	*Ammodramus henslowii*	END	END	In Ontario, Henslow's sparrow breeds in large grasslands with low disturbance, such as lightly grazed and ungrazed pastures, fallow hayfields, grassy swales in open farmland, and wet meadows. Preferred habitat contains tall, dense grass cover, typically over 30 cm high, with a high percentage of ground cover, and a thick mat of dead plant material. Henslow's sparrow generally avoids areas with emergent woody shrubs or trees, and fence lines. Areas of standing water or ephemerally wet patches appear to be important. This species breeds more frequently in patches of habitat greater than 30 ha and preferably greater than 100 ha (COSEWIC 2011).	Low - No suitable habitat present within the Study Area.
Least bittern	*Ixobrychus exilis*	THR	THR	In Ontario, the least bittern breeds in marshes, usually greater than 5 ha, with emergent vegetation, relatively stable water levels and areas of open water. Preferred habitat has water less than 1 m deep (usually 10 – 50 cm). Nests are built in tall stands of dense emergent or woody vegetation (Woodliffe 2007). Clarity of water is important as siltation, turbidity, or excessive eutrophication hinders foraging efficiency (COSEWIC 2009).	Low - No suitable habitat present within the Study Area.
Northern bobwhite	*Colinus virginianus*	END	END	In Ontario, the northern bobwhite breeds in early successional habitats. This species requires a combination of three habitat types: woody cover, cropland and grassland. Croplands provide foraging habitat, grassland and fields are used for nesting, and dense brush provides both winter forage and year round cover. These birds nest on the ground in a shallow depression lined with grasses and other dead vegetation (Brennan 1999). The distribution of native populations are restricted to southwestern Ontario (ECCC, 2018).	Low - No suitable habitat present within the Study Area.
Red-headed woodpecker	*Melanerpes erythrocephalus*	END	END	In Ontario, the red-headed woodpecker breeds in open, deciduous woodlands or woodland edges and are often found in parks, cemeteries, golf courses, orchards and savannahs (Woodliffe 2007). They may also breed in forest clearings or open agricultural areas provided that large trees are available for nesting. They prefer forests with little or no understory vegetation. They are often associated with beech or oak forests, beaver ponds and swamp forests where snags are numerous. Nests are excavated in the trunks of large dead trees (Smith et al. 2000).	Low - No suitable habitat present within the Study Area.
Wood thrush	*Hylocichla mustelina*	THR	SC	In Ontario, wood thrush breeds in moist, deciduous hardwood or mixed stands that are often previously disturbed, with a dense deciduous undergrowth and with tall trees for singing perches. This species selects nesting sites with the following characteristics: lower elevations with trees less than 16 m in height, a closed canopy cover (>70 %), a high variety of deciduous tree species, moderate subcanopy and shrub density, shade, fairly open forest floor, moist soil, and decaying leaf litter (COSEWIC 2012)	Low - No suitable habitat present within the Study Area.
Mammals					
Eastern red bat	*Lasiurus borealis*	* recommended by COSEWIC as END in May 2023, but not on list as of January 2025	END	The eastern red bat has an extensive range that covers much of the province of Ontario but centralized in Southern Ontario. They are a solitary species that roosts in the terminal foliage of mature deciduous and coniferous trees typically at the edge of a clearing, often in dead leaf clusters or pine cone clusters (Dobbyn 1994; Robinson 2020). This species migrates to the south to the US each winter prior to hibernation.	**Confirmed** - Species was detected through acoustic monitoring. Potential suitable habitat due to woodland edge habitat within the Study Area, though these areas are not very mature.

Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence within Study Area
Eastern small-footed myotis	*Myotis leibii*	—	END	This species is not known to roost within trees, but there is very little known about its roosting habits. The species generally roosts on the ground under rocks, in rock crevices, talus slopes, or rock piles, and occasionally inhabits buildings. Areas near the entrances of caves or abandoned mines may be used for hibernaculum, where the conditions are drafty with low humidity, and may be subfreezing (Humphrey 2017).	**Confirmed** - Species was detected through acoustic monitoring, however no suitable habitat present within the Study Area.
Hoary bat	*Lasiurus cinereus*	* recommended by COSEWIC as END in May 2023, but not on list as of January 2025	END	The hoary bat has an extensive range that covers much of the province of Ontario but centralized in Southern Ontario. They are a solitary species that roosts in the terminal foliage of mature deciduous and coniferous trees typically at the edge of a clearing (Dobbyn 1994). This species migrates to the south to the US each winter prior to hibernation.	**Confirmed** - Species was detected through acoustic monitoring. Potential suitable habitat due to woodland edge habitat within the Study Area, though these areas are not very mature.
Little brown myotis	*Myotis lucifugus*	END	END	In Ontario, this species range is extensive and covers much of the province. It will roost in both natural and man-made structures. They require a number of large dead trees, in specific stages of decay and that project above the canopy in relatively open areas (Lacki, 2007). May form nursery colonies in the attics of buildings within 1 km of water. Caves or abandoned mines may be used for hibernaculum, but high humidity and stable above freezing temperatures are required.	**Confirmed** - Species was detected through acoustic monitoring. Suitable habitat present due to wooded areas within the Study Area.
Northern myotis	*Myotis septentrionalis*	END	END	In Ontario, this species range is extensive and covers much of the province. It will usually roost in hollows, crevices, and under loose bark of mature trees. Roosts may be established in the main trunk or a large branch of either living or dead trees. Caves or abandoned mines may be used for hibernaculum, but high humidity and stable above freezing temperatures are required (COSSARO 2012).	Moderate - Suitable habitat present due to wooded areas within the Study Area. Species was not detected during acoustic monitoring.
Silver-haired bat	*Lasionycteris noctivagans*	* recommended by COSEWIC as END in May 2023, but not on list as of January 2025	END	The silver-haired bat has an extensive range that covers much of the province of Ontario. The often form small maternity colonies in hollow trees and bark crevices, and do not make use of buildings or caves (Dobbyn 1994). This species migrates to the south to the US each winter prior to hibernation.	**Confirmed** - Species was detected during acoustic monitoring. Suitable habitat present due to wooded areas within the Study Area.
Tri-colored bat	*Perimyotis subflavus*	END	END	In Ontario, tri-colored bat may roost in foliage, in clumps of old leaves, hanging moss or squirrel nests. They are occasionally found in buildings although there are no records of this in Canada (Poissant et al, 2010). They typically feed over aquatic areas with an affinity to large-bodied water and will likely roost in close proximity to these. Hibernatiwithin the Study Areas are found deep within caves or mines in areas of relatively warm temperatures. These bats have strong roost fidelity to their winter hibernatiwithin the Study Areas and may choose the exact same spot in a cave or mine from year to year.	Low - No suitable habitat present within the Study Area and species was not detected through acoustic monitoring.
Reptiles					
Eastern milksnake	*Lampropeltis triangulum*	SC	NAR	In Ontario, milksnake uses a wide range of habitats including prairies, pastures, hayfields, wetlands and various forest types, and is well-known in rural areas where it frequents older buildings. Proximity to water and cover enhances habitat suitability. Hibernation takes place in mammal burrows, hollow logs, gravel or soil banks, and old foundations (COSEWIC 2014).	Low - species was not detected during field visits.Habitat potentially suitable on-Site is isolated by roads and active agricultural fields.

Appendix C
SAR Screening
Scoped Environmental Impact Study
Estill Innovation Community - 12618927

Common Name	Scientific Name	SARA[1]	ESA[2]	Habitat Requirements	Likelihood of Occurrence within Study Area
Eastern ribbonsnake (Great Lakes population)	*Thamnophis sauritus*	SC	SC	In Ontario, eastern ribbonsnake is semi-aquatic, and is rarely found far from shallow ponds, marshes, bogs, streams or swamps bordered by dense vegetation. They prefer sunny locations and bask in low shrub branches. Hibernation occurs in mammal burrows, rock fissures or even ant mounds (COSEWIC 2012).	Low - species was not detected during field visits.Habitat potentially suitable on-Site is isolated by roads and active agricultural fields.
Midland painted turtle	*Chrysemys picta marginata*	SC	NAR	Painted Turtles occupy slow moving, relatively shallow and well-vegetated wetlands (e.g., swamps, marshes, ponds, fens, bogs, and oxbows) and water bodies (e.g., lakes, rivers, creeks, and streams) with abundant basking sites and organic substrate. The species is semi-tolerant of human-altered landscapes and may occasionally be found occupying urban ponds and lands subject to anthropogenic disturbance (e.g., farm ponds, impoundments, water treatment facilities) (COSEWIC 2018).	Low - Shallow pond within the Study Area does not contain water depths suitable for overwintering. No painted turtles were observed on-Site during field investigations between 2022-2024.
Snapping turtle	*Chelydra serpentina*	SC	SC	In Ontario, snapping turtle utilizes a wide range of waterbodies, but shows preference for areas with shallow, slow-moving water, soft substrates and dense aquatic vegetation. Hibernation takes place in soft substrates under water. Nesting sites consist of sand or gravel banks along waterways or roadways (COSEWIC 2008).	Low - Shallow pond within the Study Area does not contain water depths suitable for overwintering. No Snapping turtles were observed on-Site during field investigations between 2022-2024.
Vascular Plants					
Butternut	*Juglans cinerea*	END	END	In Ontario, butternut is found along stream banks, on wooded valley slopes, and in deciduous and mixed forests. It is commonly associated with beech, maple, oak and hickory (Voss and Reznicek 2012). Butternut prefers moist, fertile, well-drained soils, but can also be found in rocky limestone soils. This species is shade intolerant (Farrar 1995).	Low - Suitable habitat present within the Study Area, however species was not observed during field investigations.

[1] *Species at Risk Act* (SARA), 2002. Schedule 1; Part 1 (Extirpated), Part 2 (Endangered), Part 3 (Threatened), Part 4 (Special Concern)
[2] *Endangered Species Act* (ESA), 2007. Schedule 1 (Extirpated - EXP), Schedule 2 (Endangered - END), Schedule 3 (Threatened - THR), Schedule 4 (Special Concern - SC)

Appendix D

Significant Wildlife Habitat Screening Criteria

Significant Wildlife Habitat Criteria Schedule, Ecoregion 6E

Table 1.1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
Waterfowl Stopover and Staging Areas (Terrestrial) **<u>Rationale:</u>** Habitat important to migrating waterfowl.	• American Black Duck • Northern Pintail • Gadwall • Blue-winged Teal • Green-winged Teal • American Wigeon • Northern Shoveler • Tundra Swan	CUM1 CUT1 • Plus evidence of annual spring flooding from melt water or run-off within these Ecosites. • Fields with seasonal flooding and waste grains in the Long Point, Rondeau, Lk. St. Clair, Grand Bend and Pt. Pelee areas may be important to Tundra Swans.	Fields with sheet water during Spring (mid-March to May). • Fields flooding during spring melt and run-off provide important invertebrate foraging habitat for migrating waterfowl. • Agricultural fields with waste grains are commonly used by waterfowl, these are not considered SWH unless they have spring sheet water available [cxlviii]. <u>Information Sources</u> • Anecdotal information from the landowner, adjacent landowners or local naturalist clubs may be good information in determining occurrence. • Reports and other information available from Conservation Authorities • Sites documented through waterfowl planning processes (e.g. EHJV implementation plan) • Field Naturalist Clubs • Ducks Unlimited Canada • Natural Heritage Information Centre (NHIC) Waterfowl Concentration Area	Studies carried out and verified presence of an annual concentration of any listed species, evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • Any mixed species aggregations of 100Ⓔ or more individuals required. • The flooded field ecosite habitat plus a 100–300m radius, dependent on local site conditions and adjacent land use is the significant wildlife habitat [cxlviii]. • 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). • SWH MIST[cxlix] Index #7 provides development effects and mitigation measures.	No CUT1 present within the Study Area but lack of spring sheet water.	No Candidate habitat was not identified.	No
Waterfowl Stopover and Staging Areas (Aquatic) **<u>Rationale:</u>** Important for local and migrant waterfowl populations during the spring or fall migration or both periods combined. Sites identified are usually only one of a few in the eco-district.	• Canada Goose • Cackling Goose • Snow Goose • American Black Duck • Northern Pintail • Northern Shoveler • American Wigeon • Gadwall • Green-winged Teal • Blue-winged Teal • Hooded Merganser • Common Merganser • Lesser Scaup • Greater Scaup • Long-tailed Duck • Surf Scoter	MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7	• Ponds, marshes, lakes, bays, coastal inlets, and watercourses used during migration. Sewage treatment ponds and storm water ponds do not qualify as a SWH; however, a reservoir managed as a large wetland or pond/lake does qualify. • These habitats have an abundant food supply (mostly aquatic invertebrates and vegetation in shallow water) <u>Information Sources</u> • Environment Canada • Naturalist clubs often are aware of staging/stopover areas.	Studies carried out and verified presence of: • Aggregations of 100Ⓔ or more of listed species for 7 daysⒺ, results in >700 waterfowl use days. • Areas with annual staging of ruddy ducks, canvasbacks, and redheads are SWH [cxlix] • The combined area of the ELC ecosites and a 100 m radius area is the SWH [cxlviii] • Wetland area and shorelines associated with sites identified within the SWHTG [cxlviii] Appendix K [cxlix] are significant wildlife habitat.	No SAS and SWD4 present within the study area. The Study Area is not a known Site in the area and there were no observations of the wildlife species listed during Site visits.	No BBS did not detect any of the wildlife species listed.	No

Table 1.1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
	• White-winged Scoter • Black Scoter • Ring-necked duck • Common Goldeneye • Bufflehead • Redhead • Ruddy Duck • Red-breasted Merganser • Brant • Canvasback		• OMNRF Wetland Evaluations indicate presence of locally and regionally significant waterfowl staging. • Sites documented through waterfowl planning processes (eg. EHJV implementation plan) • Ducks Unlimited projects • Element occurrence specification by Nature Serve: http://www.natureserve.org • NHIC Waterfowl Concentration Area	• Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" [ccxi] • 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). • SWH MIST [cxlix] Index #7 provides development effects and mitigation measures.			
Shorebird Migratory Stopover Area **Rationale:** High quality shorebird stopover habitat is extremely rare and typically has a long history of use.	• Greater Yellowlegs • Lesser Yellowlegs • Marbled Godwit • Hudsonian Godwit • Black-bellied Plover • American Golden-Plover • Semipalmated Plover • Solitary Sandpiper • Spotted Sandpiper • Semipalmated Sandpiper • Pectoral Sandpiper • White-rumped Sandpiper • Baird's Sandpiper • Least Sandpiper • Purple Sandpiper • Stilt Sandpiper • Short-billed Dowitcher • Red-necked Phalarope • Whimbrel • Ruddy Turnstone • Sanderling • Dunlin	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. Information Sources • Western hemisphere shorebird reserve network. • Canadian Wildlife Service (CWS) Ontario Shorebird Survey • Bird Studies Canada • Ontario Nature • Local birders and naturalist clubs • NHIC Shorebird Migratory Concentration Area	Studies confirming: • Presence of 3 or more of listed species and >1000© shorebird use days during spring or fall migration period. (shorebird use days are the accumulated number of shorebirds counted per day over the course of the fall or spring migration period) • Whimbrel stop briefly (<24hrs) during spring migration, any site with >100© Whimbrel used for 3 years or more is significant. • The area of significant shorebird habitat includes the mapped ELC shoreline ecosites plus a 100 m radius area [cxlviii] • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects" [ccxi] • SWH MIST [cxlix] Index #8 provides development effects and mitigation measures.	No ELC ecosites not present.	No Candidate habitat was not identified.	No

Table 1.1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
Raptor Wintering Area **Rationale:** Sites used by multiple species, a high number of individuals and used annually are most significant	• Rough-legged Hawk • Red-tailed Hawk • Northern Harrier • American Kestrel • Snowy Owl **Special Concern:** • Short-eared Owl • Bald Eagle	Hawks/Owls: 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. Bald Eagle: Forest community Series: FOD, FOM, FOC, SWD, SWM or SWC on shoreline areas adjacent to large rivers or adjacent to lakes with open water (hunting area).	• The habitat provides a combination of fields and woodlands that provide roosting, foraging and resting habitats for wintering raptors. • Raptor wintering (hawk/owl) sites need to be >20 ha[cxlviii, cxlix] with a combination of forest and upland.[xvi, xvii, xviii, xix, xx, xxi.] • Least disturbed sites, idle/fallow or lightly grazed field/meadow (>15 ha) with adjacent woodlands[cxlix] • Field area of the habitat is to be wind swept with limited snow depth or accumulation. • Eagle sites have open water and large trees and snags available for roosting[cxlix] Information Sources: • OMNRF Ecologist or Biologist • Naturalist clubs • NHIC Raptor Winter Concentration Area • Data from Bird Studies Canada • Results of Christmas Bird Counts • Reports and other information available from Conservation Authorities.	Studies confirm the use of these habitats by: • One or more Short-eared Owls or; One of more Bald Eagles or; At least 10 individuals and two of the listed hawk/owl species[E] • To be significant a site must be used regularly (3 in 5 years)[cxlix] for a minimum of 20 days by the above number of birds[E]. • The habitat area for an Eagle winter site is the shoreline forest ecosites directly adjacent to the prime hunting area[E] • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #10 and #11 provides development effects and mitigation measures.	No CUT community present but no FOD, FOM or FOC, or shorelines adjacent to large rivers or lakes.	No Candidate habitat was not identified.	No
Bat Hibernacula **Rationale:** Bat hibernacula are rare habitats in all Ontario landscapes.	• Big Brown Bat • Tri-coloured Bat	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. • Active mine sites should not be considered as SWH • The locations of bat hibernacula are relatively poorly known. Information Sources • OMNRF for possible locations and contact for local experts • NHIC Bat Hibernaculum • Ministry of Northern Development and Mines for location of mine shafts. • Clubs that explore caves (e.g. Sierra Club)	• All sites with confirmed hibernating bats are SWH[E]. • The area includes 200 m radius around the entrance of the hibernaculum[cxlviii, ccvii, E] for most development types and 1000 m for wind farms[ccv]. • Studies are to be conducted during the peak swarming period (Aug.–Sept.). Surveys should be conducted following methods outlined in the "Bats and Bat Habitats: Guidelines for Wind Power Projects"[ccv]. • SWH MIST[cxlix] Index #1 provides development effects and mitigation measures.	No ELC ecosites not present.	No Candidate habitat was not identified.	No

Table 1.1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
			• University Biology Departments with bat experts.				
Bat Maternity Colonies **<u>Rationale:</u>** Known locations of forested bat maternity colonies are extremely rare in all Ontario landscapes.	• Big Brown Bat • Silver-haired Bat	Maternity colonies considered SWH are found in forested Ecosites. All ELC Ecosites in ELC Community Series: FOD FOM SWD SWM	• Maternity colonies can be found in tree cavities, vegetation and often in buildlings[xxii, xxv, xxvi, xxvii, xxxi] (buildings are not considered to be SWH). • Maternity roosts are not found in caves and mines in Ontario[xxii]. • Maternity colonies located in Mature deciduous or mixed forest stands[ccix, ccx, ccv] with >10/ha large diameter (>25 cm dbh) wildlife trees • Female Bats prefer wildlife tree (snags) in early stages of decay, class 1–3[ccxiv] or class 1 or 2.[ccxii] • Silver-haired Bats prefer older mixed or deciduous forest and form maternity colonies in tree cavities and small hollows. Older forest areas with at least 21 snags/ha are preferred[ccx, lxiv] <u>Information Sources</u> • OMNRF for possible locations and contact for local experts • University Biology Departments with bat experts.	• Maternity Colonies with confirmed use by: • >10 Big Brown Bats[E] • >5 Adult Female Silver-haired Bats[E] • The area of the habitat includes the entire woodland or a forest stand ELC Ecosite or an Ecoelement containing the maternity colonies[E]. • Evaluation methods for maternity colonies should be conducted following methods outlined in the “Bats and Bat Habitats: Guidelines for Wind Power Projects”[ccv]. • SWH MIST[cxlix] Index #12 provides development effects and mitigation measures.	No SWD present. Cavity trees may be present in the Study Area but do not meet the density requirement of 10 cavity trees/ ha.	No Candidate habitat was not identified.	No
Turtle Wintering Areas **<u>Rationale:</u>** Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	• Midland Painted Turtle **<u>Special Concern:</u>** • Northern Map Turtle • Snapping Turtle	Snapping and Midland Painted Turtles; ELC Community Classes; SW, MA, OA and SA, ELC Community Series; FEO and BOO Northern Map Turtle; Open Water areas such as deeper rivers or streams and lakes with current can also be used as over-wintering habitat.	• For most turtles, wintering areas are in the same general area as their core habitat. Water has to be deep enough not to freeze and have soft mud substrates. • Over-wintering sites are permanent water bodies, large wetlands, and bogs or fens with adequate Dissolved Oxygen[cix, cx, cxi, cxii] • Man-made ponds such as sewage lagoons or storm water ponds should not be considered SWH.	• Presence of 5 over-wintering Midland Painted Turtles is significant[E]. • One or more Northern Map Turtle or Snapping Turtle over-wintering within a wetland is significant[E]. • 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.	No SW and SA communities present, however they are likely not deep enough to not freeze overwinter.	No Candidate habitat was not identified.	No

Table 1.1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
			<u>Information Sources</u> • EIS studies carried out by Conservation Authorities. • Field Naturalists Clubs • OMNRF Ecologist or Biologist • NHIC	• Over wintering areas may be identified by searching for congregations (Basking Areas) of turtles on warm, sunny days during the fall (Sept.–Oct.) or spring (Mar.–May)[cvii]. • Congregation of turtles is more common where wintering areas are limited and therefore significant.[cix, cxcxi, cxii] • SWH MIST[cxlix] Index #28 provides development effects and mitigation measures for turtle wintering habitat.			
Reptile Hibernaculum **<u>Rationale:</u>** Generally sites are the only known sites in the area. Sites with the highest number of individuals are most significant.	**<u>Snakes:</u>** • Eastern Gartersnake • Northern Watersnake • Northern Red-bellied Snake • Northern Brownsnake • Smooth Green Snake • Northern Ring-necked Snake **<u>Special Concern:</u>** • Milksnake • Eastern Ribbonsnake	For all snakes, habitat may be found in any ecosite other than very wet ones. Talus, Rock Barren, Crevice, Cave, and Alvar sites may be directly related to these habitats. Observations or congregations of snakes on sunny warm days in the spring or fall is a good indicator.	• For snakes, hibernation takes place in sites located below frost lines in burrows, rock crevices and other natural or naturalized locations. The existence of features that go below frost line; such as rock piles or slopes, old stone fences, and abandoned crumbling foundations assist in identifying candidate SWH. • Areas of broken and fissured rock are particularly valuable since they provide access to subterranean sites below the frost line.[xliv, l, li, lii, cxii] • Wetlands can also be important over-wintering habitat in conifer or shrub swamps and swales, poor fens, or depressions in bedrock terrain with sparse trees or shrubs with sphagnum moss or sedge hummock ground cover. <u>Information Sources</u> • In spring, local residents or landowners may have observed the emergence of snakes on their property (e.g. old dug wells).	Studies confirming: • Presence of snake hibernacula used by a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. • Congregations of a minimum of five individuals of a snake sp. <u>or</u>; individuals of two or more snake spp. near potential hibernacula (e.g. foundation or rocky slope) on sunny warm days in Spring (Apr/May) and Fall (Sept/Oct)[E] • <u>Note</u>: If there are Special Concern Species present, then site is SWH • <u>Note</u>: Sites for hibernation possess specific habitat parameters (e.g. temperature, humidity, etc.) and consequently are used annually, often by many of the same individuals of a local population (i.e. strong hibernation site fidelity). Other critical life processes (e.g. mating) often take place in close proximity to hibernacula. The feature in which the hibernacula is	No -No suitable structures for reptile hibernaculum were observed within the Study Area.	No -Candidate habitat is not present.	No

Table 1.1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
			• Reports and other information available from Conservation Authorities. • Field Naturalist Clubs • University herpetologists • NHIC	located plus a 30 m radius area is the SWH[E] • SWH MIST[cxlix] Index #13 provides development effects and mitigation measures for snake hibernacula.			
Colonially-Nesting Bird Breeding Habitat (Bank and Cliff) **Rationale:** Historical use and number of nests in a colony make this habitat significant. An identified colony can be very important to local populations. All swallow population are declining in Ontario.	• Cliff Swallow • Northern Rough-winged Swallow (this species is not colonial but can be found in Cliff Swallow colonies)	Eroding banks, sandy hills, borrow pits, steep slopes, and sand piles Cliff faces, bridge abutments, silos, barns. Habitat found in the following ecosites: CUM1 CUT1 CUS1 BLO1 BLS1 BLT1 CLO1 CLS1 CLT1	• Any site or areas with exposed soil banks, undisturbed or naturally eroding that is not a licensed/permitted aggregate area. • Does not include man-made structures (bridges or buildings) or recently (2 years) disturbed soil areas, such as berms, embankments, soil, or aggregate stockpiles. • Does not include a licensed/permitted Mineral Aggregate Operation. Information Sources • Reports and other information available from Conservation Authorities. • Ontario Breeding Bird Atlas • Bird Studies Canada; *NatureCounts* http://www.birdscanada.org/birdmon/ • Field Naturalist Clubs	Studies confirming: • Presence of 1 or more nesting sites with 8[cxlix] or more cliff swallow pairs and/or rough-winged swallow pairs during the breeding season. • A colony identified as SWH will include a 50 m radius habitat area from the peripheral nests[ccvii] • Field surveys to observe and count swallow nests are to be completed during the breeding season. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”[ccxi] • SWH MIST[cxlix] Index #4 provides development effects and mitigation measures	No CUT1 ecosite present, however, no exposed eroding banks on steep slopes, sand piles, hills, etc observed within Study Area.	No Candidate habitat is not present.	No
Colonially-Nesting Bird Breeding Habitat (Tree/Shrubs) **Rationale:** Large colonies are important to local bird population, typically sites are only known colony in area and are used annually.	• Great Blue Heron • Black-crowned Night-Heron • Great Egret • Green Heron	SWM2 SWM3 SWM5 SWM6 SWD1 SWD2 SWD3 SWD4 SWD5 SWD6 SWD7 FET1	• Nests in live or dead standing trees in wetlands, lakes, islands, and peninsulas. Shrubs and occasionally emergent vegetation may also be used. • Most nests in trees are 11 to 15 m from ground, near the top of the tree. Information Sources • Ontario Breeding Bird Atlas,[ccv] colonial nest records. • Ontario Heronry Inventory 1991 available from Bird	Studies confirming: • Presence of 2[E] or more active nests of Great Blue Heron or other listed species. • The habitat extends from the edge of the colony and a minimum 300 m radius or extent of the Forest Ecosite containing the colony or any island <15.0 ha with a colony is the SWH.[cc, ccvii] • Confirmation of active heronries are to be achieved through site visits conducted	No SWD4 ecosite present, however, required species were not observed during BBS.	No Candidate habitat is not present.	No

Table 1.1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
			Studies Canada or NHIC (OMNRF). • NHIC Mixed Wader Nesting Colony • Aerial photographs can help identify large heronries. • Reports and other information available from Conservation Authorities. • MNRF District Offices. • Field Naturalist Clubs.	during the nesting season (April to August) or by evidence such as the presence of fresh guano, dead young and/or eggshells • SWH MIST[cxlix] Index #5 provides development effects and mitigation measures.			
Colonially-Nesting Bird Breeding Habitat (Ground) **<u>Rationale:</u>** Colonies are important to local bird population, typically sites are only known colony in area and are used annually.	• 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	• Nesting colonies of gulls and terns are on islands or peninsulas associated with open water or in marshy areas. • Brewers Blackbird colonies are found loosely on the ground in or in low bushes in close proximity to streams and irrigation ditches within farmlands. <u>Information Sources</u> • Ontario Breeding Bird Atlas, rare/colonial species records • Canadian Wildlife Service • Reports and other information available from Conservation Authorities. • NHIC Colonial Waterbird Nesting Area • MNRF District Offices • Field Naturalist Clubs	Studies confirming: • Presence of >25 active nests for Herring Gulls or Ring-billed Gulls, >5 active nests for Common Tern or >2 active nests for Caspian Tern[Ⓔ]. • Presence of 5 or more pairs for Brewer's Blackbird[Ⓔ]. • Any active nesting colony of one or more Little Gull, and Great Black-backed Gull is significant[Ⓔ]. • The edge of the colony and a minimum 150 m radius area of habitat, or the extent of the ELC ecosites containing the colony or any island <3.0 ha with a colony is the SWH[cc, ccvii] • Studies would be done during May/June when actively nesting. Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #6 provides development effects and mitigation measures.	No CUT ecosite present, however, no rocky island or peninsulas within lakes or large rivers present.	No Candidate Habitat is not present. Species were not present during BBS.	No
Migratory Butterfly Stopover Areas **<u>Rationale:</u>** Butterfly stopover areas are extremely rare habitats and are biologically important for butterfly species that migrate south for the winter.	• Painted Lady • Red 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	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 Erie or Lake Ontario[cxlix]. • The habitat is typically a combination of field and forest, and provides the butterflies with a location to rest prior to their long	Studies confirm: • 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/day[xxxvii], significant	No CUT and CUM ecosites present however lack sufficient size, and not within 5 km of Lake Erie or Lake Ontario.	No Candidate Habitat is not present.	No

Table 1.1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
		<u>Forest</u>: FOC FOD FOM CUP Anecdotally, a candidate site for butterfly stopover will have a history of butterflies being observed.	migration south.[xxxii, xxxiii, xxxiv, xxxv, xxxvi] • The habitat should not be disturbed, fields/meadows with an abundance of preferred nectar plants and woodland edge providing shelter are requirements for this habitat. [cxlviii, cxlix] • Staging areas usually provide protection from the elements and are often spits of land or areas with the shortest distance to cross the Great Lakes.[xxxvii, xxxviii, xxxix, xl, xli] <u>Information Sources</u> • MNRF District Offices • NHIC • Agriculture Canada in Ottawa may have list of butterfly experts. • Field Naturalist Clubs • Toronto Entomologists Association • Conservation Authorities	variation can occur between years and multiple years of sampling should occur.[xl, xlii] • Observational studies are to be completed and need to be done frequently during the migration period to estimate MUD. • MUD of >5000 **or** >3000 with the presence of Painted Ladies or Red Admirals is to be considered significant.[E] • SWH MIST[cxlix] Index #16 provides development effects and mitigation measures.			
Landbird Migratory Stopover Areas **<u>Rationale</u>:** Sites with a high diversity of species as well as high numbers are most significant.	All migratory songbirds. Canadian Wildlife Service Ontario website: http://www.ec.gc.ca/nature/default.asp?lang=En&n=421B7A9D-1 All migrant raptors species: Ontario Ministry of Natural Resources: Fish and Wildlife Conservation Act, 1997. Schedule 7: Specially Protected Birds (Raptors)	All Ecosites associated with these ELC Community Series; FOC FOM FOD SWC SWM SWD	Woodlots >5 ha[E] in size and within 5 km[iv, v, vi, vii, viii, ix, x, xi, xii, xiii, xiv, xv] of Lake Erie and Lake Ontario. If woodlands are rare in an area of shoreline, woodland fragments 2–5 ha can be considered for this habitat[E] • If multiple woodlands are located along the shoreline those Woodlands <2 km from Lake Erie and Lake Ontario are more significant[cxlix] • Sites have a variety of habitats; forest, grassland and wetland complexes[cxlix] • The largest sites are more significant[cxlix] • Woodlots and forest fragments are important habitats to migrating birds,[ccxviii] these features located along the shore and located within 5km of Lake	Studies confirm: • Use of the habitat by >200 birds/day and with >35 spp with at least 10 bird spp. recorded on at least 5 different survey dates[E]. This abundance and diversity of migrant bird species is considered above average and significant. • Studies should be completed during spring (Mar to May) and fall (Aug to Oct) migration using standardized assessment techniques. Evaluation methods to follow “Bird and Bird Habitats: Guidelines for Wind Power Projects”[ccxi] • SWH MIST[cxlix] Index #9 provides development effects and mitigation measures.	No SWD present but lack sufficient size and are not within 5 km of Lake Erie or Lake Ontario.	No Candidate Habitat is not present.	No

Table 1.1 Seasonal Concentration Areas of Animals

Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
			Erie and Lake Ontario are Candidate SWH.[cxlviii] <u>Information Sources</u> • Bird Studies Canada • Ontario Nature • Local birders and field naturalist clubs • Ontario Important Bird Areas (IBA) Program				
Deer Winter Congregation Areas **<u>Rationale</u>:** Deer movement during winter in the southern areas of Ecoregion 6E are not constrained by snow depth; however, deer will annually congregate in large numbers in suitable woodlands to reduce or avoid the impacts of winter conditions.[cxlviii]	White-tailed Deer	All Forested Ecosites with these ELC Community Series: FOC FOM FOD SWC SWM SWD Conifer plantations much smaller than 50 ha may also be used.	• Woodlots >100 ha in size or if large woodlots are rare in a planning area woodlots >50 ha[E] • Deer movement during winter in the southern areas of Ecoregion 6E are not constrained by snow depth; however, deer will annually congregate in large numbers in suitable woodlands.[cxlviii] • Large woodlots > 100 ha and up to 1500 ha are known to be used annually by densities of deer that range from 0.1–1.5 deer/ha.[ccxxiv] • Woodlots with high densities of deer due to artificial feeding are not significant[E]. <u>Information Sources</u> • MNRF District Offices • LIO/NRVIS	Studies confirm: • Deer management is an MNRF responsibility, deer winter congregation areas considered significant will be mapped by MNRF.[cxlviii] • Use of the woodlot by white-tailed deer will be determined by MNRF, all woodlots exceeding the area criteria are significant, unless determined not to be significant by MNRF.[E] • Studies should be completed during winter (Jan/Feb) when >20 cm of snow is on the ground using aerial survey techniques,[ccxxiv] ground or road surveys, or a pellet count deer density survey.[ccxxv] • SWH MIST[cxlix] Index #2 provides development effects and mitigation measures.	No SWD ecosite present, however, the Study Area does not meet the size criteria.	No Candidate Habitat is not present.	No

Table 1.2.1 Rare Vegetation Communities

Rare Vegetation Community	Candidate SWH			Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
	ELC Ecosite Codes	Habitat Description	Detailed Information and Sources	Defining Criteria			
Cliffs and Talus Slopes **<u>Rationale</u>:** Cliffs and Talus Slopes are extremely rare habitats in Ontario.	Any ELC Ecosite within Community Series: TAO CLO TAS CLS TAT CLT	A Cliff is vertical to near vertical bedrock >3 m in height. A Talus Slope is rock rubble at the base of a cliff made up of coarse rocky debris	Most cliff and talus slopes occur along the Niagara Escarpment. <u>Information Sources</u> • The Niagara Escarpment Commission has detailed information on location of these habitats.	• Confirm any ELC Vegetation Type for Cliffs or Talus Slopes[lxxviii] • SWH MIST[cxlix] Index #21 provides development effects and mitigation measures.	No ELC communities not present.	No Candidate Habitat is not present.	No

Table 1.2.1 Rare Vegetation Communities

Rare Vegetation Community	Candidate SWH			Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
	ELC Ecosite Codes	Habitat Description	Detailed Information and Sources	Defining Criteria			
			• OMNRF Districts • NHIC has location information available on their website • Field Naturalist Clubs • Conservation Authorities				
Sand Barren **<u>Rationale</u>:** Sand barrens are rare in Ontario and support rare species. Most Sand Barrens have been lost due to cottage development and forestry	ELC Ecosites: SBO1 SBS1 SBT1 Vegetation cover varies from patchy and barren to continuous meadow (SBO1), thicket-like (SBS1), or more closed and treed (SBT1). Tree cover always ≤ 60%.	Sand Barrens typically are exposed sand, generally sparsely vegetated and caused by lack of moisture, periodic fires and erosion. 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%.	A sand barren area >0.5 ha in size[Ⓔ]. <u>Information Sources</u> • OMNRF Districts • NHIC has location information available on their website. • Field Naturalist Clubs • Conservation Authorities	• Confirm any ELC Vegetation Type for Sand Barrens[lxxviii] • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.)[Ⓔ]. • SWH MIST[cxlix] Index #20 provides development effects and mitigation measures.	No ELC communities not present.	No Candidate Habitat is not present.	No
Alvar **<u>Rationale</u>:** Alvars are extremely rare habitats in Ecoregion 6E.	ALO1 ALS1 ALT1 FOC1 FOC2 CUM2 CUS2 CUT2-1 CUW2 **Five Alvar Indicator Species:** *1) Carex crawei* *2) Panicum philadelphicum* *3) Eleocharis compressa* *4) Scutellaria parvula* *5) Trichostema brachiatum* These indicator species are very specific to Alvars within Ecoregion 6E[Ⓔcxlix]	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 plants. Undisturbed alvars can be phyto- and zoogeographically diverse, supporting many uncommon or are relict plant and animal species. Vegetation cover varies from patchy to barren with a	An Alvar site > 0.5 ha in size.[lxxv] Alvar is particularly rare in Ecoregion 6E where the only known sites are found in the western islands of Lake Erie.[cxcix] <u>Information Sources</u> • Alvars of Ontario (2000), Federation of Ontario Naturalists[lxxvi] • Ontario Nature – Conserving Great Lakes Alvars[ccviii] • NHIC has location information available on their website. • OMNRF Staff • Field Naturalist Clubs • Conservation Authorities	• Field studies that identify four of the five[Ⓔ] **Alvar Indicator Species**[lxxv, cxlix] at a Candidate Alvar site is Significant. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • The alvar must be in excellent condition and fit in with surrounding landscape with few conflicting land uses[lxxv] • SWH MIST[cxlix] Index #17 provides development effects and mitigation measures.	No ELC communities not present.	No Candidate Habitat is not present.	No

Table 1.2.1 Rare Vegetation Communities

Rare Vegetation Community	Candidate SWH			Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
	ELC Ecosite Codes	Habitat Description	Detailed Information and Sources	Defining Criteria			
		less than 60% tree cover.[lxxviii]					
Old Growth Forest **<u>Rationale</u>**: Due to historic logging practices and land clearance for agriculture, old growth forest is rare in Ecoregion 6E.	Forest Community Series: FOD FOC FOM SWD SWC SWM	Old Growth forests are characterized by heavy mortality or turnover of over-storey trees resulting in a mosaic of gaps that encourage development of a multi-layered canopy and an abundance of snags and downed woody debris.	Woodland area is >0.5 ha.Ⓔ <u>Information Sources</u> • OMNRF Forest Resource Inventory mapping • OMNRF Districts • Field Naturalist Clubs • Conservation Authorities • Sustainable Forestry Licence (SFL) companies will possibly know locations through field operations. • Municipal forestry departments	Field Studies will determine: • If dominant trees species of the forest are >140 years old, then the area containing these trees is Significant Wildlife Habitat[cxlviii] • The forested area containing the old growth characteristics will have experienced no recognizable forestry activities[cxlviii] (cut stumps will not be present) • The area of forest ecosites combined or an ecoelement within an ecosite that contain the old growth characteristics is the SWH. • Determine ELC vegetation types for the forest area containing the old growth characteristics[lxxviii] • SWH MIST[cxlix] Index #23 provides development effects and mitigation measures.	No SWD is present on Site but trees are not >140 years old.	No Candidate Habitat is not present.	No
Savannah **<u>Rationale:</u>** Savannahs are extremely rare habitats in Ontario.	TPS1 TPS2 TPW1 TPW2 CUS2	A Savannah is a tallgrass prairie habitat that has tree cover between 25–60%[lxxix, lxxx, lxxxi, lxxxii, lxxxiii] In ecoregion 6E, 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).	No minimum size to site.Ⓔ Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. <u>Information Sources</u> • NHIC has location data available on their website. • OMNRF Districts • Field Naturalists Clubs • Conservation Authorities	Field studies confirm one or more of the Savannah indicator species listed in [cxlix] Appendix N should be presentⒺ. Note: Savannah plant spp. list from Ecoregion 6E should be used.[cxlviii] • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • SWH MIST[cxlix] Index #18 provides development effects and mitigation measures.	No ELC communities not present.	No Candidate Habitat is not present.	No

Table 1.2.1 Rare Vegetation Communities

Rare Vegetation Community	Candidate SWH			Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
	ELC Ecosite Codes	Habitat Description	Detailed Information and Sources	Defining Criteria			
Tallgrass Prairie **Rationale:** Tallgrass Prairies are extremely rare habitats in Ontario.	TPO1 TPO2	A Tallgrass Prairie has ground cover dominated by prairie grasses. An open Tallgrass Prairie habitat has < 25% tree cover[lxxix, lxxx, lxxxi, lxxxii, lxxxiii] In ecoregion 6E, 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).	No minimum size to site.Ⓔ Site must be restored or a natural site. Remnant sites such as railway right of ways are not considered to be SWH. Information Sources • OMNRF Districts • NHIC has location information available on their website. • Field Naturalists Clubs • Conservation Authorities	Field studies confirm one or more of the Prairie indicator species listed in [cxlix] Appendix N should be present.Ⓔ Note: Prairie plant spp. list from Ecoregion 6E should be used[cxlviii] • Area of the ELC Ecosite is the SWH. • Site must not be dominated by exotic or introduced species (<50% vegetative cover are exotic sp.). • SWH MIST[cxlix] Index #19 provides development effects and mitigation measures.	No ELC communities not present.	No Candidate Habitat is not present.	No
Other Rare Vegetation Communities **Rationale:** Plant communities that often contain rare species which depend on the habitat for survival.	Provincially Rare S1, S2 and S3 vegetation communities are listed in Appendix M of the SWHTG.[cxlviii] Any ELC Ecosite Code that has a possible ELC Vegetation Type that is Provincially Rare is Candidate SWH.	Rare Vegetation Communities may include beaches, fens, forest, marsh, barrens, dunes and swamps.	ELC Ecosite codes that have the potential to be a rare ELC Vegetation Type as outlined in Appendix M.[cxlviii] The OMNRF/NHIC will have up to date listing for rare vegetation communities. Information Sources • NHIC has location information available on their website. • OMNRF Districts • Field Naturalists Clubs • Conservation Authorities	Field studies should confirm if an ELC Vegetation Type is a rare vegetation community based on listing within Appendix M of SWHTG.[cxlviii] • Area of the ELC Vegetation Type polygon is the SWH. • SWH MIST[cxlix] Index #37 provides development effects and mitigation measures.	No Criteria ELC communities not present.	No Candidate Habitat is not present.	No

Table 1.2.2 Specialized Habitats of Wildlife considered SWH

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
Waterfowl Nesting Area **Rationale:** Important to local waterfowl populations, sites with greatest number of species and highest number of	• American Black Duck • Northern Pintail • Northern Shoveler • Gadwall • Blue-winged Teal • Green-winged Teal • Wood Duck • Hooded Merganser	All upland habitats located adjacent to these wetland ELC Ecosites are Candidate SWH: MAS1 MAS2 MAS3 SAS1 SAM1	A waterfowl nesting area extends 120 m[cxlix] from a wetland (> 0.5 ha) or a wetland (>0.5 ha) and any small wetlands (0.5 ha) within 120 m 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.[cxlix] • Upland areas should be at least 120 m wide so that	Studies confirmed: • Presence of 3 or more nesting pairs for listed species excluding MallardsⒺ, or; • Presence of 10 or more nesting pairs for listed species including Mallards.Ⓔ	No SAS and SWD communities present but upland habitats do not meet the size criteria within the Study Area limits (at least 120 m wide). The criteria	No Candidate Habitat is not present.	No

Table 1.2.2 Specialized Habitats of Wildlife considered SWH

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
individuals are significant.	• Mallard	SAF1 MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SWT1 SWT2 SWD1 SWD2 SWD3 SWD4 **Note: includes adjacency to Provincially Significant Wetlands**	predators such as raccoons, skunks, and foxes have difficulty finding nests. • Wood Ducks and Hooded Mergansers utilize large diameter trees (>40 cm dbh) in woodlands for cavity nest sites. <u>Information Sources</u> • Ducks Unlimited staff may know the locations of particularly productive nesting sites. • OMNRF Wetland Evaluations for indication of significant waterfowl nesting habitat. • Reports and other information available from Conservation Authorities.	• Any active nesting site of an American Black Duck is considered significant. • Nesting studies should be completed during the spring breeding season (April–June). Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • A field study confirming waterfowl nesting habitat will determine the boundary of the waterfowl nesting habitat for the SWH, this may be greater or less than 120 m[cxlviii] from the wetland and will provide enough habitat for waterfowl to successfully nest. • SWH MIST[cxlix] Index #25 provides development effects and mitigation measures.	species were not observed during site investigations.		
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat **<u>Rationale:</u>** Nest sites are fairly uncommon in Ecoregion 6E and are used annually by these species. Many suitable nesting locations may be lost due to increasing shoreline development pressures and scarcity of habitat.	Osprey **Special Concern** Bald Eagle	ELC Forest Community Series: FOD, FOM, FOC, SWD, SWM and SWC directly adjacent to riparian areas – rivers, lakes, ponds and wetlands	Nests are associated with lakes, ponds, rivers or wetlands along forested shorelines, islands, or on structures over water. • Osprey nests are usually at the top a tree whereas Bald Eagle nests are typically in super canopy trees in a notch within the tree's canopy. • Nests located on man-made objects are not to be included as SWH (e.g. telephone poles and constructed nesting platforms). <u>Information Sources</u> • NHIC compiles all known nesting sites for Bald Eagles in Ontario. • MNRF values information (LIO/NRVIS) will list known nesting locations. Note: data	Studies confirm the use of these nests by: • One or more active Osprey or Bald Eagle nests in an area.[cxlviii] • Some species have more than one nest in a given area and priority is given to the primary nest with alternate nests included within the area of the SWH. • For an Osprey, the active nest and a 300 m radius around the nest or the contiguous woodland stand is the SWH[ccvii], maintaining undisturbed shorelines with large trees within this area is important.[cxlviii] • For a Bald Eagle the active nest and a 400–800 m radius around the nest is the SWH.[cvi, ccvii] Area of the habitat from 400–800 m is dependent on site lines from	No SWD community present however lacks adjacency to sufficiently suitable riparian areas.	No Candidate Habitat is not present.	No

Table 1.2.2 Specialized Habitats of Wildlife considered SWH

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
			from NRVIS is provided as a point and does not represent all the habitat. • Nature Counts, Ontario Nest Records Scheme data. • OMNRF District • Check the Ontario Breeding Bird Atlas[ccv] or Rare Breeding Birds in Ontario for species documented. • Reports and other information available from Conservation Authorities. • Field Naturalists clubs	the nest to the development and inclusion of perching and foraging habitat.[cvi] • To be significant a site must be used annually. When found inactive, the site must be known to be inactive for ≥ 3 years or suspected of not being used for >5 years before being considered not significant.[ccvii] • Observational studies to determine nest site use, perching sites and foraging areas need to be done from early March to mid-August. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #26 provides development effects and mitigation measures.			
Woodland Raptor Nesting Habitat **<u>Rationale:</u>** Nests sites for these species are rarely identified; these area sensitive habitats are often used annually by these species.	• 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 >30 ha with >4 ha of interior habitat.[lxxxviiii, lxxxix, xc, xci, xciii, xciv, xcv,xcvi, cxxxiii] Interior habitat determined with a 200 m buffer.[cxlviii] • 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. • In disturbed sites, nests may be used again, or a new nest will be in close proximity to old nest. <u>Information Sources</u> • OMNRF Districts • Check the Ontario Breeding Bird Atlas[ccv] or Rare Breeding Birds in Ontario for species documented.	Studies confirm: • Presence of 1 or more active nests from species list is considered significant.[cxlviii] • Red-shouldered Hawk and Northern Goshawk – A 400 m radius around the nest or 28 ha area of habitat is the SWH[ccvii] (the 28 ha habitat area would be applied where optimal habitat is irregularly shaped around the nest) • Barred Owl—A 200 m radius around the nest is the SWH.[ccvii] • Broad-winged Hawk and Coopers Hawk—A 100 m radius around the nest is the SWH.[ccvii] • Sharp-Shinned Hawk—A 50 m radius around the nest is the SWH.[ccvii] • Conduct field investigations from early March to end of	No Forested ecosites (SWD) do not meet the minimum size criteria.	No Candidate Habitat is not present.	No

Table 1.2.2 Specialized Habitats of Wildlife considered SWH

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
			• Check data from Bird Studies Canada. • Reports and other information available from Conservation Authorities.	May. The use of call broadcasts can help in locating territorial (courting/nesting) raptors and facilitate the discovery of nests by narrowing down the search area. • SWH MIST[cxlix] Index #27 provides development effects and mitigation measures.			
Turtle Nesting Areas **Rationale:** These habitats are rare and when identified will often be the only breeding site for local populations of turtles.	• Midland Painted Turtle Special Concern • Northern Map Turtle • Snapping Turtle	Exposed mineral soil (sand or gravel) areas adjacent (<100 m)[cxlviii] or within the following ELC Ecosites: MAS1 MAS2 MAS3 SAS1 SAM1 SAF1 BOO1 FEO1	• 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. • 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. • Sand and gravel beaches adjacent to undisturbed shallow weedy areas of marshes, lakes, and rivers are most frequently used. Information Sources • Use Ontario Soil Survey reports and maps to help find suitable substrate for nesting turtles (well-drained sands and fine gravels). • Check the Ontario Herpetofaunal Summary Atlas records or other similar atlases for uncommon turtles; location information may help to find potential nesting habitat for them. • NHIC • Field Naturalist Clubs	Studies confirm: • Presence of 5 or more nesting Midland Painted Turtles[E] • One or more Northern Map Turtle or Snapping Turtle nesting is a SWH.[E] • The area or collection of sites within an area of exposed mineral soils where the turtles nest, plus a radius of 30–100 m around the nesting area dependent on slope, riparian vegetation and adjacent land use is the SWH.[cxlviii] • Travel routes from wetland to nesting area are to be considered within the SWH as part of the 30–100 m area of habitat.[cxlix] • Field investigations should be conducted in prime nesting season typically late spring to early summer. Observational studies observing the turtles nesting is a recommended method. • SWH MIST[cxlix] Index #28 provides development effects and mitigation measures for turtle nesting habitat.	No SAS ELC ecosite present but no natural sand or gravel beaches present.	No Candidate Habitat is not present.	No

Table 1.2.2 Specialized Habitats of Wildlife considered SWH

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
Seeps and Springs **<u>Rationale:</u>** Seeps/Springs are typical of headwater areas and are often at the source of coldwater streams.	• Wild Turkey • Ruffed Grouse • Spruce Grouse • White-tailed Deer • Salamander spp.	Seeps/Springs are areas where groundwater 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.[cxvii, cxlix] • Seeps and springs are important feeding and drinking areas especially in the winter will typically support a variety of plant and animal species.[cxix, cxx, cxxi, cxxii, cxiii, cxiv] <u>Information Sources</u> • Topographical Map • Thermography • Hydrological surveys conducted by Conservation Authorities and MOE • Field Naturalists Clubs and landowners • Municipalities and Conservation Authorities may have drainage maps and headwater areas mapped	Field Studies confirm: • Presence of a site with two or more[E] seeps/springs should be considered SWH. • The area of an ELC forest ecosite or an ecoelement within ecosite containing the seeps/springs is the SWH. The protection of the recharge area considering the slope, vegetation, height of trees and groundwater condition need to be considered in delineation the habitat.[cxlviii] • SWH MIST[cxlix] Index #30 provides development effects and mitigation measures	No. Site was void of seeps of springs.	No Candidate Habitat is not present.	No
Amphibian Breeding Habitat (Woodland) **<u>Rationale:</u>** These habitats are extremely important to amphibian biodiversity within a landscape and often represent the only breeding habitat for local amphibian populations	• 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.	• Presence of a wetland, pond or woodland pool (including vernal pools) >500 m^2 (about 25 m diameter) within or adjacent (within 120 m) 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. • Woodlands with permanent ponds or those containing water in most years until mid-July are more likely to be used as breeding habitat.[cxlviii] <u>Information Sources</u> • Ontario Herpetofaunal Summary Atlas (or other similar atlases) for records	Studies confirm; • Presence of breeding population of one or more of the listed newt/salamander species or two or more of the listed frog species with at least 20 individuals (adults or eggs masses) or two or more of the listed frog species with Call Level Codes of 3.[E] • A combination of observational study and call count surveys[cviii] will be required during the spring (March–June) when amphibians are concentrated around suitable breeding habitat within or near the woodland/wetlands. • The habitat is the wetland area plus a 230 m radius of	No SWD ecosite present, but no adjacent woodlands.	No Candidate Habitat is not present.	No

Table 1.2.2 Specialized Habitats of Wildlife considered SWH

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
			• Local landowners may also provide assistance as they may hear spring-time choruses of amphibians on their property. • OMNRF Districts and wetland evaluations • Field Naturalist clubs • Canadian Wildlife Service Amphibian Road Call Survey • Ontario Vernal Pool Association: http://www.ontariovernalpools.org	woodland area.[lxiii, lxv, lxvi, lxvii, lxviii, lxix, lxx, lxxi] If a wetland area is adjacent to a woodland, a travel corridor connecting the wetland to the woodland is to be included in the habitat. • SWH MIST[cxlix] Index #14 provides development effects and mitigation measures.			
Amphibian Breeding Habitat (Wetland) **Rationale:** Wetlands supporting breeding for these amphibian species are extremely important and fairly rare within Central Ontario landscapes.	• 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. Typically these wetland ecosites will be isolated (>120 m) from woodland ecosites; however, larger wetlands containing predominantly aquatic species (e.g. Bullfrog) may be adjacent to woodlands	• Wetlands >500 m^2 (about 25 m diameter),[ccvii] supporting high species diversity are significant; some small or ephemeral habitats may not be identified on MNRF mapping and could be important amphibian breeding habitats.[clxxxii] • 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. • Bullfrogs require permanent water bodies with abundant emergent vegetation. <u>Information Sources</u> • Ontario Herpetofaunal Summary Atlas (or other similar atlases) • Canadian Wildlife Service Amphibian Road Surveys and Backyard Amphibian Call Count. • OMNRF Districts and wetland evaluations. • Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of breeding population of one or more of the listed newt/salamander species or two or more of the listed frog/toad species with at least 20 individuals (adults or eggs masses) or two or more of the listed frog/toad species with Call Level Codes of 3.[E] **or;** Wetland with confirmed breeding Bullfrogs are significant.[E] • The ELC ecosite wetland area and the shoreline are the SWH. • A combination of observational study and call count surveys[cviii] will be required during the spring (March–June) when amphibians are concentrated around suitable breeding habitat within or near the wetlands. • If a SWH is determined for Amphibian Breeding Habitat (Wetlands) then Movement Corridors are to be considered as outlined in Table 1.4.1 of this Schedule. • SWH MIST[cxlix] Index #15 provides development	No SW and SA ecosites present but lack sufficient size to meet criteria.	No Candidate Habitat is not present.	No

Table 1.2.2 Specialized Habitats of Wildlife considered SWH

Specialized Wildlife Habitat	Wildlife Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
				effects and mitigation measures.			
Woodland Area-Sensitive Bird Breeding Habitat **Rationale:** Large, natural blocks of mature woodland habitat within the settled areas of Southern Ontario are important habitats for area sensitive interior forest song birds.	• 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 • Pileated Woodpecker **Special Concern:** • Cerulean Warbler • Canada Warbler	All Ecosites associated with these ELC Community Series: FOC FOM FOD SWC SWM SWD	• Habitats where interior forest breeding birds are breeding, typically large mature (>60 yrs old) forest stands or woodlots >30 ha.[cv, cxxi, cxxii, cxxiii, cxxxiv, cxxxv, cxxxvi, cxxxvii, cxxxviii, cxxxix, cxl, cxli, cxlii, cxliii, cxliv, cxlv, cxlvi, cl, cli, clii, cliii, cliv, clv, clvi, clvii, clviii, clix] • Interior forest habitat is at least 200 m from forest edge habitat. Information Sources • Local birder clubs. • Canadian Wildlife Service (CWS) for the location of forest bird monitoring. • Bird Studies Canada conducted a 3-year study of 287 woodlands to determine the effects of forest fragmentation on forest birds and to determine what forests were of greatest value to interior species • Reports and other information available from Conservation Authorities.	Studies confirm: • Presence of nesting or breeding pairs of three or more of the listed wildlife species.Ⓔ • Note: any site with breeding Cerulean Warblers or Canada Warblers is to be considered SWH.Ⓔ • Conduct field investigations in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #34 provides development effects and mitigation measures.	No SWD ecosites found on Site but lacks sufficient size requirements (i.e. < 30 ha, interior forest habitat > 200m from forest edge).	No Candidate habitat is not present.	No

Table 1.3 Habitats of Species of Conservation Concern considered SWH

Wildlife Habitat	Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
Marsh Breeding Bird Habitat **Rationale:** Wetlands for these bird species are typically productive and fairly rare in Southern Ontario landscapes.	• American Bittern • Virginia Rail • Sora • Common Moorhen • American Coot • Pied-billed Grebe • Marsh Wren • Sedge Wren • Common Loon	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 SAS1 SAM1 SAF1 FEO1	• Nesting occurs in wetlands. • All wetland habitat is to be considered as long as there is shallow water with emergent aquatic vegetation present.[cxxiv] • For Green Heron, habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs	Studies confirm: • Presence of five or more nesting pairs of Sedge Wren or Marsh Wren **or** breeding by any combination of four or more of the listed species.Ⓔ • Note: any wetland with breeding of one or more Black Terns, Trumpeter	No SAS community present but criteria species were not observed during BBS.	No Candidate habitat is not present.	No

Table 1.3 Habitats of Species of Conservation Concern considered SWH

Wildlife Habitat	Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
	• Green Heron • Trumpeter Swan **Special Concern:** • Black Tern • Yellow Rail	BOO1 For Green Heron: All SW, MA and CUM1 sites.	and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water. <u>Information Sources</u> • OMNRF District and wetland evaluations. • Field Naturalist clubs • NHIC Records. • Reports and other information available from Conservation Authorities. • Ontario Breeding Bird Atlas.	Swan, Green Heron or Yellow Rail is SWH.[E] • Area of the ELC ecosite is the SWH. • Breeding surveys should be done in May/June when these species are actively nesting in wetland habitats. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #35 provides development effects and mitigation measures.			
Open Country Bird Breeding Habitat **Rationale:** This wildlife habitat is declining throughout Ontario and North America. Species such as the Upland Sandpiper have declined significantly the past 40 years based on CWS (2004) trend records.	• Upland Sandpiper • Grasshopper Sparrow • Vesper Sparrow • Northern Harrier • Savannah Sparrow **Special Concern** • Short-eared Owl	CUM1 CUM2	• Large grassland areas (includes natural and cultural fields and meadows) >30 ha.[clx, clxi, clxii, clxiii, clxiv, clxv, clxvi, clxvii, clxviii, clxix] • 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).[E] • 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. • The Indicator bird species are area sensitive requiring larger grassland areas than the common grassland species. <u>Information Sources</u> • Agricultural land classification maps, Ministry of Agriculture • Local bird clubs • Ontario Breeding Bird Atlas	Field Studies confirm: • Presence of nesting or breeding of two or more of the listed species.[E] • A field with one or more breeding Short-eared Owls is to be considered SWH. • The area of SWH is the contiguous ELC ecosite field areas. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #32 provides development effects and mitigation measures	No CUM1 ELC community present but lacks sufficient size for criteria.	No Candidate Habitat is not present.	No

Table 1.3 Habitats of Species of Conservation Concern considered SWH

Wildlife Habitat	Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
			• EIS Reports and other information available from Conservation Authorities.				
Shrub/Early Successional Bird Breeding Habitat **Rationale**: This wildlife habitat is declining throughout Ontario and North America. The Brown Thrasher has declined significantly over the past 40 years based on CWS (2004) trend records.	Indicator Spp: • Brown Thrasher • Clay-coloured Sparrow Common Spp. • Field Sparrow • Black-billed Cuckoo • Eastern Towhee • Willow Flycatcher **Special Concern:** • Yellow-breasted Chat • Golden-winged Warbler	CUT1 CUT2 CUS1 CUS2 CUW1 CUW2 Patches of shrub ecosites can be complexed into a larger habitat for some bird species	Large field areas succeeding to shrub and thicket habitats >10 ha[clxiv] 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).[E] • Shrub thicket habitats (>10 ha) are most likely to support and sustain a diversity of these species.[clxxiii] • Shrub and thicket habitat sites considered significant should have a history of longevity, either abandoned fields or pasturelands. Information Sources • Agricultural land classification maps, Ministry of Agriculture. • Local bird clubs • Ontario Breeding Bird Atlas • Reports and other information available from Conservation Authorities.	Field Studies confirm: • Presence of nesting or breeding of one of the indicator species and at least two of the common species.[E] • A habitat with breeding Yellow-breasted Chat or Golden-winged Warbler is to be considered as Significant Wildlife Habitat.[E] • The area of the SWH is the contiguous ELC ecosite field/thicket area. • Conduct field investigations of the most likely areas in spring and early summer when birds are singing and defending their territories. • Evaluation methods to follow "Bird and Bird Habitats: Guidelines for Wind Power Projects"[ccxi] • SWH MIST[cxlix] Index #33 provides development effects and mitigation measures.	No CUT1 ecosite present but lacks sufficient size for criteria.	No Candidate habitat is not present.	No
Terrestrial Crayfish **Rationale:** Terrestrial Crayfish are only found within SW Ontario in Canada and their habitats are very rare.[ccii]	Chimney or Digger Crayfish; (*Fallicambarus fodiens)* Devil Crayfish or Meadow Crayfish; (*Cambarus Diogenes*)	MAM1 MAM2 MAM3 MAM4 MAM5 MAM6 MAS1 MAS2 MAS3 SWD SWT SWM CUM1 with inclusions of above meadow marsh	Wet meadow and edges of shallow marshes (no minimum size) should be surveyed for terrestrial crayfish. • Constructs burrows in marshes, mudflats, meadows; the ground can't be too moist. Can often be found far from water. • Both species are a semi-terrestrial burrower which spends most of its life within burrows consisting of a network of tunnels. Usually the soil is not too moist so that the tunnel is well formed.	Studies Confirm: • Presence of one or more individuals of species listed or their chimneys (burrows) in suitable meadow marsh, swamp or moist terrestrial sites.[cci] • Area of ELC ecosite or an ecoelement area of meadow marsh or swamp within the larger ecosite area is the SWH. • Surveys should be done April to August in temporary or permanent water. Note the presence of burrows or	No SWD community is present, however, terrestrial crayfish chimneys were not observed in Study Area during field investigations.	No Candidate habitat is not present.	No

Table 1.3 Habitats of Species of Conservation Concern considered SWH

Wildlife Habitat	Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosite Codes	Habitat Criteria and Information Sources	Defining Criteria			
		ecosites can be used by terrestrial crayfish.	Information Sources • Information sources from "Conservation Status of Freshwater Crayfishes" by Dr. Premek Hamr for the WWF and CNF March 1998	chimneys are often the only indicator of presence, observance or collection of individuals is very difficult.[cci] • SWH MIST[cxlix] Index #36 provides development effects and mitigation measures.			
Special Concern and Rare Wildlife Species **Rationale:** These species are quite rare or have experienced significant population declines in Ontario.	All Special Concern and Provincially Rare (S1–S3, SH) plant and animal species. Lists of these species are tracked by the NHIC.	All plant and animal element occurrences (EO) within a 1- or 10-km grid. Older element occurrences were recorded prior to GPS being available; therefore, location information may lack accuracy	When an element occurrence is identified within a 1 or 10 km grid for a Special Concern or provincially Rare species; linking candidate habitat on the site needs to be completed to ELC Ecosites.[lxxviii] Information Sources • NHIC will have Special Concern and Provincially Rare (S1–S3, SH) species lists with element occurrences data. • NHIC Website "Get Information": http://nhic.mnr.gov.on.ca • Ontario Breeding Bird Atlas • Expert advice should be sought as many of the rare spp. have little information available about their requirements.	Studies Confirm: • Assessment/inventory of the site for the identified special concern or rare species needs to be completed during the time of year when the species is present or easily identifiable. • The area of the habitat to the finest ELC scale that protects the habitat form and function is the SWH, this must be delineated through detailed field studies. The habitat needs be easily mapped and cover an important life stage component for a species e.g. specific nesting habitat or foraging habitat. • SWH MIST[cxlix] Index #37 provides development effects and mitigation measures.	Yes Candidate habitat was present for barn swallow (SC) within buildings on-site, though no breeding evidence for the species was observed during field studies.	No Breeding evidence of barn swallow were not observed during field investigations, and therefore habitat is not confirmed.	Candidate

Table 1.4 Animal Movement Corridors

Habitat	Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosites	Habitat Criteria and Information Sources	Defining Criteria			
Amphibian Movement Corridors **Rationale:** Movement corridors for amphibians moving from their terrestrial habitat to	• Eastern Newt • American Toad • Spotted Salamander • Four-toed Salamander • Blue-spotted Salamander • Gray Treefrog • Western Chorus Frog	Corridors may be found in all ecosites associated with water. • Corridors will be determined based on identifying the significant breeding habitat	Movement corridors between breeding habitat and summer habitat.[clxxiv, clxxv, clxxvi, clxxvii, clxxviii, clxxix, clxxx, clxxxi] • Movement corridors must be determined when Amphibian breeding habitat is confirmed as SWH from Table 1.2.2 **(Amphibian Breeding**	• Field Studies must be conducted at the time of year when species are expected to be migrating or entering breeding sites. • Corridors should consist of native vegetation, with several layers of vegetation. Corridors unbroken by	No Amphibian Breeding Habitat (Wetland and Woodland) are not present within the Study Area.	No Candidate habitat is not present.	No

Table 1.4 Animal Movement Corridors

Habitat	Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		ELC Ecosites	Habitat Criteria and Information Sources	Defining Criteria			
breeding habitat can be extremely important for local populations.	• Northern Leopard Frog • Pickerel Frog • Green Frog • Mink Frog • Bullfrog	for these species in Table 1.1	**Habitat –Wetland)** of this Schedule.Ⓔ <u>Information Sources</u> • MNRF District Office • NHIC • Reports and other information available from Conservation Authorities. • Field Naturalist Clubs	roads, waterways or bodies, and undeveloped areas are most significant[cxlix] • Corridors should have at least 15 m of vegetation on both sides of waterway[cxlix] or be up to 200 m wide[cxlix] of woodland habitat and with gaps <20 m.[cxlix] • Shorter corridors are more significant than longer corridors; however, amphibians must be able to get to and from their summer and breeding habitat.[cxlix] • SWH MIST[cxlix] Index #40 provides development effects and mitigation measures			

Table 1.5.1 Significant Wildlife Habitat Exceptions for Ecodistricts within Ecoregion 6E

Ecodistrict	Wildlife Habitat and Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		Ecosites and Habitat Description	Habitat Criteria and Information	Defining Criteria			
6E-14 **Rationale:** The Bruce Peninsula has an isolated and distinct population of black bears. Maintenance of large woodland tracts with mast-producing tree species is important for bears. clxxxvi, ccxvii	**Mast Producing Areas** • Black Bear	All Forested habitat represented by ELC Community Series: FOM FOD Black bears require forested habitat that provides cover, winter hibernation sites, and mast-producing tree species. clxxxv, clxxxvii,clxxxviii, clxxxix, cxc, cxci, cxcii, cxciii, ccxvii •Forested habitats need to be large enough to provide cover and protection for black bears ccxvii.	Woodland ecosites >30ha with mast-producing tree species, either soft (cherry) or hard (oak and beech), Information Sources Important forest habitat for black bears may be identified by OMNRF.	All woodlands > 30ha with a 50%composition of these ELC VegetationⒺ Types are considered significant: FOM1-1 FOM2-1 FOM3-1 FOD1-1 FOD1-2 FOD2-1 FOD2-2 FOD2-3 FOD2-4 FOD4-1 FOD5-2 FOD5-3 FOD5-7 FOD6-5	No Study Area is within Eco district 6E-1	No Candidate habitat is not present. Study Area is within Eco district 6E-1	No

Table 1.5.1 Significant Wildlife Habitat Exceptions for Ecodistricts within Ecoregion 6E

Ecodistrict	Wildlife Habitat and Species	Candidate SWH		Confirmed SWH	Candidate Habitat Present Within the Site	Confirmed Habitat Found Within the Site	SWH Type Present
		Ecosites and Habitat Description	Habitat Criteria and Information	Defining Criteria			
				• SWHMiST cxlix Index #3 provides development effects and mitigation measures.			
6E- 17 **Rationale:** Sharp-tailed grouse only occur on Manitoulin Island in Eco-region 6E, Leks are an important habitat to maintain their population	**Lek** **Sharp-tailed Grouse**	CUM CUS CUT The lek or dancing ground consists of bare, grassy or sparse shrubland. There is often a hill or rise in topography. Leks are typically a grassy field/meadow >15ha with adjacent shrublands and >30ha with adjacent deciduous woodland. Conifer trees within 500m are not tolerated.	Grasslands (field/meadow) are to be >15ha when adjacent to shrubland and >30ha when adjacent to deciduous woodland ccxix. Grasslands are to be undisturbed with low intensities of agriculture (light grazing or late haying) Leks will be used annually if not destroyed by cultivation or invasion by woody plants or tree planting Information Sources OMNRF district office Bird watching clubs Local landowners Ontario Breeding Bird Atlas	Studies confirming lek habitat are to be completed from late March to June. Any site confirmed with sharp-tailed grouse courtship activities is considered significantⒺ The field/meadow ELC ecosites plus a 200 m radius area with shrub or deciduous woodland is the lek habitatⒺ SWHMiST Index #32 provides development effects and mitigation measures	No Study Area is within Eco district 6E-1	No Candidate habitat is not present. Study Area is within Eco district 6E-1	No

Appendix E

Hydrogeological Assessment Report

Hydrogeological Assessment Report

4631 Sideroad 20 North, Puslinch Township, Ontario

Puslinch Development GP Inc.

29 May 2025

→ The Power of Commitment

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1. Introduction

GHD Limited (GHD) was retained by Puslinch Development GP Inc.(client) to carry out a hydrogeological investigation in support of the proposed development at 4631 Sideroad 20 North, Puslinch Township, Ontario (hereinafter referred to as “Site” or “Property”). A Site Location Map is provided on **Figure 1.1**.

The hydrogeological investigation was carried out in accordance with the approved GHD scope of work dated August 25, 2023. The purpose of the hydrogeological investigation was to assess the subsurface soil and groundwater conditions within the area of the proposed development. It is understood that the proposed development at the Site will include three slab-on-grade structures for industrial use that are mostly surrounded by parking lot and paved aprons. It is assumed the proposed structures will be one- or two-storey with no basements, only the required building wall footings. A figure presenting the Site Plan Layout is included on **Figure 1.2**.

The objectives of this investigation were to characterize the current geological and hydrogeological conditions throughout the Site and surrounding area, including:

1. Assess current groundwater conditions and quantify existing and potential impacts to the local groundwater regime (quality and quantity).
2. Evaluate whether the current groundwater conditions will be impacted by the proposed development.
3. Estimate the quantity of water taking for the proposed development concept.
4. Determine the need for and options for groundwater control during construction and long-term and determine the need for and nature of any mitigation measures.
5. Address requirements related to stormwater management consideration which will be done as part of a standalone document.

Geotechnical investigations (GHD, 2024) were undertaken by GHD concurrently with the hydrogeological investigation that included the following activities:

1. Borehole advancement and installation of monitoring wells in selected boreholes to facilitate the collection of groundwater levels to determine groundwater flow conditions.
2. Single well response testing (SWRT) to determine the horizontal hydraulic conductivity of the saturated geological deposits.
3. Guelph Permeameter Testing to determine the infiltration capacity of the unsaturated surficial soils.
4. Groundwater level monitoring to determine seasonal fluctuations of the groundwater table.
5. Collection of one unfiltered groundwater sample for laboratory analysis that would be used to assess options for the management of groundwater potentially collected during the construction of the development.

This report is organized into the following Sections:

Section 1.0 – Introduction: outlines the purpose, objectives and scope of work, and presents the report organization.

Section 2.0 – Background: Outlines previous investigations carried out at the Site and provides description of the existing Site conditions, background information and surrounding land uses, as well as an outline of the proposed development. The regional environmental setting, including the physiography, topography, main surface water features surrounding the Site, and the surficial geology is presented.

Section 3.0 – Methodology: Describes the field activities and methodologies used to assess the site environmental conditions and to determine potential impacts associated with the undertaking.

Section 4.0 – Geology and Hydrogeology: Provides a detailed description of the Site geology, hydrogeology and the hydraulic properties of the underlying stratigraphy, and an evaluation of the potential temporary construction water takings for the development and potential long-term takings. Current groundwater and surface water monitoring results are also provided, as well as a preliminary predevelopment water balance as part of a standalone technical memorandum (GHD, 2024).

Section 5.0 – Summary and Conclusions: Provides a summary of the study findings.

References, Figures, Tables and Appendices are provided following the text of this report, as indicated in the Table of Contents.

2. Background

2.1 Site Description

The Site is located at 4631 Sideroad 20 North in the Township of Puslinch, Ontario. The Site is currently unoccupied land, with parts of the Site being used previously as agricultural purposes. The Site is triangular in shape and is approximately 25.47 hectares (62.9 acres). The Site is currently located in a rural area developed for mixed residential, commercial, and institutional land uses (**Figure 2.1**).

The Site is bounded to the northeast by Hanlon Parkway, and by commercial/industrial buildings east of the Hanlon Parkway. The Site is bounded to the south by Concession Road 4, with agricultural lands and vacant forested land located to the south. The Site is bounded to the west by Sideroad 20 North, with single family rural residential dwellings, agricultural land and vacant forested land on the west side of Sideroad 20 North. To the northwest of the Site is Forestell Road, north of which is an industrial subdivision.

The Site and surrounding properties do not have municipal water and sewer services. Water and sewage services in the Township of Puslinch, currently consist of individual on-site private water supply wells and septic systems.

A small surface water feature (pond) is located on the southwest portion of the Site. Several more surface water features (ponds) and wetlands are located within a 500 m radius of the Site **(Figure 2.2)**.

2.2 Regional Setting

The Site is located in the Horseshoe Moraines physiographic region[1], which is characterized by till moraines, spillways, till plains, drumlins and peat and muck deposits (**Figure 2.3**). The topography at and near the Site is undulating to rolling on the moraines, with the Site having a gradual slope from north to south at an elevation ranging between 341.5 m above mean sea level (m AMSL) at MW1-23 to 336.2 m AMSL at MW13-23.

Regional surficial geology mapping[2] of the area indicates that the Site and surrounding lands are underlain by coarse textured ice-contact stratified deposits that consist of sand and gravel, minor silts and clays, and fine textured stone-poor, sandy silt to silty sand textured glacial till deposits (**Figure 2.4**). Organic deposits of peat, muck and marl and glaciofluvial deposits of sand and gravel are mapped throughout the surrounding area.

Overburden underlying the Site is generally described as a sequence of Pleistocene glacial deposits overlying dolostone bedrock of the Upper Ordovician Guelph Formation. The surficial geology and general stratigraphic framework for the Site and surrounding area consists of the following deposits:

– Surficial Material – topsoil and fill
– Ice-Contact Stratified Deposits – Sands and Gravels, minor silts and clays
– Till Deposits – Silty Sand to Sandy Silt
– Bedrock (Guelph Formation) –dolostone

The location of water wells recorded by the Ministry of the Environment Conservation and Parks (MECP) within 500 m of the Site is presented on **Figure 2.5**, and a summary of the records is presented in **Appendix H**. Based on review of

[1] Chapman, L.J. and Putnam, D.F., 1984. The Physiography of Southern Ontario. Ontario Geological Survey, Special Volume 2.
[2] Surficial Geology of Southern Ontario - Miscellaneous Release--Data 128-REV. Ontario Geological Survey, 2010.

the well records, the majority of recent records are for water supply wells, observation wells and test holes or are unknown. There are 28 water supply wells located within a 500 m of the Site.

A review of the well records indicates that all water supply wells are open holes, all of which are screened in the bedrock unit. As per the MECP water well records of water supply wells located within a 500 m radius of the Site, the bedrock unit was encountered between 32.9 and 46.9 meters below ground surface (m BGS), with an average depth of 39.7 m BGS. Six of the well records had incomplete information and for this reason, well depth could not be determined.

MECP records indicate there is one water supply well located on Site, although the Site owner does not know of any water supply wells currently on Site. It is likely that the well is located based on MECP location records which often use Lot centroid or other estimation of locations, and is not actually attributed to this parcel of land.

3. Methodology

The following activities were undertaken to fulfill the objectives of the project:

– Borehole advancement and installation of monitoring wells in selected boreholes to facilitate the collection of groundwater levels to determine groundwater flow conditions.
– Single-Well Response Tests (SWRT) to determine hydraulic conductivity and groundwater flux of the saturated stratigraphic deposits investigated.
– Infiltration testing at six locations to provide information on infiltration parameters to assess storm water management options.
– Groundwater elevation monitoring for one year to determine seasonal fluctuations of the groundwater table, and groundwater surface water interactions.
– Collection of groundwater water samples from selected monitoring wells to assess options for the management of groundwater potentially collected during the construction of the development.

The investigative activities listed above were completed concurrently with geotechnical investigations undertaken by GHD (GHD, 2024). Details of these investigations are summarized in the following sections, and GHD's field investigation methodology and protocols are provided in **Appendix A.**

3.1 Borehole Advancement and Monitoring Well Installations

The scope of work consisted of advancing thirteen (13) boreholes. Eight (8) boreholes (MW1-23 to MW13-23) were converted into monitoring wells. The well completion details for the monitoring wells are presented on **Table 3.1**, and the monitoring well and borehole locations are presented on **Figure 3.1**. Copies of the Stratigraphic and Instrumentation logs are presented in **Appendix B.**

The drilling work was carried out between November 20 and November 23, 2023 utilizing a CME-850 rubber track mounted drilling rig, supplied, and operated by Aardvark Drilling (Aardvark), under the full-time supervision of GHD experienced technical personnel. The boreholes were advanced using 8-inch (203-mm) O.D. hollow stem augers.

All monitoring wells were installed by the MECP licensed well driller, Aardvark, consistent with the requirements of Ontario Regulation 903 – Wells (R.R.O 1990) and O. Reg. 153/04 (as amended). The drilling and monitoring well installation methods and procedures are described in **Appendix A**.

Monitoring wells were constructed using 50 mm (2-inch) Schedule 40 PVC screen and casing. The well screens are typically 3.05 m (10 feet) or 1.52 m (5 feet) in length and pre-slotted (No. 10 slot) (see **Table 3.1**). Silica sand pack was placed from the bottom of the monitoring well and typically extended 0.6 m above the screen. The remaining

annular space was sealed with bentonite, and the wells were completed with either protective monument or flushmount style steel casings set in a concrete surface seal.

Soil samples were generally collected every 0.75 m depth intervals to 3.0 m BGS and then at 1.5 m intervals below 3.0 m BGS; to the termination depth of the drilled boreholes. Soil samples were collected using a 50 mm outside diameter split spoon sampler in accordance with the specifications of the Standard Penetration Test Method (ASTM D1586). In addition, at each borehole location the relative density or consistency of the soils were measured using the Standard Penetration Test (SPT) method, by counting the number of blows ('N') required to drive a conventional split barrel soil sampler 300 mm depth.

UTM coordinates were measured at each borehole location and ground surface elevations were obtained using Lecia Global Navigation Satellite System (GNSS). The coordinates provided on the Borehole Records are positioned relative to UTM Coordinates (UTM-17 NAD83) northing and easting coordinates and the ground surface elevations are referenced to Geodetic datum.

3.2 Single Well Response Testing

A single well response test was completed on monitoring well MW10-23 to estimate the horizontal hydraulic conductivity of the saturated geologic deposits underlying the Site.

Single well response tests involve the injection or removal of a known volume of water into/from the well and measuring the water level response in the well until it returns to static conditions (i.e., falling/rising head test). The results of the hydraulic testing were analyzed using the Bouwer-Rice (1976) solution for unconfined conditions as provided in the software package AQTESOLV™.

The solution was used to determine the horizontal hydraulic conductivity of the saturated soils within the immediate vicinity of the screened interval of the monitoring well. The SWRT is summarized in **Table 3.2** and the procedures are discussed in **Appendix A**. The results of the testing are presented in **Appendix C,** and are discussed in **Section 4.0**.

3.3 Groundwater Level and Surface water Monitoring

Groundwater level monitoring at the Site was conducted from November 29, 2023 through October 29, 2024. Groundwater levels were monitored in all wells using an electronic water level meter on November 29 and December 8, 2023, and February 8, April 3, May 14, June 13, August 19 and October 29, 2024. Three monitoring wells, MW1-23, MW7-23 and MW10-23, were equipped with Solinst Levelogger® pressure transducers and data loggers to continuously record water levels and provide a detailed record of the response of groundwater to climatic conditions throughout the year. Groundwater levels collected from the on-site monitoring wells are summarized in **Tables 3.3** and **3.4**, and hydrographs of the observed levels are presented in **Appendix D**.

To understand baseline conditions, GHD initiated a surface water monitoring program in May 2024 to be conducted over a monitoring period of one (1) year to ensure seasonal data is collected (i.e., spring, summer, fall, and winter). To characterise the hydroperiods of the on-Site wetland feature, GHD established one (1) monitoring location (SW1/MP1) within the wetland as shown on **Figure 4.3** of this report and **Figure 2** of the Water Balance Assessment report (Stormwater Management Report, Appendix D, GHD, 2025b). At this monitoring location, a staff gauge and mini piezometer were installed to measure discrete surface water and shallow groundwater levels installed at 0.47 mBGS of the base of pond (base estimated at 331.34 mASL) respectively, in conjunction with continuous measurements of water level and temperature recorded by non-vented pressure transducers at 15-minute intervals.

3.4 Guelph Permeameter Testing

Guelph Permeameter Tests provide information on infiltration capacity of the soils. These data are used in the assessment of stormwater management options presented in a standalone technical memorandum (GHD, 2024). The Guelph Permeameter (GP) is a well-known borehole permeameter technique. Guelph permeameter measurements

are carried out in the vadose zone above the water table, where the soil is unsaturated. The GP method measures the steady-state rate necessary to maintain a constant depth of water in an uncased cylindrical borehole above the water table.

The hydraulic conductivity measured in the unsaturated (vadose) zone is referred to as the “field-saturated” hydraulic conductivity (Kfs) (Reynolds, 1986). The Guelph Permeameter method measures the steady-state flow rate (Q) necessary to maintain a constant depth of water (H) in an uncased borehole. The hydraulic conductivity (K_{fs}) is then calculated from Q and H using the analytical solutions (after Reynolds et al., 1985). The analytical solution input parameters include the following:

– Reservoir cross sectional area.
– Water height.
– Borehole radius.
– Soil texture.
– Steady state rate of water level change.

The GP infiltration tests were completed between December 8 and December 21, 2023. A summary of the field procedures that were employed is presented in **Appendix A**. A total of six Guelph Permeameter tests were completed on the shallow soils ranging from 1.22 to 1.50 m BGS at selected locations. The results of the testing are presented in **Appendix E**, and discussed in **Section 4.0**.

3.5 Groundwater Quality

On June 13, 2024, one unfiltered groundwater sample was collected from monitoring well MW10-23 for laboratory analysis of the Provincial Water Quality Objectives (PWQO) to characterize the groundwater that may be collected during construction activities for discharge. At the time of sample collection, the other monitoring wells contained insufficient levels of groundwater to facilitate sample collection.

Prior to sampling, the well was purged to ensure that the sample collected was representative of groundwater quality. Purging of the well was considered to be complete when field measurements of pH, conductivity and temperature stabilized, which generally occurs after three to five well volumes of groundwater had been removed (see **Appendix A**).

The groundwater sample was submitted under chain of custody procedures to ALS Environmental (ALS) of Waterloo, Ontario a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited analytical laboratory. The laboratory analytical reports are provided in **Appendix F**, and the results are discussed in **Section 4.0**.

4. Geology and Hydrogeology

The following sections provide a description of the geology and hydrogeology of the Site, based on the results of the investigations completed and on the available background information. Hydrostratigraphic cross-section A-A', oriented in a northwest-southeast direction, and cross-section B-B', oriented in a southwest-northeast direction across the Site were prepared based on the stratigraphic information collected from the boreholes and monitoring wells. The locations of the profiles are presented on **Figure 3.1,** and the cross-sections are presented on **Figures 4.1**, **4.2** and **4.3**, respectively**.**

4.1 Site Geology

The following surficial materials and geologic deposits underlie the Site (see **Figures 4.1**, **4.2** and **4.3** and the borehole logs in **Appendix B)**:

– **Fill** (0.1 up to 3.0 m BGS) – sand with gravel, silty sand/sandy silt, and silt
– **Ice-Contact Stratified Deposit** (0.8 up to 11.3 m BGS) – Gravelly Sand to Sand and Silt
– **Coarse-textured Till Deposits** (0.6 up to 11.3 m BGS) – Stone-poor, Silty Sand to Sandy Silt, Silt

Disturbed Soil

A surficial layer of topsoil was encountered at the ground surface of all boreholes. Earth disturbed native soil was encountered in all boreholes below the topsoil and extended to a depth varying from approximately 0.1 m BGS to 3.0 m BGS. The disturbed composition is in general heterogeneous, consisting of sand with gravel, silty sand/sandy silt, and silt. Rootlets, corn husks and rock fragments were observed within some of the fill samples obtained from the boreholes. The fill was described as moist, brown to dark brown and loose to compact.

Gravelly Sand to Sand and Silt (Ice contact stratified deposit)

An ice-contact stratified deposit consisting of gravelly sand to sand was encountered beneath the fill / disturbed soil layer in all boreholes except BH8-23 and extended to termination depth of the boreholes in MW1-23, BH2-23, BH3-23, BH4-23, BH9-23, MW10-23, MW12-23, and MW13-23. This deposit is generally brown, moist and compact to very dense, and contains a high percentage of sand.

Silty Sand to Sandy Silt, Silt (Till)

Interbedded within the gravelly sand to sand deposit is a silty sand to sandy silt to silt till that was encountered in BH4-23, MW5-23, MW6-23, MW7-23, BH8-23, BH9-23, MW10-23, and MW11-23. The silty sand to sandy silt to silt deposit was found overlying the gravelly sand to sand deposit in BH4-23, MW6-23, MW7-23, BH9-23 and MW10-23 where it was encountered at depths ranging from 0.6 to 4.6 m BGS. The deposit was found to be to termination depth of the borehole in MW5-23, MW6-23, MW7-23, BH8-23, and MW11-23. This deposit is generally brown, moist to wet and compact to very dense.

Existing Pond

The geological unit of the existing pond present on site is probably underlie by topsoil and clay layer that overlies the Ice contact stratified and or the till unit. This will need further investigation.

4.2 Site Hydrogeology

The Site is underlain by a fill/disturbed native material followed by a gravelly sand aquifer and a silty sand till.

The field investigations completed for the Site included well development, manual groundwater elevation measurements, long-term groundwater elevation monitoring using pressure transducers, groundwater quality sampling, Single Well Response tests (SWRTs) and an assessment of the properties and groundwater conditions for the overburden material.

A review of the geological cross-sections (**Figures 4.1**, **4.2** and **4.3**) indicates the primary hydrostratigraphic units underlying the Site include the following representing two groundwater regimes and the pond perched water unit:

Disturbed Native (Leaky Aquitard)

The disturbed native material was encountered across the Site and ranged from 0.1 to 3.0 m BGS. It consists primarily of sand with gravel, silty sand/sandy silt, and silt and is unsaturated.

Ice-Contact Stratified Deposit (Aquifer)

The ice-contact stratified deposits consist of gravelly sand to sand. No single well response tests were performed within the gravelly sand/sand due to low height of water in the boreholes screened within the stratigraphic unit. For this reason, a hydraulic conductivity value was estimated using published values under following assumptions:

– As no utility map has been provided at the time of reporting, it is assumed that the subsurface utilities will enter the Site from Sideroad 20, in the vicinity of the (to be) paved entranceway and MW6-23.
– The stratigraphy around the dewatering target at MW6-23 (sandy gravel, some silt) is representative of the ice-contact stratified deposit.

According to *Groundwater* by Freeze and Cherry (1979), the hydraulic conductivity range for a silty sand is approximately 10^{-5} to 10^{-1} cm/sec and the range for a clean sand is approximately 10^{-4} to 1 cm/sec. Given that the percentage of the finest-grained material controls the hydraulic conductivity in a matrix supported soil, the sandy gravel, some silt is anticipated to have a hydraulic conductivity of approximately 10^{-4} to 10^{-2} cm/sec. It is unlikely that a significant saturated thickness will require dewatering.

Till Deposit (Leaky Aquitard)

Based on single well response testing, the horizontal hydraulic conductivity of the silty sand to sandy silt till is 8.0×10^{-4} cm/s (geometric mean), which is representative of an aquitard. The range of hydraulic conductivities calculated for the deposit ranged from 7.2×10^{-4} cm/sec (rising head test) to 8.8×10^{-4} cm/sec (falling head test).

Existing Pond (Perched Water unit)

The surficial geology of the existing pond present on site is probably underlie by topsoil and clay layer that overlies the Ice contact stratified and or the till unit. The surface water gauge (SW01) and mini piezometer (MP01) installed in the middle of the pond suggest that there is a hydraulic connection with upward gradient until mid-July 2024 before being disconnected up to mid-October 2024. As the surficial groundwater elevation at MP01 underneath the pond is not at the same elevation and doesn't follow the same pattern as the other groundwater elevation through the existing monitoring wells, based on the hydrograph (Appendix D), it seems that this pond is disconnected from the groundwater system through the till aquitard and through the Ice-Contact Stratified aquifer.

Weathered Bedrock (Aquifer) – Bedrock was not encountered during the geotechnical or hydrogeological investigations at the Site. Bedrock in the area consists of dolostone belonging to the Guelph Formation. The depth to the bedrock surface is approximately 39 m BGS based on the nearby MECP water well records.

Infiltration Rates

The hydrogeological field investigations included six Guelph Permeameter (GP) infiltration tests on shallow unsaturated soils. The GP infiltration testing field work was carried between December 8 to 21, 2023 during dry conditions, and the field saturated hydraulic conductivity (Kfs) determined from the GP tests are presented in **Appendix E**.

The infiltration testing was undertaken on shallow soils ranging from sand with gravel with silt to silt with clay at depths ranging from 1.22 to 1.50 m BGS. The testing indicates the shallow soils have a moderate infiltration rate in the range of 45 to 90 millimeters per hour (mm/h) and a moderate percolation rate in the range of 7 to 13 min/cm.

Groundwater Levels and Flow

Groundwater level measurements were collected between November 29, 2023 and October 29, 2024. Groundwater level measurements presented in meters below ground surface (m BGS) are provided in **Table 3.3** and presented on **Figure 4.4,** and groundwater level measurements presented in meters above mean sea level (m AMSL) are provided in **Table 3.4**.

Throughout the monitoring period, groundwater depth to water measurements ranged from 1.77 m BGS at MW10-23 to 10.49 m BGS at MW7-23 and groundwater elevations ranged from 337.47 m AMSL at MW1-23 to 329.54 m AMSL at MW7-23. Throughout the monitoring period, groundwater depth to water measurements ranged at MP01 from -0.41

m BGS of the pond estimated at 331.34 m AMSL and 0.22 m AGS of the pond and groundwater elevations underneath the pond ranged at MP01 from 331.12 to 331.71 m AMSL while the SW01 is ranging from 331.34 to 331.83 m AMSL.

Continuous groundwater elevation monitoring was conducted at MW1-23, MW7-23 and MW10-23 using pressure transducers. The elevation data obtained from the pressure transducers is presented on a hydrograph, in **Appendix D.** The results of the hydrograph show a rapid increase in groundwater elevation at MW1-23 and MW10-23 following a significant rain event on July 16, 2024, indicating a direct hydraulic connection between the ground surface and the gravelly sand aquifer at these locations. MW7-23 does not show the same rapid increase in elevation, likely because this monitoring well is screened much deeper in a different unit; the till deposits (aquitard) and does not have the same direct hydraulic connection to the ground surface. Furthermore, the SW01 showed also an increase in surface pond elevation following significant rainfall event on July 16, 2024 while the MP01 doesn't respond to it instantly but seems to respond to it with a delay. The MP01 seems to be hydraulic connected to the existing pond up to beginning of July before its level decreases underneath the pond level and increase again end of October 2024. The monitoring of groundwater levels within the existing monitoring wells and SW01 and MP01 is crucial post construction during and pre construction in order to confirm that there is no connection between the two-groundwater regime and the pond perched unit and if any changes occur.

Figure 4.5 presents a groundwater elevation contour map based on water level measurements collected on May 14, 2024. Groundwater at the Site appears to flow toward the southeast and does not seem to be influenced by the existing pond.

4.3 Water Taking Evaluation

GHD understands that the proposed development at the Site will include three slab-on-grade industrial structures (Industrial Buildings 1, 2, and 3) surrounded by parking lot and paved aprons. It is assumed the proposed structures will be one- or two-storey with no basements, however appropriate depth footings and utility trenches will be required.

As previously mentioned, the water table at the Site is encountered within the gravelly sand/sand deposits. Discounting the initial depth to water measurements, the water table at the Site was encountered at depths ranging from 1.77 to 10.49 m BGS with the highest water level of 1.77 m BGS measured at MW10-23 on February 8, 2024 as presented in **Table 3.3**. It is assumed that the foundation and footings excavations will extend to approximately 1.0 m BGS to 1.5 m BGS (requiring dewatering to 2.0 m BGS) and the installation of utilities (water, wastewater and other sub-service utilities) will require excavations to extend to 3.0 m BGS (requiring dewatering to 4.0 m BGS).

The monitoring wells located inside or within the immediate vicinity of Buildings 1, 2, and 3 (MW5-23, MW6-23, MW7-23, MW11-23, MW12-23, and MW13-23) were used to evaluate the need for dewatering. The water table at these locations ranged from 4.03 to 10.49 m BGS during the monitoring period. The estimated proposed building foundation and footings depths does not intersect the water table and therefore, dewatering will not be required. As the location of the subsurface utilities have not been determined, the whole Site was used to evaluate the need for dewatering. The construction excavations are anticipated to potentially intersect the water table and thus, dewatering may be required to keep the excavations in safe and dry working conditions.

The following sections provide an estimate of daily dewatering rates required to support the construction excavations.

4.3.1 Construction Water Takings – Utility Excavations

A summary of the relevant depths and corresponding elevations is provided as follows:

Table 4.3.1 Summary of Relevant Construction Dewatering Depths Utilities

Utility Excavation	Depth (m BGS)	Elevation (m AMSL)
a) Ground	0.00	338.39

Utility Excavation	Depth (m BGS)	Elevation (m AMSL)
b) Water Table	1.77*	336.62*
d) Bottom Excavation	3.00	335.39
e) Bottom Dewatering	4.00	334.39
Notes: m BGS - metres below ground surface M AMSL - metres above mean sea level. *based on a seasonal high groundwater level measured within till deposit on February 8, 2024		

The following summarizes the assumed subsurface structures that have been considered in the dewatering estimates:

Table 4.3.2 Water Taking Evaluation

Excavation	Approximate Excavation Dimensions*(1)	Water Table Depth(2)	Bottom Excavation Depth	Required Dewatering Depth [3]	Dewatering Water Column Height
	(m)	(m BGS)	(m BGS)	(m BGS)	(m)
Utility Servicing					
Utility Trenching (per section) (Assumed open trench lengths of 10, 15, 25, and 50 m are considered)	10.0 x 3.0	1.77	3.0	4.0	2.23
	15.0 x 3.0	1.77	3.0	4.0	2.23
	25.0 x 3.0	1.77	3.0	4.0	2.23
	50.0 x 3.0	1.77	3.0	4.0	2.23
Notes: m BGS metres below ground surface (1) Excavation dimensions based on assumed open trench dimensions (2) Highest water level measured to date. (3) Dewatering required is 1 m below the bottom of the excavation. = bottom of excavation – (water table + 1m)					

For the purposes of estimating dewatering, a conservative approach has been taken with the following assumptions:

– Dewatering groundwater to approximately 1 m below the assumed depth of excavation.
– The highest measured water elevation (1.77 m BGS at MW10-23 on February 8, 2024) has been used as the depth to water for excavations.
– A conservative hydraulic conductivity (10^{-3} cm/sec at MW6-23) was used for the aquifer by taking the average of the hydraulic conductivity range for the gravelly sand/sand as discussed in **Section 4.2**.
– A final 3× factor of safety has been applied for transient dewatering conditions during the initial stages of dewatering to remove the water in storage (where periods of short-term rapid drawdown are required). This also takes into account any perched water in the topsoil layer and some sloping of the excavation.

To estimate construction water taking rates GHD has used the Canadian Geotechnical Society (CGS)[3], equations for unconfined aquifer trenches and shafts. The CGC defines a shaft shaped excavation to be when the excavation length divided by the excavation width is less than 1.5. If the length/width is greater than 1.5, the excavation is considered a trench.

[3] Canadian Geotechnical Society/Southern Ontario Section Toronto Group, International Association of Hydrogeologists/ Canadian National Chapter (CGS), 2013

The following equation for construction water-taking rate of an unconfined aquifer trench provided by the Canadian Geotechnical Society (CGS):

$$Q = \frac{\pi K(H^2 - h^2)}{\ln\left(\frac{R_0}{r_w^t}\right)} + 2\left[\frac{xK(H^2 - h^2)}{2R_0}\right]$$ ***Equation 3***

Where:

- Q - is pumping rate in units of m³/day (L/day = 1,000 × m³/day)
- π - 3.14159
- K - is the hydraulic conductivity in m/day (1 m/day = 0.00115741 cm/day)
- H - is the height of groundwater pressure at the excavation in m above a relevant datum. This is the required dewatering thickness.
- h - is the height of groundwater near the excavation in m following dewatering activities and is referenced to a relevant datum
- ln - is the natural logarithm
- R_0 - is the zero-drawdown distance in m, or zone of influence (ZOI)
- X - is the length of the trench in m
- r_w^t - is the equivalent radius of the excavation in m and is estimated in the equation below:

$$r_w^t = \frac{a + b}{\pi}$$ ***Equation 4***

Where:

- a - is the length of the excavation in m
- b - is the width of the excavation in m

The empirical Sichardt relationship was used to estimate the radius to zero drawdown (R_0), representing the zone of influence (ZOI) near the excavations.

$$R_0 = 3{,}000(H-h)\sqrt{K \times \frac{1\ \text{day}}{86{,}400\ \text{seconds}}} + r_w$$ ***Equation 5***

Dewatering Groundwater – Trench Excavation

Equations 3, 4, 5 were used to estimate the dewatering rates for the building foundation and for various lengths of utility trenching. For the building foundation, it is assumed that the entire foundation will be completed as a single excavation. The input parameters estimated zone of influence, and dewatering rates are presented in the following table.

Table 4.3.3 Dewatering Parameters

Structure	Height of water (H)[1]	Height of water after dewatering (h)[2]	Trench Length (x and a)	Trench Width (b)	Equivalent radius (r_w^t)	Hydraulic Conductivity (K)		Zone of Influence (R_0)	Dewatering Rate (Q)
	(m)	(m)	(m)	(m)	(m)	(cm/sec)	(m/day)	(m)	(L/day)
Utility trenching	2.23	0	10	3.0	4.1	10^{-3}	0.864	25.3	9,200
	2.23	0	15	3.0	5.7			26.9	11,100

	2.23	0	25	3.0	8.9			30.1	14,700
	2.23	0	50	3.0	16.9			38.0	22,300

Notes:
(1) Dewatering required is 1 m below the bottom of the excavation;
= (water table + 1 m) - (bottom of excavation)
(2) Height of groundwater after dewatering has been set to a reference elevation of 0.0 m

Precipitation Contribution

Obtaining an Environmental Activity and Sector Registry (EASR) or Permit to Take Water (PTTW) for construction dewatering is based on groundwater seepage rates and should not include contribution from precipitation falling directly into or stormwater flowing into the excavation. However, significant rainfall events can contribute significant volumes of water which will need to be managed.

The climate data from the Kitchener/Waterloo Weather Station (Station ID: 6048261) was obtained for a period of 5 years from 2020 to 2024. Assuming a 2-year rainfall event occurs over a 24-hour period, a maximum of 65.7 mm of rain is conservatively estimated to fall onto the Site. The contribution to dewatering requirements from precipitation can be estimated using the equation below.

$$Q = P \times A \qquad \textit{Equation 6}$$

Where:

– Q - is pumping rate in units of m³/day (L/day = 1,000 × m³/day)
– P - is precipitation falling over a 24-hr period during a 2-year storm event in m (where m = 1/1000 mm)
– A - is area of the excavation in m^2

The following table summarizes the dewatering contribution from precipitation falling into various individual excavations. The table conservatively assumes that each excavation will be open in its entirety at one time. Less precipitation will be encountered if the construction excavations are completed in sections (e.g., excavations for the utility trench are limited to completing 10 m sections at a time).

Table 4.3.4 Excavation Precipitation Contribution

Excavation	Excavation Dimensions		Precipitation over a 24-hr period	Volume
	Length	Width		
	(m)	(m)	(mm)	(L/day)
Utility trenching	10.0	3.0	65.7	1,971
	15.0	3.0		2,957
	25.0	3.0		4,928
	50.0	3.0		9,855

Water Taking Summary

The table below provides a summary of the anticipated construction dewatering rates (contribution from groundwater seepage into the excavation and the contribution from precipitation). The estimated dewatering volumes account for groundwater inflow to the excavation as well as precipitation falling directly into the excavation. The estimated dewatering does not account for any surface water entering the excavation from other overland flow sources.

A safety factor of 3× is applied to the estimated steady-state groundwater seepage rate to account for lowering groundwater levels quickly to the base of the excavations, as may be needed, or for possible lateral extension of the excavation width to accommodate sloping requirements.

Table 4.3.5 Summary of Dewatering Rates

Excavation	Trench Length (m)	Typical Groundwater Dewatering (L/day)	×3 Groundwater Dewatering (L/day)	EASR/ PTTW(1)	Contribution from Precipitation (L/day)	Potential Maximum Dewatering Rate (L/day)
Utility trenching	10.0	9,200	27,600	N/A	1,971	29,571
	15.0	11,100	33,300	N/A	2,957	36,257
	25.0	14,700	44,100	N/A	4,928	49,028
	50.0	22,300	66,900	EASR	9,855	76,755

Notes:
(1) – the threshold for an EASR or PTTW is based on groundwater seepage only

Following the Ontario Water Resources Act, Ontario Regulation 387/04 and Ontario Regulation 63/16, registration of construction water takings on the Ontario EASR is required for temporary construction groundwater takings between 50,000 to 400,000 L/day. A PTTW is required for long-term dewatering or where temporary groundwater takings are greater than 400,000 L/day.

As shown above, the anticipated groundwater dewatering for the construction utilities will require an EASR if 50 m trench lengths are used. Shorter trench lengths will likely not require registration on the EASR.

While it is unlikely, it is possible that a hydraulic conductivity value will be closer to the upper end of the range (10^{-2} cm/sec) and that dewatering rates will be higher than those presented in **Table 5.4**. However, all local supply wells appear completed in deep overburden or within the bedrock Guelph Formation, suggesting that any temporary water taking associated with dewatering is unlikely to affect these wells.

4.4 Groundwater Management - Quality

One groundwater sample was collected on June 13, 2024, from monitoring well MW10-23 for analysis of the parameters listed in Provincial Water Quality Objectives (PWQO). Results from the laboratory analyses (**Table 4.5**) indicate that the discharge will not meet the requirements water discharge to the environment on Site unless there is pre-treatment. The following parameters had concentrations above the PWQO criteria as presented in the table below:

Table 4.4 Summary of Parameters Exceeding PWQO

Criteria	MW10-23		
	Total Metals	Dissolved Metals	Other
PWQO	Aluminum Chromium Cobalt Copper Iron Lead Phosphorus Zinc	None	Field pH

Total metals exceedances for aluminum, chromium, cobalt, copper, iron, lead, phosphorus, and zinc are noted in **Table 4.5**. However, total metals measurements reflect both dissolved and particulate-bound fractions. The elevated concentrations may, in part, result from the acid-dissolution of particulates by the preservative within the sample bottle,

rather than representing metals that are mobile under natural groundwater conditions. Therefore, these exceedances do not necessarily indicate a risk of contaminant transport. In contrast, filtered (dissolved) metals represent the mobile fraction that will be transported by groundwater and are thus more relevant for assessing potential impacts to groundwater quality.

If required, settling and filtration methods may be employed on Site to reduce suspended sediments prior to discharge.

As the water that accumulates in the excavation will primarily be a combination of groundwater and precipitation, the groundwater sample analytical results alone are not representative of the actual excavation discharge water quality. Additional sample collection will be required from the construction water takings prior to discharge to the environment.

Discharge Management

The estimated volumes of water to be managed during construction excavation are relatively small and management of the discharge water is essential for a successful project. It is important that Puslinch Development Limited Partnership consider and plan how to manage dewatering prior to construction to avoid project delays. If the volume of water and duration of dewatering is small, discharge to nearby land surface without runoff into stormwater ditches may be a viable water management alternative.

As the water that accumulates in the excavation will primarily be a combination of groundwater, surface water runoff and precipitation, the groundwater sample analytical results alone are not necessarily representative of the actual excavation discharge water quality. Additional sample collection will be required from the construction water takings prior to discharge to confirm acceptable discharge quality, should discharge occur to surface water bodies.

To manage discharge water in an environmental responsible manner, Puslinch Development Limited Partnership should consider the following steps if dewatering is required during the excavation process:

– Periodically collect water quality samples from the excavation or discharge water to confirm the water quality results from this investigation.
  - Samples should be analyzed for a list of parameters suitable to confirm the results of the groundwater sampling and should be suitable for the chosen discharge location (surface or infiltration)
  - Samples should be representative of the water to be discharged and should be collected after pre-treatment, such as bag filtering and settlement
– The following decision tree should be used to direct discharge:
  - If water quality from the excavation meets the PWQOs, it can be discharged to surface
  - If water quality does not meet PWQOs but meets the applicable ODWQS standards, it can be allowed to infiltrate back into the subsurface without off-Site runoff
  - Finally, if water quality does not meet any of the applicable standards it may need to be considered waste and disposed of off Site.

As further described in **Section 4.4**, given the low water volumes and groundwater quality, infiltration to the subsurface is likely the most practical approach to discharge management.

5. Summary and Conclusions

Based on the results of the hydrogeological investigation and monitoring undertaken to date, the following summary and conclusions are provided:

1. The Site is underlain by a disturbed native material followed by ice-contact stratified deposits of gravelly sand to sand (aquifer), followed by till deposits of silty sand to sandy silt (semi-confined aquitard) and sometimes interbedded. The existing pond seems to act as a perched water unit.

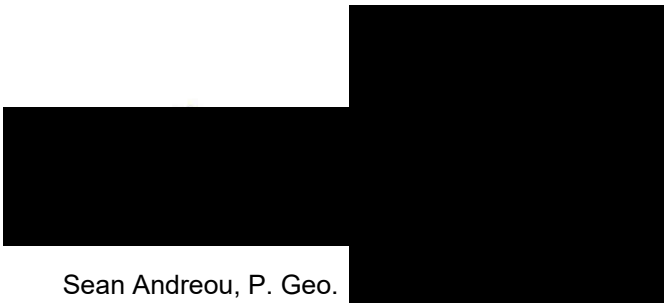
2. The horizontal hydraulic conductivity (K_h) of the silty sand till is 8.0 x 10^{-4} cm/s (geometric mean), which is representative of a leaky aquitard.
3. Depth to groundwater levels in monitoring wells ranged from 1.77 to 10.49 m BGS. Groundwater elevations in monitoring wells ranged from 329.54 to 337.47 m AMSL. Groundwater elevations underneath the pond ranged at MP01 from 331.12 to 331.71 m AMSL while the SW01 is ranging from 331.34 to 331.83 m AMSL.
4. The MP01 seems to be hydraulic connected to the existing pond up to beginning of July before its level decreases underneath the pond level and increase again end of October 2024. The MP01 seems disconnected from the other groundwater monitoring wells elevation. The monitoring of groundwater levels within the existing monitoring wells and SW01 and MP01 is crucial post construction during and pre construction in order to confirm that there is no connection between the two-groundwater regime and the pond perched unit and to monitor if any changes occur.
5. The utility excavations would involve the installation of linear infrastructure to the new development. The utility excavations are estimated to require 3 m by 15 m trench excavations up to 3 m BGS (for example) to facilitate the installation of the utilities. The utility installations could intercept the seasonally high-water table. It is anticipated that dewatering would be needed to lower the groundwater levels below the base of the excavations to provide safe dry working conditions, especially if the work occurs when the water table is high.
6. Maximum construction dewatering rates for the utility trenches were estimated for trench lengths of 10 m, 15 m, 25 m and 50 m. The maximum water takings are estimated to be 27,600 L/day (10 m), 33,300 L/day (15 m), 44,100 L/day (25 m) and 66,900 L/day (50 m). The 10 m, 15 m and 25 m trench lengths are under the 50,000 L/day EASR criteria and will therefore not require EASR registration. Trench lengths of 50 m may require registration on the EASR. A PTTW will not be required.
7. In the event that groundwater takings are required during development construction activities, it is anticipated that the groundwater can be discharged to the ground surface for infiltration if the water needs the applicable ODWQS standards. Pre-treatment, such as filtration, may be required to meet the ODWQS criteria.
8. The discharge would be a combination of groundwater, surface water runoff and precipitation into the construction excavation and would require further assessment to confirm its quality and requirement for pre-treatment. Prior to discharge to the ground surface, it is recommended the water is analyzed for the ODQWS criteria.

All of Which is Respectfully Submitted,

GHD



Jennifer Lallier, Eng.



Sean Andreou, P. Geo.

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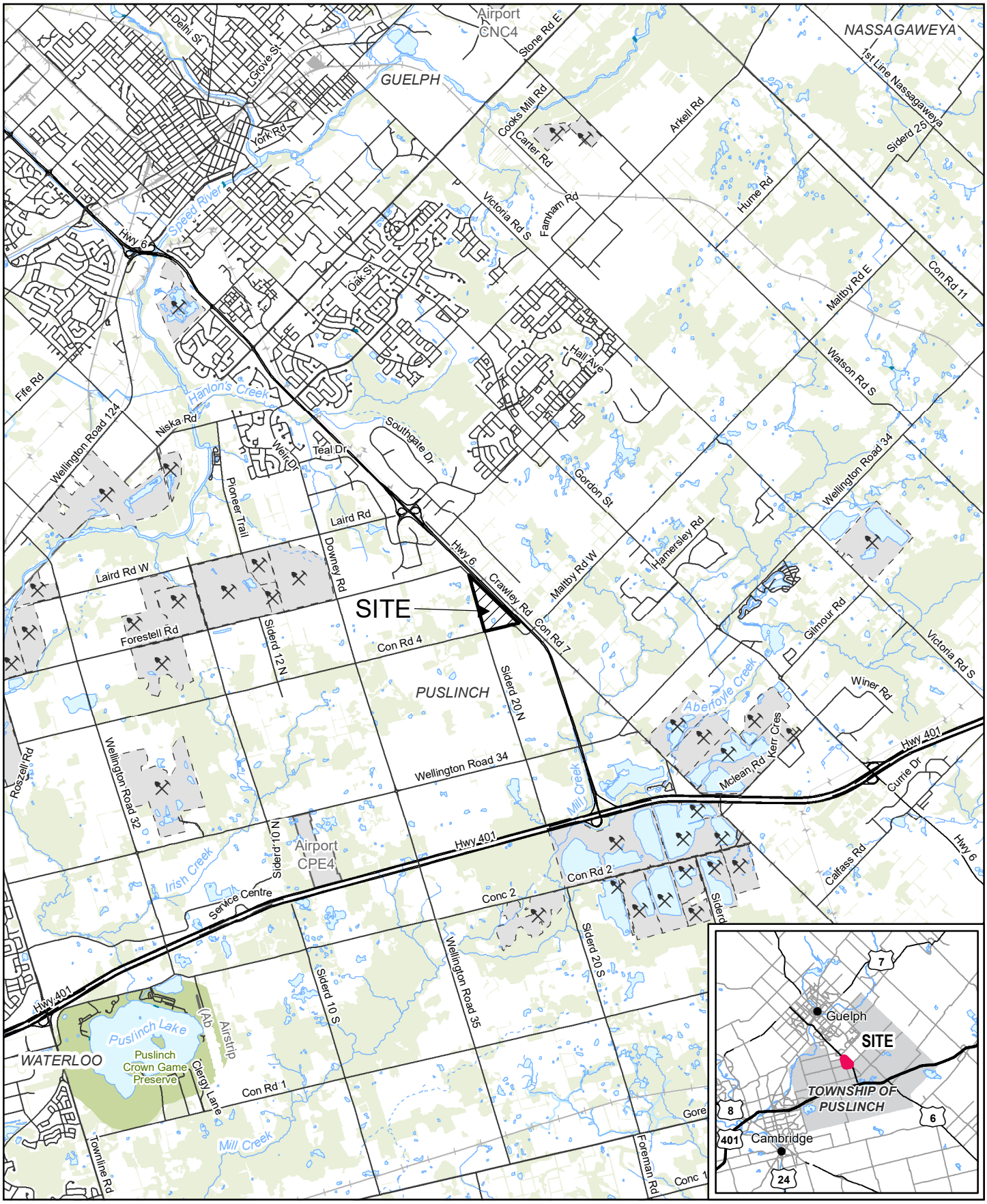
Figures



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4631 SIDEROAD 20 NORTH,
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

Project No. **12618927**
Revision No. **-**
Date **Jan 30, 2025**

SITE LOCATION MAP

FIGURE 1.1

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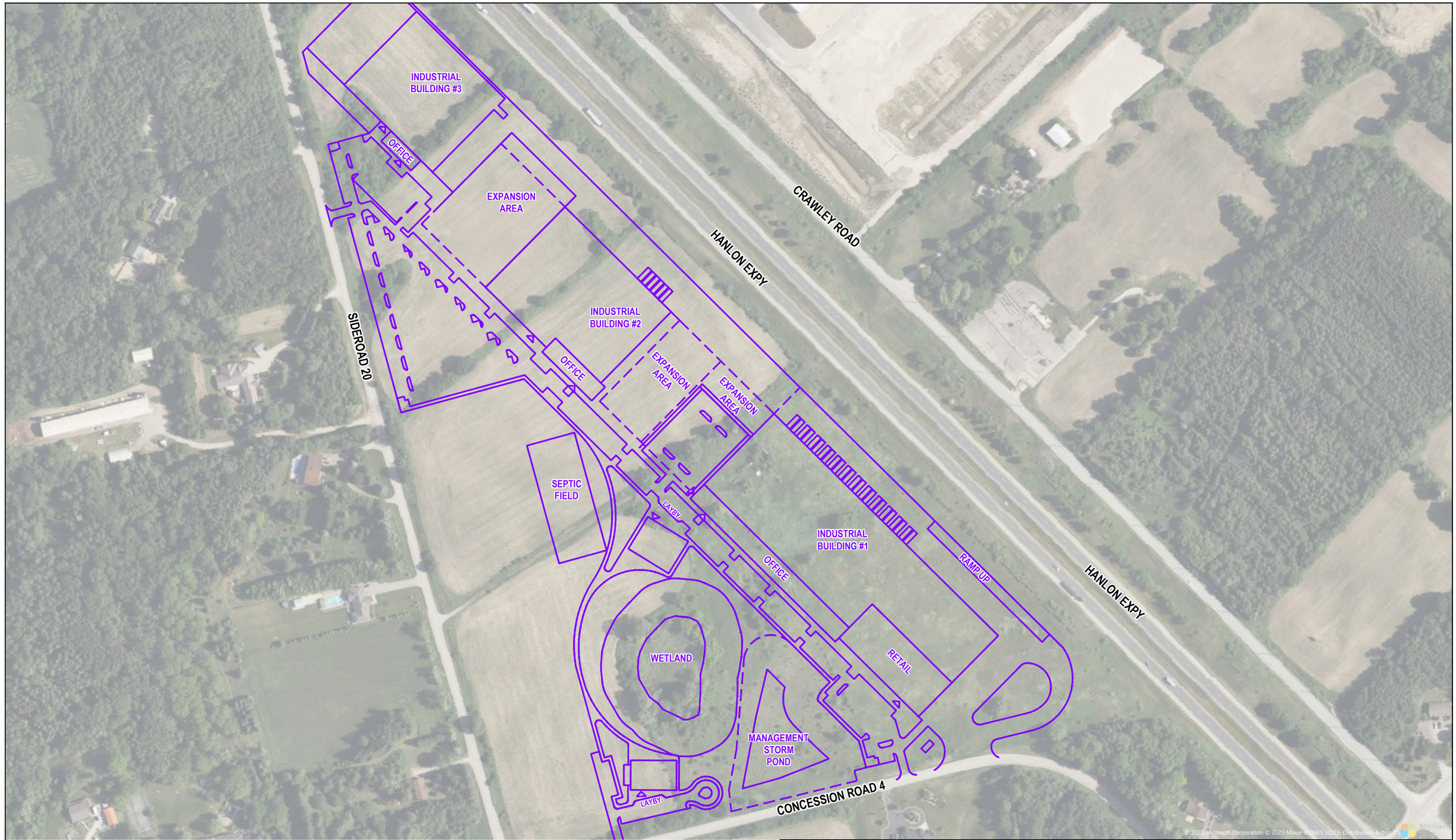

LEGEND

PROPOSED LAYOUT

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PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

SITE PLAN LAYOUT

Project No. **12618927**
Date **May 2025**

FIGURE 1.2

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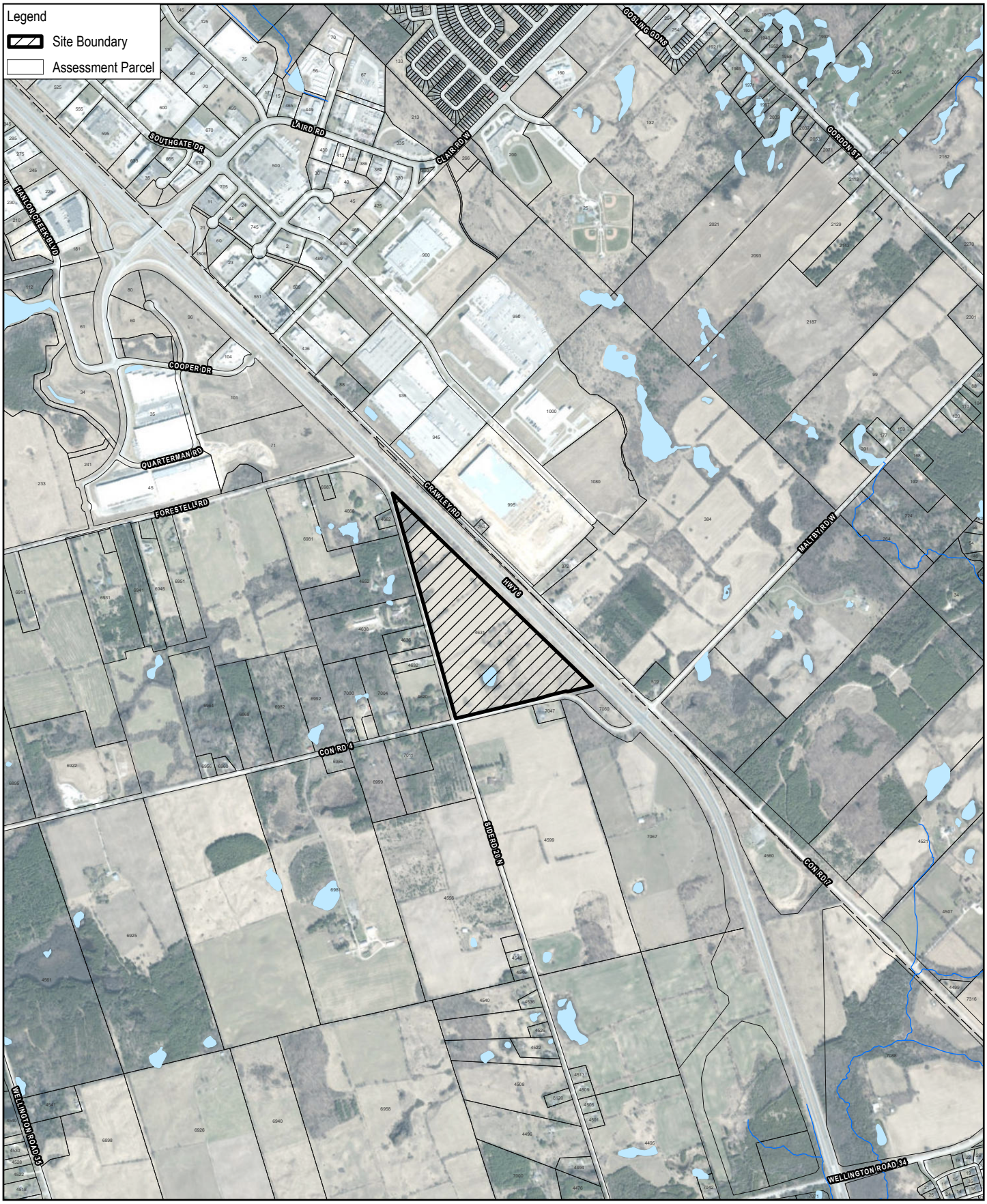

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HYDROGEOLOGICAL INVESTIGATION

Project No. **12618927**
Revision No. **-**
Date **Jan 30, 2025**

LAND USE (AERIAL IMAGE)

FIGURE 2.1

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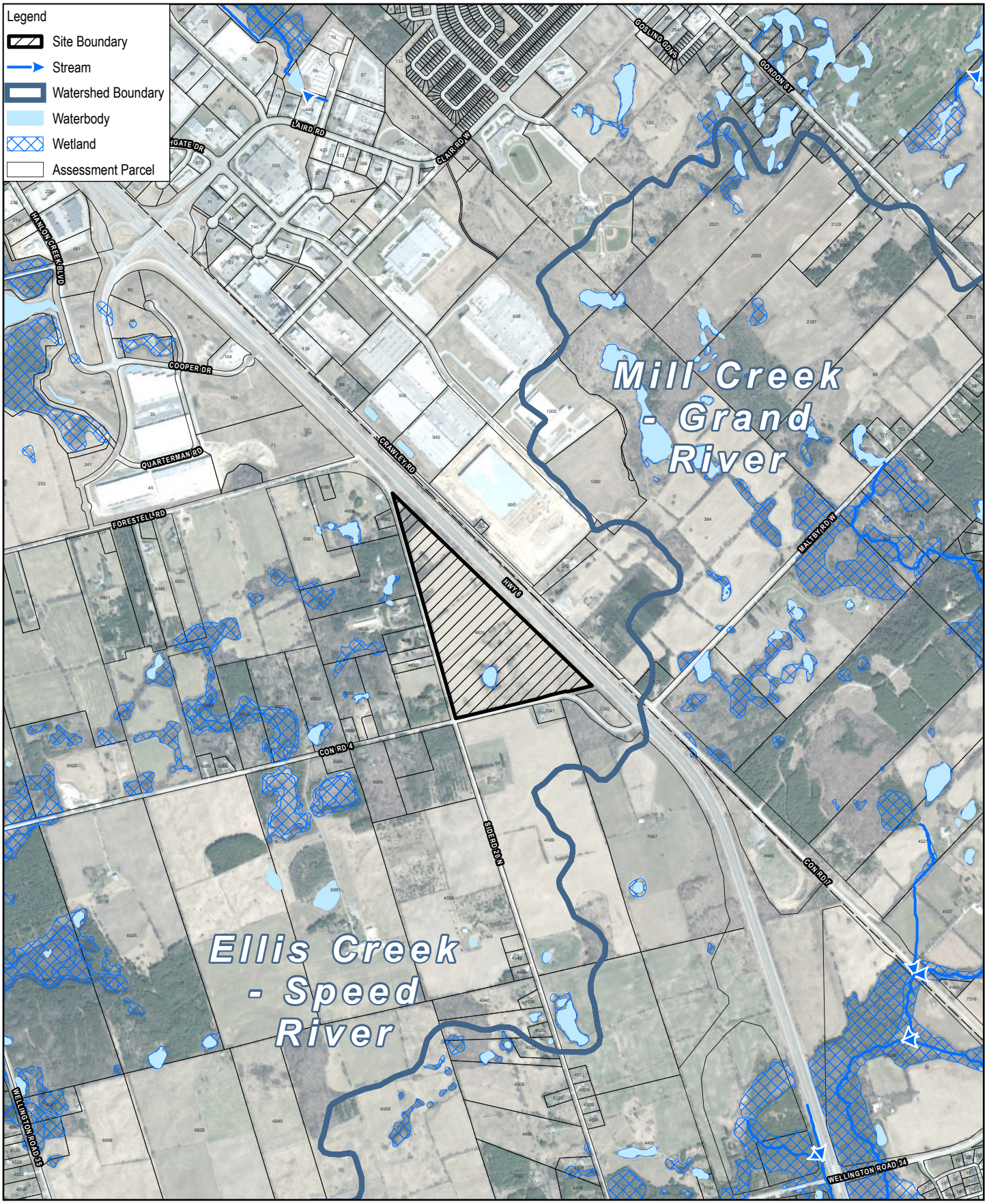

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

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PUSLINCH DEVELOPMENT GP INC.
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HYDROGEOLOGICAL INVESTIGATION

SURFACE FLOW

Project No. **12618927**
Revision No. **-**
Date **Jan 30, 2025**

FIGURE 2.2

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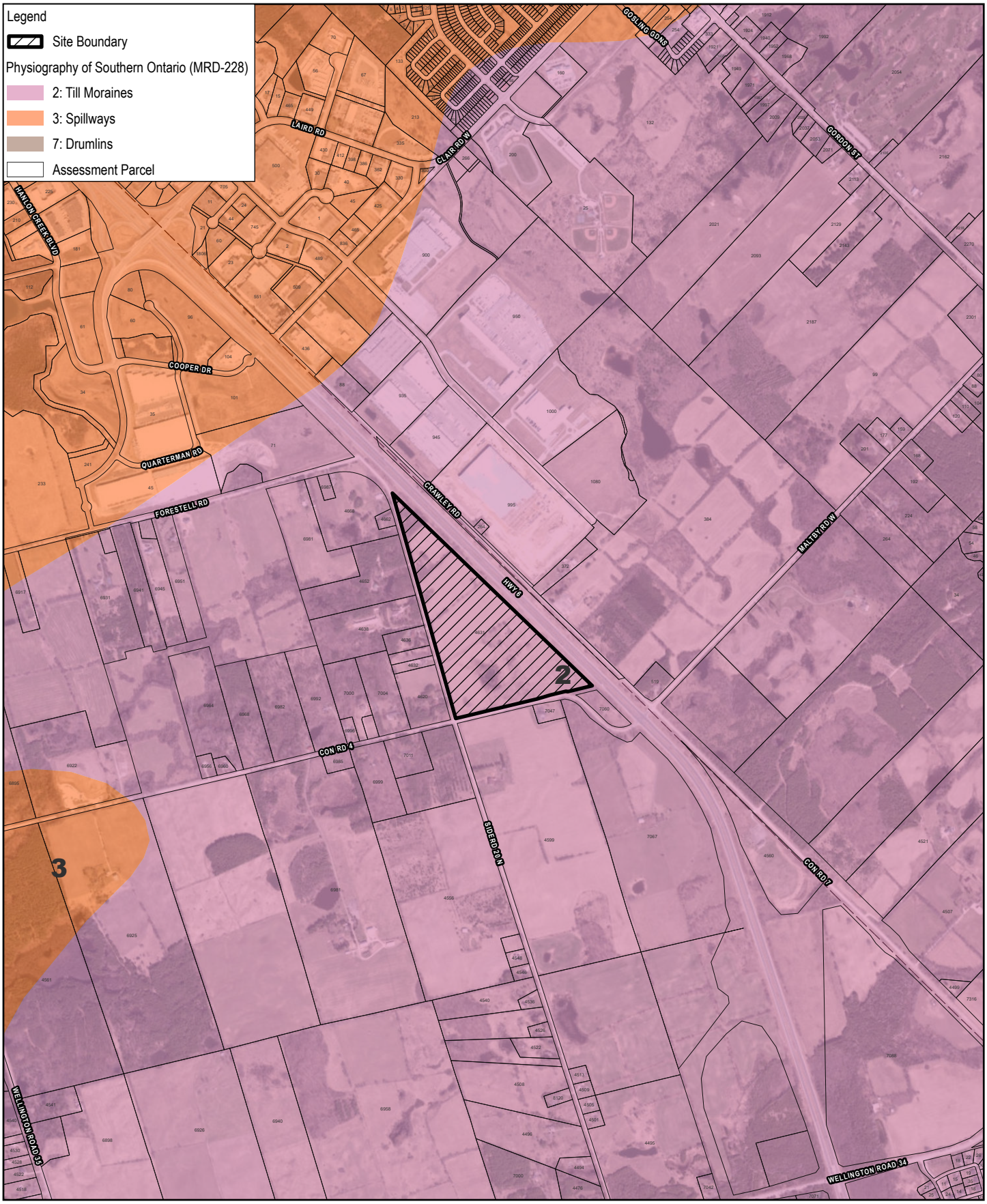
Print date: 30 Jan 2025 - 16:25

Data source: Ontario Imagery Web Map Service (OIWMS): © King's Printer for Ontario, 2022.MNRF NRVIS, 2015. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2025;
Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.



Paper Size ANSI A

0 200 400 600

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH,
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

PHYSIOGRAPHY

Project No. **12618927**
Revision No. **-**
Date **Jan 30, 2025**

FIGURE 2.3

O:\GIS\PROJECTS\12618000s\12618927\GIS\Maps\Deliverables\HydrogeologicalInvestigation\12618927_003_SurfaceFlow\12618927_002_P
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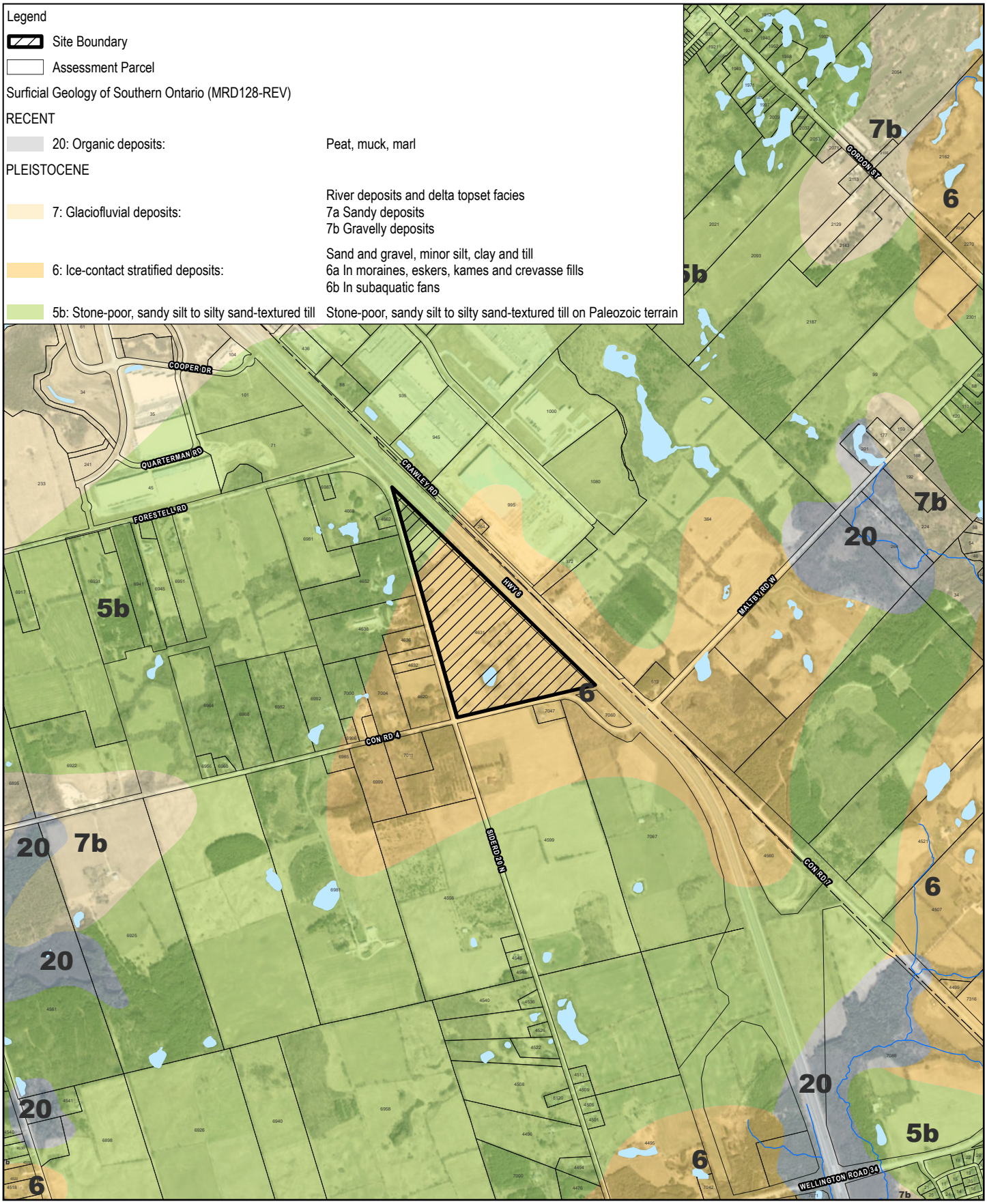

Paper Size ANSI A

0 200 400 600

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH,
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

Project No. **12618927**
Revision No. **-**
Date **Jan 30, 2025**

SURFICIAL GEOLOGY

FIGURE 2.4

O:\GIS\PROJECTS\12618000s\12618927\GIS\Maps\Deliverables\HydrogeologicalInvestigation\12618927_003_SurfaceFlow\12618927_004_S
Print date: 30 Jan 2025 - 16:23

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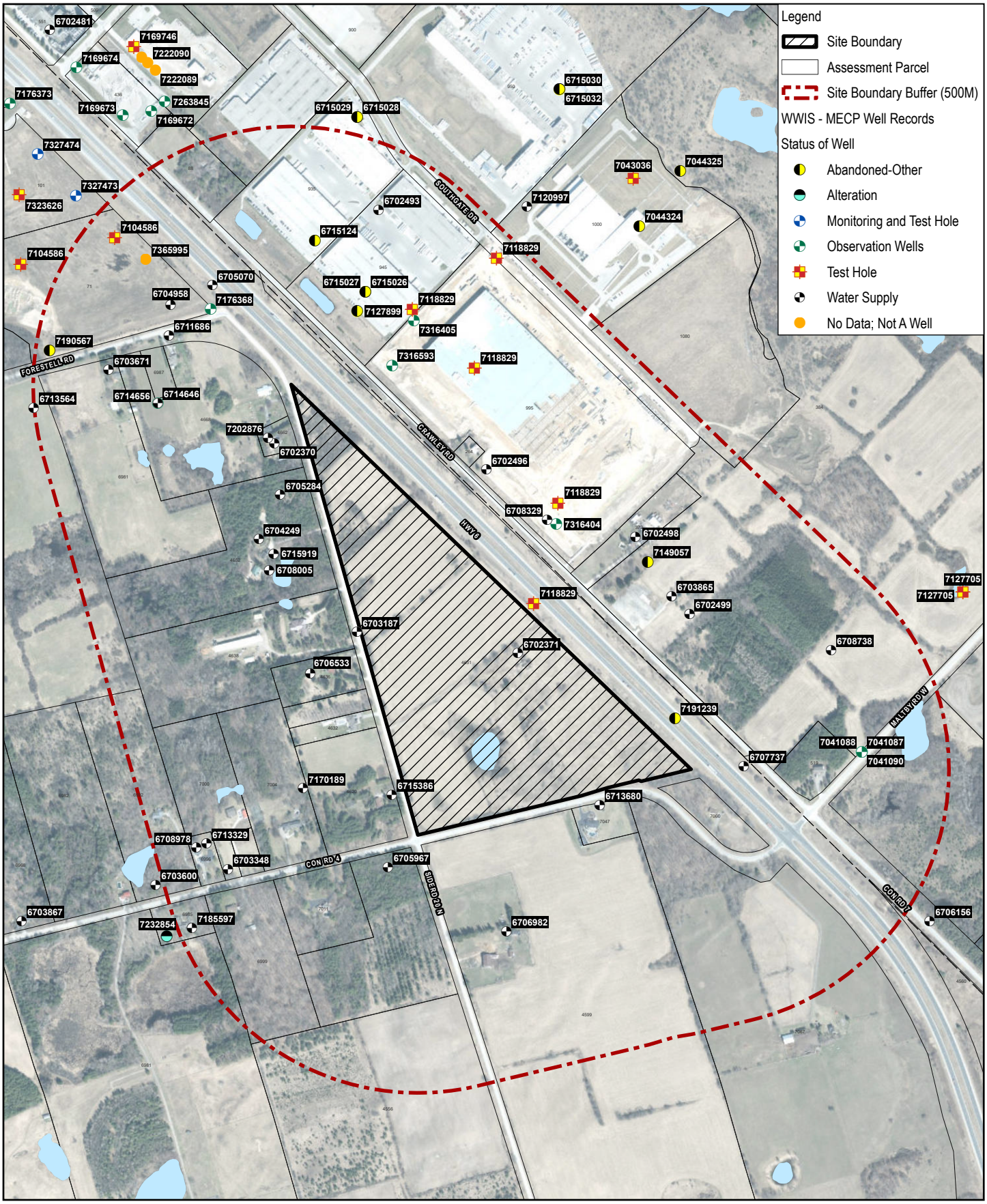

Paper Size ANSI A

0 100 200 300

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH,
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

Project No. **12618927**
Revision No. **-**
Date **Jan 30, 2025**

MECP WATER WELL RECORDS

FIGURE 2.5

Q:
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Print date: 30 Jan 2025 - 16:27

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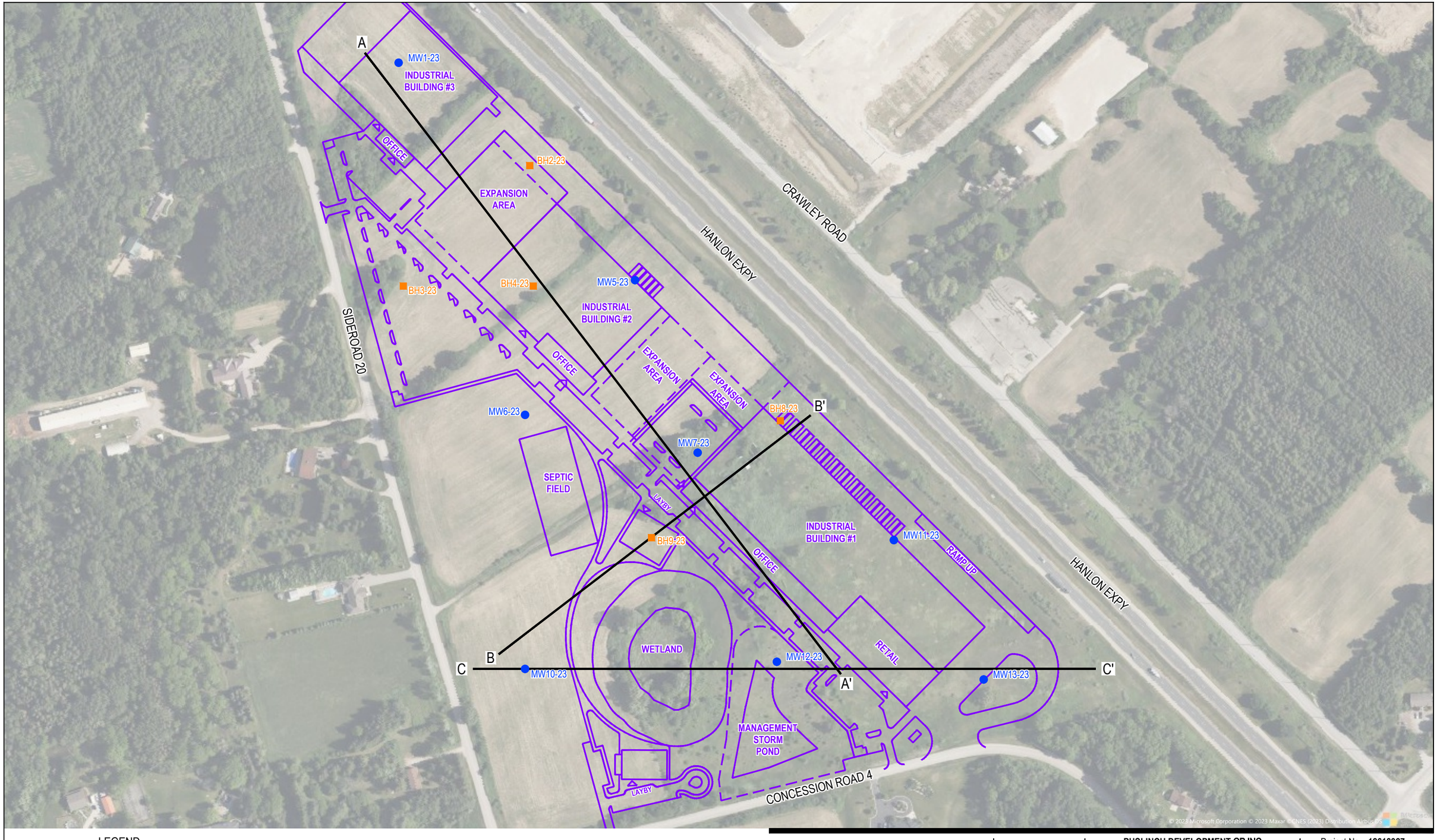


LEGEND

- MONITORING WELL LOCATION
- BOREHOLE LOCATION
- PROPOSED LAYOUT
- A — A' LOCATION OF CROSS-SECTION

0 30 60 90m

1:3000

Coordinate System: UTM83-17

N

GHD

PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

INVESTIGATIVE LOCATIONS

Project No. **12618927**
Date **May 2025**

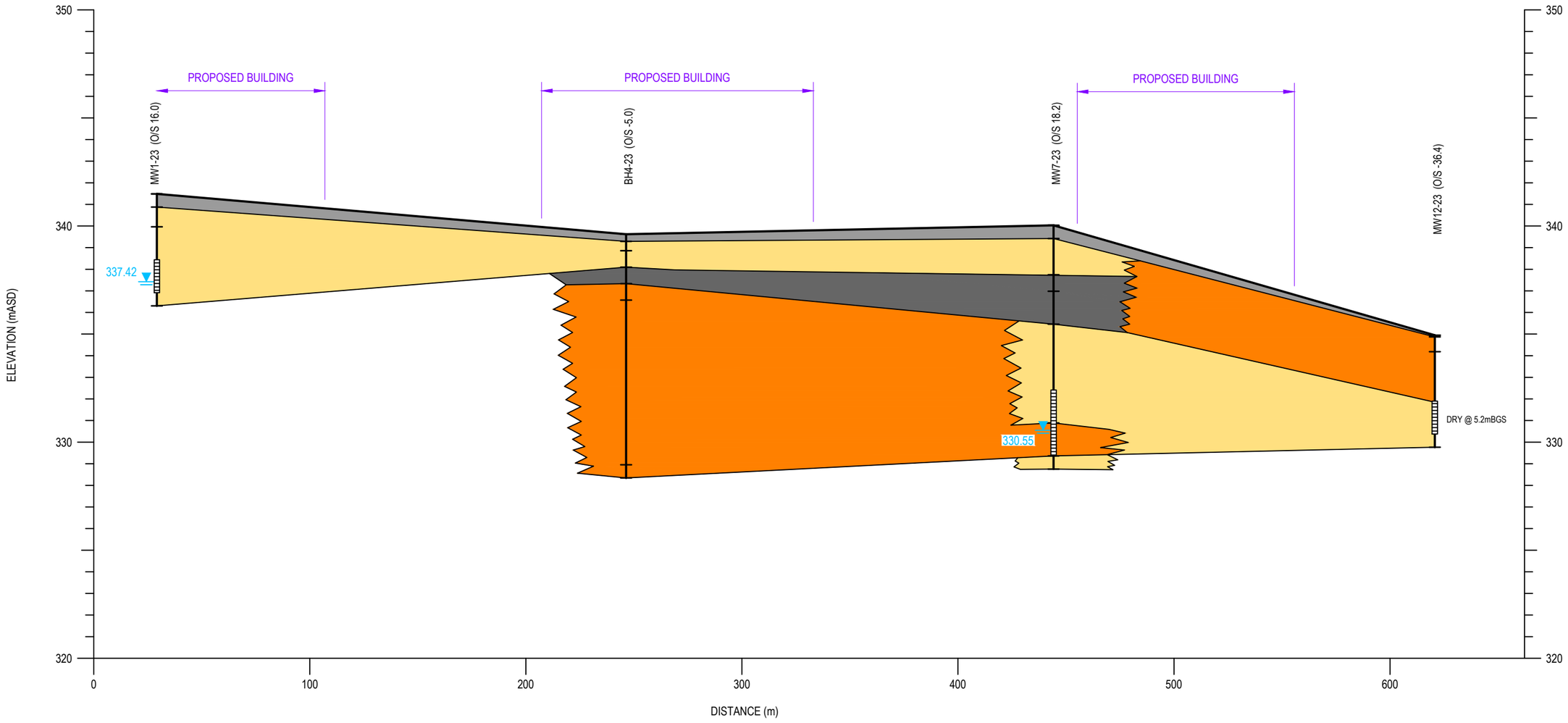
FIGURE 3.1

Filename: C:\ADSK\ACCDocs\GHD Services Pty Ltd\11230862-Enviro Projs\Project Files\12618927\01 WIP\Env\Figures\RPT-UpdateHydrogeo\12618927-GHD-00-00-RPT-EN-D101_WA-UpdateHydrogeo.dwg
Plot Date: 22 May 2025 7:33 AM

Data Source: Proposed layout from Sweeny & Co Architects Inc.; DWG TITLE: Site Plan, Contect Plan, Area Statistics; DATE: 2025-01-30; PROJ. No. : 2421; DWG No.: AC103.

A
NORTHWEST

A'
SOUTHEAST



LEGEND

MW104-19

- WELL DESIGNATION
- GROUND SURFACE
- STRATIGRAPHIC BOUNDARY
- GROUNDWATER ELEVATION (mAMSL) (DATED MAY 14, 2024)
- SCREENED INTERVAL

- TOPSOIL
- SILT (AQUITARD)
- SILTY SAND/SAND AND SANDY SILT (LEAKY AQUITARD)
- SANDY GRAVEL, SAND AND GRAVEL, GRAVEL AND SANDY SILT AND SAND AND SILT (AQUIFER)

HORIZONTAL
1:2000
0 20 40 60

VERTICAL
1:200
0 2 4 6

PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

CROSS-SECTION A-A'

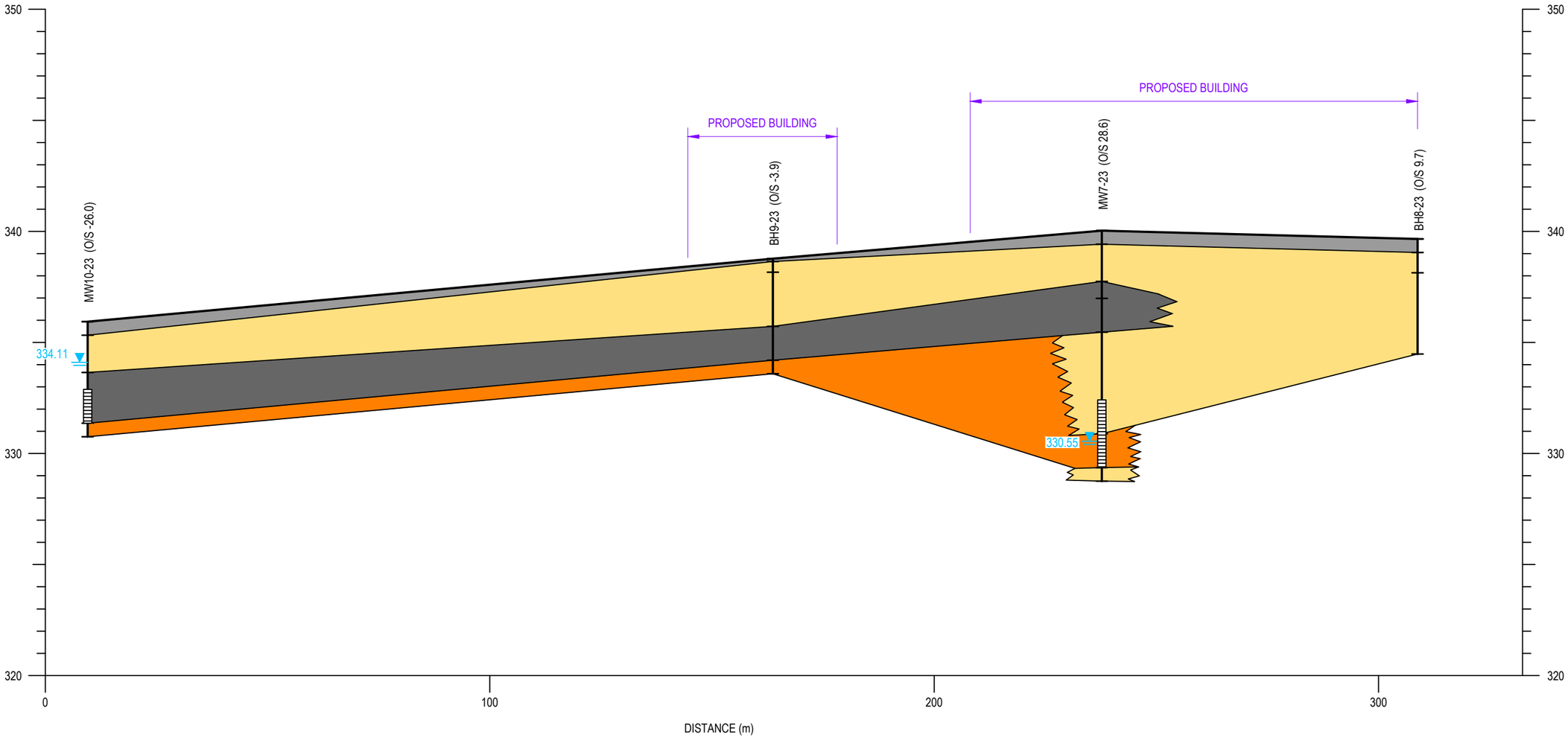
Project No. **12618927**
Date **May 2025**

FIGURE 4.1

Filename: C:\ADSK\ACCDocs\GHD Services Pty Ltd\11230862-Enviro Projs\Project Files\12618927\01 WIP\Env\Figures\RPT-UpdateHydrogeo\12618927-GHD-00-00-RPT-EN-D101_WA-UpdateHydrogeo.dwg
Plot Date: 28 May 2025 7:22 AM

B
SOUTHWEST

B'
NORTHEAST



LEGEND

MW104-19

- WELL DESIGNATION
- GROUND SURFACE
- STRATIGRAPHIC BOUNDARY
- GROUNDWATER ELEVATION (mAMSL) (DATED MAY 14, 2024)
- SCREENED INTERVAL

- TOPSOIL
- SILT (AQUITARD)
- SILTY SAND/SAND AND SANDY SILT (LEAKY AQUITARD)
- SANDY GRAVEL, SAND AND GRAVEL, GRAVEL AND SANDY SILT AND SAND AND SILT (AQUIFER)

HORIZONTAL
1:1000
0 10 20 30

VERTICAL
1:200
0 2 4 6

PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

CROSS-SECTION B-B'

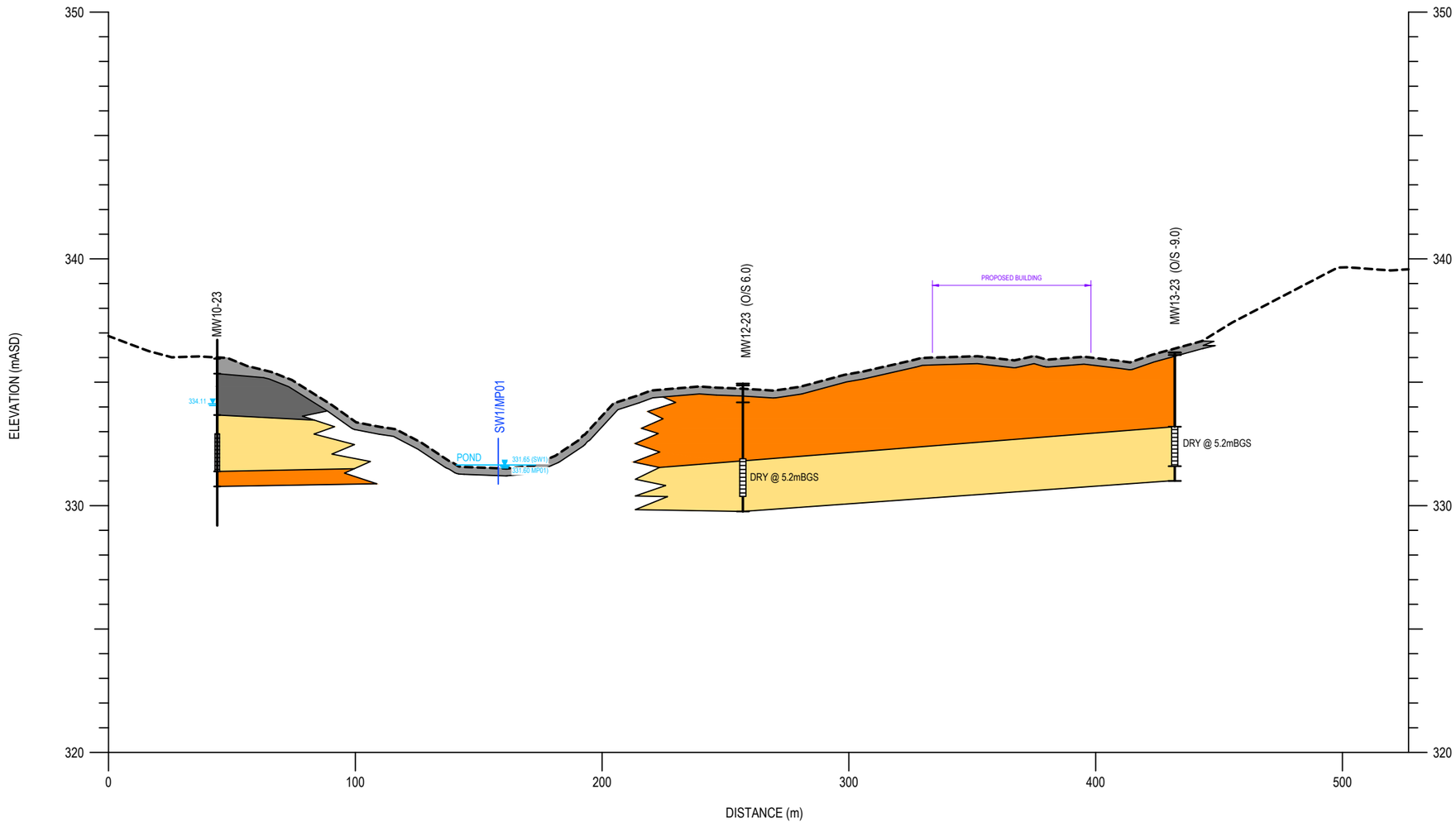
Project No. **12618927**
Date **May 2025**

FIGURE 4.2

Filename: C:\ADSK\ACCDocs\GHD Services Pty Ltd\11230862-Enviro Projs\Project Files\1261892?\01 WIP\Env\Figures\RPT-UpdateHydrogeo\12618927-GHD-00-00-RPT-EN-D101_WA-UpdateHydrogeo.dwg
Plot Date: 28 May 2025 7:21 AM

C
WEST

C'
EAST



LEGEND

MW104-19

- WELL DESIGNATION
- GROUND SURFACE
- STRATIGRAPHIC BOUNDARY
- GROUNDWATER ELEVATION (mAMSL) (DATED MAY 14, 2024)
- SCREENED INTERVAL

SW1/MP01

- SURFACE WATER MONITORING LOCATION
- APPROXIMATE GROUND SURFACE FROM DEM
- TOPSOIL
- SILT (AQUITARD)
- SILTY SAND/SAND AND SANDY SILT (LEAKY AQUITARD)
- SANDY GRAVEL, SAND AND GRAVEL, GRAVEL AND SANDY SILT AND SAND AND SILT (AQUIFER)

HORIZONTAL
1:2000
0 20 40 60
VERTICAL
1:200
0 2 4 6

GHD

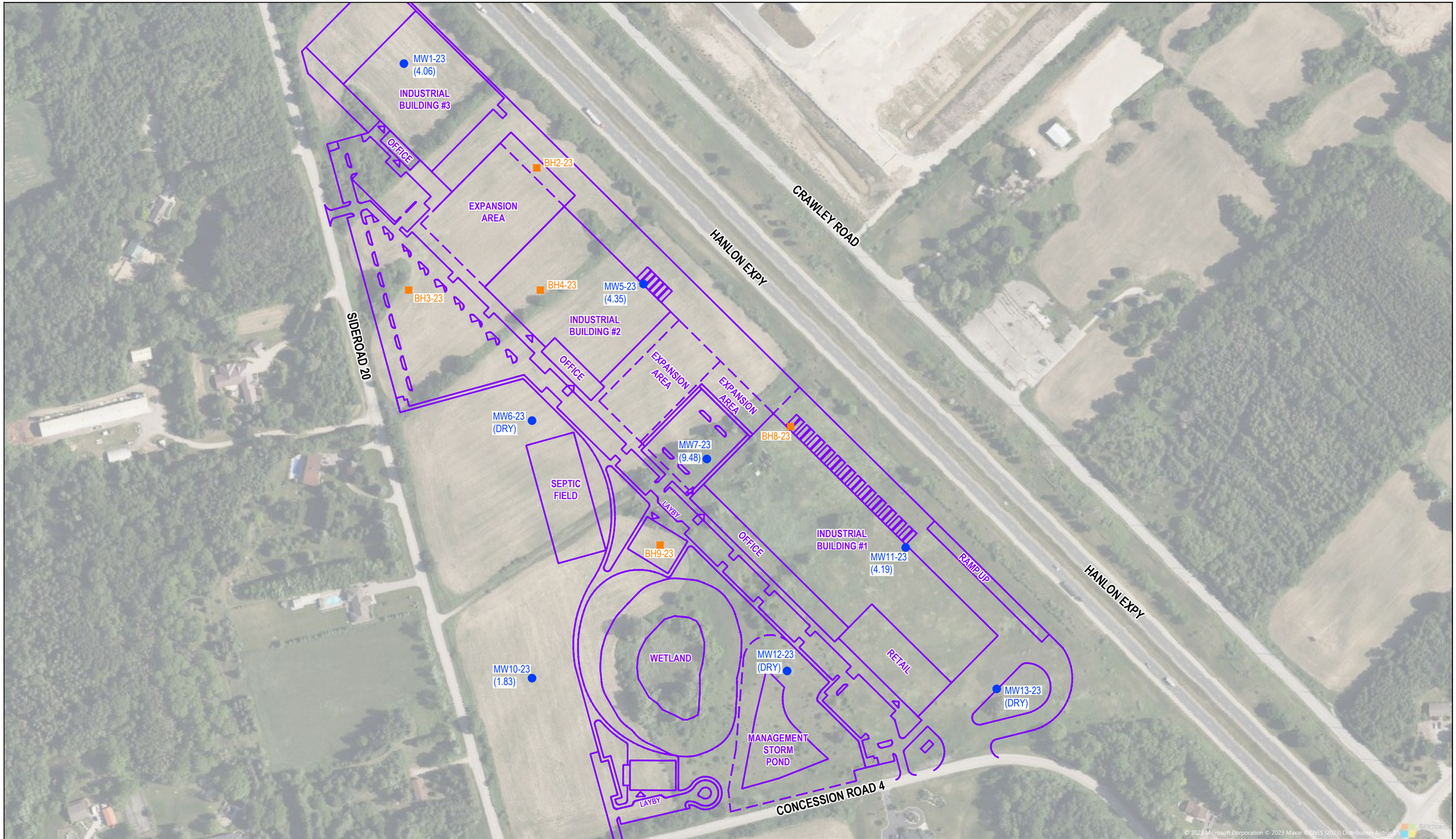
PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

CROSS-SECTION C-C'

Project No. **12618927**
Date **May 2025**

FIGURE 4.3

Filename: C:\ADSK\ACCDocs\GHD Services Pty Ltd\11230862-Enviro Projs\Project Files\12618927\01 WIP\Env\Figures\RPT-UpdateHydrogeo\12618927-GHD-00-00-RPT-EN-D101_WA-UpdateHydrogeo.dwg
Plot Date: 28 May 2025 3:22 PM



LEGEND

- MONITORING WELL LOCATION
- BOREHOLE LOCATION
- PROPOSED LAYOUT
- (4.35) DEPTH TO WATER (mBGS)
- mBGS METRES BELOW GROUND SURFACE

0 30 60 90m

1:3000

Coordinate System: UTM83-17

N

GHD

PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

DEPTH TO WATER TABLE
(MAY 14, 2024)

Project No. **12618927**
Date **May 2025**

FIGURE 4.4

Filename: C:\ADSK\ACCDocs\GHD Services Pty Ltd\11230862-Enviro Projs\Project Files\12618927\01 WIP\Env\Figures\RPT-UpdateHydrogeo\12618927-GHD-00-00-RPT-EN-D102_WA-UpdateHydrogeo.dwg
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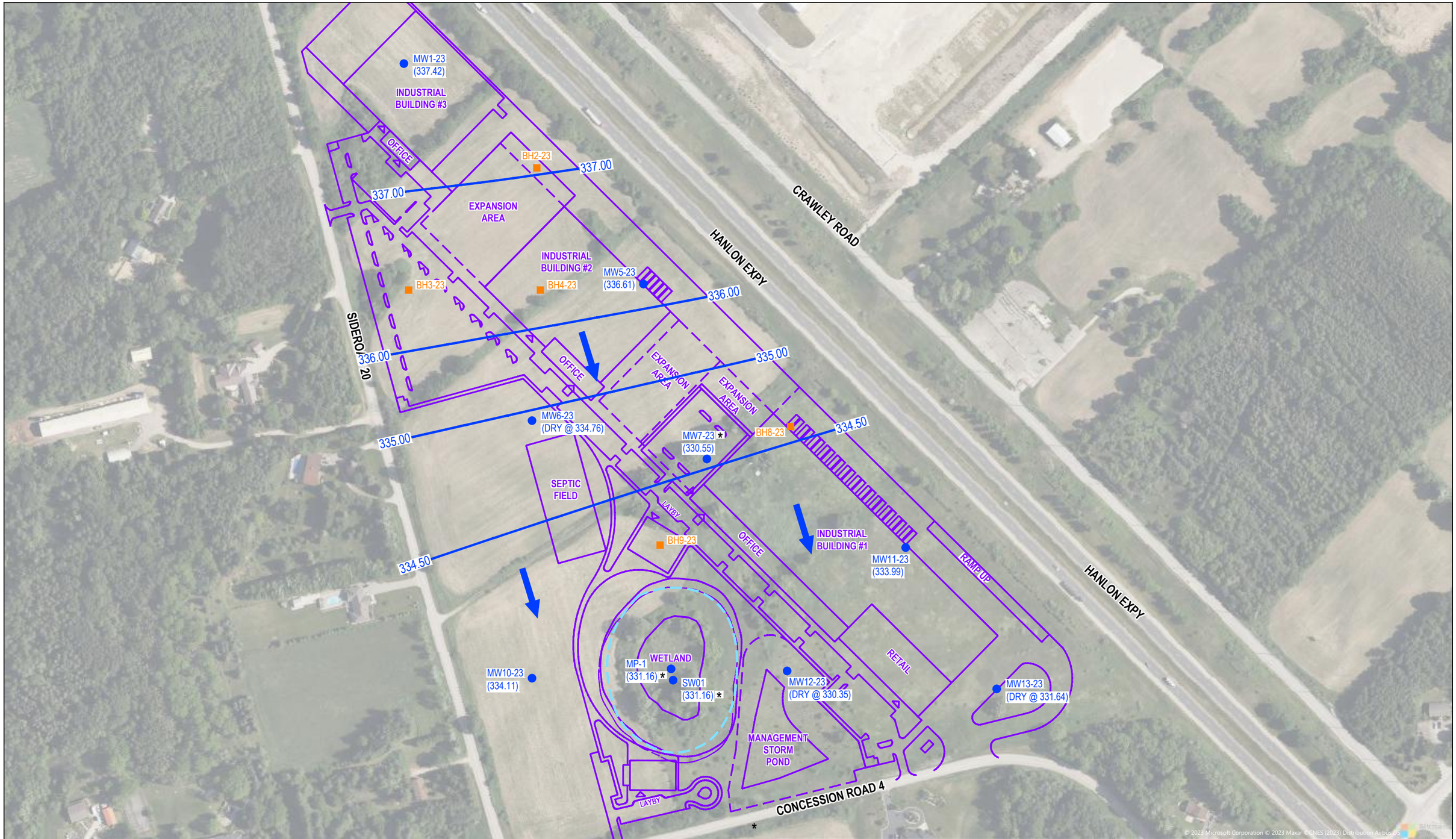
Data Source: Proposed layout from Sweeny & Co Architects Inc.; DWG TITLE: Site Plan, Contect Plan, Area Statistics; DATE: 2025-01-27; PROJ. No. : 2421; DWG No.: AC103.



LEGEND

- MONITORING WELL LOCATION
- BOREHOLE LOCATION
- PROPOSED LAYOUT
- (333.99) GROUNDWATER ELEVATION (mAMSL)
- mAMSL METRES ABOVE MEAN SEA LEVEL
- 333.00 GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- * NOT USED IN GENERATING CONTOURS
- PERCHED POND SYSTEM

0 30 60 90m

1:3000

Coordinate System: UTM83-17

N

GHD

PUSLINCH DEVELOPMENT GP INC.
4631 SIDEROAD 20 NORTH
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

GROUNDWATER ELEVATION CONTOURS (MAY 14, 2024)

Project No. **12618927**
Date **May 2025**

FIGURE 4.5

Filename: C:\ADSK\ACCDocs\GHD Services Pty Ltd\11230862-Enviro Projs\Project Files\12618927\01 WIP\Env\Figures\RPT-UpdateHydrogeo\12618927-GHD-00-00-RPT-EN-D103_WA-UpdateHydrogeo.dwg
Plot Date: 28 May 2025 3:09 PM

Data Source: Proposed layout from Sweeny & Co Architects Inc.; DWG TITLE: Site Plan, Contect Plan, Area Statistics; DATE: 2025-01-27; PROJ. No. : 2421; DWG No.: AC103.

Tables

Table 3.1

Monitoring Well Completion Details
Hydrogeological Assessment
Proposed Development
4631 Sideroad 20 North, Puslinch Township, ON
Puslinch Development GP Inc.

Well ID	Date Installed	Northing	Easting	Ground Elevation (m AMSL)	Top of Riser Elevation (m AMSL)	Total Depth Drilled (m BGS)	Screened Interval (m BGS) Top	Screened Interval (m BGS) Bottom	Screened Interval (m AMSL) Top	Screened Interval (m AMSL) Bottom	Sandpack Interval (m BGS) Top	Sandpack Interval (m BGS) Bottom	Sandpack Interval (m AMSL) Top	Sandpack Interval (m AMSL) Bottom	Screened Material
MONITORING WELLS															
MW1-23	22-Nov-23	4814372.9	564734.0	341.49	342.26	5.2	3.00	4.60	338.49	336.89	2.70	4.60	338.79	336.89	Silty Sand
MW5-23	23-Nov-23	4814191.1	564933.0	340.96	341.73	5.2	3.00	4.60	337.96	336.36	2.70	4.60	338.26	336.36	Sand to Sandy Silt Till
MW6-23	22-Nov-23	4814078.3	564840.3	339.36	340.12	5.2	3.00	4.60	336.36	334.76	2.70	4.60	336.66	334.76	Sandy Gravel
MW7-23	20-Nov-23	4814044.7	564988.1	340.03	340.84	11.3	7.60	10.70	332.43	329.33	7.30	10.70	332.73	329.33	Silty Sand to Sandy Silt
MW10-23	20-Nov-23	4813862.6	564840.1	335.94	336.74	5.2	3.00	4.60	332.94	331.34	2.70	4.60	333.24	331.34	Silt
MW11-23	21-Nov-23	4813971.5	565153.3	338.18	339.00	5.2	3.00	4.60	335.18	333.58	2.70	4.60	335.48	333.58	Gravelly Silty Sand
MW12-23	21-Nov-23	4813871.4	565052.0	334.95	335.73	5.2	3.00	4.60	331.95	330.35	2.70	4.60	332.25	330.35	Gravel and Sandy Silt
MW13-23	21-Nov-23	4813852.2	565226.4	336.24	336.97	5.2	3.00	4.60	333.24	331.64	2.70	4.60	333.54	331.64	Sand
Boreholes															
BH2-23	22-Nov-23	4814286.2	564845.0	340.4	-	5.2	-	-	-	-	-	-	-	-	-
BH3-23	22-Nov-23	4814184.8	564738.6	342.7	-	5.2	-	-	-	-	-	-	-	-	-
BH4-23	22-Nov-23	4814187.7	564849.3	339.6	-	11.3	-	-	-	-	-	-	-	-	-
BH8-23	21-Nov-23	4814072.9	565056.0	339.7	-	5.2	-	-	-	-	-	-	-	-	-
BH9-23	20-Nov-23	4813973.9	564949.1	338.8	-	5.2	-	-	-	-	-	-	-	-	-

Notes:
Surveyed by GHD personnel (Jack Ferenczy) on December 7, 2023.
UTM-17 NAD 83 (2010)CSRS
Elevations were established using GPS equipment (Leica Global Navigation Satellite System (GNSS)).

Table 3.2

Summary of Hydraulic Conductivity
Hydrogeological Assessment
Proposed Development
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development GP Inc.

			Hydraulic Conductivity (cm/s)	Hydraulic Conductivity (cm/s)	
Borehole ID	**Geologic Unit (Screened):**	**Screen Depth (mBGS)**	**Falling**	**Rising**	**Method**
MW10-23	Silt	3.0 - 4.6	8.79E-04	7.24E-04	Bouwer-Rice
			GEOMEAN	**7.98E-04**	

Table 3.3

Summary of Groundwater Levels (mBGS)
Hydrogeological Assessment
Proposed Development
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development GP Inc.

		MW1-23	MW5-23	MW6-23	MW7-23	MW10-23	MW11-23	MW12-23	MW13-23
Top of Riser (mAMSL):		342.26	341.73	340.12	340.84	336.74	339.00	335.73	336.97
Ground Surface (mAMSL):		341.49	340.96	339.36	340.03	335.94	338.18	334.95	336.24
29-Nov-23		Dry	Dry	Dry	Dry	4.44	Dry	Dry	Dry
8-Dec-23		NM	Dry	Dry	NM	4.51	NM	NM	NM
8-Feb-24		4.02	4.27	4.56	10.49	1.77	4.03	Dry	Dry
3-Apr-24		4.18	4.51	Dry	9.81	1.98	4.21	Dry	Dry
14-May-24		4.06	4.35	Dry	9.48	1.83	4.19	Dry	Dry
13-Jun-24		4.34	4.50	Dry	9.50	1.95	Dry	Dry	Dry
19-Aug-24		4.24	4.48	Dry	9.34	2.22	Dry	Dry	Dry
29-Oct-24		Dry	4.53	Dry	9.78	3.56	Dry	Dry	Dry

Notes:

NM	Not measured
mBGS	metres below ground surface
mAMSL	metres above mean sea level

Table 3.4

Summary of Groundwater Elevation (mAMSL)
Hydrogeological Assessment
Proposed Development
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development GP Inc.

	MW1-23	MW5-23	MW6-23	MW7-23	MW10-23	MW11-23	MW12-23	MW13-23
Top of Riser (mAMSL):	342.264	341.73	340.117	340.84	336.735	338.999	335.726	336.974
Ground Surface (mAMSL):	341.487	340.962	339.356	340.032	335.937	338.176	334.948	336.243
29-Nov-23	Dry	Dry	Dry	Dry	331.50	Dry	Dry	Dry
8-Dec-23	NM	Dry	Dry	NM	331.43	NM	NM	NM
8-Feb-24	337.47	336.69	334.80	329.54	334.17	334.15	Dry	Dry
3-Apr-24	337.31	336.45	Dry	330.22	333.96	333.97	Dry	Dry
14-May-24	337.42	336.61	Dry	330.55	334.11	333.99	Dry	Dry
13-Jun-24	337.15	336.46	Dry	330.53	333.99	Dry	Dry	Dry
19-Aug-24	337.25	336.48	Dry	330.69	333.72	Dry	Dry	Dry
29-Oct-24	Dry	336.43	Dry	330.25	332.38	Dry	Dry	Dry

Notes:

- No data available (inaccessible, not found, damaged, destroyed, not measured)
mBGS metres below ground surface
mAMSL metres above mean sea level

Table 4.5

Groundwater Analytical Results
Hydrogeological Assessment
Proposed Development
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development GP Inc.

			MW10-23
			GW-12618927-061324-TW-MW10-23
Sample Date:			6/13/2024
Field SDG:			WT2415964
Parameters	**Units**	**PWQOc**	
Total Metals			
Aluminum	mg/L	0.075	**1.94[c]**
Antimony	mg/L	0.02	0.00012
Arsenic	mg/L	0.005	0.00155
Barium	mg/L	-	0.0366
Beryllium	mg/L	0.011	0.000066
Boron	mg/L	0.2	0.029
Cadmium	mg/L	0.0002	0.000115
Calcium	mg/L	-	106
Chromium	mg/L	0.001	**0.00440[c]**
Cobalt	mg/L	0.0009	**0.00124[c]**
Copper	mg/L	0.005	**0.00727[c]**
Iron	mg/L	0.3	**2.56[c]**
Lead	mg/L	0.005	**0.00669[c]**
Manganese	mg/L	-	0.0963
Molybdenum	mg/L	0.04	0.000633
Nickel	mg/L	0.025	0.00303
Phosphorus	mg/L	0.01	**0.065[c]**
Selenium	mg/L	0.1	0.000747
Silver	mg/L	0.0001	ND(0.000010)
Sodium	mg/L	-	11.2
Sulfur	mg/L	-	5.58
Thallium	mg/L	0.0003	0.000042
Tungsten	mg/L	0.03	ND(0.00010)
Uranium	mg/L	0.005	0.000463
Vanadium	mg/L	0.006	0.00441
Zinc	mg/L	0.03	**0.0368[c]**
Zirconium	mg/L	0.004	0.00077
Dissolved Metals			
Aluminum (dissolved)	mg/L	0.075	0.0045
Antimony (dissolved)	mg/L	0.02	ND(0.00010)
Arsenic (dissolved)	mg/L	0.005	0.00025
Barium (dissolved)	mg/L	-	0.0214
Beryllium (dissolved)	mg/L	0.011	ND(0.000020)
Bismuth (dissolved)	mg/L	-	ND(0.000050)
Boron (dissolved)	mg/L	0.2	0.026
Cadmium (dissolved)	mg/L	0.0002	0.0000064
Caesium (dissolved)	mg/L	-	ND(0.000010)
Calcium (dissolved)	mg/L	-	93.2
Chromium (dissolved)	mg/L	0.001	0.00056
Cobalt (dissolved)	mg/L	0.0009	ND(0.00010)
Copper (dissolved)	mg/L	0.005	0.00404
Iron (dissolved)	mg/L	0.3	ND(0.010)
Lead (dissolved)	mg/L	0.005	ND(0.000050)
Lithium (dissolved)	mg/L	-	0.0046
Magnesium (dissolved)	mg/L	-	17.0
Manganese (dissolved)	mg/L	-	0.00093
Molybdenum (dissolved)	mg/L	0.04	0.000441
Nickel (dissolved)	mg/L	0.025	ND(0.00050)
Phosphorus (dissolved)	mg/L	0.01	ND(0.050)
Potassium (dissolved)	mg/L	-	1.23
Rubidium (dissolved)	mg/L	-	0.00078
Selenium (dissolved)	mg/L	0.1	0.000858
Silicon (dissolved)	mg/L	-	3.28
Silver (dissolved)	mg/L	0.0001	ND(0.000010)
Sodium (dissolved)	mg/L	-	10.8

Table 4.5

Groundwater Analytical Results
Hydrogeological Assessment
Proposed Development
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development GP Inc.

			MW10-23
			GW-12618927-061324-TW-MW10-23
Sample Date:			6/13/2024
Field SDG:			WT2415964
Parameters	**Units**	**PWQOc**	
Strontium (dissolved)	mg/L	-	0.155
Tellurium (dissolved)	mg/L	-	ND(0.00020)
Thallium (dissolved)	mg/L	0.0003	ND(0.000010)
Thorium (dissolved)	mg/L	-	ND(0.00010)
Tin (dissolved)	mg/L	-	ND(0.00010)
Titanium (dissolved)	mg/L	-	ND(0.00030)
Tungsten (dissolved)	mg/L	0.03	ND(0.00010)
Uranium (dissolved)	mg/L	0.005	0.000325
Vanadium (dissolved)	mg/L	0.006	ND(0.00050)
Zinc (dissolved)	mg/L	0.03	0.0113
Zirconium (dissolved)	mg/L	0.004	ND(0.00030)
General Chemistry			
Alkalinity, bicarbonate	mg/L	-	207
Alkalinity, carbonate	mg/L	-	ND(2.0)
Alkalinity, hydroxide	mg/L	-	ND(2.0)
Alkalinity, phenolphthalein	mg/L	-	ND(2.0)
Alkalinity, total (as CaCO3)	mg/L	25% of natural	207
Ammonia-N	mg/L	-	ND(0.0050)
Anion sum	meq/L(me/L)	-	7.01
Anion/Cation ratio	%	-	-3.39
Biochemical oxygen demand (BOD)	mg/L	-	ND(3.0)
Biochemical oxygen demand (dissolved)	mg/L	-	ND(3.0)
Cation sum	meq/L(me/L)	-	6.55
Chloride (dissolved)	mg/L	-	8.97
Color (true)	TCU	-	3.5
Conductivity	uS/cm	-	654
Dissolved organic carbon (DOC) (dissolved)	mg/L	-	3.68
Fluoride	mg/L	-	0.041
Hardness	mg/L	-	303
Hydrogen sulfide (calculated)	mg/L	-	ND(0.011)
Nitrate (as N)	mg/L	-	32.2
Nitrite (as N)	mg/L	-	ND(0.010)
Nitrite/Nitrate	mg/L	-	32.2
Orthophosphate (dissolved)	mg/L	-	0.0023
pH, field	s.u.	6.5-8.5	**6.49[c]**
pH, lab	s.u.	6.5-8.5	7.90
Phosphorus	mg/L	0.01	**0.0892[c]**
Phosphorus (dissolved)	mg/L	0.01	0.0030
Sulfate (dissolved)	mg/L	-	15.4
Sulfide	mg/L	-	ND(0.010)
Temperature, field	Deg C	-	22.3
Total dissolved solids (TDS)	mg/L	-	433
Total kjeldahl nitrogen (TKN)	mg/L	-	0.581 / 0.601
Total organic nitrogen (dissolved)	mg/L	-	0.581
Total suspended solids (TSS)	mg/L	-	114
Turbidity	NTU	10% of natural	146
Un-ionized ammonia (as NH3) (calculated)	mg/L	-	ND(0.0010)

Notes:

ND - Not detected at the associated reporting limit.

Appendices

Appendix A

Field Investigative Methodology and Protocols

Appendix A Field Investigation Methodology and Protocols

Utility Locates

Prior to initiating the subsurface investigation activities, all applicable utility companies (gas, telephone, network cables, pipelines and sewers) were contacted through Ontario One-Call. Also, a private utility locator was utilized to demarcate the location of the respective underground utilities to ensure the lines were not damaged during the investigation work.

Health and Safety

A Site-specific Health and Safety Plan (HASP) outlining specific job tasks and their related hazards was prepared and implemented by GHD prior to initiating field activities. The HASP presents the visually observed Site conditions and identifies potential physical hazards to field personnel. All GHD field and project staff working on and/or visiting the site were required to sign the HASP to document their knowledge of the potential hazards while on-site.

All drilling activities were conducted under Level D Personal Protective Equipment (PPE), which consisted of protective gloves, hard hats, safety glasses, safety boots and reflective vests at all times.

Soil Classification

The soil was logged using the Unified Soil Classification System (USGS), making special note of any visual or olfactory evidence of potential impacts.

Monitoring Well Installation

Monitoring wells were installed in selected boreholes by the licensed water well drillers consistent with Regulation 903 – Wells. GHD technical staff supervised the monitoring well construction and well development to ensure conformance with GHD's Standard Operating Procedures.

The boreholes were advanced through overburden using hollow stem augers (203 mm outside diameters). Soil samples were generally collected every 0.75 m and 1.5 m depth intervals. All sampling was conducted using a 50 millimetre (mm) outside diameter split spoon sampler in general accordance with the specifications of the Standard Penetration Test Method (ASTM D1586). The relative density or consistency of the subsurface soil layers were measured using the Standard Penetration Test (SPT) method, by counting the number of blows (‘N’) required to drive a conventional split barrel soil sampler 0.3 m depth.

The monitoring wells were constructed with 2-inch (~50 mm) Schedule 40 PVC screen and casing. The screen length used for the monitoring wells was 1.5 or 3.0 metres on average and pre-slotted (No. 10 slot). The annular space between the monitoring well screen and surrounding geological formation were backfilled with No. 3 grade silica sand to an average height of 0.6 metres above the top of the screen. The remaining annular space was backfilled with bentonite. Some monitoring wells were installed with minor alteration to the above installation details, due to the specific conditions encountered.

To complete the instrumentation, an expandable J-plug was installed on the riser style casing to cover the top of the riser pipe to protect against debris falling into the well and surface runoff infiltration. All wells were installed in a flushmount or monument configuration with concrete collar around the protective

casing. Each groundwater monitoring well was instrumented with dedicated sampling equipment consisting of polyethylene tubing and Waterra foot valves for monitoring well development and installation.

Monitoring Well Development

Subsequent to the monitoring well installation, each well was developed to ensure hydraulic connection with the screened hydrostratigraphic unit. A hydraulic connection ensures that groundwater levels and samples are representative of the subsurface condition. Development also aids in achieving low-turbidity samples.

The wells were developed using dedicated 5/8" (~16 mm) diameter polyethylene tubing with a Waterra foot valve. Well development activities were undertaken until purged water was clear. In cases where a well was purged dry before sufficient development, the well water level was allowed to recover before continuing.

Surveying

Subsequent to installation, all wells and boreholes were surveyed for vertical and lateral control, and for water table elevation reference, using a geodetic benchmark to tie in vertical elevations relative to meters above mean sea level (mAMSL) at the Site. The ground surface and top of riser pipe elevation of each of well were surveyed with respect to this benchmark.

Water Level Measurements

The measurement of groundwater levels in monitoring wells was required during the hydrogeological investigation in order to determine the presence and depth of groundwater. Water level measurements were used to determine: hydraulic head, hydraulic gradients and the direction of groundwater flow.

Since many decisions concerning the vertical and horizontal flow of groundwater through various types of geologic conditions depend on groundwater/fluid measurements, the accuracy of the measurements made at an appropriate level of precision is very important. Typically, the precision required is 1 mm, and the equipment employed had measurement resolution at this level.

Manual groundwater level measurements were measured using a Solinst water level meter. Measurements were obtained by lowering the electrode, attached to a graduated polyethylene tape, slowly into the well until the indicator sounded. To ensure accuracy, all fluid level readings were double-checked in the field when recorded.

In order to provide reliable data, each round of water level measurements was collected over as short a period of time as possible. Barometric pressure can affect groundwater levels and, therefore, observation of significant weather changes during the period of water level measurements was noted. Rainfall events and groundwater pumping can also affect groundwater level measurements. Personnel collecting water level data noted if any of these controls are in effect during the groundwater level collection period.

Groundwater Sampling

Prior to initiating groundwater sample collection, the wells were purged of the standing stagnant groundwater volume using a dedicated Waterra foot valve and polyethylene tubing. Purging was performed until the water in the well was representative of the actual conditions in the hydrostratigraphic unit. Stabilization was achieved by the removal of at least three times the volume of standing water in the well. Purging was considered complete once purged groundwater field parameters including conductivity, temperature and pH were stable. Stabilization was achieved when field measurements for conductivity and temperature were within a range of plus or minus 10 percent of the average for the last three readings

and field measurements for pH were within a range of plus or minus 0.1 pH unit of the average for the last three readings.

The wells were purged using dedicated inertial pumps. In the event of a slowly recharging well, the well was pumped dry to ensure all standing water was removed from the sand pack and then allowed to recover prior to sample collection.

In the event of a well with groundwater that contains a high amount of silt or sediment after well development, a 0.75"x36" PVC water bailer was used to collect the water.

Water samples were collected directly from the dedicated tubing or bailer to laboratory supplied sample containers. Samples were relinquished to an accredited analytical laboratory under Chain of Custody protocols.

Single Well Response Tests

Single well response tests (SWRT) were completed in selected monitoring well installations to determine the hydraulic conductivity of the screened geologic formation. The SWRT consisted of falling head tests (slug tests), and rising head tests (recovery rests) as described in the sections below.

1.1 Falling Head Test (Slug Test)

The slug test involves causing a sudden change in water level in a well and measuring the water level response within that well. Water level change may be induced by suddenly injecting or emplacing a known quantity or "slug" into the well. The slug can water or solid (stainless steel, polyvinyl chloride). A detailed description of the procedure is provided, as follows:

i) The static water level was determined prior to any testing of the well.

ii) A datalogger, programmed to measure water pressure at an appropriate interval (eg. 5 seconds), was installed in the well at a known depth.

iii) A slug of known dimensions was set in place just above the static water level.

iv) The slug was then released instantaneously until it was completely submerged in the water column.

v) After the initial positive displacement of the water column, water levels were monitored manually.

vi) When the water level reached approximately 90 percent of the original observed (static) water level, the slug was then rapidly removed from the water column to initiate a "rising-head" test.

1.2 Rising Head Test (Recovery Test)

The recovery test also involves causing a sudden change in water level in a well and measuring the water level response within that well. Water level change may be induced by suddenly removing a known quantity or "slug" out of the well. The slug is usually a stainless steel or polyvinyl chloride rod.

Recovery tests were carried out after the slug tests described above. Water level monitoring continued until the water level was within 10 percent of the original static level.

Guelph Permeameter Tests

Guelph Permeameter tests provide information on soil infiltration capacity that is used in the assessment of stormwater management options. The Guelph Permeameter is a well-known constant-head borehole permeameter technique[1].

Guelph Permeameter tests are carried out in the vadose zone above the water table, where the soil is unsaturated. The method measures the steady-state flow rate (Q) necessary to maintain a constant depth of water (H) in an uncased borehole. The hydraulic conductivity measured in the vadose zone is referred to as the "field-saturated" hydraulic conductivity (K_{fs}) and is calculated from Q and H using the analytical solutions[2] provided by the Guelph Permeameter manufacturer[3]. The analytical solution input parameters include the following:

- Reservoir cross sectional area
- Water height
- Borehole radius
- Soil texture
- Steady state rate of water level change.

The GP method measures the steady -state rate necessary to maintain a constant depth of water in an uncased cylindrical borehole above the water table. A summary of field procedures is presented below:

- Excavate a cylindrical borehole to the desired depth in the material to be tested;
- Fill the permeameter with liquid and insert it in the well;
- Start the permeameter by raising the air-inlet tube out of the outlet port;
- Set the desired H level by adjusting the height of the air-inlet tube;
- Monitor the rate of fall of the liquid surface in the reservoir until a steady rate, r, is attained;

The field saturated hydraulic conductivity is calculated using an approximate analytical solution.

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1 ASTM D5126.D5126M-90. Standard Guide for Comparison of Field Methods for Determining Hydraulic Conductivity in Vadose Zone. ASTM International, 2010.

2 Elrick, D.E. and W.D. Reynolds. Methods Of Analyzing Constant Head Well Permeameter Data. Soil Sci. Soc. Am. J. 56: 320-323. 1992b.

3 Soil Moisture Equipment Corp. Goleta, California.

Appendix B

Stratigraphy Logs

REFERENCE No.: 12618927

BOREHOLE REPORT

Page 1 of 1

BOREHOLE No.: MW1-23

ELEVATION: 341.5 m

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814372.9 EASTING: 564734.0 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry) KN/m³	LAB Testing Moisture Content %	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	COMMENTS
0		341.5		GROUND SURFACE			%		%	%			
1				TOPSOIL (229 mm) SILTY CLAY, trace sand, trace gravel, trace corn husk, rootlets, dark brown, moist, firm		SS1			18	66.7	2-2-3-3	5	Concrete
2	0.6	340.9		FILL: SANDY SILT, trace gravel, trace corn husk, brown, moist, compact (Disturbed Native)		SS2			8	50	1-5-5-12	10	0.6 m Sand 0.9 m
3	1.0												
4													
5	1.5	340.0		NATIVE: SILTY SAND, trace clay, trace gravel, brown, moist to wet, compact		SS3			8	66.7	2-11-11-13	22	Hole-plug
6													
7	2.0			moist below 2.3 m		SS4			3	62.5	8-9-13-19	22	2.7 m
8													
9													
10	3.0					SS5	9-56-28-7		7	62.5	5-10-12-16	22	3.0 m
11													
12				auger grinding from 3.7 m bgs to 4.0 m bgs									Screen
13	4.0												
14						SS6			6	54.2	12-12-16-20	28	5/14/2024
15													4.6 m
16	5.0					SS7			9	70.8	8-12-10-11	22	
17	5.2	336.3		END OF BOREHOLE									5.2 m
18													
19													
20	6.0												
21													
22													
23	7.0												
24													
25													
26	8.0												
27													
28													
29	9.0												
30													
31													
32													

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△₂ Number refer to Sensitivity
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

PIEZOMETER/ STANDPIPE INSTALLATION

NOTES:
- End of Borehole at 5.2 m bgs.
- Borehole was dry upon completion.
- bgs denotes 'below ground surface'.
- Water level taken on May 14, 2024 was 4.06 m bgs

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: BH2-23

ELEVATION: 340.4 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814286.2 EASTING: 564845.0 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry)	LAB Testing Moisture Content	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	Undisturbed Vane Value (kPa) / Remoulded Field Vane Value (kPa) / Number refer to Sensitivity / Water content (%) / Atterberg limits (%) / "N" Value (blows/12 in.-30 cm) / "DCPT" Value (blows/12 in.-30 cm)	COMMENTS (PIEZOMETER/ STANDPIPE INSTALLATION)
		340.4		GROUND SURFACE			%	KN/m³	%	%			10 20 30 40 50 60 70 80 90	
0				TOPSOIL (356 mm) CLAYEY SILT, trace sand, trace corn husk, rootlets, dark brown, moist, firm		SS1			24	70.8	1-2-3-3	5		
	0.6	339.8		SILTY SAND, brown, moist, loose (Disturbed Native)		SS2			10	66.7	1-2-2-2	4		
	1.0													
	1.5	338.8		NATIVE: SAND, trace to some silt, trace gravel, brown, moist, compact		SS3			5	62.5	3-10-18-35	28		
	2.0													
	2.3	338.1		SANDY GRAVEL, some silt, brown, moist, very dense		SS4			6	45.8	17-31-28-29	59		
	3.0					SS5	62-23-(15)		5	62.5	6-24-36-28	60		
	4.0													
				dense belolw 4.5 m bgs		SS6			6	62.5	14-16-18-26	34		
	5.0													
	5.2	335.2		END OF BOREHOLE										
	6.0			NOTES: - End of Borehole at 5.2 m bgs. - Borehole was dry upon completion of drilling. - bgs denotes 'below ground surface'.										
	7.0													
	8.0													
	9.0													

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: BH3-23

ELEVATION: 342.7 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814184.8 EASTING: 564738.6 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry) KN/m³	LAB Testing Moisture Content %	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	Undisturbed Vane Value (kPa) / Remoulded Field Vane Value (kPa) / Number refer to Sensitivity / Water content (%) / Atterberg limits (%) / "N" Value (blows/12 in.-30 cm) / "DCPT" Value (blows/12 in.-30 cm)	COMMENTS PIEZOMETER/ STANDPIPE INSTALLATION
		342.7		GROUND SURFACE			%	KN/m³	%	%			10 20 30 40 50 60 70 80 90	
0				TOPSOIL (457 mm) SANDY SILT, trace corn husks, rootlets, dark brown, moist, loose		SS1			21	58.3	2-2-2-7	4		
	0.6	342.1		FILL: SILTY SAND, rootlets, brown, moist, very loose (Disturbed Native)		SS2			16	75	2-2-1-2	3		
	1.0													
	1.5	341.2		NATIVE: SAND, some silt, some gravel to gravelly sand, brown, dry, compact		SS3			5	54.2	2-8-10-19	18		
	2.0					SS4			3	58.3	7-10-8-10	18		
	3.0					SS5	20-67-(13)		2	58.3	3-6-6-14	12		
	4.0													
	5.0			some gravel to gravelly, very dense below 4.6 m bgs		SS6			2	58.3	19-26-40-28	66		
	5.2	337.6		END OF BOREHOLE NOTES: - End of Borehole at 5.2 m bgs. - Borehole was dry upon completion of drilling. - bgs denotes 'below ground surface'.										
	6.0													
	7.0													
	8.0													
	9.0													

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: BH4-23

ELEVATION: 339.6 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814187.7 EASTING: 564849.4 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry)	LAB Testing Moisture Content	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	COMMENTS
		339.6		GROUND SURFACE			%	KN/m³	%	%			PIEZOMETER/ STANDPIPE INSTALLATION
0				TOPSOIL (330 mm)									
1	0.3	339.3		FILL: SILTY SAND/SANDY SILT, trace corn husk, rootlets, dark brown, moist, loose (Disturbed Native)		SS1			18	75	2-2-3-4	5	
2	0.8	338.9		NATIVE: SAND, some silt, brown, moist, loose		SS2	---(15)		6	66.7	2-4-5-4	9	
3	1.0												
5	1.5	338.1		SILT, trace sand, brown, moist, loose		SS3			16	79.2	1-3-3-4	6	
7	2.0												
8	2.3	337.3		SAND and SILT, trace gravel, brown, moist, compact		SS4	---(48)		11	75	3-11-12-11	23	
10	3.0	336.6		SANDY GRAVEL, some silt, trace rock fragments, brown, dry, very dense to dense		SS5			5	45.8	4-12-21-45	33	
13	4.0												
15				very dense below 4.5 m bgs		SS6			3	75	13-25-45-50/127mm	70	
16	5.0												
18							57-31-(12) SS6+SS7		--	--	--	--	
20	6.0												
21						SS7			3	79.2	19-47-46-40	93	
23	7.0												
25				SPT refusal at 7.6 m bgs		SS8			--	0	50/154mm	--	
26	8.0												
29	9.0												
30				dense below 9.1 m bgs		SS9			9	83.3	18-23-25-27	48	
32													

10 20 30 40 50 60 70 80 90

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△s Number refer to Sensitivity
○ Water content (%)
Wp Wl Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: BH4-23

ELEVATION: 339.6 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814187.7 EASTING: 564849.4 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry)	LAB Testing Moisture Content	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	Undisturbed Vane Value (kPa) / Remoulded Field Vane Value (kPa) / Number refer to Sensitivity / Water content (%) / Atterberg limits (%) / "N" Value (blows/12 in.-30 cm) / "DCPT" Value (blows/12 in.-30 cm)	COMMENTS (PIEZOMETER/ STANDPIPE INSTALLATION)
		339.6		GROUND SURFACE			%	KN/m³	%	%			10 20 30 40 50 60 70 80 90	
	10.7	329.0		SAND and SILT, trace gravel, brown, moist, very dense		SS10			9	79.2	20-29-35-44	64		
	11.0													
	11.3	328.3		END OF BOREHOLE										
	12.0			NOTES: - End of Borehole at 11.3 m bgs. - Borehole was dry upon completion of drilling. - bgs denotes 'below ground surface'.										
	13.0													
	14.0													
	15.0													
	16.0													
	17.0													
	18.0													
	19.0													

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE REPORT

Page 1 of 1

BOREHOLE No.: MW5-23

ELEVATION: 341.0 m

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 23 November 2023 DATE (FINISH): 23 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814191.1 EASTING: 564933.0 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry) KN/m³	LAB Testing Moisture Content %	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	Undisturbed Vane Value (kPa) / Remoulded Field Vane Value (kPa) / Number refer to Sensitivity / Water content (%) / Atterberg limits (%) / "N" Value (blows/12 in.-30 cm) / "DCPT" Value (blows/12 in.-30 cm)	COMMENTS (PIEZOMETER/ STANDPIPE INSTALLATION)
		341.0		GROUND SURFACE			%	KN/m³	%	%			10 20 30 40 50 60 70 80 90	
0				TOPSOIL (279 mm) SILTY SAND, corn husks, rootlets, dark brown, loose		SS1			12	70.8	1-2-3-2	5		Concrete
2	0.6	340.4		FILL: SAND, trace silt, trace gravel, brown, moist, very loose (disturbed native)		SS2			6	29.2	1-1-1-1	2		0.6 m Sand 0.9 m
5	1.5	339.4		NATIVE: SAND, trace to some silt, trace gravel, brown, dry, compact		SS3			3	--	1-5-9-8	14		Hole-Plug
9						SS4	---(10)		3	54.2	3-6-7-8	13		2.7 m
10	3.0			some gravel to gravelly below 3.0 m bgs, SPT refusal due to possible obstruction		SS5			2	37.5	10-34-50/51mm	84/203 mm		3.0 m
13	3.8	337.2		SANDY SILT TILL, trace gravel, brown, moist, dense		SS6			5	50	9-13-30-47	43		Screen
15	4.0			compact below 4.5 m bgs		SS7			7	58.3	4-7-15-23	22		4.6 m 5/14/2024
17	5.2	335.8		END OF BOREHOLE										5.2 m

NOTES:
- End of Borehole at 5.2 m bgs.
- Borehole was dry upon completion of drilling.
- bgs denotes 'below ground surface'.
- Water level taken on May 14, 2024 was 4.35 m bgs

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: MW6-23

ELEVATION: 339.4 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 22 November 2023 DATE (FINISH): 22 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814078.3 EASTING: 564840.3 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry) KN/m³	LAB Testing Moisture Content %	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	COMMENTS
0		339.4		GROUND SURFACE			%		%	%			
	0			TOPSOIL (356 mm)									
1	0.4	339.0		FILL:		SS1			23	70.8	1-2-2-3	4	Concrete
2	0.6	338.7		SILT, trace clay, rootlets. corn husks, dark brow, moist, loose									0.6 m Sand
3	1.0			NATIVE: SILT, trace clay, trace sand, brown, moist, compact		SS2	0-9-87-4 Non-Plastic		18	83.3	3-4-6-6	10	0.9 m
4													
5													
6						SS3			20	66.7	2-4-9-23	13	Hole-plug
7	2.0			trace, gravel, sand seam (approximately 50-80 mm) at 2.0 m bgs									
8	2.3	337.1		SANDY GRAVEL, some silt, brown, wet to moist, very dense		SS4	66-20-(14)		19	70.8	4-30-26-27	56	2.7 m
9													
10	3.0			SPT refusal due to possible obstruction		SS5			3	85.7	22-46-50/21mm	96/203 mm	3.0 m
11													
12													Screen
13	4.0					SS6	64-24-(12)		5	83.3	20-32-36-45	68	
14													
15	4.6	334.8		SILTY SAND, some gravel, brown, moist, very dense		SS7			6	83.3	7-22-30-25	52	4.6 m
16	5.0												
17	5.2	334.2		END OF BOREHOLE									5.2 m
18				NOTES:									
19				- End of Borehole at 5.2 m bgs.									
20	6.0			- Borehole was dry upon completion of drilling.									
21				- bgs denotes 'below ground surface'.									
22				- Borehole was dry on May 14, 2024									
23	7.0												
24													
25													
26	8.0												
27													
28													
29	9.0												
30													
31													
32													

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△₂ Number refer to Sensitivity
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

COMMENTS: PIEZOMETER/ STANDPIPE INSTALLATION

REFERENCE No.: 12618927

BOREHOLE No.: MW7-23

ELEVATION: 340.0 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 20 November 2023 DATE (FINISH): 20 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814044.7 EASTING: 564988.1 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry) KN/m³	LAB Testing Moisture Content %	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	COMMENTS
0		340.0		GROUND SURFACE			%		%	%			
1				TOPSOIL SANDY SILT, trace grass, rootlets, dark brown, moist, loose		SS1			16	25	1-2-5-4	7	Concrete
2	0.6	339.4		FILL: SILTY SAND, some gravel, brown, moist compact (Disturbed Native)		SS2			5	54.2	5-14-12-10	26	0.6 m Sand 0.9 m
3	1.0												
4													
5													
6				rootlets at 1.8 m bgs		SS3			6	70.8	5-6-13-10	19	
7	2.0												
8	2.3	337.7		SILT, trace sand, rootlets, brown, moist, compact (Disturbed Native)		SS4			16	83.3	3-6-11-9	17	
9													
10	3.0	337.0		NATIVE: SILT, trace sand, brown, moist, compact		SS5			16	79.2	4-5-15-9	20	
11													
12													
13	4.0												Hole-plug
14													
15	4.6	335.5		SILTY SAND, trace clay, some gravel, brown, moist to dry, dense		SS6	15-51-26-8		6	79.2	10-15-19-15	34	
16	5.0												
17													
18													
19													
20	6.0												
21						SS7			2	70.8	31-19-18-17	37	
22													
23	7.0												
24													7.3 m
25				SPT obstructed, no recovery									7.6 m
26	8.0					SS8			19	4.2	30-33-30-26	63	
27													
28													
29													
30	9.0												Screen
31	9.1	330.9		SILT and SAND, trace clay, trace gravel, brown, moist, dense		SS9	8-43-39-10 Non-Plastic		8	--	12-13-25-26	38	
32													5/14/2024

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
Δ Number refer to Sensitivity
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

PIEZOMETER/ STANDPIPE INSTALLATION

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: MW7-23

ELEVATION: 340.0 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 20 November 2023 DATE (FINISH): 20 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814044.7 EASTING: 564988.1 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry)	LAB Testing Moisture Content	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	COMMENTS
		340.0		GROUND SURFACE			%	KN/m³	%	%			
	10.7	329.4		SANDY SILT, trace to some gravel, brown, moist, dense		SS10			8	25	8-16-14-13	30	10.7 m
	11.0												
	11.3	328.8		END OF BOREHOLE									11.3 m

NOTES:
- End of Borehole at 11.3 m bgs.
- Borehole was dry upon completion of drilling.
- bgs denotes 'below ground surface'.
- Water level taken on May 14, 2024 was 9.48 m bgs

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△s Number refer to Sensitivity
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

PIEZOMETER/ STANDPIPE INSTALLATION

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: BH8-23

ELEVATION: 339.7 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 21 November 2023 DATE (FINISH): 21 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4814072.9 EASTING: 565056.0 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry)	LAB Testing Moisture Content	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	Undisturbed Vane Value (kPa) / Remoulded Field Vane Value (kPa) / Number refer to Sensitivity / Water content (%) / Atterberg limits (%) / "N" Value (blows/12 in.-30 cm) / "DCPT" Value (blows/12 in.-30 cm)	COMMENTS (PIEZOMETER/ STANDPIPE INSTALLATION)
		339.7		GROUND SURFACE			%	KN/m³	%	%			10 20 30 40 50 60 70 80 90	
0				TOPSOIL (330 mm) CLAYEY SILT, trace sand, rootlets, dark brown, moist, loose		SS1			26	41.7	1-2-3-4	5		
	0.6	339.1		FILL: SILTY SAND, trace gravel, rootlets, brown, moist, compact (Disturbed Native)		SS2			7	66.7	2-6-5-8	11		
	1.0													
	1.5	338.1		NATIVE: SILTY SAND, trace clay, some gravel, brown, moist, dense		SS3			5	62.5	2-11-22-11	33		
	2.0						18-42-34-6 SS3+SS4		--	--	--	--		
				compact below 2.5 m bgs crushed rock fragments		SS4			8	66.7	8-14-9-10	23		
	3.0			very dense below 3.0 m bgs		SS5			11	58.3	4-27-27-15	54		
	4.0													
				trace clay, some gravel to gravelly, brown, moist dense below 4.6 m		SS6			6	83.3	10-15-21-20	36		
	5.0													
	5.2	334.5		END OF BOREHOLE										
	6.0			NOTES: - End of Borehole at 5.2 m bgs. - Borehole was dry upon completion of drilling. - bgs denotes 'below ground surface'.										
	7.0													
	8.0													
	9.0													

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: BH9-23

ELEVATION: 338.8 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 20 November 2023 DATE (FINISH): 20 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813973.9 EASTING: 564949.1 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry)	LAB Testing Moisture Content	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	Undisturbed Vane Value (kPa) / Remoulded Field Vane Value (kPa) / Number refer to Sensitivity / Water content (%) / Atterberg limits (%) / "N" Value (blows/12 in.-30 cm) / "DCPT" Value (blows/12 in.-30 cm)	COMMENTS (PIEZOMETER/ STANDPIPE INSTALLATION)
		338.8		GROUND SURFACE			%	KN/m³	%	%			10 20 30 40 50 60 70 80 90	
0	0.1	338.6		TOPSOIL (127 mm)										
1				FILL: SANDY SILT, trace to some gravel, trace corn husk, brown, wet, loose		SS1			43	50	1-3-4-4	7		
2	0.6	338.2		NATIVE: SILTY SAND, trace sand, trace gravel, brown, moist, compact										
3	1.0					SS2			13	79.2	8-7-8-8	15		
4														
5				loose at 1.6 m bgs										
6				silt layers (approximately 100-150 mm) at 1.8 m bgs		SS3			18	75	3-4-4-5	8		
7	2.0													
8				silt layers (approximately 100 mm) at 2.3 m bgs		SS4			14	79.2	5-10-7-8	17		
9														
10	3.0	335.7		SILT, some clay, trace sand, brown, moist, compact		SS5	0-4-78-18		18	79.2	5-8-7-7	15		
11	3.0													
12														
13	4.0													
14														
15	4.6	334.2		SAND, some silt, some gravel, brown, moist, dense		SS6			5	37.5	14-14-18-21	32		
16	5.0													
17	5.2	333.6		END OF BOREHOLE										
18				NOTES:										
19				- End of Borehole at 5.2 m bgs.										
20	6.0			- Borehole was dry upon completion of drilling.										
21				- bgs denotes 'below ground surface'.										
22														
23	7.0													
24														
25														
26	8.0													
27														
28														
29	9.0													
30														
31														
32														

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: MW10-23

ELEVATION: 335.9 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 20 November 2023 DATE (FINISH): 20 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813862.6 EASTING: 564840.1 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay %)	LAB Testing Unit Weight (Dry) KN/m³	LAB Testing Moisture Content %	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	COMMENTS
0		335.9		GROUND SURFACE									
	0.6	335.3		TOPSOIL: SILT and SAND, trace gravel, trace corn husk, brown to dark brown, moist, loose		SS1			12	50	2-2-3-2	5	Concrete; 0.6 m; Sand; 0.9 m
	1.0			NATIVE: SILTY SAND, trace to some gravel, brown, moist, compact		SS2			10	54.2	2-3-10-16	13	
						SS3			7	29.2	7-17-13-8	30	Hole-plug; 5/14/2024
	2.3	333.7		SILT, trace sand, trace gravel, brown oxidized, moist, compact		SS4			17	83.3	4-9-9-14	18	2.3 m
	3.0			SPT refusal due to possible obstruction		SS5			4	45.5	40-50/127 mm	50/127 mm	3.0 m; Screen
	4.6	331.4		SAND and SILT, trace clay, some gravel, brown, moist, dense		SS6			8	--	14-17-22-22	39	4.6 m
	5.0			END OF BOREHOLE									5.2 m
	5.2	330.8											

NOTES:
- End of Borehole at 5.2 m bgs.
- Borehole was dry upon completion of drilling.
- bgs denotes 'below ground surface'.
- Water level taken on May 14, 2024 was 1.83 m bgs

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△ₛ Number refer to Sensitivity
○ Water content (%)
W_p W_l Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

PIEZOMETER/ STANDPIPE INSTALLATION

REFERENCE No.: 12618927

BOREHOLE No.: MW11-23

ELEVATION: 338.2 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 21 November 2023 DATE (FINISH): 21 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813971.5 EASTING: 565153.3 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry)	LAB Testing Moisture Content	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	Undisturbed Vane Value (kPa) / Remoulded Field Vane Value (kPa) / Number refer to Sensitivity / Water content (%) / Atterberg limits (%) / "N" Value (blows/12 in.-30 cm) / "DCPT" Value (blows/12 in.-30 cm)	COMMENTS (PIEZOMETER/ STANDPIPE INSTALLATION)
		338.2		GROUND SURFACE			%	KN/m³	%	%			10 20 30 40 50 60 70 80 90	
0				TOPSOIL (279 mm) SANDY SILT. trace gravel, rootlets, dark brown, moist		SS1			11	58.3	2-3-4-10	7		Concrete
	0.6	337.6		NATIVE: GRAVELLY SILTY SAND, trace clay, rock fragments, brown, dry to moist, compact to very dense		SS2	25-47-23-5		5	58.3	5-14-19-12	33		0.6 m Sand 0.9 m
	1.0			compact from 1.5 m to 2.5 m bgs		SS3			2	45.8	5-10-9-9	19		Hole-plug
	2.0					SS4			3	66.7	9-13-17-21	30		2.3 m
	3.0			dense below 3.0 m bgs		SS5			3	66.7	14-22-28-29	50		3.0 m Screen
	4.0													5/14/2024
	4.6	333.6		SILTY SAND, some gravel, brown, moist to wet, dense		SS6			16	66.7	6-11-27-24	38		4.6 m
	5.0			silt layer (approximately 150-200 mm) at 5.0 m bgs										
	5.2	333.0		END OF BOREHOLE										5.2 m
	6.0													
	7.0													
	8.0													
	9.0													

NOTES:
- End of Borehole at 5.2 m bgs.
- Borehole was dry upon completion of drilling.
- bgs denotes 'below ground surface'.
- Water level taken on May 14, 2024 was 4.19 m bgs

File: N:\CA\WATERLOO\PROJECTS\662\12618927\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: MW12-23

ELEVATION: 334.9 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 21 November 2023 DATE (FINISH): 21 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813871.4 EASTING: 565052.0 DRILLING TYPE:Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth Feet	Depth Metres	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments Gravel Sand Silt Clay	LAB Testing Unit Weight (Dry) KN/m³	LAB Testing Moisture Content %	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	COMMENTS
0		334.9		GROUND SURFACE			%	KN/m³	%	%			
	0.1	334.9		TOPSOIL (76 mm)									
1				FILL: SAND and GRAVEL, trace silt, rootlets, brown, moist, compact (Disturbed Native)		SS1			8	50	2-6-10-12	16	Concrete
2													0.6 m Sand
	0.8	334.2		NATIVE: GRAVEL and SANDY SILT, rock fragments, brown, dry, dense									0.9 m
3	1.0					SS2			5	37.5	8-20-16-17	36	
4													
5				compact from 1.5 m to 2.1 m bgs									
6						SS3	---(39)		4	54.2	6-14-14-23	28	Hole-plug
7	2.0												
8						SS4			2	58.3	15-20-16-29	36	
9													2.7 m
10	3.0			rock fragments, very dense below 3.1 m SPT refusal due to possible obstruction		SS5			4	68.8	19-30-50/102mm	80/254 mm	3.0 m
11													
12													Screen
13	4.0												
14													
15				dense below 4.5 m bgs									4.6 m
16	5.0					SS6			3	58.3	19-19-26-40	45	
17	5.2	329.8		END OF BOREHOLE									5.2 m
18				NOTES:									
19				- End of Borehole at 5.2 m bgs.									
20	6.0			- Borehole was dry upon completion of drilling.									
21				- bgs denotes 'below ground surface'.									
22				- Borehole was dry on May 14, 2024									
23	7.0												
24													
25													
26	8.0												
27													
28													
29	9.0												
30													
31													
32													

△ Undisturbed Vane Value (kPa)
□ Remoulded Field Vane Value (kPa)
△ₙ Number refer to Sensitivity
○ Water content (%)
w_p w_l Atterberg limits (%)
● "N" Value (blows/12 in.-30 cm)
☆ "DCPT" Value (blows/12 in.-30 cm)

10 20 30 40 50 60 70 80 90

COMMENTS: PIEZOMETER/ STANDPIPE INSTALLATION

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Report: 12618927 SOIL LOG Date: 3/12/24

REFERENCE No.: 12618927

BOREHOLE No.: MW13-23

ELEVATION: 336.2 m

BOREHOLE REPORT

CLIENT: Puslinch Development Limited Partnership

PROJECT: 12618927

LOCATION: Puslinch, Ontario

DESCRIBED BY: Carson Best CHECKED BY: Kateryna Pidriiko

DATE (START): 21 November 2023 DATE (FINISH): 21 November 2023

LEGEND

- SS - SPLIT SPOON
- ST - SHELBY TUBE
- VA - VANE SHEAR
- AU - AUGER PROBE
- RC - CORE SAMPLE
- ▼ - WATER LEVEL (MEASURED)
- ▽ - WATER LEVEL (OBSERVED)

NORTHING: 4813852.2 EASTING: 565226.4 DRILLING TYPE: Track -mounted drill rig CME 850 DRILLING METHOD: Hollow Stem Auger (O.D. 203 mm)

Depth (Feet)	Depth (Metres)	Elevation (m)	Stratigraphy	DESCRIPTION OF SOIL	SAMPLES State	SAMPLES Type and Number	LAB Testing Comments (Gravel Sand Silt Clay)	LAB Testing Unit Weight (Dry) KN/m³	LAB Testing Moisture Content %	Recovery/ TCR(%)	Blows per/15cm/ RQD(%)	'N' Value SCR(%)	COMMENTS
0		336.2		GROUND SURFACE			%		%	%			
	0.1	336.1		TOPSOIL (127 mm)									
1				NATIVE: SAND and GRAVEL, trace silt, rock fragments, brown, dry to moist, dense		SS1			5	79.2	2-15-27-21	42	Concrete; 0.6 m Sand; 0.9 m
2													
3	1.0					SS2			4	41.7	7-19-18-20	37	
4													
5													
6						SS3	---(7)		4	54.2	15-24-18-11	42	Hole-plug
7	2.0												
8				compact below 2.3 m bgs		SS4			3	50	11-12-14-19	26	2.7 m
9													
10	3.0	3.0	333.2	SAND, trace silt, brown, dry, compact		SS5	---(6)		3	66.7	6-10-13-12	23	3.0 m
11													
12													Screen
13	4.0												
14													
15		4.6	331.7	SAND and SILT, brown, dry to wet, compact									4.6 m
16	5.0					SS6			18	79.2	8-9-9-9	18	
17		5.2	331.1	END OF BOREHOLE									5.2 m
18				NOTES:									
19				- End of Borehole at 5.2 m bgs.									
20	6.0			- Borehole was dry upon completion of drilling.									
21				- bgs denotes 'below ground surface'.									
22				- Borehole was dry on May 14, 2024									
23	7.0												
24													
25													
26	8.0												
27													
28													
29	9.0												
30													
31													
32													

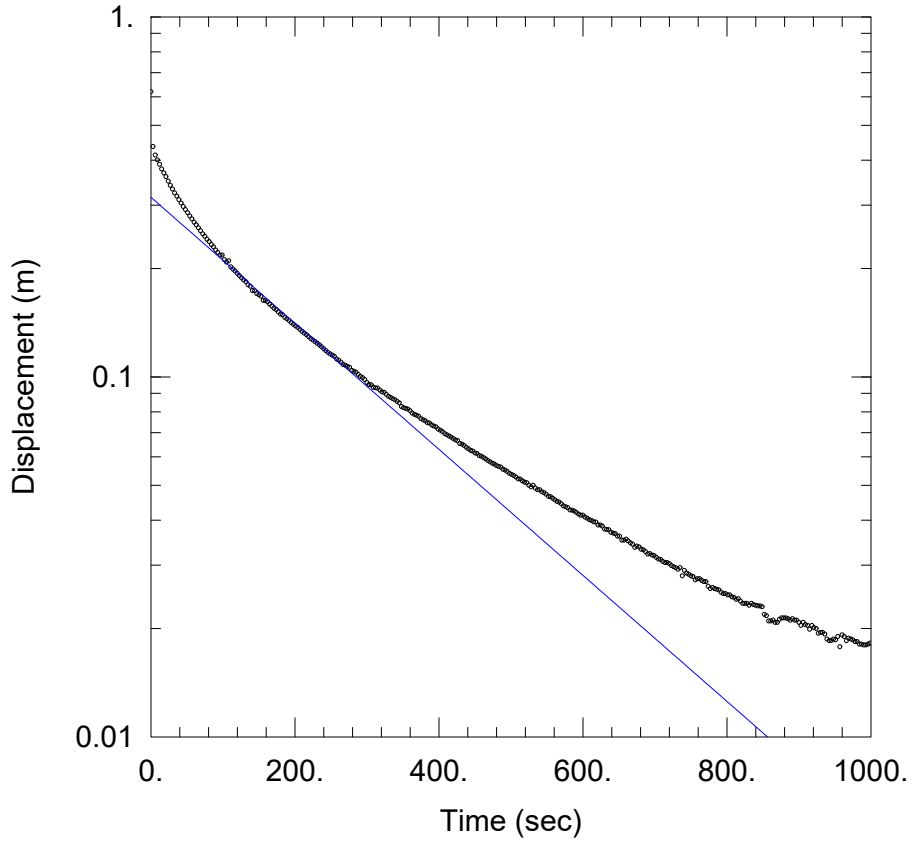
'N' Value (SCR(%)): △ Undisturbed Vane Value (kPa); □ Remoulded Field Vane Value (kPa); △s Number refer to Sensitivity; ○ Water content (%); Atterberg limits (%) w_p w_l; ● "N" Value (blows/12 in.-30 cm); ☆ "DCPT" Value (blows/12 in.-30 cm)

COMMENTS: PIEZOMETER/ STANDPIPE INSTALLATION

File: N:\CA\WATERLOO\PROJECTS\662\12618927\TECH\GEOTECH - ESTILL\GINT LOGS\12618927 LOG_GEOTECH.GPJ Library File: 12618927 GHD_GEOTECH_V10.GLB
Report: 12618927 SOIL LOG Date: 3/12/24

Appendix C

Single Well Response Tests



MW10-23 FALLING HEAD TEST

Data Set: \...\MW10-23 Falling Head Test.aqt
Date: 11/28/24 Time: 11:27:17

PROJECT INFORMATION

Company: GHD Ltd.
Client: Danby Products Ltd.
Project: 12618927
Location: Puslinch, Ontario
Test Well: MW10-23
Test Date: June 13, 2024

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0008786 cm/sec
y0 = 0.3154 m

AQUIFER DATA

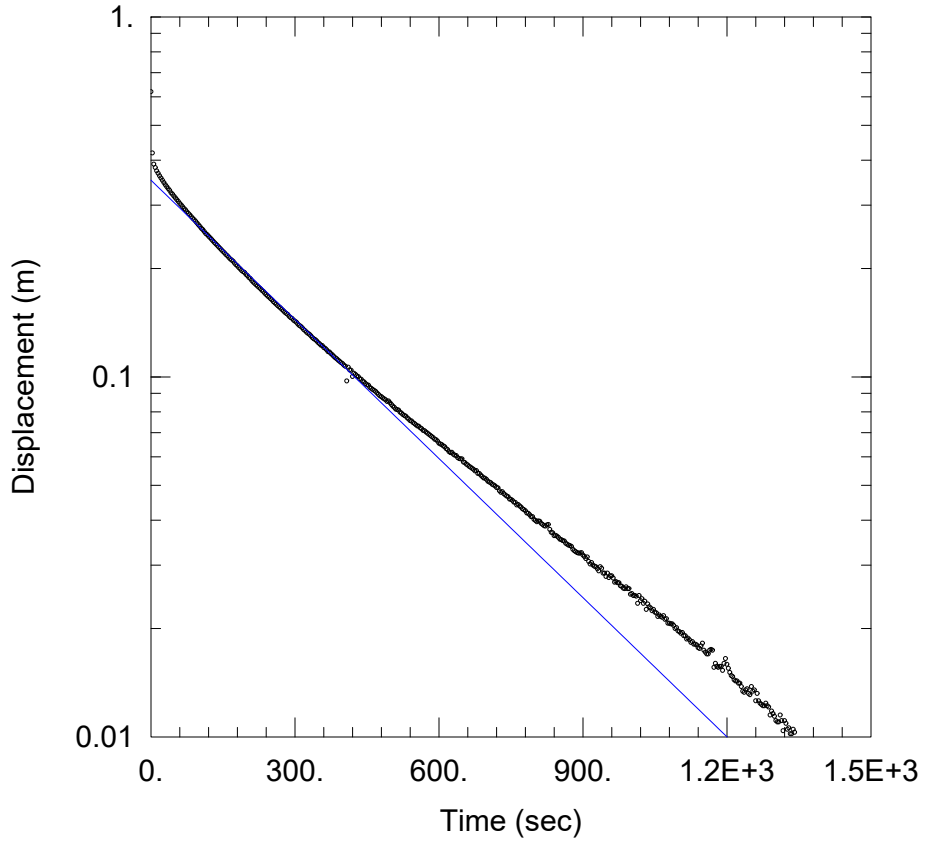
Saturated Thickness: 2.41 m

Anisotropy Ratio (Kz/Kr): 0.5

WELL DATA (MW10-23)

Initial Displacement: 0.62 m
Total Well Penetration Depth: 1.81 m
Casing Radius: 0.0254 m

Static Water Column Height: 1.81 m
Screen Length: 1.6 m
Well Radius: 0.1048 m
Gravel Pack Porosity: 0.3



MW10-23 RISING HEAD TEST

Data Set:
Date: 11/28/24 Time: 11:22:51

PROJECT INFORMATION

Company: GHD Ltd.
Client: Danby Products Ltd.
Project: 12618927
Location: Puslinch, Ontario
Test Well: MW10-23
Test Date: June 13, 2024

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0007241 cm/sec
y0 = 0.3518 m

AQUIFER DATA

Saturated Thickness: 2.41 m
Anisotropy Ratio (Kz/Kr): 0.5

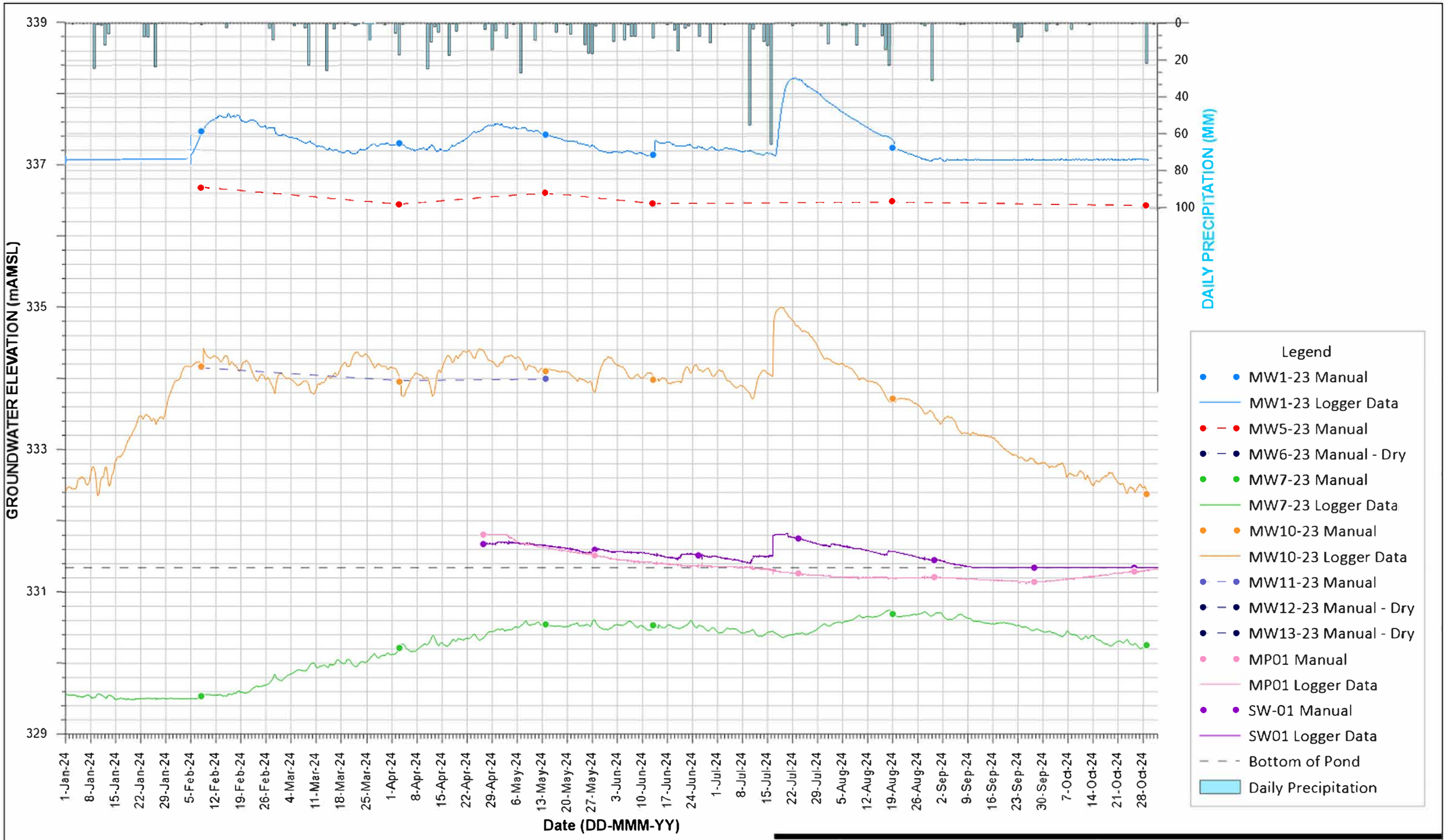
WELL DATA (MW10-23)

Initial Displacement: 0.62 m
Total Well Penetration Depth: 1.81 m
Casing Radius: 0.0254 m

Static Water Column Height: 1.81 m
Screen Length: 1.6 m
Well Radius: 0.1048 m
Gravel Pack Porosity: 0.3

Appendix D

Hydrographs



Note:
- 2024 precipitation data was obtained from the Kitchener/Waterloo Environment Canada Weather Station (Climate ID: 6144239) located approximately 14.6 kilometers west of the Site

GHD

PUSLINCH DEVELOPMENT GP INC
4631 SIDEROAD 20 NORTH, PUSLINCH TOWNSHIP, ONT
ARIO PROPOSED DEVELOPMENT
HYDROGEOLOGICAL ASSESSMENT

WATER ELEVATION HYDROGRAPH

Project No. 12604403
Date May 2025

APPENDIX D

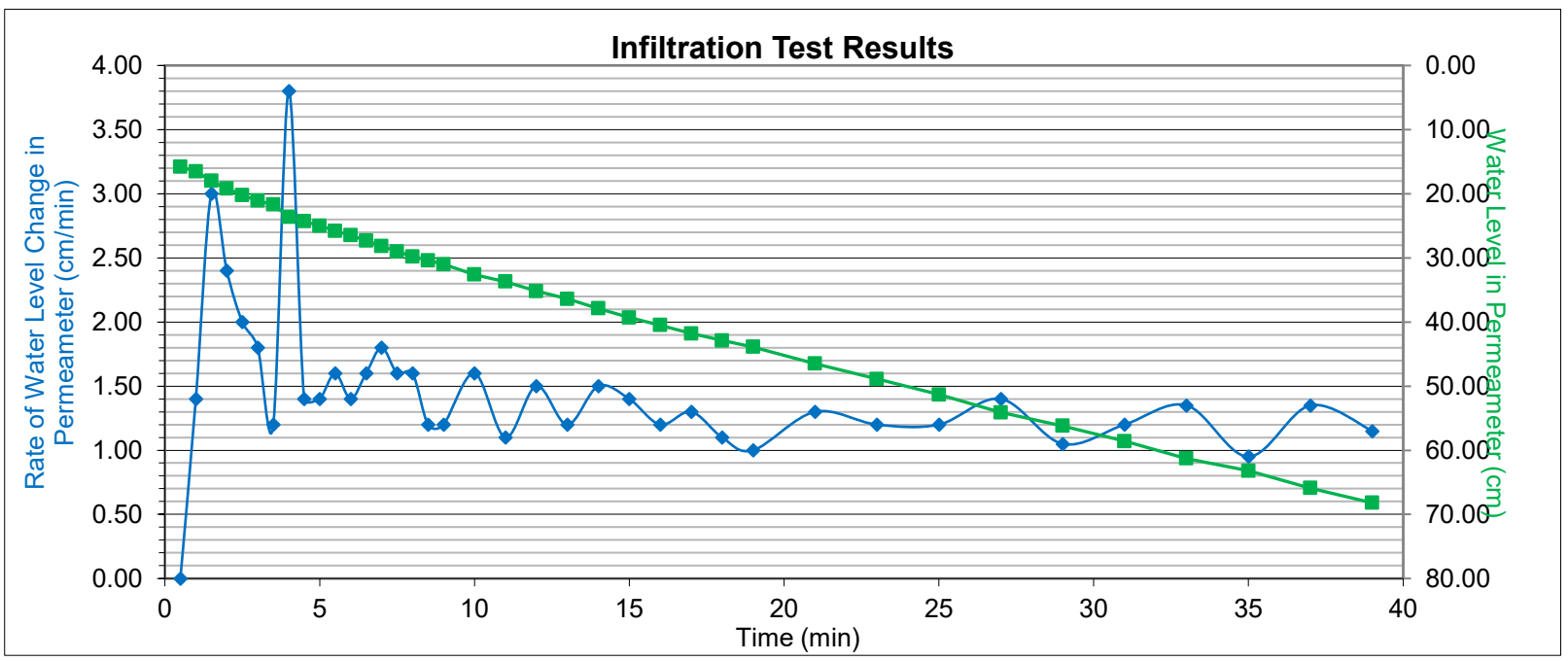
HEG file: \\ghdnet\ghd\CA\Waterloo\Projects\662\12618927\Workshare\12618927 - Hydrogeo\Hydrogeological report-X addressing client comment\Appendix D - Hydrographs_to be updated (JS)\12618927-RPT-X-Hydrograph_JS.gpj
Plot Date: May 27 2025 11:05 AM

Appendix E

Guelph Permeameter Tests

Test Location	GP1-23
Date of Test	December 8, 2023
GHD Field Personnel	Simon Howell
Depth of Test	1.22 m BGS
Field Soil Description	Sand with Gravel, with Silt

Grain Size Analysis Results (%)	
gravel	N/A
sand	N/A
silt & clay	N/A



hydraulic conductivity, field saturated[(1)] (K_{fs}) = 9.80E-04 *cm/s*

approximate infiltration rate[(2)] = $\left(\frac{K_{fs}}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}}$ *mm/h*

= 85 *mm/h*

percolation time = (infiltration rate)$^{-1}$ x (60 min/h) X (10 mm/cm)
= 7 *min/cm*

Notes: (1) see Figure C2 for calculation of K_{fs}
(2) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997.
Supplementary Guidelines to Ontario Building Code 1997.
SG-6 Percolations Times and Soil Descriptions. Toronto, Ontario.

Input

Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 10

Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.3600

Res Type	35.22
H	10
a	2.5
H/a	4
a*	0.12
C0.01	1.348
C0.04	1.436
C0.12	1.449
C0.36	1.449
C	1.449
R	1.360
Q	0.798
pi	3.142

α*= 0.12 cm^{-1}

C = 1.448962241

Q = 0.79832

K_{fs} = 9.80E-04 cm/sec
5.88E-02 cm/min
9.80E-06 m/sec
2.31E-02 inch/min
3.86E-04 inch/sec

Φ_m = 8.17E-03 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 10

Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.3600

Res Type	35.22
H	10
a	2.5
H/a	4
a*	0.12
C0.01	1.34796
C0.04	1.43553
C0.12	1.44896
C0.36	1.44896
C	1.44896
R	1.360
Q	0.79832
pi	3.1415

α*= 0.12 cm^{-1}

C = 1.448962241

Q = 0.79832

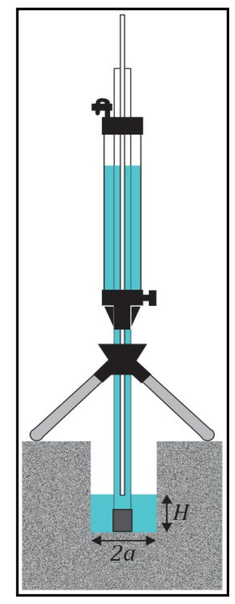
K_{fs} = 9.80E-04 cm/sec
5.88E-02 cm/min
9.80E-06 m/ses
2.31E-02 inch/min
3.86E-04 inch/sec

Φ_m = 8.17E-03 cm^2/min

Average

K_{fs} = 9.80E-04 cm/sec
5.88E-02 cm/min
9.80E-06 m/s
2.31E-02 inch/min
3.86E-04 inch/sec

Φ_m = 8.17E-03 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

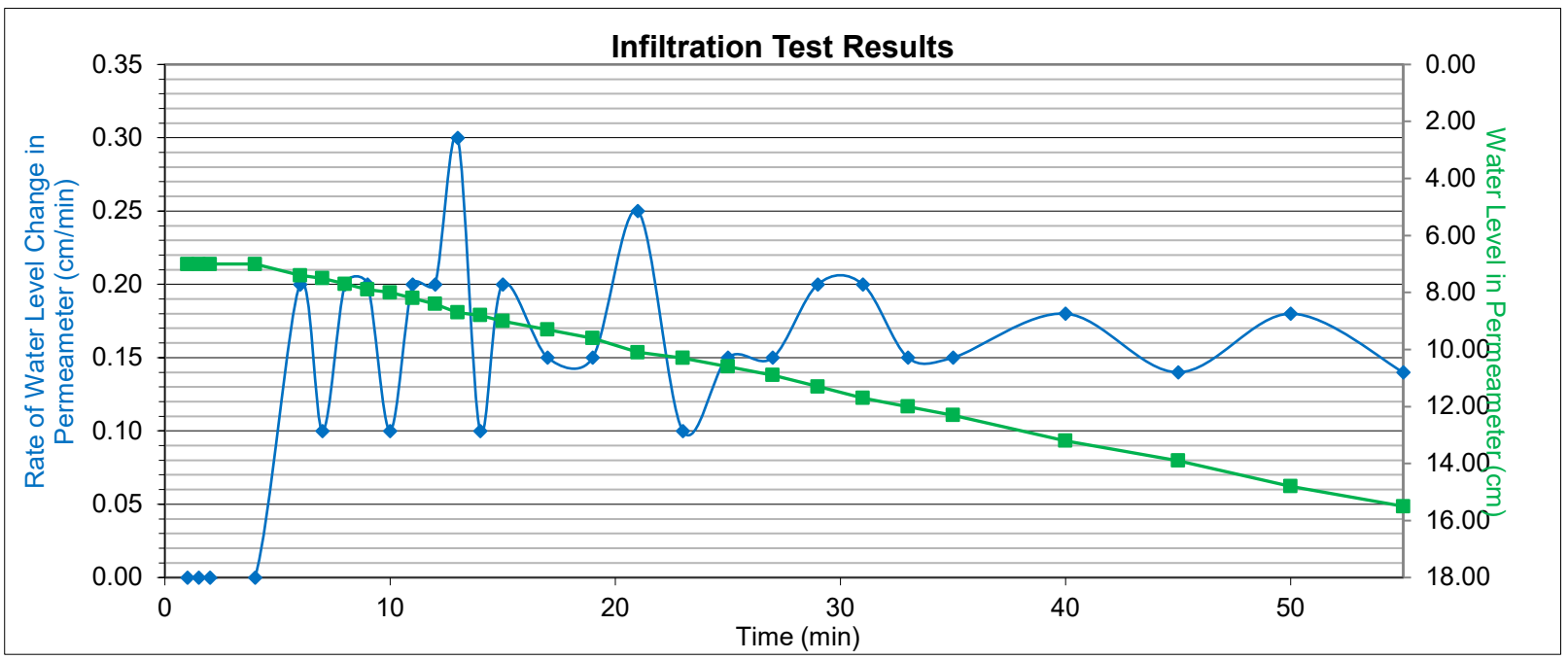
Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and $C$is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	$G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$

(Adapted from "Guelph Permeameter Calculations" spreadsheet provided by equipment manufacturer, Soilmoisture Equipment Corp.)

Test Location	GP2-23
Date of Test	December 8, 2023
GHD Field Personnel	Simon Howell
Depth of Test	1.30 m BGS
Field Soil Description	Silt with Clay

Grain Size Analysis Results (%)	
gravel	N/A
sand	N/A
silt & clay	N/A



hydraulic conductivity, field saturated[(1)] (K_{fs}) = 8.82E-05 *cm/s*

approximate infiltration rate[(2)] = $\left(\frac{K_{fs}}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}}$ *mm/h*

= 45 *mm/h*

percolation time = (infiltration rate)$^{-1}$ x (60 min/h) X (10 mm/cm)
= 13 *min/cm*

Notes: (1) see Figure C2 for calculation of K_{fs}
(2) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997.
Supplementary Guidelines to Ontario Building Code 1997.
SG-6 Percolations Times and Soil Descriptions. Toronto, Ontario.

Input

Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 9.7

Enter the Borehole Radius ("a" in cm): 3.8

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.1600

Res Type	35.22		
H	9.7		
a	3.8	α*=	0.12 cm $^{-1}$
H/a	2.553		
a*	0.12	C =	1.07772503
C0.01	1.045	Q =	0.09392
C0.04	1.099		
C0.12	1.078	K_{fs} =	8.82E-05 cm/sec
C0.36	1.078		5.29E-03 cm/min
C	1.078		8.82E-07 m/sec
R	0.160		2.08E-03 inch/min
Q	0.094		3.47E-05 inch/sec
pi	3.142		
		Φ_m =	7.35E-04 cm ^{2} /min

Single Head Method (2)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 9.7

Enter the Borehole Radius ("a" in cm): 3.8

Enter the soil texture-structure category (enter one of the below numbers): 3

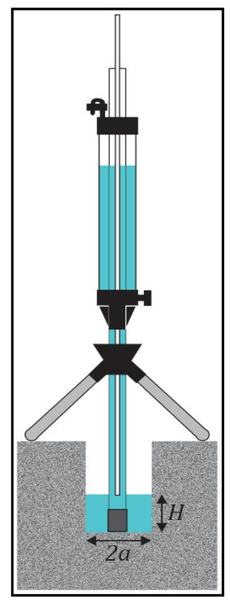
1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.1600

Res Type	35.22		
H	9.7		
a	3.8	α*=	0.12 cm $^{-1}$
H/a	2.55263		
a*	0.12	C =	1.07772503
C0.01	1.04527	Q =	0.09392
C0.04	1.0986		
C0.12	1.07773	K_{fs} =	8.82E-05 cm/sec
C0.36	1.07773		5.29E-03 cm/min
C	1.07773		8.82E-07 m/ses
R	0.160		2.08E-03 inch/min
Q	0.09392		3.47E-05 inch/sec
pi	3.1415		
		Φ_m =	7.35E-04 cm ^{2} /min

Average

K_{fs} =	8.82E-05	cm/sec
	5.29E-03	cm/min
	8.82E-07	m/s
	2.08E-03	inch/min
	3.47E-05	inch/sec
Φ_m =	7.35E-04	cm ^{2} /min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	α^*(cm^{-1})	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

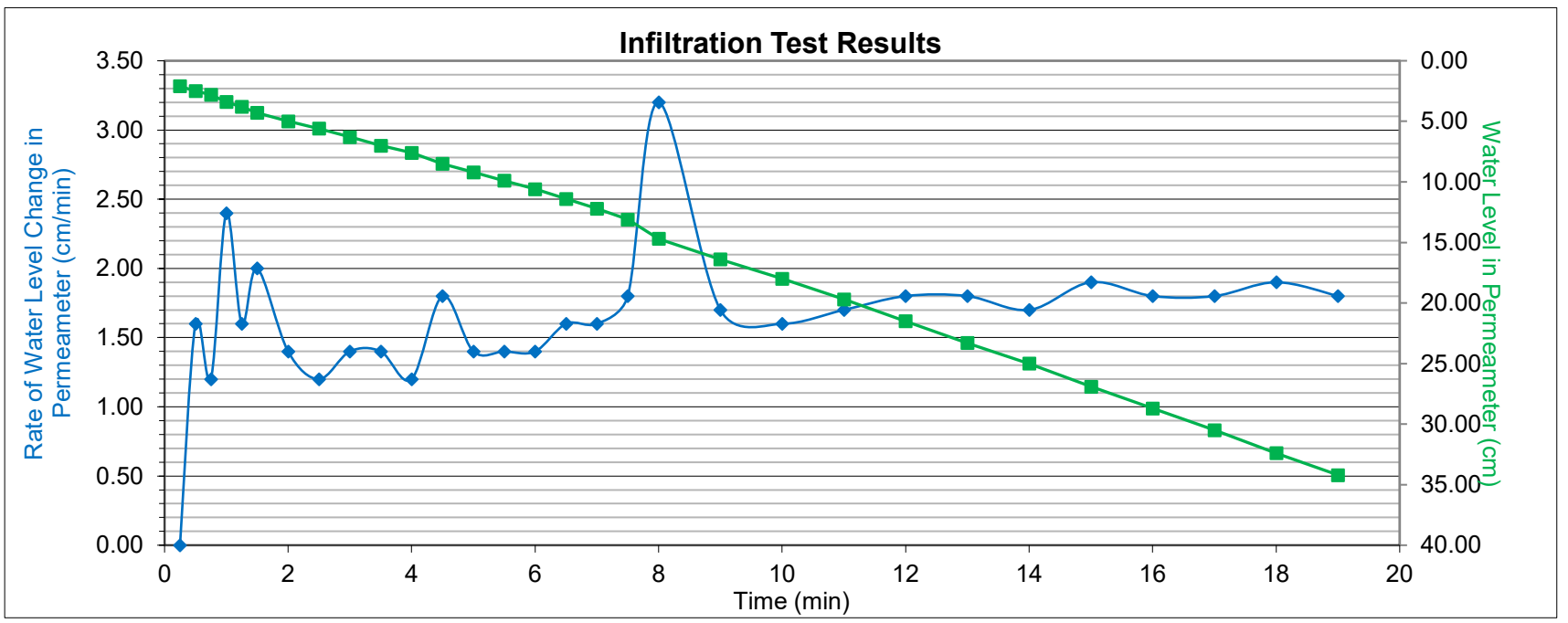
0

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and $C$is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	$G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$

(Adapted from "Guelph Permeameter Calculations" spreadsheet provided by equipment manufacturer, Soilmoisture Equipment Corp.)

Test Location	INF02-23
Date of Test	December 20, 2023
GHD Field Personnel	Palmer Willis
Depth of Test	1.50 m BGS
Field Soil Description	Sand, some silt, trace gravel



hydraulic conductivity, field saturated[(1)] (K_{fs}) = 1.23E-03 *cm/s*

approximate infiltration rate[(2)] = $\left(\frac{K_{fs}}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}}$ *mm/h*

= 90 *mm/h*

percolation time = (infiltration rate)$^{-1}$ x (60 min/h) X (10 mm/cm)
= 7 *min/cm*

Notes: (1) see Figure C2 for calculation of K_{fs}
(2) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to Ontario Building Code 1997. SG-6 Percolations Times and Soil Descriptions. Toronto, Ontario.

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GUELPH PERMEAMETER TEST RESULTS (INF02-23)

Appendix E.3a

12618927

Input

Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 10

Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.7000

Res Type	35.22
H	10
a	2.5
H/a	4
a*	0.12
C0.01	1.348
C0.04	1.436
C0.12	1.449
C0.36	1.449
C	1.449
R	1.700
Q	0.998
pi	3.142

α*= 0.12 cm^{-1}

C = 1.448962

Q = 0.9979

K_{fs} = 1.23E-03 cm/sec
7.35E-02 cm/min
1.23E-05 m/sec
2.89E-02 inch/min
4.82E-04 inch/sec

Φ_m = 1.02E-02 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 10

Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.7000

Res Type	35.22
H	10
a	2.5
H/a	4
a*	0.12
C0.01	1.34796
C0.04	1.43553
C0.12	1.44896
C0.36	1.44896
C	1.44896
R	1.700
Q	0.9979
pi	3.1415

α*= 0.12 cm^{-1}

C = 1.448962

Q = 0.9979

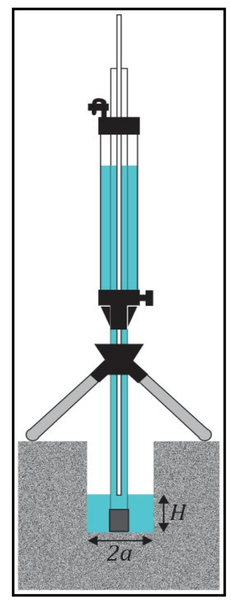
K_{fs} = 1.23E-03 cm/sec
7.35E-02 cm/min
1.23E-05 m/ses
2.89E-02 inch/min
4.82E-04 inch/sec

Φ_m = 1.02E-02 cm^2/min

Average

K_{fs} = 1.23E-03 cm/sec
7.35E-02 cm/min
1.23E-05 m/s
2.89E-02 inch/min
4.82E-04 inch/sec

Φ_m = 1.02E-02 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

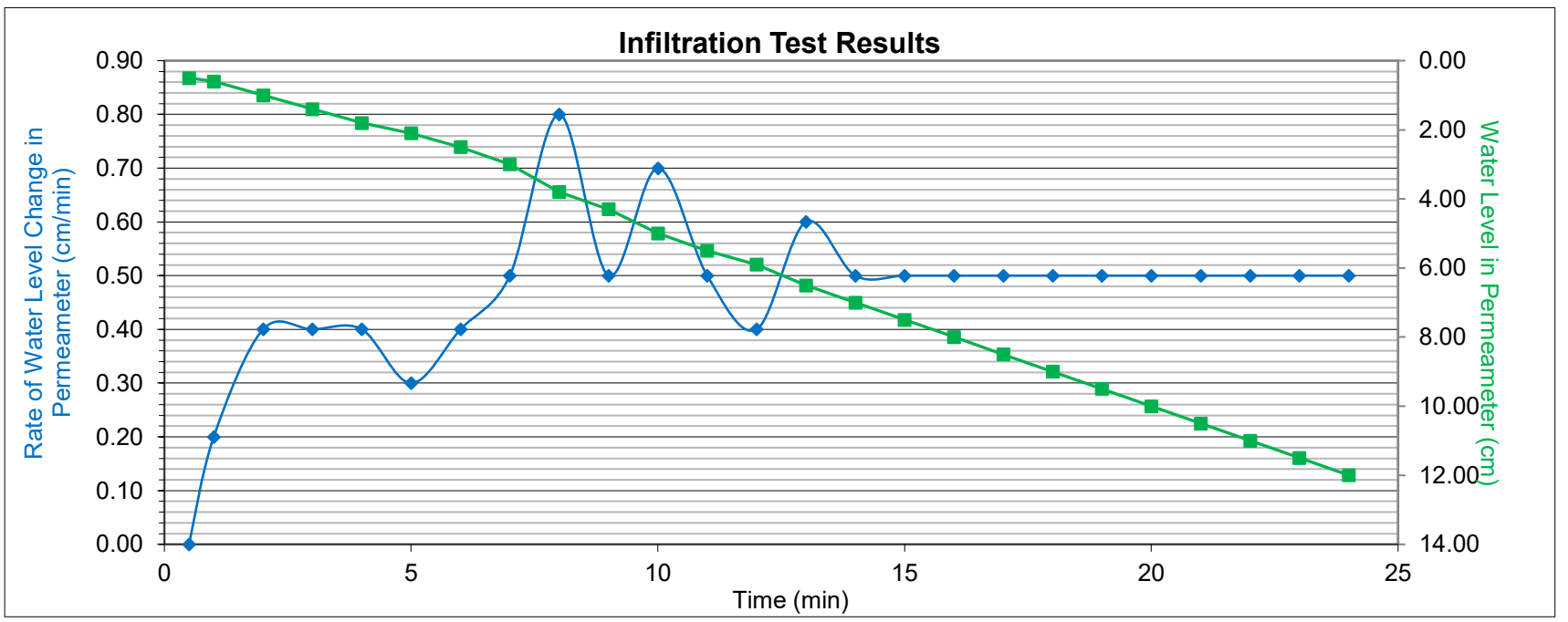
Soil Texture-Structure Category	α*(cm^{-1})	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

(Adapted from "Guelph Permeameter Calculations" spreadsheet provided by equipment manufacturer, Soilmoisture Equipment Corp.)

Test Location	INF03-23
Date of Test	December 21, 2023
GHD Field Personnel	Palmer Willis
Depth of Test	1.45 m BGS
Field Soil Description	Sand, some silt, trace gravel



hydraulic conductivity, field saturated[(1)] (K_{fs}) = 6.13E-04 *cm/s*

approximate infiltration rate[(2)] = $\left(\frac{K_{fs}}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}}$ *mm/h*

= 75 *mm/h*

percolation time = (infiltration rate)$^{-1}$ x (60 min/h) X (10 mm/cm)
= 8 *min/cm*

Notes: (1) see Figure C2 for calculation of K_{fs}

(2) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to Ontario Building Code 1997. SG-6 Percolations Times and Soil Descriptions. Toronto, Ontario.

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Infiltration Testing
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GUELPH PERMEAMETER TEST RESULTS (INF03-23)

Appendix E.4a

Input

Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 5
Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.5000

Res Type	35.22
H	5
a	2.5
H/a	2
a*	0.12
C0.01	0.904
C0.04	0.945
C0.12	0.912
C0.36	0.912
C	0.912
R	0.500
Q	0.294
pi	3.142

α*= 0.12 cm^{-1}

C = 0.911966
Q = 0.2935

K_{fs} = 6.13E-04 cm/sec
3.68E-02 cm/min
6.13E-06 m/sec
1.45E-02 inch/min
2.41E-04 inch/sec

Φ_m = 5.11E-03 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 5
Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.5000

Res Type	35.22
H	5
a	2.5
H/a	2
a*	0.12
C0.01	0.90429
C0.04	0.94462
C0.12	0.91197
C0.36	0.91197
C	0.91197
R	0.500
Q	0.2935
pi	3.1415

α*= 0.12 cm^{-1}

C = 0.911966
Q = 0.2935

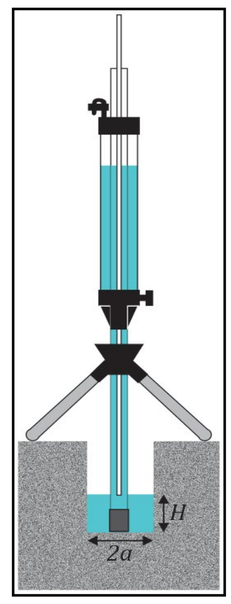
K_{fs} = 6.13E-04 cm/sec
3.68E-02 cm/min
6.13E-06 m/ses
1.45E-02 inch/min
2.41E-04 inch/sec

Φ_m = 5.11E-03 cm^2/min

Average

K_{fs} = 6.13E-04 cm/sec
3.68E-02 cm/min
6.13E-06 m/s
1.45E-02 inch/min
2.41E-04 inch/sec

Φ_m = 5.11E-03 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

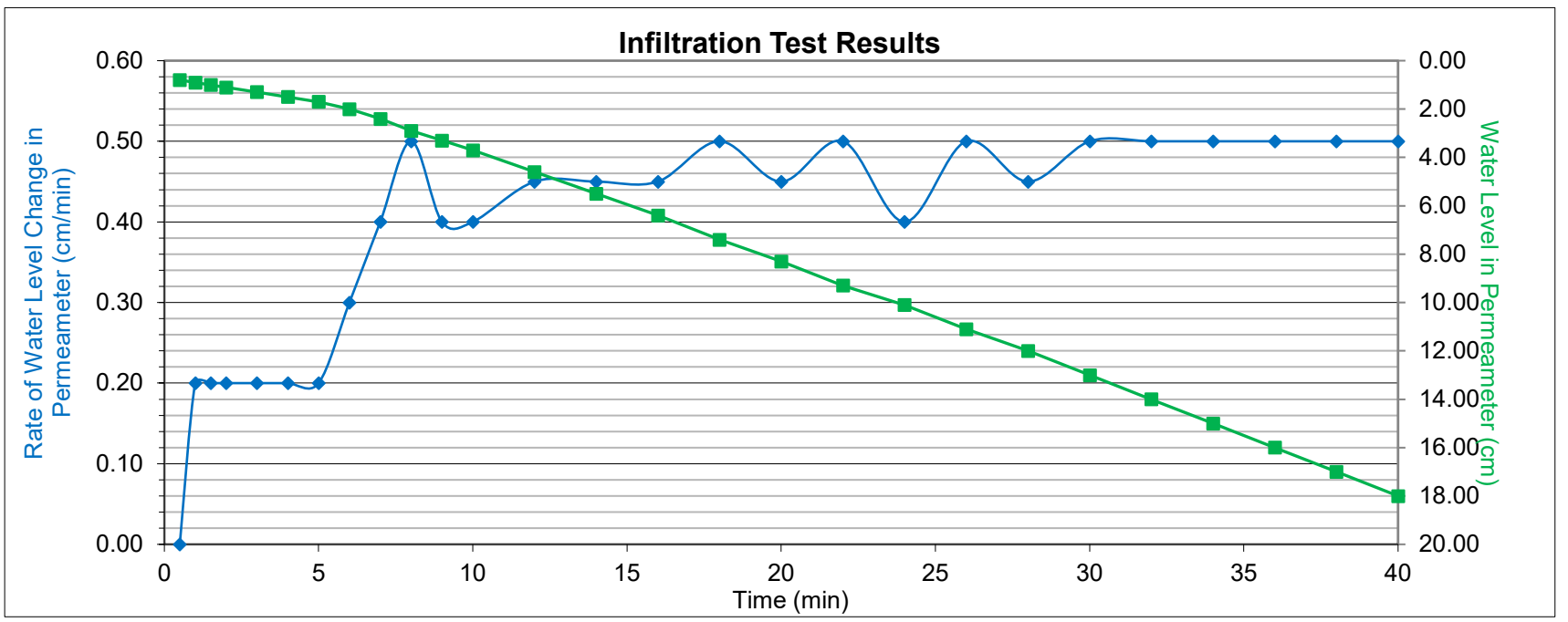
Soil Texture-Structure Category	α*(cm^{-1})	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

(Adapted from "Guelph Permeameter Calculations" spreadsheet provided by equipment manufacturer, Soilmoisture Equipment Corp.)

Test Location	INF07-23
Date of Test	December 21, 2023
GHD Field Personnel	Palmer Willis
Depth of Test	1.32 m BGS
Field Soil Description	Gravelly Clayey Silt, trace sand



hydraulic conductivity, field saturated[(1)] (K_{fs}) = 2.08E-04 *cm/s*

approximate infiltration rate[(2)] = $\left(\frac{K_{fs}}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}}$ *mm/h*

= 56 *mm/h*

percolation time = (infiltration rate)$^{-1}$ x (60 min/h) X (10 mm/cm)
= 11 *min/cm*

Notes: (1) see Figure C2 for calculation of K_{fs}
(2) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to Ontario Building Code 1997. SG-6 Percolations Times and Soil Descriptions. Toronto, Ontario.

Puslinch Development Limited Partnership
Infiltration Testing
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GUELPH PERMEAMETER TEST RESULTS (INF07-23)

Appendix E.5a

12618927

Input

Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 8.7
Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 2

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.5000

Res Type	35.22
H	8.7
a	2.5
H/a	3.48
a*	0.04
C0.01	1.248
C0.04	1.323
C0.12	1.324
C0.36	1.324
C	1.323
R	0.500
Q	0.294
pi	3.142

α*= 0.04 cm^{-1}

C = 1.323492
Q = 0.2935

K_{fs} = 2.08E-04 cm/sec
1.25E-02 cm/min
2.08E-06 m/sec
4.91E-03 inch/min
8.19E-05 inch/sec

Φ_m = 5.20E-03 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 8.7
Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 2

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.5000

Res Type	35.22
H	8.7
a	2.5
H/a	3.48
a*	0.04
C0.01	1.2482
C0.04	1.32349
C0.12	1.32432
C0.36	1.32432
C	1.32349
R	0.500
Q	0.2935
pi	3.1415

α*= 0.04 cm^{-1}

C = 1.323492
Q = 0.2935

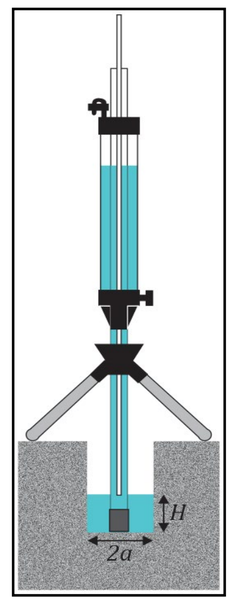
K_{fs} = 2.08E-04 cm/sec
1.25E-02 cm/min
2.08E-06 m/ses
4.91E-03 inch/min
8.19E-05 inch/sec

Φ_m = 5.20E-03 cm^2/min

Average

K_{fs} = 2.08E-04 cm/sec
1.25E-02 cm/min
2.08E-06 m/s
4.91E-03 inch/min
8.19E-05 inch/sec

Φ_m = 5.20E-03 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

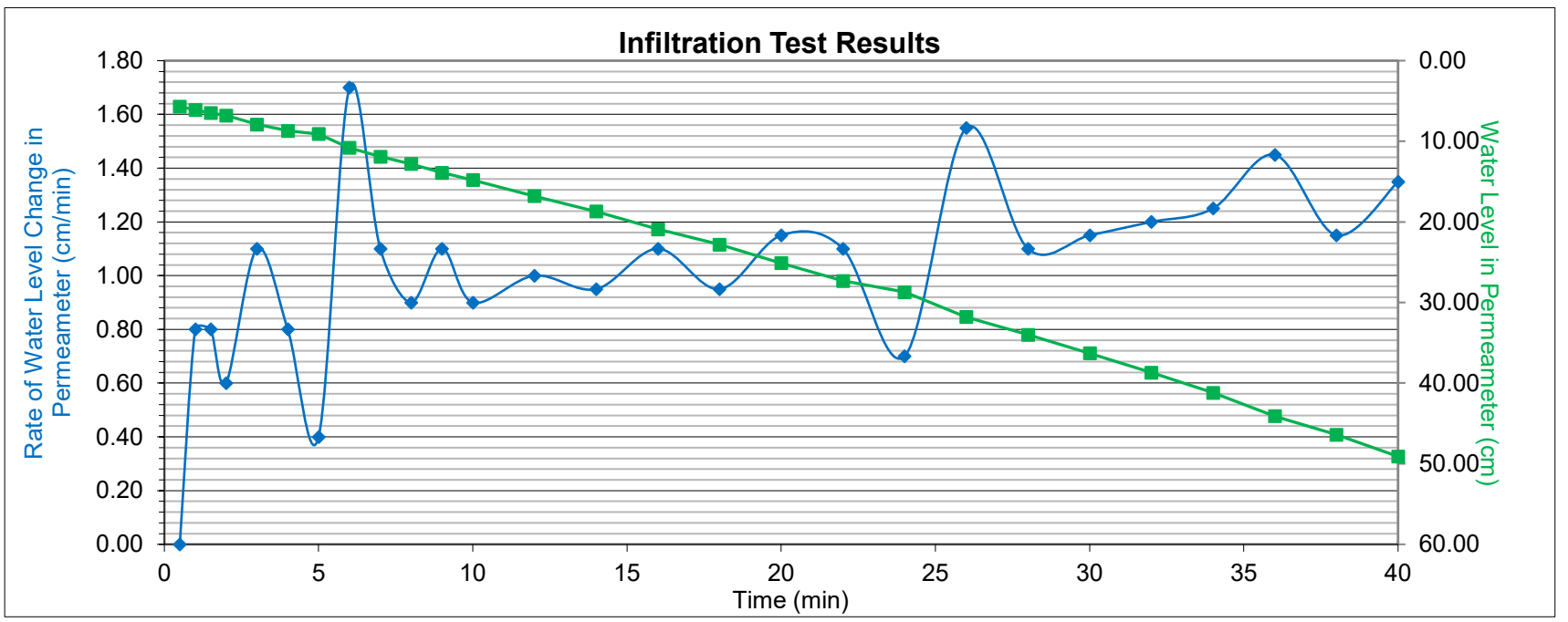
Soil Texture-Structure Category	α*(cm^{-1})	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121(H_2/a)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

(Adapted from "Guelph Permeameter Calculations" spreadsheet provided by equipment manufacturer, Soilmoisture Equipment Corp.)

Test Location	INF11-23
Date of Test	December 21, 2023
GHD Field Personnel	Palmer Willis
Depth of Test	1.29 m BGS
Field Soil Description	Gravelly Silt, some clay



hydraulic conductivity, field saturated[(1)] (K_{fs}) = 5.67E-04 *cm/s*

approximate infiltration rate[(2)] = $\left(\frac{K_{fs}}{6 \times 10^{-11}}\right)^{\frac{1}{3.7363}}$ *mm/h*

= 74 *mm/h*

percolation time = (infiltration rate)$^{-1}$ x (60 min/h) X (10 mm/cm)
= 8 *min/cm*

Notes: (1) see Figure C2 for calculation of K_{fs}
(2) Ontario Ministry of Municipal Affairs and Housing (OMMAH). 1997. Supplementary Guidelines to Ontario Building Code 1997. SG-6 Percolations Times and Soil Descriptions. Toronto, Ontario.

Puslinch Development Limited Partnership
Infiltration Testing
4631 20 Sideroad N, Puslinch, Ontario
GUELPH PERMEAMETER TEST RESULTS (INF11-23)

Appendix E.6a

12618927

Input

Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 7.5

Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 2

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.2400

Res Type	35.22
H	7.5
a	2.5
H/a	3
a*	0.04
C0.01	1.148
C0.04	1.212
C0.12	1.201
C0.36	1.201
C	1.212
R	1.240
Q	0.728
pi	3.142

α*= 0.04 cm^{-1}

C = 1.211608

Q = 0.72788

K_{fs} = 5.67E-04 cm/sec
3.40E-02 cm/min
5.67E-06 m/sec
1.34E-02 inch/min
2.23E-04 inch/sec

Φ_m = 1.42E-02 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^

(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 7.5

Enter the Borehole Radius ("a" in cm): 2.5

Enter the soil texture-structure category (enter one of the below numbers): 2

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.2400

Res Type	35.22
H	7.5
a	2.5
H/a	3
a*	0.04
C0.01	1.14768
C0.04	1.21161
C0.12	1.20101
C0.36	1.20101
C	1.21161
R	1.240
Q	0.72788
pi	3.1415

α*= 0.04 cm^{-1}

C = 1.211608

Q = 0.72788

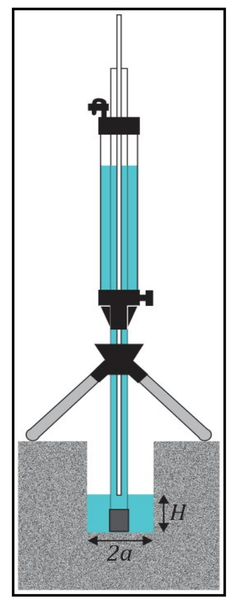
K_{fs} = 5.67E-04 cm/sec
3.40E-02 cm/min
5.67E-06 m/ses
1.34E-02 inch/min
2.23E-04 inch/sec

Φ_m = 1.42E-02 cm^2/min

Average

K_{fs} = 5.67E-04 cm/sec
3.40E-02 cm/min
5.67E-06 m/s
1.34E-02 inch/min
2.23E-04 inch/sec

Φ_m = 1.42E-02 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	α*(cm^{-1})	Shape Factor
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Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(H_1/a)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(H_2/a)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_1/a)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093(H_2/a)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm) , H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	$G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$

(Adapted from "Guelph Permeameter Calculations" spreadsheet provided by equipment manufacturer, Soilmoisture Equipment Corp.)

Appendix F

Laboratory Analytical Data

CERTIFICATE OF ANALYSIS

Work Order	: **WT2415964**	Page	: 1 of 5
Client	: **GHD Limited**	Laboratory	: ALS Environmental - Waterloo
Contact	: Jennifer Balkwill	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: 604 748 3661	Telephone	: +1 519 886 6910
Project	: 12618927-7.8	Date Samples Received	: 14-Jun-2024 10:32
PO	: 735-010621	Date Analysis Commenced	: 14-Jun-2024
C-O-C number	: ----	Issue Date	: 24-Jun-2024 13:51
Sampler	: TW		
Site	: ----		
Quote number	: 12618927, 735-010621		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Manager - Inorganics	Inorganics, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Metals, Waterloo, Ontario
Hannah Lewis	Inorganics Analyst	Inorganics, Waterloo, Ontario
Ismat Sultana	Account Manager Assistant	Administration, Waterloo, Ontario
Jon Fisher	Production Manager, Environmental	Inorganics, Waterloo, Ontario
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Nik Perkio	Senior Analyst	Inorganics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.
Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).
Measurement Uncertainty: The reported uncertainties in this report are expanded uncertainties calculated using a coverage factor of 2, which gives a level of confidence of approximately 95%.
Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Unit	*Description*
-	no units
%	percent
°C	degrees celsius
µS/cm	microsiemens per centimetre
CU	colour units (1 cu = 1 mg/l pt)
meq/L	milliequivalents per litre
mg/L	milligrams per litre
NTU	nephelometric turbidity units
pH units	pH units

>: greater than.
<: less than.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
BODL	*Limit of Reporting for BOD was increased to account for the largest volume of sample tested.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DLHC	*Detection Limit Raised: Dilution required due to high concentration of test analyte(s).*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

WT2415964-001

Sub-Matrix:**Water**
(Matrix: **Water**)

Client sample ID: GW-12618927-061324-TW-MW10-23
Client sampling date / time: 13-Jun-2024 12:25

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Field Tests								
pH, field	----	6.49	0.01	pH units	EF001/WT	-	19-Jun-2024	-
Temperature, field	----	22.3	0.01	°C	EF001/WT	-	19-Jun-2024	-
Physical Tests								
Alkalinity, bicarbonate (as CaCO3)	----	207	2.0	mg/L	E290/WT	18-Jun-2024	19-Jun-2024	1499774
Alkalinity, carbonate (as CaCO3)	----	<2.0	2.0	mg/L	E290/WT	18-Jun-2024	19-Jun-2024	1499774
Alkalinity, hydroxide (as CaCO3)	----	<2.0	2.0	mg/L	E290/WT	18-Jun-2024	19-Jun-2024	1499774
Alkalinity, phenolphthalein (as CaCO3)	----	<2.0	2.0	mg/L	E290/WT	18-Jun-2024	19-Jun-2024	1499774
Alkalinity, total (as CaCO3)	----	207	2.0	mg/L	E290/WT	18-Jun-2024	19-Jun-2024	1499774
Colour, true	----	3.5	2.0	CU	E329-L/WT	15-Jun-2024	17-Jun-2024	1495763
Conductivity	----	654	2.0	µS/cm	E100/WT	18-Jun-2024	19-Jun-2024	1499775
Hardness (as CaCO3), dissolved	----	303	0.50	mg/L	EC100/WT	-	17-Jun-2024	-
pH	----	7.90	0.10	pH units	E108/WT	18-Jun-2024	19-Jun-2024	1499776
Solids, total dissolved [TDS]	----	433 DLDS,	20	mg/L	E162/WT	-	20-Jun-2024	1504571
Solids, total suspended [TSS]	----	114 DLHC,	7.5	mg/L	E160/WT	-	20-Jun-2024	1504575
Turbidity	----	146	0.10	NTU	E121/WT	-	15-Jun-2024	1495480
Anions and Nutrients								
Ammonia, total (as N)	7664-41-7	<0.0050	0.0050	mg/L	E298/WT	17-Jun-2024	17-Jun-2024	1497917
Ammonia, un-ionized (as NH3), field	7664-41-7	<0.0010	0.001	mg/L	EC298A/WT	-	18-Jun-2024	-
Chloride	16887-00-6	8.97	0.50	mg/L	E235.Cl/WT	18-Jun-2024	19-Jun-2024	1499780
Fluoride	16984-48-8	0.041	0.020	mg/L	E235.F/WT	18-Jun-2024	19-Jun-2024	1499777
Kjeldahl nitrogen, dissolved [DKN]	----	0.601 TKNI,	0.050	mg/L	E322/WT	17-Jun-2024	17-Jun-2024	1497141
Kjeldahl nitrogen, total [TKN]	----	0.581 TKNI,	0.050	mg/L	E318/WT	18-Jun-2024	18-Jun-2024	1497915
Nitrate (as N)	14797-55-8	32.2	0.020	mg/L	E235.NO3/WT	18-Jun-2024	19-Jun-2024	1499778
Nitrate + Nitrite (as N)	----	32.2	0.0224	mg/L	EC235.N+N/WT	-	20-Jun-2024	-
Nitrite (as N)	14797-65-0	<0.010	0.010	mg/L	E235.NO2/WT	18-Jun-2024	19-Jun-2024	1499779
Nitrogen, total organic	----	0.581	0.160	mg/L	EC363/WT	-	18-Jun-2024	-
Phosphate, ortho-, dissolved (as P)	14265-44-2	0.0023	0.0010	mg/L	E378-U/WT	18-Jun-2024	19-Jun-2024	1499783
Phosphorus, total	7723-14-0	0.0892	0.0020	mg/L	E372-U/WT	18-Jun-2024	18-Jun-2024	1497916
Phosphorus, total dissolved	7723-14-0	0.0030	0.0020	mg/L	E375-T/WT	18-Jun-2024	18-Jun-2024	1499158
Sulfate (as SO4)	14808-79-8	15.4	0.30	mg/L	E235.SO4/WT	18-Jun-2024	19-Jun-2024	1499781
Organic / Inorganic Carbon								
Carbon, dissolved organic [DOC]	----	3.68 DLHC,	2.50	mg/L	E358-L/WT	19-Jun-2024	19-Jun-2024	1501234
Total Sulfides								
Sulfide, total (as H2S)	7783-06-4	<0.011	0.011	mg/L	E395-H/VA	-	20-Jun-2024	1503872
Sulfide, total (as S)	18496-25-8	<0.010	0.010	mg/L	E395-H/VA	-	20-Jun-2024	1503872
Ion Balance								
Anion sum	----	7.01	0.10	meq/L	EC101/WT	-	24-Jun-2024	-
Cation sum	----	6.55	0.10	meq/L	EC101/WT	-	24-Jun-2024	-
Ion balance (APHA)	----	-3.39	0.01	%	EC101/WT	-	24-Jun-2024	-
Total Metals								
Aluminum, total	7429-90-5	1.94	0.0030	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Antimony, total	7440-36-0	0.00012	0.00010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Arsenic, total	7440-38-2	0.00155	0.00010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Barium, total	7440-39-3	0.0366	0.00010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Beryllium, total	7440-41-7	0.000066	0.000020	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095

Analytical Results

WT2415964-001

Sub-Matrix:**Water**
(Matrix: **Water**)

Client sample ID: GW-12618927-061324-TW-MW10-23
Client sampling date / time: 13-Jun-2024 12:25

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Total Metals								
Boron, total	7440-42-8	0.029	0.010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Cadmium, total	7440-43-9	0.000115	0.0000050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Calcium, total	7440-70-2	106	0.050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Chromium, total	7440-47-3	0.00440	0.00050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Cobalt, total	7440-48-4	0.00124	0.00010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Copper, total	7440-50-8	0.00727	0.00050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Iron, total	7439-89-6	2.56	0.010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Lead, total	7439-92-1	0.00669	0.000050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Manganese, total	7439-96-5	0.0963	0.00010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Molybdenum, total	7439-98-7	0.000633	0.000050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Nickel, total	7440-02-0	0.00303	0.00050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Phosphorus, total	7723-14-0	0.065	0.050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Selenium, total	7782-49-2	0.000747	0.000050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Silver, total	7440-22-4	<0.000010	0.000010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Sodium, total	7440-23-5	11.2	0.050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Thallium, total	7440-28-0	0.000042	0.000010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Tungsten, total	7440-33-7	<0.00010	0.00010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Uranium, total	7440-61-1	0.000463	0.000010	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Vanadium, total	7440-62-2	0.00441	0.00050	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Zinc, total	7440-66-6	0.0368	0.0030	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Zirconium, total	7440-67-7	0.00077	0.00020	mg/L	E420/WT	17-Jun-2024	17-Jun-2024	1497095
Dissolved Metals								
Aluminum, dissolved	7429-90-5	0.0045	0.0010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Antimony, dissolved	7440-36-0	<0.00010	0.00010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Arsenic, dissolved	7440-38-2	0.00025	0.00010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Barium, dissolved	7440-39-3	0.0214	0.00010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Beryllium, dissolved	7440-41-7	<0.000020	0.000020	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Bismuth, dissolved	7440-69-9	<0.000050	0.000050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Boron, dissolved	7440-42-8	0.026	0.010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Cadmium, dissolved	7440-43-9	0.0000064	0.0000050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Calcium, dissolved	7440-70-2	93.2	0.050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Cesium, dissolved	7440-46-2	<0.000010	0.000010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Chromium, dissolved	7440-47-3	0.00056	0.00050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Cobalt, dissolved	7440-48-4	<0.00010	0.00010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Copper, dissolved	7440-50-8	0.00404	0.00020	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Iron, dissolved	7439-89-6	<0.010	0.010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Lead, dissolved	7439-92-1	<0.000050	0.000050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Lithium, dissolved	7439-93-2	0.0046	0.0010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Magnesium, dissolved	7439-95-4	17.0	0.0050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Manganese, dissolved	7439-96-5	0.00093	0.00010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Molybdenum, dissolved	7439-98-7	0.000441	0.000050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Nickel, dissolved	7440-02-0	<0.00050	0.00050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Phosphorus, dissolved	7723-14-0	<0.050	0.050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Potassium, dissolved	7440-09-7	1.23	0.050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Rubidium, dissolved	7440-17-7	0.00078	0.00020	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282

Analytical Results

WT2415964-001

Sub-Matrix:**Water**
(Matrix: **Water**)

Client sample ID: GW-12618927-061324-TW-MW10-23
Client sampling date / time: 13-Jun-2024 12:25

Analyte	CAS Number	Result	LOR	Unit	Method/Lab	Prep Date	Analysis Date	QCLot
Dissolved Metals								
Selenium, dissolved	7782-49-2	0.000858	0.000050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Silicon, dissolved	7440-21-3	3.28	0.050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Silver, dissolved	7440-22-4	<0.000010	0.000010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Sodium, dissolved	7440-23-5	10.8	0.050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Strontium, dissolved	7440-24-6	0.155	0.00020	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Sulfur, dissolved	7704-34-9	5.58	0.50	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Tellurium, dissolved	13494-80-9	<0.00020	0.00020	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Thallium, dissolved	7440-28-0	<0.000010	0.000010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Thorium, dissolved	7440-29-1	<0.00010	0.00010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Tin, dissolved	7440-31-5	<0.00010	0.00010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Titanium, dissolved	7440-32-6	<0.00030	0.00030	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Tungsten, dissolved	7440-33-7	<0.00010	0.00010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Uranium, dissolved	7440-61-1	0.000325	0.000010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Vanadium, dissolved	7440-62-2	<0.00050	0.00050	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Zinc, dissolved	7440-66-6	0.0113	0.0010	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Zirconium, dissolved	7440-67-7	<0.00030	0.00030	mg/L	E421/WT	14-Jun-2024	17-Jun-2024	1495282
Dissolved metals filtration location	----	Field	-	-	EP421/WT	-	14-Jun-2024	1495282
Aggregate Organics								
Biochemical oxygen demand [BOD]	----	<3.0 BODL	3.0	mg/L	E550/WT	-	17-Jun-2024	1497824
Biochemical oxygen demand [BOD], soluble	----	<3.0 BODL	3.0	mg/L	E553/WT	-	17-Jun-2024	1497782

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Accreditation section for an explanation of analyte accreditations.

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2415964**	Page	: 1 of 13
Client	: **GHD Limited**	Laboratory	: ALS Environmental - Waterloo
Contact	: Jennifer Balkwill	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 604 748 3661	Telephone	: +1 519 886 6910
Project	: 12618927-7.8	Date Samples Received	: 14-Jun-2024 10:32
PO	: 735-010621	Issue Date	: 24-Jun-2024 13:51
C-O-C number	: ----		
Sampler	: TW		
Site	: ----		
Quote number	: 12618927, 735-010621		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT-4d]										
GW-12618927-061324-TW-MW10-23	E550	13-Jun-2024	----	----	----		17-Jun-2024	4 days	3 days	✓
Aggregate Organics : Biochemical Oxygen Demand (Soluble) - 5 day										
HDPE [BOD HT-4d]										
GW-12618927-061324-TW-MW10-23	E553	13-Jun-2024	----	----	----		17-Jun-2024	4 days	3 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) [ON MECP]										
GW-12618927-061324-TW-MW10-23	E298	13-Jun-2024	17-Jun-2024	28 days	4 days	✓	17-Jun-2024	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E235.Cl	13-Jun-2024	18-Jun-2024	28 days	5 days	✓	19-Jun-2024	28 days	6 days	✓
Anions and Nutrients : Dissolved Kjeldahl Nitrogen by Fluorescence										
Amber glass dissolved (sulfuric acid) [ON MECP]										
GW-12618927-061324-TW-MW10-23	E322	13-Jun-2024	17-Jun-2024	28 days	4 days	✓	17-Jun-2024	28 days	4 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E378-U	13-Jun-2024	18-Jun-2024	7 days	5 days	✓	19-Jun-2024	7 days	6 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E235.F	13-Jun-2024	18-Jun-2024	28 days	5 days	✓	19-Jun-2024	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E235.NO3	13-Jun-2024	18-Jun-2024	7 days	5 days	✓	19-Jun-2024	7 days	6 days	✓
Anions and Nutrients : Nitrite in Water by IC										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E235.NO2	13-Jun-2024	18-Jun-2024	7 days	5 days	✓	19-Jun-2024	7 days	6 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E235.SO4	13-Jun-2024	18-Jun-2024	28 days	5 days	✓	19-Jun-2024	28 days	6 days	✓
Anions and Nutrients : Total Dissolved Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass dissolved (sulfuric acid) [ON MECP]										
GW-12618927-061324-TW-MW10-23	E375-T	13-Jun-2024	18-Jun-2024	3 days	5 days	× EHT	18-Jun-2024	3 days	5 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) [ON MECP]										
GW-12618927-061324-TW-MW10-23	E318	13-Jun-2024	18-Jun-2024	28 days	5 days	✓	18-Jun-2024	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) [ON MECP]										
GW-12618927-061324-TW-MW10-23	E372-U	13-Jun-2024	18-Jun-2024	28 days	5 days	✓	18-Jun-2024	28 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
GW-12618927-061324-TW-MW10-23	E421	13-Jun-2024	14-Jun-2024	180 days	1 days	✓	17-Jun-2024	180 days	4 days	✓
Field Tests : Field pH,EC,Salinity, TDS, Cl2,ClO2,ORP,DO, Turbidity,T,T-P,o-PO4,NH3,Chloramine										
HDPE [BOD HT-4d]										
GW-12618927-061324-TW-MW10-23	EF001	13-Jun-2024	----	----	----		19-Jun-2024	----	6 days	
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) [ON MECP]										
GW-12618927-061324-TW-MW10-23	E358-L	13-Jun-2024	19-Jun-2024	28 days	6 days	✓	19-Jun-2024	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E290	13-Jun-2024	18-Jun-2024	14 days	5 days	✓	19-Jun-2024	14 days	6 days	✓
Physical Tests : Colour (True) by Spectrometer (2 CU)										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E329-L	13-Jun-2024	15-Jun-2024	55 hrs	51 hrs	✓	17-Jun-2024	55 hrs	97 hrs	× EHT
Physical Tests : Conductivity in Water										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E100	13-Jun-2024	18-Jun-2024	28 days	5 days	✓	19-Jun-2024	28 days	6 days	✓
Physical Tests : pH by Meter										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E108	13-Jun-2024	18-Jun-2024	14 days	5 days	✓	19-Jun-2024	14 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E162	13-Jun-2024	----	----	----		20-Jun-2024	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE [ON MECP]										
GW-12618927-061324-TW-MW10-23	E160	13-Jun-2024	----	----	----		20-Jun-2024	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE [BOD HT-4d]										
GW-12618927-061324-TW-MW10-23	E121	13-Jun-2024	----	----	----		15-Jun-2024	48 hrs	47 hrs	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
GW-12618927-061324-TW-MW10-23	E420	13-Jun-2024	17-Jun-2024	180 days	4 days	✓	17-Jun-2024	180 days	4 days	✓
Total Sulfides : Total Sulfide by Colourimetry (Automated Flow)										
HDPE total (zinc acetate+sodium hydroxide)										
GW-12618927-061324-TW-MW10-23	E395-H	13-Jun-2024	----	----	----		20-Jun-2024	7 days	7 days	✓

Legend & Qualifier Definitions

EHT: Exceeded ALS recommended hold time prior to analysis.

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	1499774	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	1497917	1	20	5.0	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	1497824	1	20	5.0	5.0	✓
Biochemical Oxygen Demand (Soluble) - 5 day	E553	1497782	1	1	100.0	5.0	✓
Chloride in Water by IC	E235.Cl	1499780	1	16	6.2	5.0	✓
Colour (True) by Spectrometer (2 CU)	E329-L	1495763	1	3	33.3	5.0	✓
Conductivity in Water	E100	1499775	1	8	12.5	5.0	✓
Dissolved Kjeldahl Nitrogen by Fluorescence	E322	1497141	1	1	100.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1495282	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1501234	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1499783	1	15	6.6	5.0	✓
Fluoride in Water by IC	E235.F	1499777	1	8	12.5	5.0	✓
Nitrate in Water by IC	E235.NO3	1499778	1	17	5.8	5.0	✓
Nitrite in Water by IC	E235.NO2	1499779	1	17	5.8	5.0	✓
pH by Meter	E108	1499776	1	9	11.1	5.0	✓
Sulfate in Water by IC	E235.SO4	1499781	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	1504571	1	19	5.2	5.0	✓
Total Dissolved Phosphorus by Colourimetry (0.002 mg/L)	E375-T	1499158	1	8	12.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	1497915	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	1497095	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1497916	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	1503872	1	9	11.1	5.0	✓
TSS by Gravimetry	E160	1504575	1	20	5.0	4.7	✓
Turbidity by Nephelometry	E121	1495480	1	11	9.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	1499774	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	1497917	1	20	5.0	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	1497824	1	20	5.0	5.0	✓
Biochemical Oxygen Demand (Soluble) - 5 day	E553	1497782	1	1	100.0	5.0	✓
Chloride in Water by IC	E235.Cl	1499780	1	16	6.2	5.0	✓
Colour (True) by Spectrometer (2 CU)	E329-L	1495763	1	3	33.3	5.0	✓
Conductivity in Water	E100	1499775	1	8	12.5	5.0	✓
Dissolved Kjeldahl Nitrogen by Fluorescence	E322	1497141	1	1	100.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1495282	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1501234	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1499783	1	15	6.6	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	1499777	1	8	12.5	5.0	✓
Nitrate in Water by IC	E235.NO3	1499778	1	17	5.8	5.0	✓
Nitrite in Water by IC	E235.NO2	1499779	1	17	5.8	5.0	✓
pH by Meter	E108	1499776	1	9	11.1	5.0	✓
Sulfate in Water by IC	E235.SO4	1499781	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	1504571	1	19	5.2	5.0	✓
Total Dissolved Phosphorus by Colourimetry (0.002 mg/L)	E375-T	1499158	1	8	12.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	1497915	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	1497095	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1497916	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	1503872	1	9	11.1	5.0	✓
TSS by Gravimetry	E160	1504575	1	20	5.0	4.7	✓
Turbidity by Nephelometry	E121	1495480	1	11	9.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	1499774	1	16	6.2	5.0	✓
Ammonia by Fluorescence	E298	1497917	1	20	5.0	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	1497824	1	20	5.0	5.0	✓
Biochemical Oxygen Demand (Soluble) - 5 day	E553	1497782	1	1	100.0	5.0	✓
Chloride in Water by IC	E235.Cl	1499780	1	16	6.2	5.0	✓
Colour (True) by Spectrometer (2 CU)	E329-L	1495763	1	3	33.3	5.0	✓
Conductivity in Water	E100	1499775	1	8	12.5	5.0	✓
Dissolved Kjeldahl Nitrogen by Fluorescence	E322	1497141	1	1	100.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1495282	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1501234	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1499783	1	15	6.6	5.0	✓
Fluoride in Water by IC	E235.F	1499777	1	8	12.5	5.0	✓
Nitrate in Water by IC	E235.NO3	1499778	1	17	5.8	5.0	✓
Nitrite in Water by IC	E235.NO2	1499779	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	1499781	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	1504571	1	19	5.2	5.0	✓
Total Dissolved Phosphorus by Colourimetry (0.002 mg/L)	E375-T	1499158	1	8	12.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	1497915	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	1497095	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1497916	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	1503872	1	9	11.1	5.0	✓
TSS by Gravimetry	E160	1504575	1	20	5.0	4.7	✓
Turbidity by Nephelometry	E121	1495480	1	11	9.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	1497917	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS) - Continued							
Chloride in Water by IC	E235.Cl	1499780	1	16	6.2	5.0	✓
Dissolved Kjeldahl Nitrogen by Fluorescence	E322	1497141	1	1	100.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	1495282	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	1501234	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	1499783	1	15	6.6	5.0	✓
Fluoride in Water by IC	E235.F	1499777	1	8	12.5	5.0	✓
Nitrate in Water by IC	E235.NO3	1499778	1	17	5.8	5.0	✓
Nitrite in Water by IC	E235.NO2	1499779	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	1499781	1	14	7.1	5.0	✓
Total Dissolved Phosphorus by Colourimetry (0.002 mg/L)	E375-T	1499158	1	8	12.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	1497915	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	1497095	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	1497916	1	20	5.0	5.0	✓
Total Sulfide by Colourimetry (Automated Flow)	E395-H	1503872	1	9	11.1	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 ALS Environmental - Waterloo	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 ALS Environmental - Waterloo	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 ALS Environmental - Waterloo	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry	E160 ALS Environmental - Waterloo	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 ALS Environmental - Waterloo	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Chloride in Water by IC	E235.Cl ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC	E235.NO2 ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC	E235.NO3 ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfate in Water by IC	E235.SO4 ALS Environmental - Waterloo	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Alkalinity Species by Titration	E290 ALS Environmental - Waterloo	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 ALS Environmental - Waterloo	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 ALS Environmental - Waterloo	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Dissolved Kjeldahl Nitrogen by Fluorescence	E322 ALS Environmental - Waterloo	Water	Method Fialab 100, 2018	DKN in water is determined on a sample which is filtered (0.45 um) prior to preservation by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Colour (True) by Spectrometer (2 CU)	E329-L ALS Environmental - Waterloo	Water	APHA 2120 C (mod)	Colour (True Colour) is determined by filtering a sample through a 0.45 micron membrane filter followed by analysis of the filtrate using the platinum-cobalt colourimetric method. Colour measurements can be highly pH dependent, and apply to the pH of the sample as received (at time of testing), without pH adjustment.
Dissolved Organic Carbon by Combustion (Low Level)	E358-L ALS Environmental - Waterloo	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U ALS Environmental - Waterloo	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Dissolved Phosphorus by Colourimetry (0.002 mg/L)	E375-T ALS Environmental - Waterloo	Water	APHA 4500-P E (mod).	Total Dissolved Phosphorus is determined colourimetrically using a discrete analyzer after filtration through a 0.45 micron filter followed by heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U ALS Environmental - Waterloo	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Sulfide by Colourimetry (Automated Flow)	E395-H ALS Environmental - Vancouver	Water	APHA 4500 -S E-Auto-Colorimetry	Sulfide is determined using the gas dialysis automated methlyene blue colourimetric method. Results expressed "as H2S" if reported represent the maximum possible H_2S concentration based on the total sulfide concentration in the sample. The H_2S calculation converts Total Sulphide as (S2-) and reports it as Total Sulphide as (H2S)
Total Metals in Water by CRC ICPMS	E420 ALS Environmental - Waterloo	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Metals in Water by CRC ICPMS	E421 ALS Environmental - Waterloo	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Biochemical Oxygen Demand - 5 day	E550 ALS Environmental - Waterloo	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Biochemical Oxygen Demand (Soluble) - 5 day	E553 ALS Environmental - Waterloo	Water	APHA 5210 B (mod)	Samples are filtered then diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Dissolved Hardness (Calculated)	EC100 ALS Environmental - Waterloo	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in $CaCO_3$ equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 ALS Environmental - Waterloo	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N ALS Environmental - Waterloo	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).
Un-ionized and Ionized Ammonia (Calculation) (Field Temperature and pH)	EC298A ALS Environmental - Waterloo	Water	CCME CWQG Ammonia	Un-ionized ammonia is calculated from test results for total ammonia, field temperature and pH, and is expressed in units of mg/L "as N".

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Organic Nitrogen (Calculation)	EC363 ALS Environmental - Waterloo	Water	APHA 4500-NORG (TKN)/NH3-NITROGEN (NH3)	Total Organic Nitrogen is a calculated parameter. Total Organic Nitrogen = Total Kjeldahl Nitrogen - Ammonia.
Field pH,EC,Salinity, TDS, Cl2,ClO2,ORP,DO, Turbidity,T,T-P,o-PO4,NH3,Chloramine	EF001 ALS Environmental - Waterloo	Water	Field Measurement (Client Supplied)	Field pH,EC,Salinity, TDS, Cl2,ClO2,ORP,DO, Turbidity,T,T-P,o-PO4,NH3 or Chloramine measurements provided by client and recorded on ALS report may affect the validity of results.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 ALS Environmental - Waterloo	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 ALS Environmental - Waterloo	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Digestion for DKN in water	EP322 ALS Environmental - Waterloo	Water	APHA 4500-Norg D (mod)	Samples are filtered (0.45 um) prior to preservation and digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low
Preparation for Dissolved Organic Carbon for Combustion	EP358 ALS Environmental - Waterloo	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 ALS Environmental - Waterloo	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Digestion for Dissolved Phosphorus in water	EP375 ALS Environmental - Waterloo	Water	APHA 4500-P E (mod).	Samples are filtered through a 0.45 micron membrane filter and then heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 ALS Environmental - Waterloo	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

QUALITY CONTROL REPORT

Work Order	: **WT2415964**	Page	: 1 of 17
Client	: GHD Limited	Laboratory	: ALS Environmental - Waterloo
Contact	: Jennifer Balkwill	Account Manager	: Rick Hawthorne
Address	: 455 Phillip Street Waterloo ON Canada N2L 3X2	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 604 748 3661	Telephone	: +1 519 886 6910
Project	: 12618927-7.8	Date Samples Received	: 14-Jun-2024 10:32
PO	: 735-010621	Date Analysis Commenced	: 14-Jun-2024
C-O-C number	: ----	Issue Date	: 24-Jun-2024 13:51
Sampler	: TW		
Site	: ----		
Quote number	: 12618927, 735-010621		
No. of samples received	: 1		
No. of samples analysed	: 1		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Greg Pokocky	Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Waterloo Metals, Waterloo, Ontario
Hannah Lewis	Inorganics Analyst	Waterloo Inorganics, Waterloo, Ontario
Ismat Sultana	Account Manager Assistant	Waterloo Administration, Waterloo, Ontario
Jon Fisher	Production Manager, Environmental	Waterloo Inorganics, Waterloo, Ontario
Miles Gropen	Department Manager - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Nik Perkio	Senior Analyst	Waterloo Inorganics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 1495480)											
WT2415963-002	Anonymous	Turbidity	----	E121	0.10	NTU	46.6	50.0	7.03%	15%	----
Physical Tests (QC Lot: 1495763)											
WT2415946-001	Anonymous	Colour, true	----	E329-L	2.0	CU	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 1499774)											
WT2415896-003	Anonymous	Alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	266	265	0.482%	20%	----
Physical Tests (QC Lot: 1499775)											
WT2415896-003	Anonymous	Conductivity	----	E100	1.0	µS/cm	625	637	1.90%	10%	----
Physical Tests (QC Lot: 1499776)											
WT2415896-003	Anonymous	pH	----	E108	0.10	pH units	7.99	7.92	0.880%	4%	----
Physical Tests (QC Lot: 1504571)											
WT2415964-001	GW-12618927-061324-TW-MW10-23	Solids, total dissolved [TDS]	----	E162	20	mg/L	433	430	0.579%	20%	----
Physical Tests (QC Lot: 1504575)											
WT2416403-001	Anonymous	Solids, total suspended [TSS]	----	E160	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1497141)											
WT2415964-001	GW-12618927-061324-TW-MW10-23	Kjeldahl nitrogen, dissolved [DKN]	----	E322	0.050	mg/L	0.601	0.581	3.47%	20%	----
Anions and Nutrients (QC Lot: 1497915)											
HA2401380-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.500	mg/L	30.4	36.6	18.6%	20%	----
Anions and Nutrients (QC Lot: 1497916)											
HA2401377-002	Anonymous	Phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.495	0.498	0.570%	20%	----
Anions and Nutrients (QC Lot: 1497917)											
HA2401377-002	Anonymous	Ammonia, total (as N)	7664-41-7	E298	0.500	mg/L	25.2	25.0	0.827%	20%	----
Anions and Nutrients (QC Lot: 1499158)											
WT2415964-001	GW-12618927-061324-TW-MW10-23	Phosphorus, total dissolved	7723-14-0	E375-T	0.0020	mg/L	0.0030	0.0032	0.0001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1499777)											
WT2416130-002	Anonymous	Fluoride	16984-48-8	E235.F	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1499778)											
WT2416130-002	Anonymous	Nitrate (as N)	14797-55-8	E235.NO3	0.100	mg/L	0.830	0.843	0.012	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1499779)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 1499779) - continued											
WT2416130-002	Anonymous	Nitrite (as N)	14797-65-0	E235.NO2	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 1499780)											
WT2416130-002	Anonymous	Chloride	16887-00-6	E235.Cl	2.50	mg/L	533	536	0.543%	20%	----
Anions and Nutrients (QC Lot: 1499781)											
WT2416130-002	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	23.0	23.2	0.755%	20%	----
Anions and Nutrients (QC Lot: 1499783)											
HA2401413-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 1501234)											
TY2405881-006	Anonymous	Carbon, dissolved organic [DOC]	----	E358-L	2.50	mg/L	48.4	48.6	0.312%	20%	----
Total Sulfides (QC Lot: 1503872)											
FJ2401696-001	Anonymous	Sulfide, total (as S)	18496-25-8	E395-H	0.010	mg/L	0.050	0.042	0.007	Diff <2x LOR	----
Total Metals (QC Lot: 1497095)											
HA2401387-001	Anonymous	Aluminum, total	7429-90-5	E420	0.0030	mg/L	0.107	0.106	1.02%	20%	----
		Antimony, total	7440-36-0	E420	0.00010	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		Arsenic, total	7440-38-2	E420	0.00010	mg/L	0.40 µg/L	0.00044	0.00004	Diff <2x LOR	----
		Barium, total	7440-39-3	E420	0.00010	mg/L	4.67 µg/L	0.00458	2.01%	20%	----
		Beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		Boron, total	7440-42-8	E420	0.010	mg/L	<10 µg/L	<0.010	0	Diff <2x LOR	----
		Cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0070 µg/L	0.0000053	0.0000017	Diff <2x LOR	----
		Calcium, total	7440-70-2	E420	0.050	mg/L	1750 µg/L	1.79	2.00%	20%	----
		Chromium, total	7440-47-3	E420	0.00050	mg/L	<0.50 µg/L	<0.00050	0	Diff <2x LOR	----
		Cobalt, total	7440-48-4	E420	0.00010	mg/L	0.10 µg/L	0.00010	0.0000003	Diff <2x LOR	----
		Copper, total	7440-50-8	E420	0.00050	mg/L	<0.50 µg/L	<0.00050	0	Diff <2x LOR	----
		Iron, total	7439-89-6	E420	0.010	mg/L	214 µg/L	0.211	1.77%	20%	----
		Lead, total	7439-92-1	E420	0.000050	mg/L	0.100 µg/L	0.000100	0.0000006	Diff <2x LOR	----
		Manganese, total	7439-96-5	E420	0.00010	mg/L	34.1 µg/L	0.0337	1.23%	20%	----
		Molybdenum, total	7439-98-7	E420	0.000050	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		Nickel, total	7440-02-0	E420	0.00050	mg/L	0.74 µg/L	0.00061	0.00013	Diff <2x LOR	----
		Phosphorus, total	7723-14-0	E420	0.050	mg/L	<50 µg/L	<0.050	0	Diff <2x LOR	----
		Selenium, total	7782-49-2	E420	0.000050	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		Silver, total	7440-22-4	E420	0.000010	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		Sodium, total	7440-23-5	E420	0.050	mg/L	3530 µg/L	3.50	0.841%	20%	----
		Thallium, total	7440-28-0	E420	0.000010	mg/L	<0.010 µg/L	<0.000010	0	Diff <2x LOR	----
		Tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 1497095) - continued											
HA2401387-001	Anonymous	Uranium, total	7440-61-1	E420	0.000010	mg/L	0.013 µg/L	0.000014	0.0000006	Diff <2x LOR	----
		Vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.50 µg/L	<0.00050	0	Diff <2x LOR	----
		Zinc, total	7440-66-6	E420	0.0030	mg/L	<3.0 µg/L	<0.0030	0	Diff <2x LOR	----
		Zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 1495282)											
HA2401379-001	Anonymous	Aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0020	0.0017	0.0002	Diff <2x LOR	----
		Antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00021	0.00022	0.000005	Diff <2x LOR	----
		Barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0437	0.0444	1.49%	20%	----
		Beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		Bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		Boron, dissolved	7440-42-8	E421	0.010	mg/L	0.033	0.032	0.0002	Diff <2x LOR	----
		Cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000096	0.0000083	0.0000013	Diff <2x LOR	----
		Calcium, dissolved	7440-70-2	E421	0.050	mg/L	54.9	54.6	0.512%	20%	----
		Cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		Chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		Cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00012	0.00012	0.000003	Diff <2x LOR	----
		Copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00071	0.00070	0.00001	Diff <2x LOR	----
		Iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		Lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		Lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		Magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	34.4	34.3	0.356%	20%	----
		Manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0351	0.0353	0.670%	20%	----
		Molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000384	0.000378	0.000006	Diff <2x LOR	----
		Nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00055	0.00057	0.00002	Diff <2x LOR	----
		Phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		Potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.747	0.749	0.206%	20%	----
		Rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00086	0.00088	0.00002	Diff <2x LOR	----
		Selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		Silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.17	4.16	0.375%	20%	----
		Silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		Sodium, dissolved	7440-23-5	E421	0.050	mg/L	11.2	11.3	1.09%	20%	----
		Strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0444	0.0442	0.446%	20%	----
		Sulfur, dissolved	7704-34-9	E421	0.50	mg/L	3.92	3.73	0.19	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 1495282) - continued											
HA2401379-001	Anonymous	Tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		Thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		Thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		Tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		Uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000196	0.000199	1.67%	20%	----
		Vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00095	0.00098	0.00002	Diff <2x LOR	----
		Zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0013	0.0013	0.00007	Diff <2x LOR	----
		Zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 1497782)											
WT2415964-001	GW-12618927-061324-TW-MW10-23	Biochemical oxygen demand [BOD], soluble	----	E553	3.0	mg/L	<3.0	<3.0	0.0%	30%	----
Aggregate Organics (QC Lot: 1497824)											
WT2415968-001	Anonymous	Biochemical oxygen demand [BOD]	----	E550	3.0	mg/L	<3.0	<3.0	0.0%	30%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 1495480)						
Turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 1495763)						
Colour, true	----	E329-L	2	CU	<2.0	----
Physical Tests (QCLot: 1499774)						
Alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
Alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
Alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
Alkalinity, phenolphthalein (as CaCO3)	----	E290	1	mg/L	<1.0	----
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 1499775)						
Conductivity	----	E100	1	µS/cm	1.2	----
Physical Tests (QCLot: 1504571)						
Solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 1504575)						
Solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 1497141)						
Kjeldahl nitrogen, dissolved [DKN]	----	E322	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 1497915)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 1497916)						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 1497917)						
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 1499158)						
Phosphorus, total dissolved	7723-14-0	E375-T	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 1499777)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1499778)						
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 1499779)						
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	<0.010	----
Anions and Nutrients (QCLot: 1499780)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 1499780) - continued						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 1499781)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 1499783)						
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Organic / Inorganic Carbon (QCLot: 1501234)						
Carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Sulfides (QCLot: 1503872)						
Sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	<0.010	----
Total Metals (QCLot: 1497095)						
Aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
Antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
Arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
Barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
Beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
Boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
Cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
Calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
Chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
Cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
Copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
Iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
Lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
Manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
Nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
Phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
Selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
Silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
Sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
Thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
Tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
Uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
Vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
Zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 1497095) - continued						
Zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 1495282)						
Aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
Antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
Arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
Barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
Beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
Bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
Boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
Cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
Cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
Chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
Cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
Copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
Lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
Lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
Molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
Nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
Phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
Rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
Selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
Silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
Silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
Strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
Sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
Tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
Thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
Thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
Tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 1495282) - continued						
Titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
Tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
Uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
Vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
Zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Aggregate Organics (QCLot: 1497782)						
Biochemical oxygen demand [BOD], soluble	----	E553	2	mg/L	<2.0	----
Aggregate Organics (QCLot: 1497824)						
Biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1495480)									
Turbidity	----	E121	0.1	NTU	200 NTU	90.5	85.0	115	----
Physical Tests (QCLot: 1495763)									
Colour, true	----	E329-L	2	CU	25 CU	93.8	85.0	115	----
Physical Tests (QCLot: 1499774)									
Alkalinity, total (as CaCO3)	----	E290	1	mg/L	150 mg/L	100	85.0	115	----
Physical Tests (QCLot: 1499775)									
Conductivity	----	E100	1	µS/cm	1410 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 1499776)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 1504571)									
Solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	86.6	85.0	115	----
Physical Tests (QCLot: 1504575)									
Solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	87.8	85.0	115	----
Anions and Nutrients (QCLot: 1497141)									
Kjeldahl nitrogen, dissolved [DKN]	----	E322	0.05	mg/L	4 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 1497915)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 1497916)									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.434 mg/L	100	80.0	120	----
Anions and Nutrients (QCLot: 1497917)									
Ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	106	85.0	115	----
Anions and Nutrients (QCLot: 1499158)									
Phosphorus, total dissolved	7723-14-0	E375-T	0.002	mg/L	0.393 mg/L	111	80.0	120	----
Anions and Nutrients (QCLot: 1499777)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 1499778)									
Nitrate (as N)	14797-55-8	E235.NO3	0.02	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 1499779)									
Nitrite (as N)	14797-65-0	E235.NO2	0.01	mg/L	0.5 mg/L	98.5	90.0	110	----
Anions and Nutrients (QCLot: 1499780)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Target Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 1499781)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 1499783)									
Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.031 mg/L	107	80.0	120	----
Organic / Inorganic Carbon (QCLot: 1501234)									
Carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
Total Sulfides (QCLot: 1503872)									
Sulfide, total (as H2S)	7783-06-4	E395-H	----	mg/L	0.085 mg/L	116	80.0	120	----
Sulfide, total (as S)	18496-25-8	E395-H	0.01	mg/L	0.08 mg/L	116	80.0	120	----
Total Metals (QCLot: 1497095)									
Aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	103	80.0	120	----
Antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	104	80.0	120	----
Arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	104	80.0	120	----
Barium, total	7440-39-3	E420	0.0001	mg/L	0.012 mg/L	104	80.0	120	----
Beryllium, total	7440-41-7	E420	0.00002	mg/L	0.005 mg/L	101	80.0	120	----
Boron, total	7440-42-8	E420	0.01	mg/L	0.05 mg/L	96.8	80.0	120	----
Cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	103	80.0	120	----
Calcium, total	7440-70-2	E420	0.05	mg/L	2.5 mg/L	99.2	80.0	120	----
Chromium, total	7440-47-3	E420	0.0005	mg/L	0.012 mg/L	102	80.0	120	----
Cobalt, total	7440-48-4	E420	0.0001	mg/L	0.012 mg/L	101	80.0	120	----
Copper, total	7440-50-8	E420	0.0005	mg/L	0.012 mg/L	101	80.0	120	----
Iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	102	80.0	120	----
Lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	103	80.0	120	----
Manganese, total	7439-96-5	E420	0.0001	mg/L	0.012 mg/L	103	80.0	120	----
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.012 mg/L	103	80.0	120	----
Nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	102	80.0	120	----
Phosphorus, total	7723-14-0	E420	0.05	mg/L	0.5 mg/L	102	80.0	120	----
Selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	102	80.0	120	----
Silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	96.9	80.0	120	----
Sodium, total	7440-23-5	E420	0.05	mg/L	2.5 mg/L	106	80.0	120	----
Thallium, total	7440-28-0	E420	0.00001	mg/L	0.05 mg/L	98.4	80.0	120	----
Tungsten, total	7440-33-7	E420	0.0001	mg/L	0.005 mg/L	100	80.0	120	----
Uranium, total	7440-61-1	E420	0.00001	mg/L	0 mg/L	106	80.0	120	----
Vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	103	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Target Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 1497095) - continued									
Zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	99.6	80.0	120	----
Zirconium, total	7440-67-7	E420	0.0002	mg/L	0.005 mg/L	96.8	80.0	120	----
Dissolved Metals (QCLot: 1495282)									
Aluminum, dissolved	7429-90-5	E421	0.001	mg/L	0.1 mg/L	101	80.0	120	----
Antimony, dissolved	7440-36-0	E421	0.0001	mg/L	0.05 mg/L	99.8	80.0	120	----
Arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	0.05 mg/L	102	80.0	120	----
Barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.012 mg/L	102	80.0	120	----
Beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.005 mg/L	89.9	80.0	120	----
Bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	0.05 mg/L	96.6	80.0	120	----
Boron, dissolved	7440-42-8	E421	0.01	mg/L	0.05 mg/L	92.2	80.0	120	----
Cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.005 mg/L	98.6	80.0	120	----
Calcium, dissolved	7440-70-2	E421	0.05	mg/L	2.5 mg/L	96.8	80.0	120	----
Cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.002 mg/L	101	80.0	120	----
Chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.012 mg/L	98.4	80.0	120	----
Cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.012 mg/L	96.4	80.0	120	----
Copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.012 mg/L	96.6	80.0	120	----
Iron, dissolved	7439-89-6	E421	0.01	mg/L	0.05 mg/L	95.6	80.0	120	----
Lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.025 mg/L	94.5	80.0	120	----
Lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.012 mg/L	93.7	80.0	120	----
Magnesium, dissolved	7439-95-4	E421	0.005	mg/L	2.5 mg/L	110	80.0	120	----
Manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.012 mg/L	98.0	80.0	120	----
Molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.012 mg/L	95.5	80.0	120	----
Nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.025 mg/L	95.4	80.0	120	----
Phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	0.5 mg/L	107	80.0	120	----
Potassium, dissolved	7440-09-7	E421	0.05	mg/L	2.5 mg/L	104	80.0	120	----
Rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.005 mg/L	97.8	80.0	120	----
Selenium, dissolved	7782-49-2	E421	0.00005	mg/L	0.05 mg/L	100	80.0	120	----
Silicon, dissolved	7440-21-3	E421	0.05	mg/L	0.5 mg/L	100.0	60.0	140	----
Silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.005 mg/L	88.5	80.0	120	----
Sodium, dissolved	7440-23-5	E421	0.05	mg/L	2.5 mg/L	102	80.0	120	----
Strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.012 mg/L	104	80.0	120	----
Sulfur, dissolved	7704-34-9	E421	0.5	mg/L	2.5 mg/L	101	80.0	120	----
Tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.005 mg/L	94.0	80.0	120	----
Thallium, dissolved	7440-28-0	E421	0.00001	mg/L	0.05 mg/L	97.1	80.0	120	----
Thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.005 mg/L	94.4	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike: Target Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Dissolved Metals (QCLot: 1495282) - continued									
Tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.025 mg/L	96.9	80.0	120	----
Titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.012 mg/L	94.4	80.0	120	----
Tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.005 mg/L	92.4	80.0	120	----
Uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0 mg/L	97.2	80.0	120	----
Vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.025 mg/L	99.9	80.0	120	----
Zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.025 mg/L	96.4	80.0	120	----
Zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.005 mg/L	95.3	80.0	120	----
Aggregate Organics (QCLot: 1497782)									
Biochemical oxygen demand [BOD], soluble	----	E553	2	mg/L	198 mg/L	94.4	85.0	115	----
Aggregate Organics (QCLot: 1497824)									
Biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	94.9	85.0	115	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 1497141)										
WT2415964-001	GW-12618927-061324-TW-MW10-23	Kjeldahl nitrogen, dissolved [DKN]	----	E322	2.80 mg/L	2.5 mg/L	112	70.0	130	----
Anions and Nutrients (QCLot: 1497915)										
HA2401380-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	ND mg/L	----	ND	70.0	130	----
Anions and Nutrients (QCLot: 1497916)										
HA2401377-002	Anonymous	Phosphorus, total	7723-14-0	E372-U	ND mg/L	----	ND	70.0	130	----
Anions and Nutrients (QCLot: 1497917)										
HA2401377-002	Anonymous	Ammonia, total (as N)	7664-41-7	E298	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1499158)										
WT2415964-001	GW-12618927-061324-TW-MW10-23	Phosphorus, total dissolved	7723-14-0	E375-T	0.0976 mg/L	0.1 mg/L	97.6	70.0	130	----
Anions and Nutrients (QCLot: 1499777)										
WT2416130-002	Anonymous	Fluoride	16984-48-8	E235.F	5.07 mg/L	5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 1499778)										
WT2416130-002	Anonymous	Nitrate (as N)	14797-55-8	E235.NO3	12.7 mg/L	12.5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 1499779)										
WT2416130-002	Anonymous	Nitrite (as N)	14797-65-0	E235.NO2	2.45 mg/L	2.5 mg/L	97.8	75.0	125	----
Anions and Nutrients (QCLot: 1499780)										
WT2416130-002	Anonymous	Chloride	16887-00-6	E235.Cl	ND mg/L	----	ND	75.0	125	----
Anions and Nutrients (QCLot: 1499781)										
WT2416130-002	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	509 mg/L	500 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 1499783)										
HA2401413-001	Anonymous	Phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0202 mg/L	0.02 mg/L	103	70.0	130	----
Organic / Inorganic Carbon (QCLot: 1501234)										
TY2405881-006	Anonymous	Carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	----	ND	70.0	130	----
Total Sulfides (QCLot: 1503872)										
FJ2401696-002	Anonymous	Sulfide, total (as S)	18496-25-8	E395-H	1.09 mg/L	1 mg/L	109	75.0	125	----
Total Metals (QCLot: 1497095)										
HA2401387-002	Anonymous	Aluminum, total	7429-90-5	E420	ND mg/L	----	ND	70.0	130	----
		Antimony, total	7440-36-0	E420	0.0525 mg/L	0.05 mg/L	105	70.0	130	----
		Arsenic, total	7440-38-2	E420	0.0507 mg/L	0.05 mg/L	101	70.0	130	----
		Barium, total	7440-39-3	E420	0.0124 mg/L	0.012 mg/L	99.5	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 1497095) - continued										
HA2401387-002	Anonymous	Beryllium, total	7440-41-7	E420	0.00491 mg/L	0.005 mg/L	98.3	70.0	130	----
		Boron, total	7440-42-8	E420	0.048 mg/L	0.05 mg/L	96.9	70.0	130	----
		Cadmium, total	7440-43-9	E420	0.00530 mg/L	0.005 mg/L	106	70.0	130	----
		Calcium, total	7440-70-2	E420	2.35 mg/L	2.5 mg/L	94.2	70.0	130	----
		Chromium, total	7440-47-3	E420	0.0125 mg/L	0.012 mg/L	99.9	70.0	130	----
		Cobalt, total	7440-48-4	E420	0.0126 mg/L	0.012 mg/L	101	70.0	130	----
		Copper, total	7440-50-8	E420	0.0127 mg/L	0.012 mg/L	101	70.0	130	----
		Iron, total	7439-89-6	E420	ND mg/L	----	ND	70.0	130	----
		Lead, total	7439-92-1	E420	0.0255 mg/L	0.025 mg/L	102	70.0	130	----
		Manganese, total	7439-96-5	E420	ND mg/L	----	ND	70.0	130	----
		Molybdenum, total	7439-98-7	E420	0.0128 mg/L	0.012 mg/L	102	70.0	130	----
		Nickel, total	7440-02-0	E420	0.0251 mg/L	0.025 mg/L	100	70.0	130	----
		Phosphorus, total	7723-14-0	E420	0.505 mg/L	0.5 mg/L	101	70.0	130	----
		Selenium, total	7782-49-2	E420	0.0517 mg/L	0.05 mg/L	103	70.0	130	----
		Silver, total	7440-22-4	E420	0.00487 mg/L	0.005 mg/L	97.4	70.0	130	----
		Sodium, total	7440-23-5	E420	ND mg/L	----	ND	70.0	130	----
		Thallium, total	7440-28-0	E420	0.0493 mg/L	0.05 mg/L	98.6	70.0	130	----
		Tungsten, total	7440-33-7	E420	0.00504 mg/L	0.005 mg/L	101	70.0	130	----
		Uranium, total	7440-61-1	E420	0.000266 mg/L	0 mg/L	106	70.0	130	----
		Vanadium, total	7440-62-2	E420	0.0253 mg/L	0.025 mg/L	101	70.0	130	----
		Zinc, total	7440-66-6	E420	0.0261 mg/L	0.025 mg/L	104	70.0	130	----
		Zirconium, total	7440-67-7	E420	0.00479 mg/L	0.005 mg/L	95.9	70.0	130	----
Dissolved Metals (QCLot: 1495282)										
HA2401379-002	Anonymous	Aluminum, dissolved	7429-90-5	E421	1.04 mg/L	1 mg/L	104	70.0	130	----
		Antimony, dissolved	7440-36-0	E421	0.503 mg/L	0.5 mg/L	101	70.0	130	----
		Arsenic, dissolved	7440-38-2	E421	0.541 mg/L	0.5 mg/L	108	70.0	130	----
		Barium, dissolved	7440-39-3	E421	ND mg/L	----	ND	70.0	130	----
		Beryllium, dissolved	7440-41-7	E421	0.0482 mg/L	0.05 mg/L	96.4	70.0	130	----
		Bismuth, dissolved	7440-69-9	E421	0.498 mg/L	0.5 mg/L	99.6	70.0	130	----
		Boron, dissolved	7440-42-8	E421	0.499 mg/L	0.5 mg/L	99.8	70.0	130	----
		Cadmium, dissolved	7440-43-9	E421	0.0500 mg/L	0.05 mg/L	100.0	70.0	130	----
		Calcium, dissolved	7440-70-2	E421	ND mg/L	----	ND	70.0	130	----
		Cesium, dissolved	7440-46-2	E421	0.0263 mg/L	0.025 mg/L	105	70.0	130	----
		Chromium, dissolved	7440-47-3	E421	0.129 mg/L	0.125 mg/L	103	70.0	130	----
		Cobalt, dissolved	7440-48-4	E421	0.125 mg/L	0.125 mg/L	99.8	70.0	130	----
		Copper, dissolved	7440-50-8	E421	0.124 mg/L	0.125 mg/L	99.0	70.0	130	----
		Iron, dissolved	7439-89-6	E421	ND mg/L	----	ND	70.0	130	----
		Lead, dissolved	7439-92-1	E421	0.248 mg/L	0.25 mg/L	99.1	70.0	130	----
		Lithium, dissolved	7439-93-2	E421	0.131 mg/L	0.125 mg/L	105	70.0	130	----
		Magnesium, dissolved	7439-95-4	E421	27.4 mg/L	25 mg/L	110	70.0	130	----
		Manganese, dissolved	7439-96-5	E421	ND mg/L	----	ND	70.0	130	----
		Molybdenum, dissolved	7439-98-7	E421	0.123 mg/L	0.125 mg/L	98.3	70.0	130	----
		Nickel, dissolved	7440-02-0	E421	0.248 mg/L	0.25 mg/L	99.1	70.0	130	----
		Phosphorus, dissolved	7723-14-0	E421	5.20 mg/L	5 mg/L	104	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 1495282) - continued										
HA2401379-002	Anonymous	Potassium, dissolved	7440-09-7	E421	26.3 mg/L	25 mg/L	105	70.0	130	----
		Rubidium, dissolved	7440-17-7	E421	0.0532 mg/L	0.05 mg/L	106	70.0	130	----
		Selenium, dissolved	7782-49-2	E421	0.538 mg/L	0.5 mg/L	108	70.0	130	----
		Silicon, dissolved	7440-21-3	E421	5.16 mg/L	5 mg/L	103	70.0	130	----
		Silver, dissolved	7440-22-4	E421	0.0437 mg/L	0.05 mg/L	87.4	70.0	130	----
		Sodium, dissolved	7440-23-5	E421	25.4 mg/L	25 mg/L	102	70.0	130	----
		Strontium, dissolved	7440-24-6	E421	ND mg/L	----	ND	70.0	130	----
		Sulfur, dissolved	7704-34-9	E421	25.6 mg/L	25 mg/L	102	70.0	130	----
		Tellurium, dissolved	13494-80-9	E421	0.0483 mg/L	0.05 mg/L	96.5	70.0	130	----
		Thallium, dissolved	7440-28-0	E421	0.506 mg/L	0.5 mg/L	101	70.0	130	----
		Thorium, dissolved	7440-29-1	E421	0.0496 mg/L	0.05 mg/L	99.3	70.0	130	----
		Tin, dissolved	7440-31-5	E421	0.250 mg/L	0.25 mg/L	100	70.0	130	----
		Titanium, dissolved	7440-32-6	E421	0.124 mg/L	0.125 mg/L	99.1	70.0	130	----
		Tungsten, dissolved	7440-33-7	E421	0.0482 mg/L	0.05 mg/L	96.4	70.0	130	----
		Uranium, dissolved	7440-61-1	E421	0.00257 mg/L	0.002 mg/L	103	70.0	130	----
		Vanadium, dissolved	7440-62-2	E421	0.262 mg/L	0.25 mg/L	105	70.0	130	----
		Zinc, dissolved	7440-66-6	E421	0.252 mg/L	0.25 mg/L	101	70.0	130	----
		Zirconium, dissolved	7440-67-7	E421	0.0496 mg/L	0.05 mg/L	99.2	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

COC Number: 20 -

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Page 1 of 1

Report To	Contact and company name below will appear on the final report
Company:	GHD Ltd. (Acct GHDL100)
Contact:	Jennifer Balkwill
Phone:	519-884-0510
	Company address below will appear on the final report
Street:	455 Phillip St.
City/Province:	Waterloo, ON
Postal Code:	N2L 3X2
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	GHD Ltd. (GHDL100)
Contact:	

Reports / Recipients

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Merge QC/QCI Reports with COA ☑ YES ☐ NO ☐ N/A
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: Jennifer.Balkwill@ghd.com
Email 2: See SSOW/PO
Email 3:

Invoice Recipients

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: accountspayableCDN@ghd.com
Email 2:

Turnaround Time (TAT) Requested

☒ Routine [R] if received by 3pm M-F - no surcharges apply
☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimu
☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimu
☐ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimu
☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimu
☐ Same day [E2] if received by 10am M-S - 200% rush surcharge.
Fees may apply to rush resuests on weekends, statutory holidays a
routine tests

Date and Time Required for all E&P TATs:

For tests that can not be performed according to t

Analysis Re

Environmental Division Waterloo
Work Order Reference
WT2415964

Telephone : +1 519 886 6910

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	WT20024GHDL1000100	AFE/Cost Center:	PO#:
Job #:	12618927-7.8	Major/Minor Code:	Routing Code:
PO / AFE:	735-010621	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact: Rick H	Sampler: Terry Williams

Indicate Filtered (F), Preserved (P) or Filtered ar

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Dissolved Metals, Total Metals	Alkalinity, speciated	Anions (Cl, NO2, NO3, SO4, PO4, F)	Color, pH, TSS, TDS, Turbidity	DOC, Total Phosphorus (Dissolved)	Hardness, Ion balance	BOD, Dissolved BOD	Organic N, TKN, Dissolved TKN	Total Phosphorus (low-level)	Sulfide	Ammonia (+ unionized calculation)	SAMPLES ON HOLD	EXTENDED STORAGE RE	SUSPECTED HAZARD (se
						FP						F							
	GW-12618927-061324-TW-MW10-23	13-06-24	12:25	Water	8	X	X	X	X	X	X	X	X	X	X	X			

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO
Are samples for human consumption/ use? ☐ YES ☐ NO

Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)

SAMPLE RECEIPT DETAILS (lab use only)

Cooling Method: ☐ NONE ☒ ICE ☒ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED
Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO
Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
0.3				3.8			

SHIPMENT RELEASE (client use)

[redacted] Date: June 14 2024 Time: 10:30

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: [redacted] Date: 6/14/2024 Time: 10:32

FINAL SHIPMENT RECEPTION (lab use only)

Received by: CM Date: Jun 14/24 Time: 14:00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

B-730 mm-737
CM GC-165 N-935

Appendix G

Construction Water Taking Assessments

ATTACHMENT G

ESTIMATED WATER TAKINGS AND AREA OF INFLUENCE (STEADY STATE)
HYDROGEOLOGICAL ASSESSMENT
STORMWATER MANAGEMENT POND
CRH

Flow to a Trench for a *Unconfined Aquifer*

Information

Steady State flow to a trench for an unconfined aquifer.

Use this equation when a/b > 1.5.

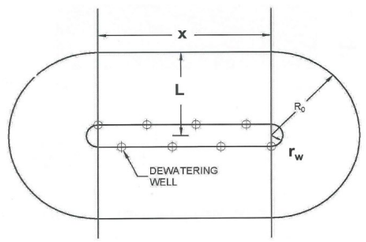
Equation 4.0

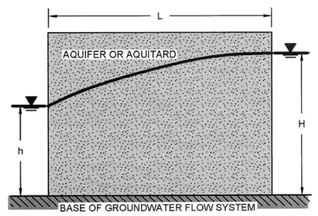
$$Q = \frac{\pi K\left(H^2 - h^2\right)}{\ln R_0 / r_w} + 2\left[\frac{xK\left(H^2 - h^2\right)}{2L}\right]$$

Equation 4.1

$$r_w = \frac{a+b}{\pi}$$

Ro is determined by the Siechardt Equation: Ro = 3000(H-hw)K^0.5 when K is in m/s





Enter Parameters

Shaft or Trench Eq'n Check: **3.3** This number **must be greater than 1.5**; if not, then use a Shaft equation.

K=	**1.00E-03**	cm/s	Input Hydraulic Conductivity in cm/s
=>	0.864	m/day	Hydraulic Conductivity converted to m/day
H=	**2.23**	m	Input height of groundwater pressure
h=	**0**	m	Input dewatering height
x=	**10**	m	Input length of trench
a=	**10**	m	Input length of excavation
b=	**3**	m	Input width of excavation
rw=	**4.14**	m	Input/calculate radius of trench
π=	3.141592654		Pi

Note: L and Ro are the same distance

*Note: Height measurements are relative to base of active groundwater

Calculating L and Ro using: $R_o = 1.5(Tt/S)^{0.5}$

T=	1.92672	m²/day	Input transmissivity in m²/day
t=	30	days	Input pumping duration in days
S=	0.3		Input storage coefficient
L=Ro=	20.82	m	Line source distance; distance of influence

Alternative equation by Bear (Bear, J., 1979. **Hydraulics of Groundwater**, McGraw-Hill, New York, 569p) $R_o = 1.5(Tt/S)^{0.5}$ where **T** is transmissivity in **m²/day**, **t** is pumping duration in **days.** $\mathbf{R_o}$ will be in **metres.**

*Note: The above Ro is for comparison. It is not the Ro used to calculate Q below.

Enter additional K values (optional)

K=	**1.00E-03**	**cm/s**	**K=**	**0.864**	**m/day**
K2=	1.00E-06	cm/s	K2=	0.000864	m/day
K3=	1.00E-05	cm/s	K3=	0.00864	m/day
K4=	1.00E-04	cm/s	K4=	0.0864	m/day
K5=	1.00E-03	cm/s	K5=	0.864	m/day
K6=	1.00E-02	cm/s	K6=	8.64	m/day
K7=	1.00E-01	cm/s	K7=	86.4	m/day
K8=	1.00E+00	cm/s	K8=	864	m/day
K9=	1.00E+01	cm/s	K9=	8640	m/day
K10=	1.00E+02	cm/s	K10=	86400	m/day

Calculated flow rate using Equation 4.0

Results for Ro (radius of influence)			Flow Results in m³/day			Flow Results in L/min			Flow Results in gal/min		
L=	**Ro=**	**25.30**	**m**	**Q=**	**9.16**	**m³/day**	**Q=**	**6.36**	**L/min**	**Q=**	**1.40**	**gal/min**
L2=	Ro2=	4.81	m	Q2=	0.10	m³/day	Q2=	0.07	L/min	Q2=	0.02	gal/min
L3=	Ro3=	6.26	m	Q3=	0.40	m³/day	Q3=	0.27	L/min	Q3=	0.06	gal/min
L4=	Ro4=	10.83	m	Q4=	1.80	m³/day	Q4=	1.25	L/min	Q4=	0.28	gal/min
L5=	Ro5=	21.16	m	Q5=	10.31	m³/day	Q5=	7.16	L/min	Q5=	1.57	gal/min
L6=	Ro6=	71.04	m	Q6=	53.53	m³/day	Q6=	37.17	L/min	Q6=	8.18	gal/min
L7=	Ro7=	215.70	m	Q7=	361.37	m³/day	Q7=	250.94	L/min	Q7=	55.20	gal/min
L8=	Ro8=	673.14	m	Q8=	2,715.08	m³/day	Q8=	1,885.35	L/min	Q8=	414.72	gal/min
L9=	Ro9=	2119.70	m	Q9=	21,840.18	m³/day	Q9=	15,165.82	L/min	Q9=	3,336.01	gal/min
L10=	R10=	6694.14	m	Q10=	183,338.71	m³/day	Q10=	127,310.40	L/min	Q10=	28,004.34	gal/min

ATTACHMENT G

ESTIMATED WATER TAKINGS AND AREA OF INFLUENCE (STEADY STATE)
HYDROGEOLOGICAL ASSESSMENT
STORMWATER MANAGEMENT POND
CRH

Flow to a Trench for a *Unconfined Aquifer*

Information

Steady State flow to a trench for an unconfined aquifer.

Use this equation when a/b > 1.5.

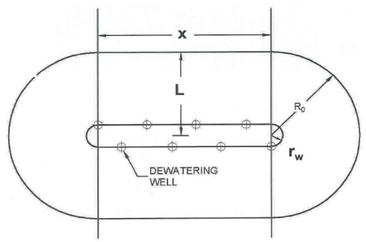
Equation 4.0

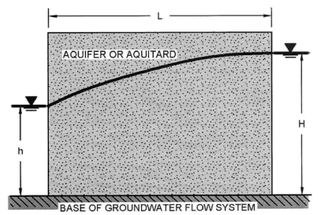
$$Q = \frac{\pi K\left(H^2 - h^2\right)}{\ln R_0 / r_w} + 2\left[\frac{xK\left(H^2 - h^2\right)}{2L}\right]$$

Equation 4.1

$$r_w = \frac{a+b}{\pi}$$

Ro is determined by the Siechardt Equation: Ro = 3000(H-hw)K^0.5 when K is in m/s





Enter Parameters

Shaft or Trench Eq'n Check: **5.0** This number **must be greater than 1.5**; if not, then use a Shaft equation.

K=	1.00E-03	cm/s	Input Hydraulic Conductivity in cm/s
=>	0.864	m/day	Hydraulic Conductivity converted to m/day
H=	**2.23**	m	Input height of groundwater pressure
h=	**0**	m	Input dewatering height
x=	**15**	m	Input length of trench
a=	**15**	m	Input length of excavation
b=	**3**	m	Input width of excavation
rw=	**5.73**	m	Input/calculate radius of trench
π=	3.141592654		Pi

Note: L and Ro are the same distance

*Note: Height measurements are relative to base of active groundwater

Calculating L and Ro using: $R_o = 1.5(Tt/S)^{0.5}$

T=	1.92672	m²/day	Input transmissivity in m²/day
t=	30	days	Input pumping duration in days
S=	0.3		Input storage coefficient
L=Ro=	20.82	m	Line source distance; distance of influence

Alternative equation by Bear (Bear, J., 1979. **Hydraulics of Groundwater**, McGraw-Hill, New York, 569p) $R_o = 1.5(Tt/S)^{0.5}$ where **T** is transmissivity in **m²/day**, **t** is pumping duration in **days.** $\mathbf{R_o}$ will be in **metres.**

*Note: The above Ro is for comparison. It is not the Ro used to calculate Q below.

Enter additional K values (optional)

K=	**1.00E-03**	**cm/s**	**K=**	**0.864**	**m/day**
K2=	1.00E-06	cm/s	K2=	0.000864	m/day
K3=	1.00E-05	cm/s	K3=	0.00864	m/day
K4=	1.00E-04	cm/s	K4=	0.0864	m/day
K5=	1.00E-03	cm/s	K5=	0.864	m/day
K6=	1.00E-02	cm/s	K6=	8.64	m/day
K7=	1.00E-01	cm/s	K7=	86.4	m/day
K8=	1.00E+00	cm/s	K8=	864	m/day
K9=	1.00E+01	cm/s	K9=	8640	m/day
K10=	1.00E+02	cm/s	K10=	86400	m/day

Calculated flow rate using Equation 4.0

Results for Ro (radius of influence)			Flow Results in m³/day			Flow Results in L/min			Flow Results in gal/min		
L= Ro=	**26.89**	**m**	**Q=**	**11.13**	**m³/day**	**Q=**	**7.73**	**L/min**	**Q=**	**1.70**	**gal/min**
L2= Ro2=	6.40	m	Q2=	0.13	m³/day	Q2=	0.09	L/min	Q2=	0.02	gal/min
L3= Ro3=	7.85	m	Q3=	0.51	m³/day	Q3=	0.36	L/min	Q3=	0.08	gal/min
L4= Ro4=	12.42	m	Q4=	2.26	m³/day	Q4=	1.57	L/min	Q4=	0.35	gal/min
L5= Ro5=	21.16	m	Q5=	13.38	m³/day	Q5=	9.29	L/min	Q5=	2.04	gal/min
L6= Ro6=	72.63	m	Q6=	62.03	m³/day	Q6=	43.07	L/min	Q6=	9.48	gal/min
L7= Ro7=	217.29	m	Q7=	400.99	m³/day	Q7=	278.45	L/min	Q7=	61.25	gal/min
L8= Ro8=	674.73	m	Q8=	2,926.40	m³/day	Q8=	2,032.09	L/min	Q8=	447.00	gal/min
L9= Ro9=	2121.30	m	Q9=	23,129.25	m³/day	Q9=	16,060.95	L/min	Q9=	3,532.91	gal/min
L10= R10=	6695.73	m	Q10=	192,070.78	m³/day	Q10=	133,373.95	L/min	Q10=	29,338.13	gal/min

ATTACHMENT G

ESTIMATED WATER TAKINGS AND AREA OF INFLUENCE (STEADY STATE)
HYDROGEOLOGICAL ASSESSMENT
STORMWATER MANAGEMENT POND
CRH

Flow to a Trench for a *Unconfined Aquifer*

Information

Steady State flow to a trench for an unconfined aquifer.

Use this equation when a/b > 1.5.

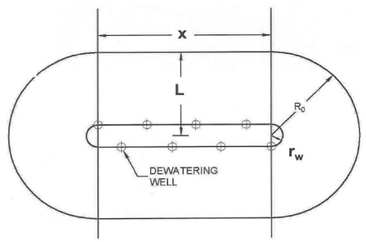
Equation 4.0

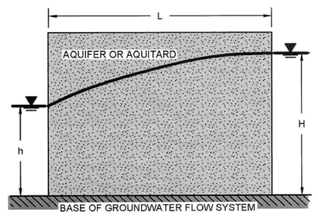
$$Q = \frac{\pi K\left(H^2 - h^2\right)}{\ln R_0 / r_w} + 2\left[\frac{xK\left(H^2 - h^2\right)}{2L}\right]$$

Equation 4.1

$$r_w = \frac{a+b}{\pi}$$

Ro is determined by the Siechardt Equation: Ro = 3000(H-hw)K^0.5 when K is in m/s





Enter Parameters

Shaft or Trench Eq'n Check: **8.3** This number **must be greater than 1.5**; if not, then use a Shaft equation.

K=	1.00E-03	cm/s	Input Hydraulic Conductivity in cm/s
=>	0.864	m/day	Hydraulic Conductivity converted to m/day
H=	2.23	m	Input height of groundwater pressure
h=	0	m	Input dewatering height
x=	25	m	Input length of trench
a=	25	m	Input length of excavation
b=	3	m	Input width of excavation
rw=	8.92	m	Input/calculate radius of trench
π=	3.141592654		Pi

Note: L and Ro are the same distance

*Note: Height measurements are relative to base of active groundwater

Calculating L and Ro using: $R_o = 1.5(Tt/S)^{0.5}$

T=	1.92672	m²/day	Input transmissivity in m²/day
t=	30	days	Input pumping duration in days
S=	0.3		Input storage coefficient
L=Ro=	20.82	m	Line source distance; distance of influence

Alternative equation by Bear (Bear, J., 1979. **Hydraulics of Groundwater**, McGraw-Hill, New York, 569p) $R_o = 1.5(Tt/S)^{0.5}$ where **T** is transmissivity in **m²/day**, **t** is pumping duration in **days.** $\mathbf{R_o}$ will be in **metres.**

*Note: The above Ro is for comparison. It is not the Ro used to calculate Q below.

Enter additional K values (optional)

K=	**1.00E-03**	**cm/s**	**K=**	**0.864**	**m/day**
K2=	1.00E-06	cm/s	K2=	0.000864	m/day
K3=	1.00E-05	cm/s	K3=	0.00864	m/day
K4=	1.00E-04	cm/s	K4=	0.0864	m/day
K5=	1.00E-03	cm/s	K5=	0.864	m/day
K6=	1.00E-02	cm/s	K6=	8.64	m/day
K7=	1.00E-01	cm/s	K7=	86.4	m/day
K8=	1.00E+00	cm/s	K8=	864	m/day
K9=	1.00E+01	cm/s	K9=	8640	m/day
K10=	1.00E+02	cm/s	K10=	86400	m/day

Calculated flow rate using Equation 4.0

Results for Ro (radius of influence)			Flow Results in m³/day			Flow Results in L/min			Flow Results in gal/min		
L= Ro=	**30.07**	**m**	**Q=**	**14.68**	**m³/day**	**Q=**	**10.19**	**L/min**	**Q=**	**2.24**	**gal/min**
L2= Ro2=	9.59	m	Q2=	0.20	m³/day	Q2=	0.14	L/min	Q2=	0.03	gal/min
L3= Ro3=	11.03	m	Q3=	0.73	m³/day	Q3=	0.51	L/min	Q3=	0.11	gal/min
L4= Ro4=	15.61	m	Q4=	3.10	m³/day	Q4=	2.15	L/min	Q4=	0.47	gal/min
L5= Ro5=	21.16	m	Q5=	20.70	m³/day	Q5=	14.38	L/min	Q5=	3.16	gal/min
L6= Ro6=	75.82	m	Q6=	77.23	m³/day	Q6=	53.63	L/min	Q6=	11.80	gal/min
L7= Ro7=	220.47	m	Q7=	469.51	m³/day	Q7=	326.03	L/min	Q7=	71.72	gal/min
L8= Ro8=	677.92	m	Q8=	3,275.05	m³/day	Q8=	2,274.19	L/min	Q8=	500.25	gal/min
L9= Ro9=	2124.48	m	Q9=	25,167.36	m³/day	Q9=	17,476.22	L/min	Q9=	3,844.23	gal/min
L10= R10=	6698.92	m	Q10=	205,449.64	m³/day	Q10=	142,664.23	L/min	Q10=	31,381.71	gal/min

ATTACHMENT G

ESTIMATED WATER TAKINGS AND AREA OF INFLUENCE (STEADY STATE)
HYDROGEOLOGICAL ASSESSMENT
STORMWATER MANAGEMENT POND
CRH

Flow to a Trench for a *Unconfined Aquifer*

Information

Steady State flow to a trench for an unconfined aquifer.

Use this equation when a/b > 1.5.

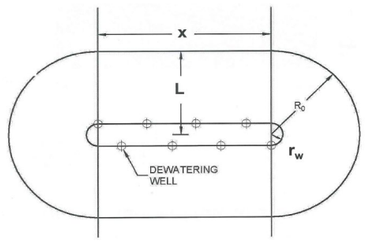
Equation 4.0

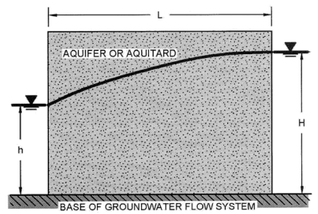
$$Q = \frac{\pi K\left(H^2 - h^2\right)}{\ln R_0 / r_w} + 2\left[\frac{xK\left(H^2 - h^2\right)}{2L}\right]$$

Equation 4.1

$$r_w = \frac{a+b}{\pi}$$

Ro is determined by the Siechardt Equation: Ro = 3000(H-hw)K^0.5 when K is in m/s





Enter Parameters

Shaft or Trench Eq'n Check: **16.7** This number **must be greater than 1.5**; if not, then use a Shaft equation.

K=	1.00E-03	cm/s	Input Hydraulic Conductivity in cm/s
=>	0.864	m/day	Hydraulic Conductivity converted to m/day
H=	2.23	m	Input height of groundwater pressure
h=	0	m	Input dewatering height
x=	50	m	Input length of trench
a=	50	m	Input length of excavation
b=	3	m	Input width of excavation
rw=	16.88	m	Input/calculate radius of trench
π=	3.141592654		Pi

Note: L and Ro are the same distance

*Note: Height measurements are relative to base of active groundwater

Calculating L and Ro using: $R_o = 1.5(Tt/S)^{0.5}$

T=	1.92672	m²/day	Input transmissivity in m²/day
t=	30	days	Input pumping duration in days
S=	0.3		Input storage coefficient
L=Ro=	20.82	m	Line source distance; distance of influence

Alternative equation by Bear (Bear, J., 1979. **Hydraulics of Groundwater**, McGraw-Hill, New York, 569p) $R_o = 1.5(Tt/S)^{0.5}$ where **T** is transmissivity in **m²/day**, **t** is pumping duration in **days.** $\mathbf{R_o}$ will be in **metres.**

*Note: The above Ro is for comparison. It is not the Ro used to calculate Q below.

Enter additional K values (optional)

K=	**1.00E-03**	**cm/s**	**K=**	**0.864**	**m/day**
K2=	1.00E-06	cm/s	K2=	0.000864	m/day
K3=	1.00E-05	cm/s	K3=	0.00864	m/day
K4=	1.00E-04	cm/s	K4=	0.0864	m/day
K5=	1.00E-03	cm/s	K5=	0.864	m/day
K6=	1.00E-02	cm/s	K6=	8.64	m/day
K7=	1.00E-01	cm/s	K7=	86.4	m/day
K8=	1.00E+00	cm/s	K8=	864	m/day
K9=	1.00E+01	cm/s	K9=	8640	m/day
K10=	1.00E+02	cm/s	K10=	86400	m/day

Calculated flow rate using Equation 4.0

Results for Ro (radius of influence)			Flow Results in m³/day			Flow Results in L/min			Flow Results in gal/min		
L= Ro=	**38.03**	**m**	**Q=**	**22.26**	**m³/day**	**Q=**	**15.46**	**L/min**	**Q=**	**3.40**	**gal/min**
L2= Ro2=	17.55	m	Q2=	0.36	m³/day	Q2=	0.25	L/min	Q2=	0.05	gal/min
L3= Ro3=	18.99	m	Q3=	1.26	m³/day	Q3=	0.87	L/min	Q3=	0.19	gal/min
L4= Ro4=	23.57	m	Q4=	4.95	m³/day	Q4=	3.44	L/min	Q4=	0.76	gal/min
L5= Ro5=	21.16	m	Q5=	69.92	m³/day	Q5=	48.56	L/min	Q5=	10.68	gal/min
L6= Ro6=	83.78	m	Q6=	109.89	m³/day	Q6=	76.31	L/min	Q6=	16.79	gal/min
L7= Ro7=	228.44	m	Q7=	612.17	m³/day	Q7=	425.09	L/min	Q7=	93.51	gal/min
L8= Ro8=	685.88	m	Q8=	3,956.80	m³/day	Q8=	2,747.60	L/min	Q8=	604.39	gal/min
L9= Ro9=	2132.44	m	Q9=	28,902.14	m³/day	Q9=	20,069.65	L/min	Q9=	4,414.70	gal/min
L10= R10=	6706.88	m	Q10=	228,742.43	m³/day	Q10=	158,838.75	L/min	Q10=	34,939.60	gal/min

Appendix H

MECP Well Records

(755)

UTM | Z | E

C05 R 14 N

Elev. 0 4 R 19 1 20

Basin 23

The Ontario Water Resources Commission Act

WATER WELL RECORD

GROUND WATER BRANCH
67 No 2369
OCT 28 1963
ONTARIO WATER RESOURCES COMMISSION

County or District Wellington Township, Village, Town or City PUSLINCH

Con. 4 Lot 19 Date completed 22 (day) Oct (month) 63 (year)

[redacted] ress 95 St Arnaud Street Guelph
ARNAUD

Casing and Screen Record

Inside diameter of casing 6 1/4

Total length of casing 130

Type of screen —

Length of screen —

Depth to top of screen —

Diameter of finished hole 6 1/4

Pumping Test

Static level 53 Ground level

Test-pumping rate 25 G.P.M.

Pumping level 60

Duration of test pumping 1/2 hr

Water clear or cloudy at end of test clear

Recommended pumping rate 15 G.P.M.

with pump setting of 75 feet below ground surface

Well Log / Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
Pit	0	5	130	fresh
Sandy clay with gravel and stones	5	75		
Muddy silty sand	75	120		
Sand and Gravel	120	125		
Gravel	125	130		

For what purpose(s) is the water to be used? Small for farm and Purposed house

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Wesley Packham

Address Smithville

Licence Number 918

Name of Driller or Borer W. Packham

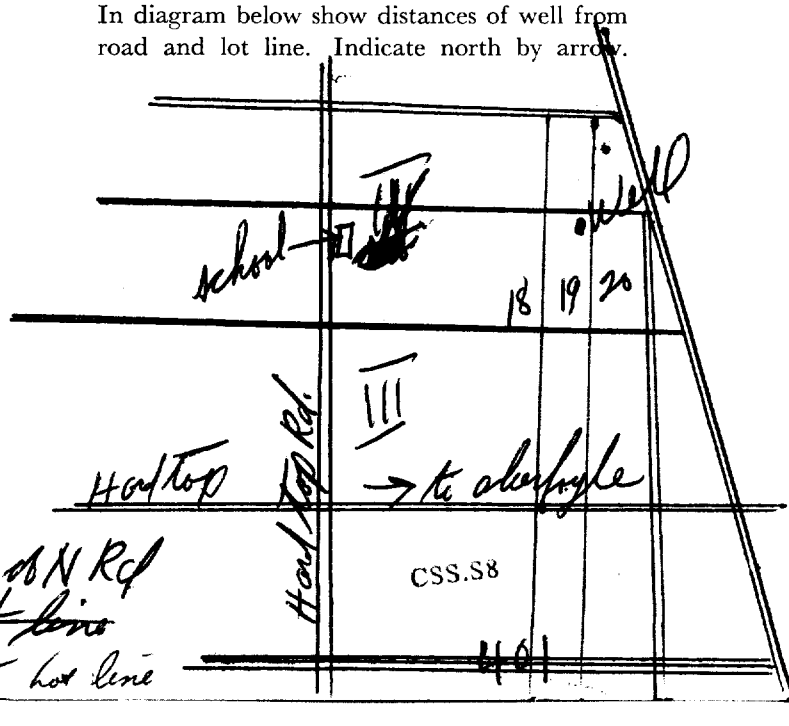
Address Smithville

Date Oct 22/63

[redacted] tractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



450 ft S of N Rd
~~near 20 lot line~~
700' W. of EAST lot line

Form 7 15M-60-4138

OWRC COPY

UTM Z E

5 R
CON IV N

Elev. 6 R 1140
LOT 20

Basin 23

The Ontario Water Resources Commission Act, 1957

67 No 2870
GROUND WATER BRANCH
MAY 4 1959
ONTARIO WATER RESOURCES COMMISSION

WATER WELL RECORD

County or District Wellington Township, Village, Town or City Puslinch

Con. 4 Lot 20 Date completed April 30th 1959 (day month year)

[redacted] Address R R # 6 Guelph Ont.

Casing and Screen Record

Inside diameter of casing 4½ inch
Total length of casing 137½ ft
Type of screen nil
Length of screen nil
Depth to top of screen nil
Diameter of finished hole 4½ inch

Pumping Test

Static level 70 FT
Test-pumping rate 8 G.P.M.
Pumping level 80 FT
Duration of test pumping 2 hours
Water clear or cloudy at end of test clear
Recommended pumping rate 6 G.P.M.
with pumping level of 80 FT

Well Log

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
top soil	-0	2	140-160'	90 FT	fresh
br. clay-big stones	2	25			
br. clay - gravel	25	52			
fine gravel	52	70			
fine sand	70	87			
grey clay - fine sand	87	104			
coarse sand	104	112			
grey clay coarse sand	112	128			
coarse sand gravel	128	133			
rock(br. limestone)	133	160			
Total depth - 160 ft.					

For what purpose(s) is the water to be used?
house

Is well on upland, in valley, or on hillside?
Hillside

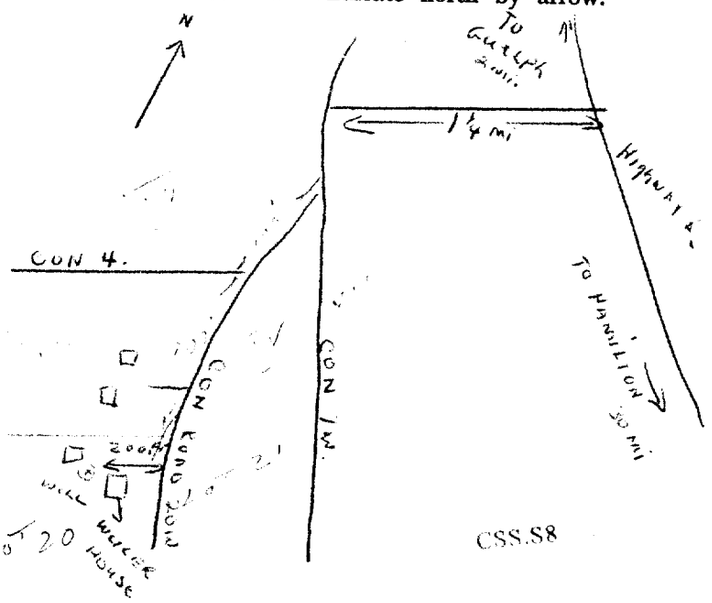
Drilling Firm J L Graham
Address R R # 3 Guelph Ont.

Licence Number 157
Name of Driller Robert H Graham
Address R R # 3 Guelph Ont.
Date May 1st 1959

[redacted] J L Graham per.
(Signature of Licensed Drilling Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

Form 5
15M-58-4149

UTM Z E

5 R N

Elev. 5 R 1 1 1 0

Basin 2 3

County or District Wellington

Con. 4 Lot 21

[redacted]

GROUND WATER BRANCH
67 No 2371
FEB 19 1962
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act

WATER WELL RECORD

Township, Village, Town or City Puslinch

Date completed 6th February 1962 (day month year)

Address R R # 6 Guelph Ont.

Casing and Screen Record

Inside diameter of casing 4¼ inch

Total length of casing 129 ft

Type of screen none

Length of screen nil

Depth to top of screen nil

Diameter of finished hole 4¼ inch

Pumping Test

Static level 60 ft

Test-pumping rate 8 G.P.M.

Pumping level 115 ft

Duration of test pumping 3 hrs

Water clear or cloudy at end of test clear

Recommended pumping rate 8 G.P.M.

with pump setting of 115 ft feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
large boulders , clay	0	10	215 ft	fresh
clay small stones	10	45		
soft clay grey	45	70		
brown clay	70	82		
grey clay	82	100		
large stones	100	110		
hard pan	110	125		
brown rock	125	190		
black rock	190	205		
light grey rock	205	230		

For what purpose(s) is the water to be used?

farm

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm

J L Graham Drilling Contractor

Address 119 Renfield St. Guelph Ont.

Licence Number 481

Name of Driller or Borer Arthur Titus

Address Yarmouth Street Guelph Ont.

Date February 16th 1962

J L Graham per

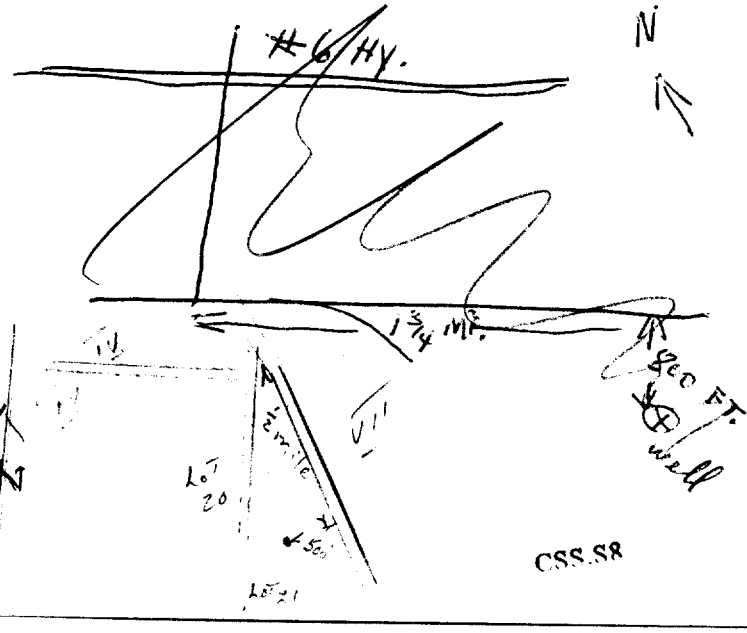
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M Sets 60-5930

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



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UTM | | Z | | | | | | E

9 R | | | | | | | N

Elev. 9 R 1132

Co. 12 Kil

Basin 12 Lot 13

16d

ONTARIO

The Water-well Drillers Act, 1954

Department of Mines

GROUND WATER BRANCH
DEC 3 1957
67 No. 2496
ONTARIO WATER RESOURCES COMMISSION

Water-Well Record

*Wellington

[redacted] ip, Village, Town or City Puslinch

Village, Town or City)

Address RR 6 Guelph ONT

Date completed 22 October 1957
(day) (month) (year)

Pipe and Casing Record		Pumping Test	
Casing diameter(s)	5 inch	Static level	50 FT
Length(s)	125 FT	Pumping rate	900 GPH
Type of screen	NONE	Pumping level	53 FT
Length of screen	NONE	Duration of test	2½ hrs

Well Log / **Water Record**

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
Boulders	0	28	125'–128'	78'	Fresh
Sand Gravel	28	57			
Silt Sand	57	69			
Brown Clay	69	80			
Sand	80	95			
Silt Small Stones	95	108			
Sand Gravel	108	120			
Gravel	120	122			
Silt	122	125			
Brown Rock	125	128			

For what purpose(s) is the water to be used? farm

Is water clear or cloudy? clear

Is well on upland, in valley, or on hillside?

Drilling firm J. L. Graham

Address RR3 Guelph ONT

Name of Driller George Peres

Address 72 Carden St Guelph

Licence Number 764

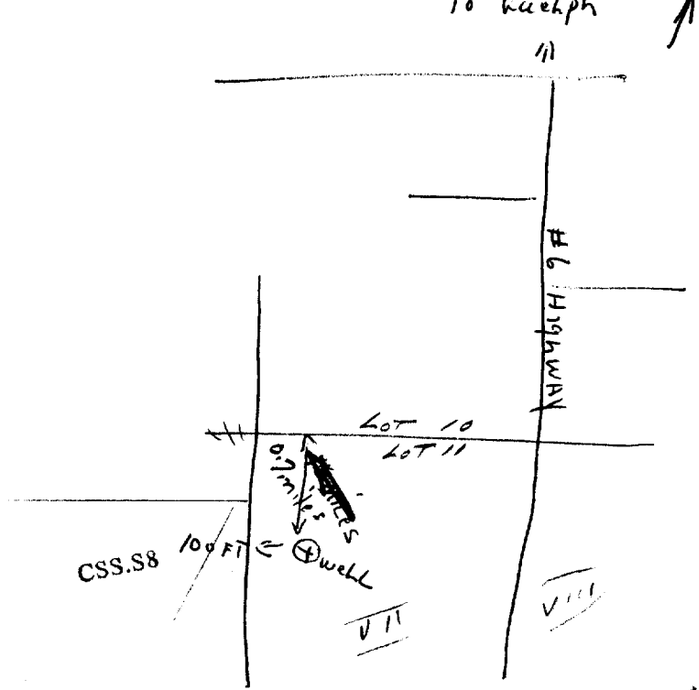
I certify that the foregoing statements of fact are true.

Date Oct 22/57 [redacted]

Signature of Licensee mcb

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS.S8

Form 5

UTM | Z | E
5 R | N
Elev. 4 R 1 1 2
Basin 23
CON VII
LOT 14

(540)

ONTARIO

67 No. 2498

GROUND WATER BRANCH
FEB 9 1959
ONTARIO WATER RESOURCES COMMISSION

The Water-well Drillers Act, 1954
Department of Mines

Water-Well Record

County or Territorial District Wellington Township, Village, Town or City Puslinch
[redacted] Village, Town or City) R R # 6 Guelph On
[redacted] ddress R R # 6 Guelph Ont.
Date completed [redacted] (day) (month) (year)

Pipe and Casing Record	Pumping Test
Casing diameter(s) 4½ inch I.D.	Static level 70 ft
Length(s) 144 ft.	Pumping rate 600 G.P.H.
Type of screen none	Pumping level 70 ft
Length of screen none	Duration of test 2½ hours

Well Log / **Water Record**

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
clay gravel boulders	0	10	148'-152'	82 ft.	fresh
sand & boulders	10	22			
fine sand	22	45			
gravel	45	67			
sand	67	81			
brown clay	81	93			
hard pan	93	97			
silty clay	97	133			
hard pan	133	137			
brown rock	137	152			

For what purpose(s) is the water to be used?
farm
Is water clear or cloudy? clear
Is well on upland, in valley, or on hillside?
upland
Drilling firm J. L. Graham
Address R R # 3 Guelph Ont.

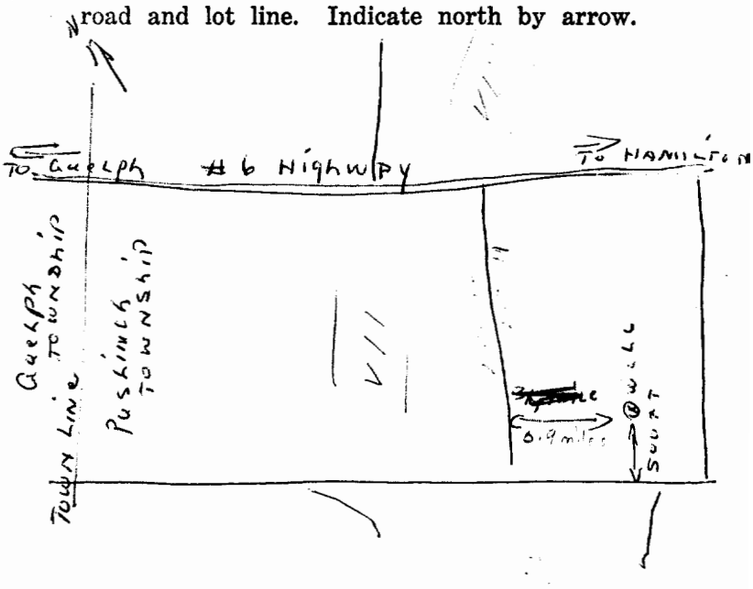
Name of Driller George Peres
Address 72 Cardeh Street, Guelph Ont.
Licence Number 764

I certify that the foregoing statements of fact are true.

Date Jan 26th/59 J. L. Graham [redacted]
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

CS$.S8

UTM 36 Z Con VII E

5 R Lot 14 N

Elev. A R 1110

Basin 23

The Ontario Water Resources Commission Act

WATER WELL RECORD

67 No. 2499

WATER RESOURCES COMMISSION

ONTARIO WATER RESOURCES COMMISSION

County or District Well

Township, Village, Town or City Puslinch

Con. 7 VII Lot 14

Date completed 1st Sept 1967 (day month year)

[redacted]ress R R 6 Guelph

Casing and Screen Record

Inside diameter of casing 5"

Total length of casing 67 Feet

~~Type of screen~~

~~Length of screen~~

~~Depth to top of screen~~

Diameter of finished hole 5"

Pumping Test

Static level 50 Feet

Test-pumping rate 12 G.P.M.

Pumping level 56

Duration of test pumping 2 hours

Water clear or cloudy at end of test clear

Recommended pumping rate 8 G.P.M.

with pump setting of 60 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
stones clay gravel	0	40		
sand	40	45		
gravel	45	51		
sand	51	60		
stones gravel	60	67	67	fresh

For what purpose(s) is the water to be used? house

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm Albert Earley

Address 202 Neeve St

Licence Number 2423

Name of Driller or Borer Albert Earley

Address 202 Neeve St

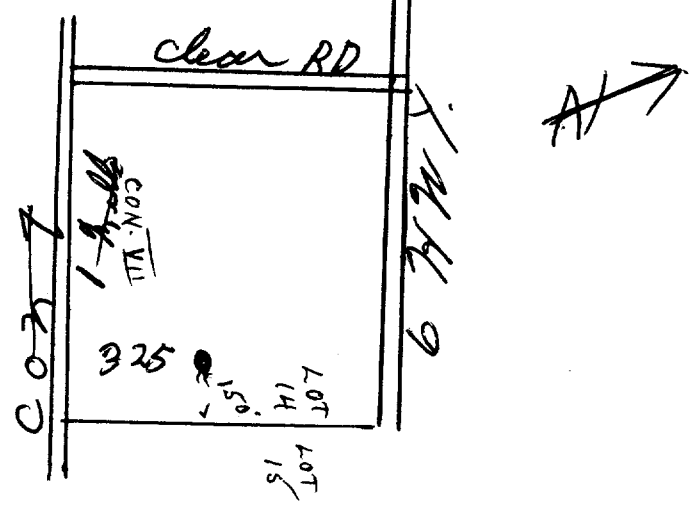
Date Sept 4 1967

[redacted]

(Signature of Licensed Drilling or Boring Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 7 15M-60-4138

OWRC COPY

CSS.S8

Con IV Lot 20

40 P/89

CODED

6703187

3 9

WATER RESOURCES COMMISSION

ONTARIO WATER RESOURCES COMMISSION

Rotary - KP
driller - Graham
helper - Mollison

Elev. 5 R 1132

23

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District Wellington Township, Village, Town or City Puslinch twsp.

Con. #4 Lot #20 Date completed 31st July 1968 (day month year)

[redacted]dress ~~35 Nicklin Crt.~~ RR. #6 Guelph, Ont.

Casing and Screen Record

Inside diameter of casing 4 inch

Total length of casing 148 ft

Type of screen ---

Length of screen ---

Depth to top of screen ---

Diameter of finished hole 4 inch

Pumping Test

Static level 69 ft

Test-pumping rate 6 G.P.M.

Pumping level 100 ft

Duration of test pumping ¾ hour

Water clear or cloudy at end of test clear

Recommended pumping rate 6 G.P.M.

with pump setting of 120 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
brown clay and stones	0	60	155'	fresh
brown clay & gravel	60	105	180 '	
grey clay & sand	105	123		
grey clay, gravel	123	140		
brown rock	140	180		
black rock	180	190		
total depth - 190 ft				

For what purpose(s) is the water to be used? domestic

Is well on upland, in valley, or on hillside? hillside

Drilling or Boring Firm GRAHAM WELL DRILLING

Address (mailing) 51 Gladstone Ave. Guelph Ont.

Licence Number 2855

Name of Driller or Borer Robert Graham

Address 212 Waverley Dr Guelph

Date July 31st 1968

J L Graham [redacted]

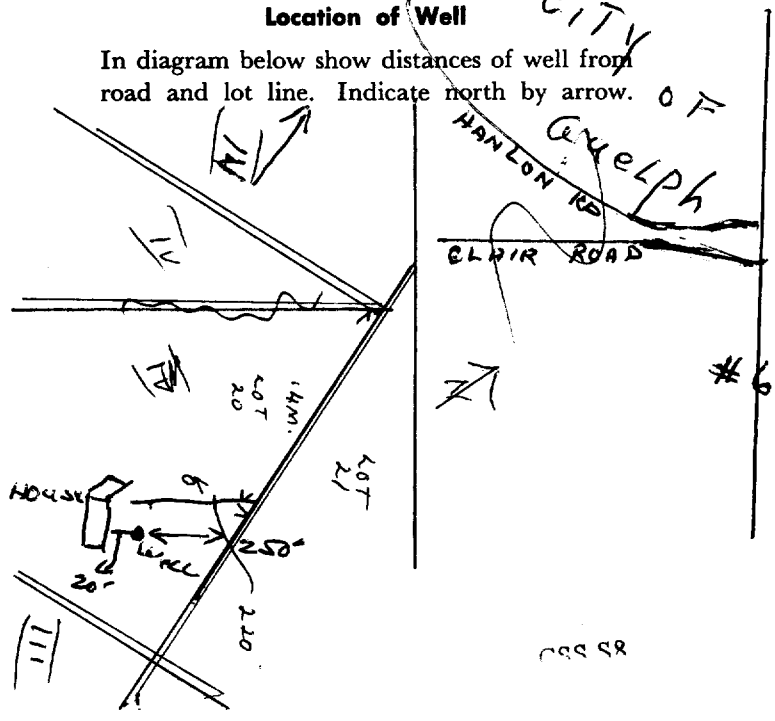
(Signature of Licensed Drilling or Boring Contractor)

Form 7 5M 60-20912

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CSS 58

40 P 8g

The Ontario Water Resources Commission Act

WATER WELL RECORD

6703600.

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

(11)

MUNICIP. 6701/2 CON. C & N 04

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Puslinch	#4	#019

OWNER (SURNAME FIRST) [redacted] ADDRESS Ridgeway Ave. Guelph Ont.

DATE COMPLETED DAY 28 MO. Jan YR 1970 (01 70)

HING 8/13390 RC. 4 ELEVATION 1100 RC. 5 BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
brown	dlay	stones		0	20
brown	clay	[redacted] sand, gravel		20	50
	gravel			50	60
brown	clay	gravel		60	93
brown	sand			93	98
brown	clay	gravel		98	120
lt. brown	rock			120	140
dk. brown	rock			140	175
lt brown & grey rock				175	183
		total depth - 183 ft.			

31 a020dast12 a050dast09/11 a060 11 a093dast11 a098d08 a148dast11 1

32g - [redacted] Syms Erie 22w8(1)

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0180'– 183	☒ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL
	☐ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL
	☐ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL
	☐ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL
	☐ 1 FRESH ☐ 3 SULPHUR ☐ 2 SALTY ☐ 4 MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
	☒ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☐ 4 OPEN HOLE	.188	0	0123'
	☐ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☒ 4 OPEN HOLE		123	0183
	☐ 1 STEEL ☐ 2 GALVANIZED ☐ 3 CONCRETE ☐ 4 OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	DEPTH SET AT – FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: ☐ 1 PUMP ☒ 2 BAILER

PUMPING RATE: 0010 GPM. DURATION OF PUMPING: 01 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: ☐ 1 PUMPING ☒ 2 RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
030 FEET	040 FEET	030 FEET	FEET	FEET	FEET

IF FLOWING, GIVE RATE: GPM. PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: ☒ 1 CLEAR ☐ 2 CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

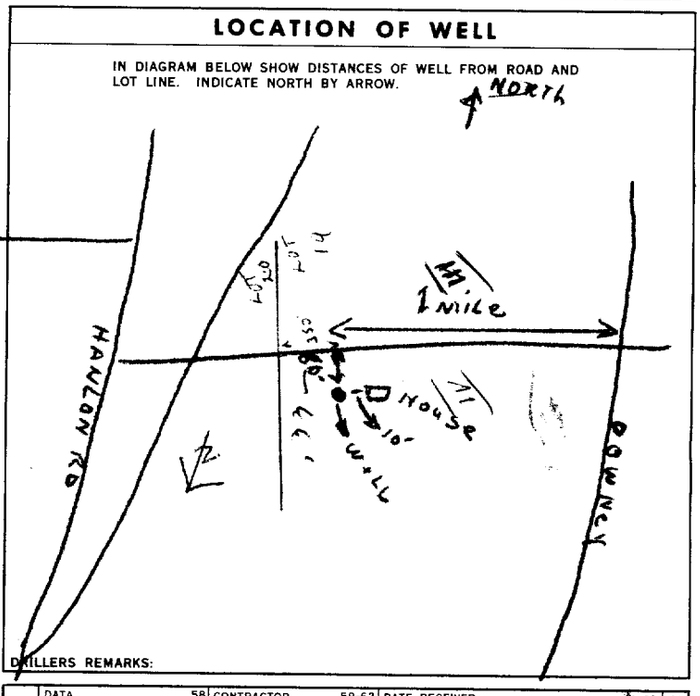
RECOMMENDED PUMP SETTING: 060 FEET

RECOMMENDED PUMPING RATE: 0010 GPM.

[redacted] GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 54: 1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE 55-56 01: ☒ DOMESTIC; ☐ STOCK; ☐ IRRIGATION; ☐ INDUSTRIAL; ☐ OTHER; ☐ COMMERCIAL; ☐ MUNICIPAL; ☐ PUBLIC SUPPLY; ☐ COOLING OR AIR CONDITIONING; ☐ NOT USED

METHOD OF DRILLING 57 2: ☐ CABLE TOOL; ☒ ROTARY (CONVENTIONAL); ☐ ROTARY (REVERSE); ☐ ROTARY (AIR); ☐ AIR PERCUSSION; ☐ BORING; ☐ DIAMOND; ☐ JETTING; ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: GRAHAM WELL DRILLING — LICENCE NUMBER: 2406

ADDRESS: R R #2 Guelph Ont.

NAME OF DRILLER OR BORER: James W Hawkins — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: J L Graham per [redacted] SUBMISSION DATE: DAY 29 MO. Jan YR 70

OFFICE USE ONLY

DATA SOURCE 58: 1 — CONTRACTOR 59-62: 2406 — DATE RECEIVED 63-68: 100270

DATE OF INSPECTION: 13/3/70 — INSPECTOR: F/P S.C.

REMARKS: CSS.SS

7

OWRC COPY

The Ontario Water Resources Commission Act

WATER WELL RECORD

401/89

Water management in Ontario

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2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6703671 | MUNICIP. 67012 | CON. Con 04

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Puslinch	4	020

[redacted] R#6, ~~Galt~~ Guelph Ont.

DATE COMPLETED: DAY 18 MO. ~~04~~ 07 YR. 70

UTM NG 1 4 4 0 0 | RC. 4 | ELEVATION 1 1 2 0 | RC. 5 | BASIN CODE 2 3

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
Brown	Gravel	Stones, Clay		0	35
Br	Sand			35	85
Grey	Clay			85	106
Grey	Clay	Gravelly		106	143½
Brown	Limestone			143½	157

31 | 003561112 05 | 008560 9 | 010620 5 | 014420 5 IV | 015761 5

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0155	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
~~6~~ 6	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	~~145~~ 0145
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		145	0157 ~~157~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	DEPTH SET AT – FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

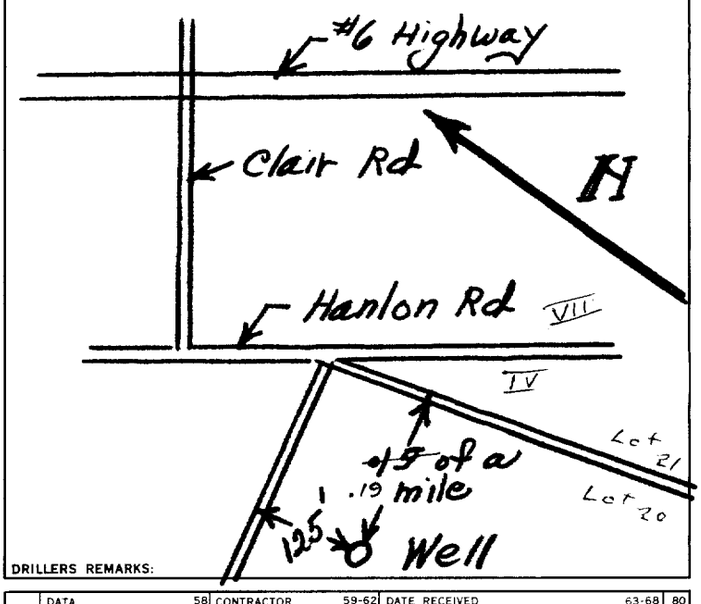
71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER	PUMPING RATE: 0018 GPM.	DURATION OF PUMPING: 01 HOURS 30 MINS.		
STATIC LEVEL: 054 FEET	WATER LEVEL END OF PUMPING: ~~154~~ 125 FEET	WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY		
		15 MINUTES: 100 FEET	30 MINUTES: 125 FEET	45 MINUTES: 125 FEET	60 MINUTES: 125 FEET
IF FLOWING, GIVE RATE: GPM.	PUMP INTAKE SET AT: FEET	WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY		
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP	RECOMMENDED PUMP SETTING: 125 FEET	RECOMMENDED PUMPING RATE: 0010 GPM.		

50-53 0002 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL	1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED
WATER USE 01	1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED
METHOD OF DRILLING	1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: George J. Wallis — LICENCE NUMBER: 5417

ADDRESS: RR #2 Stoney Creek

NAME OF DRILLER OR BORER: Same — LICENCE NUMBER:

[redacted] SUBMISSION DATE: 27 MO. 7 YR. 70

C COPY

OFFICE USE ONLY

DATA SOURCE	CONTRACTOR	DATE RECEIVED
1	5417	180670

DATE OF INSPECTION: 23/12/70 — INSPECTOR: P/E

REMARKS: CSS.S8

7

40P/89

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 (1 2) — ~~6703865~~ 6703865 — MUNICIP. 67012 (10 14) — CON. CON (15) 07 (22 23 24)

COUNTY OR DISTRICT (3 9)	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT (25-27)
WELLINGTON	PUSLINCH	7	014

[redacted] R.R.6 GUELPH — DATE COMPLETED (48-53): DAY 28 MO. ~~OCT~~ 10 YR. 70

		RC.	ELEVATION	RC.	BASIN CODE
	1395 0 (24)	4 (25)	1115 (26)	5 (30)	23 (31)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
		Top soil		0	1
		Clay gravel stones		1	22
		clay gravel		22	45
		gravel sand		45	70
		sand clay		70	99
Grey		Clay		99	118
		gravel clay sand		118	136
		Hard packed gravel		136	140
		Lime rock		140	165

31 aaa1 a2 | aaa2 ast N 1/2 | aa45 a5 N | aa7d 1/1 a9 | aa99 a9 ast | a1182 ast | 1

32 a130 1/1 a5 a9 | a140 1/1 | a165 1 ST (1 2 | 10 | 14 15 | 21 | 32 | 43 | 54 | 65 | 75 | 80)

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0165 (10-13)	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (14)
(15-18)	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (19)
(20-23)	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (24)
(25-28)	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (29)
(30-33)	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL (34) (80)

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
~~6~~ 4 (11)	1 ☒ STEEL (12) 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	205	0	~~140~~ 136 (16)
04				0141
(17-18)	1 ☐ STEEL (19) 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			(20-23) 0165
(24-25)	1 ☐ STEEL (26) 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			(27-30)

SCREEN

SIZE(S) OF OPENING (SLOT NO.) (31-33)	DIAMETER (34-38) INCHES	LENGTH (39-40) FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN (41-44) FEET	(80)

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
(10-13)	(14-17)	
(18-21)	(22-25)	
(26-29)	(30-33) (80)	

71 PUMPING TEST

PUMPING TEST METHOD (10)	PUMPING RATE (11-14)	DURATION OF PUMPING (15-16 HOURS, 17-18 MINS.)
1 ☒ PUMP 2 ☐ BAILER	0008 GPM.	02 HOURS 00 MINS.

STATIC LEVEL (19-21)	WATER LEVEL END OF PUMPING (22-24)	25 WATER LEVELS DURING 1 ☒ PUMPING 2 ☐ RECOVERY	15 MINUTES (26-28)	30 MINUTES (29-31)	45 MINUTES (32-34)	60 MINUTES (35-37)
070 FEET	100 FEET		100 FEET	100 FEET	100 FEET	100 FEET

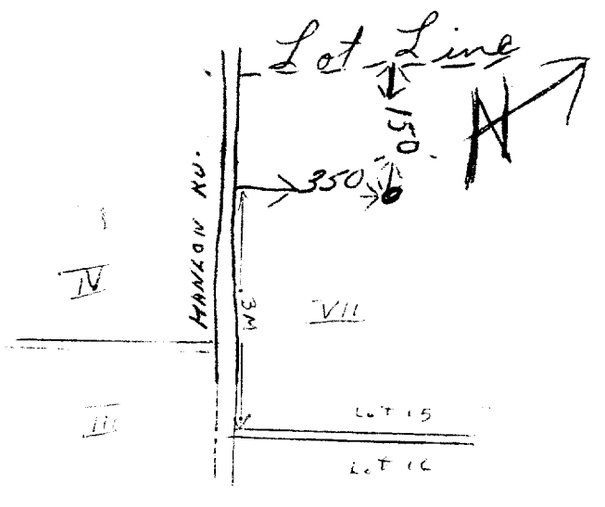
IF FLOWING, GIVE RATE (38-41)	PUMP INTAKE SET AT	WATER AT END OF TEST (42)
GPM.	100 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING (43-45)	RECOMMENDED PUMPING RATE (46-49)
☐ SHALLOW ☐ DEEP	120 FEET	0007 GPM.

(50-53) 000.3 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL (54)

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE (55-56) 01

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING (57)

1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Albert Earley — LICENCE NUMBER: 1906

ADDRESS: 202 Neeve St Guelph

NAME OF DRILLER OR BORER: Albert Earley — LICENCE NUMBER: 1906

SIGNATURE OF CONTRACTOR: [redacted] — SUBMISSION DATE: DAY 6 MO. Nov YR. 70

OFFICE USE ONLY

DATA SOURCE (58): 1 — CONTRACTOR (59-62): 1906 — DATE RECEIVED (63-68): 080171 (80)

DATE OF INSPECTION: 19 /2 /11 — INSPECTOR

REMARKS:

P

WI

OWRC COPY

40 P/89

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6703867 | MUNICIP. Guelph | CON. CON 04

COUNTY OR DISTRICT: Wellington. | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Puslinch Township | CON.; BLOCK, TRACT, SURVEY, ETC.: TRont Conc 4 IV | LOT: PT 19

[redacted] RR. #6 Guelph. | DATE COMPLETED: DAY 25 MO. 11 YR. 70

UTM | 81 33 20 | RC. 4 | ELEVATION 1094 | RC. 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
Brown		clay stones		0	15
		cars gravel		15	20
		Boulders		20	27
Gray		clay gravel		27	40
		Gravel		47	75
Gray		Clay sand		75	128
		Lime rock		128	160
Brown		rock		160	190

31 | 0015 | 0 | 05 | 12 | | 0020 | 11 | | 0027 | 13 | | 0040 | 20 | 05 | 11 | | 0075 | 11 | | 0128 | 20 | 05 | 09 | | 1

32 | 0160 | 15 | | 0190 | 26

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0170	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
0190	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
~~04~~	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	205"	0	~~0190~~ 0130
04			129-6	~~190~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0190
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	DEPTH SET AT – FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER | PUMPING RATE: 0010 GPM | DURATION OF PUMPING: 04 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
030 FEET	075 FEET	075 FEET	075 FEET	075 FEET	075 FEET

1 ☒ PUMPING 2 ☐ RECOVERY

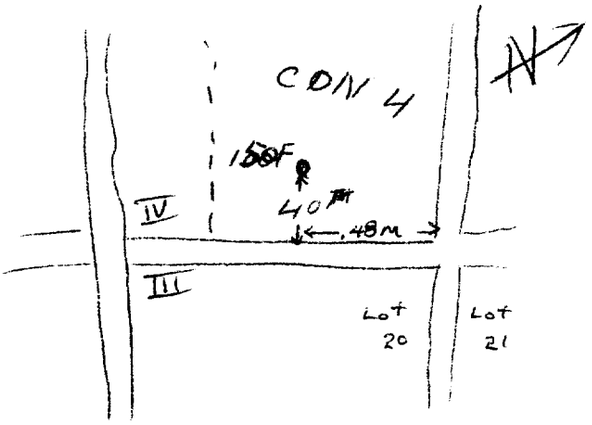
IF FLOWING, GIVE RATE: GPM. | PUMP INTAKE SET AT: 80 FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 080 FEET | RECOMMENDED PUMPING RATE: 0007 GPM.

000.2 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL (54)
1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE (55-56) 01
1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING (57)
1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Albert Earley | LICENCE NUMBER: 1906

ADDRESS: 202 Queen St Guelph

NAME OF DRILLER OR BORER: Albert Earley | LICENCE NUMBER: 1906

SIGNATURE OF CONTRACTOR: [redacted] | SUBMISSION DATE: DAY 25 MO. Nov YR. 70

OFFICE USE ONLY

DATA SOURCE 58: 1 | CONTRACTOR 59-62: 1906 | DATE RECEIVED 63-68: 080171

DATE OF INSPECTION | INSPECTOR

REMARKS: CSS.S8 | P L | WI

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The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

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2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6704249 | MUNICIP. GAIA | CON. GAN | 04

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Puslinch	4	020

[redacted] R # 6 Guelph Ont.

DATE COMPLETED: DAY 03 MO. 06 YR. 72

UTHING 8114060 | RC 4 | ELEVATION 1030 | RC 6 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
brown	clay	stones		0	50
"	"	gravel		50	80
"	" & sand			80	95
"	" "			95	132
"	" "	gravel		132	172
lt brown	rock			132	203
lt "	& grey rock			203	214
		total depth – 214 ft.			
rig #1					

31 | 0050 0057 12 | 0083 0087 11 | 0132 0138 28 | 0172 0178 28 11 | 0203 0206 | 0214 0220

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0190	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
0214 to 214	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
04	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0142 ~~141'6"~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		141'6"	0214 ~~214~~
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	DEPTH SET AT – FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0008 GPM | DURATION OF PUMPING: 01 HOURS 00 MINS.

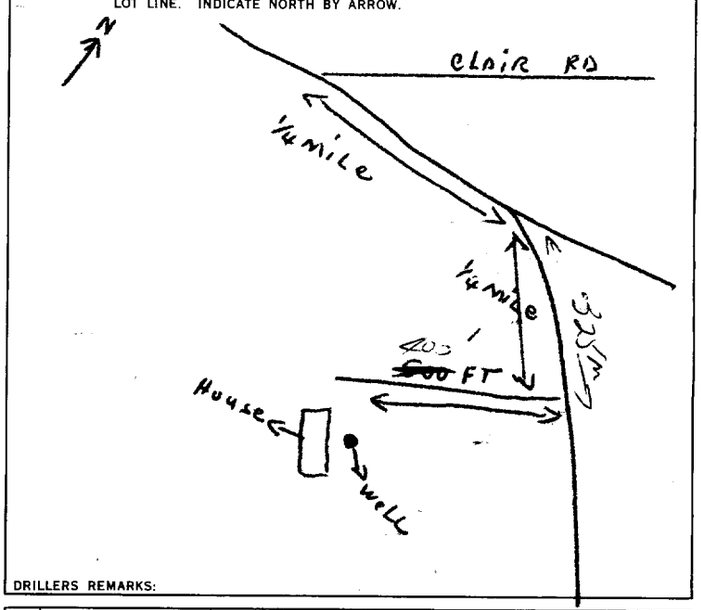
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
072 FEET	145 FEET	FEET	072 FEET	FEET	FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST	RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
GPM.	FEET	1 ☒ CLEAR 2 ☐ CLOUDY	☐ SHALLOW ☒ DEEP	160 FEET	0008 GPM.

50-53: 0010 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: GRAHAM WELL DRILLING | LICENCE NUMBER: 2406

ADDRESS: R R # 2 Guelph Ont.

NAME OF DRILLER OR BORER: James Hawkins | LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: J L Graham pe[redacted] | SUBMISSION DATE: DAY 15 MO. June YR. 72

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 2406 | DATE RECEIVED: 220672

DATE OF INSPECTION | INSPECTOR

REMARKS: CSS.SS | P | WI

OWRC COPY

The Ontario Water Resources Commission Act

WATER WELL RECORD

40P/89

Water management in Ontario

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2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6704390 | MUNICIP. 6791/2 | CON. GAN 04

COUNTY OR DISTRICT: Wellington | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Puslinch | CON., BLOCK, TRACT, SURVEY, ETC.: 4 | LOT: 018

[redacted] 11 King St Weston | DATE COMPLETED: DAY 11 MO. Aug YR. 72

G 1/3340 | RC. 4 | ELEVATION 1/010 | RC. 5 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
Brown	clay		Stones	0	10
Grey	gravel		Pit Run	10	35
Grey	clay and Gravel			35	70
Grey	sandy clay			70	101
Grey	Gravel			101	105

31 | 0010 0451 12 | 0035 12 W | 0070 2 451 W | 0101 2 451 28 | 0105 451 W

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0105	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	0105
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN: SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET | MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER | PUMPING RATE: 0025 GPM | DURATION OF PUMPING: 01 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
030 FEET	045 FEET		030 FEET	030 FEET	030 FEET	030 FEET

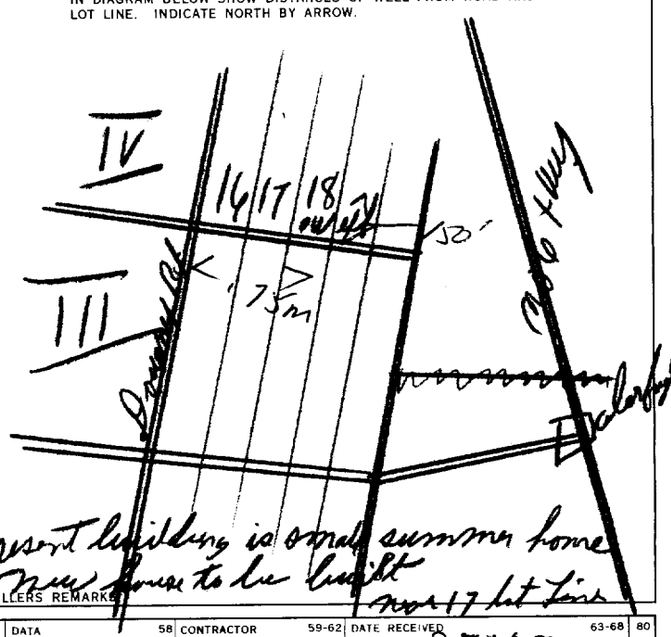
IF FLOWING, GIVE RATE: GPM. | PUMP INTAKE SET AT: FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 080 FEET | RECOMMENDED PUMPING RATE: 0010 GPM.

0001.7 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



FINAL STATUS OF WELL: 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01: 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING: 1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Wesley Packham | LICENCE NUMBER: 4208

ADDRESS: RR2 Ariss

NAME OF DRILLER OR BORER: [redacted] Packham | LICENCE NUMBER: 4207

[redacted] | SUBMISSION DATE: DAY 11 MO. Aug YR. 72

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 4208 | DATE RECEIVED 251072

DATE OF INSPECTION | INSPECTOR

REMARKS:

P | WI

OWRC COPY

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

40 P/86

Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6704958 | MUNICIP. 67012 | CON. CON 04

COUNTY OR DISTRICT: Wellington | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Pusleinch | CON., BLOCK, TRACT, SURVEY, ETC.: 4 | LOT: 020

[redacted] Hovam St Anton

DATE COMPLETED: DAY 25 MO. 09 YR 73

UTM 14514 | RC 4 | ELEVATION 1130 | RC 4 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	clay	Sandy		0	20
Grey	clay		Stony	20	78
Grey	gravel			78	80

31 | 00206528 | 00780512 | 00802111

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0080	1 ☒ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
06	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	~~80~~ 0080
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	15		
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER

PUMPING RATE: 0020 GPM | DURATION OF PUMPING: 01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
040 FEET	060 FEET		040 FEET	040 FEET	040 FEET	040 FEET

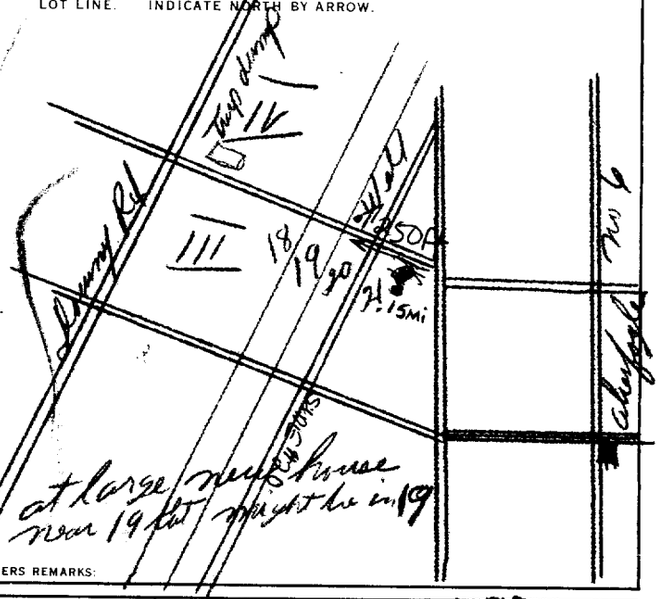
IF FLOWING, GIVE RATE: GPM | PUMP INTAKE SET AT: FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 075 FEET | RECOMMENDED PUMPING RATE: 0010 GPM

001.0

LOCATION OF WELL 6414

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 1

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING 2

1 ☐ CABLE TOOL 2 ☒ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Wesley Jackson | LICENCE NUMBER: 4508

ADDRESS: [redacted] Chesley

NAME OF DRILLER OR BORER: Wesley Jackson | LICENCE NUMBER: 4508

SIGNATURE OF CONTRACTOR: [redacted] | SUBMISSION DATE: DAY 25 MO. Sept YR 73

MINISTRY OF THE ENVIRONMENT COPY

OFFICE USE ONLY

DATA SOURCE 58: 1 | CONTRACTOR 59-62: 4208 | DATE RECEIVED 63-68: 29 01 74 | 80

DATE OF INSPECTION | INSPECTOR

REMARKS: CSS.S8 SWP

FORM 7 07-091

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

Ontario

40 P/86

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 6705284 MUNICIP. 67012 CON. C&N 04

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Puslinch	4	020

[redacted] R.R.# 6 GUELPH, Ontario

DATE COMPLETED: DAY 26 MO 09 YR 74

UTM 14146 RC 4 ELEVATION 1120 RC 4 BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	Topsoil			0	1
Brown	clay	sand, stones		1	67
Gray	"	stones		67	130
Brown	rock			130	147
			Total Depth 147 feet		

31 0001 02 0067605 28 12 0130 20 512 0147 626

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0147	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
05"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0130
05"	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		130	0147
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	0020 GPM.	01 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
066 FEET	089 FEET		066 FEET	FEET	FEET	FEET

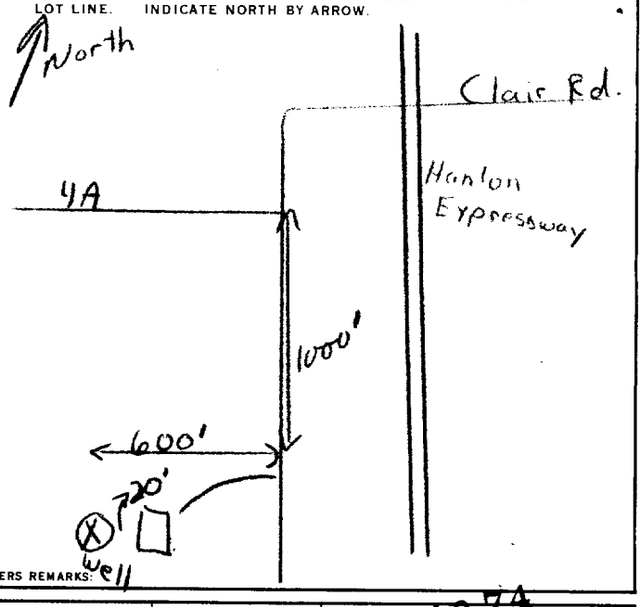
IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	110 FEET	0015 GPM

0000.9 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL 6414

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 1

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING 2

1 ☐ CABLE TOOL 2 ☒ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: GRAHAM WELL DRILLING LIMITED — LICENCE NUMBER: 2336

ADDRESS: 212 Waverley Drive, GUELPH, Ontario

NAME OF DRILLER OR BORER: RH Graham — LICENCE NUMBER: 10R

SIGNATURE OF CONTRACTOR: [redacted] — SUBMISSION DATE: DAY 26 MO. 9 YR. 74

OFFICE USE ONLY

DATA SOURCE 1 — CONTRACTOR 2336 — DATE RECEIVED 07 10 74

DATE OF INSPECTION — INSPECTOR

REMARKS: CSS SS — P9A — WI

MINISTRY OF THE ENVIRONMENT COPY

FORM 7 07-091

MINISTRY OF THE ENVIRONMENT

The Ontario Water Resources Act

WATER WELL RECORD

40P/89

Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6705967 | MUNICIP 67012 | CON. CON 03

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
WELL [redacted]	PUSLINCH	3 CON.	020
[redacted]	RR#6 GUELPH.	DATE COMPLETED DAY 16 MO 9 YR 76	

RC | ELEVATION | RC | BASIN CODE | II | III | IV

6705967 11 564750 4813424 4 1118 4 23 AUG 09, 1977 319

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	S	sand Gravel Boulders		0	50
Brown		fine sand		50	110
/		sand Gravel		110	130
Brown		shaly Lime Stone		130	140
Grey		rock		140	180
White		rock		180	200

31 | 0050 | 0281 | 1153 | 0110 | 6080 | 0130 | 2811 | 0140 | 1715 | 0180 | 0226 | 0200 | 0126

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0175	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
0197	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
05	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ [redacted]	188	0	~~140~~ 0140
			140	~~200~~ 0200
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE			0200
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER

PUMPING RATE: 0011 GPM | DURATION OF PUMPING: 03 HOURS 00 MINS

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
056 FEET	056 FEET	056 FEET	056 FEET	056 FEET	056 FEET

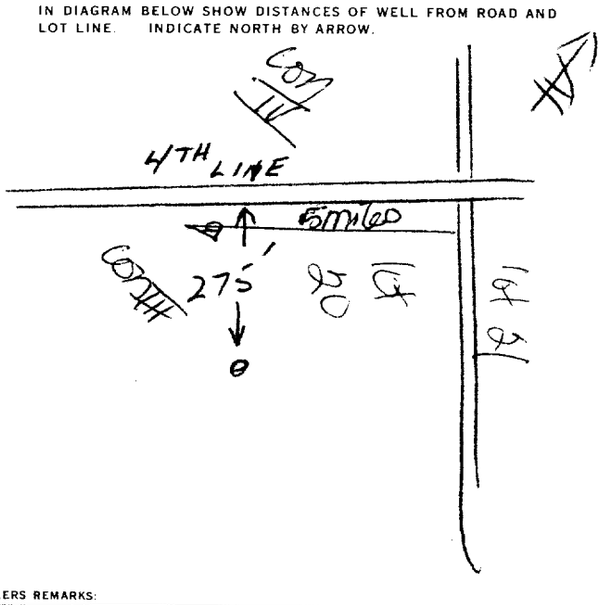
IF FLOWING, GIVE RATE: GPM | PUMP INTAKE SET AT: 80 FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING: 080 FEET | RECOMMENDED PUMPING RATE: 0011 GPM

GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL 6413

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 1

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 01

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING 1

1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Albert Carlson | LICENCE NUMBER: 1906

ADDRESS: 202 Nerve St Guelph

NAME OF DRILLER OR BORER: Lloyd Trodden | LICENCE NUMBER: 1906

SIGNATURE OF CONTRACTOR [redacted] | SUBMISSION DATE DAY 16 MO Jan YR 77

OFFICE USE ONLY

DATA SOURCE 1 | CONTRACTOR 1906 | DATE RECEIVED 050476

DATE OF INSPECTION | INSPECTOR

REMARKS: CSS.S8 | P | WI

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FORM 7 MOE 07-

Ministry of the Environment

Ontario

The Ontario Water Resources Act

WATER WELL RECORD

40 P/8g

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 6706533 | MUNICIP 67012 | CON. CON 04

COUNTY OR DISTRICT: WELLINGTON | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Peel Twp | CON., BLOCK, TRACT, SURVEY, ETC.: 4 | LOT: 20 19-30

[redacted]

DATE COMPLETED: DAY 6 MO Sept YR 77

NG 13800 | RC 4 | ELEVATION 1110 | RC 4 | BASIN CODE 23

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	Top soil			0	1
	Brown	sand + gravel		1	73
	grey	silty sand, gravel + clay streaks		73	147
	grey	clay + hardpan		147	154
	Brown	limestone		154	160

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
160	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
5	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE	188	0	155
5	4 ☒ OPEN HOLE		155	160
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER	PUMPING RATE: 20 GPM	DURATION OF PUMPING: 1½ HOURS ___ MINS	
STATIC LEVEL: 70 FEET	WATER LEVEL END OF PUMPING: 82 FEET	WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY	
15 MINUTES: FEET	30 MINUTES: FEET	45 MINUTES: FEET	60 MINUTES: 82 FEET
IF FLOWING GIVE RATE: GPM	PUMP INTAKE SET AT: 100 FEET	WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY	
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP	RECOMMENDED PUMP SETTING: 100 FEET	RECOMMENDED PUMPING RATE: 10 GPM	

FINAL STATUS OF WELL

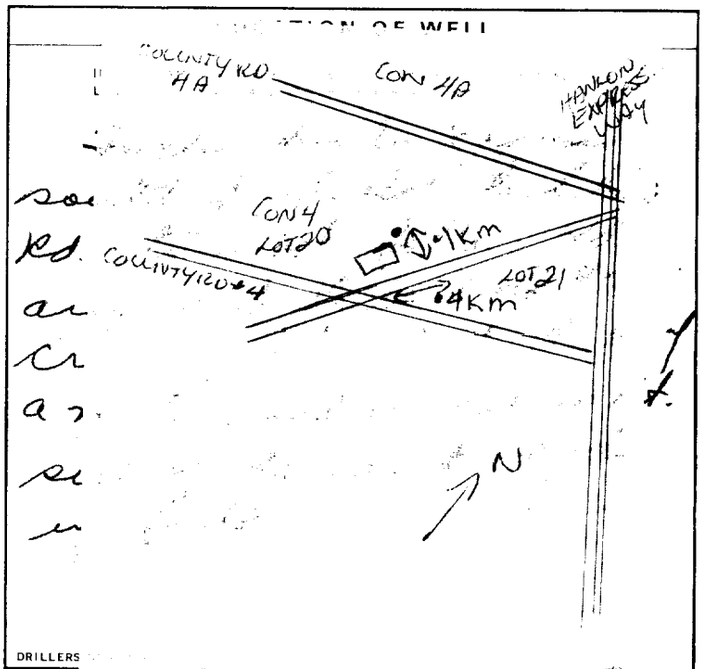
1 ☒ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☐ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE

1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☐ CABLE TOOL
2 ☒ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING



DRILLERS

CONTRACTOR

NAME OF WELL CONTRACTOR: Paul Weber Water Wells | LICENCE NUMBER: 5469

ADDRESS: RR 2 Bradam

NAME OF DRILLER OR BORER: K. Frankl | LICENCE NUMBER: 5469

SIGNATURE OF CONTRACTOR: [redacted]

SUBMISSION DATE: DAY 15 MO. 10 YR. 77

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED

DATE OF INSPECTION: July 30, 1980 | INSPECTOR

REMARKS: CSS.S8 P-4N

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FORM NO. 0506—4—77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

11/79

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 — 6706982 — MUNICIP. 67012 — CON. CON 03

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY ETC	LOT
Wellington	Puslinch	3	021

[redacted] Pleasant Rd., Guelph, Ontario

DATE COMPLETED: DAY 17 MO Apr. YR 79

UTM ZONE 17 — EASTING 18 13300 24 — NORTHING RC 4 25 — ELEVATION 1110 26 RC 30 — BASIN CODE 23 31

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
	Top soil			0	1
Brown	Clay	Stones		1	47
Brown	Clay	Gravels		47	75
Gray	Clay	Gravels		75	128
L. Brown	Rock			128	158
D. Brown	Rock			158	171
		Total Depth			171

31 — 0091 02 — 0047 6051 2 — 5" & shoe — 0075 6051 11 — 0128 2051 11 — 0158 6112 75 — 0171 6112 65

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0165-170	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
05"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188	0	0128
05"	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		128	0171
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE: — DEPTH TO TOP OF SCREEN FEET:

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0010 GPM — DURATION OF PUMPING: 01 HOURS 00 MINS

WATER LEVEL DURING: 1 ☐ PUMPING 2 ☒ RECOVERY

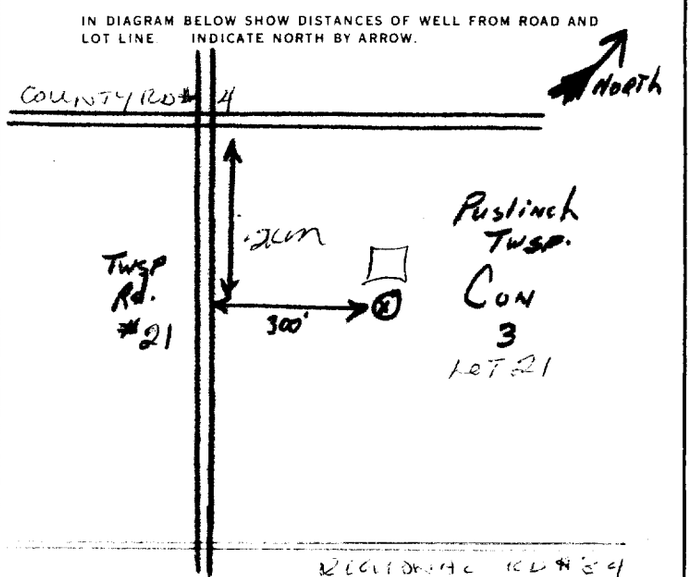
STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
060 FEET	075 FEET	060 FEET	FEET	FEET	FEET

IF FLOWING GIVE RATE: GPM — PUMP INTAKE SET AT: FEET — WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP — RECOMMENDED PUMP SETTING: 090 FEET — RECOMMENDED PUMPING RATE: 0010 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL 54: 1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 55-56: 01 — 1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING 57: 1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Graham Well Drilling Ltd. — LICENCE NUMBER: 2336

ADDRESS: Guelph, Ontario

NAME OF DRILLER OR BORER: J. Hawkins 22w — LICENCE NUMBER:

SIG [redacted] — SUBMISSION DATE: DAY 30 MO Apr. YR 79

OFFICE USE ONLY

DATA SOURCE 58: 1 — CONTRACTOR 59-62: 2336 — DATE RECEIVED 63-68: 010679 — 80

DATE OF INSPECTION: July 30, 1980 — INSPECTOR:

REMARKS: CSS.S8

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 6708305 MUNICIP CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
Wellington	Puslinch	Con. 4	19

[redacted]. 6 Guelph, Ontario

DATE COMPLETED: DAY 16 MO. 10 YR. 85

RC ELEVATION RC BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
brown	clay	stones		0	8
brown	gravel	clay		8	83
brown	sand			83	125
brown	gravel	sand		125	130

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
130	1 ☒ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
5	1 ☒ STEEL; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE	188	0	130
	1 ☐ STEEL; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE			
	1 ☐ STEEL; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER

PUMPING RATE: 10 GPM

DURATION OF PUMPING: 2 HOURS ____ MINS

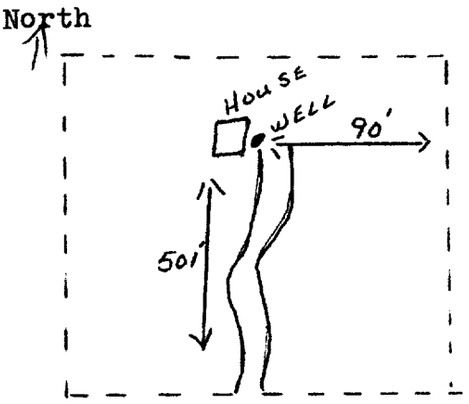
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
52 FEET	57 FEET	FEET	FEET	FEET	57 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	70 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	70 FEET	10 GPM

8976 LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL
1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE
1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF DRILLING
1 ☐ CABLE TOOL; 2 ☒ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☐ ROTARY (AIR); 5 ☐ AIR PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Hugh Morrison Well Drilling ltd. LICENCE NUMBER

ADDRESS: R.R. 5 Mount Forest, Ontario

NAME OF DRILLER OR BORER: Hugh Morrison LICENCE NUMBER: 3740

[redacted] SUBMISSION DATE: DAY ____ MO. ____ YR. ____

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED: 07 11 83

DATE OF INSPECTION | INSPECTOR

REMARKS

CSS.ES

MINISTRY OF THE ENVIRONMENT COPY

FORM NO. 0506—4—77 FORM 7

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

6708329

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

MUNICIP | CON

COUNTY OR DISTRICT: [redacted] | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Puslinch | CON. BLOCK, TRACT, SURVEY, ETC: VII | LOT: 14

[redacted] RR#6 Guelph Ont.

DATE COMPLETED: DAY 18 MO Sept YR 85

ELEVATION | RC | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	Clay	gravel		0	20
Gray	gravel	clay		20	80
Gray	clay			80	105
Gray	gravel	sand clay		105	114
Cleen	gravel			114	116

31

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
116	1 ☒ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	188	0	116
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP (Air) 2 ☐ BAILER | PUMPING RATE: 50 GPM | DURATION OF PUMPING: 1 HOURS 0 MINS

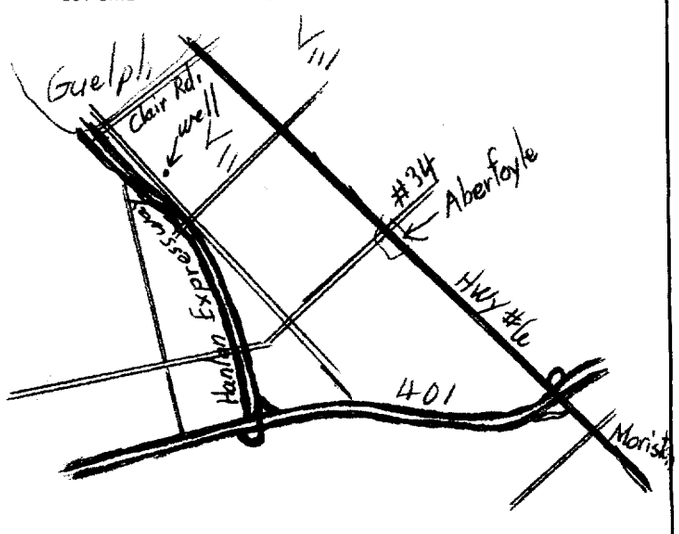
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
55 FEET	110 FEET		55 FEET	55 FEET	55 FEET	55 FEET

IF FLOWING, GIVE RATE: GPM | PUMP INTAKE SET AT: 110 FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 110 FEET | RECOMMENDED PUMPING RATE: 20 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE

1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF DRILLING

1 ☐ CABLE TOOL; 2 ☐ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☒ ROTARY (AIR); 5 ☐ AIR PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Packham Well Drilling Inc. | LICENCE NUMBER: 4207

ADDRESS: 1235 Trinity Rd Ancaster Ont.

NAME OF DRILLER OR BORER: Mervyn Packham | LICENCE NUMBER: 4207

SIGNATURE OF CONTRACTOR: [redacted] | SUBMISSION DATE: DAY 18 MO. Sept YR 85

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED: 09 0186

DATE OF INSPECTION | INSPECTOR

REMARKS

CSS.ES

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FORM NO. 0506—4—77 FORM 7

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

97/87

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

6708978

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON.	BLOCK	TRACT	SURVEY, ETC.	LOT
[redacted]	Puslinch	3				20

DATE COMPLETED: DAY 05 MO 010 YR 87

[redacted] 10 Princeton Place, Guelph, ONT.

BASIN CODE: W16-354

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	CLAY	SAND		0	20
"	"	" STONES		20	40
"	"	GRAVEL		40	60
"	"	" STONES	HARD	60	85
"	"	SAND		85	124
BROWN	ROCK		BROKEN	124	130
			TOTAL DEPTH	130	Ft.

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
127	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
5	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	126
5	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		126	130
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE: | DEPTH TO TOP OF SCREEN FEET:

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	20 GPM	1 HOURS ____ MINS

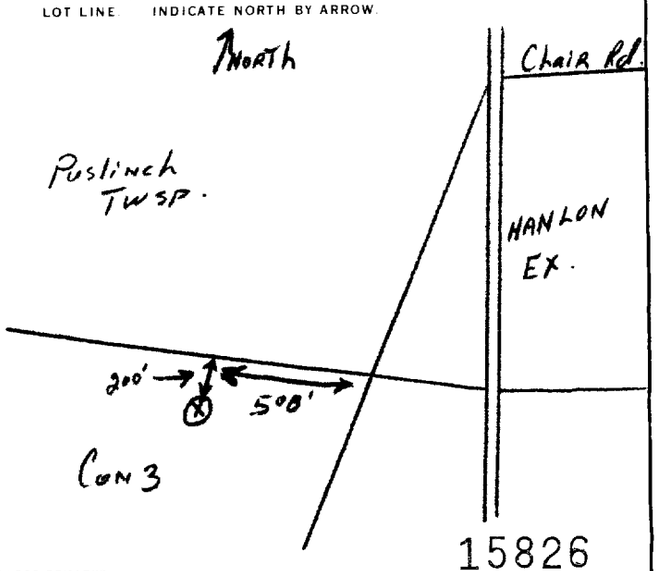
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
50 FEET	52 FEET	1 ☐ PUMPING 2 ☒ RECOVERY	50 FEET	FEET	FEET	FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	70 FEET	15 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



15826

DRILLERS REMARKS

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED 9 ☐ DEWATERING

WATER USE

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING 2336 ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Graham Well Drilling Ltd. | WELL CONTRACTOR'S LICENCE NUMBER: 2336

ADDRESS: Guelph, ONT.

NAME OF WELL TECHNICIAN: J. Hawkins | WELL TECHNICIAN'S LICENCE NUMBER: T-042

[redacted] TRACTOR | SUBMISSION DATE: DAY 030 MO 010 YR 87

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR | DATE RECEIVED: NOV 04 1987

DATE OF INSPECTION | INSPECTOR

REMARKS

CSS.ES

FORM NO. 0506 (11/86) FORM 9

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Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

20/88

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 6709239 MUNICIP CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON.	BLOCK, TRACT, SURVEY, ETC	LOT
WELLINGTON	PUSLINCH	4		PT 19

OWNER Puslinch Estates c/o LEUTHARD J. A. LTD.
ADDRESS P.O. BOX 111 N1H 656 GUELPH
DATE COMPLETED DAY 15 MO 04 YR 88

21 UTM ZONE EASTING NORTHING RC ELEVATION RC BASIN CODE II III IV

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	TOP SOIL			0	1
BROWN	CLAY, SAND			1	25
BROWN	SAND, GRAVEL			25	65
BROWN	FINE SAND			65	85
BROWN	CLAY SAND			85	119
BROWN	ROCK			119	124
			Total depth	124	ft

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
124	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	120
6	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC		120	124
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
10-13	14-17	
18-21	22-25	
26-29	30-33	

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	60 GPM	3 HOURS ___ MINS

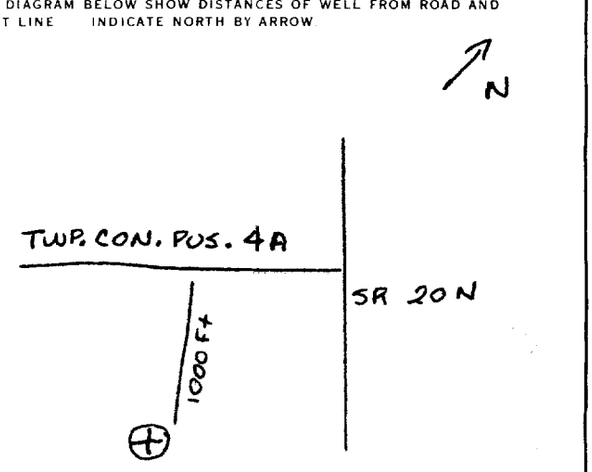
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
37 FEET	FEET	1 ☒ PUMPING 2 ☐ RECOVERY	FEET	FEET	FEET	39 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	100 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	80 FEET	60 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE INDICATE NORTH BY ARROW



21757

DRILLERS REMARKS

FINAL STATUS OF WELL
1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED 9 ☐ DEWATERING

WATER USE
1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF CONSTRUCTION
1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☒ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: GRAHAM WELL DRILLING LTD
WELL CONTRACTOR'S LICENCE NUMBER: 2336
ADDRESS: RR 5 ROCKWOOD
NAME OF WELL TECHNICIAN: JIM HAWKINS
WELL TECHNICIAN'S LICENCE NUMBER: T-0427
SUBMISSION DATE: DAY 30 MO 04 YR 88

OFFICE USE ONLY

DATA SOURCE
CONTRACTOR: 2336
DATE RECEIVED: MAY 17 1988
DATE OF INSPECTION
INSPECTOR
REMARKS

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FORM NO. 0506 (11/86) FORM 9

Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

2-95

11 6711686 Municipality 67012 Con. CON 04

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
[redacted]	PUSLINCH TWP	CON. 4	20

Address: RR#6 GUELPH, ONT. N1H-6J3

Date completed: 27 day 01 month 95 year

Northing | RC | Elevation | RC | Basin Code | ii | iii | iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth – feet From	Depth – feet To
BROWN	CLAY	STONES		0	25
BROWN	SAND	GRAVEL		25	50
BROWN	SAND			50	70
GREY	CLAY	GRAVEL		70	85
GREY	CLAY			85	130
L. BROWN	ROCK			130	145
M. BROWN	ROCK			145	158
			TOTAL DEPTH	158'	
		6" DRIVE SHOE			

41 WATER RECORD

Water found at – feet	Kind of water
158	1 [X] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas
	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas
	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas
	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas
	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth – feet From	Depth – feet To
6"	1 [X] Steel 2 [ ] Galvanized 3 [ ] Concrete 4 [ ] Open hole 5 [ ] Plastic	.188	+2	131
6"	1 [ ] Steel 2 [ ] Galvanized 3 [ ] Concrete 4 [X] Open hole 5 [ ] Plastic		131	158
	1 [ ] Steel 2 [ ] Galvanized 3 [ ] Concrete 4 [ ] Open hole 5 [ ] Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet
Material and type	Depth at top of screen feet	

61 PLUGGING & SEALING RECORD

[X] Annular space [ ] Abandonment

Depth set at – feet From	Depth set at – feet To	Material and type (Cement grout, bentonite, etc.)
0	25	BENSEAL

71 PUMPING TEST

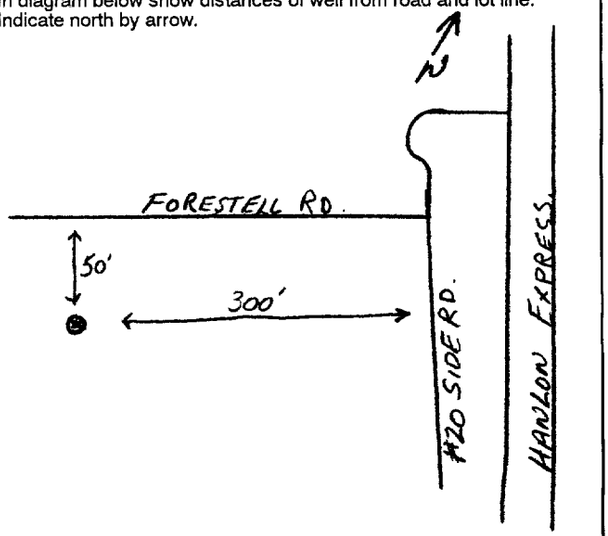
Pumping test method: 1 [X] Pump 2 [ ] Bailer
Pumping rate: 10 GPM
Duration of pumping: 3 Hours 0 Mins

Static level	Water level end of pumping	Water levels during: 1 [X] Pumping 2 [ ] Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
48'8" feet	58'6" feet	55'1" feet	56'3" feet	57' feet	57'4" feet

If flowing give rate: GPM
Pump intake set at: 90 feet
Water at end of test: [X] Clear [ ] Cloudy
Recommended pump type: [ ] Shallow [X] Deep
Recommended pump setting: 90 feet
Recommended pump rate: 10 GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



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FINAL STATUS OF WELL

1 [X] Water supply 2 [ ] Observation well 3 [X] Test hole 4 [ ] Recharge well 5 [ ] Abandoned, insufficient supply 6 [ ] Abandoned, poor quality 7 [ ] Abandoned (Other) 8 [ ] Dewatering 9 [ ] Unfinished 10 [ ] Replacement well

WATER USE

1 [X] Domestic 2 [ ] Stock 3 [ ] Irrigation 4 [ ] Industrial 5 [ ] Commercial 6 [ ] Municipal 7 [ ] Public supply 8 [ ] Cooling & air conditioning 9 [ ] Not used 10 [ ] Other

METHOD OF CONSTRUCTION

1 [ ] Cable tool 2 [ ] Rotary (conventional) 3 [ ] Rotary (reverse) 4 [X] Rotary (air) 5 [ ] Air percussion 6 [ ] Boring 7 [ ] Diamond 8 [ ] Jetting 9 [ ] Driving 10 [ ] Digging 11 [ ] Other

Name of Well Contractor: GRAHAM WELL DRILLING
Well Contractor's Licence No.: 2336
Address: RR.#5 ROCKWOOD, ONT. N0B-2K0
Name of Well Technician: TIM WILSON
Well Technician's Licence No.: T-1924
Signature of Technician/Contractor: [redacted]
Submission date: 28 day 02 mo 95 yr

MINISTRY USE ONLY
Data source | Contractor: 2336 | Date received: MAR 13 1995
Date of inspection | Inspector
Remarks

CSS.ES

0506 (07/94) Front Form 9

2 - MINISTRY OF ENVIRONMENT & ENERGY COPY

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 | 6713564 | Municipality 67012 | Con. CON 04

105-00

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
WELLINGTON	PUSLINCH TWP	CON 4	18

[redacted]

Address: 6945 FORESTELL RD GUELPH.

Date completed: 14 day 11 month 00 year

21 | UTM | Northing | RC | Elevation | RC | Basin Code | ii | iii | iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	CLAY	STONES		0	25
BROWN	SAND	GRAVEL		25	75
GREY	CLAY	SAND		75	120
GREY	SAND			120	130
GREY	CLAY	GRAVEL		130	136
BROWN	ROCK			136	180
			TOTAL DEPTH	180'	
		6" DRIVE SHOE			

31

32

41 WATER RECORD

Water found at - feet	Kind of water
170-180	1 ☒ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas 6 ☐

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6"	1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	+1	137
6"	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☒ Open hole 5 ☐ Plastic		137	180
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Material and type: | Depth at top of screen feet:

61 PLUGGING & SEALING RECORD

☒ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0	25	BENTONITE

71 PUMPING TEST

Pumping test method: 1 ☒ Pump 2 ☐ Bailer

Pumping rate: 18 GPM

Duration of pumping: 1 Hours 0 Mins

Static level: 51 feet

Water level end of pumping: 57 feet

Water levels during: 1 ☒ Pumping 2 ☐ Recovery

15 minutes	30 minutes	45 minutes	60 minutes
57 feet	57 feet	57 feet	57 feet

If flowing give rate: GPM

Pump intake set at: feet

Water at end of test: ☒ Clear ☐ Cloudy

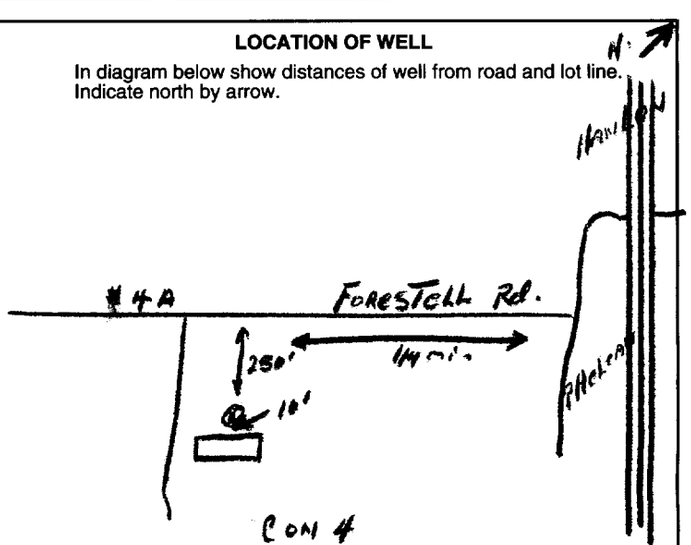
Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump setting: 100 feet

Recommended pump rate: 10-15 GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



224131

FINAL STATUS OF WELL

1 ☒ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well 5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE

1 ☒ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION

1 ☐ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☒ Rotary (air) 5 ☐ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
GRAHAM WELL DRILLING LTD	2336
Address: RR #5 ROCKWOOD, ONT. N0B-2K0	
Name of Well Technician: TIM WILSON.	Well Technician's Licence No.
Signature of Technician/Contractor: [redacted]	Submission date: 030 day 011 mo 00 yr

MINISTRY USE ONLY

Data source	Contractor	Date received
	2336	DEC 15 2000
Date of inspection	Inspector	
Remarks: CSS.ES0		

0506 (07/00) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 (1 2) **6713680** Municipality 67012 (10 14) Con. CON (15 22 23 24) 03

23-01

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot (25-27)
WELLINGTON	PUSLINCH TWP	CON 3	21

[redacted]

Address: 82 SUNNYLEA CR. GUELPH, ONT

Date completed (48-53): 16 (day) 05 (month) 01 (year)

21 (1 2) UTM (10 12 17 18 24) Northing (25) RC (26) Elevation (30) RC (31) Basin Code (47) ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
BROWN	CLAY	STONES		0	18
BROWN	SAND	GRAVEL - BOULDERS		18	65
GREY	CLAY	SAND		65	105
GREY	CLAY	GRAVEL		105	121
BROWN	ROCK			121	140
			TOTAL DEPTH	140'	
		6" DRIVE SHOE			

31 (10 14 15 21) 32 (32 43 54 65 75 80)

41 WATER RECORD

Water found at - feet	Kind of water
10-13: 137-140	1 [X] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas (14)
15-18	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas (19)
20-23	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas (24)
25-28	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas (29)
30-33	1 [ ] Fresh 2 [ ] Salty 3 [ ] Sulphur 4 [ ] Minerals 5 [ ] Gas (34) (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
10-11: 6"	1 [X] Steel (12) 2 [ ] Galvanized 3 [ ] Concrete 4 [ ] Open hole 5 [ ] Plastic	.188	+1	122 (13-16)
17-18: 6"	1 [ ] Steel (19) 2 [ ] Galvanized 3 [ ] Concrete 4 [X] Open hole 5 [ ] Plastic		122	140 (20-23)
24-25	1 [ ] Steel (26) 2 [ ] Galvanized 3 [ ] Concrete 4 [ ] Open hole 5 [ ] Plastic			(27-30)

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter (34-38) inches	Length (39-40) feet
Material and type	Depth at top of screen (41-44) feet	(30)

61 PLUGGING & SEALING RECORD

[X] Annular space [ ] Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
0 (10-13)	25 (14-17)	BENTONITE
18-21	22-25	
26-29	30-33	(60)

71 PUMPING TEST

Pumping test method (10): 1 [X] Pump 2 [ ] Bailer

Pumping rate (11-14): 16 GPM

Duration of pumping (15-16): 1 Hours (17-18): 0 Mins

25 Water levels during: 1 [X] Pumping 2 [ ] Recovery

Static level	Water level end of pumping	15 minutes	30 minutes	45 minutes	60 minutes
19-21: 49 feet	22-24: 52 feet	26-28: 52 feet	29-31: 52 feet	32-34: 52 feet	35-37: 52 feet

If flowing give rate (38-41): GPM

Pump intake set at: feet

Water at end of test (42): [X] Clear [ ] Cloudy

Recommended pump type: [ ] Shallow [X] Deep

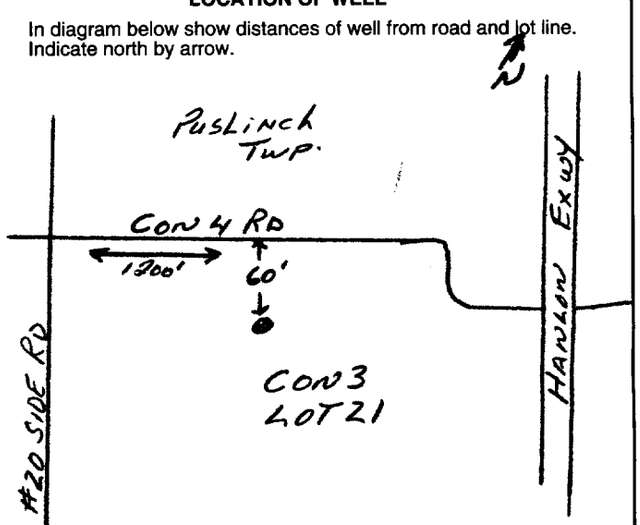
Recommended pump setting (43-45): 80 feet

Recommended pump rate (46-49): 10-15 GPM

(50-53)

LOCATION OF WELL

In diagram below show distances of well from road and lot line.
Indicate north by arrow.



224159

FINAL STATUS OF WELL (54)

1 [X] Water supply 2 [ ] Observation well 3 [ ] Test hole 4 [ ] Recharge well 5 [ ] Abandoned, insufficient supply 6 [ ] Abandoned, poor quality 7 [ ] Abandoned (Other) 8 [ ] Dewatering 9 [ ] Unfinished 10 [ ] Replacement well

WATER USE (55-56)

1 [X] Domestic 2 [ ] Stock 3 [ ] Irrigation 4 [ ] Industrial 5 [ ] Commercial 6 [ ] Municipal 7 [ ] Public supply 8 [ ] Cooling & air conditioning 9 [ ] Not use 10 [ ] Other

METHOD OF CONSTRUCTION (57)

1 [ ] Cable tool 2 [ ] Rotary (conventional) 3 [ ] Rotary (reverse) 4 [X] Rotary (air) 5 [ ] Air percussion 6 [ ] Boring 7 [ ] Diamond 8 [ ] Jetting 9 [ ] Driving 10 [ ] Digging 11 [ ] Other

Name of Well Contractor	Well Contractor's Licence No.
GRAHAM WELL DRILLING LTD	2336
Address: RR#5 ROCKWOOD, ONT. N0B-2K0	
Name of Well Technician: Tim Wilson	Well Technician's Licence No.: T-1924
Signature of Technician/Contractor: [redacted]	Submission date: 31 (day) 05 (mo) 01 (yr)

MINISTRY USE ONLY

Data source (58)	Contractor (59-62)	Date received (63-68) (80)
	2336	JUN 1 1 2001
Date of inspection	Inspector	
Remarks: CSS.ES1		

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0506 (07/00) Front Form 9

Ontario **Ministry of Environment and Energy**

The Ontario Water Resources Act

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 (1–2) **6714646** Municipality 67012 (10–14) Con. CON (15–22) 04 (23–24)

County or District [redacted] | Township/Borough/City/Town/Village PUSHMACH | Con Block tract survey, etc. 4 | Lot (25-27) S½ 20

Address of Well Location Side Rd 20 nr. Pushmach | Date completed (48-53) 08 day 10 month 03 year

21 (1–2) UTM Zone (10) Easting (12–17) Northing (18–24) RC (25) Elevation (26) RC (30) Basin Code (31) ii iii iv (47)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	TOP SOIL			0	1
BROWN	CLAY	SAND + STONES		1	15
BROWN	CLAY	GRAVEL		15	35
BROWN	GRAVEL	SAND		35	65
BROWN	CLAY	STONES + GRAVEL		65	122
BROWN	LIMESTONE	SOFT + BROKEN		122	140
BROWN	LIMESTONE		MED.	140	180
GREY	LIMESTONE		MED.	180	200
			TOTAL = 200 FT.		
		6 1/4" CASING DRIVE			

31 (1–2)

32 (10–14, 15–21, 32–43, 54–65, 75–80)

41 WATER RECORD

Water found at - feet	Kind of water
135 (10-13)	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (14)
200 (15-18)	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (19)
UNTESTED (20-23)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (24)
(25-28)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (29)
(30-33)	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas (34) (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6¼ (10-11)	1 ☑ Steel (12) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	12	122 (13-16)
6¼ (17-18)	1 ☐ Steel (19) 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		122	200 (20-23)
(24-25)	1 ☐ Steel (26) 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			(27-30)

SCREEN

Sizes of opening (Slot No.) (31-33) | Diameter (34-38) inches | Length (39-40) feet

Material and type | Depth at top of screen (41-44) feet (30)

61 PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0 (10-13)	20 (14-17)	BENSEAL
(18-21)	(22-25)	
(26-29)	(30-33)	(80)

71 PUMPING TEST

Pumping test method (10) 1 ☑ Pump 2 ☐ Bailer | Pumping rate (11-14) 20 GPM | Duration of pumping (15-16) 1 Hours (17-18) Mins

Static level (19-21) 52 feet | Water level end of pumping (22-24) 110 feet | Water levels during (25) 1 ☑ Pumping 2 ☐ Recovery

15 minutes (26-28) 110 feet | 30 minutes (29-31) 110 feet | 45 minutes (32-34) 110 feet | 60 minutes (35-37) 110 feet

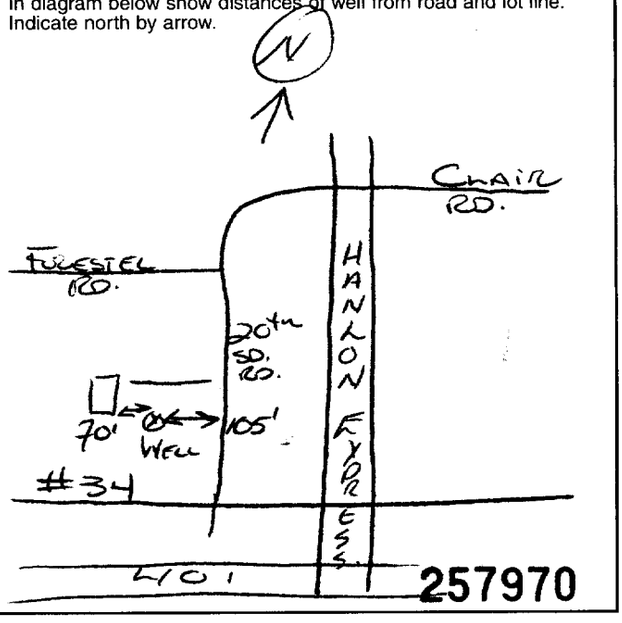
If flowing give rate (38-41) GPM | Pump intake set at feet | Water at end of test (42) ☑ Clear ☐ Cloudy

Recommended pump type ☐ Shallow ☐ Deep | Recommended pump setting (43-45) 160 feet | Recommended pump rate (46-49) 20 GPM

(50-53)

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



FINAL STATUS OF WELL (54)

1 ☑ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well 5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE (55-56)

1 ☑ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION (57)

1 ☐ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☑ Rotary (air) 5 ☐ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor [redacted] LTD | Well Contractor's Licence No. 2663

Address N1H RR#5 GUELPH ONT. 6J2

Name of Well Technician JOHN WHITNEY | Well Technician's Licence No. T-2790

Signature of Technician/Contractor [redacted] | Submission date 01 day 11 mo 03 yr

MINISTRY USE ONLY

Data source (58) | Contractor (59-62) 2663 | Date received (63-68) OCT 28 2003 (80)

Date of inspection | Inspector

Remarks

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Ontario **Ministry of Environment and Energy**

The Ontario Water Resources Act

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 — 6714656 — Municipality 67012 — Con. CON 04

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Wellington	Puslinch	4	20

Owner's surname	First Name	Address of Well Location	Date completed
City of Guelph.		Rural	25 07 03 (day month year)

21 — UTM: Zone — Easting — Northing — RC — Elevation — RC — Basin Code — ii — iii — iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	TOPSOIL			0	2
Red	Silt	Gravel		2	18
Brn Red	Silt	Sand		18	23
Brn	Silt	Gravel Cabbles		23	44
Bra	Silt	Sand		44	56
Brn	Silt Sand	Cobbles		56	72
Gry	Silt	Sand		72	79
Gry	Sand	Clay Stones		79	93
Gry	Clay	Sand Stones		93	108
Brn	Limestone			108	128

31

32

41 WATER RECORD

Water found at - feet	Kind of water
120	1 ☑ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6"	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	+2	112
2"	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	SCH 80	+2	[redacted] 118
2"	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	SCR	118	128

SCREEN

Sizes of opening (Slot No.)	Diameter	Length
10	2 inches	10 feet

Material and type: PVC — Depth at top of screen: 118 feet

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0	112	Bentonite Slurry

71 PUMPING TEST

Pumping test method: 1 ☑ Pump 2 ☐ Bailer — Pumping rate: 1 GPM — Duration of pumping: 1 Hours 0 Mins

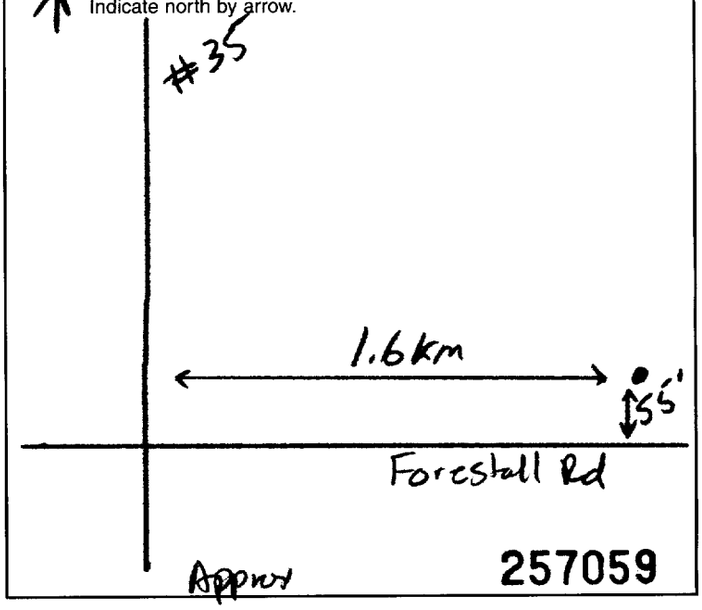
Static level	Water level end of pumping	Water levels during: 1 ☑ Pumping 2 ☐ Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
42 feet	120 feet	120 feet	120 feet	120 feet	120 feet

If flowing give rate: GPM — Pump intake set at: 120 feet — Water at end of test: ☑ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep — Recommended pump setting: 120 feet — Recommended pump rate: 1 GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Approx

257059

FINAL STATUS OF WELL

1 ☑ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well 5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE

1 ☐ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☑ Not use 10 ☐ Other

METHOD OF CONSTRUCTION

1 ☐ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☑ Rotary (air) 5 ☐ Air percussion 6 ☐ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
DURL HOPPER LTD	2644
Address: RR#7 ST MARYS ONT N4K1C9	
Name of Well Technician: DOUGLAS HOPPER	Well Technician's Licence No. T2323
Signature: [redacted]	Submission date: 28 08 03 (day mo yr)

MINISTRY USE ONLY

Data source	Contractor	Date received
	2644	OCT 15 2003

Date of inspection: — Inspector: — Remarks:

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Ontario Ministry of the Environment

46-04

Well Tag Number (Place sticker and print number below)

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN 67012 CON CON 07 LOT 11

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
COURTNEY'S ALBERTA CO. INC.		874 SINCLAIR RD.

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
	OAKVILLE	Ontario	L6K-2Y1	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
WELLINGTON	PUSLINCH	11-12	7

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
CRAWLEY RD & CLAIR RD WEST	GUELPH, ONT	

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation:
	83	17	564721	4814763	GARMIN	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
			ABANDONMENT RECORD (2" OBSERVATION WELLS) GROUP #1		

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)

Water Record

Water found at ___ Metres / Kind of Water

- ___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
- ___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
- ___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was
☐ Clear and sediment free
☐ Other, specify

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
2"	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized		0	15 m
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☐ Annular space ☒ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	15	BENTONITE	

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☒ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

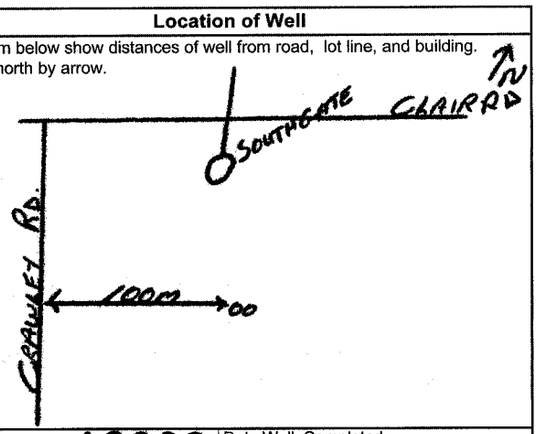
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☒ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☐ Water Supply ☐ Recharge well ☐ Unfinished ☒ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 10330

Date Well Completed YYYY MM DD: 2004 08 13

Was the well owner's information package delivered? ☐ Yes ☒ No

Date Delivered YYYY MM DD

Well Contractor/Technician Information

Name of Well Contractor: GRAHAM WELL DRILLING LTD

Well Contractor's Licence No.: 2336

Business Address (street name, number, city etc.): RR#5 ROCKWOOD, ONT. N0B-2K0

Name of Well Technician (last name, first name): WILSON, Jim

Well Technician's Licence No.: T-1924.

Signature of Technician: X [redacted]

Date Submitted YYYY MM DD: 2004 08 31

Ministry Use Only

Data Source	Contractor
	2336
Date Received YYYY MM DD: SEP 10 2004	Date of Inspection YYYY MM DD
Remarks	Well Record Number: 6715026

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en français

Ontario Ministry of the Environment

47-04

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Well Tag Number (Place sticker and print number below)

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN 6701 2 CON CON 07 LOT 11

Well Owner's Information and Location of Well Information

First Name	Last Name	Mailing Address (Street Number/Name, RR,Lot,Concession)
COURTNEY'S	ALBERTA CO. INC	874 SINCLAIR RD

County/District/Municipality	Township/City/Town/Village	Province	Postal Code	Telephone Number (include area code)
WELLINGTON	OAKVILLE	Ontario	L6K-2Y1	

Address of Well Location (County/District/Municipality)	Township	Lot	Concession
WELLINGTON	PUSLINCH	11-12	7

RR#/Street Number/Name	City/Town/Village	Site/Compartment/Block/Tract etc.
CRAWLEY RD & CLAIR RD WEST	GUELPH, ONT.	

GPS Reading	NAD	Zone	Easting	Northing	Unit Make/Model	Mode of Operation
	83	17	564721	4814763	GARMIN	☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
			ABANDONMENT RECORD. (2" OBSERVATION WELLS) GROUP #1		

Hole Diameter

Depth From	Depth To	Diameter Centimetres

Water Record

Water found at ___ Metres / Kind of Water

- ___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
- ___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
- ___ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was
☐ Clear and sediment free
☐ Other, specify

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
2"	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized		0	23m
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		

No Casing or Screen

☐ Open hole

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___hrs +___ min	2		2	
Final water level end of pumping ___metres	3		3	
Recommended pump type. ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___metres	5		5	
Recommended pump rate. (litres/min)	10		10	
	15		15	
If flowing give rate - (litres/min)	20		20	
	25		25	
If pumping discontinued, give reason.	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☐ Annular space ☒ Abandonment

Depth set at - Metres From	Depth set at - Metres To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	23	BENTONITE	

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☒ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☒ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☐ Water Supply ☐ Recharge well ☐ Unfinished ☒ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor	Well Contractor's Licence No.
GRAHAM WELL DRILLING LTD	2336

Business Address (street name, number, city etc.): RR#5 ROCKWOOD, ONT. N0B-2K0

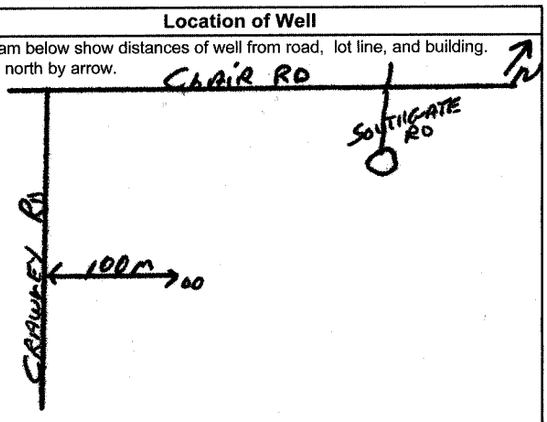
Name of Well Technician (last name, first name)	Well Technician's Licence No.
WILSON, JIM	T-1924.

Signature of Technician: X [redacted]

Date Submitted: 04 08 31 (YYYY MM DD)

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 10331

Date Well Completed: 2004 08 13 (YYYY MM DD)

Was the well owner's information package delivered? ☐ Yes ☒ No

Date Delivered: YYYY MM DD

Ministry Use Only

Data Source	Contractor
	2336
Date Received: SEP 10 2004 (YYYY MM DD)	Date of Inspection: YYYY MM DD
Remarks	Well Record Number: 6715027

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag Number (I A017772 A017772

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

RR#/Street Number/Name: RR# 6 4620 - 20th S.R. | City/Town/Village: Guelph | Site/Compartment/Block/Tract etc.

GPS Reading: NAD 83 | Zone 17 | Easting 564772 | Northing 4813788 | Unit Make/Model: Trimble Scout PC | Mode of Operation: ☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To	Depth From (m)	Depth To (m)
BLACK	TOP SOIL		(TOTAL = 180/54.86)	0	2	0	0.61
BROWN	SAND			2	15	0.61	4.57
BROWN	CLAY	STONES + GRAVEL		15	65	4.57	19.81
BROWN	SAND			65	80	19.81	24.38
BROWN	CLAY	GRAVEL		80	90	24.38	27.43
	GRAVEL			90	100	27.43	30.48
BROWN	CLAY	SILT + STONES		100	125	30.48	38.10
BROWN	LIMESTONE	LIGHT		125	140	38.10	42.67
BROWN	LIMESTONE	DARK	(6 1/4" / 40.32 DRIVE SHOE)	140	180	42.67	54.86

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6.09	25.4
6.09	40.32	15.8

Water Record

Water found at Metres	Kind of Water
54.86 m	☑ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other: UNTESTED
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
___ m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was ☑ Clear and sediment free ☐ Other, specify

Chlorinated ☑ Yes ☐ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
15.87 / 6 1/4	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0.48 / .188	0.61 / +2	38.10 / 125
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

Screen

Outside diam	Material	Slot No.		
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			

No Casing or Screen

☐ Open hole — 38.10 / 125 — 54.86 / 180

Test of Well Yield

Pumping test method: SUBMERSIBLE PUMP

Pump intake set at - (metres) 110

Pumping rate - (litres/min) 18 GPM

Duration of pumping ___ hrs + ___ min

Final water level end of pumping 83.5 metres

Recommended pump type. ☐ Shallow ☑ Deep

Recommended pump depth. 130 FT metres

Recommended pump rate. 18GPM (litres/min)

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		41		83.5
1	50		1	75
2	54		2	66.25
3	58		3	64.24
4	60		4	60.25
5	62		5	56.26
10	74		10	47.31
15	79		15	43.34
20	81		20	43.41
25	83		25	43.46
30	83.5		30	
40	83.5		40	
50	83.5		50	
60	83.5		60	

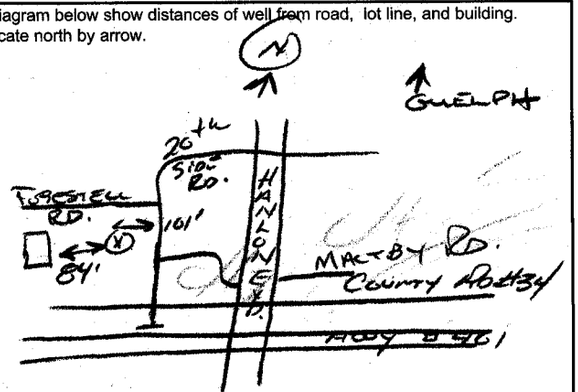
Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	6.09	QUICK GROUT	40 GAL.

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Method of Construction

☐ Cable Tool ☑ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☑ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☑ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Audit No. Z 28965

Date Well Completed: 2005 / 06 / 20

Was the well owner's information package delivered? ☑ Yes ☐ No

Date Delivered: 2005 / 05 / 25

Well Contractor/Technician Information

Name of Well Contractor: HANLON CREEK DRILLING LTD. | Well Contractor's Licence No. 2663

Business Address (street name, number, city etc.): R.R. #5 GUELPH ONT. N1H 6J2

Name of Well Technician (last name, first name): WHITNEY JOHN | Well Technician's Licence No. T-2790

Signature of Technician/Contractor: X [redacted] | Date Submitted: 2005 / 07 / 01

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Data Source	Contractor
	2663
Date Received: JUL 05 2005	Date of Inspection
Remarks	Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐ *Cette formule est disponible en français*

32-06

Ontario Ministry of the Environment

Well Tag (r below) A 033313

A033313

Well Record

Regulation 903 Ontario Water Resources Act

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Instructions for Completing Form

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- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

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Well Owner's Information and Location of Well Information

[redacted]

WELLINGTON | PUSLINCH | 20 | 4

RR#/Street Number/Name: 4652 20TH SIDE RD. RR #6 | City/Town/Village: GUELPH | Site/Compartment/Block/Tract etc.:

GPS Reading: NAD 83 | Zone 17 | Easting 564543 | Northing 4814255 | Unit Make/Model: GARMIN | Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
BROWN	CLAY	STONES		0	25
BROWN	GRAVEL	SAND		25	78
BROWN	SAND			78	85
GREY	CLAY	SAND		85	128
GREY	GRAVEL	SAND - GRAVEL		128	132
BROWN	ROCK		FRACTURED	132	140

Hole Diameter

Depth From	Depth To	Diameter
0	20	8 3/4
20	140	6

Water Record

Water found at 140 FT | Kind of Water: ☒ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

☐ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

☐ m ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

After test of well yield, water was: ☒ Clear and sediment free ☐ Other, specify

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam	Material	Wall thickness	Depth From	Depth To
Casing				
6"	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.188	+16"	133
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		133	140

Test of Well Yield

Pumping test method: SUB

Pump intake set at - 100 FT

Pumping rate - 10 GPM

Duration of pumping 1 hrs + 0 min

Final water level end of pumping 72 FT

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth. 100 FT

Recommended pump rate. 10 GPM

If flowing give rate - (litres/min)

If pumping discontinued, give reason.

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level		62		
1	65		1	72
2	68		2	70
3	70		3	68
4	71		4	69
5	72		5	66
10	72		10	64
15	72		15	62
20	72		20	62
25	72		25	62
30	72		30	62
40	72		40	62
50	72		50	62
60	72		60	62

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - From	Depth set at - To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	20	BENTONITE SLURRY	

Method of Construction

☐ Cable Tool ☒ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☐ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☒ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: GRAHAM WELL DRILLING LTD | Well Contractor's Licence No.: 2336

Business Address (street name, number, city etc.): RR#5 ROCKWOOD, ON. N0B-2K0

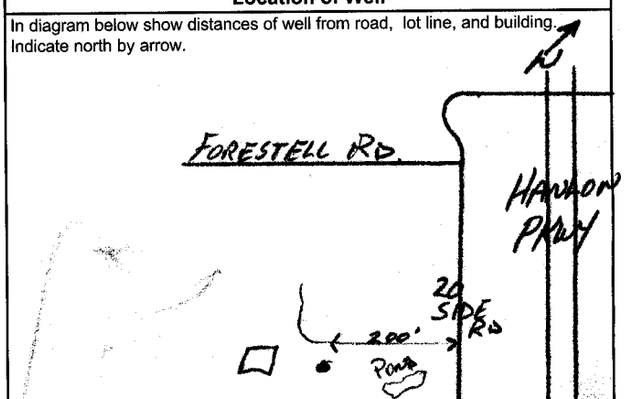
Name of Well Technician (last name, first name): WILSON JIM | Well Technician's Licence No.: T-1924

Signature of T[redacted] | Date Submitted YYYY MM DD: 2006 09 29

X

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 49310 | Date Well Completed YYYY MM DD: 2006 09 [redacted]

Was the well owner's information package delivered? ☐ Yes ☐ No | Date Delivered YYYY MM DD: 2006 09 19

Ministry Use Only

Data Source | Contractor: 2336

Date Received YYYY MM DD: OCT 17 2006 | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☒ Well Owner's Copy ☐

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag N A 062521 ...nd/or Print Below)

A062521

Master Well Record for Cluster Well Construction

Regulation 903 Ontario Water Resources Act

Steve Denstedt Page ____ of ____

Master Well Owner's and Land Owner's Information

[redacted]

County/District/Municipality	City/Town/Village	Province	Postal Code
~~[illegible]~~ ~~[illegible]~~ ~~[illegible]~~ Southgate Dr.	Puslinch	13 & 14	7
	~~[illegible]~~ Guelph	Ontario	N1G3M5

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation:
NAD 83	17	564812	4814728	magellan	Sportrak	☐ Undifferentiated ☑ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	To
Brown	Fine Sand			0	3.
Brown	silt till		Dry	3	10.6

Hole Details

Depth (Metres) From	To	Diameter (Centimetres)
0	10.6	21

Water Use

☐ Public ☐ Industrial ☐ Not used ☐ Other, specify
☐ Domestic ☐ Commercial ☐ Dewatering
☐ Livestock ☐ Municipal ☑ Monitoring
☐ Irrigation ☐ Test Hole ☐ Cooling & Air Conditioning

Method of Construction

☐ Cable Tool ☐ Air Percussion ☐ Digging
☐ Rotary (Conventional) ☐ Diamond ☑ Boring
☐ Rotary (Reverse) ☐ Jetting ☐ Other, specify
☐ Rotary (Air) ☐ Driving Auger

Status of Well

☑ Test Hole ☐ Abandoned, Insufficient Supply
☐ Replacement Well ☐ Abandoned, Poor Water Quality
☐ Dewatering Well ☐ Other, specify
☐ Alteration (Construction) ☐ Abandoned, other, specify

No Casing and Screen Used

Open Hole ☐ Yes ☑ No

Static Water Level Test

N A. Metres

Screen

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Concrete ☑ Plastic

Outside Diameter (Centimetres): 6.4. Slot No.: .020

Construction Details

Inside Diameter (Centimetres)	Material (steel, plastic, fibreglass, concrete, galvanized)	Wall Thickness	Depth (Metres) From	To
5.1	plastic	.65.	0	6.0

Water Details

Water found at Depth: N A. Metres ☐ Gas — Kind of Water: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Water found at Depth: Metres ☐ Gas — Kind of Water: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Water found at Depth: Metres ☐ Gas — Kind of Water: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Disinfected ☐ Yes ☑ No If no, provide reason:

Date Master Well Completed (yyyy/mm/dd): 2008/02/18

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Used (Cubic Metres)
0	5.4	Bentonite	

Cluster Information *(Please also fill out the additional Cluster Well Information for Well Construction for each parcel of land and cluster.)*

Total Wells in Cluster: 4

Total Wells on this Property: 5

Please indicate Number of Cluster Well Information Log Sheets Submitted: 1

Location of Well Cluster

Detailed Map must be provided as an attachment no larger than legal size (8.5" x 14"). Sketches are not allowed.

☐ Check box to confirm detailed map is provided as per Section 11.1 (3)

Consent to release additional information concerning the cluster to the Director upon request

Signature of Technician/Contractor: [redacted] Date (yyyy/mm/dd):

Well Contractor and Well Technician Information

Business Name of Well Contractor: Geo-Environmental Drilling inc

Well Contractor's Licence No: 6607

Business Address (Street No./Name, number, RR): 340 market Dr.

Municipality: Milton

Province: ON Postal Code: L9T5A4 Business E-mail Address:

Bus.Telephone No. (inc. area code): 9058763388 Name of Well Technician (Last Name, First Name): Paquette Jeff.

Well Technician's Licence No.: 2386 Signature of Technician: [redacted] Date Submitted (yyyy/mm/dd): 2008/02/29

M 01231

FEB 02 2009

Date Received (yyyy/mm/dd): Date of Inspection (yyyy/mm/dd):

Remarks:

1992 (11/2006)

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Ontario

Ministry of the Environment

Well Tag No. for Master Well *(Print Well Tag No.)*

A062521

Cluster Well Information for Cluster Well Construct

Regulation 903 Ontario Water Resources A

[redacted]

Address of Well Location (Street Number/Name, RR)	Lot	Concession	Township	County/District/Municipality
Southgate Rd.	13+14	7	Puslinch	

City/Town/Village	Province	Postal Code	GPS Unit Make	Model	Unit Mode of Operation
Guelph	Ontario	N1G3M5			☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify:

Signature of Technician/Contractor	Date *(yyyy/mm/dd)*
[redacted]	2008/02/21

Well # on Sketch	UTM Coordinates Zone	Easting	Northing	Full Depth of Hole (metres)	Hole Diameter (cm)	Method of Construction	Casing Material	Casing Length (metres)	Screen Interval (metres) From	To	Annular Space Sealant Used	Static Water Level (metres)	Abandonment Sealant Used	Comments	Date of Completion *(yyyy/mm/dd)*
#2	17	564932	4814614	9.4	21	Auger	Plastic	4.8	4.8	9.4	Bentonite	N/A			2008/02/20
#3	17	565047	4814158	7.8	21	Auger	Plastic	4.8	4.8	7.8	Bentonite	N/A			2008/02/20
#4	17	565094	4814353	9.7	21	Auger	Plastic	5.1	5.1	9.7	Bentonite	N/A			2008/02/21
#5	17	564975	4814827	10.	21	Auger	Plastic	5.4	5.4	10	Bentonite	N/A			2008/02/22

Well Contractor and Well Technician Information

Business Name of Well Contractor	Business Address (Street Number/Name, RR)	Municipality	Province
Geo-Environmental Drilling Inc	340 market Dr.	Milton	ON

Postal Code	Business Telephone No. *(inc. area code)*	Well Contractor's Licence No.	Business E-mail Address
L9T5A4	9058763388	6607	

Name of Well Technician (First Name, Last Name)	Well Technician's Licence No.	Date Submitted *(yyyy/mm/dd)*	Signature of Technician
Jeff Paquette	2386	2008/02/21	[redacted]

Date 1st Well in Cluster Constructed *(yyyy/mm/dd)*	Date Last Well in Cluster Constructed *(yyyy/mm/dd)*
2008/02/20	2008/02/22

Ministry Use Only

Date Received *(yyyy/mm/dd)*	Date Inspected *(yyyy/mm/dd)*
FEB 0 2 2009	

Audit No.	Remarks
C 02288	M01231

Ministry's Copy

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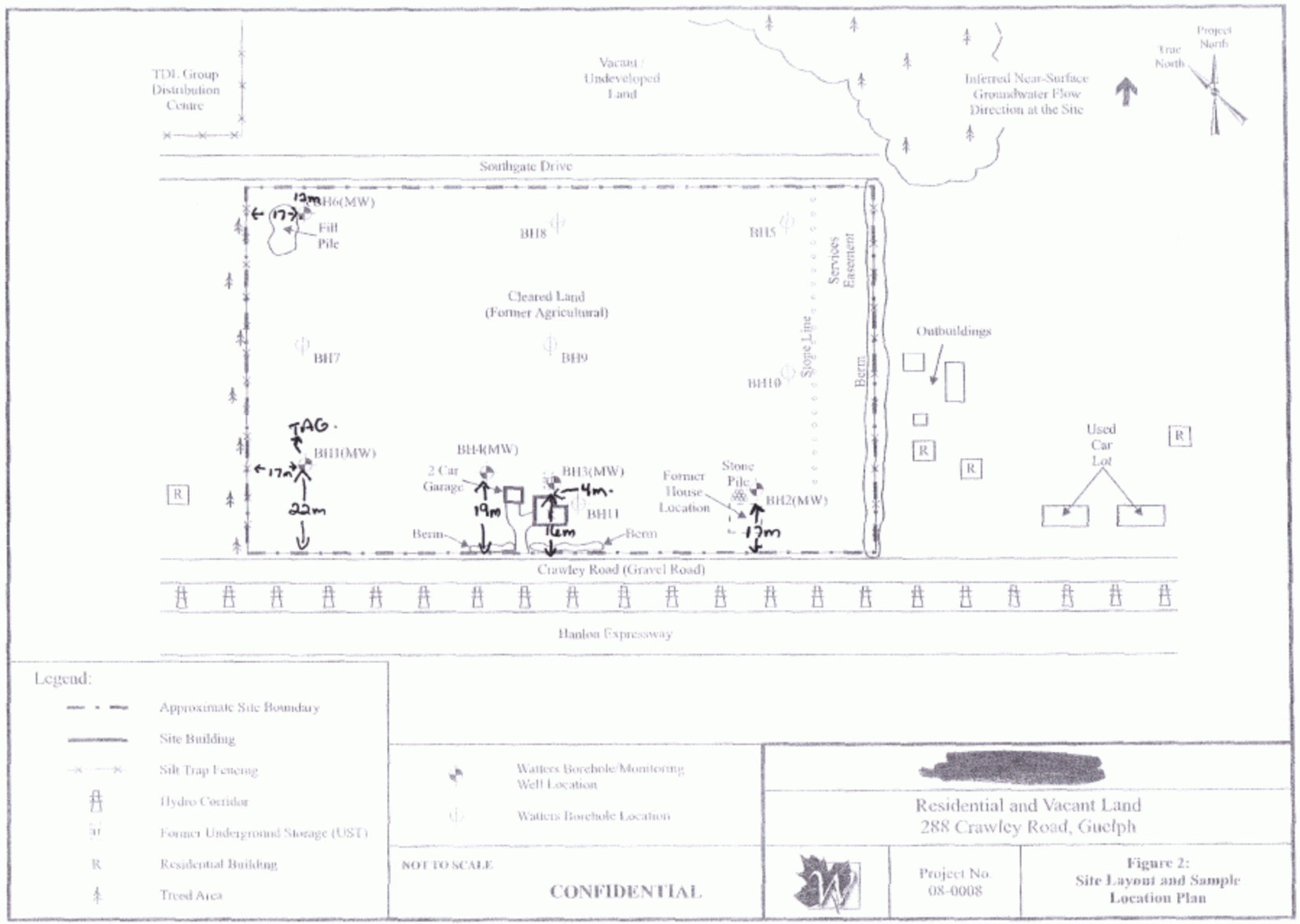
FEB 0 2 2009

C-6607 Motor Coach



Legend:

- Approximate Site Boundary
- Site Building
- Silt Trap Fencing
- Hydro Corridor
- Former Underground Storage (UST)
- R Residential Building
- Treed Area
- Watters Borehole/Monitoring Well Location
- Watters Borehole Location

NOT TO SCALE

CONFIDENTIAL

[redacted]

Residential and Vacant Land
288 Crawley Road, Guelph

Project No. 08-0008

Figure 2: Site Layout and Sample Location Plan

Ontario Ministry of the Environment

Well Tag No. *(Place Sticker and/or Print Below)*

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Well Owner's Information

First Name	Last Name	E-mail Address	Well Constructed by Well Owner
D'URZO	DEMOLITION INC.		☐

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
700 Flint Rd. Suite 200	NORTH YORK	ON	M3J2J5	4166611367

Part A Construction and/or Major Alteration of a Well

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
Crawley Rd.	Puslinch	13	7

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	Guelph	Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	17	561705	4817125	Garmin eTREX		☒ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	Depth (Metres) To
	Abandonment of 5-inch diameter well - 268 Ft. deep				

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
268'	6'	Bentonite chips	43 bgs.

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Rotary (Air) ☐ Digging
☐ Air percussion ☐ Boring
☐ Other, specify _____

Water Use

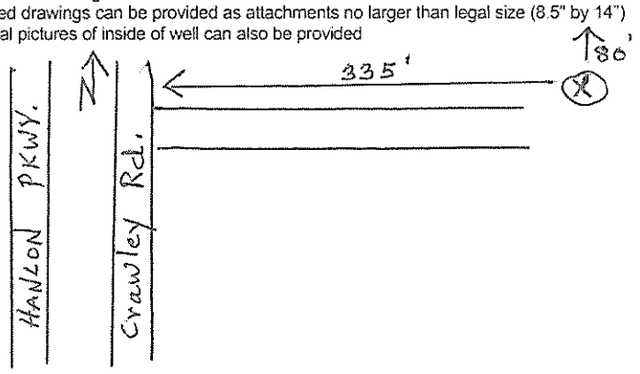
☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify _____

Status of Well

☐ Water Supply ☐ Dewatering Well ☐ Observation and/or Monitoring Hole
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Alteration (Construction)
☐ Test Hole ☐ Abandoned, Poor Water Quality ☐ Other, specify _____
☐ Recharge Well ☒ Abandoned, other, specify _____

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



Date Well Completed (yyyy/mm/dd)	Was the well owner's information package delivered?	Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd)
2007/12/11	☐ Yes ☐ No	

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
DAVIDSON WELL DRILLING LIMITED	1737

Business Address (Street No./Name, number, RR)	Municipality
147 North St. W.	WINGHAM

Province	Postal Code	Business E-mail Address
ON	N0G2W0	info@davidsondrilling.com

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5193571960	REAVIE, GARY

Well Technician's Licence No.	Signature	Date Submitted (yyyy/mm/dd)
0156	[redacted]	2007/12/31

Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method

Pump intake set at *(Metres)*

Pumping rate *(Litres/min)*

Duration of pumping _____ hrs + _____ min

Final water level end of pumping *(Metres)*

Recommended pump type ☐ Shallow ☐ Deep

Recommended pump depth _____ Metres

Recommended pump rate *(Litres/min)*

If flowing give rate *(Litres/min)*

Draw Down Time (Min)	Draw Down Water Level (Metres)	Recovery Time (Min)	Recovery Water Level (Metres)
Static Level		Static Level	
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Water Details

Water found at Depth	Kind of Water
_____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
_____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
_____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Casing Used	Screen Used
☐ Galvanized	☐ Galvanized
☐ Steel	☐ Steel
☐ Fibreglass	☐ Fibreglass
☐ Plastic	☐ Plastic
☐ Concrete	☐ Concrete

No Casing and Screen Used
☐ Open Hole

Disinfected? ☒ Yes ☐ No

Casing and Well Details
Diameter of the Hole *(Centimetres)*
Depth of the Hole *(Metres)*
Wall Thickness *(Metres)*
Inside Diameter of the Casing *(Metres)*
Depth of the Casing *(Metres)*

Ministry Use Only

Audit No.	Well Contractor No.
Z 75436	
Date Received (yyyy/mm/dd) FEB 08 2008	Date of Inspection (yyyy/mm/dd)
Remarks	

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Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*
NO TAG
WELL ABANDONMENT.

Well Record

Regulation 903 Ontario Water Resources Act

Page _____ of _____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Industrial Equities Guelph Ltd Partnership.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
55 Kelfield St	Etobicoke	Ont	M9W5A3	

Well Location

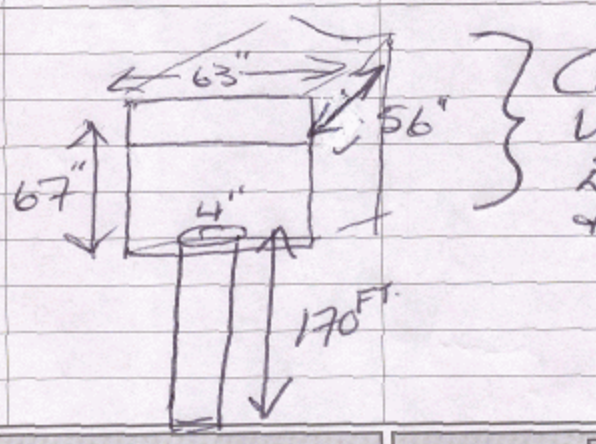
Address of Well Location (Street Number/Name)	Township	Lot	Concession
384 Crawley Rd	Puslinch.	14.	7

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	Guelph	Ontario	N1L1G5

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	565268	4814239		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
WELL	ABANDONMENT				



Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
-67	170FT	BENTONITE GROUT	750 lbs.
0	-67	FILL	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* _____

Well Use

☐ Public ☐ Commercial ☐ Not used
☑ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☑ Abandoned, other, *specify* Construction
☐ Other, *specify* _____

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping _____ hrs + _____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Hannen Water Drilling Ltd	2163

Business Address (Street Number/Name)	Municipality
RR#5 #5896 Wellington Rd. #7	Wellington

Province	Postal Code	Business E-mail Address
ONT.	N1H6J2	hanlonwelldr.linc@bellnet.ca

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
519 763 8239	Hannen Henry

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
0590	[redacted]	2010 07 20

Well owner's information package delivered: ☐ Yes ☑ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2010 06 15

Ministry Use Only

Audit No. z113986

Received JUL 29 2010

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Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* **A117282**

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
4636 20 side Rd	Puslinch	20	4

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	Puslinch	Ontario	N1H6J3

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	564600	4813800		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	5'	Bentonite clay	4 bags

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used ☐ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☐ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5"	steel	1/188 + 15'		6½'
5"	steel	188	6½	155'

Status of Well

☑ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☐ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, *specify* ☐ Other, *specify* well head extension

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Fresh	Untested	Other, *specify*
	☐		☐	☐	
	☐		☐	☐	
	☐		☐	☐	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

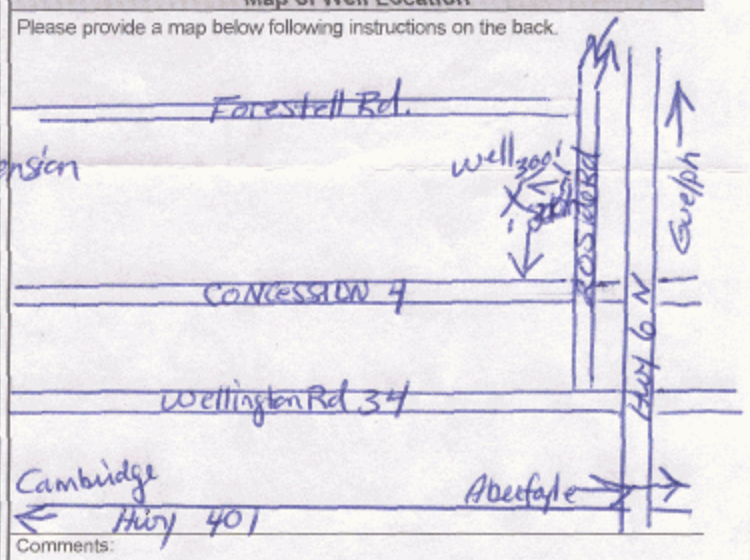
Well production (l/min / GPM)

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		50'		
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
DM DAVIDSON WATER PUMPING EQUIPMENT	6013

Business Address (Street Number/Name)	Municipality
4614 12 side Rd RR#6 Guelph	

Province	Postal Code	Business E-mail Address
ON	N1H6J3	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5198223039	DAVIDSON DON

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T6500	Don Davidson	20110901

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered Y Y Y Y M M D D

Date Work Completed 20110831

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Audit No. z132870

Received OCT 18 2011

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Ontario — Ministry of the Environment

11-0014-01

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: [X] Metric [ ] Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A126034

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
	Guelph Land Holdings Inc.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
2381 Bristol Circle, Suite C200	Oakville	ON	L6H5S9	9058290444

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
PROPERTY BORDERED BY: LAIRD RD, FORESTELL RD, DOWNEY RD, & THE HANLON EXPRESSWAY	GUELPH		

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON REGION	GUELPH.	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	564421	4814789		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SAND	TOPSOIL	SOFT	0	1.5
BROWN	GRAVEL	BOULDERS	HARD	1.5	4.5
BROWN	CLAY	GRAVEL	HARD	4.5	12.1
BROWN	SAND		SOFT	12.1	16.7

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	10.9	BENTONITE	

Method of Construction

[ ] Cable Tool [ ] Diamond
[ ] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [ ] Driving
[X] Boring [ ] Digging
[ ] Air percussion
[ ] Other, *specify* _____

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [X] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5.1	PLASTIC	.165	0	13.1

Status of Well

[ ] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[X] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, *specify*
[ ] Other, *specify*

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
6.4	PLASTIC	10	13.1	16.1

Water Details

Water found at Depth (m/ft)	Kind of Water	Water found at Depth (m/ft)	Kind of Water	Water found at Depth (m/ft)	Kind of Water
[ ] Gas	[ ] Fresh [ ] Untested [ ] Other, *specify*	[ ] Gas	[ ] Fresh [ ] Untested [ ] Other, *specify*	[ ] Gas	[ ] Fresh [ ] Untested [ ] Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	16.7	21

Results of Well Yield Testing

After test of well yield, water was:
[ ] Clear and sand free
[ ] Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping _____ hrs + _____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? [ ] Yes [ ] No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.

Please see attached map.

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Hardwick Drilling Inc.	7 1 3 1 8

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
25 Lewis Road - Unit C	Guelph	ON	N1H1E9	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
5198269340	England, Matt	30599	[redacted]	2012/01/19

Well owner's information package delivered: [ ] Yes [ ] No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2012/01/05

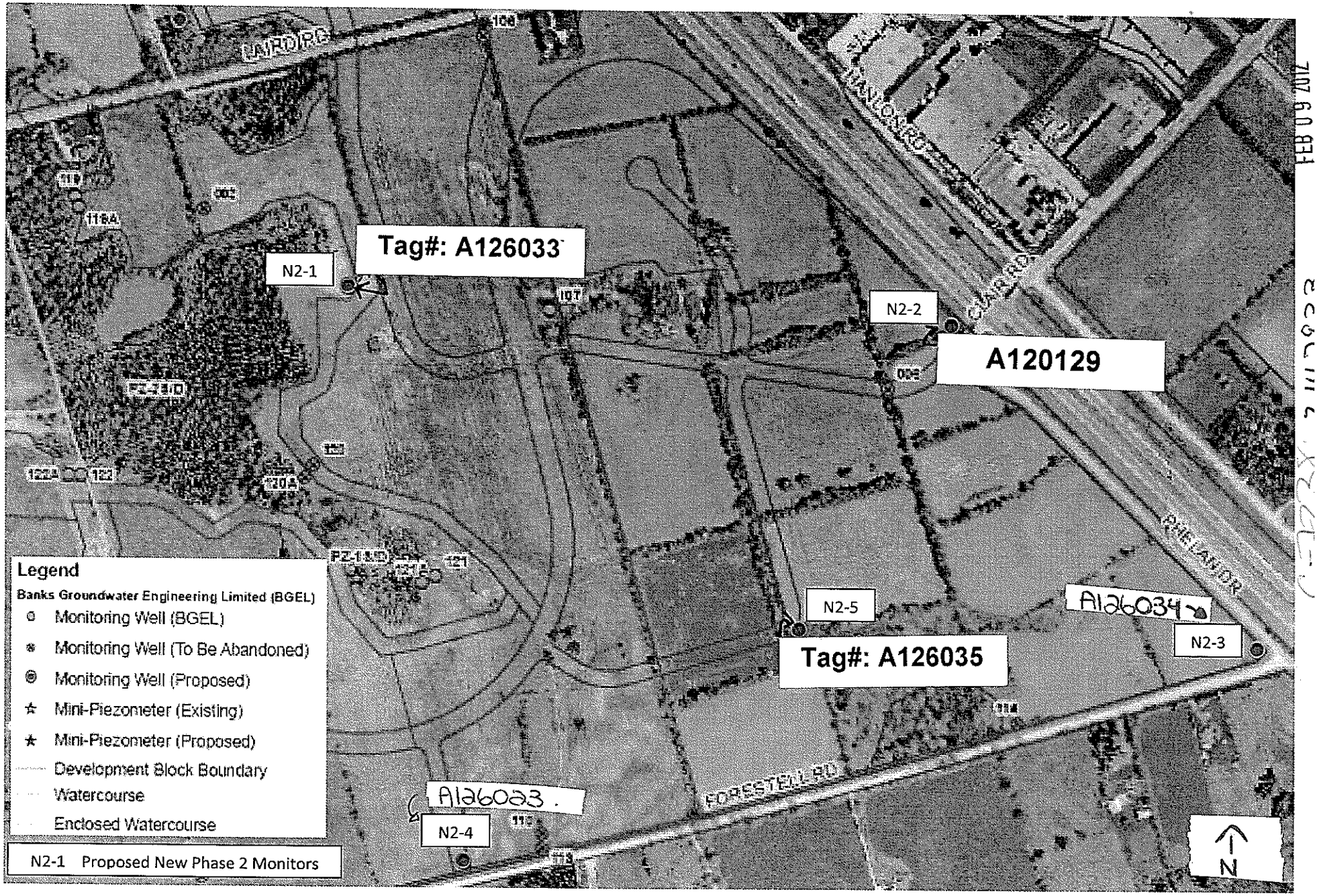
Ministry Use Only

Audit No. Z 142933

Received FEB 09 2012

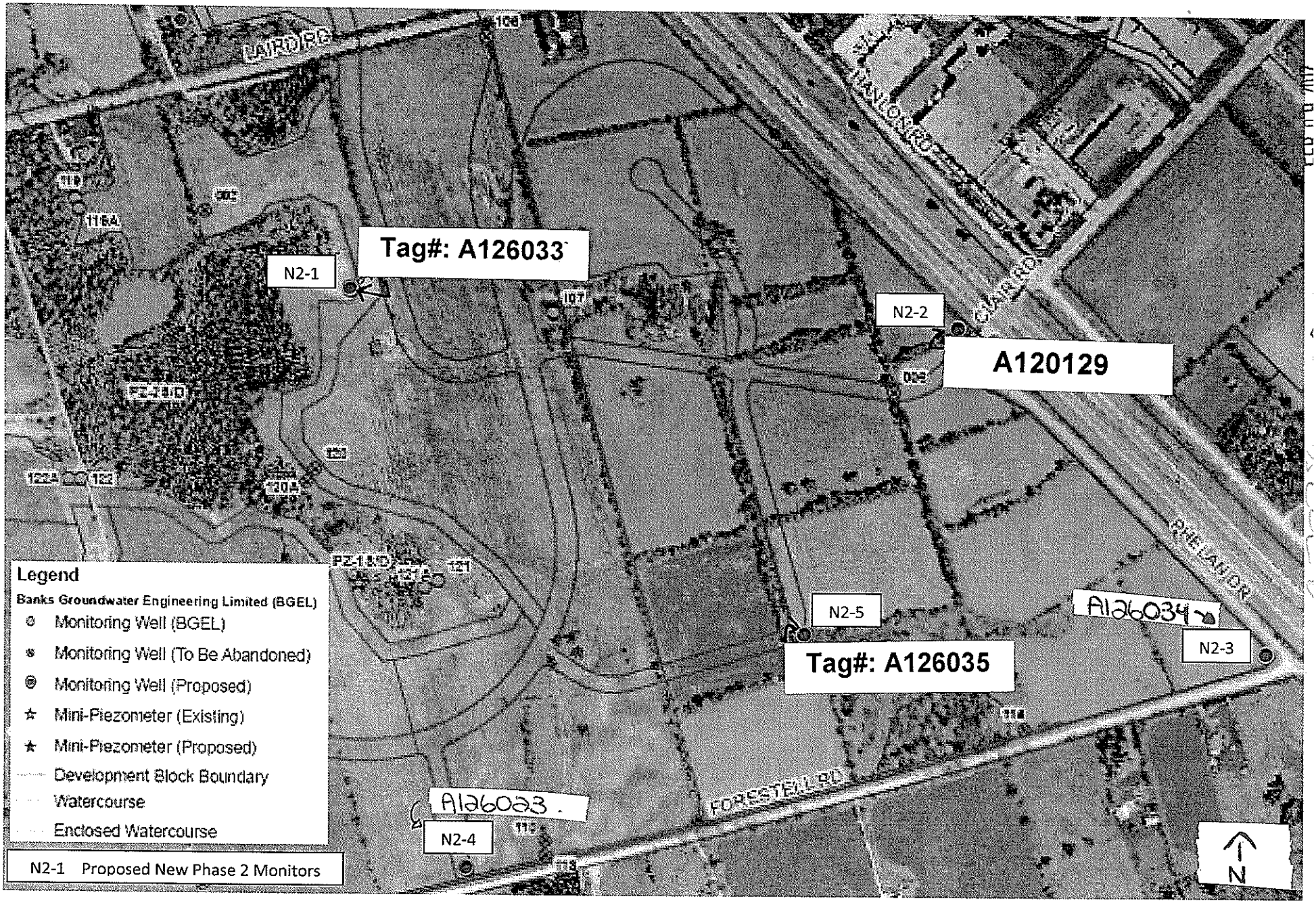
Phase 2 Updated Groundwater Monitoring Locations

11-0014-01



Phase 2 Updated Groundwater Monitoring Locations

11-0014-01



Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* 125527 **Tag#: A125527**

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
	PUSLINCH	19	3

County/District/Municipality	City/Town/Village	Province	Postal Code
WELLINGTON		Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	564385	4813530		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SILTY CLAY & STONES			0	23ft
BROWN	GRAVEL SAND			23ft	76ft
GRAY	CLAY & STONES			76ft	110ft
GRAY	LIMESTONE			110ft	122ft
		USE CENTRALIZER			

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	112ft	BENTONITE SLURRY	75 gals

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* ____

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* ____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼	steel	.188	0	112ft
6in	open hole	112ft	122ft	

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	
118ft	☒ Fresh ☐ Untested	☐ Gas ☐ Other, *specify*
	☐ Fresh ☐ Untested	☐ Gas ☐ Other, *specify*
	☐ Fresh ☐ Untested	☐ Gas ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	112ft	8.75in
112ft	122ft	6in

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
KEITH LANG WELL DRILLING INC	7154

Business Address (Street Number/Name)	Municipality
251 ELDON ST GODERICH ONT	

Province	Postal Code	Business E-mail Address
	N&A3R9	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
	KEITH LANG

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T446	[redacted]	Y Y Y Y M M D D

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, *specify* ____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)* 60ft

Pumping rate *(l/min / GPM)* 20gpm

Duration of pumping 1 ± hrs + 0 min

Final water level end of pumping *(m/ft)* 48ft

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)* 60ft

Recommended pump rate *(l/min / GPM)* 20ft

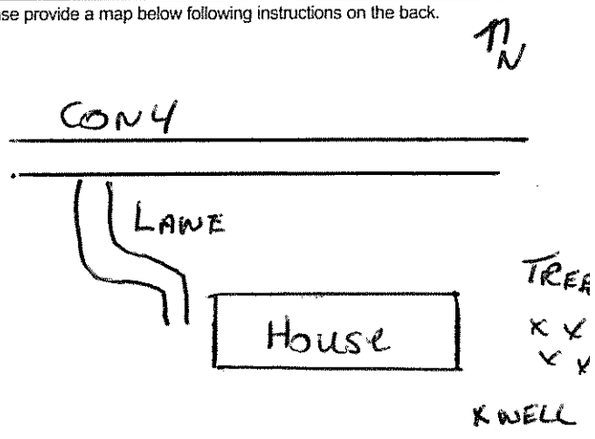
Well production *(l/min / GPM)*

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		28*FT		
1		29ft	1	38ft
2		31ft	2	33ft
3		34ft	3	30ft
4		37ft	4	28ft
5		40ft	5	27ft
10		46ft	10	26ft
15		48ft	15	
20		48ft	20	
25		48ft	25	
30		48ft	30	
40		48ft	40	
50		48ft	50	
60		48ft	60	26ft

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well owner's information package delivered ☒ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2012 7 13

Ministry Use Only

Audit No. Z142151

Received AUG 16 2012

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Well Tag No. *(Place Sticker and/or Print Below)*: WELL ABANDONMENT

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☑ Metric ☐ Imperial

Page _____ of _____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Industrial Equities Guelph		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
55 Kelfield St	Etobicoke	Ont	M9W5A3	4162473305

Well Location

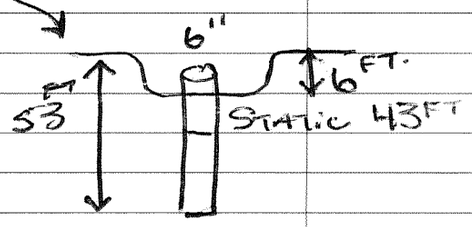
Address of Well Location (Street Number/Name)	Township	Lot	Concession
289 Crawley Rd	Puslinch.	13	7

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	Guelph	Ontario	N1L1G5

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	565321	4813936		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To



Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	6	FILL	
6	53	BENTONITE	500 lbs.

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping _____ hrs + _____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* _____

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

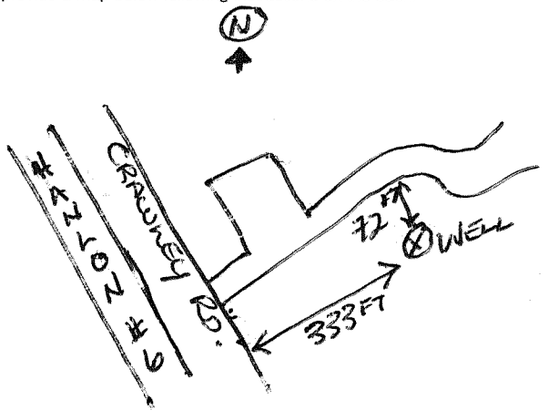
☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☑ Abandoned, other, *specify* CONSTRUCTION
☐ Other, *specify* _____

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From	Hole Diameter Depth To	Hole Diameter (cm/in)
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify* _____			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify* _____			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify* _____			

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
HANNON WELL DRILLING LTD	2613

Business Address (Street Number/Name)	Municipality
#5896 CNTY RD. #7 RR#5	GUELPH

Province	Postal Code	Business E-mail Address
ON	N1H6J2	hannonwelldrilling@bellnet.ca

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
5197639239	HANNON HENRY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
0590	[redacted]	2012/11/25

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☑ No		2012/10/25

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Audit No. Z152024

Received NOV 13 2012

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Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*

Tag#: A141353

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
4662 20 Side Rd N RR#6	Puslinch	Pt Lot 20	4

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington	Guelph	Ontario	N1H6J3

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	0801207	4832496		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	4'	Bentonite	4 bags

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* _____

Well Use

☐ Public ☐ Commercial ☐ Not used
☑ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5"	Steel	.188	+30"	4'
4"	Steel	.188	4'	158'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
	NA			

Status of Well

☑ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	+30"	4'	5"
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	4'	158'	4"
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*			

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at (m/ft): 100'

Pumping rate (l/min / GPM):

Duration of pumping: ____ hrs + ____ min

Final water level end of pumping (m/ft):

If flowing give rate (l/min / GPM):

Recommended pump depth (m/ft):

Recommended pump rate (l/min / GPM): 8 gpm

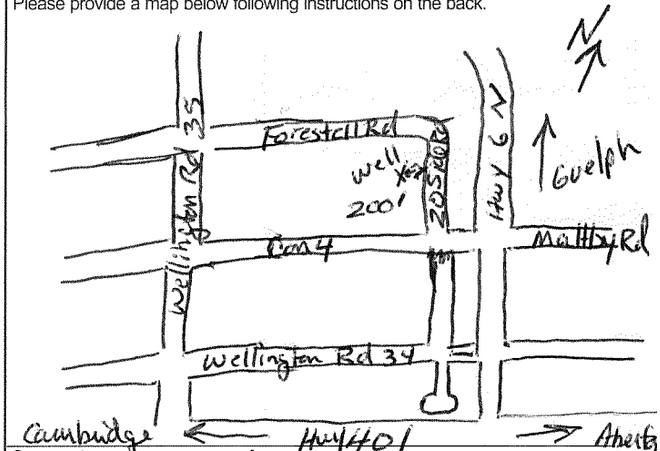
Well production (l/min / GPM):

Disinfected? ☑ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		58'		
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Well Head extension

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
DM DAVIDSON WATER PUMPING EQUIPMENT	6013

Business Address (Street Number/Name)	Municipality
4614 12 side Rd RR#6	Guelph

Province	Postal Code	Business E-mail Address
ON	N1H6J3	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5198223039	DON DAVIDSON

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T650	[redacted]	2013/05/16

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☐ No		2013/05/16

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Audit No. Z162125

Received JUN 10 2013

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Well Tag No. *(Place Sticker and/or Print Below)* A168284

Tag #: A168284

Well Record

Regulation 903 Ontario Water Resources Act

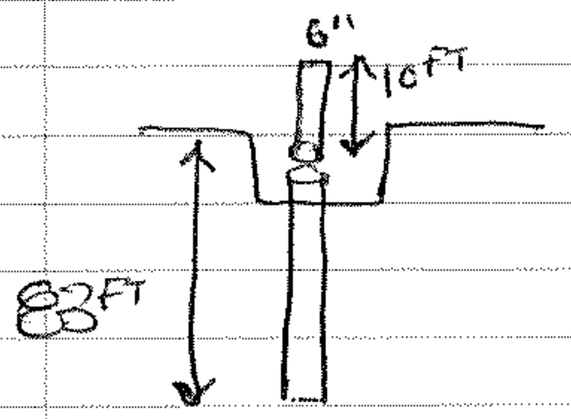
Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
#7004 CON 4	PUSLINCH	20	3
County/District/Municipality	**City/Town/Village**	**Province**	**Postal Code**
WELLINGTON	PUSLINCH	Ontario	N1H6J3
UTM Coordinates NAD 83 Zone 17 Easting 564336 Northing 4813514	**Municipal Plan and Sublot Number**	**Other**	

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
		WELL EXTENTION			



Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	6	BENTONITE	150 lbs.

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☑ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☑ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify* EXTENTION
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: ☐ Fresh ☐ Untested	Other, *specify*
Water found at Depth (m/ft)	Gas	Kind of Water: ☐ Fresh ☐ Untested	Other, *specify*
Water found at Depth (m/ft)	Gas	Kind of Water: ☐ Fresh ☐ Untested	Other, *specify*

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

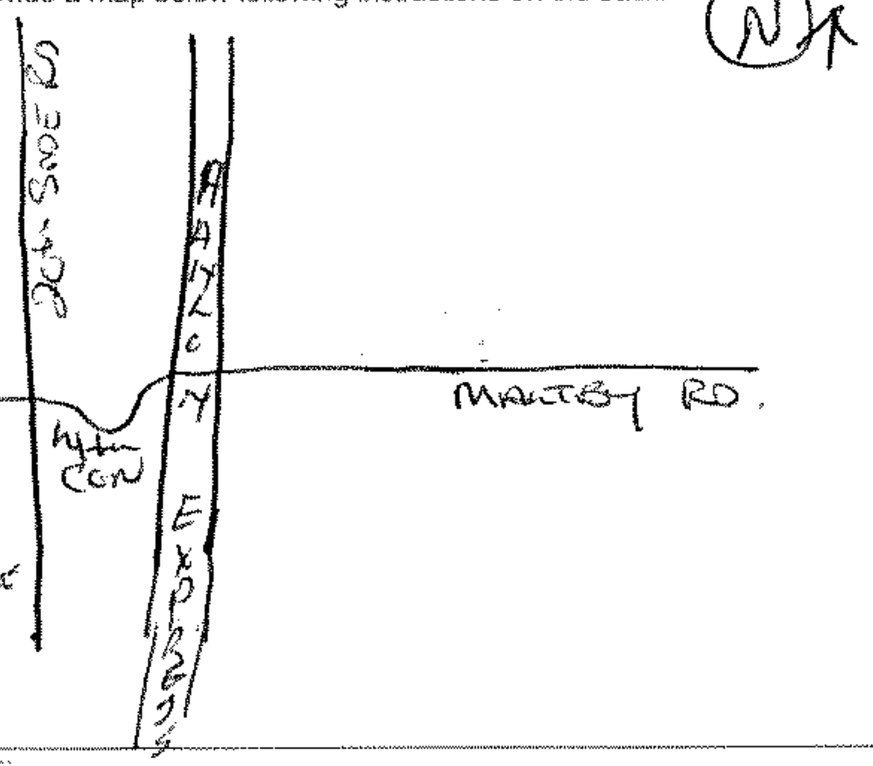
Well production *(l/min / GPM)*

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back. N/A



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Hanson Well Drilling Ltd	2663
Business Address (Street Number/Name)	**Municipality**
#5896 Wellington Rd 7 #7225	Guelph
Province	**Postal Code**
ON	N1H6J2
Business E-mail Address	info@hansonwelldrilling.com
Bus. Telephone No. (inc. area code)	5197638239
Name of Well Technician (Last Name, First Name)	Hanson, Honey
Well Technician's Licence No.	0590 [redacted]
Signature of Technician and Contractor	
Date Submitted	2014/12/05

Well owner's information package delivered ☐ Yes ☑ No

Date Package Delivered

Date Work Completed 2014/11/05

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Audit No. Z 192621

DEC 02 2014

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Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A 247476

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

KIMLEY HORN

Address of Well Location (Street Number/Name)	Township	Lot	Concession
945 SOUTHGATE Drive.			

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington County	GUELPH	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	560509	4814312		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BROWN	SAND GRAVEL	COBBLES	VERY DENSE	0'	20'
BROWN	SAND	BOULDERS	VERY DENSE	20'	25'
BROWN	SAND GRAVEL		VERY DENSE	25'	35'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0'	6"	CONCRETE	
6"	23'	BENTONITE CHIPS	
23'	35'	SILICA SAND	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☒ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
2"	PLASTIC	3/16	0'	25'
4"x4"	Steel	1/8"	-1'	+3'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
2"	PLASTIC	010	25'	35'

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	
31	☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*
	☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*
	☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	35'	8 1/2

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

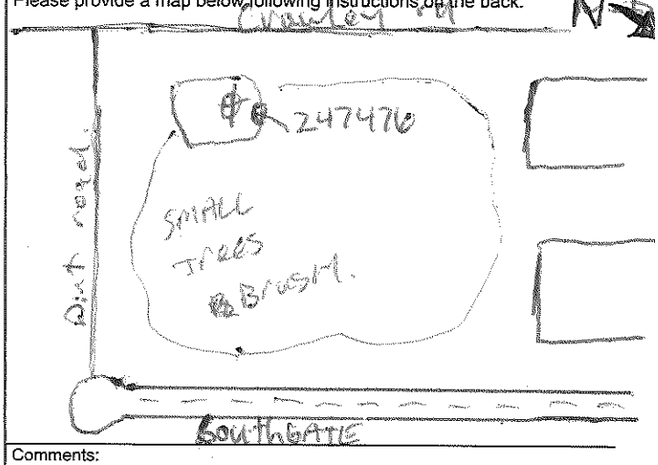
Well production (l/min / GPM)

Disinfected? ☐ Yes ☒ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	31'			
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: STICK-UP CASING

Well Contractor and Well Technician Information

LONDON SOIL TEST LTD.
712078 Southgate Sdrd. 71, RR #6
Dundalk, ON N0C 1B0
519-455-5777 info@londonsoil.com

Well Contractor's Licence No.: 7910

Municipality:

Address:

Bus. Telephone No. *(inc. area code)*:

Name of Well Technician (Last Name, First Name): COLLETTE RAYMOND

Well Technician's Licence No.: 3552

Signature of Technician and/or Contractor: [redacted]

Date Submitted: 2018/08/01

Well owner's information package delivered: ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 2018/07/19

Ministry Use Only

Audit No. Z294670

AUG 13 2018

Received

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Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A237649

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
995 SOUTHGATE Drive			

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington County	GUELPH	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	561811	4814707		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	SAND GRAVEL		VERY DENSE	0'	20'
BROWN	SAND	COBBLES	VERY DENSE	20'	30'
BROWN	SAND GRAVEL	COBBLES	VERY DENSE	30'	50'
BROWN	SAND	GRAVEL	DENSE	50'	55'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0'	6"	CONCRETE	
6"	43'	BENTONITE CHIPS	
43'	55'	SILICA SAND	

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☒ Other, specify Auger

Well Use

☐ Public ☐ Commercial ☐ Not used ☐ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☒ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
2"	PLASTIC	3/16	0'	45'
4"x4"	Steel	1/8"	-1'	+3'

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☒ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
2"	PLASTIC	010	45'	55'

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water: Fresh / Untested / Other, specify
45	☐	
	☐	
	☐	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	55'	8.5

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify 45'

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

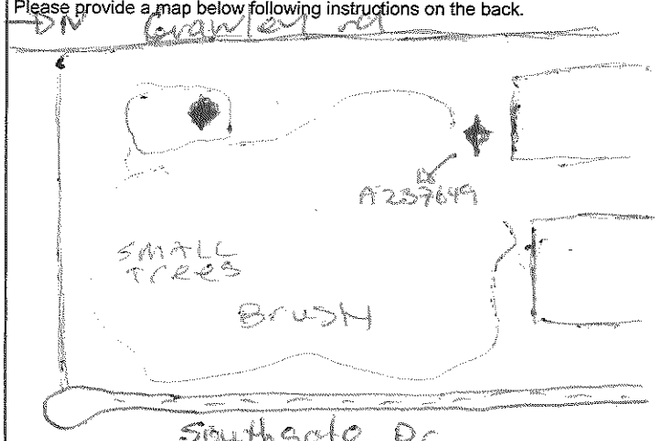
Well production (l/min / GPM)

Disinfected? ☐ Yes ☒ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	45'		
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: STICK-UP CASING

Well Contractor and Well Technician Information

LONDON SOIL TEST LTD.
712078 Southgate Sdrd. 71, RR #6
Dundalk, ON N0C 1B0
519-455-5777 info@londonsoil.com

Well Contractor's Licence No. 7119 10

Municipality

Address

Bus.Telephone No. *(inc. area code)*

Name of Well Technician (Last Name, First Name) COLLETTE RAYMOND

Well Technician's Licence No. 3552

Signature of Technician and Contractor [redacted]

Date Submitted 2018/08/01

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered

Date Work Completed 2018/07/19

Ministry Use Only

Audit No. Z294669

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Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below): A247383

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
795 SOUTHGATE DR			

County/District/Municipality	City/Town/Village	Province	Postal Code
Wellington County	Guelph	Ontario	

UTM Coordinates Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83 17	564773	4814620		

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Brown	SAND		Loose	0	1
Brown	SAND	GRAVEL	Dense	1	35
Brown	COARSE SAND		WET.	35	45

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
45	34	SILICA SAND	
34	0	HYDRATED Bentonite	

Method of Construction

☐ Cable Tool ☐ Diamond ☐ Rotary (Conventional) ☐ Jetting ☐ Rotary (Reverse) ☐ Driving ☐ Boring ☐ Digging ☐ Air percussion ☒ Other, specify Auger

Well Use

☐ Public ☐ Commercial ☐ Not used ☐ Domestic ☐ Municipal ☐ Dewatering ☐ Livestock ☐ Test Hole ☒ Monitoring ☐ Irrigation ☐ Cooling & Air Conditioning ☐ Industrial ☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
2"	PVC	3/16"	35	+3
4"x4"	Steel	1/8"	-1'	+3'

Status of Well

☐ Water Supply ☐ Replacement Well ☐ Test Hole ☐ Recharge Well ☐ Dewatering Well ☒ Observation and/or Monitoring Hole ☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality ☐ Abandoned, other, specify ☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
2"	PVC	.010	45	35

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? ☐ Yes ☒ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Water Details

Water found at Depth (m/ft) ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify

Water found at Depth (m/ft) ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify

Water found at Depth (m/ft) ☐ Gas — Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Map of Well Location

Please provide a map below following instructions on the back.

SEE ATTACHED MAP.

Comments:

Well Contractor and Well Technician Information

LONDON SOIL TEST LTD.
712078 Southgate Sdrd. 71, RR #6
Dundalk, ON N0C 1B0
519-455-5777 info@londonsoil.com

Well Contractor's Licence No.: 7190

Municipality:

Address:

Bus. Telephone No. (inc. area code):

Name of Well Technician (Last Name, First Name): WATTS Mike

Well Technician's Licence No.: 1671

Signature of Technician and/or Contractor: [redacted]

Date Submitted: 0180801

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered: Y Y Y Y M M D D

Date Work Completed: 20180769

Ministry Use Only

Audit No. Z285276

AUG 13 2018

Received

506E (2014/11)

Ministry's Copy

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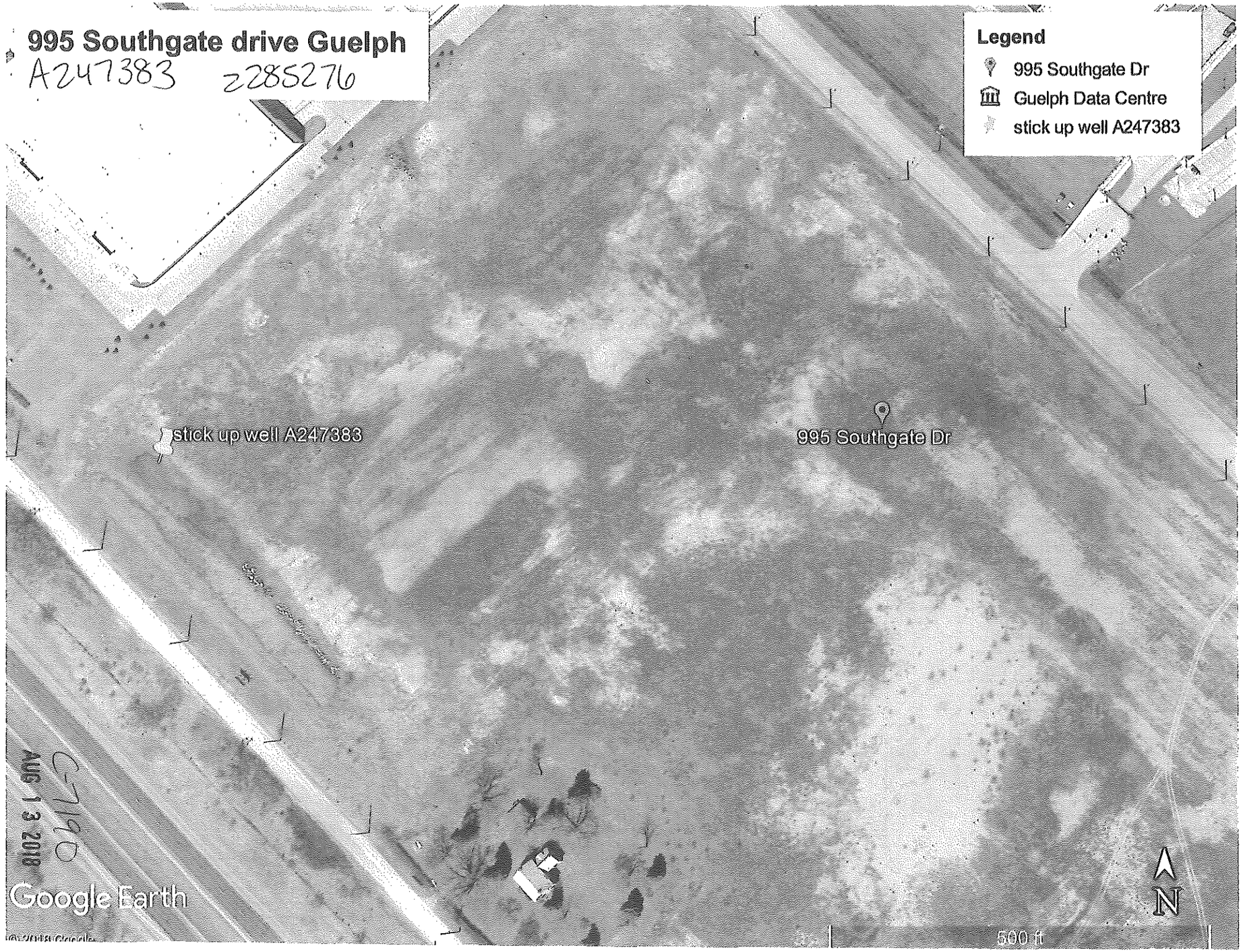
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Legend
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Guelph Data Centre
stick up well A247383
stick up well A247383
995 Southgate Dr
G7190
AUG 13 2018
Google Earth
500 ft
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75-20

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag#:A310505 (below)

A310505

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
7002 CON 4	PUSLINCH	PT 20	4
County/District/Municipality	**City/Town/Village**	**Province**	**Postal Code**
WELLINGTON	PUSLINCH	Ontario	N0B2J0
UTM Coordinates Zone / Easting / Northing	**Municipal Plan and Sublot Number**	**Other**	
NAD 83 / 17 564508 4813671			

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
BROWN	CLAY	SAND		0	15
BROWN	CLAY	SAND-GRAVEL		15	60
BROWN	SAND	GRAVEL		60	80
BROWN	SAND		FINE	80	120
GREY	CLAY	GRAVEL		120	134
GREY	ROCK		FRACTURED	134	138
			TOTAL DEPTH	138	FT

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	20	BENTONITE	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☒ Other, specify AIR ROTARY

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/8	STEEL	.188	+2	135
6 1/8	OPEN HOLE		135	138

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water	Gas	Other, specify
138 FT	☒ Fresh ☐ Untested	☐ Gas	☐ Other, specify
	☐ Fresh ☐ Untested	☐ Gas	☐ Other, specify
	☐ Fresh ☐ Untested	☐ Gas	☐ Other, specify

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	20	10"
20	138	6 1/8"

Results of Well Yield Testing

After test of well yield, water was:
☒ Clear and sand free
☐ Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft): 65 FT

Pumping rate (l/min / GPM): 12 GPM

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 52 FT

If flowing give rate (l/min/GPM)

Recommended pump depth (m/ft): 65 FT

Recommended pump rate (l/min/GPM): 12 GPM

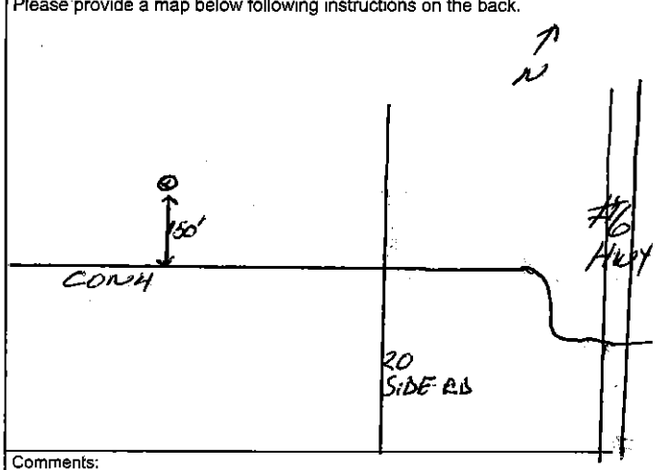
Well production (l/min/GPM): 12 GPM

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	51		
1	52	1	51
2	52	2	
3	52	3	
4	52	4	
5	52	5	
10	52	10	
15	52	15	
20	52	20	
25	52	25	
30	52	30	
40	52	40	
50	52	50	
60	52	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Jim Wilson Well Drilling LTD	7185
Business Address (Street Number/Name)	**Municipality**
551 EBYCREST RD.	WATERLOO
Province	**Postal Code**	**Business E-mail Address**
ON	N2J4G8	
Bus. Telephone No. (inc. area code)	**Name of Well Technician (Last Name, First Name)**
5196482412	Wilson Jim
Well Technician's Licence No.	**Signature of Technician and/or Contractor**	**Date Submitted**
7194	[redacted]	2020/12/31

Well owner's information package delivered: ☒ Yes ☐ No

Date Package Delivered: 2020/12/22

Date Work Completed: 2020/12/22

Ministry Use Only

Audit No. Z352749

Received JAN 19 2021

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Appendix F

Surface Water Monitoring Report

455 Phillip Street, Unit 100A
Waterloo, Ontario N2L 3X2
Canada
www.ghd.com

Our ref: 12618927

07 February 2025

Mr. Jim Estill
Puslinch Development Limited Partnership
5070 Whitelaw Road
Guelph, ON N1H 6Z9

Surface Water Monitoring Assessment – Puslinch Development Limited Partnership Innovation Community

Dear Mr. Estill

1. Introduction

GHD Limited (GHD) prepared this Surface Water Monitoring Assessment letter for Puslinch Development Limited Partnership (Client) in support of a proposed industrial warehouse-style building at 4631 Sideroad 20 North, Puslinch Township, Ontario (Site). The Site is bounded by industrial and residential developments, as well as forested areas and wetlands. Future development requires careful consideration of surface water features within and adjacent to the Site.

1.1 Purpose of this letter

The purpose of this technical letter is to provide a summary of the Surface Water Monitoring Assessment tasks completed throughout the monitoring period from April to November 2024 to support the Environmental Impact Study (EIS) Terms of Reference (TOR) (GHD, 2024). The objective of the surface water monitoring assessment is to characterize the interaction between groundwater and the surface water features identified at the Site during due diligence completed in 2022, specifically the wetland located within the southern portion of the Site. The information collected as part of this assessment will be used to support the impact assessment as part of the EIS and hydrogeological assessment.

The following tasks were included in the EIS TOR as part of the surface water monitoring assessment:

– Install a continuous water level and temperature logger within the wetland in spring 2024. The continuous water level and temperature logger will be set to record surface water levels at a 15-minute interval.
– Install one mini-piezometer equipped with a continuous water level and temperature logger within the wetland in spring 2024. The logger will be set to record shallow groundwater levels at a 15-minute interval to determine surface water/groundwater interaction.
– Survey top of T-bar and substrate at the logger location to determine elevations.
– Download loggers monthly and collect manual water level measurements for a minimum of one year following installation.
– Remove loggers at the end of the monitoring period.

– Prepare a surface water assessment report to summarize the field observations and support the ecological and hydrogeological investigations.

1.2 Scope and limitations

This technical letter has been prepared by GHD for Puslinch Development Limited Partnership. It is not prepared as, and is not represented to be, a deliverable suitable for reliance by any person for any purpose. It is not intended for circulation or incorporation into other documents. The matters discussed in this memorandum are limited to those specifically detailed in the memorandum and are subject to any limitations or assumptions specially set out.

GHD has prepared this letter on the basis of information provided by the Client and others who provided information to GHD (which may also include Government authorities), which GHD has not independently verified or checked for the purpose of this memorandum. GHD does not accept liability in connection with such unverified information, including errors and omissions in the memorandum which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this memorandum are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this memorandum are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this memorandum.

Accessibility of documents

If this technical memorandum is required to be accessible in any other format this can be provided by GHD upon request and at an additional cost if necessary.

2. Site description

The Site is located in the rural area of the Township of Puslinch, Wellington County, adjacent to the City of Guelph. More specifically, the subject property is bounded by Provincial Highway 6 (Hanlon Parkway) to the north and east, Concession Road 4 to the south and Side Road 20 N to the west. The subject property has a triangular shape and an area of approximately 25.47 hectares (61 acres). The Site lot area consists of unoccupied land currently used for agricultural purposes. There is a small vegetated/wetland area just north of Concession Road 4 that is part of the Cranberry Oil Well Bog Wetland Complex, a provincially significant wetland complex. This small vegetated/wetland area is where the surface water monitoring location was established (Figure 1).

The Site is located within the jurisdiction of the Grand River Conservation Authority (GRCA) and is located within the Grand River sub-watershed, which ultimately drains to Lake Erie. The Site sits within a Tier 2 Significant Groundwater Recharge Area (SGRA), a Well Head Protection Area (WHPA), and a regulated zone for the on-Site wetland. The on-Site provincially significant wetland feature sits at an elevation of 331 meters above sea level (masl) and internally drains (i.e., no outlet).

There are a variety of land use types within one (1) kilometre (km) of the Site. The following list summarizes the general land uses surrounding the Site:

– An area of industrial properties located to the north of the Site, on the east side of the Hanlon Parkway.
– Several wetlands within the GRCA regulation limit located on the west boundary of the Site, as well as further east of the Site.

– Residential and agricultural properties located along Forestell Rd, Side Road 20 N, and Concession Road 4 Line along the south and west boundaries of the Site.

It is understood that the proposed development at the Site will include slab-on-grade industrial structures surrounded by parking lots, paved aprons, and a stormwater management pond. It is assumed the proposed structures will be one or two storeys with no basements. It understood that the existing wetland feature will not be altered as part of the proposed development.

3. Surface water monitoring assessment

Surface water and shallow groundwater data was collected from the on-Site wetland area to characterize seasonal patterns and to assess surface water and shallow groundwater contributions during pre-development conditions. The surface water assessment included the following tasks:

– A Site visit (April 26, 2024) to conduct a Site reconnaissance and establish one (1) surface water monitoring location, including the installation of a mini-piezometer to assess the surface water and shallow groundwater interactions and the installation of transducers to measure water levels and water temperatures of the surface water and shallow groundwater at the monitoring location.
– A field monitoring event conducted each month between May and November 2024 to collect manual water levels and download the transducers.
– Data analysis of the water level and water temperature data collected at the monitoring location from April 26, 2024 to November 26, 2024 (seven month monitoring period).
– Data processing of local precipitation data during the monitoring period.

GHD did not conduct discrete flow monitoring as part of the surface water monitoring assessment due to lack of identified flow paths into or out of the wetland area. A hydrograph with continuous water level at the monitoring location was prepared based on the data collected during the monitoring period which can be used to identify the timing of contributions to the on-Site wetland area (i.e., hydroperiod).

A photographic log is provided in Attachment 1.

3.1 Monitoring methodology

A surface water monitoring location identified as SW1/MP1 was established within the wetland located in the southwest area of the Site boundary, identified in Figure 1.

At the monitoring location, a non-vented pressure transducer (Solinst Model 3001 – Levelogger Edge) was installed to measure continuous surface water level and temperature at 15-minute intervals. The transducer was attached to a staff gauge t-bar. Similarly, a transducer was installed within the mini-piezometer to measure continuous shallow groundwater levels as well as water temperature. The continuous water level data was compensated using barometric pressure data collected by a Solinst barologger in proximity to the monitoring location. Manual surface water levels were measured to confirm the continuous water level dataset at the monitoring station and used to convert the water levels to water elevations.

Air temperature data and 2024 precipitation data was obtained from the Kitchener/Waterloo Environment Canada Weather Station (Climate ID: 6144239) located approximately 14.6 kilometers west of the Site. In addition, Climate Normal (1981-2010) data was obtained from the Waterloo Wellington A weather station (Climate ID: 6149387). A summary of the monthly meteorological data during the monitoring period is provided in Table 1.

Table 1 Meteorological data

Month/Year	Average monthly air temperature (°C)	Climate normal temperature (°C)	Total monthly precipitation (mm)	Climate normal precipitation (mm)
April 2024	7.7	6.2	108.0	74.5
May 2024	14.6	12.5	102.1	82.3
June 2024	18.5	17.6	81.5	82.4
July 2024	20.4	20.0	149.0	98.6
August 2024	19.0	18.9	103.5	83.9
September 2024	16.7	14.5	23.4	87.8
October 2024	9.8	8.2	32.0	67.4
November 2024	5.3	2.5	43.6	87.1

The monthly precipitation totals during the monitoring period were higher than the average climate normal in almost all the spring and summer of 2024, but was much lower than the climate normal for the fall months. In addition, the monthly average temperatures in the spring and summer were slightly greater than the climate normal temperatures, with the greatest difference observed in November being 2.8 °C greater than the climate normal.

3.2 Monitoring results

A total of eight monitoring events were conducted for the collection of manual water level measurements. A summary of the manual water level measurement is provided in Attachment 2.

The continuous and manual surface water and shallow groundwater levels relative to local precipitation are presented in Attachment 3. The following observations were made with respect to water levels measured during the monitoring period:

– Surface water was observed at SW1/MP1 throughout the spring and summer months (April to August 2024).
– The wetland area at the monitoring location was observed to be dry during the September, October and November 2024 events; however open water was observed south of the monitoring location within the wetland area during the September 2024 event. The entirety of the wetland area was observed to be dry during the October and November 2024 events.
– Surface water level responses to precipitation events were observed at SW1/MP1, especially after large precipitation events. Notable precipitation events (greater than 20 mm within a 24-hour period) that took place during the monitoring period included: May 7th (27 mm), July 10th (55.3 mm), July 16th (65.7 mm), August 18th (22.9 mm), August 30th (31.1 mm), and October 29th (21.8 mm).
– The interaction between the shallow groundwater and surface water over the monitoring period indicates a gaining wetland (i.e., shallow groundwater is discharging into the wetland) as seen in the hydrograph in Attachment 3. Dry conditions observed at the surface of the wetland during the September event even though the shallow groundwater level measured in MP1 was above the ground surface indicates water loss from the wetland due to evaporation and transpiration as no surface runoff was observed leaving the wetland.
– A slow increasing response in MP1 water levels was observed in response to the two large precipitation events in mid-July followed by a steady decrease in water levels observed at the end of September when the surface of the wetland was observed to be dry at the monitoring location.

The continuous water temperatures recorded at the monitoring location, along with ambient air temperatures, are also presented within the hydrograph in Attachment 3. The following observations were made with respect to water temperatures measured during the monitoring period:

– Surface water temperatures at SW1 were observed to generally follow the ambient air temperature trend.
– The shallow groundwater temperature data collected within the mini piezometer followed an overall steady decreasing or increasing trend that correlates with the ambient air temperatures, with a very slow observed response time to warming and cooling conditions.

4. Summary and Conclusions

Based on the results of the surface water assessment and monitoring undertaken to date, the following summary and conclusions are provided:

– One monitoring location was established in April 2024 to collect manual and continuous water level and temperature data within the wetland area located within the southern portion of the Site.
– Eight monitoring events were completed in 2024 to collect manual water level measurements and download continuous water level and temperature data within the wetland area.
– There was no defined inlet or outlet flow path or active flow observed within the wetland area during the monitoring events.
– The shallow groundwater levels were observed to increase throughout the monitoring period with levels observed above ground surface from mid-July to the end of October, indicating that the shallow groundwater aquifer is contributing to the surface water in the wetland (i.e., gaining wetland condition).
– Surface water temperatures were observed to generally follow the ambient air temperature trend. Shallow groundwater temperature data followed an overall steady decreasing or increasing trend that correlates with the ambient air temperatures, with a slow observed response time to warming and cooling conditions compared to surface water temperatures.
– The wetland at the monitoring location was observed to be dry during the September, October and November 2024 events. Open water was observed south of the monitoring location, still within the wetland boundary during the September 2024 event. The entirety of the wetland area was observed to be dry during the October and November events.
– Should further monitoring within the wetland be required in 2025, it is recommended that a second monitoring location be established within the wetland to capture lower water levels during the fall months.

Regards

[redacted]

Sarah Andrew, P.Eng.
Water Resources Engineer

+1 519 340-3902
sarah.andrew@ghd.com

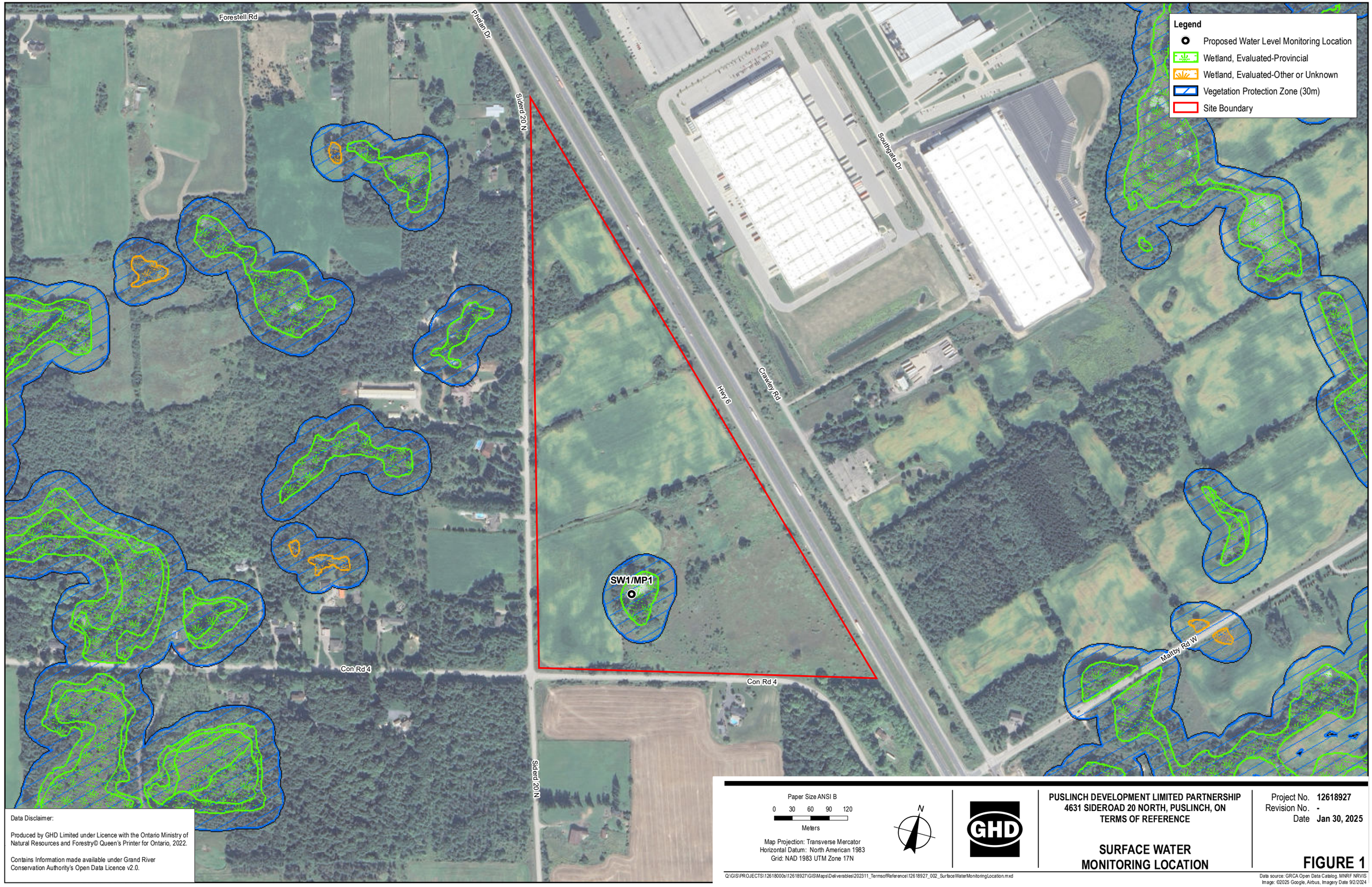
[redacted]

Juliana Orr
Water Resources Field Technician

+1 226 750 6525
juliana.orr@ghd.com

Copy to: Peter Zytner (GHD)
Jason Haelzle (GHD)

Figures



Data Disclaimer:

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Contains Information made available under Grand River Conservation Authority's Open Data Licence v2.0.

Paper Size ANSI B

0 30 60 90 120

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

PUSLINCH DEVELOPMENT LIMITED PARTNERSHIP
4631 SIDEROAD 20 NORTH, PUSLINCH, ON
TERMS OF REFERENCE

SURFACE WATER MONITORING LOCATION

Project No. **12618927**
Revision No. **-**
Date **Jan 30, 2025**

FIGURE 1

Q:\GIS\PROJECTS\12618000s\12618927\GIS\Maps\Deliverables\202311_TermsofReference\12618927_002_SurfaceWaterMonitoringLocation.mxd

Data source: GRCA Open Data Catalog, MNRF NRVIS
Image: ©2025 Google, Airbus, Imagery Date 9/2/2024

Attachments

Attachment 1

Photographic log



Photo 1 – Wetland location on April 26, 2024.



Photo 2 – SW1/MP1 installation with continuous loggers on April 26, 2024.

Site Photographs



Photo 3 – Wetland on May 27, 2024.



Photo 4 – SW1/MP1 water level on May 27, 2024.



Photo 5 – SW1/MP1 and wetland on June 25, 2024.



Photo 6 – SW1/MP1 and wetland on July 23, 2024.



Photo 7 – SW1/MP1 and wetland on August 30, 2024.



Photo 8 – SW1/MP1 and wetland on September 27, 2024.



Photo 9 – SW1/MP1 on October 25, 2024.



Photo 10 – Wetland on November 26, 2024.

Attachment 2

Manual water level measurements

Attachment 2

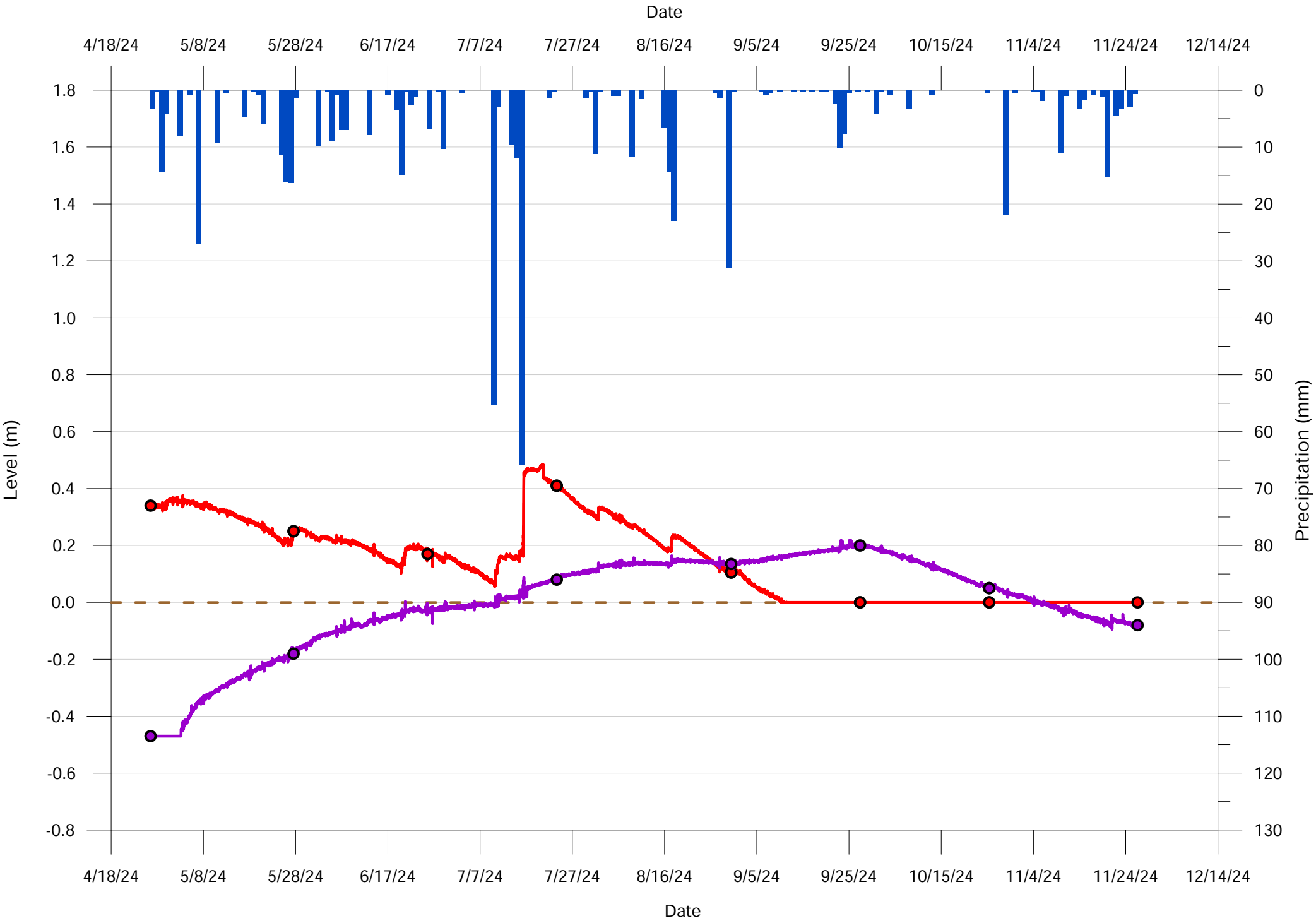
Manual Water Level Measurements
Surface Water Monitoring Assessment
Puslinch Development Limited Partnership
Puslinch, Ontario

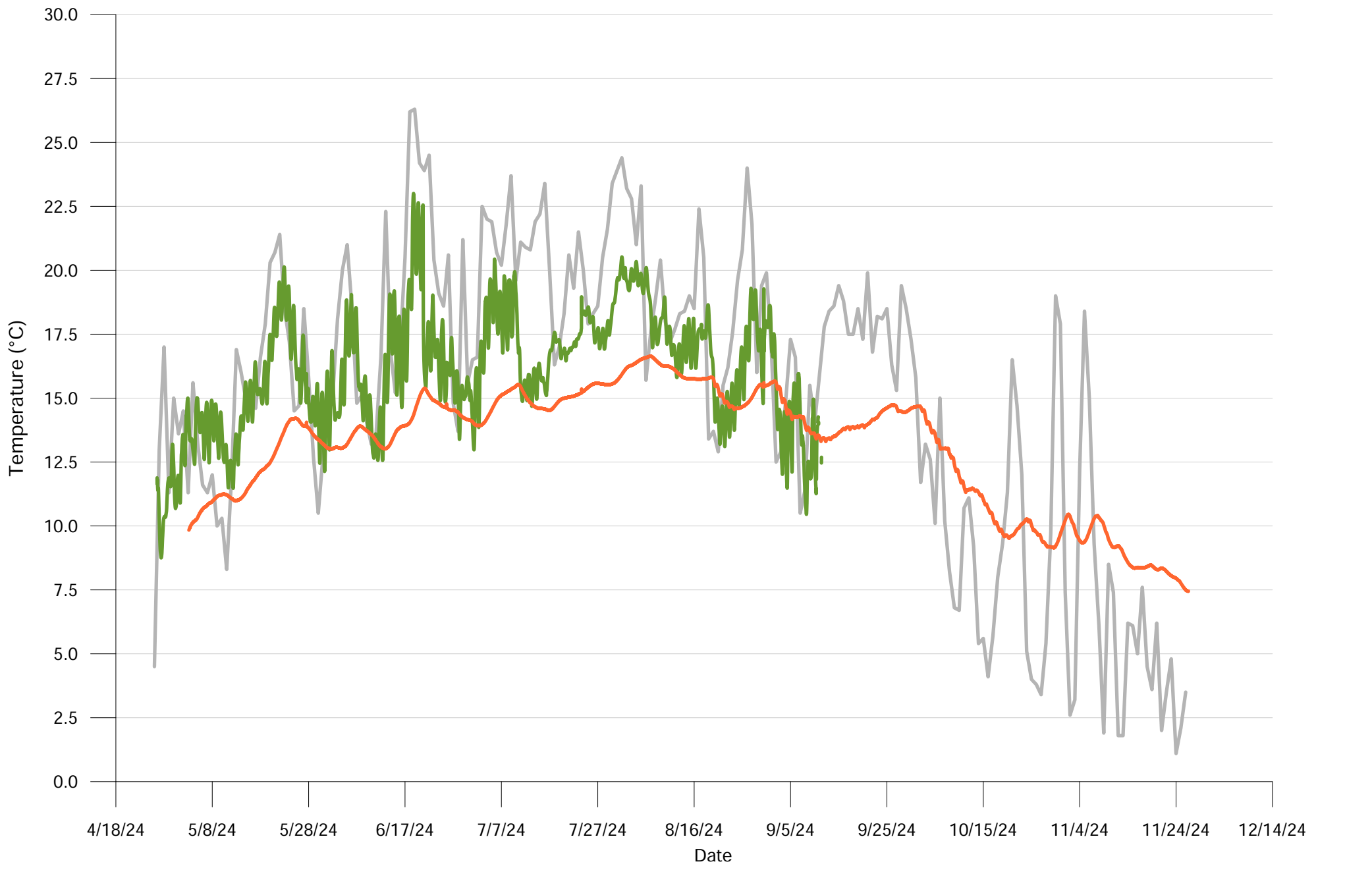
Date	SW-01	MP-01
4/26/2024	0.340	-0.470
5/27/2024	0.250	-0.180
6/25/2024	0.170	-
7/23/2024	0.410	0.080
8/30/2024	0.105	0.135
9/27/2024	0.000	0.200
10/25/2024	0.000	0.050
11/26/2024	0.000	-0.080

Notes:
Positive water level is above ground surface.
Negative water level is below ground surface.

Attachment 3

SW1-MP1 Hydrograph





Notes:
- Precipitation and ambient temperature data provided from the Kitchener/ Waterloo (Climate ID: 6144239) Environment Canada weather station and supplemented with the Roseville (Climate ID: 6147188) Environment Canada weather station.
- Gaps in the continuous water temperature were caused by dry conditions.

PUSLINCH DEVELOPMENT LIMITED PARTERNSHIP
PUSLINCH, ONTARIO
SURFACE WATER ASSESSMENT

SW1/MP1 - SURFACE WATER HYDROGRAPH AND TEMPERATURE DATA

Project No. 12618927
Date January 2025

Appendix G

Water Balance Report

Technical memorandum

30 May 2025

To	Puslinch Development GP Inc	**Contact No.**	519-340-3902
Copy to		**Email**	sarah.andrew@ghd.com
From	Sarah Andrew, GHD Maxwell Robinson, GHD	**Project No.**	12618927
Project Name	Estill Innovation Community		
Subject	Preliminary Site-Specific and Feature-Based Water Balance Analysis		

1. Introduction

GHD Limited (GHD) was retained by Puslinch Development GP Inc (Client) to complete preliminary Site-specific and feature-based water balance assessments in support of a proposed industrial and community development at 4631 Sideroad 20 North, Puslinch Township, Ontario (hereafter referred to as the 'Site'). A non-continuous hydrological model (Thornthwaite and Mather) at a monthly resolution was adopted for this approach. Both assessments were completed for pre-development and post-development (uncontrolled and controlled) conditions. The Site location is shown on Figure 1.

1.1 Purpose of this memorandum

Two (2) water balance analyses were conducted for this assessment. The objective of the Site-specific analysis is to characterize the impact of the proposed development on groundwater recharge in comparison to pre-development conditions. The objective of the feature-based assessment is to characterize the hydroperiods of the on-Site wetland feature (a part of the Cranberry Oil Well Bog Wetland Complex) and assess the impact of the proposed development on its hydrological functions. The approach used to complete the analyses is summarized below:

– Review available topographic data, climate data, hydrogeological data, and plans and drawings for the proposed development at the Site.
– Perform a subcatchment delineation to determine the contributing drainage areas of the on-Site wetland feature.
– Complete monthly water balance calculations using the Thornthwaite and Mather approach for the Site and on-Site wetland feature under pre-development and post-development (uncontrolled and controlled) conditions.
– Compare the predicted infiltration and runoff volumes between the pre- and post-development conditions to assess the impact of the proposed development on the hydrological function of the on-Site wetland feature, with and without SWM and low impact development (LID) controls in place.

1.2 Scope and limitations

This technical memorandum has been prepared by GHD for Puslinch Development GP Inc. It is not prepared as, and is not represented to be, a deliverable suitable for reliance by any person for any purpose. It is not intended for circulation or incorporation into other documents. The matters discussed in this technical memorandum are limited to those specifically detailed in the technical memorandum and are subject to any limitations or assumptions specially set out.

GHD has prepared this technical memorandum on the basis of information provided by the Client and others who provided information to GHD (which may also include Government authorities), which GHD has not independently verified or checked for the purpose of this technical memorandum. GHD does not accept liability in connection with such unverified information, including errors and omissions in the technical memorandum which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this technical memorandum are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this technical memorandum are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this technical memorandum.

Accessibility of documents

If this technical memorandum is required to be accessible in any other format this can be provided by GHD upon request and at an additional cost if necessary.

2. Site description

2.1 Pre-development conditions

Under pre-development conditions, the Site is situated in the rural area of the Township of Puslinch, Wellington County, adjacent to the City of Guelph. The Site is bounded by Provincial Highway 6 (Hanlon Parkway) to the east, Concession Road 4 to the south and Side Road 20 N to the west. The Site is triangular in shape and is approximately 25.47 hectares (ha) and currently consists of unoccupied land used for agricultural purposes. There is a small vegetated/wetland area just north of Concession Road 4 that is part of the Cranberry Oil Well Bog Wetland Complex, a provincially significant wetland complex. Approximately 24.46 ha of the Site drains internally within several depressions located throughout while 1.01 ha drains offsite. The surficial soils within the Site are primarily gravel, sandy silt, and silty sand based on the Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA) AgMaps database and borehole logs conducted by GHD (2024). A map of the pre-development conditions for both the Site-specific and feature-based water balance analyses is provided on Figure 2.

The Site is located within the jurisdiction of the Grand River Conservation Authority (GRCA) and is located within the Grand River sub-watershed, which ultimately drains to Lake Erie. The Site sits within a Tier 2 Significant Groundwater Recharge Area (SGRA), a Well Head Protection Area (WHPA), and a regulated zone for the on-Site wetland. The on-Site provincially significant wetland feature sits at an elevation of 331 metres above sea level (masl) and internally drains (i.e., no outlet).

To evaluate the impacts of the proposed development on the hydrological function of the on-Site wetland feature, an assessment point was placed at the center of the on-Site wetland feature. This assessment point will be used to evaluate the changes in drainage area and surplus contributing to the on-Site wetland feature.

2.2 Post-development conditions

Under post-development conditions, the Site will consist of three (3) slab-on-grade industrial structures and two (2) slab-on-grade commercial structures surrounded by parking lots, paved aprons, walkways, and roadways. A SWM pond will also be included to meet stormwater control criteria. It is assumed the proposed structures will be one- to two-stories with no basements. These areas are based on the "Puslinch Industrial Development OPA/ZBA Site Plan" prepared by Sweeny & Co Architects (January 2025). In the southwest corner of the Site, adjacent to Sideroad 20 North, there is additional capacity to accommodate a future slab-on-grade industrial structure and adjacent walkways/roadways/parking lots, if desired. Additionally, the expansion areas adjacent to the proposed industrial buildings will likely be developed in the future as parking lots. For the purposes of this assessment, the potential future industrial structure, adjacent walkways/roadways/parking lots, and expansion areas will be considered in the Site-specific and feature-based water balance assessments to account for the additional impervious area when designing the proposed SWM and LID measures.

As the Site Plan is currently in development, GHD understands that any changes to the Concept Plan would require the revision of the post-development (uncontrolled and controlled) condition scenarios of the water balance assessment. A map of the post-development conditions, per the Site Plan to-date, for both the Site-specific and feature-based water balance analyses is provided on Figure 3.

Based on the GHD post-development drainage plan, approximately 2.71 ha will drain internally within the wetland, 22.44 ha to the SWM pond, and 0.32 ha will drain off-Site. For the purposes of the Site-specific water balance assessment, under the post-development (uncontrolled) conditions scenario, the runoff to the SWM pond will be considered off-Site drainage (i.e., uncontrolled runoff). For the feature-based water balance assessment, as all runoff within the on-Site wetland features catchment will internally drain, there will be no split between internal and external drainage areas.

A land use breakdown of the pre- and post-development conditions for the Site-specific water balance is provided below in Table 1.

Table 1 Site-specific land use breakdown of the pre- and post-development condition areas

Land use	Internally draining area		Off-Site draining area	
	Area (ha)	Total percent area (%)	Area (ha)	Total percent area (%)
Pre-development				
Moderately rooted agriculture (corn)	12.72	52.0	0.51	50.5
Meadow	4.55	18.6	0.36	35.6
Meadow (former gravel quarry)	4.25	17.4	0.02	2.0
Abandoned farm buildings	0.03	0.1	-	-
Thicket/hedgerows	2.55	10.4	0.12	11.9
On-Site wetland (shallow aquatic)	0.20	0.8	-	-
On-Site wetland (deciduous swamp)	0.16	0.7	-	-
Total Site area:	**24.46**	**100**	**1.01**	**100**
Post-development				
Grassed area/SWM pond banks	0.76	28.0	6.03	26.5
Grassed area/SWM pond banks (former gravel quarry)	-	-	0.89	3.9
Industrial/community buildings	0.22	8.1	6.84	30.1
Parking lots/walkways/roadways	0.4	14.8	8.66	38.0
On-Site wetland (shallow aquatic)	0.2	7.4	-	-

Land use	Internally draining area		Off-Site draining area	
	Area (ha)	Total percent area (%)	Area (ha)	Total percent area (%)
On-Site wetland (deciduous swamp)	0.16	5.9	-	-
Meadow (wetland buffer)	0.66	24.4	-	-
Thicket (wetland buffer)	0.31	11.4	-	-
SWM pond	-	-	0.34	1.5
Total Site area:	**2.71**	**100**	**22.76**	**100**

A breakdown of pre- and post-development conditions land uses for the feature-based water balance is provided below in Table 2.

Table 2 Feature-based land use breakdown of the pre- and post-development condition areas

Assessment point	AP-1	
Land use	**Area (ha)**	**Total percent area (%)**
Pre-development		
Moderately rooted agriculture (corn)	9.79	50.9
Meadow	4.88	25.4
Meadow (former gravel quarry)	2.52	13.1
Abandoned farm buildings	0.03	0.2
Thicket/hedgerows	1.03	5.3
Roadway	0.62	3.2
On-Site wetland (shallow aquatic)	0.20	1.1
On-Site wetland (deciduous swamp)	0.16	0.8
Total Site area:	**19.23**	**100**
Post-development		
Grassed area	0.76	28.0
Community buildings	0.22	8.1
Walkways	0.40	14.8
On-Site wetland (shallow aquatic)	0.20	7.4
On-Site wetland (deciduous swamp)	0.16	5.9
Meadow (wetland buffer)	0.66	24.4
Thicket (wetland buffer)	0.31	11.4
Total Site area:	**2.71**	**100**

3. Surface water balance

3.1 Methodology

The Site-specific and feature-based water balance assessments were conducted based on the standard methodology described in the document titled “Hydrogeological Assessment Submissions, Conservation Authority Guidelines for Development Applications (June 2013)”. The standardized water balance approach is

to utilize the “Meteorological Service Data Analysis and Archive Division of Environment Canada (EC)” to provide monthly water balance summaries for different soil-water holding capacities.

Water holding capacity (WHC)

The maximum soil storage is quantified as the water holding capacity (WHC), which is defined based on a combination of land use and soil type, as presented in Table 3.1 of the MOE SWM Manual (2003). The WHC represents the total amount of water that can be stored in the soil capillaries and is defined as the water content between the field capacity and wilting point (the practical maximum and minimum soil water content, respectively). WHC values typically range from approximately 10 millimetres (mm) for bedrock and impervious areas to 400 mm for mature forest over silt loam.

Climate data

The water balance assessments presented herein are based on composite meteorological data from the Environment and Climate Change Canada (ECCC) Thornthwaite and Mather water budget. Historical records spanning 48 years between 1975 to 2023 were compiled from six nearby climate stations, with missing observations substituted with records from nearby stations. The stations are summarized in Table 3 with the ECCC data presented in Table A1 in Appendix A.

Table 3 ECCC climate stations near the Site

Climate ID	Station name	Record period(s)	Distance from Site (km)
6143069	Guelph Arboretum	1975 – 1997	8.3 NW
6149387	Waterloo Wellington Airport	1997 – 2001	15.6 SW
6143090	Guelph Turfgrass CS	2001 – 2003	8.3 NW
6149388	Region of Waterloo Int’l Airport	2003 – 2010	14.8 SW
6144239	Kitchener/Waterloo	2010 – 2021	14.8 SW
6143092	Guelph Turfgrass Institute	2021 – 2023	8.3 NW

Model approach

The results from EC water balance model presents the following monthly output: temperature (mean), precipitation, rainfall, snowmelt, potential evapotranspiration (PET), actual evapotranspiration (AET), and water surplus (WS) for each of the years in the historic record, as well as average monthly values over the entire record. The model is used to estimate the soil storage (water) surplus based on a provided soil water holding capacities.

The Thornthwaite and Mather (1957) method is used to calculate the potential and actual amounts of evapotranspiration and water surplus. The calculations are performed on a daily basis and consists of daily precipitation (rainfall and snowmelt) and temperature data to estimate evapotranspiration (ET), soil-water storage, and water surplus. The EC water balance model utilizes a daily timestep developed by the Meteorological Service of Canada (MSC), as daily data allows for more accurate modelling of snowmelt and snow storage, which are of particular importance in a cold weather/winter climate (Johnstone and Louie, 1983).

The water balance calculations are based on the following equation:

$$P = S + ET + WS$$

Where:

P = precipitation

S = change in soil water storage

ET = evapotranspiration

WS = water surplus (surface runoff and infiltration)

Precipitation (P) is either rain or snow depending on the mean daily temperature. Evapotranspiration (ET) refers to the water that is lost to the atmosphere due to evaporation from soil or water and due to transpiration from plants and trees. The Thornthwaite & Mather (1957) methodology estimates AET based on the following condition: 1) AET equals PET when there is enough water available within the soil storage (water holding capacity) to meet the evapotranspiration demand, otherwise, 2) AET equals the amount of water that is available for evapotranspiration.

The water surplus (WS) is the difference between P and AET and is calculated when the water holding capacity of the soil storage is exceeded. The WS represents the total water available in each month to runoff as surface overland flow or infiltrate to the ground and recharge the groundwater table. The average annual water surplus is separated into infiltration and runoff based on an infiltration factor. The infiltration factor is presented in Table 3.1 of the MOE SWM Manual (2003). Site-specific infiltration factors are estimated based on aggregating the infiltration factors for topography, surficial soil type, and vegetative cover factors (land use).

3.2 Catchment delineation

The “Watershed Delineation Tool” in PCSWMM was used to delineate the feature-based sub-catchment area for the pre-development condition as shown on Figure 2. Results of the analysis showed three drainage splits: 1) along the northern boundary from Sideroad 20 N going northeast across the Site to Highway 6, 2) along the southeast boundary from Concession Road 4 going northeast across the Site to Highway 6, and 3) along the southwest boundary from Sideroad 20 N going southeast across the Site to Concession Road 4. The post-development (uncontrolled) conditions sub-catchment area for the feature-based water balance was based on the finalized drainage plan completed by GHD showing the adjacent pervious areas and walkways would gravity drain to the wetland as shown on Figure 3.

Assessment point 1 (AP-1)

Assessment point-1 (AP-1) is located within the center of the on-Site wetland feature. The sub-catchment for this assessment point has a total area of 19.23 ha, of which 17.29 ha lies within the Site boundary. The predominant land use of the sub-catchment within the Site is moderately rooted agriculture, cultural thicket/hedgerows, and cultural meadow. The proposed development will decrease the size of the sub-catchment, rediverting the majority of the drainage either offsite, to an LID measure or to the SWM facility for runoff attenuation prior to discharge.

3.3 Surface water balance parameters

The surficial soils are primarily sandy silt, silty sand, and gravel deposits (i.e., loam) within the surrounding area, based on the borehole drilling logs completed by GHD (2024). A former gravel quarry is present underneath the Site along the southern boundary with its surficial soil primarily consisting of fine sand, gravel, and silt (i.e., fine sandy loam) based on the borehole drilling logs GHD (2024). Available topography for the Site can be classified as rolling to hilly land with an average slope between 3.8 - 28 m/km. The maximum soil storage was quantified using a WHC based on guidelines provided in Table 3.1 of the MOE SWM Manual (2003). The infiltration factors and WHCs for the pre-development and post-development land uses, Site-specific topography, surficial soil type, and vegetative cover factors are presented for the Site-specific and feature-based water balance assessments in Table A2 and Table A3 in Appendix A, respectively.

The water balance analysis was developed under the following assumptions:

– WHCs were chosen based on Table 3.1 in the MOE SWM Manual (2003) corresponding to the loam soil type, pre- and post-development (uncontrolled and controlled) condition land uses for the Site-specific and feature-based water balances.

– For the impervious areas, WHCs of 2 mm and 10 mm were chosen to represent the roofed and paved areas, respectively. A WHC of 2 mm was chosen for roofed areas as minimal depression storage is available on sloped roofs. A WHC of 10 mm was chosen for paved areas due to the presence of depressions throughout the surface which could hold runoff.
– Assuming changes to grading and GW level, the septic tank should be at a depth that will not impact infiltration.
– For the on-Site wetland feature (i.e., the shallow aquatic wetland and deciduous swamp), WHCs of 175 and 325 mm were chosen, respectively, to represent the storage capacity provided by the depressions of the wetland and treed swamp based on the observation of standing water present throughout the majority of the year, as discussed in Section 6.0.
– For the SWM pond area, a value for the annual lake evaporation to represent the open water was obtained from the lake evaporation climate normals for Waterloo Wellington ECCC Meteorological Station between 1981 to 2010 (690 mm/year).
– For the SWM pond, a null infiltration factor was chosen due to the incorporation of an impermeable geotextile liner covering the bottom of the pond due to high groundwater levels.
– For the on-Site wetland feature and adjacent areas draining to it, an infiltration factor of 1.00 was chosen due to the wetland internally draining as no outlet is present other than during storm events greater than the 100-year storm event.
– For the internally draining areas, an infiltration factor of 1.00 was chosen to represent the added infiltration within the various depressions across the Site. For the purposes of the controlled scenario, the areas draining to the SWM pond were not assigned this infiltration factor so the total runoff from the SWM pond could be estimated.
– Net surplus was estimated by multiplying the estimated monthly surplus for the assumed WHC by the associated drainage area. AET and surplus values were obtained from the meteorological data from the composite Guelph - Waterloo ECCC Meteorological Station based on the WHC assigned to each land use area.
– Runoff was calculated as the difference between surplus and infiltration.

4. Site-specific surface water balance

4.1 Water balance results

An average annual water balance was carried out on a Site-specific basis. The results for the pre-development and post-development (uncontrolled) conditions are presented in this section.

4.1.1 Pre-development conditions

Based on the results of the assessment, the average annual pre-development water balance was estimated on a Site-specific basis as summarized in Table 4, with detailed monthly values provided in Table A4 in Appendix A.

Table 4 Pre-development average annual water balance results – Site-specific

Drainage area	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
Internally draining area	24.46	208,660	141,125	67,005	67,005	-
Off-Site draining area	1.01	8,600	5,840	2,735	1,540	1,195
Total	**25.47**	**217,260**	**146,965**	**69,740**	**68,545**	**1,195**

Notes:

1. Volumes are rounded for reporting purposes.

4.1.2 Post-development (uncontrolled) conditions

Based on the results of the assessment, the average annual post-development (uncontrolled) water balance was estimated on a Site-specific basis as summarized in Table 5, with detailed monthly values provided in Table A5 in Appendix A.

Table 5 Post-development (uncontrolled) average annual water balance results – Site-specific

Land use	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
Internally draining area	2.71	23,115	14,650	8,420	8,420	-
Off-Site draining area	22.76	194,145	110,470	83,620	11,845	71,775
Total	**25.47**	**217,260**	**125,120**	**92,040**	**20,265**	**71,775**

Notes:

1. Volumes are rounded for reporting purposes.

4.1.3 Post-development (controlled) conditions

Under post-development (controlled) conditions, several LID measures are proposed to be incorporated into the Site design to infiltrate clean roof runoff from the proposed buildings as well as grassed area adjacent to the daycare and gym to meet the water quantity control requirements of the SWM criteria detailed in the GHD SWM Report (2025). The proposed LID measures are composed of underground infiltration chamber, infiltration trenches, overland depression areas, and diverting drainage to the existing on-Site wetland feature (via the SWM pond) to promote on-Site infiltration. The infiltration systems will only collect roof drainage and drainage from landscaped areas, and to provide storage to retain water to promote infiltration. These infiltration systems are sized to retain the roof runoff from a minimum of 25 mm rainfall event. These infiltration systems are to be placed to provide a minimum of 1.0 m vertical clearance between the bottom of the facilities to the high groundwater elevation. Based on the 25 mm design storm and a 48-hour drawdown time, a historical rainfall assessment using meteorological data over a 48-year record from the composite Guelph - Waterloo ECCC Meteorological Station was completed to determine the runoff reduction factor for a 25 mm design storm. Based on the analysis, a runoff reduction factor of 87% and 94% was assigned to the roofed and landscaped areas, respectively.

A SWM pond facility is proposed to be located at the south boundary of the Site and was designed to receive and store runoff for a total Site drainage area of 22.44 ha up to and including the 100-year design storm event. Two outlet structures are proposed to manage the runoff discharge from the SWM pond. A low-flow orifice with a diameter of 375 mm at elevation 331.67 m is designed to release water from the SWM pond at a controlled flow rate, that discharges directly into the on-Site wetland feature. An emergency spillway is proposed at an elevation of 332.86 m to convey excess water from the SWM pond during high-flow events south toward the roadside ditch located just north of Concession Road 4. Total runoff volumes for the LID measures and SWM pond are provided in Table A6 in Appendix A.

Based on the results of the assessment, the average annual post-development (controlled) water balance was estimated on a Site-specific basis as summarized in Table 5, with detailed monthly values provided in Table A7 in Appendix A.

Table 6 Post-development (controlled) average annual water balance results – Site-specific

Land use	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
Internally draining area	25.15	214,530	123,480	90,955	43,730	47,225
Off-Site draining area	0.32	2,730	1,640	1,085	345	740
Additional Infiltration Measures						
On-Site Wetland via SWM Pond Low Flow Orifice	-	-	-	-	47,000	(47,000)
On-Site Wetland via LID #5/6 Overflow	-	-	-	-	220	(220)
Total	**25.47**	**217,260**	**125,120**	**92,040**	**91,295**	**745**

Notes:

1. Volumes are rounded for reporting purposes.

4.2 Summary of water balance results

A summary of the annual water balance assessment considering surplus, infiltration, and runoff for the pre-development and post-development (uncontrolled and controlled) conditions is provided in Table 7, with detailed annual values provided in Table A8 in Appendix A.

Table 7 Summary of average annual water balance results – Site-specific

Scenario	Area (ha)	Average annual volume [1]					
		Surplus (S)		Infiltration (I)		Runoff (R)	
		m^3/yr	mm/yr	m^3/yr	mm/yr	m^3/yr	mm/yr
Pre-development	25.47	69,740	274	68,545	269	1,195	5
Post-development (uncontrolled)	25.47	92,040	361	20,265	80	71,775	281
Post-development (controlled)	25.47	92,040	361	91,295	358	745	3
Pre- to post-development difference							
Absolute difference	-	22,300	87	22,750	89	(450)	(2)
Percent difference	0%	32%	32%	33%	33%	-38%	-38%

Notes:

1. Volumes are rounded for reporting purposes.

Under post-development (uncontrolled) conditions, Site-specific surplus is anticipated to increase by 22,300 m^3/year (87 mm/year), representing a corresponding decrease in evapotranspiration due to changes in land use. Direct infiltration is anticipated to decrease by 48,280 m^3/year (190 mm/year) due to an increase in impervious area. This will effectively increase the runoff generated within the Site by 70,580 m^3/year (277 mm/year).

Under post-development (controlled) conditions, Site-specific surplus is anticipated to increase by 22,300 m^3/year (87 mm/year), representing a corresponding decrease in evapotranspiration due to changes in land use. Direct infiltration is anticipated to increase by 22,750 m^3/year (89 mm/year) due to the implementation of LIDs and runoff retention in the on-Site wetland feature. The retention of runoff within the on-Site wetland will also effectively decrease the runoff generated within the Site by 450 m^3/year (2 mm/year).

5. Feature-based surface water balance

5.1 Water balance results

An average annual water balance was carried out on a feature-based basis. The results for the pre-development and post-development (uncontrolled and controlled) conditions are presented in this section.

5.1.1 Pre-development conditions

Based on the results of the assessment, the average annual pre-development water balance was estimated on a feature-based basis as summarized in Table 8, with detailed monthly values provided in Table A9 in Appendix A.

Table 8 Pre-development average annual water balance results – feature-based

Assessment point	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
AP-1	19.23	164,070	110,130	53,515	28,700	24,815

Notes:

1. Volumes are rounded for reporting purposes.

5.1.2 Post-development (uncontrolled) conditions

Based on the results of the assessment, the average annual post-development (uncontrolled) water balance was estimated on a feature-based basis as summarized in Table 9, with detailed monthly values provided in Table A10 in Appendix A.

Table 9 Post-development (uncontrolled) average annual water balance results – feature-based

Assessment points	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
AP-1	2.71	23,115	14,650	8,420	3,800	4,620

Notes:

1. Volumes are rounded for reporting purposes.

5.1.3 Post-development (controlled) conditions

Based on the results of the assessment with incorporation of the proposed LID and SWM measures detailed in Section 4.13, the average annual post-development (controlled) water balance was estimated on a feature-based basis as summarized in Table 9, with detailed monthly values provided in Table A11 in Appendix A.

Table 10 Post-development (controlled) average annual water balance results – feature-based

Assessment points	Area (ha)	Average annual volume m^3/a [1]				
		Precipitation (P)	Evapotranspiration (ET)	Surplus (S)	Infiltration (I)	Runoff (R)
AP-1	25.15	214,530	123,480	90,955	40,815	50,140

Notes:

1. Volumes are rounded for reporting purposes.

5.2 Summary of water balance results

A summary of the annual water balance assessment considering surplus, infiltration, and runoff for the pre-development and post-development (uncontrolled and controlled) conditions is provided in Table 11 for AP-1, with detailed annual values provided in Table A12 in Appendix A.

Table 11 Summary of average annual water balance results – feature-based (AP-1)

Scenario	Area (ha)	Average annual volume [1]					
		Surplus (S)		Infiltration (I)		Runoff (R)	
		m^3/yr	mm/yr	m^3/yr	mm/yr	m^3/yr	mm/yr
Pre-development	19.23	53,515	278	28,700	149	24,815	129
Post-development (uncontrolled)	2.71	8,420	311	3,800	140	4,620	170
Post-development (controlled)	25.15	90,955	361	40,815	162	50,140	199
Pre- to post-development difference							
Absolute difference	5.92	37,440	195	12,115	63	25,325	132
Percent difference	31%	70%	70%	42%	42%	102%	102%

Notes:

1. Volumes are rounded for reporting purposes.
2. Absolute difference is averaged over the pre-development area.

Under post-development (uncontrolled) conditions, surplus to AP-1 is anticipated to decrease by 84% (234 mm/year) compared to pre-development conditions. The change in surplus represents a decrease in evapotranspiration caused by the change in land use and decrease in catchment area of 16.52 ha (86%). Direct infiltration is anticipated to decrease by 24,900 m^3/year (129 mm/year) and runoff to AP-1 is expected to decrease by 20,195 m^3/year (105 mm/year).

Under post-development (controlled) conditions, surplus to AP-1 is anticipated to increase by 37,440 (195 mm/year) compared to pre-development conditions. The change in surplus represents a decrease in evapotranspiration caused by the change in land use and increase in catchment area of 5.92 ha (31%) due to the diversion of stormwater runoff captured in the SWM pond to the on-Site wetland. Direct infiltration is anticipated to increase by 12,115 m^3/year (64 mm/year) and runoff to AP-1 is expected to increase by 25,325 m^3/year (132 mm/year). However, it is to be noted that the estimated annual infiltration within the catchment of the on-Site wetland under this water balance assessment is not fully representative of the groundwater contribution to the wetland as groundwater flow direction is not accounted for. For the purposes of this feature-based water balance assessment, only the runoff contribution will be analyzed for potential wetland impacts.

Summary

Overall, the results of the water balance analysis predict an increase in average monthly infiltration across the Site and an increase in average monthly runoff to the on-Site wetland feature (i.e., AP-1). Both increases can be attributed to the change in land use on the Site as well as the incorporation of the proposed LID measures as well as the diversion of runoff from the SWM pond to the on-Site wetland feature.

6. Assessment of the on-Site wetland features hydroperiod

6.1 Wetland water level monitoring

To understand baseline conditions, GHD initiated a surface water monitoring program in May 2024 to be conducted over a monitoring period of one (1) year to ensure seasonal data is collected (i.e., spring, summer,

fall, and winter). To characterise the hydroperiods of the on-Site wetland feature, GHD established one (1) monitoring location (SW1/MP1) within the wetland as shown on Figure 2.

At this monitoring location, a staff gauge and mini piezometer were installed to measure discrete surface water and shallow groundwater levels, respectively, in conjunction with continuous measurements of water level and temperature recorded by non-vented pressure transducers at 15-minute intervals.

The continuous and manual surface water level hydrograph for the wetland, relative to local precipitation, is presented in Appendix B. As depicted in the hydrograph, surface water levels were observed within the wetland throughout the late spring to late summer with water levels going dry shortly after the beginning of September. Shallow groundwater levels were observed to be below the ground surface from the spring to early summer (May to July) and the late fall (November to December), with levels raising above the ground surface throughout the summer and early fall (July to November). These observations indicate a losing condition for the wetland feature as the shallow groundwater levels were below the ground surface for the majority of the monitoring period. Throughout the monitoring period to date, both the shallow groundwater and surface water levels showed responses to large precipitation events, with surface water showing a more exaggerated response. Based on the monitoring data to date for the water levels within the on-Site wetland feature, it can be inferred that the hydroperiod of the feature falls within the late spring to late summer months of the year (May to September) before becoming dry for the remainder of the year.

6.2 Water balance

Under post-development (uncontrolled) conditions, the on-Site wetland feature (i.e., AP-1) was estimated to experience a runoff deficit of 20,195 m^3/year (105 mm/year). Table 12 below shows a breakdown of the monthly runoff volumes to the on-Site wetland feature to characterize the potential changes to its hydroperiods under post-development (uncontrolled and controlled) conditions.

Table 12 Summary of average monthly runoff volumes to on-Site wetland feature

Scenario	Area		Average monthly runoff volume to on-Site wetland feature (AP-1)							
	Pre-development	Post-development	Pre-development		Post-development (uncontrolled)		Post-development (controlled)		Change from pre-development	
	ha	ha	m^3/a	mm/a	m^3/a	mm/a	m^3/a	mm/a	m^3/a	mm/a
January	19.23	25.15	2,220	12	440	16	4,910	20	2,690	14
February			3,890	20	630	23	6,445	26	2,555	13
March			6,635	34	1,055	39	10,640	42	4,005	21
April			4,195	22	655	24	6,675	27	2,480	13
May			1,225	6	190	7	1,690	7	465	2
June			275	1	50	2	275	1	-	-
July			125	1	45	2	330	1	205	1
August			115	1	35	1	285	1	170	1
September			720	4	190	7	2,350	9	1,630	8
October			700	4	240	9	3,340	13	2,640	14
November			2,060	11	540	20	6,925	28	4,865	25
December			2,655	14	550	20	6,275	25	3,620	19
Total	**19.23**	**25.15**	**24,815**	**129**	**4,620**	**170**	**50,140**	**199**	**25,325**	**132**

*Red shaded areas indicate the assumed hydroperiods of the on-Site wetland feature based on analysis.

Under pre-development conditions, the on-Site wetland feature receives the majority of its yearly runoff volume from late fall to the spring freshet. This observation is partially in line with the hydroperiods identified in the water level monitoring program results to date as detailed in Section 6.1 above. More monitoring data will need to be procured to confirm the hydroperiods as high precipitation volumes during the summer of 2024 resulted in increased surface water levels in the wetland.

Under post-development (uncontrolled) conditions, the reduction of runoff volume to the on-Site wetland feature due to catchment loss would greatly impact the duration of the features hydroperiod. However, with the diversion of runoff from the SWM pond, under post-development (controlled) conditions, the hydroperiods of the on-Site wetland feature are similar or greater than pre-development conditions.

As the on-Site wetland feature is a provincially significant wetland, to mitigate the anticipated impacts to the hydroperiods from the development due to increased runoff, an overflow within the wetland area will be incorporated into the SWM design that will outlet offsite. This overflow will allow the wetland to receive runoff and infiltrate as per existing conditions but discharge additional runoff, if needed, to prevent the wetland from flooding out. Detailed related to the overflow will be determined during the detailed design phase.

It should be noted that should the site plan change and/or full buildout of the site does not occur, then the estimated runoff from the development would change (i.e., potentially decrease), resulting in less impact to the wetland. It is recommended that the feature-based water balance be revised should the site plan change.

7. Conclusions and recommendations

Site-specific and feature-based water balance analyses were completed to characterize the impact of the proposed development on groundwater recharge and the on-Site wetland feature in comparison to pre-development conditions. The assessment resulted in the following conclusions and recommendations.

– Compared to pre-development conditions (69,740 m^3/yr), average annual surplus over the Site area will increase by 22,300 m^3/yr (87 mm/yr) under post-development (controlled) conditions.
– Compared to pre-development conditions (68,545 m^3/yr), average annual infiltration over the Site area will increase by 2,750 m^3/yr (89 mm/yr) under post-development (controlled) conditions due to the proposed LID and SWM measures.
– Compared to pre-development conditions (1,195 m^3/yr), average annual runoff over the Site area will decrease by 450 m^3/yr (2 mm/yr) under post-development (controlled) conditions.
– The results of the analysis predict an increase in average monthly runoff to the on-Site wetland feature at AP-1. This increase can be attributed to the diversion of controlled runoff from the SWM pond to the on-Site wetland feature.
– The results of the analysis predict significant changes to the hydroperiod of the on-Site wetland feature due to diversion of controlled runoff from the SWM pond. An overflow in the wetland is proposed to mitigate the impact to the wetland from the anticipated increased runoff.
– GHD recommends revising the water balance assessment should the site plan change.

Regards

[redacted]

Sarah Andrew, P.Eng.
Water Resources Engineer

[redacted]

Maxwell Robinson, B.Eng.
Surface Water Professional

8. References

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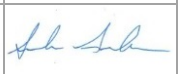
Project name		Puslinch Development GP Inc					
Document title		Preliminary Site-Specific & Feature-Based Water Balance Analysis Technical Memorandum					
Project number		12618927					
File name		12618927-MEM-02-Site-Specific & Feature-Based Water Balances - 20250530.docx					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S3	P01	Max Robinson	Sarah Andrew	On file			31 Jan 2025
S4	C01	Max Robinson	Sarah Andrew	On file	Mark Moini	On file	07 Feb 2025
S4	C02	Max Robinson	Sarah Andrew		Mark Moini		30 May 2025
[Status code]							
[Status code]							

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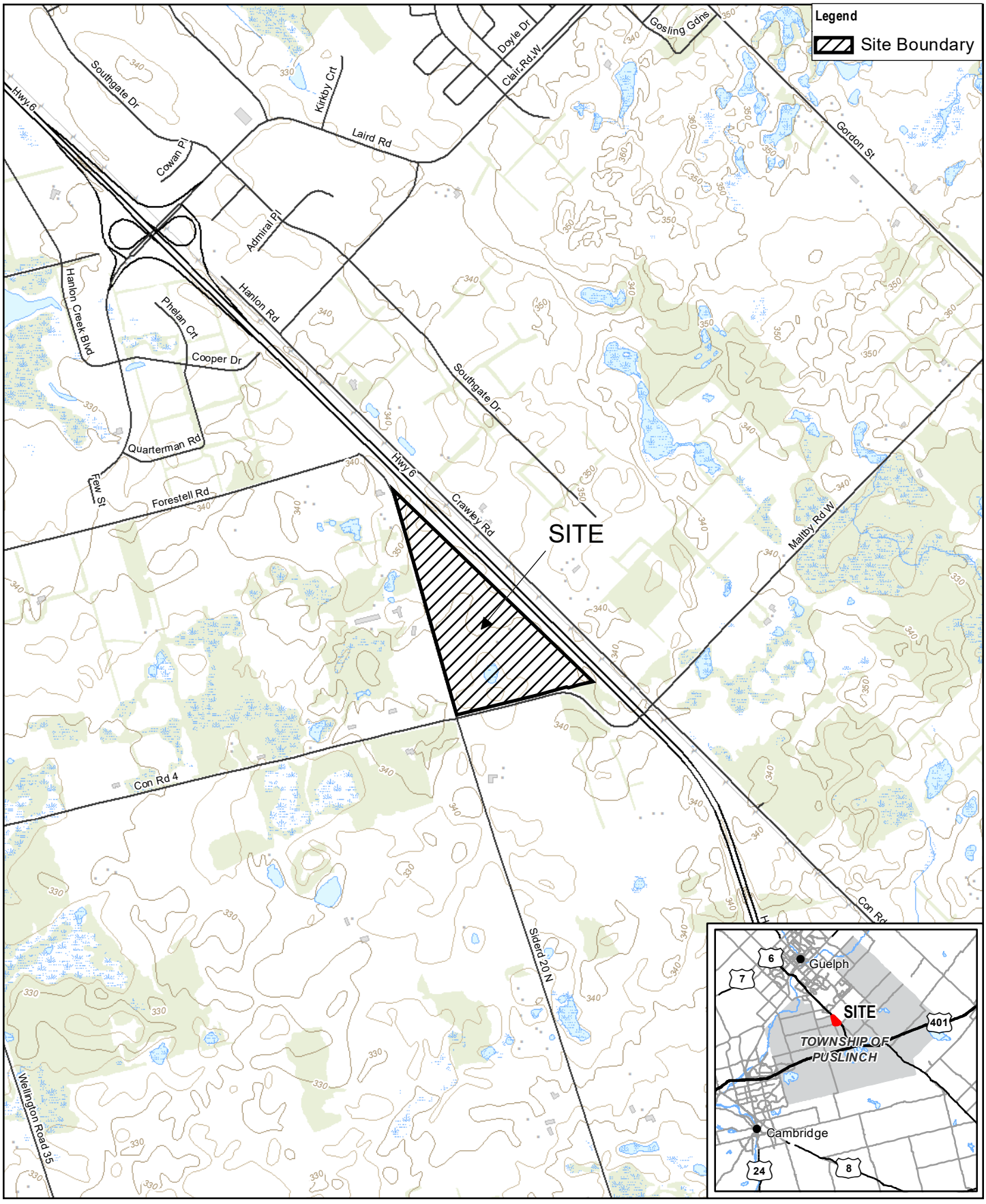
Figures



Paper Size ANSI A

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

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GHD

PUSLINCH DEVELOPMENT GP INC
4631 SIDEROAD 20 NORTH,
PUSLINCH TOWNSHIP, ONTARIO
HYDROGEOLOGICAL INVESTIGATION

Project No. **12618927**
Revision No. **-**
Date **May 27, 2025**

SITE LOCATION MAP

FIGURE 1

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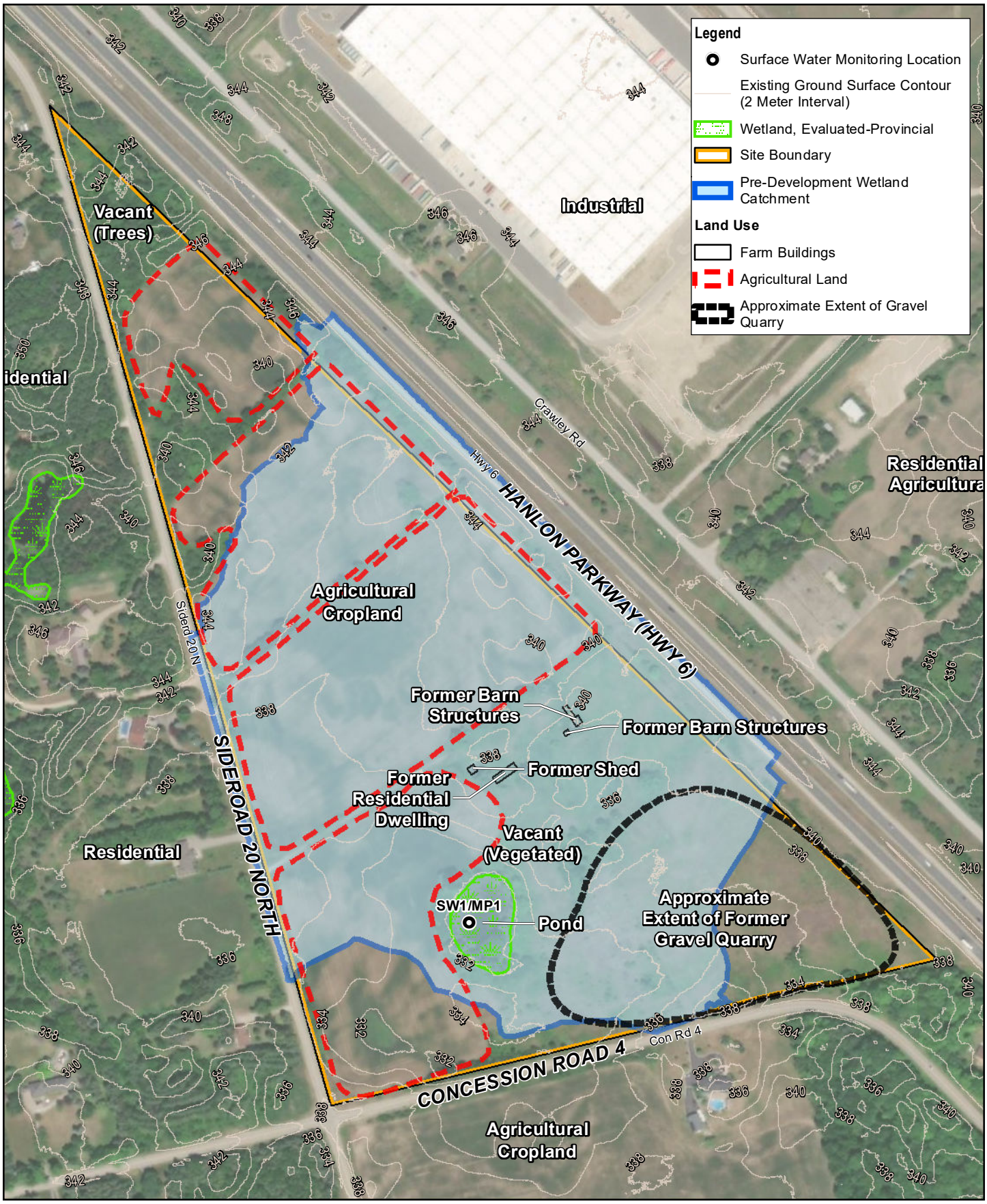
Data source: MNDMNRF NRVIS, 2021. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © King's Printer 2025.



Paper Size ANSI A

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PUSLINCH DEVELOPMENT GP INC
4631 SIDEROAD 20 NORTH, PUSLINCH TOWNSHIP, ON
SITE-SPECIFIC AND FEATURE-BASED WATER BALANCE ASSESSMENTS

PRE-DEVELOPMENT CONDITIONS

Project No. **12618927**
Revision No. **-**
Date **May 27, 2025**

FIGURE 2

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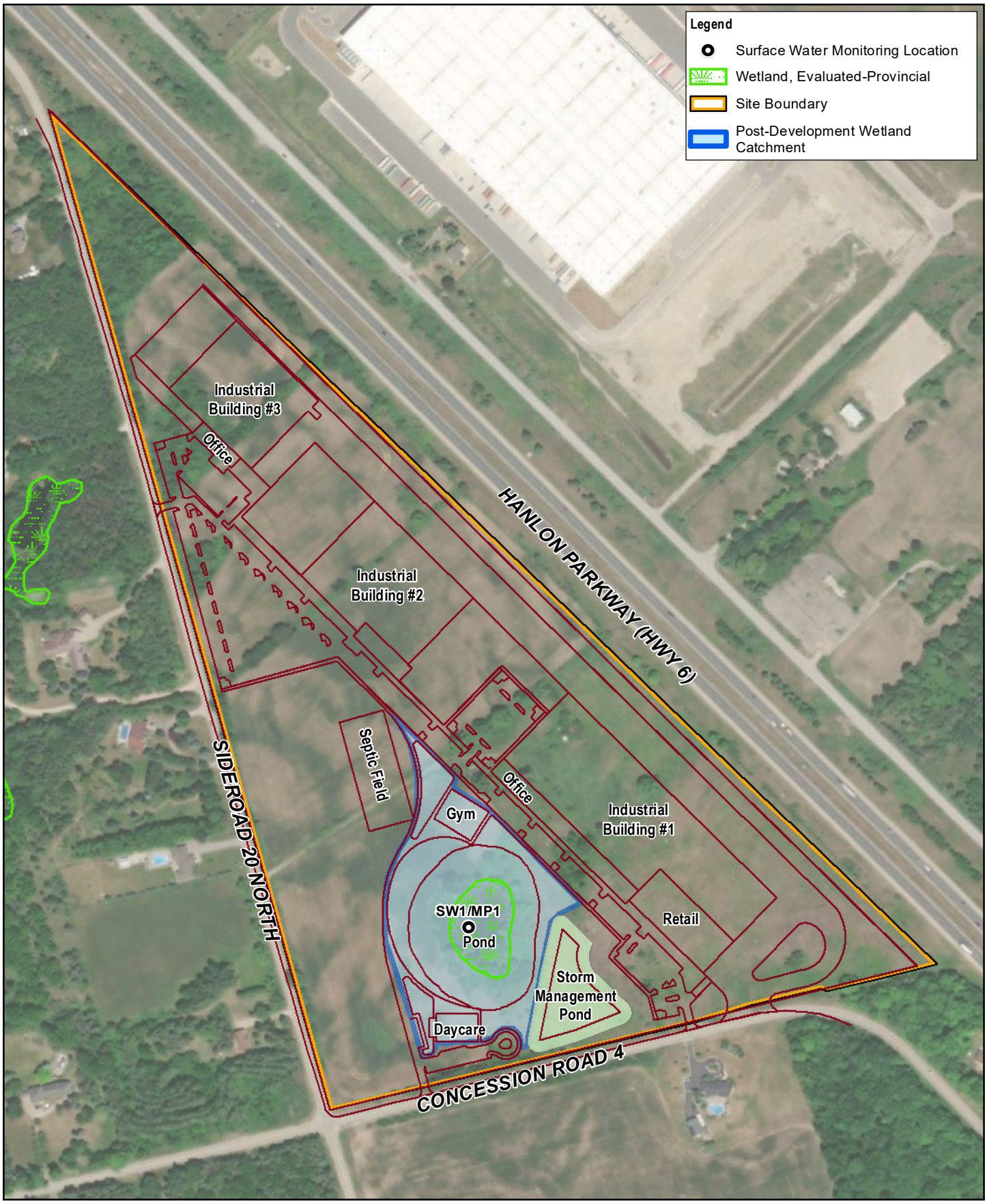
Data source: MNDMNRF, 2022. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, ©King's Printer 2025. Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community.



Paper Size ANSI A

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Map Projection: Transverse Mercator
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Grid: NAD 1983 UTM Zone 17N

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PUSLINCH DEVELOPMENT GP INC
4631 SIDEROAD 20 NORTH, PUSLINCH TOWNSHIP, ON
SITE-SPECIFIC AND FEATURE-BASED
WATER BALANCE ASSESSMENTS

Project No. 12618927
Revision No. -
Date May 28, 2025

POST-DEVELOPMENT CONDITIONS

FIGURE 3

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Print date: 28 May 2025 - 11:55

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Appendices

Appendix A

Water balance summary results

ECCC Water Budget Data
Site-Specific and Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Guelph - Waterloo			WATER BUDGET MEANS FOR THE PERIOD 1975 - 2023			DC20492
	LAT	43.48	WATER HOLDING CAPACITY	2 mm	HEAT INDEX	35.09
	LONG	80.2	LOWER ZONE	1 mm	A	1.055

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
1-Jan	-6.7	56	23	14	1	1	0	36	33	2	264
1-Feb	-6.2	49	23	25	1	1	0	47	33	2	312
1-Mar	-1.1	61	40	47	9	9	0	78	8	2	373
1-Apr	5.8	73	69	11	32	32	0	48	0	2	446
1-May	12.4	76	76	0	76	63	-14	14	0	1	521
1-Jun	17.3	79	79	0	109	75	-35	5	0	0	600
1-Jul	19.9	88	88	0	128	82	-46	7	0	0	689
1-Aug	18.9	79	79	0	113	75	-38	5	0	0	767
1-Sep	14.8	85	85	0	76	60	-16	24	0	1	852
1-Oct	8.5	71	70	0	39	37	-2	33	0	2	71
1-Nov	2.5	73	65	6	13	13	0	58	2	2	144
1-Dec	-3.2	63	37	14	3	3	0	48	14	2	208
AVE	**6.8 TTL**	**853**	**734**	**117**	**600**	**451**	**-151**	**403**			

Guelph - Waterloo			WATER BUDGET MEANS FOR THE PERIOD 1975 - 2023			DC20492
	LAT	43.48	WATER HOLDING CAPACITY	10 mm	HEAT INDEX	35.09
	LONG	80.2	LOWER ZONE	6 mm	A	1.055

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.7	56	23	14	1	1	0	36	33	10	264
1-Feb	-6.2	49	23	25	1	1	0	47	33	10	312
1-Mar	-1.1	61	40	47	9	9	0	78	8	10	373
1-Apr	5.8	73	69	11	32	32	0	48	0	10	446
1-May	12.4	76	76	0	76	67	-10	14	0	5	521
1-Jun	17.3	79	79	0	109	78	-31	4	0	2	600
1-Jul	19.9	88	88	0	128	83	-45	5	0	2	689
1-Aug	18.9	79	79	0	113	76	-37	4	0	1	767
1-Sep	14.8	85	85	0	76	61	-16	21	0	5	852
1-Oct	8.5	71	70	0	39	37	-2	30	0	8	71
1-Nov	2.5	73	65	6	13	13	0	57	2	10	144
1-Dec	-3.2	63	37	14	3	3	0	48	14	10	208
AVE	**6.8 TTL**	**853**	**734**	**117**	**600**	**461**	**-141**	**392**			

ECCC Water Budget Data
Site-Specific and Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Guelph - Waterloo			WATER BUDGET MEANS FOR THE PERIOD 1975 - 2023			DC20492
	LAT	43.48	WATER HOLDING CAPACITY	75 mm	HEAT INDEX	35.09
	LONG	80.2	LOWER ZONE	45 mm	A	1.055

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.7	56	23	14	1	1	0	35	33	75	264
1-Feb	-6.2	49	23	25	1	1	0	47	33	75	312
1-Mar	-1.1	61	40	47	9	9	0	78	8	75	373
1-Apr	5.8	73	69	11	32	32	0	48	0	75	446
1-May	12.4	76	76	0	76	76	0	14	0	61	521
1-Jun	17.3	79	79	0	109	103	-6	3	0	34	600
1-Jul	19.9	88	88	0	128	102	-26	1	0	18	689
1-Aug	18.9	79	79	0	113	84	-29	1	0	13	767
1-Sep	14.8	85	85	0	76	63	-13	8	0	27	852
1-Oct	8.5	71	70	0	39	38	-1	13	0	47	71
1-Nov	2.5	73	65	6	13	13	0	37	2	69	144
1-Dec	-3.2	63	37	14	3	3	0	43	14	75	208
AVE	**6.8 TTL**	**853**	**734**	**117**	**600**	**525**	**-75**	**328**			

Guelph - Waterloo			WATER BUDGET MEANS FOR THE PERIOD 1975 - 2023			DC20492
	LAT	43.48	WATER HOLDING CAPACITY	100 mm	HEAT INDEX	35.09
	LONG	80.2	LOWER ZONE	60 mm	A	1.055

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.7	56	23	14	1	1	0	34	33	100	264
1-Feb	-6.2	49	23	25	1	1	0	47	33	100	312
1-Mar	-1.1	61	40	47	9	9	0	78	8	100	373
1-Apr	5.8	73	69	11	32	32	0	48	0	100	446
1-May	12.4	76	76	0	76	76	0	14	0	85	521
1-Jun	17.3	79	79	0	109	107	-2	3	0	54	600
1-Jul	19.9	88	88	0	128	111	-17	1	0	30	689
1-Aug	18.9	79	79	0	113	88	-24	1	0	20	767
1-Sep	14.8	85	85	0	76	63	-13	7	0	35	852
1-Oct	8.5	71	70	0	39	38	-1	8	0	59	71
1-Nov	2.5	73	65	6	13	13	0	30	2	88	144
1-Dec	-3.2	63	37	14	3	3	0	38	14	98	208
AVE	**6.8 TTL**	**853**	**734**	**117**	**600**	**542**	**-57**	**309**			

Entered by: MR
Reviewed by: SA

ECCC Water Budget Data
Site-Specific and Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Guelph - Waterloo			WATER BUDGET MEANS FOR THE PERIOD 1975 - 2023			DC20492
	LAT	43.48	WATER HOLDING CAPACITY	150 mm	HEAT INDEX	35.09
	LONG	80.2	LOWER ZONE	90 mm	A	1.055

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.7	56	23	14	1	1	0	28	33	148	264
1-Feb	-6.2	49	23	25	1	1	0	46	33	149	312
1-Mar	-1.1	61	40	47	9	9	0	77	8	150	373
1-Apr	5.8	73	69	11	32	32	0	48	0	150	446
1-May	12.4	76	76	0	76	76	0	14	0	135	521
1-Jun	17.3	79	79	0	109	109	0	3	0	102	600
1-Jul	19.9	88	88	0	128	123	-5	1	0	66	689
1-Aug	18.9	79	79	0	113	97	-16	1	0	48	767
1-Sep	14.8	85	85	0	76	65	-11	7	0	60	852
1-Oct	8.5	71	70	0	39	38	-1	6	0	87	71
1-Nov	2.5	73	65	6	13	13	0	22	2	124	144
1-Dec	-3.2	63	37	14	3	3	0	31	14	141	208
AVE	**6.8 TTL**	**853**	**734**	**117**	**600**	**567**	**-33**	**284**			

Guelph - Waterloo			WATER BUDGET MEANS FOR THE PERIOD 1975 - 2023			DC20492
	LAT	43.48	WATER HOLDING CAPACITY	175 mm	HEAT INDEX	35.09
	LONG	80.2	LOWER ZONE	105 mm	A	1.055

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.7	56	23	14	1	1	0	25	33	171	264
1-Feb	-6.2	49	23	25	1	1	0	45	33	173	312
1-Mar	-1.1	61	40	47	9	9	0	76	8	175	373
1-Apr	5.8	73	69	11	32	32	0	48	0	175	446
1-May	12.4	76	76	0	76	76	0	14	0	160	521
1-Jun	17.3	79	79	0	109	109	0	3	0	127	600
1-Jul	19.9	88	88	0	128	125	-2	1	0	89	689
1-Aug	18.9	79	79	0	113	101	-12	1	0	66	767
1-Sep	14.8	85	85	0	76	67	-9	7	0	78	852
1-Oct	8.5	71	70	0	39	38	-1	6	0	104	71
1-Nov	2.5	73	65	6	13	13	0	21	2	142	144
1-Dec	-3.2	63	37	14	3	3	0	29	14	161	208
AVE	**6.8 TTL**	**853**	**734**	**117**	**600**	**575**	**-24**	**276**			

Entered by: MR
Reviewed by: SA

ECCC Water Budget Data
Site-Specific and Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Guelph - Waterloo			WATER BUDGET MEANS FOR THE PERIOD 1975 - 2023			DC20492
	LAT	43.48	WATER HOLDING CAPACITY	200 mm	HEAT INDEX	35.09
	LONG	80.2	LOWER ZONE	120 mm	A	1.055

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.7	56	23	14	1	1	0	23	33	193	264
1-Feb	-6.2	49	23	25	1	1	0	43	33	198	312
1-Mar	-1.1	61	40	47	9	9	0	75	8	200	373
1-Apr	5.8	73	69	11	32	32	0	48	0	200	446
1-May	12.4	76	76	0	76	76	0	14	0	185	521
1-Jun	17.3	79	79	0	109	109	0	3	0	152	600
1-Jul	19.9	88	88	0	128	127	-1	1	0	112	689
1-Aug	18.9	79	79	0	113	104	-9	1	0	87	767
1-Sep	14.8	85	85	0	76	68	-8	7	0	97	852
1-Oct	8.5	71	70	0	39	38	-1	6	0	123	71
1-Nov	2.5	73	65	6	13	13	0	20	2	162	144
1-Dec	-3.2	63	37	14	3	3	0	28	14	182	208
AVE	**6.8 TTL**	**853**	**734**	**117**	**600**	**581**	**-19**	**269**			

Guelph - Waterloo			WATER BUDGET MEANS FOR THE PERIOD 1975 - 2023			DC20492
	LAT	43.48	WATER HOLDING CAPACITY	325 mm	HEAT INDEX	35.09
	LONG	80.2	LOWER ZONE	195 mm	A	1.055

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.7	56	23	14	1	1	0	18	33	309	264
1-Feb	-6.2	49	23	25	1	1	0	38	33	319	312
1-Mar	-1.1	61	40	47	9	9	0	72	8	324	373
1-Apr	5.8	73	69	11	32	32	0	48	0	324	446
1-May	12.4	76	76	0	76	76	0	14	0	310	521
1-Jun	17.3	79	79	0	109	109	0	3	0	277	600
1-Jul	19.9	88	88	0	128	128	0	1	0	236	689
1-Aug	18.9	79	79	0	113	111	-2	1	0	203	767
1-Sep	14.8	85	85	0	76	73	-3	7	0	208	852
1-Oct	8.5	71	70	0	39	38	0	6	0	234	71
1-Nov	2.5	73	65	6	13	13	0	19	2	274	144
1-Dec	-3.2	63	37	14	3	3	0	28	14	295	208
AVE	**6.8 TTL**	**853**	**734**	**117**	**600**	**594**	**-5**	**255**			

ECCC Water Budget Data
Site-Specific and Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Guelph - Waterloo		WATER BUDGET MEANS FOR THE PERIOD 1975 - 2023			DC20492
LAT	43.48	WATER HOLDING CAPACITY	350 mm	HEAT INDEX	35.09
LONG	80.2	LOWER ZONE	210 mm	A	1.055

DATE	TEMP	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC
1-Jan	-6.7	56	23	14	1	1	0	18	33	333	264
1-Feb	-6.2	49	23	25	1	1	0	38	33	343	312
1-Mar	-1.1	61	40	47	9	9	0	72	8	349	373
1-Apr	5.8	73	69	11	32	32	0	48	0	349	446
1-May	12.4	76	76	0	76	76	0	14	0	335	521
1-Jun	17.3	79	79	0	109	109	0	3	0	302	600
1-Jul	19.9	88	88	0	128	128	0	1	0	261	689
1-Aug	18.9	79	79	0	113	111	-1	1	0	228	767
1-Sep	14.8	85	85	0	76	74	-2	7	0	232	852
1-Oct	8.5	71	70	0	39	39	0	6	0	258	71
1-Nov	2.5	73	65	6	13	13	0	19	2	298	144
1-Dec	-3.2	63	37	14	3	3	0	28	14	318	208
AVE	**6.8 TTL**	**853**	**734**	**117**	**600**	**596**	**-3**	**255**			

Waterloo Wellington Station Climate Normals - Lake Evaporation (1981 - 2010)			
DATE	**PCPN**	**LAKE EVAP**	**PCPN. - LAKE EVAP.**
1-Jan	56	0	56
1-Feb	49	0	49
1-Mar	61	0	61
1-Apr	73	0	73
1-May	76	130	-54
1-Jun	79	147	-68
1-Jul	88	152	-64
1-Aug	79	124	-45
1-Sep	85	84	1
1-Oct	71	53	18
1-Nov	73	0	73
1-Dec	63	0	63
TOTAL	**853**	**690**	**163**

Entered by: MR
Reviewed by: SA

Table A2

Land Type Parameters
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Land Use	WHC	Type of Land Use	Soil Type (HSG)	Infiltration Factor					Drainage Area (m^2)	
				Topo	Soils	Cover	Total I.D.A	Total O.D.A	Internally Draining Area	Off-Site Draining Area
Moderately Rooted Agriculture (Corn)	175 mm	Agricultural Land / Tilled	Loam (BC)	0.15	0.30	0.10	1.00	0.55	127,119	5,064
Meadow	200 mm	Pasture & Shrubs	Loam (BC)	0.15	0.30	0.10	1.00	0.55	45,521	3,638
Meadow (Former Gravel Quarry)	150 mm	Pasture & Shrubs	Fine Sandy Loam (B)	0.15	0.30	0.10	1.00	0.55	42,511	176
Abandoned Farm Buildings	10 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	1.00	0.00	321	-
Thicket / Hedgerows	350 mm	Mature Forest	Loam (BC)	0.15	0.30	0.20	1.00	0.65	25,487	1,203
On-Site Wetland (Shallow Aquatic)	175 mm	Wetland	Loam (BC)	0.20	0.30	0.10	1.00	1.00	2,027	-
On-Site Wetland (Deciduous Swamp)	325 mm	Treed Swamp	Loam (BC)	0.20	0.30	0.20	1.00	1.00	1,635	-
						Total	**1.00**	**0.56**	**244,620**	**10,080**

Post-Development (Uncontrolled) Conditions

Land Use	WHC	Type of Land Use	Soil Type (HSG)	Infiltration Factor					Drainage Area (m^2)	
				Topo	Soils	Cover	Total I.D.A	Total O.D.A	Internally Draining Area	Off-Site Draining Area
Grassed Area / SWM Pond Banks	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	1.00	0.55	7,502	60,267
Grassed Area / SWM Pond Banks (Former Gravel Quarry)	75 mm	Urban Lawns	Fine Sandy Loam (B)	0.15	0.30	0.10	1.00	0.55	-	8,902
Industrial / Community Buildings	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	1.00	0.00	2,149	68,400
Parking Lots / Walkways / Roadways	10 mm	Impervious Areas - Paved	N/A	0.00	0.00	0.00	1.00	0.00	4,035	86,622
On-Site Wetland (Shallow Aquatic)	175 mm	Wetland	Loam (BC)	0.20	0.30	0.10	1.00	1.00	2,027	-
On-Site Wetland (Deciduous Swamp)	325 mm	Treed Swamp	Loam (BC)	0.20	0.30	0.20	1.00	1.00	1,635	-
Meadow (Wetland Buffer)	150 mm	Pasture & Shrubs	Loam (BC)	0.15	0.30	0.10	1.00	0.55	6,632	-
Thicket (Wetland Buffer)	350 mm	Mature Forest	Loam (BC)	0.15	0.30	0.20	1.00	0.65	3,119	-
SWM Pond	PCPN. - LAKE EVAP.	Open Water	Loam (BC)	0.00	0.00	0.00	1.00	0.00	-	3,410
						Total	**1.00**	**0.17**	**27,100**	**227,600**

Table A2

Land Type Parameters
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Land Use	WHC	Type of Land Use	Soil Type (HSG)	Infiltration Factor					Drainage Area (m^2)	
				Topo	Soils	Cover	Total I.D.A	Total O.D.A	Internally Draining Area	Off-Site Draining Area
Grassed Area	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	1.00	0.55	1,502	2,043
Grassed Area / SWM Pond Banks (Former Gravel Quarry) to SWM Pond	75 mm	Urban Lawns	Fine Sandy Loam (B)	0.15	0.30	0.10	0.55	0.55	8,902	-
Grassed Area / SWM Pond Banks to SWM Pond	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	0.55	0.55	58,224	-
Parking Lots / Walkways / Roadways	10 mm	Impervious Areas - Paved	N/A	0.00	0.00	0.00	1.00	0.00	4,035	1,157
Parking Lots / Walkways / Roadways to SWM Pond	10 mm	Impervious Areas - Paved	N/A	0.00	0.00	0.00	0.00	0.00	85,464	-
On-Site Wetland (Shallow Aquatic)	175 mm	Wetland	Loam (BC)	0.20	0.30	0.10	1.00	1.00	2,027	-
On-Site Wetland (Deciduous Swamp)	325 mm	Treed Swamp	Loam (BC)	0.20	0.30	0.20	1.00	1.00	1,635	-
Meadow (Wetland Buffer)	150 mm	Pasture & Shrubs	Loam (BC)	0.15	0.30	0.10	1.00	0.55	6,632	-
Thicket (Wetland Buffer)	350 mm	Mature Forest	Loam (BC)	0.15	0.30	0.20	1.00	0.65	3,119	-
SWM Pond	PCPN. - LAKE EVAP.	Open Water	Loam (BC)	0.00	0.00	0.00	0.00	0.00	3,410	-
Industrial / Community Buildings to LID #1A - Underground Infiltration Chamber	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	0.87	17,000	-
Industrial / Community Buildings to LID #1B - Underground Infiltration Trench	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	0.87	8,900	-
Industrial / Community Buildings to LID #2 - Underground Infiltration Chamber	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	0.87	28,100	-
Industrial / Community Buildings to LID #3 - Underground Infiltration Chamber	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	0.87	14,400	-
Industrial / Community Buildings to LID #5 - Overland Depression Area	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	0.87	1,200	-
Grassed Area to LID #5 - Overland Depression Area	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	0.94	0.94	3,100	-
Industrial / Community Buildings to LID #6 - Overland Depression Area	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	0.87	949	-
Grassed Area to LID #6 - Overland Depression Area	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	0.94	0.94	2,900	-
						Total	**0.49**	**0.35**	**251,500**	**3,200**

Table A3

Land Type Parameters
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Land Use	WHC	Type of Land Use	Soil Type (HSG)	Infiltration Factor				Area of Subcatchment (m^2)
				Topo	Soils	Cover	Total	AP-1
Moderately Rooted Agriculture (Corn)	175 mm	Agricultural Land / Tilled	Loam (BC)	0.15	0.30	0.10	0.55	97,943
Meadow	200 mm	Pasture & Shrubs	Loam (BC)	0.15	0.30	0.10	0.55	48,819
Meadow (Former Gravel Quarry)	150 mm	Pasture & Shrubs	Fine Sandy Loam (B)	0.15	0.30	0.10	0.55	25,170
Abandoned Farm Buildings	10 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.00	321
Thicket / Hedgerows	350 mm	Mature Forest	Loam (BC)	0.15	0.30	0.20	0.65	10,275
Roadway	2 mm	Impervious Areas - Paved	N/A	0.00	0.00	0.00	0.00	6,154
On-Site Wetland (Shallow Aquatic)	175 mm	Wetland	Loam (BC)	0.00	0.00	0.00	1.00	2,027
On-Site Wetland (Deciduous Swamp)	325 mm	Treed Swamp	Loam (BC)	0.00	0.00	0.00	1.00	1,635
						Total	**0.55**	**192,343**

Post-Development (Uncontrolled) Conditions

Land Use	WHC	Type of Land Use	Soil Type (HSG)	Infiltration Factor				Area of Subcatchment (m^2)
				Topo	Soils	Cover	Total	AP-1
Grassed Area	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	0.55	7,502
Grassed Area (Former Gravel Quarry)	75 mm	Urban Lawns	Fine Sandy Loam (B)	0.15	0.30	0.10	0.55	-
Community Buildings	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.00	2,149
Walkways	10 mm	Impervious Areas - Paved	N/A	0.00	0.00	0.00	0.00	4,035
On-Site Wetland (Shallow Aquatic)	175 mm	Wetland	Loam (BC)	0.00	0.00	0.00	1.00	2,027
On-Site Wetland (Deciduous Swamp)	325 mm	Treed Swamp	Loam (BC)	0.00	0.00	0.00	1.00	1,635
Meadow (Wetland Buffer)	150 mm	Pasture & Shrubs	Loam (BC)	0.15	0.30	0.10	0.55	6,632
Thicket (Wetland Buffer)	350 mm	Mature Forest	Loam (BC)	0.15	0.30	0.20	0.65	3,119
						Total	**0.50**	**27,100**

Table A3

Land Type Parameters
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Type	WHC	Type of Land Use	Soil Type (HSG)	Infiltration Factor				Area of Subcatchment (m^2)
				Topo	Soils	Cover	Total	AP-1
Grassed Area	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	0.55	1,502
Grassed Area / SWM Pond Banks (Former Gravel Quarry) to SWM Pond	75 mm	Urban Lawns	Fine Sandy Loam (B)	0.15	0.30	0.10	0.55	8,902
Grassed Area / SWM Pond Banks to SWM Pond	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	0.55	58,224
Walkways	10 mm	Impervious Areas - Paved	N/A	0.00	0.00	0.00	0.00	4,035
Parking Lots / Walkways / Roadways to SWM Pond	10 mm	Impervious Areas - Paved	N/A	0.00	0.00	0.00	0.00	85,464
On-Site Wetland (Shallow Aquatic)	175 mm	Wetland	Loam (BC)	0.00	0.00	0.00	1.00	2,027
On-Site Wetland (Deciduous Swamp)	325 mm	Treed Swamp	Loam (BC)	0.00	0.00	0.00	1.00	1,635
Meadow (Wetland Buffer)	150 mm	Pasture & Shrubs	Loam (BC)	0.15	0.30	0.10	0.55	6,632
Thicket (Wetland Buffer)	350 mm	Mature Forest	Loam (BC)	0.15	0.30	0.20	0.65	3,119
SWM Pond	PCPN. - LAKE EVAP.	Open Water	Loam (BC)	0.00	0.00	0.00	0.00	3,410
Industrial / Community Buildings to LID #1A - Underground Infiltration Chamber	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	17,000
Industrial / Community Buildings to LID #1B - Underground Infiltration Trench	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	8,900
Industrial / Community Buildings to LID #2 - Underground Infiltration Chamber	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	28,100
Industrial / Community Buildings to LID #3 - Underground Infiltration Chamber	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	14,400
Industrial / Community Buildings to LID #5 - Overland Depression Area	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	1,200
Grassed Area to LID #5 - Overland Depression Area	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	0.94	3,100
Industrial / Community Buildings to LID #6 - Overland Depression Area	2 mm	Impervious Areas - Roof	N/A	0.00	0.00	0.00	0.87	949
Grassed Area to LID #6 - Overland Depression Area	100 mm	Urban Lawns	Loam (BC)	0.15	0.30	0.10	0.94	2,900
						Total	**0.45**	**251,500**

Table A4

Pre-Dev Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Total Area	24.46	ha

Site-Specific Water Balance - Internally Draining Area

			Moderately Rooted Agriculture (Corn)		***Meadow***		***Meadow (Former Gravel Quarry)***	
			WHC	***175 mm***	***WHC***	***200 mm***	***WHC***	***150 mm***
			Infiltration Factor	***1.00***	***Infiltration Factor***	***1.00***	***Infiltration Factor***	***1.00***
			Area (m^2)	***127,119***	***Area (m^2)***	***45,521***	***Area (m^2)***	***42,511***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	25	3,178	1	23	1,047	1	28	1,190
February	49	1	1	45	5,720	1	43	1,957	1	46	1,955
March	61	9	9	76	9,661	9	75	3,414	9	77	3,273
April	73	32	32	48	6,102	32	48	2,185	32	48	2,041
May	76	76	76	14	1,780	76	14	637	76	14	595
June	79	109	109	3	381	109	3	137	109	3	128
July	88	128	125	1	127	127	1	46	123	1	43
August	79	113	101	1	127	104	1	46	97	1	43
September	85	76	67	7	890	68	7	319	65	7	298
October	71	39	38	6	763	38	6	273	38	6	255
November	73	13	13	21	2,669	13	20	910	13	22	935
December	63	3	3	29	3,686	3	28	1,275	3	31	1,318
Total	**853**	**600**	**575**	**276**	**35,085**	**581**	**269**	**12,245**	**567**	**284**	**12,073**

Table A4

Pre-Dev Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Total Area	24.46	ha

Site-Specific Water Balance - Internally Draining Area

			Abandoned Farm Buildings		***Thicket / Hedgerows***		***On-Site Wetland (Shallow Aquatic)***	
			WHC	***10 mm***	***WHC***	***350 mm***	***WHC***	***175 mm***
			Infiltration Factor	***1.00***	***Infiltration Factor***	***1.00***	***Infiltration Factor***	***1.00***
			Area (m^2)	***321***	***Area (m^2)***	***25,487***	***Area (m^2)***	***2,027***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**
January	56	1	1	36	1	18	1	25
February	49	1	1	47	1	38	1	45
March	61	9	9	78	9	72	9	76
April	73	32	32	48	32	48	32	48
May	76	76	67	14	76	14	76	14
June	79	109	78	4	109	3	109	3
July	88	128	83	5	128	1	125	1
August	79	113	76	4	111	1	101	1
September	85	76	61	21	74	7	67	7
October	71	39	37	30	39	6	38	6
November	73	13	13	57	13	19	13	21
December	63	3	3	48	3	28	3	29
Total	**853**	**600**	**461**	**392**	**596**	**255**	**575**	**276**

			Abandoned Farm Buildings		***Thicket / Hedgerows***		***On-Site Wetland (Shallow Aquatic)***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(m^3)**	**(mm)**	**(m^3)**
January	56	1	1	12	1	459	1	51
February	49	1	1	15	1	968	1	91
March	61	9	9	25	9	1,835	9	154
April	73	32	32	15	32	1,223	32	97
May	76	76	67	4	76	357	76	28
June	79	109	78	1	109	76	109	6
July	88	128	83	2	128	25	125	2
August	79	113	76	1	111	25	101	2
September	85	76	61	7	74	178	67	14
October	71	39	37	10	39	153	38	12
November	73	13	13	18	13	484	13	43
December	63	3	3	15	3	714	3	59
Total	**853**	**600**	**461**	**126**	**596**	**6,499**	**575**	**559**

Table A4

Pre-Dev Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Total Area	24.46	ha

Site-Specific Water Balance - Internally Draining Area

On-Site Wetland (Deciduous Swamp)	
WHC	***325 mm***
Infiltration Factor	***1.00***
Area (m^2)	***1,635***

Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Precip. Volume***	***Actual Evap. Volume***	***Surplus Volume***	***Infiltration Volume***	***Surface Runoff Volume***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**
January	56	1	1	18	29	13,699	245	5,966	5,966	0
February	49	1	1	38	62	11,986	245	10,770	10,770	0
March	61	9	9	72	118	14,922	2,202	18,480	18,480	0
April	73	32	32	48	79	17,857	7,828	11,742	11,742	0
May	76	76	76	14	23	18,591	18,588	3,425	3,425	0
June	79	109	109	3	5	19,325	26,654	734	734	0
July	88	128	128	1	2	21,527	30,651	246	246	0
August	79	113	111	1	2	19,325	24,936	246	246	0
September	85	76	73	7	11	20,793	16,536	1,717	1,717	0
October	71	39	38	6	10	17,368	9,321	1,475	1,475	0
November	73	13	13	19	31	17,857	3,180	5,091	5,091	0
December	63	3	3	28	46	15,411	734	7,112	7,112	0
Total	**853**	**600**	**594**	**255**	**417**	**208,661**	**141,119**	**67,004**	**67,004**	**0**

Table A4

Pre-Dev Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Total Area	1.01	ha

Site-Specific Water Balance - Off-Site Draining Area

			Moderately Rooted Agriculture (Corn)		***Meadow***		***Meadow (Former Gravel Quarry)***	
			WHC	***175 mm***	***WHC***	***200 mm***	***WHC***	***150 mm***
			Infiltration Factor	***0.55***	***Infiltration Factor***	***0.55***	***Infiltration Factor***	***0.55***
			Area (m^2)	***5,064***	***Area (m^2)***	***3,638***	***Area (m^2)***	***176***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	25	127	1	23	84	1	28	5
February	49	1	1	45	228	1	43	156	1	46	8
March	61	9	9	76	385	9	75	273	9	77	14
April	73	32	32	48	243	32	48	175	32	48	8
May	76	76	76	14	71	76	14	51	76	14	2
June	79	109	109	3	15	109	3	11	109	3	1
July	88	128	125	1	5	127	1	4	123	1	0
August	79	113	101	1	5	104	1	4	97	1	0
September	85	76	67	7	35	68	7	25	65	7	1
October	71	39	38	6	30	38	6	22	38	6	1
November	73	13	13	21	106	13	20	73	13	22	4
December	63	3	3	29	147	3	28	102	3	31	5
Total	**853**	**600**	**575**	**276**	**1,398**	**581**	**269**	**979**	**567**	**284**	**50**

Entered by: MR
Reviewed by: SA

Table A4

Pre-Dev Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Total Area	1.01	ha

Site-Specific Water Balance - Off-Site Draining Area

			Abandoned Farm Buildings		***Thicket / Hedgerows***		***On-Site Wetland (Shallow Aquatic)***			
			WHC	***10 mm***	***WHC***	***350 mm***	***WHC***	***175 mm***		
			Infiltration Factor	***0.00***	***Infiltration Factor***	***0.65***	***Infiltration Factor***	***1.00***		
			Area (m^2)	***0***	***Area (m^2)***	***1,203***	***Area (m^2)***	***0***		
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	36	0	1	18	22	1	25	0
February	49	1	1	47	0	1	38	46	1	45	0
March	61	9	9	78	0	9	72	87	9	76	0
April	73	32	32	48	0	32	48	58	32	48	0
May	76	76	67	14	0	76	14	17	76	14	0
June	79	109	78	4	0	109	3	4	109	3	0
July	88	128	83	5	0	128	1	1	125	1	0
August	79	113	76	4	0	111	1	1	101	1	0
September	85	76	61	21	0	74	7	8	67	7	0
October	71	39	37	30	0	39	6	7	38	6	0
November	73	13	13	57	0	13	19	23	13	21	0
December	63	3	3	48	0	3	28	34	3	29	0
Total	**853**	**600**	**461**	**392**	**0**	**596**	**255**	**307**	**575**	**276**	**0**

Table A4

Pre-Dev Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Total Area	1.01	ha

Site-Specific Water Balance - Off-Site Draining Area

On-Site Wetland (Deciduous Swamp)	
WHC	***325 mm***
Infiltration Factor	***1.00***
Area (m^2)	***0***

Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Precip. Volume***	***Actual Evap. Volume***	***Surplus Volume***	***Infiltration Volume***	***Surface Runoff Volume***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**
January	56	1	1	18	0	564	10	237	132	104
February	49	1	1	38	0	494	10	438	246	193
March	61	9	9	72	0	615	91	758	425	332
April	73	32	32	48	0	736	323	484	272	212
May	76	76	76	14	0	766	766	141	79	62
June	79	109	109	3	0	796	1,099	30	17	13
July	88	128	128	1	0	887	1,271	10	6	4
August	79	113	111	1	0	796	1,040	10	6	4
September	85	76	73	7	0	857	687	71	40	31
October	71	39	38	6	0	716	384	60	34	26
November	73	13	13	19	0	736	131	206	115	90
December	63	3	3	28	0	635	30	288	162	126
Total	**853**	**600**	**594**	**255**	**0**	**8,598**	**5,842**	**2,733**	**1,534**	**1,199**

Table A5

Post-Dev (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	2.71	ha

Site-Specific Water Balance - Internally Draining Area

			Grassed Area / SWM Pond Banks		***Grassed Area / SWM Pond Banks (Former Gravel Quarry)***			***Industrial / Community Buildings***		
			WHC	***100 mm***	***WHC***	***75 mm***		***WHC***	***2 mm***	
			Infiltration Factor	***1.00***	***Infiltration Factor***	***1.00***		***Infiltration Factor***	***1.00***	
			Area (m^2)	***7,502***	***Area (m^2)***	***0***		***Area (m^2)***	***2,149***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	34	255	1	35	0	1	36	77
February	49	1	1	47	353	1	47	0	1	47	101
March	61	9	9	78	585	9	78	0	9	78	168
April	73	32	32	48	360	32	48	0	32	48	103
May	76	76	76	14	105	76	14	0	63	14	30
June	79	109	107	3	23	103	3	0	75	5	11
July	88	128	111	1	8	102	1	0	82	7	15
August	79	113	88	1	8	84	1	0	75	5	11
September	85	76	63	7	53	63	8	0	60	24	52
October	71	39	38	8	60	38	13	0	37	33	71
November	73	13	13	30	225	13	37	0	13	58	125
December	63	3	3	38	285	3	43	0	3	48	103
Total	**853**	**600**	**542**	**309**	**2,318**	**525**	**328**	**0**	**451**	**403**	**866**

Table A5

Post-Dev (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	2.71	ha

Site-Specific Water Balance - Internally Draining Area

			Parking Lots / Walkways / Roadways		***On-Site Wetland (Shallow Aquatic)***			***On-Site Wetland (Deciduous Swamp)***		
			WHC	***10 mm***	***WHC***	***175 mm***		***WHC***	***325 mm***	
			Infiltration Factor	***1.00***	***Infiltration Factor***	***1.00***		***Infiltration Factor***	***1.00***	
			Area (m^2)	***4,035***	***Area (m^2)***	***2,027***		***Area (m^2)***	***1,635***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	36	145	1	25	51	1	18	29
February	49	1	1	47	190	1	45	91	1	38	62
March	61	9	9	78	315	9	76	154	9	72	118
April	73	32	32	48	194	32	48	97	32	48	79
May	76	76	67	14	56	76	14	28	76	14	23
June	79	109	78	4	16	109	3	6	109	3	5
July	88	128	83	5	20	125	1	2	128	1	2
August	79	113	76	4	16	101	1	2	111	1	2
September	85	76	61	21	85	67	7	14	73	7	11
October	71	39	37	30	121	38	6	12	38	6	10
November	73	13	13	57	230	13	21	43	13	19	31
December	63	3	3	48	194	3	29	59	3	28	46
Total	**853**	**600**	**461**	**392**	**1,582**	**575**	**276**	**559**	**594**	**255**	**417**

Table A5

Post-Dev (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	2.71	ha

Site-Specific Water Balance - Internally Draining Area

			Meadow (Wetland Buffer)		***Thicket (Wetland Buffer)***			***SWM Pond***		
			WHC	***150 mm***	***WHC***	***350 mm***		***WHC***	***PCPN. - LAKE EVAP.***	
			Infiltration Factor	***1.00***	***Infiltration Factor***	***1.00***		***Infiltration Factor***	***1.00***	
			Area (m^2)	***6,632***	***Area (m^2)***	***3,119***		***Area (m^2)***	***0***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	28	186	1	18	56	0	56	0
February	49	1	1	46	305	1	38	119	0	49	0
March	61	9	9	77	511	9	72	225	0	61	0
April	73	32	32	48	318	32	48	150	0	73	0
May	76	76	76	14	93	76	14	44	130	-54	0
June	79	109	109	3	20	109	3	9	147	-68	0
July	88	128	123	1	7	128	1	3	152	-64	0
August	79	113	97	1	7	111	1	3	124	-45	0
September	85	76	65	7	46	74	7	22	84	1	0
October	71	39	38	6	40	39	6	19	53	18	0
November	73	13	13	22	146	13	19	59	0	73	0
December	63	3	3	31	206	3	28	87	0	63	0
Total	**853**	**600**	**567**	**284**	**1,884**	**596**	**255**	**795**	**690**	**163**	**0**

Entered by: MR
Reviewed by: SA

Table A5

Post-Dev (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	2.71	ha

Site-Specific Water Balance - Internally Draining Area

Month	*Precipitation*	*Potential Evap.*	*Precip. Volume*	*Actual Evap. Volume*	*Surplus Volume*	*Infiltration Volume*	*Surface Runoff Volume*
(-)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
January	56	1	1,518	27	800	800	0
February	49	1	1,328	27	1,220	1,220	0
March	61	9	1,653	244	2,075	2,075	0
April	73	32	1,978	867	1,301	1,301	0
May	76	76	2,060	1,995	379	379	0
June	79	109	2,141	2,741	90	90	0
July	88	128	2,385	3,022	56	56	0
August	79	113	2,141	2,504	48	48	0
September	85	76	2,304	1,765	283	283	0
October	71	39	1,924	1,027	332	332	0
November	73	13	1,978	352	859	859	0
December	63	3	1,707	81	979	979	0
Total	**853**	**600**	**23,116**	**14,652**	**8,421**	**8,421**	**0**

Entered by: MR
Reviewed by: SA

Table A5

Post-Dev (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	22.76	ha

Site-Specific Water Balance - Off-Site Draining Area

			Grassed Area / SWM Pond Banks		***Grassed Area / SWM Pond Banks (Former Gravel Quarry)***			***Industrial / Community Buildings***		
			WHC	***100 mm***	***WHC***	***75 mm***		***WHC***	***2 mm***	
			Infiltration Factor	***0.55***	***Infiltration Factor***	***0.55***		***Infiltration Factor***	***0.00***	
			Area (m^2)	***60,267***	***Area (m^2)***	***8,902***		***Area (m^2)***	***68,400***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	34	2,049	1	35	312	1	36	2,462
February	49	1	1	47	2,833	1	47	418	1	47	3,215
March	61	9	9	78	4,701	9	78	694	9	78	5,335
April	73	32	32	48	2,893	32	48	427	32	48	3,283
May	76	76	76	14	844	76	14	125	63	14	958
June	79	109	107	3	181	103	3	27	75	5	342
July	88	128	111	1	60	102	1	9	82	7	479
August	79	113	88	1	60	84	1	9	75	5	342
September	85	76	63	7	422	63	8	71	60	24	1,642
October	71	39	38	8	482	38	13	116	37	33	2,257
November	73	13	13	30	1,808	13	37	329	13	58	3,967
December	63	3	3	38	2,290	3	43	383	3	48	3,283
Total	**853**	**600**	**542**	**309**	**18,622**	**525**	**328**	**2,920**	**451**	**403**	**27,565**

Table A5

Post-Dev (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	22.76	ha

Site-Specific Water Balance - Off-Site Draining Area

			Parking Lots / Walkways / Roadways		***On-Site Wetland (Shallow Aquatic)***			***On-Site Wetland (Deciduous Swamp)***		
			WHC	***10 mm***	***WHC***	***175 mm***		***WHC***	***325 mm***	
			Infiltration Factor	***0.00***	***Infiltration Factor***	***1.00***		***Infiltration Factor***	***1.00***	
			Area (m^2)	***86,622***	***Area (m^2)***	***0***		***Area (m^2)***	***0***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	36	3,118	1	25	0	1	18	0
February	49	1	1	47	4,071	1	45	0	1	38	0
March	61	9	9	78	6,756	9	76	0	9	72	0
April	73	32	32	48	4,158	32	48	0	32	48	0
May	76	76	67	14	1,213	76	14	0	76	14	0
June	79	109	78	4	346	109	3	0	109	3	0
July	88	128	83	5	433	125	1	0	128	1	0
August	79	113	76	4	346	101	1	0	111	1	0
September	85	76	61	21	1,819	67	7	0	73	7	0
October	71	39	37	30	2,599	38	6	0	38	6	0
November	73	13	13	57	4,937	13	21	0	13	19	0
December	63	3	3	48	4,158	3	29	0	3	28	0
Total	**853**	**600**	**461**	**392**	**33,956**	**575**	**276**	**0**	**594**	**255**	**0**

Entered by: MR
Reviewed by: SA

Table A5

Post-Dev (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	22.76	ha

Site-Specific Water Balance - Off-Site Draining Area

			Meadow (Wetland Buffer)			***Thicket (Wetland Buffer)***			***SWM Pond***		
			WHC	***150 mm***		***WHC***	***350 mm***		***WHC***	***PCPN. - LAKE EVAP.***	
			Infiltration Factor	***0.55***		***Infiltration Factor***	***0.65***		***Infiltration Factor***	***0.00***	
			Area (m^2)	***0***		***Area (m^2)***	***0***		***Area (m^2)***	***3,410***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	28	0	1	18	0	0	56	191
February	49	1	1	46	0	1	38	0	0	49	167
March	61	9	9	77	0	9	72	0	0	61	208
April	73	32	32	48	0	32	48	0	0	73	249
May	76	76	76	14	0	76	14	0	130	-54	-185
June	79	109	109	3	0	109	3	0	147	-68	-232
July	88	128	123	1	0	128	1	0	152	-64	-218
August	79	113	97	1	0	111	1	0	124	-45	-153
September	85	76	65	7	0	74	7	0	84	1	3
October	71	39	38	6	0	39	6	0	53	18	62
November	73	13	13	22	0	13	19	0	0	73	249
December	63	3	3	31	0	3	28	0	0	63	215
Total	**853**	**600**	**567**	**284**	**0**	**596**	**255**	**0**	**690**	**163**	**556**

Table A5

Post-Dev (Uncontrolled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	22.76	ha

Site-Specific Water Balance - Off-Site Draining Area

Month	*Precipitation*	*Potential Evap.*	*Precip. Volume*	*Actual Evap. Volume*	*Surplus Volume*	*Infiltration Volume*	*Surface Runoff Volume*
(-)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
January	56	1	12,746	224	8,132	1,298	6,834
February	49	1	11,152	224	10,704	1,788	8,916
March	61	9	13,884	2,018	17,695	2,967	14,727
April	73	32	16,615	7,174	11,010	1,826	9,184
May	76	76	17,298	15,814	2,954	533	2,421
June	79	109	17,980	19,753	664	114	550
July	88	128	20,029	20,914	763	38	725
August	79	113	17,980	18,187	604	38	566
September	85	76	19,346	14,032	3,957	271	3,686
October	71	39	16,160	8,544	5,516	329	5,187
November	73	13	16,615	2,914	11,291	1,176	10,115
December	63	3	14,339	673	10,329	1,470	8,859
Total	**853**	**600**	**194,143**	**110,471**	**83,620**	**11,848**	**71,771**

Entered by: MR
Reviewed by: SA

Post-Dev (Controlled) Conditions - LID SWM Measures
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

SWM Pond Low Flow Orifice Outlet to On-Site Wetland

Site Runoff Controlled within the Proposed SWM Pond

Landuse	Area (m^2)	Runoff Volume (mm/year)	Runoff Volume to SWM Pond (m^3/year)
Grassed Area / SWM Pond Banks (Former Gravel Quarry)	8,902	148	1,314
Grassed Area / SWM Pond Banks	58,224	139	8,096
Parking Lots / Walkways / Roadways	85,464	392	33,502
SWM Pond	3,410	163	556
Total	**156,000**	**279**	**43,468**

LID Overflow Controlled within the Proposed SWM Pond

Landuse	Area (m^2)	Runoff Volume (mm/year)	Runoff Overflow Volume to SWM Pond (m^3/year)
Industrial / Community Buildings to LID #1A - Underground Infiltration Chamber	17,000	52	879
Industrial / Community Buildings to LID #1B - Underground Infiltration Trench	8,900	52	460
Industrial / Community Buildings to LID #2 - Underground Infiltration Chamber	28,100	52	1,453
Industrial / Community Buildings to LID #3 - Underground Infiltration Chamber	14,400	52	744
Total	**68,400**	**52**	**3,536**

LID Overflow Outleted to On-Site Wetland

Landuse	Area (m^2)	Runoff Volume (mm/year)	Runoff Overflow Volume to On-Site Wetland (m^3/year)
Industrial / Community Buildings to LID #5 - Overland Depression Area	1,200	52	62
Grassed Area to LID #5 - Overland Depression Area	3,100	18	55
Industrial / Community Buildings to LID #6 - Overland Depression Area	949	52	49
Grassed Area to LID #6 - Overland Depression Area	2,900	18	52
Total	**8,149**	**27**	**218**

Total Drainage Area to SWM Pond (m^2)	224,400
SWM Pond Total Runoff Volume to On-Site Wetland (m^3/year)	47,004
Runoff Reduction Factor (based on internally draining nature)	1.00
Total Infiltration in On-Site Wetland (m^3/year)	**47,004**
Total Infiltration in On-Site Wetland (mm/year)	**212**
Total LID Overflow Drainage Area to On-Site Wetland (m^2)	8,149
Total LID Overflow Volume to On-Site Wetland (m^3/year)	218
Runoff Reduction Factor (based on internally draining nature)	1.00
Total Infiltration in On-Site Wetland (m^3/year)	**218**
Total Infiltration in On-Site Wetland (mm/year)	**27**

Entered by: MR
Reviewed by: AB

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	25.15	ha

Site-Specific Water Balance - Internally Draining Area

			Grassed Area		***Grassed Area / SWM Pond Banks (Former Gravel Quarry) to SWM Pond***		***Grassed Area / SWM Pond Banks to SWM Pond***	
			WHC	***100 mm***	***WHC***	***75 mm***	***WHC***	***100 mm***
			Infiltration Factor	***1.00***	***Infiltration Factor***	***0.55***	***Infiltration Factor***	***0.55***
			Area (m^2)	***1,502***	***Area (m^2)***	***8,902***	***Area (m^2)***	***58,224***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**
January	56	1	1	34	1	35	1	34
February	49	1	1	47	1	47	1	47
March	61	9	9	78	9	78	9	78
April	73	32	32	48	32	48	32	48
May	76	76	76	14	76	14	76	14
June	79	109	107	3	103	3	107	3
July	88	128	111	1	102	1	111	1
August	79	113	88	1	84	1	88	1
September	85	76	63	7	63	8	63	7
October	71	39	38	8	38	13	38	8
November	73	13	13	30	13	37	13	30
December	63	3	3	38	3	43	3	38
Total	**853**	**600**	**542**	**309**	**525**	**328**	**542**	**309**

			Grassed Area		***Grassed Area / SWM Pond Banks (Former Gravel Quarry) to SWM Pond***		***Grassed Area / SWM Pond Banks to SWM Pond***	
			WHC	***100 mm***	***WHC***	***75 mm***	***WHC***	***100 mm***
			Infiltration Factor	***1.00***	***Infiltration Factor***	***0.55***	***Infiltration Factor***	***0.55***
			Area (m^2)	***1,502***	***Area (m^2)***	***8,902***	***Area (m^2)***	***58,224***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(m^3)**	**(mm)**	**(m^3)**
January	56	1	1	51	1	312	1	1,980
February	49	1	1	71	1	418	1	2,737
March	61	9	9	117	9	694	9	4,541
April	73	32	32	72	32	427	32	2,795
May	76	76	76	21	76	125	76	815
June	79	109	107	5	103	27	107	175
July	88	128	111	2	102	9	111	58
August	79	113	88	2	84	9	88	58
September	85	76	63	11	63	71	63	408
October	71	39	38	12	38	116	38	466
November	73	13	13	45	13	329	13	1,747
December	63	3	3	57	3	383	3	2,213
Total	**853**	**600**	**542**	**464**	**525**	**2,920**	**542**	**17,991**

Entered by: MR
Reviewed by: SA

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	25.15	ha

Site-Specific Water Balance - Internally Draining Area

			Parking Lots / Walkways / Roadways		***Parking Lots / Walkways / Roadways to SWM Pond***		***On-Site Wetland (Shallow Aquatic)***		
			WHC	***10 mm***	***WHC***	***10 mm***	***WHC***	***175 mm***	
			Infiltration Factor	***1.00***	***Infiltration Factor***	***0.00***	***Infiltration Factor***	***1.00***	
			Area (m^2)	***4,035***	***Area (m^2)***	***85,464***	***Area (m^2)***	***2,027***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	36	145	1	36	3,077	1	25	51
February	49	1	1	47	190	1	47	4,017	1	45	91
March	61	9	9	78	315	9	78	6,666	9	76	154
April	73	32	32	48	194	32	48	4,102	32	48	97
May	76	76	67	14	56	67	14	1,197	76	14	28
June	79	109	78	4	16	78	4	342	109	3	6
July	88	128	83	5	20	83	5	427	125	1	2
August	79	113	76	4	16	76	4	342	101	1	2
September	85	76	61	21	85	61	21	1,795	67	7	14
October	71	39	37	30	121	37	30	2,564	38	6	12
November	73	13	13	57	230	13	57	4,871	13	21	43
December	63	3	3	48	194	3	48	4,102	3	29	59
Total	**853**	**600**	**461**	**392**	**1,582**	**461**	**392**	**33,502**	**575**	**276**	**559**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	25.15	ha

Site-Specific Water Balance - Internally Draining Area

			On-Site Wetland (Deciduous Swamp)		***Meadow (Wetland Buffer)***			***Thicket (Wetland Buffer)***		
			WHC	***325 mm***	***WHC***	***150 mm***		***WHC***	***350 mm***	
			Infiltration Factor	***1.00***	***Infiltration Factor***	***1.00***		***Infiltration Factor***	***1.00***	
			Area (m^2)	***1,635***	***Area (m^2)***	***6,632***		***Area (m^2)***	***3,119***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	18	29	1	28	186	1	18	56
February	49	1	1	38	62	1	46	305	1	38	119
March	61	9	9	72	118	9	77	511	9	72	225
April	73	32	32	48	79	32	48	318	32	48	150
May	76	76	76	14	23	76	14	93	76	14	44
June	79	109	109	3	5	109	3	20	109	3	9
July	88	128	128	1	2	123	1	7	128	1	3
August	79	113	111	1	2	97	1	7	111	1	3
September	85	76	73	7	11	65	7	46	74	7	22
October	71	39	38	6	10	38	6	40	39	6	19
November	73	13	13	19	31	13	22	146	13	19	59
December	63	3	3	28	46	3	31	206	3	28	87
Total	**853**	**600**	**594**	**255**	**417**	**567**	**284**	**1,884**	**596**	**255**	**795**

Entered by: MR
Reviewed by: SA

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	25.15	ha

Site-Specific Water Balance - Internally Draining Area

			SWM Pond		***Industrial / Community Buildings to LID #1A - Underground Infiltration Chamber***		***Industrial / Community Buildings to LID #1B - Underground Infiltration Trench***			
			WHC	***PCPN. - LAKE EVAP.***	***WHC***	***2 mm***	***WHC***	***2 mm***		
			Infiltration Factor	***0.00***	***Infiltration Factor***	***0.87***	***Infiltration Factor***	***0.87***		
			Area (m^2)	***3,410***	***Area (m^2)***	***17,000***	***Area (m^2)***	***8,900***		
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	0	56	191	1	36	612	1	36	320
February	49	1	0	49	167	1	47	799	1	47	418
March	61	9	0	61	208	9	78	1,326	9	78	694
April	73	32	0	73	249	32	48	816	32	48	427
May	76	76	130	-54	-185	63	14	238	63	14	125
June	79	109	147	-68	-232	75	5	85	75	5	45
July	88	128	152	-64	-218	82	7	119	82	7	62
August	79	113	124	-45	-153	75	5	85	75	5	45
September	85	76	84	1	3	60	24	408	60	24	214
October	71	39	53	18	62	37	33	561	37	33	294
November	73	13	0	73	249	13	58	986	13	58	516
December	63	3	0	63	215	3	48	816	3	48	427
Total	**853**	**600**	**690**	**163**	**556**	**451**	**403**	**6,851**	**451**	**403**	**3,587**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	25.15	ha

Site-Specific Water Balance - Internally Draining Area

			Industrial / Community Buildings to LID #2 - Underground Infiltration Chamber		***Industrial / Community Buildings to LID #3 - Underground Infiltration Chamber***			***Industrial / Community Buildings to LID #5 - Overland Depression Area***		
			WHC	***2 mm***	***WHC***	***2 mm***		***WHC***	***2 mm***	
			Infiltration Factor	***0.87***	***Infiltration Factor***	***0.87***		***Infiltration Factor***	***0.87***	
			Area (m^2)	***28,100***	***Area (m^2)***	***14,400***		***Area (m^2)***	***1,200***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	36	1,012	1	36	518	1	36	43
February	49	1	1	47	1,321	1	47	677	1	47	56
March	61	9	9	78	2,192	9	78	1,123	9	78	94
April	73	32	32	48	1,349	32	48	691	32	48	58
May	76	76	63	14	393	63	14	202	63	14	17
June	79	109	75	5	141	75	5	72	75	5	6
July	88	128	82	7	197	82	7	101	82	7	8
August	79	113	75	5	141	75	5	72	75	5	6
September	85	76	60	24	674	60	24	346	60	24	29
October	71	39	37	33	927	37	33	475	37	33	40
November	73	13	13	58	1,630	13	58	835	13	58	70
December	63	3	3	48	1,349	3	48	691	3	48	58
Total	**853**	**600**	**451**	**403**	**11,324**	**451**	**403**	**5,803**	**451**	**403**	**484**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	25.15	ha

Site-Specific Water Balance - Internally Draining Area

			Grassed Area to LID #5 - Overland Depression Area		***Industrial / Community Buildings to LID #6 - Overland Depression Area***		***Grassed Area to LID #6 - Overland Depression Area***	
			WHC	***100 mm***	***WHC***	***2 mm***	***WHC***	***100 mm***
			Infiltration Factor	***0.94***	***Infiltration Factor***	***0.87***	***Infiltration Factor***	***0.94***
			Area (m^2)	***3,100***	***Area (m^2)***	***949***	***Area (m^2)***	***2,900***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	34	105	1	36	34	1	34	99
February	49	1	1	47	146	1	47	45	1	47	136
March	61	9	9	78	242	9	78	74	9	78	226
April	73	32	32	48	149	32	48	46	32	48	139
May	76	76	76	14	43	63	14	13	76	14	41
June	79	109	107	3	9	75	5	5	107	3	9
July	88	128	111	1	3	82	7	7	111	1	3
August	79	113	88	1	3	75	5	5	88	1	3
September	85	76	63	7	22	60	24	23	63	7	20
October	71	39	38	8	25	37	33	31	38	8	23
November	73	13	13	30	93	13	58	55	13	30	87
December	63	3	3	38	118	3	48	46	3	38	110
Total	**853**	**600**	**542**	**309**	**958**	**451**	**403**	**382**	**542**	**309**	**896**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	25.15	ha

Site-Specific Water Balance - Internally Draining Area

Month	*Precipitation*	*Potential Evap.*	*Precip. Volume*	*Actual Evap. Volume*	*Surplus Volume*	*Infiltration Volume*	*Surface Runoff Volume*
(-)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
January	56	1	14,084	248	8,821	4,185	4,636
February	49	1	12,324	248	11,774	5,729	6,045
March	61	9	15,342	2,233	19,520	9,557	9,963
April	73	32	18,360	7,939	12,157	5,905	6,252
May	76	76	19,114	17,576	3,288	1,722	1,566
June	79	109	19,869	22,185	743	496	247
July	88	128	22,132	23,613	811	508	303
August	79	113	19,869	20,423	645	381	264
September	85	76	21,378	15,597	4,201	1,968	2,233
October	71	39	17,857	9,450	5,798	2,608	3,189
November	73	13	18,360	3,225	12,022	5,432	6,590
December	63	3	15,845	744	11,175	5,243	5,933
Total	**853**	**600**	**214,530**	**123,482**	**90,956**	**43,734**	**47,222**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	0.32	ha

Site-Specific Water Balance - Off-Site Draining Area

			Grassed Area		***Grassed Area / SWM Pond Banks (Former Gravel Quarry) to SWM Pond***		***Grassed Area / SWM Pond Banks to SWM Pond***		
			WHC	***100 mm***	***WHC***	***75 mm***	***WHC***	***100 mm***	
			Infiltration Factor	***0.55***	***Infiltration Factor***	***0.55***	***Infiltration Factor***	***0.55***	
			Area (m^2)	***2,043***	***Area (m2)***	***0***	***Area (m2)***	***0***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	34	69	1	35	0	1	34	0
February	49	1	1	47	96	1	47	0	1	47	0
March	61	9	9	78	159	9	78	0	9	78	0
April	73	32	32	48	98	32	48	0	32	48	0
May	76	76	76	14	29	76	14	0	76	14	0
June	79	109	107	3	6	103	3	0	107	3	0
July	88	128	111	1	2	102	1	0	111	1	0
August	79	113	88	1	2	84	1	0	88	1	0
September	85	76	63	7	14	63	8	0	63	7	0
October	71	39	38	8	16	38	13	0	38	8	0
November	73	13	13	30	61	13	37	0	13	30	0
December	63	3	3	38	78	3	43	0	3	38	0
Total	**853**	**600**	**542**	**309**	**631**	**525**	**328**	**0**	**542**	**309**	**0**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	0.32	ha

Site-Specific Water Balance - Off-Site Draining Area

			Parking Lots / Walkways / Roadways		***Parking Lots / Walkways / Roadways to SWM Pond***			***On-Site Wetland (Shallow Aquatic)***		
			WHC	***10 mm***	***WHC***	***10 mm***		***WHC***	***175 mm***	
			Infiltration Factor	***0.00***	***Infiltration Factor***	***0.00***		***Infiltration Factor***	***1.00***	
			Area (m2)	***1,157***	***Area (m2)***	***0***		***Area (m2)***	***0***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	36	1	36	0	1	25	0
February	49	1	1	47	1	47	0	1	45	0
March	61	9	9	78	9	78	0	9	76	0
April	73	32	32	48	32	48	0	32	48	0
May	76	76	67	14	67	14	0	76	14	0
June	79	109	78	4	78	4	0	109	3	0
July	88	128	83	5	83	5	0	125	1	0
August	79	113	76	4	76	4	0	101	1	0
September	85	76	61	21	61	21	0	67	7	0
October	71	39	37	30	37	30	0	38	6	0
November	73	13	13	57	13	57	0	13	21	0
December	63	3	3	48	3	48	0	3	29	0
Total	**853**	**600**	**461**	**392**	**461**	**392**	**0**	**575**	**276**	**0**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	0.32	ha

Site-Specific Water Balance - Off-Site Draining Area

			On-Site Wetland (Deciduous Swamp)		***Meadow (Wetland Buffer)***		***Thicket (Wetland Buffer)***	
			WHC	***325 mm***	***WHC***	***150 mm***	***WHC***	***350 mm***
			Infiltration Factor	***1.00***	***Infiltration Factor***	***0.55***	***Infiltration Factor***	***0.65***
			Area (m2)	***0***	***Area (m2)***	***0***	***Area (m2)***	***0***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	18	0	1	28	0	1	18	0
February	49	1	1	38	0	1	46	0	1	38	0
March	61	9	9	72	0	9	77	0	9	72	0
April	73	32	32	48	0	32	48	0	32	48	0
May	76	76	76	14	0	76	14	0	76	14	0
June	79	109	109	3	0	109	3	0	109	3	0
July	88	128	128	1	0	123	1	0	128	1	0
August	79	113	111	1	0	97	1	0	111	1	0
September	85	76	73	7	0	65	7	0	74	7	0
October	71	39	38	6	0	38	6	0	39	6	0
November	73	13	13	19	0	13	22	0	13	19	0
December	63	3	3	28	0	3	31	0	3	28	0
Total	**853**	**600**	**594**	**255**	**0**	**567**	**284**	**0**	**596**	**255**	**0**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	0.32	ha

Site-Specific Water Balance - Off-Site Draining Area

			SWM Pond		***Industrial / Community Buildings to LID #1A - Underground Infiltration Chamber***		***Industrial / Community Buildings to LID #1B - Underground Infiltration Trench***	
			WHC	***PCPN. - LAKE EVAP.***	***WHC***	***2 mm***	***WHC***	***2 mm***
			Infiltration Factor	***0.00***	***Infiltration Factor***	***0.87***	***Infiltration Factor***	***0.87***
			Area (m2)	***0***	***Area (m2)***	***0***	***Area (m2)***	***0***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**
January	56	1	0	56	1	36	1	36
February	49	1	0	49	1	47	1	47
March	61	9	0	61	9	78	9	78
April	73	32	0	73	32	48	32	48
May	76	76	130	-54	63	14	63	14
June	79	109	147	-68	75	5	75	5
July	88	128	152	-64	82	7	82	7
August	79	113	124	-45	75	5	75	5
September	85	76	84	1	60	24	60	24
October	71	39	53	18	37	33	37	33
November	73	13	0	73	13	58	13	58
December	63	3	0	63	3	48	3	48
Total	**853**	**600**	**690**	**163**	**451**	**403**	**451**	**403**
				(m^3)		**(m^3)**		**(m^3)**
				0		0		0
				0		0		0
				0		0		0
				0		0		0
				0		0		0
				0		0		0
				0		0		0
				0		0		0
				0		0		0
				0		0		0
				0		0		0
				0		**0**		**0**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	0.32	ha

Site-Specific Water Balance - Off-Site Draining Area

			Industrial / Community Buildings to LID #2 - Underground Infiltration Chamber		***Industrial / Community Buildings to LID #3 - Underground Infiltration Chamber***		***Industrial / Community Buildings to LID #5 - Overland Depression Area***	
			WHC	***2 mm***	***WHC***	***2 mm***	***WHC***	***2 mm***
			Infiltration Factor	***0.87***	***Infiltration Factor***	***0.87***	***Infiltration Factor***	***0.87***
			Area (m2)	***0***	***Area (m2)***	***0***	***Area (m2)***	***0***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**
January	56	1	1	36	1	36	1	36
February	49	1	1	47	1	47	1	47
March	61	9	9	78	9	78	9	78
April	73	32	32	48	32	48	32	48
May	76	76	63	14	63	14	63	14
June	79	109	75	5	75	5	75	5
July	88	128	82	7	82	7	82	7
August	79	113	75	5	75	5	75	5
September	85	76	60	24	60	24	60	24
October	71	39	37	33	37	33	37	33
November	73	13	13	58	13	58	13	58
December	63	3	3	48	3	48	3	48
Total	**853**	**600**	**451**	**403**	**451**	**403**	**451**	**403**

			Industrial / Community Buildings to LID #2 - Underground Infiltration Chamber		***Industrial / Community Buildings to LID #3 - Underground Infiltration Chamber***		***Industrial / Community Buildings to LID #5 - Overland Depression Area***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(m^3)**	**(mm)**	**(m^3)**
January	56	1	1	0	1	0	1	0
February	49	1	1	0	1	0	1	0
March	61	9	9	0	9	0	9	0
April	73	32	32	0	32	0	32	0
May	76	76	63	0	63	0	63	0
June	79	109	75	0	75	0	75	0
July	88	128	82	0	82	0	82	0
August	79	113	75	0	75	0	75	0
September	85	76	60	0	60	0	60	0
October	71	39	37	0	37	0	37	0
November	73	13	13	0	13	0	13	0
December	63	3	3	0	3	0	3	0
Total	**853**	**600**	**451**	**0**	**451**	**0**	**451**	**0**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	0.32	ha

Site-Specific Water Balance - Off-Site Draining Area

			Grassed Area to LID #5 - Overland Depression Area		***Industrial / Community Buildings to LID #6 - Overland Depression Area***		***Grassed Area to LID #6 - Overland Depression Area***	
			WHC	***100 mm***	***WHC***	***2 mm***	***WHC***	***100 mm***
			Infiltration Factor	***0.94***	***Infiltration Factor***	***0.87***	***Infiltration Factor***	***0.94***
			Area (m2)	***0***	***Area (m2)***	***0***	***Area (m2)***	***0***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(mm)**
January	56	1	1	34	1	36	1	34
February	49	1	1	47	1	47	1	47
March	61	9	9	78	9	78	9	78
April	73	32	32	48	32	48	32	48
May	76	76	76	14	63	14	76	14
June	79	109	107	3	75	5	107	3
July	88	128	111	1	82	7	111	1
August	79	113	88	1	75	5	88	1
September	85	76	63	7	60	24	63	7
October	71	39	38	8	37	33	38	8
November	73	13	13	30	13	58	13	30
December	63	3	3	38	3	48	3	38
Total	**853**	**600**	**542**	**309**	**451**	**403**	**542**	**309**

			Grassed Area to LID #5 - Overland Depression Area		***Industrial / Community Buildings to LID #6 - Overland Depression Area***		***Grassed Area to LID #6 - Overland Depression Area***	
			WHC	***100 mm***	***WHC***	***2 mm***	***WHC***	***100 mm***
			Infiltration Factor	***0.94***	***Infiltration Factor***	***0.87***	***Infiltration Factor***	***0.94***
			Area (m2)	***0***	***Area (m2)***	***0***	***Area (m2)***	***0***
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***	***Actual Evap.***	***Surplus***
(-)	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(m^3)**	**(mm)**	**(m^3)**
January	56	1	1	0	1	0	1	0
February	49	1	1	0	1	0	1	0
March	61	9	9	0	9	0	9	0
April	73	32	32	0	32	0	32	0
May	76	76	76	0	63	0	76	0
June	79	109	107	0	75	0	107	0
July	88	128	111	0	82	0	111	0
August	79	113	88	0	75	0	88	0
September	85	76	63	0	60	0	63	0
October	71	39	38	0	37	0	38	0
November	73	13	13	0	13	0	13	0
December	63	3	3	0	3	0	3	0
Total	**853**	**600**	**542**	**0**	**451**	**0**	**542**	**0**

Table A7

Post-Dev (Controlled) Conditions Water Balance Calculations
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions

Total Area	0.32	ha

Site-Specific Water Balance - Off-Site Draining Area

Month	*Precipitation*	*Potential Evap.*	*Precip. Volume*	*Actual Evap. Volume*	*Surplus Volume*	*Infiltration Volume*	*Surface Runoff Volume*
(-)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
January	56	1	179	3	111	38	73
February	49	1	157	3	150	53	98
March	61	9	195	29	250	88	162
April	73	32	234	102	154	54	100
May	76	76	243	233	45	16	29
June	79	109	253	309	11	3	7
July	88	128	282	323	8	1	7
August	79	113	253	268	7	1	6
September	85	76	272	199	39	8	31
October	71	39	227	120	51	9	42
November	73	13	234	42	127	34	94
December	63	3	202	10	133	43	90
Total	**853**	**600**	**2,730**	**1,641**	**1,085**	**347**	**738**

Summary of Calculations - Annual
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions - Internally Draining Area											
Land Use	*Area*	*Precipitation*		*Evapotranspiration*		*Surplus/Deficit*		*Infiltration*		*Runoff*	
	(ha)	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*
Moderately Rooted Agriculture (Corn)	12.72	108,430	853	73,095	575	35,085	276	35,085	276	-	-
Meadow	4.55	38,830	853	26,450	581	12,245	269	12,245	269	-	-
Meadow (Former Gravel Quarry)	4.25	36,260	853	24,105	567	12,075	284	12,075	284	-	-
Abandoned Farm Buildings	0.03	275	853	150	467	125	389	125	389	-	-
Thicket / Hedgerows	2.55	21,740	853	15,190	596	6,500	255	6,500	255	-	-
On-Site Wetland (Shallow Aquatic)	0.20	1,730	853	1,165	575	560	276	560	276	-	-
On-Site Wetland (Deciduous Swamp)	0.16	1,395	853	970	593	415	254	415	254	-	-
Total	**24.46**	**208,660**	**853**	**141,125**	**577**	**67,005**	**274**	**67,005**	**274**	**-**	**-**

Pre-Development Conditions - Off-Site Draining Area											
Land Use	*Area*	*Precipitation*		*Evapotranspiration*		*Surplus/Deficit*		*Infiltration*		*Runoff*	
	(ha)	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*
Moderately Rooted Agriculture (Corn)	0.51	4,320	853	2,910	575	1,400	276	770	152	630	124
Meadow	0.36	3,105	853	2,115	581	980	269	540	148	440	121
Meadow (Former Gravel Quarry)	0.02	150	853	100	569	50	284	30	171	20	114
Thicket / Hedgerows	0.12	1,025	853	715	594	305	254	200	166	105	87
Total	**1.01**	**8,600**	**853**	**5,840**	**579**	**2,735**	**271**	**1,540**	**153**	**1,195**	**119**

Post-Development (Uncontrolled) Conditions - Internally Draining Area											
Land Use	*Area*	*Precipitation*		*Evapotranspiration*		*Surplus/Deficit*		*Infiltration*		*Runoff*	
	(ha)	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*
Grassed Area / SWM Pond Banks	0.76	6,400	853	4,065	542	2,320	309	2,320	309	-	-
Industrial / Community Buildings	0.22	1,835	853	970	451	865	403	865	403	-	-
Parking Lots / Walkways / Roadways	0.40	3,440	853	1,860	461	1,580	392	1,580	392	-	-
On-Site Wetland (Shallow Aquatic)	0.20	1,730	853	1,165	575	560	276	560	276	-	-
On-Site Wetland (Deciduous Swamp)	0.16	1,395	853	970	593	415	254	415	254	-	-
Meadow (Wetland Buffer)	0.66	5,655	853	3,760	567	1,885	284	1,885	284	-	-
Thicket (Wetland Buffer)	0.31	2,660	853	1,860	596	795	255	795	255	-	-
Total	**2.71**	**23,115**	**858**	**14,650**	**543**	**8,420**	**313**	**8,420**	**313**	**-**	**-**

Post-Development (Uncontrolled) Conditions - Off-Site Draining Area											
Land Use	*Area*	*Precipitation*		*Evapotranspiration*		*Surplus/Deficit*		*Infiltration*		*Runoff*	
	(ha)	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*
Grassed Area / SWM Pond Banks	6.03	51,405	853	32,665	542	18,620	309	10,240	170	8,380	139
Grassed Area / SWM Pond Banks (Former Gravel Quarry)	0.89	7,595	853	4,675	525	2,920	328	1,605	180	1,315	148
Industrial / Community Buildings	6.84	58,345	853	30,850	451	27,570	403	-	-	27,570	403
Parking Lots / Walkways / Roadways	8.66	73,890	853	39,930	461	33,955	392	-	-	33,955	392
SWM Pond	0.34	2,910	853	2,350	689	555	163	-	-	555	163
Total	**22.76**	**194,145**	**853**	**110,470**	**485**	**83,620**	**367**	**11,845**	**52**	**71,775**	**315**

Summary of Calculations - Annual
Site-Specific Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Controlled) Conditions - Internally Draining Area											
Land Use	*Area*	*Precipitation*		*Evapotranspiration*		*Surplus/Deficit*		*Infiltration*		*Runoff*	
	(ha)	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*
Grassed Area	0.15	1,280	853	815	542	465	310	465	310	-	-
Grassed Area / SWM Pond Banks (Former Gravel Quarry) to SWM Pond	0.89	7,595	853	4,675	525	2,920	328	1,605	180	1,315	148
Grassed Area / SWM Pond Banks to SWM Pond	5.83	49,665	853	31,555	542	17,990	309	9,895	170	8,095	139
Parking Lots / Walkways / Roadways	0.40	3,440	853	1,860	461	1,580	392	1,580	392	-	-
Parking Lots / Walkways / Roadways to SWM Pond	8.55	72,900	853	39,400	461	33,500	392	-	-	33,500	392
On-Site Wetland (Shallow Aquatic)	0.20	1,730	853	1,165	575	560	276	560	276	-	-
On-Site Wetland (Deciduous Swamp)	0.16	1,395	853	970	593	415	254	415	254	-	-
Meadow (Wetland Buffer)	0.66	5,655	853	3,760	567	1,885	284	1,885	284	-	-
Thicket (Wetland Buffer)	0.31	2,660	853	1,860	596	795	255	795	255	-	-
SWM Pond	0.34	2,910	853	2,350	689	555	163	-	-	555	163
Industrial / Community Buildings to LID #1A - Underground Infiltration Chamber	1.70	14,500	853	7,665	451	6,850	403	5,970	351	880	52
Industrial / Community Buildings to LID #1B - Underground Infiltration Trench	0.89	7,590	853	4,015	451	3,590	403	3,130	352	460	52
Industrial / Community Buildings to LID #2 - Underground Infiltration Chamber	2.81	23,970	853	12,675	451	11,325	403	9,870	351	1,455	52
Industrial / Community Buildings to LID #3 - Underground Infiltration Chamber	1.44	12,285	853	6,495	451	5,805	403	5,060	351	745	52
Industrial / Community Buildings to LID #5 - Overland Depression Area	0.12	1,025	853	540	450	480	400	420	350	60	50
Grassed Area to LID #5 - Overland Depression Area	0.31	2,645	853	1,680	542	960	310	905	292	55	18
Industrial / Community Buildings to LID #6 - Overland Depression Area	0.09	810	853	430	453	380	400	330	348	50	53
Grassed Area to LID #6 - Overland Depression Area	0.30	2,475	853	1,570	541	900	310	845	291	55	19
Total	**25.15**	**214,530**	**854**	**123,480**	**491**	**90,955**	**361**	**43,730**	**174**	**47,225**	**188**

Post-Development (Controlled) Conditions - Off-Site Draining Area											
Land Use	*Area*	*Precipitation*		*Evapotranspiration*		*Surplus/Deficit*		*Infiltration*		*Runoff*	
	(ha)	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*	*(m^3)*	*(mm)*
Grassed Area	0.20	1,745	853	1,105	541	630	308	345	169	285	140
Parking Lots / Walkways / Roadways	0.12	985	853	535	462	455	393	-	-	455	393
Total	**0.32**	**2,730**	**853**	**1,640**	**513**	**1,085**	**339**	**345**	**108**	**740**	**231**

Annual Summary											
Pre-Development Conditions	25.47	217,260	853	146,965	577	69,740	274	68,545	269	1,195	5
Post-Development (Uncontrolled) Conditions	25.47	217,260	855	125,120	491	92,040	361	20,265	80	71,775	281
Additional Infiltration Measures											
On-Site Wetland via SWM Pond Low Flow Orifice	-	-	-	-	-	-	-	47,000	212	(47,000)	(212)
On-Site Wetland via LID #5/6 Overflow	-	-	-	-	-	-	-	220	27	(220)	(27)
Post-Development (Controlled) Conditions	25.47	217,260	853	125,120	491	92,040	361	91,295	358	745	3
Pre- to Post- Development Difference											
Post-Development (Controlled) Conditions	-	-	-	(21,845)	(86)	22,300	87	22,750	89	(450)	(2)
Percentage Change	0%	0%	0%	-15%	-15%	32%	32%	33%	33%	-38%	-38%

Notes:
Values are rounded for reporting purposes.
Positive value for infiltration difference is a surplus and a negative value is a deficit.
Positive value for runoff difference is an increase in runoff and a negative value is a decrease in runoff.

Table A9

Pre-Dev Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Total Area	19.23	ha

Feature-Based Water Balance Analysis - AP-1

			Moderately Rooted Agriculture (Corn)			***Meadow***			***Meadow (Former Gravel Quarry)***		
			WHC	***175 mm***		***WHC***	***200 mm***		***WHC***	***150 mm***	
			Infiltration Factor	***0.55***		***Infiltration Factor***	***0.55***		***Infiltration Factor***	***0.55***	
			Area (m^2)	***97,943***		***Area (m^2)***	***48,819***		***Area (m^2)***	***25,170***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	25	2,449	1	23	1,123	1	28	705
February	49	1	1	45	4,407	1	43	2,099	1	46	1,158
March	61	9	9	76	7,444	9	75	3,661	9	77	1,938
April	73	32	32	48	4,701	32	48	2,343	32	48	1,208
May	76	76	76	14	1,371	76	14	683	76	14	352
June	79	109	109	3	294	109	3	146	109	3	76
July	88	128	125	1	98	127	1	49	123	1	25
August	79	113	101	1	98	104	1	49	97	1	25
September	85	76	67	7	686	68	7	342	65	7	176
October	71	39	38	6	588	38	6	293	38	6	151
November	73	13	13	21	2,057	13	20	976	13	22	554
December	63	3	3	29	2,840	3	28	1,367	3	31	780
Total	**853**	**600**	**575**	**276**	**27,032**	**581**	**269**	**13,132**	**567**	**284**	**7,148**

Table A9

Pre-Dev Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Total Area	19.23	ha

Feature-Based Water Balance Analysis - AP-1

			Abandoned Farm Buildings		***Thicket / Hedgerows***		***Roadway***			
			WHC	***10 mm***	***WHC***	***350 mm***	***WHC***	***2 mm***		
			Infiltration Factor	***0.00***	***Infiltration Factor***	***0.65***	***Infiltration Factor***	***0.00***		
			Area (m^2)	***321***	***Area (m^2)***	***10,275***	***Area (m^2)***	***6,154***		
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	36	12	1	18	185	1	36	222
February	49	1	1	47	15	1	38	390	1	47	289
March	61	9	9	78	25	9	72	740	9	78	480
April	73	32	32	48	15	32	48	493	32	48	295
May	76	76	67	14	4	76	14	144	63	14	86
June	79	109	78	4	1	109	3	31	75	5	31
July	88	128	83	5	2	128	1	10	82	7	43
August	79	113	76	4	1	111	1	10	75	5	31
September	85	76	61	21	7	74	7	72	60	24	148
October	71	39	37	30	10	39	6	62	37	33	203
November	73	13	13	57	18	13	19	195	13	58	357
December	63	3	3	48	15	3	28	288	3	48	295
Total	**853**	**600**	**461**	**392**	**126**	**596**	**255**	**2,620**	**451**	**403**	**2,480**

Table A9

Pre-Dev Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Pre-Development Conditions

Total Area	19.23	ha

Feature-Based Water Balance Analysis - AP-1

			On-Site Wetland (Shallow Aquatic)			***On-Site Wetland (Deciduous Swamp)***							
			WHC	***175 mm***		***WHC***	***325 mm***						
			Infiltration Factor	***1.00***		***Infiltration Factor***	***1.00***						
			Area (m^2)	***2,027***		***Area (m^2)***	***1,635***						
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Precip. Volume***	***Actual Evap. Volume***	***Surplus Volume***	***Infiltration Volume***	***Surface Runoff Volume***
(-)	(mm)	(mm)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
January	56	1	1	25	51	1	18	29	10,771	192	4,774	2,552	2,222
February	49	1	1	45	91	1	38	62	9,425	192	8,513	4,623	3,890
March	61	9	9	76	154	9	72	118	11,733	1,731	14,560	7,926	6,633
April	73	32	32	48	97	32	48	79	14,041	6,155	9,232	5,035	4,197
May	76	76	76	14	28	76	14	23	14,618	14,535	2,693	1,469	1,224
June	79	109	109	3	6	109	3	5	15,195	20,746	590	315	275
July	88	128	125	1	2	128	1	2	16,926	23,848	231	105	126
August	79	113	101	1	2	111	1	2	15,195	19,424	218	105	113
September	85	76	67	7	14	73	7	11	16,349	12,922	1,456	734	721
October	71	39	38	6	12	38	6	10	13,656	7,313	1,328	629	698
November	73	13	13	21	43	13	19	31	14,041	2,500	4,231	2,173	2,058
December	63	3	3	29	59	3	28	46	12,118	577	5,691	3,035	2,656
Total	**853**	**600**	**575**	**276**	**559**	**594**	**255**	**417**	**164,069**	**110,136**	**53,515**	**28,701**	**24,814**

Table A10

Post-Dev (Uncontrolled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	2.71	ha

Feature-Based Water Balance Analysis - AP-1

			Grassed Area			***Community Buildings***			***Walkways***		
			WHC	***100 mm***		***WHC***	***2 mm***		***WHC***	***10 mm***	
			Infiltration Factor	***0.55***		***Infiltration Factor***	***0.00***		***Infiltration Factor***	***0.00***	
			Area (m^2)	***7,502***		***Area (m^2)***	***2,149***		***Area (m^2)***	***4,035***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	34	255	1	36	77	1	36	145
February	49	1	1	47	353	1	47	101	1	47	190
March	61	9	9	78	585	9	78	168	9	78	315
April	73	32	32	48	360	32	48	103	32	48	194
May	76	76	76	14	105	63	14	30	67	14	56
June	79	109	107	3	23	75	5	11	78	4	16
July	88	128	111	1	8	82	7	15	83	5	20
August	79	113	88	1	8	75	5	11	76	4	16
September	85	76	63	7	53	60	24	52	61	21	85
October	71	39	38	8	60	37	33	71	37	30	121
November	73	13	13	30	225	13	58	125	13	57	230
December	63	3	3	38	285	3	48	103	3	48	194
Total	**853**	**600**	**542**	**309**	**2,318**	**451**	**403**	**866**	**461**	**392**	**1,582**

Entered by: MR
Reviewed by: SA

Table A10

Post-Dev (Uncontrolled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	2.71	ha

Feature-Based Water Balance Analysis - AP-1

			On-Site Wetland (Shallow Aquatic)			***On-Site Wetland (Deciduous Swamp)***			***Meadow (Wetland Buffer)***		
			WHC	***175 mm***		***WHC***	***325 mm***		***WHC***	***150 mm***	
			Infiltration Factor	***1.00***		***Infiltration Factor***	***1.00***		***Infiltration Factor***	***0.55***	
			Area (m^2)	***2,027***		***Area (m^2)***	***1,635***		***Area (m^2)***	***6,632***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	25	51	1	18	29	1	28	186
February	49	1	1	45	91	1	38	62	1	46	305
March	61	9	9	76	154	9	72	118	9	77	511
April	73	32	32	48	97	32	48	79	32	48	318
May	76	76	76	14	28	76	14	23	76	14	93
June	79	109	109	3	6	109	3	5	109	3	20
July	88	128	125	1	2	128	1	2	123	1	7
August	79	113	101	1	2	111	1	2	97	1	7
September	85	76	67	7	14	73	7	11	65	7	46
October	71	39	38	6	12	38	6	10	38	6	40
November	73	13	13	21	43	13	19	31	13	22	146
December	63	3	3	29	59	3	28	46	3	31	206
Total	**853**	**600**	**575**	**276**	**559**	**594**	**255**	**417**	**567**	**284**	**1,884**

Entered by: MR
Reviewed by: SA

Table A10

Post-Dev (Uncontrolled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	2.71	ha

Feature-Based Water Balance Analysis - AP-1

Thicket (Wetland Buffer)	
WHC	***350 mm***
Infiltration Factor	***0.65***
Area (m^2)	***3,119***

Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Precip. Volume***	***Actual Evap. Volume***	***Surplus Volume***	***Infiltration Volume***	***Surface Runoff Volume***
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**
January	56	1	1	18	56	1,518	27	800	359	441
February	49	1	1	38	119	1,328	27	1,220	592	628
March	61	9	9	72	225	1,653	244	2,075	1,020	1,054
April	73	32	32	48	150	1,978	867	1,301	646	655
May	76	76	76	14	44	2,060	1,995	379	188	191
June	79	109	109	3	9	2,141	2,741	90	40	49
July	88	128	128	1	3	2,385	3,022	56	13	43
August	79	113	111	1	3	2,141	2,504	48	13	34
September	85	76	74	7	22	2,304	1,765	283	94	188
October	71	39	39	6	19	1,924	1,027	332	89	243
November	73	13	13	19	59	1,978	352	859	316	542
December	63	3	3	28	87	1,707	81	979	431	548
Total	**853**	**600**	**596**	**255**	**795**	**23,116**	**14,652**	**8,421**	**3,804**	**4,617**

Entered by: MR
Reviewed by: SA

Table A11

Post-Dev (Controlled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	25.15	ha

Feature-Based Water Balance Analysis (AP-1)

			Grassed Area			***Grassed Area / SWM Pond Banks (Former Gravel Quarry) to SWM Pond***			***Grassed Area / SWM Pond Banks to SWM Pond***		
			WHC	***100 mm***		***WHC***	***75 mm***		***WHC***	***100 mm***	
			Infiltration Factor	***0.55***		***Infiltration Factor***	***0.55***		***Infiltration Factor***	***0.55***	
			Area (m^2)	***1,502***		***Area (m^2)***	***8,902***		***Area (m^2)***	***58,224***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	(mm)	(mm)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)
January	56	1	1	34	51	1	35	312	1	34	1,980
February	49	1	1	47	71	1	47	418	1	47	2,737
March	61	9	9	78	117	9	78	694	9	78	4,541
April	73	32	32	48	72	32	48	427	32	48	2,795
May	76	76	76	14	21	76	14	125	76	14	815
June	79	109	107	3	5	103	3	27	107	3	175
July	88	128	111	1	2	102	1	9	111	1	58
August	79	113	88	1	2	84	1	9	88	1	58
September	85	76	63	7	11	63	8	71	63	7	408
October	71	39	38	8	12	38	13	116	38	8	466
November	73	13	13	30	45	13	37	329	13	30	1,747
December	63	3	3	38	57	3	43	383	3	38	2,213
Total	**853**	**600**	**542**	**309**	**464**	**525**	**328**	**2,920**	**542**	**309**	**17,991**

Table A11

Post-Dev (Controlled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	25.15	ha

Feature-Based Water Balance Analysis (AP-1)

			Walkways			***Parking Lots / Walkways / Roadways to SWM Pond***			***On-Site Wetland (Shallow Aquatic)***		
			WHC	***10 mm***		***WHC***	***10 mm***		***WHC***	***175 mm***	
			Infiltration Factor	***0.00***		***Infiltration Factor***	***0.00***		***Infiltration Factor***	***1.00***	
			Area (m^2)	***4,035***		***Area (m^2)***	***85,464***		***Area (m^2)***	***2,027***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	(mm)	(mm)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)
January	56	1	1	36	145	1	36	3,077	1	25	51
February	49	1	1	47	190	1	47	4,017	1	45	91
March	61	9	9	78	315	9	78	6,666	9	76	154
April	73	32	32	48	194	32	48	4,102	32	48	97
May	76	76	67	14	56	67	14	1,197	76	14	28
June	79	109	78	4	16	78	4	342	109	3	6
July	88	128	83	5	20	83	5	427	125	1	2
August	79	113	76	4	16	76	4	342	101	1	2
September	85	76	61	21	85	61	21	1,795	67	7	14
October	71	39	37	30	121	37	30	2,564	38	6	12
November	73	13	13	57	230	13	57	4,871	13	21	43
December	63	3	3	48	194	3	48	4,102	3	29	59
Total	**853**	**600**	**461**	**392**	**1,582**	**461**	**392**	**33,502**	**575**	**276**	**559**

Table A11

Post-Dev (Controlled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	25.15	ha

Feature-Based Water Balance Analysis (AP-1)

			On-Site Wetland (Deciduous Swamp)			***Meadow (Wetland Buffer)***			***Thicket (Wetland Buffer)***		
			WHC	***325 mm***		***WHC***	***150 mm***		***WHC***	***350 mm***	
			Infiltration Factor	***1.00***		***Infiltration Factor***	***0.55***		***Infiltration Factor***	***0.65***	
			Area (m^2)	***1,635***		***Area (m^2)***	***6,632***		***Area (m^2)***	***3,119***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	1	18	29	1	28	186	1	18	56
February	49	1	1	38	62	1	46	305	1	38	119
March	61	9	9	72	118	9	77	511	9	72	225
April	73	32	32	48	79	32	48	318	32	48	150
May	76	76	76	14	23	76	14	93	76	14	44
June	79	109	109	3	5	109	3	20	109	3	9
July	88	128	128	1	2	123	1	7	128	1	3
August	79	113	111	1	2	97	1	7	111	1	3
September	85	76	73	7	11	65	7	46	74	7	22
October	71	39	38	6	10	38	6	40	39	6	19
November	73	13	13	19	31	13	22	146	13	19	59
December	63	3	3	28	46	3	31	206	3	28	87
Total	**853**	**600**	**594**	**255**	**417**	**567**	**284**	**1,884**	**596**	**255**	**795**

Table A11

Post-Dev (Controlled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	25.15	ha

Feature-Based Water Balance Analysis (AP-1)

			SWM Pond			***Industrial / Community Buildings to LID #1A - Underground Infiltration Chamber***			***Industrial / Community Buildings to LID #1B - Underground Infiltration Trench***		
			WHC	***PCPN. - LAKE EVAP.***		***WHC***	***2 mm***		***WHC***	***2 mm***	
			Infiltration Factor	***0.00***		***Infiltration Factor***	***0.87***		***Infiltration Factor***	***0.87***	
			Area (m^2)	***3,410***		***Area (m^2)***	***17,000***		***Area (m^2)***	***8,900***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	**(mm)**	**(mm)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**	**(mm)**	**(mm)**	**(m^3)**
January	56	1	0	56	191	1	36	612	1	36	320
February	49	1	0	49	167	1	47	799	1	47	418
March	61	9	0	61	208	9	78	1,326	9	78	694
April	73	32	0	73	249	32	48	816	32	48	427
May	76	76	130	-54	-185	63	14	238	63	14	125
June	79	109	147	-68	-232	75	5	85	75	5	45
July	88	128	152	-64	-218	82	7	119	82	7	62
August	79	113	124	-45	-153	75	5	85	75	5	45
September	85	76	84	1	3	60	24	408	60	24	214
October	71	39	53	18	62	37	33	561	37	33	294
November	73	13	0	73	249	13	58	986	13	58	516
December	63	3	0	63	215	3	48	816	3	48	427
Total	**853**	**600**	**690**	**163**	**556**	**451**	**403**	**6,851**	**451**	**403**	**3,587**

Table A11

Post-Dev (Controlled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	25.15	ha

Feature-Based Water Balance Analysis (AP-1)

			Industrial / Community Buildings to LID #2 - Underground Infiltration Chamber			***Industrial / Community Buildings to LID #3 - Underground Infiltration Chamber***			***Industrial / Community Buildings to LID #5 - Overland Depression Area***		
			WHC	***2 mm***		***WHC***	***2 mm***		***WHC***	***2 mm***	
			Infiltration Factor	***0.87***		***Infiltration Factor***	***0.87***		***Infiltration Factor***	***0.87***	
			Area (m^2)	***28,100***		***Area (m^2)***	***14,400***		***Area (m^2)***	***1,200***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	(mm)	(mm)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)
January	56	1	1	36	1,012	1	36	518	1	36	43
February	49	1	1	47	1,321	1	47	677	1	47	56
March	61	9	9	78	2,192	9	78	1,123	9	78	94
April	73	32	32	48	1,349	32	48	691	32	48	58
May	76	76	63	14	393	63	14	202	63	14	17
June	79	109	75	5	141	75	5	72	75	5	6
July	88	128	82	7	197	82	7	101	82	7	8
August	79	113	75	5	141	75	5	72	75	5	6
September	85	76	60	24	674	60	24	346	60	24	29
October	71	39	37	33	927	37	33	475	37	33	40
November	73	13	13	58	1,630	13	58	835	13	58	70
December	63	3	3	48	1,349	3	48	691	3	48	58
Total	**853**	**600**	**451**	**403**	**11,324**	**451**	**403**	**5,803**	**451**	**403**	**484**

Table A11

Post-Dev (Controlled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	25.15	ha

Feature-Based Water Balance Analysis (AP-1)

			Grassed Area to LID #5 - Overland Depression Area			***Industrial / Community Buildings to LID #6 - Overland Depression Area***			***Grassed Area to LID #6 - Overland Depression Area***		
			WHC	***100 mm***		***WHC***	***2 mm***		***WHC***	***100 mm***	
			Infiltration Factor	***0.94***		***Infiltration Factor***	***0.87***		***Infiltration Factor***	***0.94***	
			Area (m^2)	***3,100***		***Area (m^2)***	***949***		***Area (m^2)***	***2,900***	
Month	***Precipitation***	***Potential Evap.***	***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***		***Actual Evap.***	***Surplus***	
(-)	(mm)	(mm)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)	(mm)	(mm)	(m^3)
January	56	1	1	34	105	1	36	34	1	34	99
February	49	1	1	47	146	1	47	45	1	47	136
March	61	9	9	78	242	9	78	74	9	78	226
April	73	32	32	48	149	32	48	46	32	48	139
May	76	76	76	14	43	63	14	13	76	14	41
June	79	109	107	3	9	75	5	5	107	3	9
July	88	128	111	1	3	82	7	7	111	1	3
August	79	113	88	1	3	75	5	5	88	1	3
September	85	76	63	7	22	60	24	23	63	7	20
October	71	39	38	8	25	37	33	31	38	8	23
November	73	13	13	30	93	13	58	55	13	30	87
December	63	3	3	38	118	3	48	46	3	38	110
Total	**853**	**600**	**542**	**309**	**958**	**451**	**403**	**382**	**542**	**309**	**896**

Table A11

Post-Dev (Controlled) Conditions Water Balance Calculations - Monthly Analysis
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

Post-Development (Uncontrolled) Conditions

Total Area	25.15	ha

Feature-Based Water Balance Analysis (AP-1)

Month	*Precipitation*	*Potential Evap.*	*Precip. Volume*	*Actual Evap. Volume*	*Surplus Volume*	*Infiltration Volume*	*Surface Runoff Volume*
(-)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)
January	56	1	14,084	248	8,821	3,913	4,908
February	49	1	12,324	248	11,774	5,328	6,445
March	61	9	15,342	2,233	19,520	8,881	10,639
April	73	32	18,360	7,939	12,157	5,483	6,674
May	76	76	19,114	17,576	3,288	1,599	1,689
June	79	109	19,869	22,185	743	466	277
July	88	128	22,132	23,613	811	483	328
August	79	113	19,869	20,423	645	360	285
September	85	76	21,378	15,597	4,201	1,850	2,351
October	71	39	17,857	9,450	5,798	2,457	3,340
November	73	13	18,360	3,225	12,022	5,096	6,927
December	63	3	15,845	744	11,175	4,900	6,275
Total	**853**	**600**	**214,530**	**123,482**	**90,956**	**40,817**	**50,139**

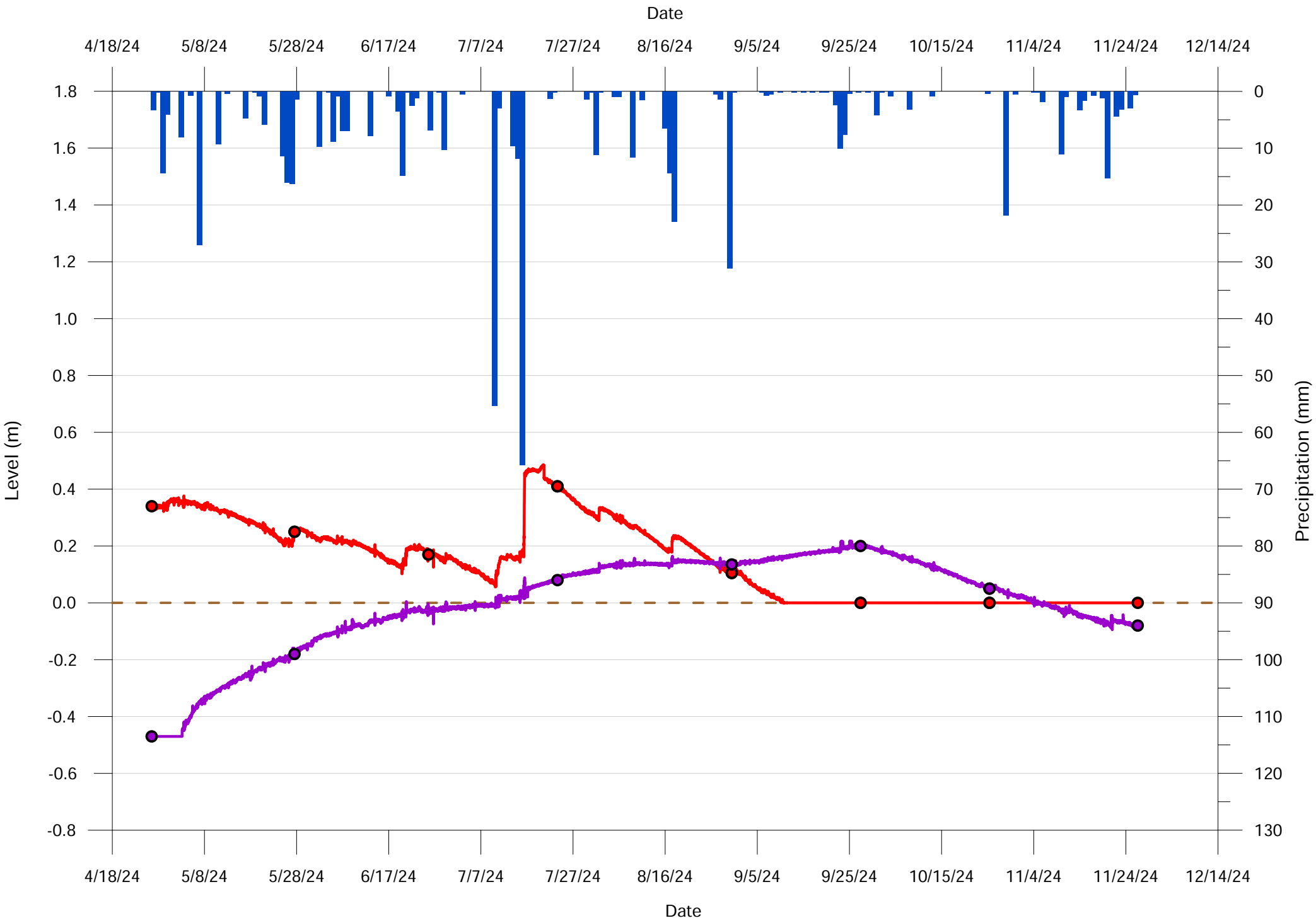
Summary of Calculations - Monthly
Feature-Based Water Balance Analysis
4631 Sideroad 20 North, Puslinch Township, Ontario
Puslinch Development Limited Partnership

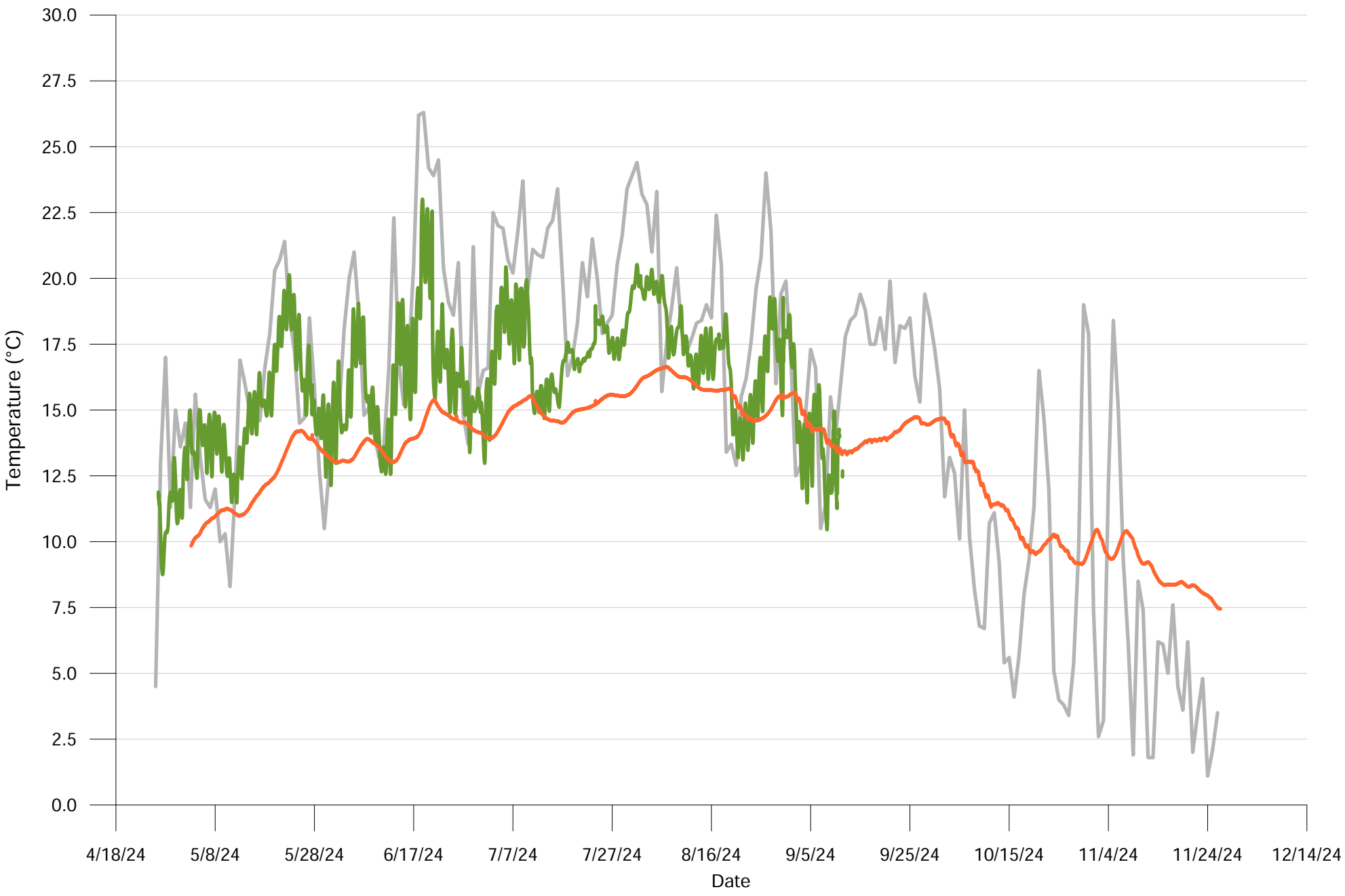
AP-1												
Month	Details	Area	Precipitation		Evapotranspiration		Surplus/Deficit		Infiltration		Runoff	
		(ha)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)
January	Pre-Development Conditions	19.23	10,770	56	190	1	4,770	25	2,550	13	2,220	12
	Post-Development (Uncontrolled) Conditions	2.71	1,520	56	25	1	800	30	360	13	440	16
	Post-Development (Controlled) Conditions	25.15	14,085	56	250	1	8,820	35	3,910	16	4,910	20
	Difference (Pre-Development to Controlled)	(16.52)	3,315	17	60	0	4,050	21	1,360	7	2,690	14
February	Pre-Development Conditions	19.23	9,425	49	190	1	8,515	44	4,625	24	3,890	20
	Post-Development (Uncontrolled) Conditions	2.71	1,330	49	25	1	1,220	45	590	22	630	23
	Post-Development (Controlled) Conditions	25.15	12,325	49	250	1	11,775	47	5,330	21	6,445	26
	Difference (Pre-Development to Controlled)	(16.52)	2,900	15	60	0	3,260	17	705	4	2,555	13
March	Pre-Development Conditions	19.23	11,735	61	1,730	9	14,560	76	7,925	41	6,635	34
	Post-Development (Uncontrolled) Conditions	2.71	1,650	61	245	9	2,075	77	1,020	38	1,055	39
	Post-Development (Controlled) Conditions	25.15	15,340	61	2,230	9	19,520	78	8,880	35	10,640	42
	Difference (Pre-Development to Controlled)	(16.52)	3,605	19	500	3	4,960	26	955	5	4,005	21
April	Pre-Development Conditions	19.23	14,040	73	6,155	32	9,230	48	5,035	26	4,195	22
	Post-Development (Uncontrolled) Conditions	2.71	1,980	73	870	32	1,300	48	645	24	655	24
	Post-Development (Controlled) Conditions	25.15	18,360	73	7,940	32	12,160	48	5,485	22	6,675	27
	Difference (Pre-Development to Controlled)	(16.52)	4,320	22	1,785	9	2,930	15	450	2	2,480	13
May	Pre-Development Conditions	19.23	14,620	76	14,535	76	2,695	14	1,470	8	1,225	6
	Post-Development (Uncontrolled) Conditions	2.71	2,060	76	1,995	74	380	14	190	7	190	7
	Post-Development (Controlled) Conditions	25.15	19,110	76	17,575	70	3,290	13	1,600	6	1,690	7
	Difference (Pre-Development to Controlled)	(16.52)	4,490	23	3,040	16	595	3	130	1	465	2
June	Pre-Development Conditions	19.23	15,195	79	20,745	108	590	3	315	2	275	1
	Post-Development (Uncontrolled) Conditions	2.71	2,140	79	2,740	101	90	3	40	1	50	2
	Post-Development (Controlled) Conditions	25.15	19,870	79	22,185	88	740	3	465	2	275	1
	Difference (Pre-Development to Controlled)	(16.52)	4,675	24	1,440	7	150	1	150	1	-	-
July	Pre-Development Conditions	19.23	16,925	88	23,850	124	230	1	105	1	125	1
	Post-Development (Uncontrolled) Conditions	2.71	2,385	88	3,020	111	55	2	10	0	45	2
	Post-Development (Controlled) Conditions	25.15	22,130	88	23,610	94	810	3	480	2	330	1
	Difference (Pre-Development to Controlled)	(16.52)	5,205	27	(240)	(1)	580	3	375	2	205	1
August	Pre-Development Conditions	19.23	15,195	79	19,425	101	220	1	105	1	115	1
	Post-Development (Uncontrolled) Conditions	2.71	2,140	79	2,505	92	50	2	15	1	35	1
	Post-Development (Controlled) Conditions	25.15	19,870	79	20,425	81	645	3	360	1	285	1
	Difference (Pre-Development to Controlled)	(16.52)	4,675	24	1,000	5	425	2	255	1	170	1
September	Pre-Development Conditions	19.23	16,350	85	12,920	67	1,455	8	735	4	720	4
	Post-Development (Uncontrolled) Conditions	2.71	2,300	85	1,765	65	280	10	90	3	190	7
	Post-Development (Controlled) Conditions	25.15	21,380	85	15,595	62	4,200	17	1,850	7	2,350	9
	Difference (Pre-Development to Controlled)	(16.52)	5,030	26	2,675	14	2,745	14	1,115	6	1,630	8
October	Pre-Development Conditions	19.23	13,655	71	7,315	38	1,330	7	630	3	700	4
	Post-Development (Uncontrolled) Conditions	2.71	1,925	71	1,030	38	330	12	90	3	240	9
	Post-Development (Controlled) Conditions	25.15	17,855	71	9,450	38	5,800	23	2,460	10	3,340	13
	Difference (Pre-Development to Controlled)	(16.52)	4,200	22	2,135	11	4,470	23	1,830	10	2,640	14
November	Pre-Development Conditions	19.23	14,040	73	2,500	13	4,230	22	2,170	11	2,060	11
	Post-Development (Uncontrolled) Conditions	2.71	1,980	73	350	13	860	32	320	12	540	20
	Post-Development (Controlled) Conditions	25.15	18,360	73	3,225	13	12,020	48	5,095	20	6,925	28
	Difference (Pre-Development to Controlled)	(16.52)	4,320	22	725	4	7,790	41	2,925	15	4,865	25
December	Pre-Development Conditions	19.23	12,120	63	575	3	5,690	30	3,035	16	2,655	14
	Post-Development (Uncontrolled) Conditions	2.71	1,705	63	80	3	980	36	430	16	550	20
	Post-Development (Controlled) Conditions	25.15	15,845	63	745	3	11,175	44	4,900	19	6,275	25
	Difference (Pre-Development to Controlled)	(16.52)	3,725	19	170	1	5,485	29	1,865	10	3,620	19
Annual Summary												
Pre-Development Conditions		19.23	164,070	853	110,130	573	53,515	278	28,700	149	24,815	129
Post-Development (Uncontrolled) Conditions		2.71	23,115	853	14,650	541	8,420	311	3,800	140	4,620	171
Post-Development (Controlled) Conditions		25.15	214,530	853	123,480	491	90,955	361	40,815	162	50,140	199
Pre- to Post- Development Difference												
Post-Development (Controlled) Conditions		5.92	50,460	262	13,350	69	37,440	195	12,115	63	25,325	132
Percentage Change		31%	31%	31%	12%	12%	70%	70%	42%	42%	102%	102%

Notes:
Values are rounded for reporting purposes.
Positive value for infiltration difference is a surplus and a negative value is a deficit.
Positive value for runoff difference is an increase in runoff and a negative value is a decrease in runoff.

Appendix B

SW1/MP1 hydrograph





Notes:
- Precipitation and ambient temperature data provided from the Kitchener/ Waterloo (Climate ID: 6144239) Environment Canada weather station and supplemented with the Roseville (Climate ID: 6147188) Environment Canada weather station.
- Gaps in the continuous water temperature were caused by dry conditions.

PUSLINCH DEVELOPMENT LIMITED PARTERNSHIP
PUSLINCH, ONTARIO
SURFACE WATER ASSESSMENT

SW1/MP1 - SURFACE WATER HYDROGRAPH AND TEMPERATURE DATA

Project No. 12618927
Date May 2025

Appendix H

Photographic Log



Photo 1 - View of the CUM1-1 and OAG on the southwest side of the Site. View facing west. May 13, 2024.



Photo 2 - View of the SWD4-1 and SAS on the south side of the Site. View facing west. May 13, 2024.

Photographic Record



Photo 3 - View of the Hedge and OAG in the central portion of the Site. View facing southwest. May 13, 2024.



Photo 4 - View of the CUT1 on the southwest side of the Site. View facing west. May 13, 2024.



Photo 5 - View of the CUM1-1 on the east side of the Site. View facing northeast. August 26, 2024.



Photo 6 - View of the OAG, Hedge, and CUT1 on the east and north sides of the Site. View facing north. August 26, 2024.



Photo 7 - View of the CUM1-1 and SWD4-1 on the south side of the Site. View facing west. August 26, 2024.



Photo 8 - View of the SAS and SWD4-1 on the south side of the Site. View facing northeast. August 26, 2024.



Photo 9 - View of the existing barn structure on- Site that may provide suitable habitat for bats. June 22, 2022.



Photo 10 - View of the existing shed structure on- Site that may provide suitable habitat for bats. View facing southwest. June 22, 2022.

Appendix I

Vascular Plant List

Appendix I
Vascular Plant List
Scoped Environmental Impact Study
Estill Innovation Community - 12618927

Scientific Name	Common Name	Coefficient of Conservatism (CC)	Wetness Index	Weediness Index	Provincial Status (S-Rank)	ESA Status	SARA Status	Local Status Wellington Dufferin Riley 1989	Ecological Land Classification					
									SWD4-1	SAS	CUM1-1	CUT1	OAG	Hedge
Equisetaceae	**Horsetail Family**													
Equisetum arvense	Field Horsetail	0	0		S5			X				x		x
Onocleaceae	**Sensitive Fern Family**													
Onoclea sensibilis	Sensitive Fern	4	-3		S5			X	x					
Cupressaceae	**Cypress Family**													
Juniperus virginiana var. virginiana	Eastern Red Cedar	4	3		S5			X				x		
Pinaceae	**Pine Family**													
Picea glauca	White Spruce	6	3		S5			X				x		
Pinus resinosa	Red Pine	8	3		S5			X				x		
Adoxaceae	**Moschatel Family**													
Sambucus canadensis	Common Elderberry	5	-2		S5			X						x
Viburnum opulus ssp. opulus	Cranberry Viburnum		-3		SNA				x					
Anacardiaceae	**Cashew Family**													
Rhus typhina	Staghorn Sumac	1	5		S5			X				x		
Apiaceae	**Carrot Family**													
Anthriscus sylvestris	Wild Chervil		5	-2	SNA				x					
Daucus carota	Wild Carrot		5	-2	SNA			X			x	x		x
Apocynaceae	**Milkweed Family**													
Asclepias syriaca	Common Milkweed	0	5		S5			X			x	x		x
Asteraceae	**Aster Family**													
Achillea millefolium	Common Yarrow		3	-1	SNA			X			x			
Ambrosia artemisiifolia	Common Ragweed	0	3		S5			X						x
Arctium minus	Common Burdock		3	-2	SNA			X						x
Centaurea stoebe	Spotted Knapweed		5	-3	SNA						x			
Cichorium intybus	Wild Chicory		5	-1	SNA			X						x
Cirsium arvense	Canada Thistle		3	-1	SNA			X						x
Eutrochium maculatum var. maculatum	Spotted Joe Pye Weed	3	-5		S5			X	x					
Hieracium vulgatum	Common Hawkweed		5	-1	SNA			X			x	x		
Solidago altissima var. altissima	Tall Goldenrod	1	3		S5			X			x	x		
Solidago canadensis	Canada Goldenrod	1	3		S5			X			x	x		x
Solidago nemoralis var. nemoralis	Grey-Stemmed Goldenrod	2	5		S5			X				x		
Symphyotrichum ericoides var. ericoides	White Heath Aster	4	4		S5			X			x	x		
Symphyotrichum novae-angliae	New England Aster	2	-2		S5			X			x			
Taraxacum officinale	Common Dandelion		3	-2	SNA			X			x			x
Balsaminaceae	**Touch-Me-Not Family**													
Impatiens capensis	Spotted Jewelweed	4	-3		S5			X	x					
Boraginaceae	**Borage Family**													
Echium vulgare	Common Viper's Bugloss		5	-2	SNA			X				x		x
Brassicaceae	**Mustard Family**													
Alliaria petiolata	Garlic Mustard		0	-3	SNA				x			x		x
Barbarea vulgaris	Bitter Wintercress		0	-1	SNA			X				x		
Cardamine hirsuta	Hairy Bittercress		3	-1	SNA									x
Lepidium campestre	Field Peppergrass		5	-1	SNA			X						x
Caprifoliaceae	**Honeysuckle Family**													
Lonicera canadensis	Canada Fly Honeysuckle	6	3		S5			X	x					
Lonicera morrowii	Morrow's Honeysuckle		3	-1	SNA							x		
Lonicera tatarica	Tartarian Honeysuckle		3	-3	SNA			X	x					x
Cornaceae	**Dogwood Family**													
Cornus stolonifera	Red-Osier Dogwood	2	-3		S5			X	x	x		x		
Cucurbitaceae	**Gourd Family**													
Echinocystis lobata	Wild Cucumber	3	-2		S5			X						
Elaeagnaceae	**Oleaster Family**													
Elaeagnus umbellata	Autumn Olive		3	-3	SNA						x	x		x
Fabaceae	**Legume Family**													
Desmodium canadense	Canada Tick-Trefoil	5	1		S4			X						x
Gleditsia triacanthos	Honey Locust	3	0		S2?									x
Glycine max	Soybean		5	-1	SNA								x	
Medicago falcata	Yellow Alfalfa		5		SNA			X			x	x		

Appendix I
Vascular Plant List
Scoped Environmental Impact Study
Estill Innovation Community - 12618927

Scientific Name	Common Name	Coefficient of Conservatism (CC)	Wetness Index	Weediness Index	Provincial Status (S-Rank)	ESA Status	SARA Status	Local Status Wellington Dufferin Riley 1989	Ecological Land Classification					
									SWD4-1	SAS	CUM1-1	CUT1	OAG	Hedge
Robinia pseudoacacia	Black Locust		3	-3	SNA			X				x		
Securigera varia	Purple Crown-Vetch		5	-2	SNA						x			
Trifolium pratense	Red Clover		3	-2	SNA			X			x	x		x
Vicia cracca	Tufted Vetch		5	-1	SNA			X			x			x
Fagaceae	**Beech Family**													
Quercus macrocarpa	Burr Oak	5	1		S5			X						
Grossulariaceae	**Currant Family**													
Ribes americanum	Wild Black Currant	4	-3		S5			X				x		x
Juglandaceae	**Walnut Family**													
Juglans nigra	Black Walnut	5	3		S4?			X						x
Lamiaceae	**Mint Family**													
Leonurus cardiaca ssp. cardiaca	Common Motherwort		5	-2	SNA			X						x
Nepeta cataria	Catnip		3	-2	SNA			X						x
Scutellaria galericulata var. pubescens	Marsh Skullcap	6	-5		S5			X		x				
Malvaceae	**Mallow Family**													
Tilia americana	Basswood	4	3		S5			X				x		x
Oleaceae	**Olive Family**													
Fraxinus americana	White Ash	4	3		S4			X				x		
Syringa vulgaris	Common Lilac		5	-2	SNA			X				x		x
Onagraceae	**Evening-Primrose Family**													
Circaea canadensis ssp. canadensis	Canada Enchanter's Nightshade	3	3		S5			X	x					
Plantaginaceae	**Plantain Family**													
Plantago lanceolata	English Plantain		3	-1	SNA			X			x	x		
Plantago major	Common Plantain		3	-1	SNA			X			x	x		
Veronica arvensis	Corn Speedwell		5	-1	SNA			X						x
Polygonaceae	**Buckwheat Family**													
Rumex crispus	Curled Dock		0	-2	SNA			X	x					
Primulaceae	**Primrose Family**													
Lysimachia thyrsiflora	Tufted Yellow Loosestrife	7	-5		S5			X		x				
Ranunculaceae	**Buttercup Family**													
Ranunculus abortivus	Kidney-Leaved Buttercup	2	-2		S5			X	x					
Rhamnaceae	**Buckthorn Family**													
Frangula alnus	Glossy Buckthorn		0	-3	SNA			X						
Rhamnus cathartica	European Buckthorn		0	-3	SNA			X	x		x	x		x
Rosaceae	**Rose Family**													
Fragaria virginiana	Wild Strawberry	2	1		S5			X	x			x		
Geum laciniatum	Rough Avens	4	-3		S4			X	x			x		
Geum urbanum	Wood Avens		5	-1	SNA							x		
Malus pumila	Common Apple		5	-1	SNA			X				x		x
Prunus virginiana var. virginiana	Chokecherry	2	1		S5			X				x		
Pyrus communis	Common Pear		5	-1	SNA							x		
Rubus idaeus ssp. strigosus	North American Red Raspberry	0	-2		S5			X	x					x
Galium mollugo	Smooth Bedstraw		5	-2	SNA			X			x	x		
Potentilla argentea	Silvery Cinquefoil		3	-2	SNA			X						x
Potentilla recta	Sulphur Cinquefoil		5	-2	SNA			X						x
Prunus mahaleb	Mahaleb Cherry		5	-1	SNA									x
Salicaceae	**Willow Family**													
Populus balsamifera	Balsam Poplar	4	-3		S5			X			x	x		
Populus tremuloides	Trembling Aspen	2	0		S5			X	x			x		x
Salix nigra	Black Willow	6	-5		S4				x					
Sapindaceae	**Maple Family**													
Acer negundo	Manitoba Maple	0	-2		S5			X	x					x
Acer platanoides	Norway Maple		5	-3	SNA			X	x					x
Acer saccharinum	Silver Maple	5	-3		S5			X	x					
Acer saccharum	Sugar Maple	4	3		S5			X	x		x	x		
Scrophulariaceae	**Figwort Family**													
Verbascum thapsus ssp. thapsus	Common Mullein		5	-2	SNA			X			x			x

Appendix I
Vascular Plant List
Scoped Environmental Impact Study
Estill Innovation Community - 12618927

Scientific Name	Common Name	Coefficient of Conservatism (CC)	Wetness Index	Weediness Index	Provincial Status (S-Rank)	ESA Status	SARA Status	Local Status Wellington Dufferin Riley 1989	Ecological Land Classification					
									SWD4-1	SAS	CUM1-1	CUT1	OAG	Hedge
Solanaceae	**Nightshade Family**													
Solanum dulcamara	Bittersweet Nightshade		0	-2	SNA			X						x
Typhaceae	**Cattail Family**													
Typha angustifolia	Narrow-Leaved Cattail	3	-5		SNA			X		x				
Ulmaceae	**Elm Family**													
Ulmus americana	White Elm	3	-2		S5			X				x		x
Urticaceae	**Nettle Family**													
Urtica dioica ssp. dioica	European Stinging Nettle		0	-1	SNA				x			x		
Vitaceae	**Grape Family**													
Parthenocissus vitacea	Thicket Creeper	4	3		S5			X	x			x		
Vitis riparia	Riverbank Grape	0	-2		S5			X	x		x	x		x
Alismataceae	**Water-Plantain Family**													
Alisma triviale	Northern Water-Plantain	1	-5		S5					x				
Araceae	**Arum Family**													
Arisaema triphyllum	Jack-In-The-Pulpit	5	-2		S5			X	x					
Lemna minor	Small Duckweed	2	-5		S5			X		x				
Asparagaceae	**Asparagus Family**													
Asparagus officinalis	Garden Asparagus		3	-1	SNA			X						x
Polygonatum multiflorum	Eurasian Solomon's Seal				SNA							x		
Cyperaceae	**Sedge Family**													
Schoenoplectus tabernaemontani	Soft-Stemmed Bulrush	5	-5		S5			X		x				
Liliaceae	**Lily Family**													
Erythronium americanum ssp. americanum	Yellow Trout Lily	5	5		S5			X				x		
Poaceae	**Grass Family**													
Bromus inermis	Smooth Brome		5	-3	SNA			X			x	x		x
Calamagrostis canadensis var. canadensis	Bluejoint Reedgrass	4	-5		S5			X				x		x
Dactylis glomerata	Orchard Grass		3	-1	SNA			X						x
Glyceria striata	Fowl Mannagrass	3	-5		S5			X		x				
Lolium arundinaceum	Tall Fescue		3	-1	SNA			X			x	x		x
Miscanthus sacchariflorus	Amur Silvergrass		5	-1	SNA							x		
Phalaris arundinacea var. arundinacea	Reed Canary Grass	0	-3		S5			X			x	x		x
Phleum pratense ssp. pratense	Common Timothy		3	-1	SNA			X			x			
Phragmites australis ssp. australis	European Reed		-3		SNA					x				
Poa pratensis ssp. pratensis	Kentucky Bluegrass		3		SNA			X			x	x		x
Triticum aestivum	Common Wheat		5	-1	SNA								x	

Notes

Co-efficient of Conservatism, Wetness & Weediness

Oldham, M.J., W.D. Bakowsky and D.A. Sutherland. 1995. Floristic quality assessment for southern Ontario. OMNR, Natural Heritage Information Centre, Peterborough. 68 pp.

Co-efficient of Conservatism: This value, ranging from 0 (low) to 10 (high), is based on a species tolerance of disturbance and fidelity to a specific habitat integrity.

Weediness Index: This value, ranging from -1 (low) to -3 (high) quantifies the potential invasiveness of non-native plants. In combination with the percentage of non-native plants, it can be used as an indicator of disturbance.

Wetness Index: This value, ranging from -5 (obligate wetland) to 5 (upland) provides the probability of a species occurring in wetland or upland habitats.
FACW (Facultative Wetland): usually occurs in wetlands, but occasionally found in non-wetlands (estimated 67-99% probability)
FAC (Facultative): equally likely to occur in wetlands or non-wetlands (estimated 34-66% probability)
FACU (Facultative Upland): occasionally occurs in wetlands, but usually occurs in non-wetlands (estimated 1-33% probability)
UPL (Upland): occurs almost never in wetlands under natural conditions (estimated <1% probability)

Further refinement of the Facultative categories are denoted by a "+" or "-" to express exaggerated tendencies for those species. The "+" denotes a greater estimated probability occurring in wetlands than species in the general indicator category, but a lesser probability than species occurring in the next higher category. The "-" denotes a lesser estimated probability of occurring in wetlands than species in the general indicator category, but a greater probability than species occurring in the next lower general category.

Each wetland category has been assigned a numerical value to facilitate the quantification of the wetness index. The wetland categories and their corresponding values are as follows:
OBL : -5
FACW+: -4
FACW: -3
FACW-: -2
FAC+: -1
FAC: 0
FAC-: 1
FACU+: 2
FACU: 3
FACU-: 4

Appendix I
Vascular Plant List
Scoped Environmental Impact Study
Estill Innovation Community - 12618927

Scientific Name	Common Name	Coefficient of Conservatism (CC)	Wetness Index	Weediness Index	Provincial Status (S-Rank)	ESA Status	SARA Status	Local Status Wellington Dufferin Riley 1989	Ecological Land Classification					
									SWD4-1	SAS	CUM1-1	CUT1	OAG	Hedge
UPL: 5														
Provincial Status S Rank *Natural Heritage Information Centre (NHIC). (2020) Provincial status of plants, wildlife and vegetation communities database. http://www.mnr.gov.on.ca/MNR/nhic/nhic.html. OMNR, Peterborough.* *Provincial ranks are used by the NHIC to set protection priorities for rare species and natural communities. Provincial ranks are used by the NHIC to set protection priorities for rare species and natural communities. These rankings are based on the total number of extant Ontario populations and the degree to which they are potentially or actively threatened with destruction. These ranks are not legal designations. S4 and S5 species are generally uncommon to common in the province. Species ranked S1-S3 are considered to be rare in Ontario.* ***S2: Imperiled -*** *Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.* ***S4: Apparently Secure*** **-** Uncommon but not rare; some cause for long-term concern due to declines or other factors. **S5: Secure** - Common, widespread, and abundant in the nation or state/province. **SH: Possibly Extirpated (Historical)—**Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences. **SNA: Unranked** — Status not assigned. **"?"** following a rank indicates uncertainty about the assigned rank. **Q: Questionable taxonomy** —Taxonomic distinctiveness of this entity is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation status.														
Local Status Ranks X: native species present (collection-based) and all exotic species														
ESA Status Endangered Species Act (ESA), 2007. Extirpated - EXP, Endangered - END, Threatened - THR, Special Concern - SC														
SARA Status Species at Risk Act (SARA), 2002. Extirpated - EXP, Endangered - END, Threatened - THR, Special Concern - SC														

Appendix J

Arborist Report

Arborist Report

Estill Innovation Community, Township of Puslinch, ON

Puslinch Development GP Inc.

07 February 2025

→ The Power of Commitment



Project name		Estill Innovation Community					
Document title		Arborist Report | Estill Innovation Community, Township of Puslinch, ON					
Project number		12618927					
File name		12618927-RPT2-Arborist Report					
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**		
			Name	**Signature**	**Name**	**Signature**	**Date**
S3	A	Mariann Lobbezoo	J-P Fleras	On File	Peter Zytner	On File	7/02/25
S4	0	Mariann Lobbezoo	Graham Mulvihill Nicole Charlton	[redacted]	Peter Zytner	[redacted]	7/02/25

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1. Introduction

GHD Limited (GHD) was retained by Puslinch Development GP Inc. to prepare an Environmental Impact Study (EIS) for the proposed development located at 4631 Side Road 20 North, Township of Puslinch, Ontario (herein refereed to as 'Site'). This Arborist Report (i.e., Tree Inventory and Tree Protection Plan) has been prepared as a component of the EIS submission in support of tree removal and planning approvals for the proposed development. The Arborist Report is based on the Site Plan dated February 7, 2025.

This Arborist Report is in preliminary stages and is expected to be augmented and re-assessed as the design progresses and additional information and designs are finalized throughout the approvals process.

1.1 Purpose of this report

The purpose of this arborist report is to document the tree inventory methodology, results, and anticipated developmental impacts. This report describes site recommendations including tree removals, a tree preservation plan, and construction monitoring in compliance with by-laws and policies applicable to the Site.

1.2 Scope and limitations

This report: has been prepared by GHD for Puslinch Development GP Inc. and may only be used and relied on by Puslinch Development GP Inc. for the purpose agreed between GHD and Puslinch Development GP Inc. as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Puslinch Development GP Inc. arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.3 Background

1.3.1 Site Setting

The Site is located between Sideroad 20 North and Highway 6/Hanlon Parkway at 4631 Side Road 20 North in the Township of Puslinch (herein referenced to as 'Township') and within the County of Wellington (herein referenced to as 'County'). The Site is approximately 25.47 hectares (ha; 62.94 acres) in size and is composed of an agricultural landscape surrounded by a low density, rural residential area. Existing Site use was a former single-detached residential dwelling with associated agricultural fields and buildings. The Site is mainly composed

of forested areas, agricultural fields, treed fencerows, and several dilapidated structures. A wetland that is part of a provincially significant wetland (PSW): Cranberry Oil Well Bog Wetland Complex is located on the southern end of the Site. A wooded area is also present in the northern corner of the Site in addition to two treed thickets along Sideroad 20 N.

1.4 Proposed Development

The proposed development will consist of an 'Agriculture Hub' including commercial buildings, loading areas, parking areas, walking trails, a storm management pond, and landscaped areas. The proposed limit of development is presented as **Appendix A – Proposed Site Plan**. Based on the proposed Site Plan, permanent development will not extend beyond the 30-meter (m) wetland setback or within the wooded area in the north corner.

Trees are established on Site and will require removal to accommodate the development footprint.

2. Policy Framework

Policy frameworks including legislation, policies, and regulations pertinent to natural heritage features and functions applicable to the Site are provided in the EIS (GHD, 2025). Policy framework specifically pertaining to the arborist scope is described below in **Section 2.1**.

2.1 County of Wellington By-Law 5115-09

The County of Wellington Conservation and Sustainable Use of Woodlands By-Law 5115-09 (2009) (herein referred to as 'By-law') goal is to uphold natural environments within the County by preserving woodlands and maintaining good forestry practices. The By-law defines woodlands as "*land, one hectare (2.47 acres) or more in area measured to the drip line, and includes any unforested corridors within the area that are equal to or less than 30 metres (98.4 feet) in width, with at least:*

> *(i) 1,000 trees of any size, per hectare (405 trees, of any size, per acre);*
>
> *(ii) 750 trees, measuring over 5 centimetres in diameter, per hectare (304 trees, measuring over 2 inches in diameter, per acre);*
>
> *(iii) 500 trees, measuring over 12 centimetres in diameter, per hectare (202 trees, measuring over 4.7 inches in diameter, per acre); or*
>
> *(iv) 250 trees, measuring over 20 centimetres in diameter, per hectare (101 trees, measuring over 7.9 inches in diameter, per acre)*

but does not include a cultivated fruit orchard, nut orchard or a plantation established for the purpose of producing Christmas trees".

Unforested corridors are defined as "*a break in the forest cover or forest canopy, which includes but is not limited to, highways and roads, railway rights-of-way, drains, lanes, paths, golf course fairways, utility lines or natural open spaces*".

A wooded area approximately 1 ha in size is present in the north portion of the Site. This area was not inventoried or included in the report's scope but would likely meet the woodland density requirements of 1,000 trees of any size. This area is connected through an unforested corridor that is less than 30 m wide (Side Road 20 North) to an off-site wooded area that is assumed to be defined as a 'woodland' under the By-law based on its size and density. There are additional on-site wooded areas approximately 0.5 and 0.15 ha along Side Road 20 North that

are also connected through a unforested corridor to the central, off-site woodland. As such, all three on-site wooded areas discussed above are considered part of a woodland.

Despite meeting the size criteria to be defined as a woodland, tree removals within these woodlands may be exempt from this by-law if:

(d) the injuring or destruction of trees imposed after December 31, 2002 as a condition to the approval of a site plan, a plan of subdivision or a consent under Section 41, 51 or 53, respectively, of the Planning Act or as a requirement of a site plan agreement or subdivison agreement entered into under those sections;

(e) the injuring or destruction of trees imposed after December 31, 2002 as a condition to a development permit authorized by regulation made under Section 70.2 of the Planning Act or as a requirement of an agreement entered into under the regulation;

Without appropriate cause for exemption, tree removals within these woodlands are subject to permits under the By-law including:

a) Good Forestry Practices Permits;

(b) Circumference Permits; and

(c) Clearing Permits.

Based on the proposed works and tree clearing that will be required on Site, a Clearing Permit will be required. Applicable permits must be submitted to the County's Planning and Development Department and issued prior to tree removals taking place.

3. Site Visit and Tree Inventory

A Site visit and tree inventory/survey was completed on May 3 and November 20, 2024, and January 10, 2025, by a GHD International Society of Arboriculture (ISA) Certified Arborist alongside an experienced ecologist. The purpose of the Site visit and tree inventory was to document the location, condition, and quantity of Site trees such that tree preservation and tree removal could be determined.

The tree inventory included Site trees with a diameter at breast height (DBH) greater than 10 centimetres (cm) located within or adjacent to the anticipated limit of development (i.e., trees with the potential to be impacted). Trees within a wooded area in the northern portion of the Site and trees within the on-Site PSW were not inventoried since they will not be impacted by the development. Off-Site trees located on private and MTO property were not inventoried unless they were anticipated to be impacted by proposed development. Inventoried trees were tagged with a metal ID tag for clear field identification and tree locations were recorded.

Tree inventory data that was collected during the Site visits included tree species, DBH, estimated height and dripline radius. Each tree was assessed, assigned a condition rating (based on trunk integrity, canopy vitality, and canopy structure), and assigned an overall health rating (i.e., healthy, fair, poor, decline, or dead) based on the condition ratings and overall appearance of the tree. The DBH of inventoried trees was typically measured at 1.37 m above grade, apart from trees with branch unions, large lateral branches, or deformities that would result in an unrepresentative DBH measurement.

The assessment of trunk integrity included observations of trunk lean, cracks/splits/seams, presence of cavities or decay, presence of multiple stems, the presence of mechanical damage to the trunk or roots, and the presence of girdling roots. The assessment of canopy vitality included observation of the vigour and health of the canopy. Crown health and budding features were used as the primary indicator of crown vigour for deciduous trees. Bud density, wound callousing, twig elongation, twig dieback, epicormic growth, and the presence of pests and pathogens were also used as indicators of canopy vitality. Crown structure observations included the overall

structural quality of the crown. Observations included the presence of codominant leaders, multiple branch connection points, epicormic growth, deadwood, and broken branches.

Trees were also surveyed for cavities, loose bark, and knotholes that could provide potentially suitable bat maternity roosting habitat. Cavity trees and species at risk (SAR) habitat implications are discussed in the EIS (GHD 2025).

In total, 292 trees were inventoried on Site. The tree inventory is presented in **Appendix B – Tree Inventory and Tree Removal and Protection Plan Figures** and summarized in **Appendix C – Tree Inventory Table**. Numerous trees of varying species, size, and condition are established across the Site. Most of the trees were distributed along fencerows throughout the Site in addition to several thickets along the road.

4. Tree Ownership

Most Site trees are considered privately-owned and are established on the subject Site. Township and MTO-owned trees are located along the Site boundaries. Township and MTO trees with the potential to be impacted were inventoried. Tree ownership is summarized in **Appendix C – Tree Inventory Table**.

5. Species At Risk

No tree species at risk were identified on Site during the tree inventory.

6. Recommendations

The following recommendations are provided to guide tree removals, tree relocation/transplanting, tree pruning, tree preservation and protection, root-sensitive excavation and root pruning, monitoring, and tree compensation.

6.1 Tree Retention

Based on the proposed limit of development (dated February 2025), it is anticipated that trees within the northern woodland and trees within the on-site PSW will be retained since there is no anticipated development within the woodland or within 30 m of the PSW. Trees along the northern woodland boundary were inventoried and include six, inventoried trees to be retained. Retained trees are summarized per **Table 1** below.

Table 1 Proposed Tree Retention Summary

Common Name	Scientific Name	Invasive	Quantity
Common Pear	*Pyrus communis*	No	2
Sugar Maple	*Acer saccharum*	No	1
White Oak	*Quercus alba*	No	1
Manitoba Maple	*Acer negundo*	No	1
Glossy Buckthorn	*Frangula alnus*	Yes	1
Total			**6**

Tree protection measures to mitigate construction impacts on trees proposed for retention are further described in **Section 7.3.**

6.2 Tree Injury

It is expected that the proposed development will require excavation or the placement of fill within the root zone of trees established along the proposed limit of disturbance. Accordingly, trees along the Site boundary on Township and MTO property may be injured from development activities (including but not limited to Site access, material storage, grading, and root or canopy pruning) that infringe into a tree's minimum protection distance (MPD) or that cause root injury/loss due to compaction (up to ~30%). The MPD is based on the DBH of a tree and recommended distances are summarized in **Table 2**. The MPD for each tree is displayed in **Appendix B – Tree Inventory and Tree Removal and Protection Plan Figures** and summarized in **Appendix C – Tree Inventory Table**.

Table 2 Recommended Minimum Protection Distances

Trunk Diameter (DBH)	Minimum Protection Distances Required for Trees
<10 cm	1.2 m
10 - 30 cm	1.8 m
31 - 40 cm	2.4 m
41 - 50 cm	3.0 m
51 - 60 cm	3.6 m
61 - 70 cm	4.2 m
71 - 80 cm	4.8 m
81 - 90 cm	5.4 m
91 - 100 cm	6.0 m
>100 cm	6 cm Protection for Each 1 cm Diameter

It is anticipated that 29 trees along the Site boundary on Township and MTO property may be injured but are proposed to be retained as injury is not expected to result in tree decline. Trees proposed for injury are summarized per **Table 3** below**.** While some canopy and root loss are expected, significant impacts to Site trees proposed for injury are not anticipated. The potential developmental impacts on these trees should be reassessed as the design progresses throughout the approvals process.

Table 3 Proposed Tree Injury Summary

Common Name	Scientific Name	Invasive	Quantity
Apple/Crabapple species	*Malus* sp.	No	1
Basswood	*Tilia americana*	No	12
Black Cherry	*Prunus serotina var. serotina*	No	2
Black Locust	*Robinia pseudoacacia*	Yes	1
Cherry Species	*Prunus sp.*	No	1
Common Pear	*Pyrus communis*	No	1
Eastern Hop-hornbeam	*Ostrya virginiana*	No	1
European Buckthorn	*Rhamnus cathartica*	Yes	3

Common Name	Scientific Name	Invasive	Quantity
Honey Locust	*Gleditsia triacanthos*	No	1
Manitoba Maple	*Acer negundo*	No	1
Red Maple	*Acer rubrum*	No	1
Sugar Maple	*Acer saccharum*	No	1
Trembling Aspen	*Populus tremuloides*	No	2
White Ash	*Fraxinus americana*	No	1
Total			**29**

When working near trees established on MTO and municipal property, care must be taken to mitigate root and canopy impacts. Under no circumstances shall excavation extend beyond the property boundary. Any canopy pruning required for trees established on adjacent properties must be approved by the property owner and must be completed by competent Arborists.

It should be noted that the ash tree proposed for injury has been impacted by the emerald ash borer and is in decline.

6.3 Tree Removal

Most Site trees are proposed for removal. Based on the proposed limit of development (dated February 2025) it is expected that the removal of 257 trees will be required. Removals are summarized per **Table 4** below:

Table 4 Proposed Tree Removal Summary

Common Name	Scientific Name	Invasive	Quantity
Apple/Crabapple species	*Malus* sp.	No	15
Balsam Poplar	*Populus balsamifera*	No	26
Basswood	*Tilia americana*	No	68
Black Cherry	*Prunus serotina* var. *serotina*	No	15
Black Locust	*Robinia pseudoacacia*	Yes	4
Black Walnut	*Juglans nigra*	No	1
Buckthorn Species*	*Rhamnus* sp.	Yes	10
Cherry species	*Prunus* sp.	No	2
Chokecherry	*Prunus virginiana* var. *virginiana*	No	1
Common Pear	*Pyrus communis*	No	15
Eastern White Pine	*Pinus strobus*	No	2
Elm species*	*Ulmus* sp.	No	12
European Buckthorn	*Rhamnus cathartica*	Yes	1
Glossy Buckthorn	*Frangula alnus*	Yes	3
Hawthorn species	*Crataegus* sp.	No	7
Honey Locust	*Gleditsia triacanthos*	No	10
Manitoba Maple	*Acer negundo*	No	4
Norway Maple	*Acer platanoides*	Yes	1

Common Name	Scientific Name	Invasive	Quantity
Russian Olive	*Elaeagnus angustifolia*	Yes	3
Siberian Elm	*Ulmus pumila*	Yes	6
Sugar Maple	*Acer saccharum*	No	7
Trembling Aspen	*Populus tremuloides*	No	18
White Elm	*Ulmus americana*	No	22
White Oak	*Quercus alba*	No	1
White Spruce	*Picea glauca*	No	3
Total			**257**
Notes			
*These trees were inventoried during the leaf-off season and snow-covered ground and were not able to be identified to species.			

Trees proposed for removal are presented on **Appendix B – Tree Inventory and Tree Removal and Protection Plan Figures** and summarized in **Appendix C – Tree Inventory Table**. Proposed tree removal size ranges from 8.0 cm DBH to 107.8 cm DBH, with an average of 27.6 cm DBH based on the maximum DBH for each tree.

Tree removal has been proposed within the limit of development only and no tree removal beyond the Site property limits are proposed. Tree removal will be re-assessed as the design progresses throughout the approvals process.

Tree removal must not occur between April 1 and October 31 of any given year unless a qualified biologist can confirm the absence of nests, nesting birds, or bat maternity roosts, not more than 48 hours in advance of proposed tree removals.

6.3.1 Beneficial Re-use of Timber

Several high-quality sawlogs can be salvaged from trees proposed for removal on Site. Species of suitable size and quality include sugar maple, of which six trees with a DBH greater than 40 cm could be salvaged for beneficial re-use. Additionally, species of moderate quality that could be beneficially re-used included basswood, white elm, Siberian elm, and white spruce with seven trees being greater than 40 cm DBH with good quality for reuse. Overall, 13 trees with a DBH greater than 40 cm could be salvaged for beneficial re-use, including firewood or used as structure for natural habitat.

7. Tree Preservation Plan

7.1 Tree Relocation (Transplanting)

Currently, no trees are proposed for transplanting. In general, trees less 10 cm DBH are suitable for transplanting, however, established Site trees are not considered suitable species for landscape plantings due to their size, condition, and species composition. Further, the timing of proposed works is not yet confirmed, and seasonal timing of transplant stock is an important consideration for tree survival.

7.2 Canopy Pruning

The majority of trees within or adjacent the limit of development are proposed for removal. Tree pruning will be required for at least 29 trees located offsite on MTO property along Highway 6 as described in **Table 2**. Tree 93

will require crown pruning since portions of the crown hang over the property limit and extend into the grading limits. Similarly, the other trees marked for injury are near the grading limits and will likely require root and crown pruning. Removal of these trees marked for injury may be required if a significant number of roots and/or structural roots are exposed during root-sensitive excavation and root pruning. Any pruning, or other tree injury, to trees established on adjacent private properties must be approved by the property owners. All canopy pruning must be completed by competent and experienced Arborists in accordance with current industry standards and best management practices (BMPs).

The necessity for canopy pruning excavation will be re-assessed as the design progresses throughout the approvals process.

7.3 Tree Protection Barrier/Fencing

Tree protection barrier/fencing will be installed in areas where the potential for root, root zone, or trunk and canopy damage from construction equipment and/or excavation is present. Tree protection barrier/fencing will be used to define tree protection zones (TPZs) and will be the primary means of protecting Site trees. TPZs will be considered the areas protected by tree protection barrier. Tree protection barrier/fencing will act as a both a physical and visual barrier for Site trees to mitigate accidental mechanical damage to trees being preserved.

Tree Protection fencing should be installed along the northern woodland boundary to minimize impacts on trees from the proposed development. Alternatively, additional permits may be required by the County pending impacts to trees within the woodland. Tree Protection fencing should also be installed along the southeastern corner to minimize impacts on trees that are established on private property adjacent to the Site.

Installation and maintenance of enhanced erosion and sediment controls (ESC) are recommended in the EIS to create a 30 m PSW boundary where no vegetation removals or construction activity is permitted within the marked off area (GHD, 2025). The ESC fencing may also function as tree protection fencing for trees within the PSW.

Tree protection barrier/fencing must be installed in advance of any invasive Site work, such as tree removal, grading, or excavation. Following installation, tree protection barrier/fencing must be inspected by a tree management professional.

7.4 Root-Sensitive Excavation and Root Pruning

Root-sensitive excavation and root pruning is proposed for trees established along the property and development limits where excavation is expected within the crown drip line. The following recommendations must be considered:

- Root-sensitive excavation shall be completed by hand-digging, air spade, or hydrovac by a qualified operator and under the supervision of a competent and experienced Arborist when excavating within/under the canopy/crown drip line
- Hydrovac water pressure shall be limited such that exposed roots are not damaged and root bark is not torn or damaged
- The depth of the root-sensitive excavation shall be 600 mm below existing grade such that most roots are exposed
- Root pruning shall be completed by a competent and experienced Arborist
- As the roots are exposed, the Arborist shall assess and prune roots; accordingly, all roots shall be cut with a clean and sharp handsaw or loppers at the face of the excavation or beyond any identified sinker roots that could potentially be preserved
- If the excavation is completed in the summer, or during dry or hot weather, roots shall be kept moist with topsoil, sand, or moist burlap.

If significant structural roots must be removed and the subject tree becomes destabilized, excavation and root pruning shall halt, and the situation shall be reassessed. The necessity for root-sensitive and root pruning excavation will be re-assessed as the design progresses.

7.5 Construction and Post-Construction Monitoring/Inspections

It is recommended that a tree management professional (i.e., an ISA Certified Arborist) is present on-site to confirm that all tree protection measures/barrier/fencing have been installed per the approved Arborist Report (i.e., the Tree Inventory and Tree Protection Plan) prior to commencing rough grading.

Tree protection barrier/fencing inspections should be completed weekly during the construction phase. Weekly monitoring and monthly reporting are recommended during development activities to document the condition of tree protection barrier/fence, and/or to document any tree damage and/or signs of distress. Should changes in tree condition be observed, tree removal may be warranted to mitigate the risk of tree failure.

8. Compensation

In total, 257 trees (including ten dead trees) are proposed for removal and 29 trees are proposed for injury to facilitate the development. Consultation with the County and Township is in process to determine tree compensation quantities and specifications such as species, size, and stock type. The Township and County have been contacted and correspondence is documented in **Appendix D – Agency Correspondence**. A compensation planting plan that describes tree compensation quantities will be finalized throughout the approvals process.

Suitable compensation planting areas may exist within proposed landscaped areas on Site where compensation trees and shrubs could be placed around walking paths and buildings. Interspersing compensation trees with existing trees could also provide increased canopy density and species diversity. Compensation planting areas should be evaluated upon finalization of the Site Landscaping Plan.

All compensation planting material should be native and sourced from a local nursery supplier.

9. Closing

GHD trusts that this Arborist Report provides the required information to fulfill the requirements of the Township of Puslinch and County of Wellington. This report will be revised as the design progresses throughout the approvals process and as additional information becomes available. Please do not hesitate to contact the author or reviewers with questions or concerns.

Appendices

Appendix A

Proposed Site Plan



Paper Size ANSI A

0 40 80 120 160

Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

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GHD

PUSLINCH DEVELOPMENT LIMITED PARTNERSHIP
4631 SIDEROAD 20 NORTH, PUSLINCH, ON
ARBORIST REPORT
ESTILL INNOVATION COMMUNITY

PROPOSED SITE PLAN

Project No. **12618927**
Revision No.
Date **Jan 17, 2025**

Appendix A

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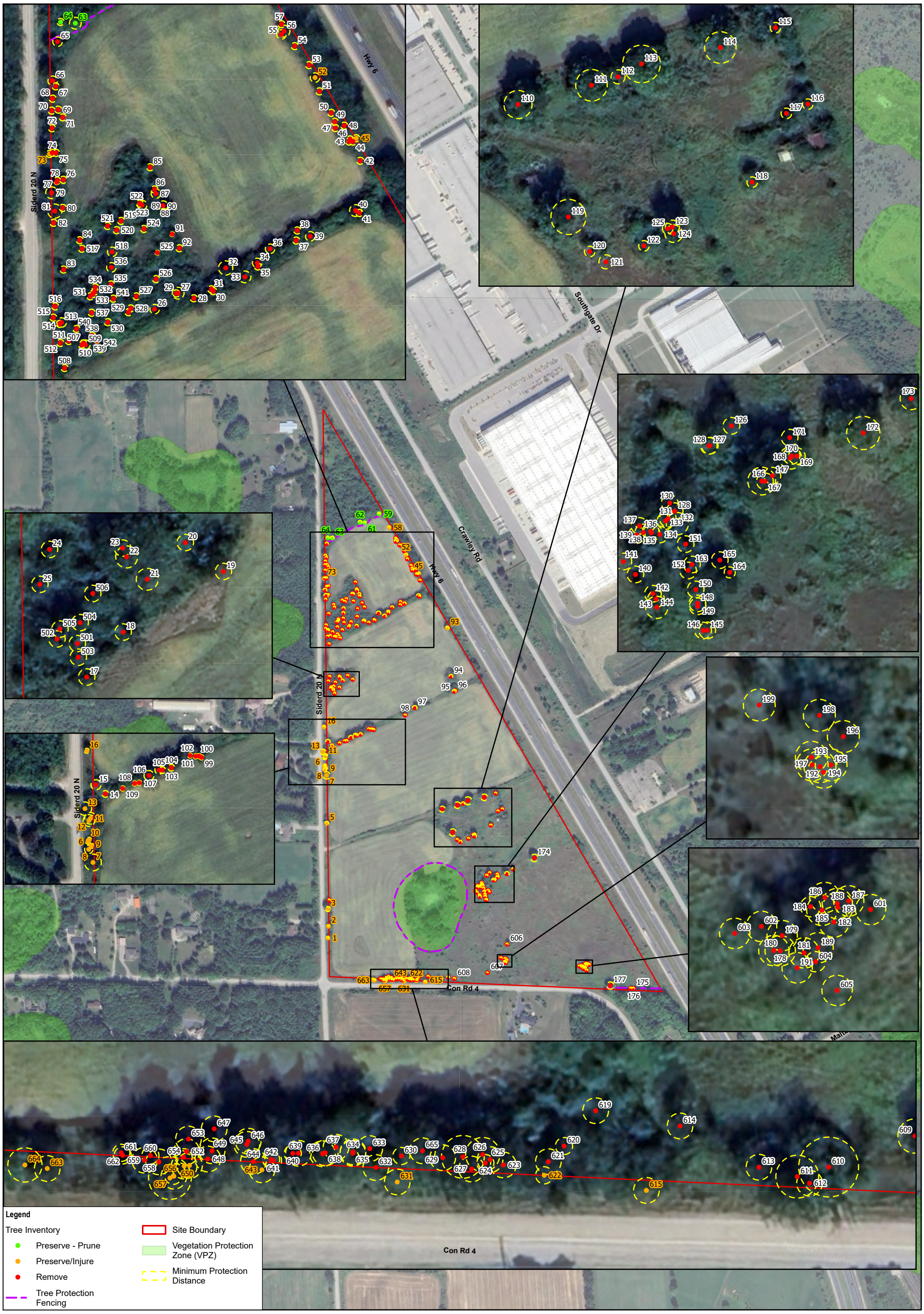
Data source: GRCA Open Data Catalog. MNRF NRVIS, 2018.2025
Image: ©2025 Google, Imagery Date 8/17/2022

Appendix B

Tree Inventory and Tree Removal and Protection Plan Figures



Paper Size ANSI B

0 40 80 120 160

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

N

GHD

PUSLINCH DEVELOPMENT LIMITED PARTNERSHIP
4631 SIDEROAD 20 NORTH, PUSLINCH, ON
ARBORIST REPORT
ESTILL INNOVATION COMMUNITY

TREE INVENTORY AND REMOVAL

Project No. **12618927**
Revision No. **-**
Date **Jan 28, 2025**

Appendix B

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Print date: 28 Jan 2025 - 16:28

Data source: Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: tblignaut

Appendix C

Tree Inventory Table

Appendix C
Tree Inventory
Arborist Report
Estill Innovation Community - 12618927

Tree ID	Inventory Type	Common Name	Scientific Name	Ownership	Estimated Height (m)	Measured Trunk Diameters	Maximum DBH	dbh_aggr	DBH Approximated	Height of DBH (m)	Dripline Radius (m)	MPD	Trunk Integrity	Canopy Structure	Canopy Vigour	Overall Health	Bat Flag	Proposed Action	Rationale	Compensatio	Notes	x	y
				Township of Puslinch offsite																	Rubbing/crossing		
1	Single Tree	European Buckthorn	*Rhamnus cathartica*		6	13.2, 19.5, 20	20	24	Yes	1.37	4	1.8	Fair	Fair	Fair	Fair	0	INJURE	Near Grading Limits	TBD	Included bark Multi stemmed	-80.19872303	43.47469088
				Township of Puslinch offsite																	Rubbing/crossing Included bark		
2	Single Tree	European Buckthorn	*Rhamnus cathartica*		6	16.5, 10.5, 6	16.5	6	Yes	1.37	5	1.2	Fair	Fair	Fair	Fair	0	INJURE	Near Grading Limits	TBD	Multi stemmed Codominate leader	-80.19873376	43.47426145
				Township of Puslinch offsite																	Rocks under root bullnose		
3	Single Tree	Sugar Maple	*Acer saccharum*		13	68.2	68.2	68.2	No	1.37	6.5	4.2	Fair-Good	Fair	Good	Fair-Healthy	0	INJURE	Near Grading Limits	TBD	Chained crowth of leaders	-80.19886716	43.47435611
4	Single Tree	Black Walnut	*Juglans nigra*	Site/western boundary\	6.5	14.1	14.1	14.1	No	1.37	6.5	1.8	Good	Fair-Good	Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19888913	43.47463872
				Township of Puslinch offsite																	Multistemmed		
5	Single Tree	Apple/Crabapple species	*Malus sp.*		11	47, 46.8	47	46.8	No	1.37	4	3	Poor-Fair	Fair	Fair	Fair-Healthy	0	INJURE	Near Grading Limits	TBD	Cavity at 1m heart wood rot Major Eccromic alone leaders	-80.19932606	43.47523498
6	Single Tree	Black Cherry	*Prunus serotina var. serotina*		8	19.1	19.1	19.1	No	1.37	3	1.8	Fair-Good	Fair	Fair	Fair-Good	Poor-Fair	0	INJURE	Near Grading Limits	TBD	Minimum lean Codominate leader leader	-80.19966958	43.47654417
				Township of Puslinch offsite																	Multistemmed Included bark		
7	Single Tree	Basswood	*Tilia americana*		14	69.5, 67.2	69.5	96.7	No	1.37	6.5	6	Fair-Good	Fair	Good	Fair-Healthy	0	INJURE	Near Grading Limits	TBD	Dead Foraging cavities	-80.19957604	43.47642177
				Township of Puslinch offsite																	Top ice/floor Cavity occupied by bird		
8	Single Tree	Black Cherry	*Prunus serotina var. serotina*		10	41	41	41	No	1.37	2.5	3	Poor-Fair	Poor	Poor-Fair	Poor-Fair	0	INJURE	Near Grading Limits	TBD		-80.19964097	43.47649646
9	Single Tree	European Buckthorn	*Rhamnus cathartica*		7	12.5, 9.4, 10.9	12.5	10.9	No	1.37	2.5	1.8	Fair-Good	Fair-Good	Poor-Fair	Poor-Fair	0	INJURE	Near Grading Limits	TBD		-80.19967953	43.47651094
10	Single Tree	White Ash	*Fraxinus americana*	*Township of Puslinch offsite*	6	14.6	14.6	14.6	No	1.37	3	1.8	Poor	Poor	Poor	Poor (to decline)	0	REMOVE	Near Grading Limits	TBD	Emerald Ash Borer existence in trunk Major lean	-80.19965767	43.47655934
				Township of Puslinch offsite																	Butts along trunk Codominate leader		
11	Single Tree	Basswood	*Tilia americana*		12	64.2	64.2	64.2	No	1.37	5	4.2	Fair	Fair	Fair-Good	Fair	0	INJURE	Near Grading Limits	TBD	Lean towards agricultural field Major base eating/mice crowns	-80.19969467	43.47669342
12	Single Tree	Basswood	*Tilia americana*	*Township of Puslinch offsite*	12	65.6	65.6	65.6	No	1.37	6	4.2	Fair-Good	Fair-Good	Fair	Fair-Good	0	INJURE	Near Grading Limits	TBD	Major base eating/mice crowns Butts along trunk	-80.19970258	43.47667721
				Township of Puslinch offsite																	Multistemmed Lean towards agricultural field		
13	Single Tree	Basswood	*Tilia americana*		12	414.4,48.5,42.8	48.5	76.8	No	1.37	6.5	4.8	Poor-Fair	Poor-Fair	Fair-Good	Fair	0	INJURE	Near Grading Limits	TBD	Dead Minimum flaking bark	-80.19976389	43.47674484
				Site																	Not suitable for bats		
14	Single Tree	White Elm	*Ulmus americana*		11	31.6	31.6	31.6	No	1.37	2.5	2.4	Poor	Poor	Poor	Dead	1	REMOVE	Overstorey with Grading Limits	TBD	Dead	-80.19982098	43.47688699
15	Single Tree	White Elm	*Ulmus americana*		14	55.7	55.7	55.7	No	1.37	3	3.6	Poor	Poor	Poor	Dead	1	REMOVE	Overstorey with Grading Limits	TBD	Dead Multistemmed	-80.19972178	43.47691151
				Township of Puslinch offsite																	Codominate leader		
16	Single Tree	Red Maple	*Acer rubrum*		9	16.2, 13.3, 9.1	16.2	22.9	No	1.37	2.5	1.8	Poor-Fair	Poor-Fair	Fair-Good	Fair-Healthy	0	INJURE	Near Grading Limits	TBD	Deadwood grape in canopy Downed Adjacent trunk on stem	-80.19987474	43.47710015
				Site																	Codominate leader		
17	Single Tree	White Elm	*Ulmus americana*		11	18.7	18.7	18.7	No	1.37	2.5	1.8	Fair	Fair	Fair-Good	Dead	1	REMOVE	Overstorey with Grading Limits	TBD		-80.19983346	43.47702846
18	Single Tree	White Elm	*Ulmus americana*	Site	12	23.4	23.4	23.4	No	1.37	2.5	1.8	Fair-Good	Fair	Fair-Good	Dead	1	REMOVE	Overstorey with Grading Limits	TBD	Minimum downed woody debris branch Moderate downed woody debris	-80.19978023	43.477122
19	Single Tree	Siberian Elm	*Ulmus pumila*	Site	6	42, 30, 25	42	25	No	1.37	3.5	1.8	Poor-Fair	Fair	Fair	Poor (in decline)	0	REMOVE	Overstorey with Grading Limits	TBD	Rubbing/crossing of Adjacent shrubs Multi-stemmed	-80.19954647	43.47799698
20	Single Tree	Russian Olive	*Elaeagnus angustifolia*	Site	4	11	11	11	No	1.37	3	1.8	Poor-Fair	Poor	Fair	Dead	1	REMOVE	Overstorey with Grading Limits	TBD	Half of trunk on floor	-80.19966770	43.47751150
21	Single Tree	White Elm	*Ulmus americana*	Site	12	37.5	37.5	37.5	No	1.37	3	2.4	Poor-Fair	Poor-Fair	Poor	Dead	1	REMOVE	Overstorey with Grading Limits	TBD	Fungal bodies present Riverbank crave in lower branches	-80.19974088	43.4778446
22	Single Tree	Elm species	*Ulmus sp.*	Site	12	55, 30.5	55	30.5	No	1.37	6.5	2.4	Fair-Good	Fair-Good	Fair	Fair	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19983986	43.47787715
23	Single Tree	Elm species	*Ulmus sp.*	Site	7	12.4	12.4	12.4	No	1.37	2.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Rubbing/crossing with Adjacentdcanet tree	-80.19982404	43.477392
24	Single Tree	Hawthorn species	*Crataegus sp.*	Site	6	15.4, 13.6, 13.5	15.4	20.5	No	1.37	2.5	1.8	Fair	Poor-Fair	Poor-Fair	Poor (in decline)	0	REMOVE	Overstorey with Grading Limits	TBD	Rubbing/crossing within it self	-80.200017	43.47785348
25	Single Tree	Hawthorn species	*Crataegus sp.*	Site	6	16.4, 12, 11.5	16.4	16.6	No	1.37	3	1.8	Fair-Good	Fair	Poor-Fair	Poor	0	REMOVE	Overstorey with Grading Limits	TBD	Rubbing/crossing within it self	-80.20001668	43.4777821
				Site																	Multi-stemmed		
26	Single Tree	Apple/Crabapple species	*Malus sp.*		7	21.8, 20.1	21.8	29.7	No	1.37	2.5	2.4	Fair-Good	Fair	Fair	Poor-Fair	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19974158	43.47688157
				Site																	Multi-stemmed Minimum Epicormic		
27	Single Tree	Apple/Crabapple species	*Malus sp.*		7	34.5, 32, 33	34.5	47.7	No	1.37	4	3	Fair-Good	Fair	Fair	Poor-Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Minimum Epicormic Codominate leader	-80.19962349	43.47677847
28	Single Tree	White Elm	*Ulmus americana*	Site	9	28.5	28.5	28.5	No	1.37	4	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Riverbank crave in canopy	-80.19952059	43.47677383
29	Single Tree	Cherry species	*Prunus sp.*	Site	7	23.9	23.9	23.9	No	1.37	2.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Minimum downed woody debris Dead tree Adjacent in canopy	-80.19963369	43.47677551
30	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	9	38.2, 18	38.2	18	No	1.37	5	1.8	Fair	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Riverbank crave in canopy Minimum downed woody debris	-80.19941747	43.4768176
31	Single Tree	White Elm	*Ulmus americana*	Site	10	28.5	28.5	28.5	No	1.37	4	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Riverbank crave in canopy Codominate leader	-80.1994278	43.47683331
32	Single Tree	White Elm	*Ulmus americana*	Site	12	38, 35	38	51.7	No	1.37	5	3.6	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Riverbank crave in canopy Codominate leader	-80.19973427	43.4768461
33	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	10	31, 33	33	45.3	No	1.37	3.5	3	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Dead Adjacent tree leaning on canopy Riverbank grape in canopy	-80.19924353	43.47682652
34	Single Tree	White Elm	*Ulmus americana*	Site	6	30.5	30.5	30.5	No	1.37	4	2.4	Fair-Good	Poor	Fair-Good	Poor-Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Tree naturally turned over crowns starting	-80.1991912	43.47692232
35	Single Tree	Glossy Buckthorn	*Frangula alnus*	Site	5	14	14	14	No	1.37	2	1.8	Good	Good	Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Included barbed wire Included bark at fork of the tree	-80.19918169	43.47698724
36	Single Tree	Siberian Elm	*Ulmus pumila*	Site	9	30.5	30.5	30.5	No	1.37	4	2.4	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Metal fence abutting trunk	-80.19913467	43.4709795
37	Single Tree	European Buckthorn	*Rhamnus cathartica*	Site	4.5	16, 14, 11	16	17.8	No	1.37	4	1.8	Poor-Fair	Poor-Fair	Poor	Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Rubbing/crossing within it self Cavity along northern trunk	-80.19899063	43.47714586
38	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	9	37, 33, 20	37	20	No	1.37	4	1.8	Poor-Fair	Fair	Fair-Good	Poor-Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Lean trunk	-80.19898875	43.47610416
39	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	7	31	31	31	No	1.37	3	2.4	Fair	Fair	Fair-Good	Fair-Good	0	REMOVE	Overstorey with Grading Limits	TBD	Rocks under bulbous of trunk Riverbank grape in canopy	-80.19891048	43.47618003
40	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	13	41.5	41.5	41.5	No	1.37	5.5	3	Good	Fair-Good	Fair-Good	Poor-Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Codominate leader Riverbank grape in canopy	-80.19876717	43.47624546
41	Single Tree	Norway Maple	*Acer platanoides*	Site	10	14	14	14	No	1.37	3.5	1.8	Fair	Fair-Good	Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Wire imbeded in trunk at base	-80.19854915	43.47615034
42	Single Tree	Black Locust	*Robinia pseudoacacia*	Site	8	22.5	22.5	22.5	No	1.37	3	1.8	Good	Fair-Good	Fair-Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Codominate leader	-80.19879147	43.47675845
43	Single Tree	Black Locust	*Robinia pseudoacacia*	Site	11	18.5	18.5	18.5	No	1.37	3.5	1.8	Fair	Fair	Fair-Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Rubbing/crossing with Adjacent tree Poor structure of upper canopy	-80.19882283	43.47664307
44	Single Tree	Black Locust	*Robinia pseudoacacia*	Site	11	19	19	19	No	1.37	3.5	1.8	Fair	Fair	Fair-Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Rubbing/crossing with Adjacent tree Poor structure of upper canopy	-80.19880038	43.47664723
				Minimumairstry of Transportation-offsite																	Codominate leader Poor structure of upper canopy		
45	Single Tree	Black Locust	*Robinia pseudoacacia*		11	25	25	25	No	1.37	3.5	1.8	Fair	Fair	Fair-Good	Fair	0	INJURE	Near Grading Limits	TBD	Codominate leader Rubbing/crossing with Adjacent tree	-80.19878509	43.47666596
46	Single Tree	Black Locust	*Robinia pseudoacacia*	Site	11	27	27	27	No	1.37	3.5	1.8	Fair	Fair	Fair-Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Poor structure of upper canopy	-80.19882066	43.4766535
47	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	8	18.5	18.5	18.5	No	1.37	3.5	1.8	Fair-Good	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Cavity	-80.19892753	43.47668994
48	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	8	15.5	15.5	15.5	No	1.37	3	1.8	Fair	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	unbalanced canopy	-80.19887741	43.47670759
49	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	8	17	17	17	No	1.37	3	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19894051	43.47671414
50	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	8	23.4	23.4	23.4	No	1.37	3.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	unbalanced canopy	-80.19897659	43.47674948
51	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	8	19.2	19.2	19.2	No	1.37	3	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	unbalanced canopy Offsite	-80.19908183	43.47683091
52	Single Tree	Honey Locust	*Gleditsia triacanthos*	*Minimumairstry of Transportation - offsite*	11	30	30	30	Yes	1.37	4	2.4	Fair-Good	Fair	Fair-Good	Fair-Healthy	0	INJURE	Near Grading Limits	TBD	Pushed over and fell on fence	-80.19915907	43.47688676
53	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	9	12.2	12.2	12.2	No	1.37	1.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19918521	43.47693498
54	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	9	15.8	15.8	15.8	No	1.37	3.5	1.8	Fair-Good	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Unbalanced canopy	-80.19930169	43.47683257
				Site																	Unbalanced canopy Codominate leader		
55	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	9	24, 21.6	24	32.3	No	1.37	3.5	2.4	Fair	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Bubbleuse/crane in canopy	-80.19940108	43.48003994
56	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	11	40.5	40.5	40.5	No	1.37	4	3	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Codominate leader	-80.19939054	43.48005887
57	Single Tree	Honey Locust	*Gleditsia triacanthos*	Site	8	16.6	16.6	16.6	No	1.37	2.5	1.8	Fair	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed	-80.19941745	43.48008431
58	Single Tree	Common Pear	*Pyrus communis*	*Minimumairstry of Transportation - offsite-(between two fences)*	6	23.5	23.5	23.5	No	1.37	3.5	1.8	Fair	Fair	Fair-Good	Fair-Healthy	0	INJURE	Near Grading Limits	TBD	Rubbing/crossing with Adjacent tree Between two fences	-80.19963002	43.4802167
59	Single Tree	Sugar Maple	*Acer saccharum*	Site	7	15	15	15	No	1.37	3.5	1.8	Poor-Fair	Poor-Fair	Fair	Fair-Healthy	0	PRESERVE	Within Woodlot on North End	TBD	Major lean Bend of fallen limb	-80.19988196	43.48015488
60	Single Tree	White Oak	*Quercus alba*	Site	7	12.8	12.8	12.8	No	1.37	1.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	PRESERVE	Within Woodlot on North End	TBD		-80.19987139	43.48037764
61	Single Tree	Common Pear	*Pyrus communis*	Site	7	16.5	16.5	16.5	No	1.37	3	1.8	Fair	Fair-Good	Good	Fair-Healthy	0	PRESERVE	Within Woodlot on North End	TBD		-80.20010871	43.48019538
62	Single Tree	Common Pear	*Pyrus communis*	Site	8	38.5, 24.5	38.5	45.6	No	1.37	4.5	3	Fair-Good	Fair-Good	Good	Fair-Healthy	0	PRESERVE	Within Woodlot on North End	TBD		-80.20020295	43.48018525
63	Single Tree	Manitoba Maple	*Acer negundo*	Site	8	29 32	32	43.2	No	1.37	6.5	3	Poor-Fair	Poor-Fair	Good	Fair-Healthy	0	PRESERVE	Within Woodlot on North End	TBD	Tree on forest floor	-80.20068961	43.47985414
64	Single Tree	Glossy Buckthorn	*Frangula alnus*	Site	6	20, 17, 14	20	24.4	No	1.37	3	1.8	Fair	Fair	Fair	Fair	0	PRESERVE	Within Woodlot on North End	TBD		-80.20076091	43.47984281
65	Single Tree	White Oak	*Quercus alba*	Site	10	29.5	29.5	29.5	No	1.37	3	2.4	Fair	Poor-Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Trunk elbows at 4 m Codominate after	-80.19978457	43.47670191
66	Single Tree	Basswood	*Tilia americana*	Site	10	27.4, 24.1, 22	27.4	35.1	No	1.37	5	2.4	Fair	Poor-Fair	Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed	-80.20027483	43.47624091
67	Single Tree	Basswood	*Tilia americana*	Site	10	25.7, 21.1, 11.4	25.7	28.1	No	1.37	3	1.8	Fair-Good	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed Rubbing/crossins from Adiacent tree	-80.20059012	43.47652258
68	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	10	21.5	21.5	21.5	No	1.37	3	1.8	Good	Fair-Good	Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Bent upper canopy	-80.20068883	43.47649485
69	Single Tree	Basswood	*Tilia americana*	Site	9	15.5, 10.5	15.5	10.5	No	1.37	4	1.8	Good	Fair-Good	Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.20063762	43.4794538
70	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	8	16.5	16.5	16.5	No	1.37	4	1.8	Fair-Good	Fair-Good	Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.2056756	43.47940497
71	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	8	13.6	13.6	13.6	No	1.37	4	1.8	Fair	Fair-Good	Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Minimum lean	-80.20058851	43.47942391
72	Single Tree	Basswood	*Tilia americana*	Site	7	18.5, 13.4, 10.6	18.5	17.1	No	1.37	4	1.8	Fair	Poor-Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed	-80.20064667	43.47936345
73	Single Tree	Basswood	*Tilia americana*	*Township of Puslinch offsite*	7	27.5, 15	27.5	15	No	1.37	4.5	1.8	Fair	Poor-Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed	-80.20062184	43.47934701
74	Single Tree	Basswood	*Tilia americana*	Site	12	23.4, 16.7	23.4	16.7	No	1.37	3.5	1.8	Fair	Poor-Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed	-80.20060695	43.47925519
75	Single Tree	Basswood	*Tilia americana*	Site	11	22, 15.5	22	15.5	No	1.37	3	1.8	Fair	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed	-80.20058345	43.47925932
76	Single Tree	Siberian Elm	*Ulmus pumila*	Site	5	14, 13	14	13	No	1.37	3	1.8	Fair	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed	-80.20064785	43.47914873
77	Single Tree	Basswood	*Tilia americana*	Site	5	10.3	10.3	10.3	No	1.37	1.5	1.2	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.20053362	43.47913056
78	Single Tree	Basswood	*Tilia americana*	Site	5	12.4	12.4	12.4	No	1.37	1.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.20053355	43.47913782
79	Single Tree	Basswood	*Tilia americana*	Site	13	51, 50	51	50	No	1.37	6.5	3	Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed Multiple Epicormic	-80.20054839	43.47907816
80	Single Tree	Basswood	*Tilia americana*	Site	7.5	29.5, 15	29.5	15	No	1.37	4	1.8	Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multiple Epicormic	-80.19947777	43.47907497
81	Single Tree	Basswood	*Tilia americana*	Site	13	58.5	58.5	58.5	No	1.37	5.5	3.6	Good	Fair-Good	Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.20059032	43.47900072
82	Single Tree	Basswood	*Tilia americana*	Site	13	29.5, 22, 22	29.5	22	No	1.37	4.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed	-80.20048619	43.47894748
83	Single Tree	Common Pear	*Pyrus communis*	Site	7	15	15	15	No	1.37	2.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.20035547	43.47875249
84	Single Tree	Glossy Buckthorn	*Frangula alnus*	Site	6	10.7	10.7	10.7	No	1.37	2.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.20033037	43.47869058
85	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	8	26, 17.5	26	17.5	No	1.37	3.5	1.8	Poor-Fair	Poor-Fair	Poor-Fair	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed	-80.19999013	43.47930302
86	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	6	24, 15	24	15	No	1.37	3.5	1.8	Fair	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19992004	43.47930992
87	Single Tree	Common Pear	*Pyrus communis*	Site	7	37	37	37	No	1.37	3.5	2.4	Fair	Poor-Fair	Poor-Fair	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.199914	43.47919319
88	Single Tree	Common Pear	*Pyrus communis*	Site	7	23, 20	23	30.5	No	1.37	4	2.4	Fair-Good	Fair-Good	Fair-Good	Poor-Fair	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19983145	43.47914628
89	Single Tree	Common Pear	*Pyrus communis*	Site	8	25, 15	25	15	Yes	1.37	3	1.8	Fair-Good	Fair-Good	Fair-Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19983966	43.47912036
90	Single Tree	Common Pear	*Pyrus communis*	Site	7	20, 19, 19	20	19	No	1.37	3	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19983247	43.47911971
91	Single Tree	Common Pear	*Pyrus communis*	Site	7	23, 7.5	23	7.5	No	1.37	3.5	1.2	Fair-Good	Fair-Good	Fair-Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19975189	43.47932315
92	Single Tree	Common Pear	*Pyrus communis*	Site	6.5	14.5, 13.5	14.5	13.5	No	1.37	3.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19968579	43.47897842
			Acer negundo																		Multi-stemmed Offsite		
93	Single Tree	Manitoba Maple		*Minimumairstry of Transportation - offsite*	9.5	45, 30	45	30	No	1.37	6	2.4	Fair-Good	Fair	Fair-Good	Fair	0	REMOVE	Near Grading Limits	TBD	Leaning over site Moderate lean	-80.19794004	43.47868808
94	Single Tree	Manitoba Maple	*Acer negundo*	Site	11	45, 45, 45	45	45	No	1.37	8	3	Poor	Poor	Fair-Good	Poor	0	REMOVE	Overstorey with Grading Limits	TBD	Critical fail on all stems Stems on floor	-80.19787154	43.47870545
95	Single Tree	Manitoba Maple	*Acer negundo*	Site	9.5	46	46	46	No	1.37	6	3	Poor-Fair	Poor-Fair	Fair-Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD		-80.19784655	43.4781611
96	Single Tree	Manitoba Maple	*Acer negundo*	Site	9.5	10.5, 13	13	13	No	1.37	3.5	1.8	Poor-Fair	Poor-Fair	Fair-Good	Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Multi-stemmed Codominate leader	-80.19746555	43.47811455
97	Single Tree	Siberian Elm	*Ulmus pumila*	Site	9.5	53, 22	53	57.4	No	1.37	5	3.6	Fair-Good	Poor-Fair	Fair	Fair	0	REMOVE	Overstorey with Grading Limits	TBD	Codominate leader	-80.1981782	43.47772064
98	Single Tree

Appendix C
Tree Inventory
Arborist Report
Estill Innovation Community - 12618927

Tree ID	Inventory Type	Common Name	Scientific Name	Ownership	Estimated Height (m)	Measured Trunk Diameters	Maximum DBH	dbh_aggr	DBH Approximated	Height of DBH (m	Dripline Radius (m)	MPD	Trunk Integrity	Canopy Structure	Canopy Vigour	Overall Health	Bat Flag	Proposed Action	Rationale	Compensatio	Notes	x	y
188	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	15	22.5	22.5	22.5	No	1.37	6	1.8	Fair	Fair-Good	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19348104	43.47467364
189	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	8	16.9	16.9	16.9	No	1.37	5	1.8	Fair	Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19346213	43.47462292
191	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	18	18.3	18.3	18.3	No	1.37	6	1.8	Fair	Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19351447	43.47459666
192	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	8	14.3	14.3	14.3	No	1.37	4	1.8	Fair	Poor-Fair	Poor-Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19351251	43.47439849
193	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	8	15.7	15.7	15.7	No	1.37	4	1.8	Poor-Fair	Poor-Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19351634	43.47443039
194	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	15	19.5	19.5	19.5	No	1.37	4	1.8	Fair	Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19350601	43.47439497
195	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	8	22.13	22	13	No	1.37	4	1.8	Poor-Fair	Poor-Fair	Poor-Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Hollow trunk	-80.19350714	43.47443455
196	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	12	16.7	16.7	16.7	No	1.37	4	1.8	Fair	Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19350847	43.47443693
197	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	12	17.8	17.8	17.8	No	1.37	4	1.8	Poor-Fair	Poor-Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19351014	43.47444060
198	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	15	24.3 17.5	24.3	17.5	No	1.37	6	1.8	Poor-Fair	Poor-Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19351214	43.47444497
199	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	8	14.4, 19.7	19.7	19.7	No	1.37	2	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19329473	43.47444464
501	Single Tree	White Elm	*Ulmus americana*	Site	7.5	19.5	19.5	19.5	No	1.37	2	1.8	Fair	Fair	Poor-Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Riverbank grape	-80.19388047	43.47769773
502	Single Tree	White Elm	*Ulmus americana*	Site	8	29.7	29.7	29.7	No	1.37	3	1.8	Fair	Poor-Fair	Fair-Healthy	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Riverbank grape	-80.19393656	43.47768446
503	Single Tree	White Elm	*Ulmus americana*	Site	7	17.5	17.5	17.5	No	1.37	3	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Riverbank grape	-80.19388898	43.47766205
504	Single Tree	White Elm	*Ulmus americana*	Site	8	15.5	15.5	15.5	No	1.37	3	1.8	Fair	Fair-Good	Poor-Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19388724	43.47772899
505	Single Tree	White Elm	*Ulmus americana*	Site	8	18.3	18.3	18.3	No	1.37	2	1.8	Fair	Fair	Poor-Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19393583	43.47770672
506	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	4,5	11, 11, 11	11	11,5	No	1.37	3	1.8	Dead	Dead	Dead-Declining	Dead	0	REMOVE	Overlapping with Grading Limits	TBD	Multistemmed - 11 cm 11 cm 11cm other stems	-80.19387907	43.4775007
507	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site	4	11	11	11	No	1.37	3	1.8	Dead	Dead	Dead	Dead	0	REMOVE	Overlapping with Grading Limits	TBD	Bluethorn mess	-80.19393413	43.47644801
508	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site	5	10.7	10.7	10.7	No	1.37	3	1.8	Dead	Poor-Fair	Dead	Dead	0	REMOVE	Overlapping with Grading Limits	TBD	Bluethorn mess	-80.19393464	43.47643364
509	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	14	14	14	14	No	1.37	4	1.8	Dead	Dead-Declining	Dead-Declining	Dead	0	REMOVE	Overlapping with Grading Limits	TBD	Black licorice - mushrooms from trunk	-80.19393475	43.47644754
510	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	15	38.8	38.8	38.8	No	1.37	4	1.8	Dead-Declining	Dead	Dead-Declining	Dead-Declining	0	REMOVE	Overlapping with Grading Limits	TBD	Bluethorn mess	-80.19393758	43.47644315
511	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	8	16	16	16	No	1.37	5	1.8	Dead-Declining	Dead-Declining	Dead-Declining	Dead-Declining	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19393164	43.47644763
512	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	4,5	4,5	4,5	4,5	No	1.37	3	1.8	Dead	Dead-Declining	Dead-Declining	Dead	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19393497	43.47643497
513	Single Tree	Elm species	*Ulmus sp.*	Site	20	30.5	30.5	30.5	No	1.37	5	2.4	Fair	Fair-Good	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Riverbank grape, Epicormic above dbh	-80.20028509	43.47765194
514	Single Tree	Common Pear	*Pyrus communis*	Site	6	28	28	28	No	1.37	2.5	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.20022649	43.47763026
515	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	4	11,5, 11,5	11,5	11,5	No	1.37	3	1.8	Dead	Poor	Dead-Poor	Dead	0	REMOVE	Overlapping with Grading Limits	TBD	Multistem, one stem horizontal	-80.19354395	43.47615616
516	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	8	23.5 18.8	23.5	18.8	No	1.37	3	1.8	Fair	Poor-Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Codominate leader	-80.20024853	43.47763001
517	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site	4,5	13 12 10.8	13	10.8	Yes	1.37	2	1.8	Fair	Poor-Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Multistem	-80.20027696	43.47685138
518	Single Tree	Elm species	*Ulmus sp.*	Site	11	31.4, 33	33	33	Yes	1	3.5	2.4	Poor	Poor-Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Codominate leader second Dbh taken at 1 m stem corne	-80.20008846	43.47688324
519	Single Tree	Hawthorn species	*Crataegus sp.*	Site	5.5	23.8	23.8	23.8	No	1.37	2.5	1.8	Fair	Good	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD	Riverbank grape	-80.20008301	43.47663276
520	Single Tree	Hawthorn species	*Crataegus sp.*	Site	6.5	23	23	23	No	1.37	2	1.8	Fair	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD	Confirm whether hawthorn or buckthorn	-80.20008519	43.47659875
521	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	7	14.1	14.1	14.1	No	1.37	3	1.8	Dead-Dor	Fair-Good	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19347705	43.47664615
522	Single Tree	Elm species	*Ulmus sp.*	Site	10	21.8	21.8	21.8	No	1.37	3	1.8	Fair	Fair-Good	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Riverbank grape	-80.19366864	43.47613061
523	Single Tree	Elm species	*Ulmus sp.*	Site	17	34.2	34.2	34.2	No	1.37	4.5	2.4	Fair	Poor-Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Codominate leader, Riverbank grape	-80.1999793	43.4701267
524	Single Tree	Common Pear	*Pyrus communis*	Site	8	16.8,22.5	22.5	28.1	Yes	0.5	3	1.8	Fair	Poor-Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Multistem, Dbh for bone stem taken with 5. Riverbank grape	-80.19393136	43.47662239
525	Single Tree	Eastern White Pine	*Pinus strobus*	Site	6	10.8, 7.9	10.8	7.9	No	1.37	1.5	1.2	Good	Fair-Good	Good	Healthy	0	REMOVE	Overlapping with Grading Limits	TBD	Riverbank grape, Multi-stemmed	-80.1998133	43.47663382
526	Single Tree	Eastern White Pine	*Pinus strobus*	Site	12	20.2	20.2	20.2	No	1.37	3	1.8	Good	Good	Good	Healthy	0	REMOVE	Overlapping with Grading Limits	TBD		-80.1997797	43.47661557
527	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site	7	18.3	18.3	18.3	No	1.37	2	1.8	Fair-Good	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD	Codominate leader	-80.19987197	43.4767166
528	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site	10	24.3 17.3	24.3	17.3	No	1.37	3	1.8	Poor-Fair	Fair-Good	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Codominate leader sassucker holes	-80.19988368	43.47667234
529	Single Tree	Elm species	*Ulmus sp.*	Site	12	25	25	25	No	1.37	3	1.8	Fair-Good	Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Codominate leader, Riverbank grape	-80.19989497	43.47663789
530	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site	5	25	25	25	No	1.37	3	1.8	Poor-Fair	Poor-Fair	Poor-Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Dbh estimated all stems contorted leaning to north	-80.20000517	43.47657046
531	Single Tree	Elm species	*Ulmus sp.*	Site	8	14.2	14.2	14.2	No	1.37	2	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD		-80.20015157	43.47666464
532	Single Tree	Elm species	*Ulmus sp.*	Site	7	11.2	11.2	11.2	No	1.37	1.5	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD		-80.20013201	43.47669173
533	Single Tree	Elm species	*Ulmus sp.*	Site	6.5	11	11	11	No	1.37	1	1.8	Fair	Fair-Good	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.20013669	43.47667769
534	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site		15.5 11	15.5	11	No	1.37	2	1.8	Poor-Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.20013664	43.4767101
535	Single Tree	Common Pear	*Pyrus communis*	Site	15	23, 18.1	23	18.1	No	1.37	4	1.8	Poor-Fair	Poor-Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Sapsucker, Multi-stemmed at base rotting	-80.20004471	43.47674052
536	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	10	35.5	35.5	35.5	No	1	3	2.4	Fair	Poor-Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Multi-stemmed above dbh	-80.20008912	43.47661662
537	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site	7	20 15 13	20	13	No	1.37	2	1.8	Fair	Fair-Good	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Dbh estimated all stems contained	-80.20018614	43.47653359
538	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site	4	18.8	18.8	18.8	No	1.37	1.5	1.8	Dead-Dor	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Endemic at base	-80.19997908	43.47640765
539	Single Tree	Buckthorn Species	*Rhamnus sp.*	Site	4	19.4, 19.5	19.4	19.5	No	1.37	3	1.8	Fair	Dead-Dor	Dead-Dor	Dead	0	REMOVE	Overlapping with Grading Limits	TBD	Endemic at base	-80.19994215	43.47647974
540	Single Tree	Elm species	*Ulmus sp.*	Site	20	25	25	25	No	1.37	4	1.8	Poor	Poor	Poor	Dead	0	REMOVE	Overlapping with Grading Limits	TBD		-80.20019423	43.47655053
541	Single Tree	Elm species	*Ulmus sp.*	Site	7	14.9	14.9	14.9	No	1.37	2	1.8	Fair	Fair-Good	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Kink at base	-80.200008	43.47668054
542	Single Tree	Apple/Crabapple species	*Malus sp.*	Site	5	18.5 15.8 14.5	18.5	14.5	No	1.37	2	1.8	Poor-Fair	Poor-Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.20000786	43.4764437
601	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	6	11.8	11.8	11.8	No	1.37	4	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19343169	43.47467631
602	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	8	11	11	11	No	1.37	4	1.8	Poor-Fair	Poor-Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19350007	43.47462980
603	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	6	11.5	11.5	11.5	No	1.37	3	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19361554	43.47461558
604	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	8	10	10	10	No	1.37	3	1.2	Fair	Poor-Fair	Poor-Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19349072	43.47460787
605	Single Tree	Balsam Poplar	*Populus balsamifera*	Site	10	11.5	11.5	11.5	No	1.37	4	1.8	Fair	Fair	Fair-Good	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19346868	43.47458397
606	Single Tree	Siberian Elm	*Ulmus pumila*	Site	12	27.9	27.9	27.9	No	1.37	5	1.8	Fair	Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19315531	43.47466358
607	Single Tree	Cherry species	*Prunus sp.*	Site	6	13, 9	13	9	No	1.37	2	1.2	Fair	Poor-Fair	Poor	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19336569	43.47418097
608	Single Tree	Basswood	*Tilia americana*	Site	17	26, 16.5	26	16.5	No	1.37	4	1.8	Fair	Fair-Good	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Riverbank grape Multistem	-80.1969224	43.4739755
609	Single Tree	Siberian Elm	*Ulmus pumila*	Site	17	14.5	14.5	14.5	No	1.37	4	1.2	Dead-Dor	Dead-Dor	Dead-Dor	Dead	0	REMOVE	Overlapping with Grading Limits	TBD	Loose bark	-80.19619366	43.47456576
610	Single Tree	Sugar Maple	*Acer saccharum*	Site	22	64	64	64	No	1.37	10	4.2	Poor	Poor-Fair	Poor	Poor (in decline)	0	REMOVE	Overlapping with Grading Limits	TBD	Broken dead leader Fungus growth Second stem is a snag	-80.19682211	43.47390476
611	Single Tree	Basswood	*Tilia americana*	Site	15	46.2	46.2	46.2	No	1.37	10	3	Poor	Poor	Poor	Poor (in decline)	0	REMOVE	Overlapping with Grading Limits	TBD	Two branches with leaves	-80.19633068	43.47388316
612	Single Tree	Basswood	*Tilia americana*	Site	26	25.2, 23.2, 16.1	25.2	16.1	No	1.37	6	1.8	Poor-Fair	Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19630731	43.47387912
613	Single Tree	Basswood	*Tilia americana*	Site	8	23.5, 12.8	23.5	12.8	No	1.37	3	1.8	Poor-Fair	Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.1963599	43.47388259
614	Single Tree	Basswood	*Tilia americana*	Site	16	16.5, 13.5	16.5	13.5	No	1.37	3	1.8	Fair	Fair	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD	Riverbank grape	-80.19654603	43.47390814
			**Township of Puslinch offsite*																		Large cluster of stems including two large snags 31.5 and Multista		
615	Single Tree	Basswood	*Tilia americana*	Site	15	19.5, 14, 11.5	19.5	11.5	No	1.37	10	1.8	Poor	Poor	Poor-Fair	Poor	0	INJURE	Near Grading Limits	TBD		-80.19657761	43.47381893
619	Single Tree	Basswood	*Tilia americana*	Site	12	10.5	10.5	10.5	No	1.37	2	1.8	Fair	Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19697709	43.47390024
620	Single Tree	Basswood	*Tilia americana*	Site	6	9	9	9	No	1.37	2	1.2	Poor-Fair	Poor-Fair	Fair	Poor-Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19673466	43.47384714
621	Single Tree	Basswood	*Tilia americana*	Site	15	22	22	22	No	1.37	5	1.8	Fair	Good	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19675436	43.47382316
622	Single Tree	Basswood	*Tilia americana*	Site	15	12.8, 12.6, 9.7	12.8	9.7	No	1.37	3	1.2	Poor-Fair	Poor-Fair	Fair-Good	Fair	0	INJURE	Near Grading Limits	TBD	Dead fascia, in a cluster of trees	-80.19679545	43.47385146
623	Single Tree	Basswood	*Tilia americana*	Site	15	20.3, 16, 12.7	20.3	12.7	No	1.37	6	1.8	Poor-Fair	Poor-Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19682641	43.47384098
624	Single Tree	Basswood	*Tilia americana*	Site	6	9.2	9.2	9.2	No	1.37	2	1.2	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19685584	43.4738016
625	Single Tree	Basswood	*Tilia americana*	Site	15	15.4	15.4	15.4	No	1.37	4	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19685291	43.47380744
626	Single Tree	Basswood	*Tilia americana*	Site	20	30	30	30	No	1.37	2	2.4	Fair	Fair	Poor-Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Dead wood	-80.19680749	43.47381121
627	Single Tree	Basswood	*Tilia americana*	Site	15	13.3	13.3	13.3	No	1.37	3	1.8	Fair	Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19688005	43.47379002
628	Single Tree	Basswood	*Tilia americana*	Site	25	36.4, 22.8, 20.8	36.4	47.7	No	1.37	6	3	Fair	Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Clumped	-80.1968668	43.47382216
629	Single Tree	Basswood	*Tilia americana*	Site	10	13.8, 11.6	13.8	11.6	No	1.37	6	1.8	Poor	Poor-Fair	Fair	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19683317	43.4737974
630	Single Tree	Basswood	*Tilia americana*	Site	8	10.1, 8	10.1	8	No	1.37	3	1.2	Poor-Fair	Poor-Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19700327	43.47378391
631	Single Tree	Cherry species	*Prunus sp.*	**Township of Puslinch offsite*	8	13.5	13.5	13.5	No	1.37	2	1.8	Fair	Fair	Fair-Good	Fair	0	INJURE	Near Grading Limits	TBD		-80.19699602	43.47375582
632	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	10	13.2	13.2	13.2	No	1.37	3	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19704115	43.47376172
633	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	8	21	21	21	No	1.37	2	1.8	Poor	Poor	Poor	Dead	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19705953	43.47378293
634	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	15	25	25	25	No	1.37	6	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19708614	43.47377393
635	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	20	23.5	23.5	23.5	No	1.37	4	1.8	Poor	Poor	Poor	Dead	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19708587	43.47377194
636	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	8	14	14	14	No	1.37	3	1.8	Poor	Poor	Poor	Dead	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19713642	43.47376183
637	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	20	26	26	26	No	1.37	8	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD	Minimum Acerbarrell	-80.19714955	43.47373475
638	Single Tree	Black Cherry	*Prunus serotina var. serotina*	Site	25	24.5, 16	24.5	16	No	1.37	8	1.8	Fair	Fair	Fair	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19713209	43.47376273
639	Single Tree	Basswood	*Tilia americana*	Site	25	26.3	26.3	26.3	No	1.37	8	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19717709	43.47375462
640	Single Tree	Basswood	*Tilia americana*	Site	16	18.5, 10.6, 7.8	18.5	7.8	No	1.37	6	1.2	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19718646	43.47375284
641	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	18	16, 8.3	16	8.3	No	1.37	6	1.2	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19721636	43.4737376
642	Single Tree	Trembling Aspen	*Populus tremuloides*	**Township of Puslinch offsite*	8	10.2	10.2	10.2	No	1.37	3	1.2	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19722913	43.47373986
643	Single Tree	Trembling Aspen	*Populus tremuloides*	**Township of Puslinch offsite*	8	11.2	11.2	11.2	No	1.37	3	1.8	Fair	Fair	Fair	Fair	0	INJURE	Near Grading Limits	TBD		-80.1972311	43.47372306
644	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	20	22, 13.5	22	13.5	No	1.37	4	1.8	Fair	Fair	Fair-Good	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19724668	43.47372936
645	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	10	12.5	12.5	12.5	No	1.37	3	1.8	Poor-Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19734757	43.47374845
646	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	25	26.5, 21.23	26.5	23	No	1.37	10	1.8	Fair	Fair	Poor (in decline)	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Two dead leaders other leader is fair	-80.19736705	43.47371176
647	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	8	11.3	11.3	11.3	No	1.37	3	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19732877	43.47373807
648	Single Tree	Basswood	*Tilia americana*	Site	9	13.7	13.7	13.7	No	1.37	3	1.8	Fair	Poor	Poor	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Cavities into dbh	-80.19719647	43.47371934
649	Single Tree	Basswood	*Tilia americana*	Site	10	12.4	12.4	12.4	No	1.37	3	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19732282	43.47373065
650	Single Tree	Basswood	*Tilia americana*	**Township of Puslinch offsite*	20	23.2	23.2	23.2	No	1.37	6	1.8	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	INJURE	Near Grading Limits	TBD		-80.19736305	43.47370324
651	Single Tree	Basswood	*Tilia americana*	**Township of Puslinch offsite*	18	18.2, 17.4	18.2	17.4	No	1.37	6	1.8	Fair	Fair-Good	Poor-Fair	Fair	0	INJURE	Near Grading Limits	TBD		-80.19735442	43.47370575
652	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	8	12.5, 11	12.5	16.7	No	1.37	3	1.8	Poor	Fair	Poor-Fair	Poor (in decline)	0	REMOVE	Overlapping with Grading Limits	TBD	Significant decay Hazard- leader severed and hanging	-80.1973652	43.47372174
653	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	8	10.5	10.5	10.5	No	1.37	3	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Bowed	-80.19736754	43.47372753
654	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	6	10.1	10.1	10.1	No	1.37	1	1.2	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD		-80.19736786	43.47371384
655	Single Tree	Basswood	*Tilia americana*	**Township of Puslinch offsite*	20	26, 23.4, 13.2	26	13.2	No	1.37	10	1.8	Fair	Fair	Fair-Good	Fair	0	INJURE	Near Grading Limits	TBD	Codominate leader	-80.19737591	43.47368769
656	Single Tree	Trembling Aspen	*Populus tremuloides*	**Township of Puslinch offsite*	5	9.5	9.5	9.5	No	1.37	2	1.2	Poor	Poor	Poor (in decline)	Poor	0	INJURE	Near Grading Limits	TBD	Other side of fence	-80.19737715	43.47368795
657	Single Tree	Basswood	*Tilia americana*	**Township of Puslinch offsite*	20	41	41	41	No	1.37	10	3	Fair-Good	Fair-Good	Fair-Good	Fair-Healthy	0	INJURE	Near Grading Limits	TBD	Fill at base	-80.19738017	43.47368414
658	Single Tree	Basswood	*Tilia americana*	Site	10	18	18	18	No	1.37	4	1.8	Fair	Fair	Fair	Fair	0	REMOVE	Overlapping with Grading Limits	TBD	Bowed	-80.1974073	43.47370043
659	Single Tree	Trembling Aspen	*Populus tremuloides*	Site	10	11.2	11.2	11.2	No	1.37

Appendix D

Agency Correspondence

From: Lynne Banks
To: Mariann Lobbezoo
Cc: Amy Douglas; J-P Fleras; Peter Zytner; James Boivin
Subject: RE: Arborist Compensation Rates
Date: Tuesday, January 21, 2025 9:37:28 AM
Attachments: image006.png
image007.png
image010.png
image011.png
image012.png
image013.png
image014.png

> You don't often get email from lbanks@puslinch.ca. Learn why this is important

Hi Mariann –

I spoke with one of our consulting ecologists and she advised that there is no specific compensation rate that she's aware of. The Township defers to the County's forest conservation bylaw which states that the County will determine if the number of replacement trees is appropriate:

https://puslinch.ca/wp-content/uploads/2019/11/forest-conservation-by-law.pdf

5.8 The County may issue a permit subject to those conditions that are deemed necessary, including but not limited to:

(a) the manner and timing in which the injuring or destruction of trees is to be carried out;
(b) the qualifications of persons authorized to injure or destroy trees;
(c) the species, size, number and location of replacement trees to be planted; and
(d) measures to be implemented to mitigate the direct and indirect effects of the injuring or destruction of trees on the natural environment.

Note this bylaw is only relevant to the cutting or destruction of trees in a **forested area greater than 1 hectare/2.47 acres** (woodlands). The only other relevant policy of note is County OP 10.1.3g:

10.1.3 Matters for Consideration

The County will consider the following when considering new lot creation by subdivision, consent or part lot control:

a) that any new lots will be consistent with official plan policies and zoning regulations;

b) that all lots can be adequately serviced with water, sewage disposal, stormwater management or drainage, fire protection, roads, utilities, solid waste disposal to accepted municipal standards and without undue financial burden on the municipality;

c) that sufficient *reserve water and sewage plant capacity* will be available when lots are created in areas to be serviced by central water and sewage systems;

d) that all lots will have safe driveway access to an all-season maintained public road and that access to a local road will be preferred over county and provincial roads, where practical;

e) that public streets, spaces and facilities will be safe, meet the needs of pedestrians, and facilitate pedestrian and non-motorized movement, including, but not limited to, walking and cycling.

f) that the topography, soils and drainage of the site are satisfactory for the lot sizes and uses proposed;

g) that tree loss related to anticipated *development* be kept to a minimum and, wherever reasonable, be compensated for by new tree planting;

You can reach out to the County's forestry department is you have any questions.

Regards –

Lynne

<!--[if !vml]--><!--[endif]-->Lynne Banks
Development and Legislative Coordinator
Township of Puslinch
7404 Wellington Rd 34, Puslinch ON N0B 2J0
519-763-1226 ext. 226 Fax 519-736-5846 www.puslinch.ca

From: Mariann Lobbezoo <Mariann.Lobbezoo@ghd.com>
Sent: Wednesday, January 15, 2025 8:45 AM
To: Lynne Banks <lbanks@puslinch.ca>
Cc: Amy Douglas <Amy.Douglas@ghd.com>; J-P Fleras <J-P.Fleras@ghd.com>; Peter Zytner <Peter.Zytner@ghd.com>; James Boivin <James.Boivin@ghd.com>

Subject: Arborist Compensation Rates

Hello Lynne,

We are putting together an Arborist Report for a property within the Township of Puslinch.

We were wondering whether there is a specific compensation rate calculation you would like us to follow for the proposed tree removals.

Thank you for your time,

Mariann

Mariann Lobbezoo (She/Her)
M.Sc.
Graduate Ecologist

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From: Adam Buitendyk
To: Mariann Lobbezoo
Cc: Amy Douglas; J-P Fleras; Peter Zytner; James Boivin; Meagan Ferris
Subject: RE: Arborist Compensation Rates
Date: Wednesday, February 5, 2025 4:07:03 PM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png
image006.png

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Hi Mariann,

Wellington County does not have a standard methodology for determining compensation rates for tree removals on development sites. For sites like this a compensation rate is typically proposed by the applicant's consultant as part of the arborist report which in turn is peer reviewed by an independent ecologist retained by the Township/County.

It is also my understanding that the subject site is located within an area that is part of study being undertaken collaboratively between the Township of Puslinch and the County which is referred to as Puslinch by Design Study – Employment Land Study. The outcomes of this study may have some implications on the subject lands and there is the potential that this employment study could result in local study and/or landscaping requirements. This study and its future process and the outcomes may need to be considered as you move forward with your proposal.

Regards,

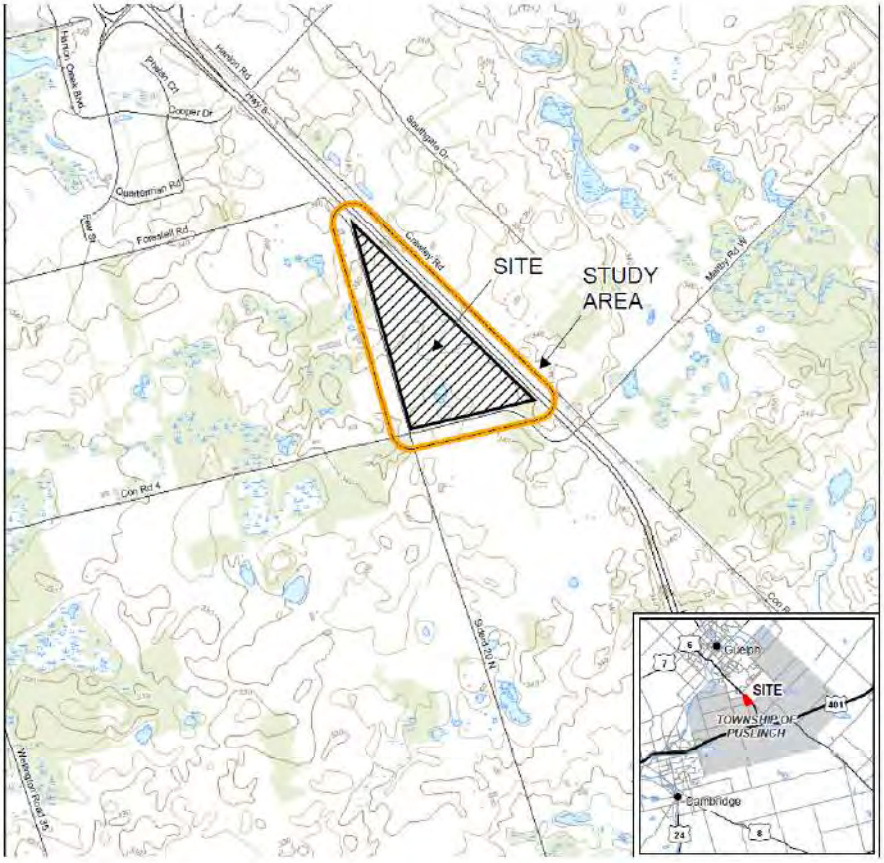
Adam Buitendyk
Environmental Resource Specialist/Forester
County of Wellington Planning & Development
74 Woolwich Street
Guelph ON N1H 3T9
T 519.837.2600 x 2960
E adamb@wellington.ca

From: Mariann Lobbezoo <Mariann.Lobbezoo@ghd.com>
Sent: Monday, February 3, 2025 1:39 PM
To: Adam Buitendyk <adamb@wellington.ca>
Cc: Brad Carberry <bradc@wellington.ca>; Amy Douglas <Amy.Douglas@ghd.com>; J-P Fleras <J-P.Fleras@ghd.com>; Peter Zytner <Peter.Zytner@ghd.com>; James Boivin <James.Boivin@ghd.com>
Subject: RE: Arborist Compensation Rates

Hi Adam,

Thank you for taking the time to assist us.

The property is located at 4631 Side Road 20 North, Township of Puslinch, Ontario (See the image below).



The arborist report is being submitted as part of an Environmental Impact Study for an official plan and zoning bylaw amendment application. Upon approval, approximately 250 trees are anticipated to be removed. However, tree removals will be re-assessed as development designs progress.

Please let us know if you have any additional questions.

Kindly,

Mariann

Mariann Lobbezoo (She/Her)

M.Sc.

Graduate Ecologist

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From: Adam Buitendyk <adamb@wellington.ca>
Sent: Thursday, January 30, 2025 1:58 PM
To: Mariann Lobbezoo <Mariann.Lobbezoo@ghd.com>
Cc: Brad Carberry <bradc@wellington.ca>
Subject: RE: Arborist Compensation Rates

> You don't often get email from adamb@wellington.ca. Learn why this is important

Hi Mariann,

Brad forwarded me your email, but I need for context to respond accurately. Could you please provide the property address let me know why the arborist report is being prepared.

Thanks,

Adam Buitendyk
Environmental Resource Specialist/Forester
County of Wellington Planning & Development
74 Woolwich Street
Guelph ON N1H 3T9
T 519.837.2600 x 2960
E adamb@wellington.ca

From: Brad Carberry <bradc@wellington.ca>
Sent: Wednesday, January 29, 2025 12:37 AM
To: Adam Buitendyk <adamb@wellington.ca>
Subject: Fw: Arborist Compensation Rates

Hi Adam
Please see message below.

From: Wellington County <no-reply@web-response.com>
Sent: Tuesday, January 28, 2025 10:31:52 AM
To: Brad Carberry <bradc@wellington.ca>
Subject: Arborist Compensation Rates

CAUTION: This email originated from outside the organization. Do not click links or open attachments unless you know the contents to be safe.

Dear Mr. Carberry,

We are putting together an Arborist Report for a property within the Township of Puslinch and we are wondering whether there is a specific compensation rate calculation you would like us to follow for the proposed tree removals.

We connected with the Township, and they mentioned that the County's forestry department determines whether the number of replacement trees are appropriate.

Please let us know if you have a preferred compensation rate calculation for us to implement.

Thank you for your time,

Mariann

Mariann Lobbezoo (She/Her)
M.Sc.
Graduate Ecologist

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Submitted on Tue, 01/28/2025 - 10:31am

This email was sent to you by Mariann Lobbezoo<Mariann.Lobbezoo@ghd.com> through https://www.wellington.ca/.

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Appendix K

Breeding Bird Surveys Results

Appendix K
Breeding Bird Survey Results
Scoped Environmental Impact Study
Estill Innovation Community - 12618927

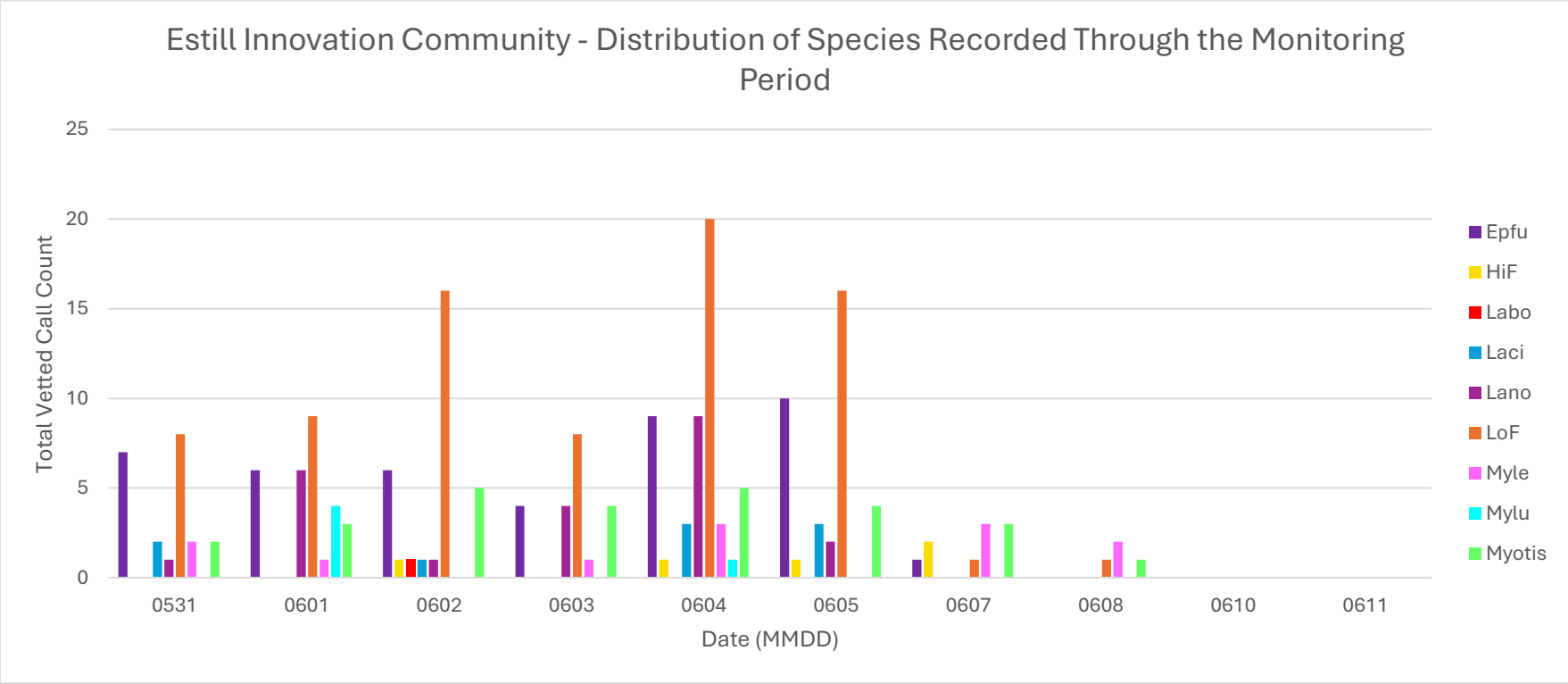
Species		Ontario Status	Species at Risk Ontario (SARO)	Species at Risk Act (SARA)	BBS 1			BBS 2			BBS 3			Highest Breeding Evidence
Common Name	Scientific Name				June 2, 2022	June 16, 2022	July 4, 2024	June 2, 2022	June 16, 2022	July 4, 2024	June 2, 2022	June 16, 2022	July 4, 2024	
American crow	*Corvus brachyrhynchos*	S5								O:X	O:X		O:X	O
American goldfinch	*Spinus tristis*	S5			P:S	P:S	O:X	O:X	O:X	O:X	O:X	P:H	P:S	PR
American redstart	*Setophaga ruticilla*	S5B					P:S							P
American robin	*Turdus migratorius*	S5			O:X	P:S	P:S	O:X	P:S	P:S	P:S	PR:V	P:S	PR
Balitmore oriole	*Icterus galbula*	S4B						P:S	P:S			P:S		PR
Barn Swallow	***Hirundo rustica***	**S4B**	**SC**	**THR**						**O:X**				**O**
Black-capped chickadee	*Poecile atricapillus*	S5			P:S									P
Brown-headed cowbird	*Molothrus ater*	S5									O:X			O
Chipping sparrow	*Spizella passerina*	S5B, S3N					P:S			P:S				P
Common grackle	*Quiscalus quiscula*	S5			PR:P	P:H								PR
Common yellowthroat	*Geothlypis trichas*	S5						P:S					P:S	P
Downy woodpecker	*Picoides pubescens*	S5								O:X				O
Eastern kingbird	*Tyrannus tyrannus*	S4B					P:S	P:S	P:S				P:S	PR
Eastern meadowlark	***Sturnella magna***	**S4B, S3N**	**THR**	**THR**				**P:S**	**PR:A**		**P:H**			**PR**
Eastern phoebe	*Sayornis phoebe*	S5B								P:S				P
European starling	*Sturnus vulgaris*	SNA			P:H	PR:P		PR:P		P:S	O:X	P:H	O:X	PR
Field sparrow	*Spizella pusilla*	S4B, S3N				P:S				P:S			P:S	P
Gray catbird	*Dumetella carolinensis*	S5B, S3N					P:S	P:S	P:S	P:S	P:S		P:S	PR
House Wren	*Troglodytes aedon*	S5B					P:S							P
Indigo bunting	*Passerina cyanea*	S5B				P:S	P:S			P:S	P:S	P:S	P:S	PR
Killdeer	*Charadrius vociferus*	S4B								O:X			O:X	O
Mallard	*Anas platyrhynchos*	S5						PR:V						PR
Northern cardinal	*Cardinalis cardinalis*	S5			P:S	P:S	P:S			P:S			P:S	PR
Northern flicker	*Colaptes auratus*	S5			P:S									P
Northern waterthrush	*Parkesia noveboracensis*	S5B					P:S							P
Pileated woodpecker	*Dryocopus pileatus*	S5								O:X				O
Red-eyed Vireo	*Vireo olivaceus*	S5B					P:S							P
Red-winged blackbird	*Agelaius phoeniceus*	S5			O:X			PR:P		P:S	O:X		P:S	PR
Savannah sparrow	*Passerculus sandwichensis*	S5B, S3N								P:S	P:S		P:S	P
Song sparrow	*Melospiza melodia*	S5			P:S	P:S		P:S		P:S			P:S	PR
Tree swallow	*Tachycineta bicolor*	S4B						O:X						O
Turkey vulture	*Cathartes aura*	S5B, S3N			O:X			O:X			O:X	O:X		P
Warbling Vireo	*Vireo gilvus*	S5B											P:S	P
Yellow Warbler	*Setophaga petechia*	S5B								P:S				P

Notes:

All species listed were observed within the Study Area unless otherwise noted, if species listed are not documented in a point count they were incidentally observed during other field investigations.
All species listed were identified by song/vocalizations unless otherwise noted.
O: Species observed ('X': observed during breeding season but no evidence of breeding)
P: Possible breeding ('S': singing male present; 'H': species observed in breeding season in suitable nesting habitat)
PR: Probable breeding ('P': Pair observed; 'T': Permanent territory presumed through territorial behaviour on both visits; 'D': Courtship or display; 'V': visiting probable nest site; 'A': Agitated behaviour or anxiety calls of an adult; 'B': Brood Patch; 'N': Nest-building)
C: Confirmed breeding ('DD': Distraction display; 'NU': Used nest or eggshells found; 'FY': Recently fledged young; 'AE': Adult leaving or entering nest site; 'FS': Adult carrying fecal sac; 'CF': adult carrying food for young; 'NE': Nest with eggs; 'NY': Nest with young)
Capital letters: Observed within standardized bird survey timeLower case: Observed outside of standardized bird survey time*: Observed outside the Study Area
Endangered Species Act (ESA), 2007. Species at Risk in Ontario (SARO) List, 2007 (O.Reg 230/08); Schedule 1 (Extirpated - EXP), Schedule 2 (Endangered - END), Schedule 3 (Threatened - THR), Schedule 4 (Special Concern - SC)
Species at Risk Act (SARA), 2002. Extirpated - EXP, Endangered - END, Threatened - THR, Special Concern - SC

Appendix L

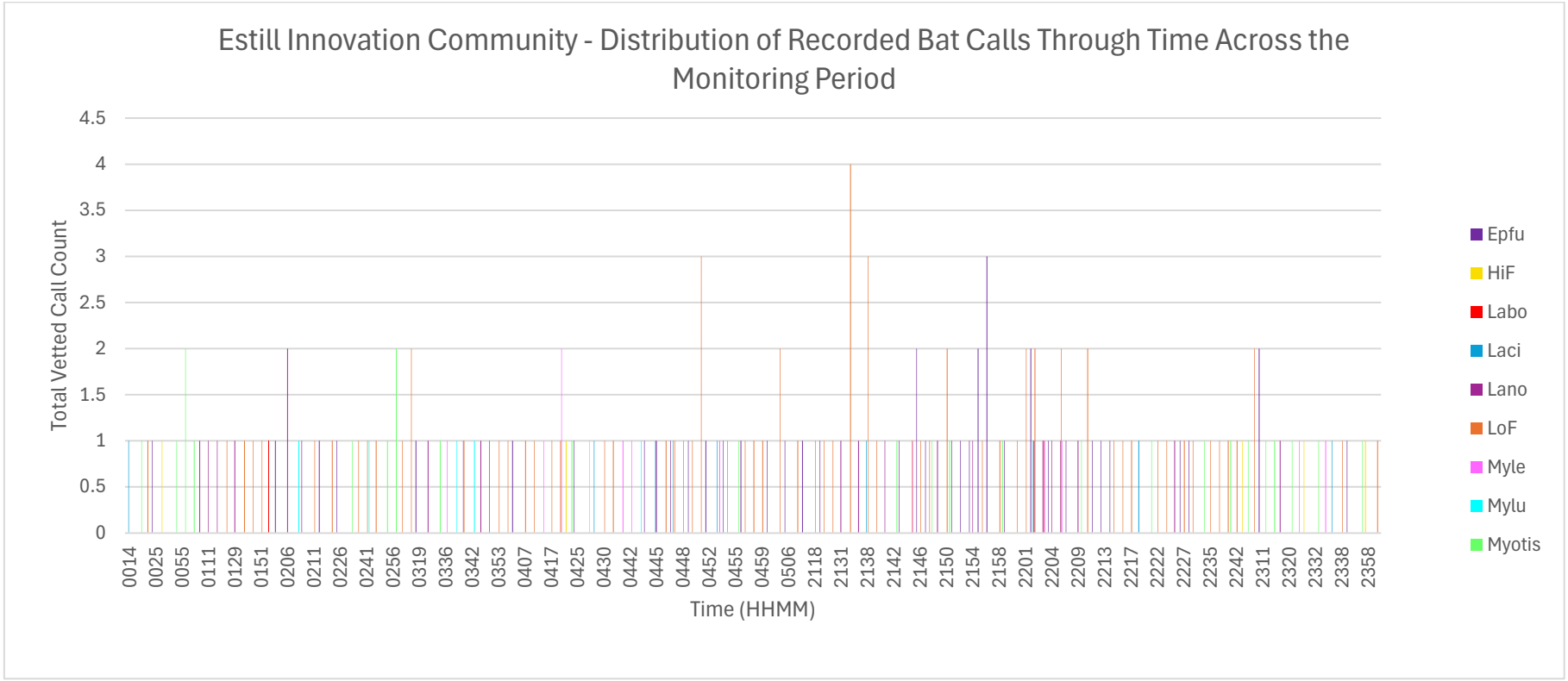
Bat Acoustic Monitoring Results



Epfu – Big brown bat (*Eptesicus fuscus*)
HiF – High Frequency
LoF – Low Frequency
Labo – Eastern red bat (*Lasiurus borealis*)
Laci – Hoary bat (*Lasiurus cinereus*)
Lano – Silver-haired bat (*Lasionycteris noctivagans*)
Myle – Eastern small-footed myotis (*Myotis leibii*)
Mylu – Little brown myotis (*Myotis lucifugus*)
Myotis - Identified as a *Myotis sp*. (possible little brown myotis, northern myotis or tri-colored bat), but cannot make determination.

Appendix M

Bat Acoustic Time of Night Analysis



Epfu – Big brown bat (*Eptesicus fuscus*)
HiF – High Frequency
LoF – Low Frequency
Labo – Eastern red bat (*Lasiurus borealis*)
Laci – Hoary bat (*Lasiurus cinereus*)
Lano – Silver-haired bat (*Lasionycteris noctivagans*)
Myle – Eastern small-footed myotis (*Myotis leibii*)
Mylu – Little brown myotis (*Myotis lucifugus*)
Myotis - Identified as a *Myotis sp*. (possible little brown myotis, northern myotis or tri-colored bat), but cannot make determination.

Appendix N

Site Development Concept

Puslinch Industrial Develpoment
21-Jan-25

2421

*** NOTE: SURVEY INFORMATION TAKEN VAN HARTEN SURVEY DATED 2022-06-20**

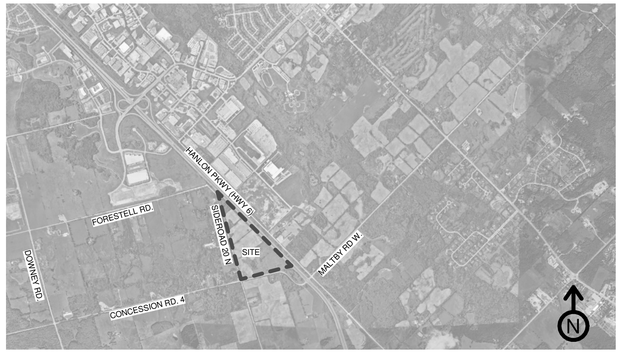
*** NOTE: WETLAND TAKEN FROM GHD TOPOGRAPHIC PLAN CI-101 DATED 2024-01-09**

Gross Constructed Area Summary

		Total GCA	Office	Warehouse	Manufacturing	Retail	Conference	Food Service	Gym	Daycare
Industrial Bldg #1	Tenant 1	245,000 sf *22,761 m2*	30,000 sf *2,787 m2*	150,000 sf *13,935 m2*	50,000 sf *4,645 m2*	15,000 sf *1,394 m2*				
	Tenant 1 Expansion	50,000 sf *4,645 m2*		37,500 sf *3,484 m2*	12,500 s.f *1,161 m2*					
	Tenant 2	230,000 sf *21,368 m2*	20,000 sf *1,858 m2*	200,000 sf *18,580 m2*		10,000 sf *929 m2*				
	Tenant 2 Expansion	100,000 sf *9,290 m2*		100,000 sf *9,290 m2*						
	Retail	15,000 sf *1,394 m2*			15,000 s.f *1,394 m2*					
	Shared Spaces	25,000 sf *2,323 m2*					20,000 sf *1,858 m2*	5,000 sf *465 m2*		
		665,000 sf ***61,780 m2***								
	Industrial Bldg #2	120,000 sf *11,148 m2*	10,000 sf *929 m2*		110,000 sf *10,219 m2*					
	Expansion	75,000 sf *6,968 m2*			75,000 sf *6,968 m2*					
		195,000 sf **18,115.94 m2**								
	Industrial Bldg #3	140,500 sf *13,053 m2*	5,000 sf *465 m2*		135,500 sf *12,588 m2*					
		140,500 ft **13,053 m2**								
	Gym	15,000 sf *1,394 m2*							15,000 sf *1,394 m2*	
		15,000 sf ***1,394 m2***								
	Daycare	10,000 sf *929 m2*								10,000 s.f *929 m2*
		10,000 sf ***929 m2***								
Total GCA		**1,025,500 sf** ***95,271 m2***	65,000 sf *6,039 m2*	487,500 sf *45,290 m2*	398,000 sf *36,975 m2*	25,000 sf *2,323 m2*	20,000 sf *1,858 m2*	5,000 sf *465 m2*	15,000 sf *1,394 m2*	10,000 sf *929 m2*

VEHICULAR PARKING		
TENANT	**REQUIRED**	**PROVIDED**
Industrial Building #1, #2, #3	*Refer to Traffic Impact Study prepared by GHD Limited for details.	801
Gym		70
Daycare		23
TOTAL PARKING		**894**
ACCESSIBLE PARKING		
All Buildings	*Refer to Traffic Impact Study prepared by GHD Limited for details.	**26**

Sweeny and Co Architects Inc.



Context Map
1 : 1

CAR PARKING SPACE:

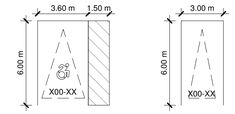
NOTES:

- DRIVE AISLE MINIMUM 6.0m UNLESS OTHERWISE NOTED.

MINIMUM PARKING SPACE DIMENSIONS:

ACCESSIBLE :
WIDTH: 3.6m
LENGTH: 6.0m

STANDARD :
WIDTH: 3.0m
LENGTH: 6.0m



BICYCLE PARKING SPACE:

MINIMUM BICYCLE PARKING SPACE DIMENSIONS:

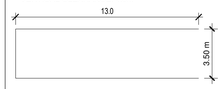
HORIZONTAL:
WIDTH: 0.60m
LENGTH: 1.80m



TYPICAL LOADING SPACE:

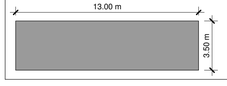
MINIMUM TRAILER SPACE DIMENSIONS:

LENGTH: 13.00m
WIDTH: 3.50m
VERTICAL CLEARANCE: 4.0m



MINIMUM LOADING SPACE DIMENSIONS:

LENGTH: 13.00m
WIDTH: 3.50m
VERTICAL CLEARANCE: 4.0m



Parking Requirement
1 : 200

1 AC103 OPA / ZBA Site Plan
1 : 1500

DRAWING NOT TO BE SCALED

Contractor must check and verify all dimensions on the job and report any discrepancies to the architect before proceeding with the work.

This drawing shall not be used for construction purposes until signed by the consultant responsible. This drawing, as an instrument of service, is provided by and is the property of Sweeny & Co. Architects.

ISSUED / REVISED yy-mm-dd

ISSUED FOR OPA / ZBA	2025-02-07

SITE SYMBOL LEGEND:

F FACILITY ENTRANCE
R RETAIL ENTRANCE
O OFFICE ENTRANCE

Sweeny&Co Architects

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PROJ. NAME
Puslinch Industrial
4631 Sideroad 20 N
Puslinch Township

OWNER
Estill Innovation Hub

DWG TITLE
Site Plan, Contect Plan, Area Statistics

DATE:	2025-01-30
SCALE :	As indicated
DRAWN :	AT
CHECKED :	GD
PROJ. No. :	2421

DWG No.
AC103

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