Hydrogeological Assessment, 2509 Cedar Creek Road, Township of North Dumfries, ON

Final Report

May 7, 2024

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161414214

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Abbreviations

AMSL	above mean sea level
AO	Aesthetic Objectives
BGS	below ground surface
BV	Bureau Veritas
cfu	colony-forming unit
EASR	Environmental Activity Sector Registry
GRCA	Grand River Conservation Area
ET	evapotranspiration
GRIN	Grand River Information Network
HDPE	high density polyethylene
HVA	Highly Vulnerable Aquifer
ICA	Issue Contributing Area
IMAC	Interim Maximum Acceptable Criteria
IPZ	Intake Protection Zone
LESPA	Lake Erie Source Protection Area
Levelogger	Solinst Edge Levelogger®
MAC	Maximum Acceptable Criteria
MECP	Ministry of Environment, Conservation and Parks
ODWS	Ontario Drinking Water Quality Standards
OGS	Ontario Geological Survey
O. Reg.	Ontario Regulation

PSW	Provincially Significant Wetland
PTTW	Permit to Take Water
RCS	Roseville Climate Station
SGRA	Significant Groundwater Recharge Area
Site	2509 Cedar Creek Road, North Dumfries Township
SPP	Source Protection Plan
Stantec	Stantec Consulting Ltd.
WHPA	Well Head Protection Area
WWR	Water Well Record
ZOI	(dewatering) zone of influence

1 Introduction

Cedar Creek Holding Inc. retained Stantec Consulting Ltd. (Stantec) to complete a hydrogeological assessment in support of an Official Plan and Zoning By-Law Amendment Application related to the lands municipally known as 2509 Cedar Creek Road in the Township of North Dumfries, Ontario (Site). The Site is rectangular shaped with frontage on Cedar Creek Road west of Earl Thompson Road in the Community of Ayr. The Site covers an area of approximately 18.03 ha. Most of the Site is presently vacant and used for agricultural purposes with the only structures consisting of a residential dwelling and associated driveways and ancillary structures located in the northwest portion of the property. The Site is bounded to the north by Cedar Creek Road with industrial use beyond, to the east and south by agricultural lands, and to the west by existing industrial development. Figure A-1 (Appendix A) shows the location of Site.

The proposed official plan and zoning by-law amendment application is required to permit the redevelopment of the Site into seven industrial lots, with an access roadway from Cedar Creek planned along the western property limit and a stormwater management (SWM) facility planned in the south end of the property. The individual industrial lots will be approximately 2.1 ha in size and will be developed with industrial use buildings, which are anticipated to be slab on grade foundations. Stantec understands that there will be no sanitary sewer or water servicing to the lots and that individual subsurface sewage disposal systems (i.e., septic beds) and water supply wells are proposed for each industrial lot. The proposed development is illustrated on a proposed Draft Plan, prepared by Stantec dated January 12, 2024, and provided in Appendix C. The proposed development layout is also presented on Figure A-1.

The objectives of the hydrogeological assessment are to assess baseline groundwater conditions throughout the Site, evaluate how the form and/or function of the hydrogeological system could be impacted by the proposed development, and recommend potential mitigation measures to be employed throughout the Site to maintain pre-development groundwater functions under the post-development condition. Stantec structured the investigation to address requirements for proposed developments as outlined in the Conservation Authority Guidelines to Support Development Applications – Hydrogeological Assessment Submissions (June 2013). Specifically, the hydrogeological investigation included the following tasks:

- Characterizing the geological/hydrostratigraphic and groundwater conditions throughout the Site, including the assessment of seasonal groundwater depth / fluctuations, horizontal and vertical hydraulic gradients, flow patterns and rates, and groundwater quality.
- Preliminary assessment of onsite soil permeability.
- Assessing whether proposed buildings and associated servicing infrastructure will intercept the groundwater table, evaluating the potential need for temporary construction dewatering, and identifying what mitigation measures could be employed at the subject lands to minimize any potential disturbances to the groundwater flow system and local private water well supplies.

- Completing a preliminary monthly pre- and post-development water balance for the Site, including assessing the suitability of the Site for the potential use of post-development Low Impact Development (LID) stormwater infiltration.
- Reviewing the proposed land use activities for conformity with Source Water Protection requirements as stipulated in the Clean Water Act, S.O. 2006, Chapter 22.
- Completing a desktop-level groundwater supply assessment and identifying water supply aquifers in the local area and proportion of local private wells drawing their groundwater supplies from these aquifers.
- Completing a preliminary nitrate loading assessment for sewage effluent.
- Identify any other potential hydrogeological constraints to the development of the subject lands and evaluate potential mitigation measures to alleviate these constraints.

This report is arranged into eight sections, including this introduction (Section 1). Section 2 presents the physical setting of the Site at a regional scale. Sections 3 and 4 present the investigation methodology and a description of the local geological and hydrogeological conditions, respectively. Section 5 presents the preliminary pre- and post-development water balance for the Site, with Section 6 discussing the potential hydrogeological effects of the project together with potential measures to mitigate these effects. Report conclusions and references are listed in Sections 7 and 8, respectively.

All figures and tables referenced in this report are presented in Appendices A and B, respectively. The Concept Plan for the proposed development is presented in Appendix C. Appendices D to I include Regional Vertical Hydraulic Gradient and Groundwater Recharge Mapping, Regional Groundwater Flow Mapping, Borehole Logs, Hydraulic Response Testing Analytical Solutions, Laboratory Certificate of Analysis, and Sewage System Nitrate Loading Assessment Mapping, respectively.

2 Physical Setting

2.1 Physiography and Topography

The Site resides near the eastern extents of the physiographic region defined by Chapman and Putnam (2007) as the Waterloo Sand Hills (Waterloo Moraine), with the boundary of the Horseshoe Moraines intersecting the southeast corner of the Site (Figure A-2). The Waterloo Moraine consists of ridges of sandy till or sand and gravel kames or kame moraines, with thick sequences of outwash sands occurring between lows. The Horseshoe Moraines are described as irregular knobs and ridges of stony glacial till moraines consisting of steep-sided mounds of irregularly bedded sand and gravel deposits and broad meltwater spillways and swampy floors.

The Site is situated in the Cedar Creek Subwatershed under the Grand River Conservation Authority (GRCA) jurisdiction. Topography and surface water features in proximity of the Site are shown on Figure A-1. Existing topography at the Site is hummocky and generally slopes from higher elevations in northern portion of the Site down to the southeast, with elevations ranging from approximately 318 m near the northern property limit to 301 m above mean sea level (AMSL) near the southern property limit.

According to mapping created using the Grand River Information Network (GRIN) (GRCA, 2024), the Site does not extend through any Provincially Significant Wetland (PSW) or Area of Natural Scientific Interest. Cedar Creek and the associated Roseville Swamp Cedar Creek Wetland Complex PSW are located approximately 300 m to the southeast of the Site (Figure A-1).

The Site is generally split by a drainage divide running east to west near the centre of the property. The drainage divide creates two predominant drainage zones (flows to the east and flows to the south), with flows from both directions draining overland to neighbouring properties and ultimately discharging to Cedar Creek (Stantec, 2024; Figure A-9).

2.2 Regional Geology and Hydrogeology

Figure A-3 represents the surficial geology in and near the Site as mapped by the Ontario Geological Survey (OGS) (2010). This mapping indicates that the Site is predominantly covered by sandy glaciofluvial deposits (Units 7a, Figure A-3). Areas of ice-contact stratified deposits of sand and gravel (Unit 6, Figure A-3) are present to the north of the Site. Recent organic deposits of peat and muck associated with Cedar Creek / PSW (Unit 20, Figure A-3) are present to the east of the Site.

Geological and hydrogeological conditions throughout the surrounding area have been mapped and described in the Upper Cedar Creek Scoped Subwatershed Study report (Matrix Solutions Inc. *et. al.*, 2019) and the Grand River Source Protection Area Approved Assessment Report (LERSPC, 2022a). In summary, subsurface conditions in the region containing the Site are interpreted to consist of the following hydrostratigraphic units:

Waterloo Moraine and Equivalents (AFB1/ATB2/AFB2): This hydrostratigraphic unit represents the main water supply aquifer in the core areas of the Waterloo Moraine. Depending on the depositional environment, the composition of this unit varies from a layered silt and fine sand to coarse sand and gravel. In some areas, Aquifer 1 is interpreted to be bisected by the Middle Maryhill Till and equivalents (ATB2) aquitard deposits (silty to clayey till, silt, and clay), which effectively separates Aquifer 1 into two units: the Upper Waterloo Moraine Stratified Sediments and equivalents (AFB1) deposits (mainly fine sand, some gravel) and the Middle Waterloo Moraine Stratified Sediments and equivalents (AFB2) deposits (mainly fine sand, some gravel). The sediments of Aquifer 1 where exposed at ground surface, represent an important source of groundwater recharge to this aquifer system. In general, hydraulic conductivities for aquifer units AFB1/AFB2 generally range from 10^{-5} m/s to 10^{-3} m/s (Matrix Solutions Inc. *et. al.*, 2019).

Lower Maryhill Till and Equivalents (ATB3): this aquitard unit corresponds to the Lower Maryhill Till and stratified equivalents deposits of silty to clayey till that represents one of the primary regional hydrostratigraphic units (Bajc and Shirota, 2007). Along the flanks of the Waterloo Moraine, the Lower Maryhill Till is often found to be discontinuous. The current investigation was not interpreted to extend into this unit.

Below the Lower Maryhill Till and stratified equivalents (ATB3) are deposits of the Upper/Lower Catfish Creek Till (ATC1/ATC2), Pre-Catfish Creek course-textured glaciofluvial/lacustrine deposits (AFD1), Canning Drift Till and fine-textured glaciolacustrine deposits (ATE1), and underlying bedrock consisting of Guelph Formation limestone (Armstrong and Dodge, 2007). In the Cedar Creek Subwatershed, bedrock is typically encountered 50 m to 100 m BGS (Matrix Solutions Inc. *et. al.*, 2019). A review of Ministry of the Environment, Conservation and Parks (MECP) water well records (WWRs) occurring within 500 m of the Site (Figure 3), identified one record (WWR 6503967) extending to bedrock. This well is mapped approximately 215 m northwest of the Site and data from this well suggests top of bedrock is encountered at a depth of approximately 82.3 m BGS. A summary of the MECP WWR data is provided in Table B-1 (Appendix B).

The regionally extensive overburden and bedrock aquifers located throughout the Grand River watershed provide notable amounts of groundwater for municipal and private use. Several aquifers situated beneath the Waterloo Moraine are used by the Region of Waterloo for drinking water supply, with the three major overburden aquifers supplying approximately 50% of the municipal groundwater usage (LERSPC, 2022a). Groundwater discharge from these aquifers also provide baseflow to numerous surface water features located on the flanks of the moraine (LERSPC, 2022a).

GRIN mapping (GRCA, 2024) indicates that upward vertical hydraulic gradients are present beneath the Site (Figure D.1, Appendix D). Further east of the Site near Cedar Creek, areas are mapped as having downward vertical hydraulic gradients. GRIN mapping (GRCA, 2024) also indicates that annual groundwater recharge rates across the Site range from 300 to 400 mm/year (Figure D.2, Appendix D).

Regional mapping (Matrix et. al, 2019) indicates the shallow overburden (AFB2) groundwater table in proximity to the Site is encountered between approximately 300 m AMSL and 303 m AMSL, with groundwater flow moving from the northwest to the southeast towards Cedar Creek (Figure GW-13, Appendix E).

2.3 Source Water Protection

As established under the Ontario Clean Water Act, 2006, S.O., 2006, c. 22, source protection areas and associated land use restrictions exist for all municipal drinking water sources located in the Lake Erie Source Protection Area (SPA) (LERSPC, 2022a). The Ontario Ministry of the Environment (now MECP) introduced the Clean Water Act as a means of ensuring the protection of drinking water sources within the province. The Clean Water Act requires that a detailed Assessment Report be prepared for each municipal drinking water system, with this Assessment Report incorporating numerous components as outlined in the document “Technical Rules: Assessment Report, Clean Water Act (2006), November 20, 2008, as amended December 2021”. This legislation provides a basic framework for communities to follow in developing an approach to protecting their municipal water supplies, with the key components of this approach being as follows:

- Identification and assessment of risks to the quality and quantity of municipal drinking water sources. This information is presented in a detailed Assessment Report, with the content of this report consisting of (i) the defining of Well Head Protection Areas (WHPA) for groundwater drinking water sources and Intake Protection Zones (IPZ) for surface water drinking water sources, (ii) completion of a vulnerability assessment for each WHPA and IPZ, and (iii) identification of drinking water issues and threats.
- Preparation of a Source Protection Plan (SPP) that addresses identified drinking water threats.

In the Lake Erie SPA, the MECP has designated five types of vulnerable areas that apply to drinking water sources.

Wellhead Protection Area (WHPA): an area delineated on the ground surface that represents the capture zone for the underlying aquifer in which a given municipal well draws its water. The zone represents the total amount of time it would take for groundwater to flow through the aquifer system and reach the intake of a given municipal well. The zones are defined as follows:

- WHPA-A: 100 m radius around the municipal well.
- WHPA-B: Time-of-travel to the municipal well is two years or less.
- WHPA-C: Time-of-travel to the municipal well is equal to or less than five years and greater than two years.
- WHPA-D: Time-of-travel to the municipal well is equal to or less than 25 years and greater than five years.
- WHPA-E: Time-of-travel via surface water is less than the time sufficient to allow the operator of a system to respond to a spill for wells where there is an interaction between surface water and groundwater supply that may impact the water quality at the well.

Based on a review of the online MECP Source Water Protection Information Atlas (MECP, 2024b) and as shown in Figure A-4, the Site is not located within a WHPA. The nearest WHPA is located approximately 1.5 km south of the Site and is associated with the Ayr Well Field.

Significant Groundwater Recharge Area (SGRA): Groundwater recharge represents the proportion of precipitation and/or surface water runoff that infiltrates to the subsurface and reaches the groundwater table. Recharge areas are classified as "significant" when they supply more water to an aquifer used as a drinking water source than the surrounding area. The LERSPC (2022a) defines a SGRA to be an area where the annual recharge rate is greater than the average plus 15% or more across the source protection region. As per the Assessment Report (LERSPC, 2022a), lands in the Grand River SPA are deemed to be SGRA when the annual recharge rate is greater than 202 mm/year. Based on a review of the online MECP Source Water Protection Information Atlas (2024b) and as shown in Figure A-4, the entire Site is classified as SGRA.

Highly Vulnerable Aquifer (HVA): Defined as subsurface, geologic formations that are sources of drinking water, which could be easily affected by the release of pollutants on the ground surface. The HVA is identified using variables that include depth to the aquifer, physical properties of the overlying soil and/or rock, and the aquifer composition. In general, an HVA will consist of granular aquifer materials (i.e., sands and gravels) that are exposed near the ground surface and where a relatively shallow water table is present. Based on a review of the online MECP Source Water Protection Information Atlas (2024b) and as shown in Figure A-4, the Site does not occur in an area designated as HVA.

Intake Protection Zone (IPZ): A zone established around a drinking / surface water intake in which a spill or leak may get to the intake too quickly for the operators of the municipal water treatment plant to shut the intake down until the pollutant passes by. These zones also include land adjacent to streams and storm sewers where surface water runoff can quickly reach the intake. Based on a review of the online MECP Source Water Protection Information Atlas (2024b) and as shown in Figure A-4, the Site is not intercepted by an IPZ.

Water Quantity Vulnerable Area (WHPA-Q): Water quantity vulnerable areas are determined through a tiered process of water budget analyses as set out in the Technical Rules under O. Reg. 287/07. WHPA-Q is defined as an area where an activity can occur and pose a threat to drinking water quantities. Any activity that takes water without returning it to the same source (Q1) or an activity which reduces recharge (Q2) may be a threat in WHPA-Q. Based on a review of the online MECP Source Water Protection Information Atlas (2024b), the Site is not located within a WHPA-Q1 or WHPA-Q2.

Issue Contributing Area (ICA): ICAs were also defined for municipal sources, as needed, where historical raw water quality data suggested that anthropogenic activity could be deteriorating drinking water quality. Based on a review of the online MECP Source Water Protection Information Atlas (2024b) and as shown in Figure A-4, the Site does not intercept any ICAs. The nearest ICA is located approximately five kilometres to the east of the Site and is associated with the Cambridge Middle Street Well Field.

3 Methodology

Section 3.0 provides the methodology used to obtain the data required to complete the hydrogeological investigation. The key components of the hydrogeological investigation included the following:

- monitoring well installation and development
- groundwater level monitoring
- hydraulic response testing
- groundwater sampling and testing.
- private well sampling and testing.

The sections below provide descriptions of the hydrogeological investigation components.

3.1 Site Instrumentation

As part of a geotechnical investigation completed by Stantec (2022a), a total of eight boreholes (BH/MW01-22 to BH/MW08-22, Figure A-1) were advanced on the Site between February 15 and 18, 2022 to depths ranging from approximately 5.2 m BGS to 14.3 m BGS. All boreholes were equipped with a monitoring well installed in accordance with Ontario Regulation 903 (O. Reg. 903) (MECP, 1990). The borehole logs presenting the subsurface conditions encountered at each location are provided in Appendix F. Figure 1 also shows the location of Cross Section A-A' (Figure A-5), which was constructed using the results of the on-Site drilling investigation. Results of the geotechnical investigation are reported under separate cover.

Each monitoring well consists of 50 mm inside diameter, Schedule 40 PVC pipe, with a No. 10 slot screen (0.01-inch slot) having a screen length of 3.0 m. The annular space between the monitoring well pipe and surrounding geological formation was backfilled with well sand to 0.3 m to 0.6 m above the top of screen, with the remainder of the annular space being filled with a granular bentonite to prevent a hydraulic connection from occurring between the soil layers along the length of the casing. The monitoring wells were completed with above ground lockable protective steel casings. The elevation of the existing grade and top-of-pipe at each monitoring well was surveyed to a geodetic benchmark by the Geomatics division of Stantec. Monitoring well construction details and survey data are summarized in Table B-2 and on the borehole logs provided in Appendix F.

Following installation, Stantec personnel developed the monitoring wells and to remove drilling fluids, solids or other particulates that may have been introduced during drilling/installation. Stantec purged each monitoring well on using dedicated 16 mm inside diameter high density polyethylene (HDPE) tubing connected to a D-25 Waterra™ foot valve. Using the dedicated tubing, Stantec purged a between two to seven standing column volumes from wells to clear out any fine-grained sediments and, subsequently, establish a proper hydraulic connection with the native aquifer material.

3.2 Groundwater Level Monitoring

Groundwater levels were recorded at the monitoring wells using a combination of automated and manual measurement methods. Stantec manually measured water levels at the monitoring wells during five Site visits that occurred between March 2022 and November 2023 using a battery operated Heron™ water level meter. Equipped with an electrode connected to a graduated polyethylene tape, Stantec used the meter to measure the depth to water by slowly lowering the electrode into the well until the buzzer sounded. Stantec recorded the water level measurements in meters to the nearest 0.01 m. To provide a continuous record of water level monitoring, Stantec installed a Solinst Edge Levelogger® (Levelogger) into the water column of each monitoring well. The Leveloggers collected water level measurements at one-hour intervals from March 10, 2022, through November 22, 2023, to capture seasonal groundwater fluctuations across the Site. To obtain an accurate measurement of the groundwater level at each well, the water level data recorded by the Leveloggers is corrected for atmospheric pressure using data obtained from a Solinst® Edge Barologger® (Barologger), which was suspended in the air in BH/MW02-22.

A summary of the manual groundwater level measurements collected from the monitoring well network is provided in Table B-3. The hydrograph presenting both the automatic and manually collected groundwater levels is provided on Figure 6. Stantec did not present groundwater level fluctuations for BH/MW04-22 to BH/MW08-22 as these wells were consistently dry over the monitoring period. The precipitation and temperature data provided on the hydrograph was obtained from the Environment Canada (2024) website for the Roseville Climate Station (ID 6147188), with this climate station being situated approximately four kilometers northwest of the Site. Groundwater contours based elevations recorded in the monitoring wells on March 10, 2022, are shown on Figure A-7.

3.3 Hydraulic Response and Infiltration Testing

To estimate the horizontal hydraulic conductivity of the deposits beneath the Site, Stantec performed in-situ hydraulic response testing on monitoring well BH/MW02-22, which is screened from approximately 10.4 m to 13.5 m BGS (301.4 m to 304.5 m AMSL) in sandy silt materials. The test consisted of creating an instantaneous change in the monitoring well water level by removing a known volume of water from the well (i.e., rising head / bail test), followed by recording the time taken for the resulting water level to return to its static condition using a combination of manual and continuous (i.e., Levelogger) water level measurements. The testing results were analyzed using the Bouwer and Rice (1976) / Bouwer (1989) solution provided in the software package AQTESOLV™ Pro Version 4.5 (Duffield, 2014) to calculate the horizontal hydraulic conductivity of the aquifer sediments in the immediate vicinity of the screened interval of the monitoring well. Table B-2 presents the calculated horizontal hydraulic conductivity, with the analytical solutions for the data being presented in Appendix G.

Stantec also used the in-situ hydraulic response testing result obtained from monitoring well BH/MW02-22 to provide an estimate of the infiltration rate for the sandy silt deposits present beneath the Site. Since hydraulic conductivity in the horizontal direction is generally one order (potentially two orders for clay-based deposits) of magnitude higher than hydraulic conductivity in the vertical direction (Todd 1980; Freeze and Cherry 1979), the vertical hydraulic conductivity for the sandy silt surrounding the

screen of BH/MW02-22 was assumed to be one order of magnitude lower than in-situ measured horizontal hydraulic conductivity. The Credit Valley Conservation-Toronto and Region Conservation (CVC-TRCA) (2010) method for converting vertical hydraulic conductivity to an infiltration rate was then applied to these data, with the result being presented in Table B-4.

Assessment of the infiltration potential for the on-Site shallow soils involved the use of a Guelph Permeameter (a constant head permeameter designed to measure in-situ vertical hydraulic conductivities of a given substrate). The Guelph Permeameter testing was performed by Stantec on May 3 and November 3, 2022. The Guelph Permeameter testing locations (GP1-22 through GP5-22) are presented on Figure A-1. Stantec used a hand auger to drill a 50 mm diameter cylindrical hole into the native at each testing location, with the depths of these holes ranging from 0.75 m to 0.80 m BGS. The Guelph Permeameter was then filled with water, inserted into the hole while making a concerted effort to avoid knocking debris into the hole, and then stabilized against the substrate. Once set-up, Stantec proceeded to record the eventual steady-state rate of water recharge into the soil. The infiltration rate for each soil tested was converted from the measured vertical hydraulic conductivity to an infiltration rate using the established relationship between vertical hydraulic conductivity and infiltration rate presented by the CVC/TRCA (2010). Table B-4 presents the results of this soil infiltration testing.

3.4 Groundwater Sampling and Testing

Groundwater quality samples were collected from three on-Site monitoring wells (BH/MW01-22, BH/MW02-22, and BH/MW03-22) on January 27, 2023. The samples were collected to help establish pre-development groundwater quality conditions at the Site.

Groundwater sampling from monitoring wells involved using the same tubing that was used to develop the monitoring wells. Prior to collecting the sample, Stantec personnel purged each well until the field parameters of pH, temperature, and conductivity stabilized, indicating that the sample would be reflective of groundwater drawn from the groundwater system (and not stagnant water residing in the well casing). Following purging, sampled groundwater was poured directly from the HDPE tubing into lab supplied sample bottles. Groundwater samples collected for metals analysis were field filtered using disposable in line 0.45 µm (micron) filters attached to the HDPE tubing. The groundwater samples were carefully packed into coolers with ice, which was added to maintain sample temperatures below 10˚C during transit to the analytical laboratory. Samples were delivered to Bureau Veritas (BV) for laboratory analysis of general chemistry, metals, and bacteriological parameters. Chain of custody forms were completed and included with the samples.

The results of the groundwater quality testing are summarized in Table B-5. A copy of the laboratory certificate of analysis is presented in Appendix H.

3.5 Private Well Sampling and Testing

To assess groundwater quality conditions in the regional aquifer in which local domestic / industrial / commercial wells draw their water supply, Stantec conducted a door-to-door survey at nearby adjacent properties on May 13, 2022, to confirm private well owner interest in participating in a well water quality sampling program. A total of four private well owners agreed to participate in the sampling program. The locations of the participating properties are shown on Figure A-1, which included properties at 2396 Cedar Creek Road, 2407 Cedar Creek Road, 111 Earl Thompson Road, and 121 Earl Thompson Road.

Well construction details were not available from the private well owners. Based on review of available MECP (2024) WWR data, the following well records may potentially be associated with three of the participating properties (Figure A-1 and Table B-1):

- **111 Earl Thompson Road** - WWR 6509777 completed in June 2004 to a depth of 29 m BGS for industrial use. The well is 0.15 m in diameter and screened from 28.0 to 28.9 m BGS in overburden. The overburden consists of sand and silt to 11.6 m BGS, underlain by clay to 23.8 m BGS, and then sand and gravel to end of hole. The static water level recorded at the time of completion was 19.5 m BGS.
- **121 Earl Thompson Road** - WWR 6506712 completed in September 1989 to a depth of 23.2 m BGS for industrial use. The well is 0.15 m in diameter and completed as open hole in overburden. The overburden consists of sand and gravel to 7.6 m BGS, underlain by sand to 9.1 m BGS, followed by clay and gravel to 21.6 m BGS, and then gravel to the end of hole. The static water level recorded at the time of completion was 17.3 m BGS.
- **2396 Cedar Creek Road** - WWR 6505707 completed in June 1985 to a depth of 9.8 m BGS for domestic/livestock use. The well is 0.76 m in diameter and completed as open hole in overburden. The overburden consists of 0.6 m of surficial clay underlain by sandy clay to 1.5 m BGS, then sand to 7.9 m BGS, fine gravel to 8.2 m BGS and then layered sand and clay to the end of hole. The static water level recorded at the time of completion was 7.3 m BGS.

Water samples were either collected from an outdoor tap (i.e., 2407 Cedar Creek Road and 111 Earl Thompson Road) or a tap inside a garage (i.e., 2396 Cedar Creek Road and 121 Earl Thompson Road). The sample from 2396 Cedar Creek Road was collected out of the resident's hose attached to the tap. Stantec personnel made all reasonable attempts to collect water quality samples from a raw water tap, if available. Prior to collecting the water sample, Stantec disinfected the tap spout with a dilute bleach solution and allowed the water to run for a minimum of 10 minutes. Water samples were collected directly into labelled, laboratory supplied containers. The water samples were carefully packed into coolers with ice, which was added to maintain sample temperatures below 10˚C during transit to the analytical laboratory. Samples were delivered to BV for laboratory analysis of general chemistry, metals, and bacteriological parameters. Chain of custody forms were completed and included with the samples.

The results of the groundwater quality testing are summarized in Table B-6. A copy of the laboratory certificate of analysis is presented in Appendix H.

4 Local Geology and Hydrogeology

4.1 Local Geology and Hydrostratigraphy

Figure A-1 shows the location of Cross-Section A-A' (Figure A-5). This northeast to southwest profile shows the interpreted subsurface stratigraphic conditions beneath the Site based on the borehole drilling logs (Appendix F). Figure A-3 presents the surficial geology throughout the Site as mapped by the OGS (2010), which indicates that the Site is mostly covered by sandy glaciofluvial deposits (Units 7a, Figure A-3).

Overall, the on-Site drilling results from the geotechnical investigation generally support the OGS interpreted surficial soils that cover the property. Borehole drilling results indicate soil conditions beneath the Site consists of topsoil (silty sand) overlying sand, sand and gravel, and gravel deposits extending to depths up to the termination depths of the boreholes to an elevation of approximately 296.6 m AMSL (i.e., maximum borehole termination at BH/MW08-22). Cobbles and boulders were noted in the sandy and gravelly deposits with auger refusal occurring in this unit at BH/MW04-22 and BH/MW08-22. The sandy and gravelly deposits are interpreted to represent Upper Waterloo Moraine Stratified Sediments and equivalents (AFB1) and/or Middle Waterloo Moraine Stratified Sediments and equivalents (AFB2) aquifer deposits. Localized sandy silt and/or silty clay deposits were encountered in the northern portion of the Site underlying the sandy and gravelly deposits at BH/MW01-22, BH/MW02-22, and BH/MW03-22 at depths ranging from 1.5 m BGS to 7.8 m BGS (307.3 m AMSL to 301.9 m AMSL) and extended to depths up to at least 14.3 m BGS (BH/MW02-22) or elevation 299.9 m AMSL (borehole termination at BH/MW03-22). The silt/clay deposits are inferred as Middle Maryhill Till and equivalents (ATB2) aquitard deposits.

Bedrock was not encountered during the geotechnical investigations by Stantec. Based on review of available MECP WWRs mapped within 500 m of the Site (Figure A-3; Table B-1), one WWR (6503967) reported overburden extending to approximately 82.3 m BGS before encountering limestone bedrock. Data from this well described the overburden as consisting of clay loam to 1.5 m BGS, gravel "pit run" to 7.6 m BGS, sandy clay to 22.9 m BGS, and clay with gravel "hardpan" (i.e., description by drillers that refers to the Catfish Creek Till) to 83.2 m BGS.

4.2 Local Hydrogeology

4.2.1 Groundwater Levels and Flow

Figure A-6 and Table B-2 present the continuous and manual groundwater levels recorded within the on-Site monitoring wells between March 10, 2022, and November 22, 2023. The groundwater levels recorded in BH/MW01-22 to BH/MW03-22, located in the north end of the Site, ranged from approximately 2.3 m BGS (BH/MW03-22) to 11.6 m BGS (BH/MW02-22), equating to elevations ranging from approximately 303.2 m to 305.9 m AMSL over the monitoring period. Monitoring wells BH/MW04-22 to BH/MW08-22, which reside in the central and southern areas of the Site, were dry throughout the monitoring period to depths ranging from 5.0 m BGS to 6.0 m BGS (305.9 m AMSL to 296.8 m AMSL),

suggesting the groundwater table occurs deeper than these depths in these areas of the Site. There is potential for the groundwater levels recorded in BH/MW01-22 to BH/MW03-22 to represent localized perched groundwater conditions, given the positioning of the well screens in or slightly above less permeable sandy silt/silty clay deposits encountered in these areas. Review of regional mapping (Matrix Solutions Inc. *et. al*., 2019) suggests the shallow overburden (AFB2) groundwater table near to the Site is generally encountered between 300 m AMSL and 303 m AMSL (Figure GW-13, Appendix E).

Seasonal variation in the groundwater table is expected at the Site. As shown in Figure A-6, water levels declined gradually from early March 2022 through February 2023 and then increased slightly from early March 2023 in response to infiltrating precipitation events and snowpack melt. Groundwater levels remained relatively stable through to early September 2023 and then declined steadily to the end of the monitoring period. In southern Ontario, high groundwater table conditions typically occur in spring due to lower evapotranspiration losses and/or a melting snowpack, which provide a greater volume of water to infiltrate and recharge the underlying aquifer systems. Low groundwater table conditions generally occur in the late summer to early fall as more water is drawn from the subsurface over this period to meet evapotranspiration demands. Overall, the difference between the minimum and maximum groundwater elevations observed within the monitoring wells over the monitoring period ranged from 0.9 m (BH/MW01-22) to 1.5 m (BH/MW03-22).

Figure A-6 presents interpreted high groundwater elevation contours based on measurements obtained from the on-Site monitoring wells between March 2022 and November 2023. Flow through the suspected perched groundwater system residing in shallow localized sandy silt and/or silty clay deposits of ATB2 in the north end of the Site is interpreted to be northward. As noted in Figure GW-13 (Appendix E), regional mapping indicates groundwater flow in the shallow overburden aquifer (AFB2) moves from the northwest to the southeast beneath the Site towards Cedar Creek.

4.2.2 Hydraulic Conductivity

The horizontal hydraulic conductivity calculated from the in-situ hydraulic response testing completed at BH/MW02-22, which is fully screened within the sandy silt deposits of ATB2, is 4.0×10^{-6} m/s (Table B-2; Appendix G). This hydraulic conductivity result falls within the range of literature values provided for these types of deposits (Fetter, 2001).

4.2.3 Infiltration Potential

Hydraulic conductivity in the horizontal direction is generally one order (potentially two orders for clay-based deposits) of magnitude higher than hydraulic conductivity in the vertical direction (Todd 1980; Freeze and Cherry 1979). Estimated infiltration rates were calculated based on an established relationship between vertical hydraulic conductivity and infiltration rate presented in Credit Valley Conservation-Toronto and Region Conservation (CVC-TRCA) (2010). Assuming the vertical hydraulic conductivity is estimated based on the horizontal hydraulic conductivity result reported for BH/MW02-22 (Table B-2; Appendix G) , the infiltration rate for the sandy silt deposit is estimated at 36 mm/hour (Table A-4).

Vertical hydraulic conductivities for the native sand to silty sand surficial deposits of AFB1/AFB2, measured at depths of 0.8 m BGS using the Guelph Permeameter ranged from 3.8×10^{-6} m/s to 2.9×10^{-5} m/s, for a geometric mean of 2.0×10^{-5} m/s (Table B-4). These vertical hydraulic conductivities convert to infiltration rates ranging from 66 mm/hour to 113 mm/hour, for an average infiltration rate of 103 mm/hour (Table B-4).

4.2.4 Groundwater Quality

Tables B-5 and B-6 provide the baseline groundwater quality data for the on-Site monitoring wells and private wells sampled near the Site, respectively, with results compared against the Ontario Drinking Water Quality Standards (O. Reg. 169/03) (ODWS) for health-related (i.e., Maximum Acceptable Criteria (MAC), and Interim Maximum Acceptable Criteria (IMAC)) and non-health related (i.e., Aesthetic Objectives (AO) and Operational Guidelines (OG)) parameters. Technical documentation of the ODWS is provided by the MECP (2006).

Figure A-8 provides a comparison of the groundwater quality analyses at each on-Site monitoring well and off-Site private well location. Groundwater sampled from the monitoring and private wells is generally characterized as calcium-bicarbonate type water, except for one location (i.e., 121 Earl Thompson Road) where sodium-chloride type water is present and two locations (i.e., BH/MW01-22 and 111 Earl Thompson Road) where mixed calcium-magnesium chloride type water occurs. The difference in groundwater quality is expected to reflect the greater contribution of salt-laden runoff from Earl Thompson Road, with the infiltration of this water resulting in greater concentrations of sodium and chloride from winter road salting activities being recharged to the groundwater system.

As shown in Table B-5, none of the tested parameters were detected above applicable ODWS health-related criteria in the samples analyzed from the on-Site monitoring wells, except for the nitrate concentration at BH/MW03-22 (13.2 mg/L) exceeding the ODWS MAC (10 mg/L) for this parameter. The elevated nitrate concentration is likely the result of historical agricultural land use at the Site. Results of the groundwater quality analysis for the on-Site monitoring wells show the following exceedances of the indicated non-health related criteria (Table B-5):

- Hardness: exceeded the ODWS OG (80-100 mg/L) in all samples with results ranging from 290 mg/L to 400 mg/L.
- Total Dissolved Solids: exceeded the ODWS AO (500 mg/L) in samples collected from BH/MW01-22 (640 mg/L) and BH/MW02-22 (520 mg/L).
- Sodium: exceeded the Medical Officer Reporting Limit (20 mg/L) in all samples with results ranging from 21 mg/L to 130 mg/L.

For the private well sampling results (Table B-6), none of the tested parameters were detected above applicable ODWS health-related criteria. Total coliform was detected above the ODWS Microbiological Standards (0 cfu/100 mL) in the sample collected from 2396 Cedar Creek Road (1 cfu/100 mL). However, as previously noted in Section 3.4, the sample at this location was collected out of the resident's hose attached to the tap and is likely a reflection of bacteria accumulation captured on the end of the sampling port (i.e., end of hose) rather than being representative of raw groundwater quality. Results of the water quality analysis for the private wells indicated the following exceedances of the following non-health related criteria (Table B-6):

- Hardness: exceeded the ODWS OG (80-100 mg/L) in all samples with results ranging from 350 mg/L to 870 mg/L.
- Chloride: exceeded the ODWS AO (250 mg/L) in samples collected from 111 Earl Thompson road (520 mg/L) and 121 Earl Thompson Road (1,700 mg/L).
- Total Dissolved Solids: exceeded the ODWS AO (500 mg/L) in samples collected from 111 Earl Thompson road (1,200 mg/L) and 121 Earl Thompson Road (3,100 mg/L).
- Total Iron: slightly exceeded the ODWS AO (0.3 mg/L) in the sample collected from 2396 Cedar Creek Road (0.35 mg/L).
- Sodium: exceeded the ODWS AO (200 mg/L) and/or the Medical Officer Reporting Limit (20 mg/L) in the samples collected from 111 Earl Thompson Road (250 mg/L), 121 Earl Thompson Road (860 mg/L), and 2396 Cedar Creek Road (34 mg/L)

These exceedances of the ODWS are common in overburden aquifers of southern Ontario.

5 Water Balance

5.1 Methodology

In the hydrologic cycle, the flow of water into and out of system can be described through a simplified water balance equation as follows:

$$P = ET + S + R + I \quad \textbf{Equation 1}$$

Where:

P = precipitation
ET = evapotranspiration
S = change in groundwater storage
R = runoff
I = infiltration (groundwater recharge)

Equation 1 may be further simplified by ignoring the change in groundwater storage (S), which trends over time to zero. The various components of the hydrologic cycle may be estimated through calculations or based on measurements made in the field. Precipitation (P) is typically a measured value. Evapotranspiration (ET) is calculated based on measured air temperatures. Infiltration (I) and Runoff (R) are calculated based on P and ET, where the difference between P and ET is the water surplus (WS) available for Infiltration (I) and Recharge (R) as follows:

$$WS = P - ET \quad \textbf{Equation 2}$$

Where WS is used to calculate Infiltration (I) after applying an infiltration factor (IF),

$$I = WS \times IF \quad \textbf{Equation 3}$$

And R is estimated by subtracting Infiltratiuon (I) from WS,

$$R = WS - I \quad \textbf{Equation 4}$$

For this assessment, ET was calculated using the soil moisture balance model by Thornthwaite and Mather (1955). In the Thornthwaite and Mather model, monthly potential evapotranspiration (PET) is calculated based on the measured average monthly daily temperature (T_a) and a heat index (H_i) value that assumes 12 hours of daylight in a day and 30 days in a month, as follows:

$$PET = 16 \times \left(\frac{10T_a}{H_i}\right)^{\alpha} \quad \textbf{Equation 5}$$

Where T_a is taken as zero degrees Celsius for months with negative temperatures, and H_i, the heat index, is estimated as,

$$H_i = \sum_{i=1}^{12} \left(\frac{10T_a}{5}\right)^{1.514} \quad \textbf{Equation 6}$$

For α

$$\alpha = 0.49 + (0.0179 \times H_i) - \left(0.0000771 \times H_i^2\right) + \left(0.000000675 \times H_i^3\right) \quad \textbf{Equation 7}$$

PET values are then multiplied by an adjustment factor, after Thornthwaite and Mather (1957), which represents the average number of daylight hours per month at the latitude of the subject property to give the Adjusted Potential Evapotranspiration (PET_{adj}).

Actual Evapotranspiration (AET) is derived as,

$$AET = PET_{adj} - \Delta S \quad \textbf{Equation 8}$$

Where ΔS is the change in storage for the month, calculated as

$$\Delta S = S_{mc} \times e^{\left(\frac{APWL}{S_{mc}}\right)} \quad \textbf{Equation 9}$$

Where:

S_{mc} = soil moisture capacity

APWL = accumulated potential water loss, calculated for $\Delta P < 0$ as $APWL = -\sum_{i=0}^{12} PET_i$, and for $\Delta P > 0$ by rearranging equation 8; with ΔP= net precipitation = P - PET_{adj}

WS is derived by subtracting AET from the monthly precipitation,

$$WS = P - AET \quad \textbf{Equation 10}$$

And the infiltration and runoff calculated per Equations 3 and 4 above.

Details pertaining to the water balance analysis completed for the Site are provided in the sections below.

5.2 Pre-Development

The existing on-Site drainage catchment areas (i.e., Catchment 105 and 106) are provided on Figure A-9 and summarized below:

- Catchment 105: 7.06 ha of predominantly agricultural area in the north portion of the Site including a small house and driveway, draining to agricultural land to the east and eventually to Cedar Creek.

- Catchment 106: 11.00 ha of agricultural area in the southern portion of the Site draining south and eventually to Cedar Creek.

For the water balance analysis, the Site was broken down into a series of sub-areas based on topographic, soil type, and land cover characteristics. Figure A-9 shows the distribution of the sub-areas (i.e., Sub-Area A to Sub-Area D; Table B-7) used in the pre-development water balance analysis. The overall infiltration factor (IF) for a sub-area represents the sum of infiltration factors assigned to each of the previously mentioned sub-area characteristics based on published values presented by the MECP (2003). As per Equation 3 (Section 5.1), the IF is then multiplied against the water surplus (WS) for a given sub-area to provide a calculated value of infiltration (INF). The sum of all sub-area INF associated with each catchment then represents the overall pre-development infiltration value for that area.

Topographic conditions across the Site are deemed to be rolling to hilly based on slopes that range from 0.8% to 5% (Stantec, 2024). The main soil type consists sandy and gravelly deposits associated with Upper Waterloo Moraine Stratified Sediments and equivalents (AFB1) and/or Middle Waterloo Moraine Stratified Sediments and equivalents (AFB2), which are assumed to represent sand loam (MECP, 2003). Land cover is consistent with agricultural (i.e., moderately rooted crops) and woodlands/mixed meadow (i.e., pasture and shrubs) areas with varying imperviousness. Based on these parameters, infiltration factors were estimated at 0.85 and 0.90 (where a value of 1.00 indicates that the full WS volume infiltrates). Stantec notes that the IF for soils cover was adjusted to values outside the typical range of the factor values published in MECP (2003) to allow for calculated infiltration rates in each sub-area to be in line with annual groundwater recharge rates assigned to the Site by the GRCA (Figure D.2, Appendix D).

The Roseville Climate Station (RCS) provided long-term monthly averages (1981-2010) for air temperature and precipitation data (Environment Canada, 2024) for use in the water balance analysis (Table B-8). Located approximately four kilometers northwest of the Site, the assumption is that the monthly average precipitation and air temperatures recorded at the station is reflective of the precipitation and air temperature fluctuation trends that have historically occurred at the Site. As shown in Table B-7, the average annual precipitation in the Site is estimated at 919 mm based on data obtained from the RCS. Annual actual evapotranspiration is estimated at 543 mm in Sub-Areas A and C and at 550 mm in Sub-Areas B and D, equating to 376 mm and 368 mm of surplus water that is available for runoff and infiltration within these respective Sub-Areas (Table B-7).

Based on the previously mentioned water balance components, the annual volume of infiltration occurring within Catchments 105 and 106 (Figure A-9) under pre-development conditions is calculated at 59,680 m^3, equating to a rate of 330 mm/year (Table B-7) and falling in the range of infiltration values estimated for the Site as presented in the GRCA (2023) mapping (i.e., 300-400 mm/year; Figure D.2, Appendix D). The average annual volume of surface water runoff under existing conditions within Catchments 105 and 106 is 8,504 m^3 (47 mm/year) (Table B-7).

5.3 Post-Development

Details pertaining to the movement and discharge of post-development surface water flows throughout the Site are provided in the Stantec (2024) Stormwater Management and Functional Servicing Report, which is provided under separate cover. The projected post-development catchments for the Site are presented in Figure A-10 and new sub-areas were derived accordingly based on topographic, soil type and land cover characteristics. For the analysis, the distribution of surficial soils found under the pre-development condition is assumed to remain relatively unchanged under the post-development condition, with proposed grading activities adjusting topographic relief, and land cover being predominantly converted to impervious surfaces (e.g., rooftops, concrete/asphalt roadways, and walkways) with the remaining pervious areas being replaced with vegetation cover typical of urban developments (i.e., urban lawns). The proposed lot grading in the Site will range between a minimum of 2.5% and a maximum of 6.0% (Stantec, 2024).

The post-development catchments and assigned sub-areas are as follows (Figure A-10 and Table B-9):

- Catchment 200: 0.14 ha of fully pervious cover in the northwest corner of the property comprising a small portion of the West Road Ditch grassed swale (Sub-Area E). Overland flow will drain to the by-pass storm sewer and discharge uncontrolled to the east.
- Catchment 201: 0.64 ha of 90% impervious cover in the northwest corner of property containing a portion of the East Road Ditch and developed area (Sub-Area F). Overland flow will drain to the by-pass storm sewer and discharge uncontrolled to the east.
- Catchment 202: 8.82 ha of 90% impervious cover in developed area covering the east portion of the Site (Sub-Area G). Overland flow will be conveyed through a grassed swale (Rear Lot Ditch) to the east inlet of the SWM facility for infiltration.
- Catchment 203: 0.55 ha of fully pervious cover on the far east side of the Site containing the by-pass storm sewer outlet and plunge pool (Sub-Area H) and draining off-site to the east.
- Catchment 204: 4.92 ha of 90% impervious cover in the developed area covering the western portion of the Site including the access road (Sub-Area I). Overland flow will be conveyed through the East Road Ditch to the west inlet of the SWM facility system for infiltration.
- Catchment 205: 1.63 ha of 15% impervious cover consisting of the SWM facility in the south end of the Site (Sub-Area J). The proposed SWM facility is designed to infiltrate all runoff to the facility up to the 10-year storm event, while major storm events greater than the 10-year storm will be attenuated in an infiltration cell and eventually discharge to Cedar Creek through an outlet channel (Stantec, 2024).
- Catchment 206: 1.22 ha of fully pervious cover consisting of a grassed swale (West Road Ditch) on the far west side of the Site (Sub-Area K). Catchment 206 will route flow around the SWM facility to the outlet channel at the southeast corner of the Site.
- Catchment 207: 0.14 ha of fully pervious cover on the far south side of the Site (Sub-Area L). Overland flow will drain off-site to the south.

Based on the previously mentioned water balance components, the volume of infiltration occurring in Catchments 200 to 207 under the post-development condition is calculated to be approximately 15,114 m^3/year, equating to a rate of 84 mm/year (Table B-9) and representing a deficit of approximately 44,566 m^3/year compared to pre-development conditions in the absence of post-development mitigation measures. The volume of surface water runoff projected to occur under the post-development condition between Catchments 200 to 207 is approximately 120,643 m^3/year (668 mm/year) (Table B-9), representing a surplus of approximately 112,139 m^3/year compared to pre-development conditions in the absence of mitigation measures. Approximately 110,616 m^3/year of runoff captured by Catchments 202 and 204 (Sub-Areas G and I) will be directed to the SWM facility for infiltration post-development. Overall, with mitigation annual infiltration and runoff are estimated at a surplus of 66,050 m^3 and 1,523 m^3, respectively, compared to pre-development conditions.

Evapotranspiration volumes have been removed from the above calculations. Further discussion on the water balance and infiltration is provided in Section 6.1.

6 Effects Assessment

6.1 Water Balance and Infiltration

Proposed development for the Site will involve the construction of seven industrial lots and a SWM facility. With this development will come the introduction of increased impervious surfaces (e.g., rooftops, concrete/asphalt roadways, parking lots and walkways) and, subsequently, a corresponding reduction in the volume of water infiltrating to the subsurface.

As discussed in Section 5.2, annual pre-development infiltration at the Site is projected to be reduced by 44,566 m^3 under the post-development condition (i.e., from 59,680 m^3 to 15,114 m^3). However, to assist in mitigating this projected infiltration deficit, runoff captured by post-development Catchments 202 and 204 (Figure A-10) will be directed to the proposed SWM facility in the south end of the Site to infiltrate (via an infiltration cell), resulting in an estimated annual stormwater volume of 110,616 m^3 being returned to the subsurface and, subsequently, reducing the annual infiltration deficit of 44,566 m^3 to a surplus of 66,050 m^3 (i.e., 110,616 m^3 - 44,566 m^3 = 66,050 m^3) (Table 9).

Annual pre-development runoff at the Site is calculated at 8,504 m^3 with an unmitigated post-development runoff volume projected to be 120,643 m^3, resulting in a surplus of 112,139 m^3 (Section 5.3). Given the stormwater runoff volume of 110,616 m^3 captured by post-development Catchments 202 and 204 will be returned to the subsurface via the SWM facility infiltration cell, the mitigated annual runoff volume under post-development is estimated at a surplus of 1,523 m^3 (Table B-9).

A key constraint in the use of infiltration galleries as a post-development infiltration augmentation measure is the positioning of the seasonally high groundwater table. As per CVC-TRCA (2010), the recommended vertical separation between the base of an infiltration gallery and the high groundwater table must be at least one meter. The base elevation of the SWM facility infiltration cell is proposed at 301.5 m AMSL (Stantec, 2024), which is above the maximum depth of the monitoring wells installed in the southern end of the Site (BH/MW07-22 and BH/MW08-22) that were dry to 300.4 m AMSL and 296.8 m AMSL throughout the monitoring period (Section 4.2.1; Figure A-6 and Table B-3).

6.2 Source Water Protection

A drinking-water threat is an activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water. The following activities are prescribed by the province of Ontario under O. Reg. 287/07 to be drinking water threats (i.e., Significant Drinking Water Threat Policy Categories):

1. The establishment, operation, or maintenance of a waste disposal site within the meaning of Part V of the *Environmental Protection Act*.

    a. Untreated sewage
    b. Waste disposal
    c. Mine tailings

2. The establishment, operation, or maintenance of a system that collects, stores, transmits, treats, or disposes of sewage.

    a. Stormwater management
    b. Wastewater treatment plants/sewer systems
    c. On-site sewage systems
    d. Industrial effluent

3. The application of agricultural source material to land.

4. The storage of agricultural source material.

5. The management of agricultural source material.

6. The application of non-agricultural source material to land.

7. The handling and storage of non-agricultural source material.

8. The application of commercial fertilizer to land.

9. The handling and storage of commercial fertilizer.

10. The application of pesticide to land.

11. The handling and storage of pesticide.

12. The application of road salt.

13. The handling and storage of road salt.

14. The storage of snow.

15. The handling and storage of fuel.

16. The handling and storage of a dense non-aqueous phase liquid (DNAPL).

17. The handling and storage of an organic solvent.

18. The management of runoff that contains chemicals used in the de-icing of aircraft.

19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.

20. An activity that reduces the recharge of an aquifer.

21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard. O. Reg. 385/08, s. 3.

22. The establishment and operation of a liquid hydrocarbon pipeline as per O. Reg. 385/08, s. 3.

As indicated in Section 2.3, and shown in Figure A-4, the Site lies in a SGRA. No protection policies are specified in the Source Protection Plan (SPP) (LERSPC, 2022b) for SGRA and, subsequently, such policies will not be applicable to the future development of the Site. However, as previously mentioned in Section 6.1, pre-development infiltration volumes will be at least maintained and likely exceeded post-development and, as such, the proposed development will not affect the existing groundwater recharge function that the Site provides to the underlying aquifers.

Stantec understands that septic beds are proposed for each industrial lot as part of the future redevelopment plan for the Site. The Source Protection Plan (SPP) (LESPC, 2022b) includes policies related to on-site sewage systems which apply to WHPAs and ICAs. As indicated in Section 2.3, the Site is not situated in a WHPA or ICA.

Potable water demands for the Site are proposed to be supplied by on-Site private wells. As indicated in Secion 2.3, the Site is not located within a WHPA-Q1-A or WHPA-Q2-A. Additionally, projected infiltration deficits resulting from the development will be addressed through the use of an on-Site SWM facility infiltration cell, resulting in post-development infiltration volumes to exceed pre-development volumes. (Section 6.1). As such, the Site proposes no threat to the quantity of source water available for use by muncipal production wells.

Snow removal and maintenance of roads and parking areas is likely to include the application of de-icing chemicals. The Contractor retained to apply these de-icing chemicals is advised to follow best management practices as identified in the Transportation Association of Canada Salt Management Guide (Second Edition) (https://www.tac-atc.ca/en/publications/ptm-saltmgmt-e).

6.3 Groundwater Dewatering

With the construction of below ground structures (e.g., building foundations) and servicing infrastructure (e.g., SWM facilities, sewers, and watermains) comes the potential of intercepting the groundwater table and, consequently, the need for short-term construction dewatering and/or the installation of permanent drainage systems (in the absence of waterproofing). Over the monitoring period from March 2022 to November 2023, groundwater was only encountered in the three monitoring wells in the north end of the Site at depths ranging from approximately 2.3 m BGS to 11.6 m BGS (303.2 m AMSL to 305.9 m AMSL) and these levels likely represent perched groundwater conditions, given that these wells are screened in lower permeability deposits of sandy silt to silty clay associated with ATB2. The monitoring wells in the central and southern areas of the Site were dry up to 6.0 m BGS or 296.8 m AMSL.

Where required, dewatering will result in the lowering of the groundwater table to the base of a given excavation and/or underground structure. The effects of local dewatering in general cannot be mitigated, since dewatering deliberately seeks to create an effect (i.e., lowering of groundwater levels). Stantec understands the Site will be developed with buildings expected to be slab on grade construction and that no storm and/or sanitary sewers or water servicing to the lots is planned (i.e., the lots will be privately serviced by individual water supply wells and subsurface sewage disposals systems). In addition, the projected base of the SWM facility infiltration cell (i.e., 301.5 m AMSL) will be constructed above the high groundwater table recorded in the southern end of the Site (i.e., where the groundwater table is found to

be located below an elevation of at least 296.8 m AMSL). As such, minimal to no groundwater dewatering during construction is anticipated for the Site.

6.3.1 Permitting

If excavations are anticipated to occur below the groundwater table and dewatering is required at volumes that exceed 50,000 L/day, registration of an MECP EASR or for a PTTW will be required for this dewatering to occur under O. Reg 64/16 and O. Reg 63/16A. A PTTW is required when groundwater volumes for construction dewatering are expected to exceed 400,000 L/day or when groundwater collected and discharged from a permanent drainage system exceeds 50,000 L/day. An EASR is required when construction dewatering volumes are projected to range from 50,000 L to 400,000 L/day.

Stantec notes that amendments made to EASR requirements by the MECP for construction dewatering include the following:

1. The ability to register multiple dewatering pits for a single project under the same EASR.
2. Allowing construction dewatering of up to 400,000 L/day for each dewatering pit as long as the dewatering zone of influence (ZOI) do not overlap.
3. Stormwater runoff into excavations does not count towards the 400,000 L/day water taking limit, however, registrants will at a minimum be required to keep a record of precipitation events, or if determined by a Qualified Person, detailed monitoring/documentation.
4. Registrants will be required to notify the local municipalities and conservation authorities if the water taking is intended to continue for more than 365 days.

When dewatering volumes are projected to be greater than 50,000 L/day, the following mitigation measures are likely to be required for either an EASR or PTTW application:

- **Groundwater Discharge Management** – Establishment of an appropriate dewatering system that will dissipate the energy and reduce the sediment content of discharging water for the purpose of limiting potential erosion effects if groundwater is to be discharged to a receiving surface water feature. Common measures include the use of sediment control basins, erosion pads, geotextile filter bags, and the positioning of straw bale/filter cloth barriers downgradient of the discharge point. The quality of the groundwater discharge must also meet Provincial Water Quality Objectives (PWQO) (MECP, 1994) if discharging to a surface water receiver. When discharging to the regional sewer system for disposal, the quality of this water must not exceed parameter concentrations as listed under the Region of Waterloo Sewer Use By-Law.
- **Private Well Monitoring** – The monitoring of private wells expected to be located within the dewatering zone of influence (ZOI) (as estimated from a detailed dewatering assessment) for drawdown interference, which could potentially affect the operation of private wells with regards to water quantities. The providing of affected well owners with temporary potable water supplies or reducing dewatering rates and/or duration would be required if notable interference effects are observed.

6.4 Municipal and Private Well Supply Interference

The municipal water supply system for the Township of North Dumfries is supplied by groundwater wells. No municipal wells are located within 500 m of the Site. The nearest municipal wells are associated with the Ayr Well Field, which is situated greater than 4.5 km southwest of the Site. The Ayr Well Field production wells (A1, A2 and A3) are screened from approimately 43 m to 51 m BGS in the Pre-Catfish Creek Aquifer (AFD1), which is overlain by an aquitard and aquifer sequence including the Middle Maryhill Till (ATB2) and Waterloo Moraine Sands (AFB1/AFB2) (LESPC, 2022a). Given the distance to the Site and depth of the production wells, future construction/operation activities at the Site are not expected to interfere with the aquifers in which the production wells obtains their groundwater supplies.

A review of MECP WWRs identified 58 records mapped within 500 m of the Site (Figure A-3). From these 58 WWRs, a total of 33 wells are identified as being used for the purposes of domestic/livestock (7), domestic/commercial (1), industrial/commercial (24) and irrigation (1), with the remaining records identified as abandoned, observation/monitoring/test wells, or provided no information on use. Details of these wells are summarized in Table B-1. Most private supply wells surrounding the Site are utilized by the commercial/industrial properties to the west of the Site (along Earl Thomson Road) and to the northwest of the Site (along Cedar Creek Road and Cochrane Drive) (Figure A-1).

The majority of the private supply wells are deeper overburden installations, with 28 supply wells constructed to depths between 21.3 m BGS and 60.7 m BGS, three wells constructed to depths between 18.0 m BGS and 18.6 m BGS, and only one shallow overburden well constructed to a depth less than 10 m BGS (Table 1). One well (WWR 6503967) is contructed in bedrock to a depth of 96.9 m BGS. The nearest private supply well (WWR 6509243) is mapped approximately 28 m west of the Site and appears to be associated with the property at the south end of Earl Thompson Road. This well was constructed in October 2002 to a depth of 29.9 m BGS in the overburden for domestic/commercial use. Most nearby private wells appear to be constructed in the fine sand to coarse sand and gravel deposits of AFB1/AFB2.

Based on the typical depth of private wells surrounding the Site (see Section 6.6) together with the future development plan for the Site (i.e., no construction dewatering likely required), no private well interference from on-Site construction activities is anticipated.

6.5 Subsurface Sewage Disposal Systems - Nitrate Loading

As shown Figure A-1, seven industrial lots covering an area of approximately two hectares each will be privately serviced by individual subsurface sewage disposal systems. A discussion on the potential design options for the sewage systems is provided in the Sewage System Feasibility Study (Stantec, 2022b); however, for this preliminary sewage loading evaluation, Stantec assumes that each lot will be serviced by a conventional septic system consisting of a septic bed having no tertiary treatment add-on. The sewage loading effects to the local groundwater system presented in this evaluation is to be treated as a high-level exercise and that a more detailed evaluation will need to be performed during the detailed design stages of the project when the future commercial use, layout of the septic system footprint, number of employees, and quality of wastewater produced for each lot is clarified.

Nitrate is a critical parameter of concern when assessing the potential effects to groundwater quality and, subsequently, any downgradient groundwater receptors (e.g., private water supply wells) of sewage effluent plumes generated by the septic systems. Possible attenuation mechanisms for nitrate include dilution by dispersion in the groundwater flow system, plant uptake, and denitrification; however, in assessing the attenuation of nitrate from the groundwater system, only dilution is accepted by the MECP (1996) as a quantifiable attenuation mechanism for this parameter. The application of this attenuating mechanism in the evaluation involves using the precipitation and/or stormwater infiltration / recharge that occurs downgradient of the septic bed plume area to dilute groundwater nitrate to acceptable downgradient concentration objectives. Based on regional groundwater flow patterns, sewage effluent discharging to the shallow groundwater system from the proposed septic beds will flow through the predominantly sand, sand and gravel, and gravel deposits of AFB1/AFB2 in an easterly direction towards Cedar Creek (Figure I-1, Appendix I). The concentration of nitrate that will be in groundwater upon reaching a downgradient receptor can be calculated using the following simplified mass balance model:

$$CPB = [((MS + MP)(1000000)) / (RS + RP)]$$

where, CPB = groundwater nitrate concentration at downgradient receptor (mg/L)

MS = mass of nitrate in sewage effluent discharge (kg/yr)

MP = mass of nitrate in precipitation infiltration (kg/yr)

RS = sewage effluent recharge volume (L/yr)

RP = precipitation recharge volume (L/yr)

For this evaluation, Stantec has selected the location of the nearest private residential water supply well downgradient / east of the Site (i.e., at 2407 Cedar Creek Road; Figure I-1, Appendix I) to represent the downgradient boundary / receptor of groundwater affected by the sewage effluent plume flowing from the future industrial development. The inputs used in the above mass balance model equation are described below, with the subsequent calculations being presented in Table B-10.

MS – As per the Water and Sewage System Feasibility Study (Stantec, 2022b), the combined sewage flow generated from the seven proposed septic systems (i.e., one per lot) from a projected total of 303 employees is 22,732 L/day, equating to an average sewage effluent volume of 3,247 L/lot/day. As per the MECP (1996), Stantec assumes that the sewage effluent will have a nitrate concentration of 40 mg/L (recognizing that this a typical concentration assumed for a single residential dwelling and will be used as a surrogate as no details on the quality of wastewater generated by the septic systems is available at this time). Using the above input parameters, the total mass of nitrate that will discharge to the shallow groundwater system on an annual basis from the proposed development is estimated at 332 kg (Table B-10).

MP – The mass of nitrate entering the groundwater system from infiltrating precipitation is assumed to be negligible.

RS – Assuming an average flow of 3,247 L/lot/day, the total volume of water that will recharge the groundwater system from the septic beds on an annual basis is 8,296,085 L.

RP – Based on the MECP (2008) Design Guidelines for Sewage Works, a constant groundwater recharge rate of 0.25 m/year is used in sewage plume dilution calculations, with this value acting as a surrogate for all potential subsurface mechanisms involved with the attenuation of a specified contaminant (i.e., nitrate). Stantec has assumed that the total area available for precipitation infiltration / dilution of the sewage plume will include the remaining post-development pervious area of the Site (10% of 180,600 m^2 = 18,060 m^2) together with approximately 180,000 m2 of downgradient agricultural lands positioned between the Site and private well servicing the farm at 2407 Cedar Creek Road. Using the previously mentioned input parameters, the total volume of infiltrating water that will recharge the regional groundwater system containing the sewage plume on an annual basis is 49,515,000 L.

Using the above loading calculation, the nitrate concentration estimated to occur in groundwater reaching the downgradient receptor (i.e., private well at 2407 Cedar Creek Road) is 5.7 mg/L (Table B-10), which is below the limit of 10 mg/L for nitrate set by MECP (1996) and below the ODWS (MOE, 2006).

Based on the results of the preliminary nitrate loading assessment, unacceptable groundwater quality effects to downgradient receptors (i.e., private water supply wells) are not anticipated from the proposed development.

6.6 Spill Containment and Response

The potential exists for spills during any construction activity, with the most probable type of spill occurring being attributable to the refuelling of major construction equipment that cannot readily leave the Site (e.g., earth movers). The potential impacts of a spill could be the contamination of soils, groundwater and/or surface water. By implementing proper protocols for the handling of fuels and lubricants during construction, the risk of a spill occurring will be greatly reduced. The procedures to be implemented to prevent onsite spills are as follows:

- All trucks or other road vehicles would be refueled and maintained offsite, where practicable.
- Refueling and lubrication of other construction equipment would not be allowed within 30 m of a drainage system or dewatering excavation.
- Regular inspections of hydraulic and fuel systems on machinery, with leaks being repaired immediately upon detection or the equipment being removed from Site.
- Spill kits containing absorbent materials would be kept on hand; and
- Implement best management practices and develop an emergency spill response plan.

Given that anticipated construction activities at the Site are not expected to involve the storage or use of bulk chemicals or fuels, a potential spill that may occur would be localized and involve a small volume of material. If there were to be an accidental release of a deleterious substance, the higher permeability soils that cover the Site will allow the rapid infiltration and movement of these substances through the subsurface, causing potential harm to the quality of the groundwater system. Overall, standard containment facilities and emergency response materials are to be maintained on-Site as required, with refuelling, equipment maintenance, and other potentially contaminating activities being confined to designated areas. As appropriate, spills are to be reported immediately to the MECP Spills Action Centre.

7 Conclusions

The following conclusions are provided based on the completed hydrogeological assessment:

1. Stratigraphic conditions beneath the Site consist predominantly of surficial topsoil (silty sand) overlying native deposits of silty sand, sand and/or gravel interpreted to represent the Waterloo Moraine and Equivalents (AFB1/ATB2) aquifer deposits. Localized sandy silt and/or silty clay deposits, inferred as Middle Maryhill Till and equivalents (ATB2) aquitard deposits, were encountered in the northern portion of the Site underlying the sandy and gravelly deposits.

2. Bedrock was not encountered during the Site investigation. Bedrock beneath the Site is mapped as Guelph Formation dolostone and is reported to occur at a depth of approximately 82.3 m BGS near the Site based on MECP well record data.

3. Over the monitoring period (i.e., March 2022 to November 2023, groundwater was encountered in three of the eight on-Site monitoring wells, which occur in the northern portions of the property (i.e., BH/MW01-22 to BH/MW03-22). Groundwater levels ranged from approximately 2.3 m BGS (BH/MW03-22) to 11.6 m BGS (BH/MW02-22), equating to elevations ranging from approximately 303.2 m to 305.9 m AMSL and appear to represent localized perched groundwater conditions, given that these wells are screened in or slightly above less permeable sandy silt/silty clay deposits in this area of the Site. Monitoring wells located in the central and southern areas of the Site (i.e., BH/MW04-22 to BH/MW08-22) were dry throughout the monitoring period and indicate that the groundwater table occurs below an elevation of 296.8 m AMSL in this portion of the Site.

4. Regional mapping as presented in Matrix Solutions Inc. *et. al*. (2019) (Figure GW-13, Appendix E) suggests that groundwater flow through the aquifer deposits of AFB1/AFB2 from the northwest to the southeast beneath the Site towards Cedar Creek.

5. Regional mapping provided by the GRCA (2024) indicates that annual groundwater recharge rates across the Site range from 300 to 400 mm/year.

6. In-situ hydraulic response testing completed on BH/MW02-22 indicates that the horizontal hydraulic conductivity of the sandy silt deposits of ATB2 encountered beneath the northern portion of the Site is in the range of 4.0×10^{-6} m/s, equating to an estimated infiltration rate of 36 mm/hour.

7. Guelph Permeameter testing completed on the native silty sand to sand and gravel deposits of AFB1/AFB2 show these deposits to have vertical hydraulic conductivities that range from 3.8×10^{-6} m/s to 2.9×10^{-5} m/s, for a geometric mean of 2.0×10^{-5} m/s. These vertical hydraulic conductivities convert to infiltration rates ranging from 66 mm/hour to 114 mm/hour, for an average infiltration rate of 103 mm/hour.

8. Water quality sampling results from local private wells drawing from the AFB1/AFB2 aquifer indicates that this groundwater is largely classified as calcium-bicarbonate type water. Private wells situated close to Earl Thompson Road had sodium-chloride to mixed calcium-magnesium chloride type water, likely a reflection of salt-laden runoff from road salting activities infiltrating and recharging the groundwater system.

9. No tested parameters were detected above their applicable standards ODWS health-related standard in the groundwater samples collected from local private wells. Groundwater quality for the private wells exceeded non-health related criteria for one or more of hardness, total dissolved solids, total iron, chloride, and sodium, which is typical in southern Ontario aquifers.

10. Annual pre-development infiltration at the Site is projected to be reduced by 44,566 m^3 under the post-development condition without mitigation. However, to assist in mitigating this projected infiltration deficit, runoff captured by post-development Catchments 202 and 204 will be directed to the proposed SWM facility and returned to the subsurface via an infiltration cell, resulting in an estimated annual stormwater volume of 110,616 m^3 being returned to the subsurface. Subsequently, pre-development infiltration volumes at the Site will be exceeded by approximately 66,050 m^3 under the post-development condition.

11. The Site does not intercept a WHPA, HVA, IPZ or ICA; however, the Site is classified as a SGRA. Overall, no protection policies specified in the SPP apply to this Site. However, suitable mitigation measures should be in place at the Site to address potential spills that may occur during construction.

12. Potable water demands for the Site are proposed to be supplied by on-Site private wells. The Site is not located within a WHPA-Q1-A or WHPA-Q2-A. Additionally, projected infiltration deficits resulting from the development will be addressed via an on-Site SWM facility infiltration cell, resulting in post-development infiltration volumes to exceed pre-development volumes. As such, the Site proposes no threat to the quantity of source water available for use by regional municipal production wells.

13. The high groundwater table is expected to occur below proposed subsurface foundations and associated infrastructure proposed for the Site and, as such, minimal to no groundwater dewatering during the construction of the proposed development is anticipated.

14. Based on the depth of private wells surrounding the Site together with the future development plan for the Site (i.e., no construction dewatering likely required), no interference to off-Site private well quantities from on-Site construction activities are anticipated.

15. Seven industrial lots covering an area of approximately two hectares each will be privately serviced by individual subsurface sewage disposal systems. Based on the results of the preliminary nitrate loading assessment, unacceptable groundwater quality effects to downgradient receptors (i.e., private water supply wells) are not anticipated from the proposed development. However, the projected sewage loading effects to the local groundwater system presented in this evaluation is to be treated as a high-level exercise and that a more detailed evaluation will need to be performed during the detailed design stages of the project when the future commercial use, layout of the septic system footprint, number of employees, and quality of wastewater produced for each lot is clarified.

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Appendices

Appendix A Figures

Stantec

Legend

- Study Area
- Monitoring Well (Stantec, 2022)
- Guelph Permeameter (Stantec, 2022)
- Private Well - Water Quality Sample Location
- Cross-Section Location
- Topographic Contour (mAMSL)

Proposed Site Development

- Proposed Development Plan
- Proposed Building
- Proposed Septic Field
- Possible Well Location

0 100 200 metres

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Notes

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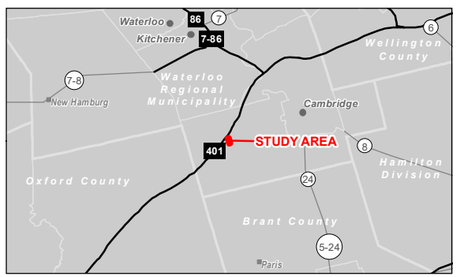

Project Location
Township of
North Dumfries

161414214 REVA
Prepared by CMC on 2024-03-20

Client/Project
CEDAR CREEK ROAD HOLDINGS INC.
HYDROGEOLOGIAL ASSESSMENT
2509 CEDAR CREEK ROAD, NORTH DUMFRIES

Figure No.
A-1

Title
Site Plan

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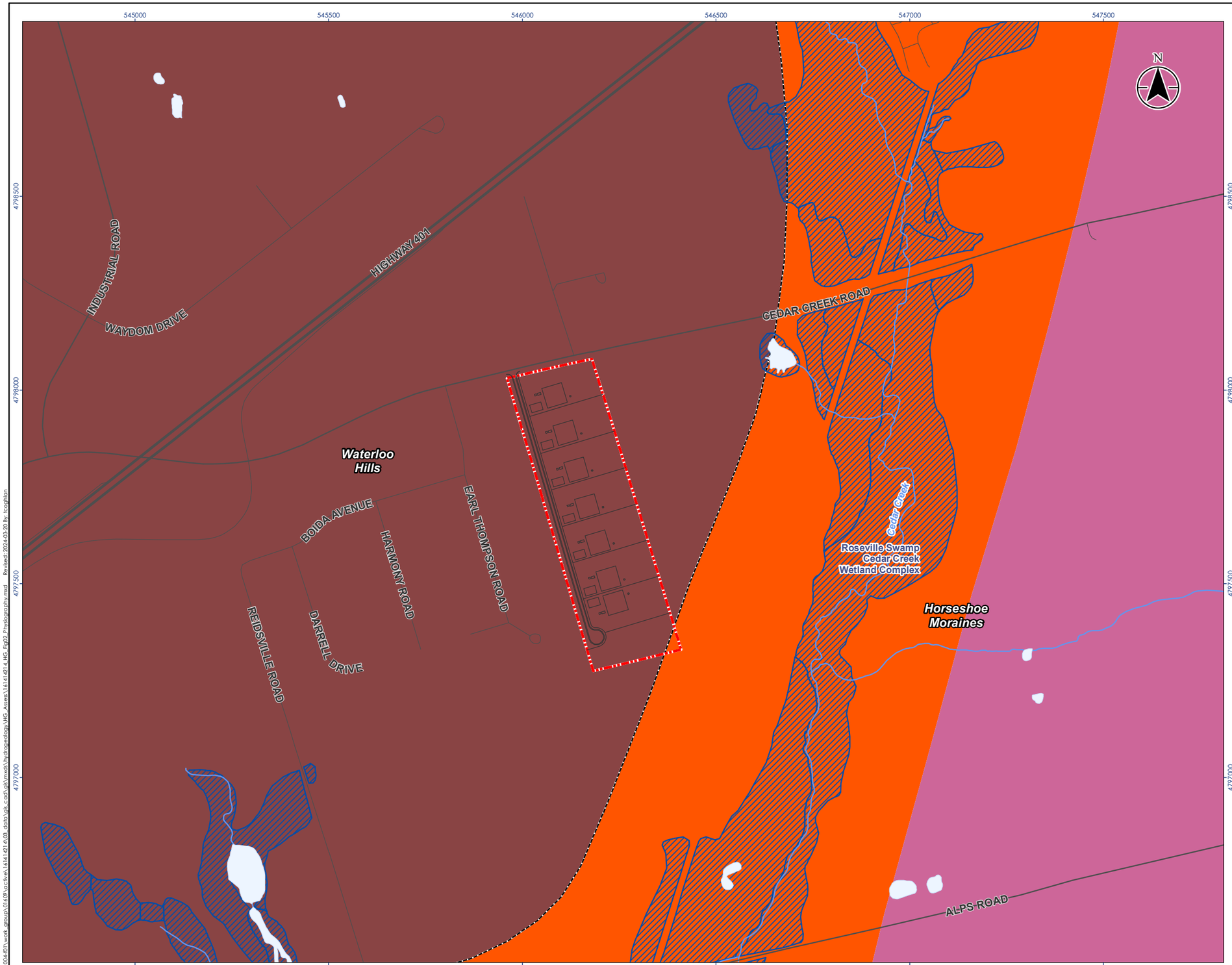

Stantec

Legend

- Study Area
- Proposed Development Plan

Base Features

- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)
- Physiographic Region Boundary

Physiography

- 4: Kame Moraines
- 3: Spillways
- 2: Till Moraines

0 250 500 m

1:10,000 (At original document size of 11x17)

Notes

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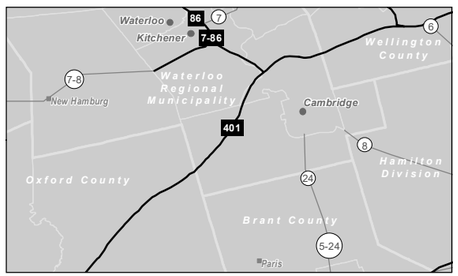
3. Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.



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Township of North Dumfries

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HYDROGEOLOGIAL ASSESSMENT
2509 CEDAR CREEK ROAD, NORTH DUMFRIES

Figure No.
A-2

Title
Physiography

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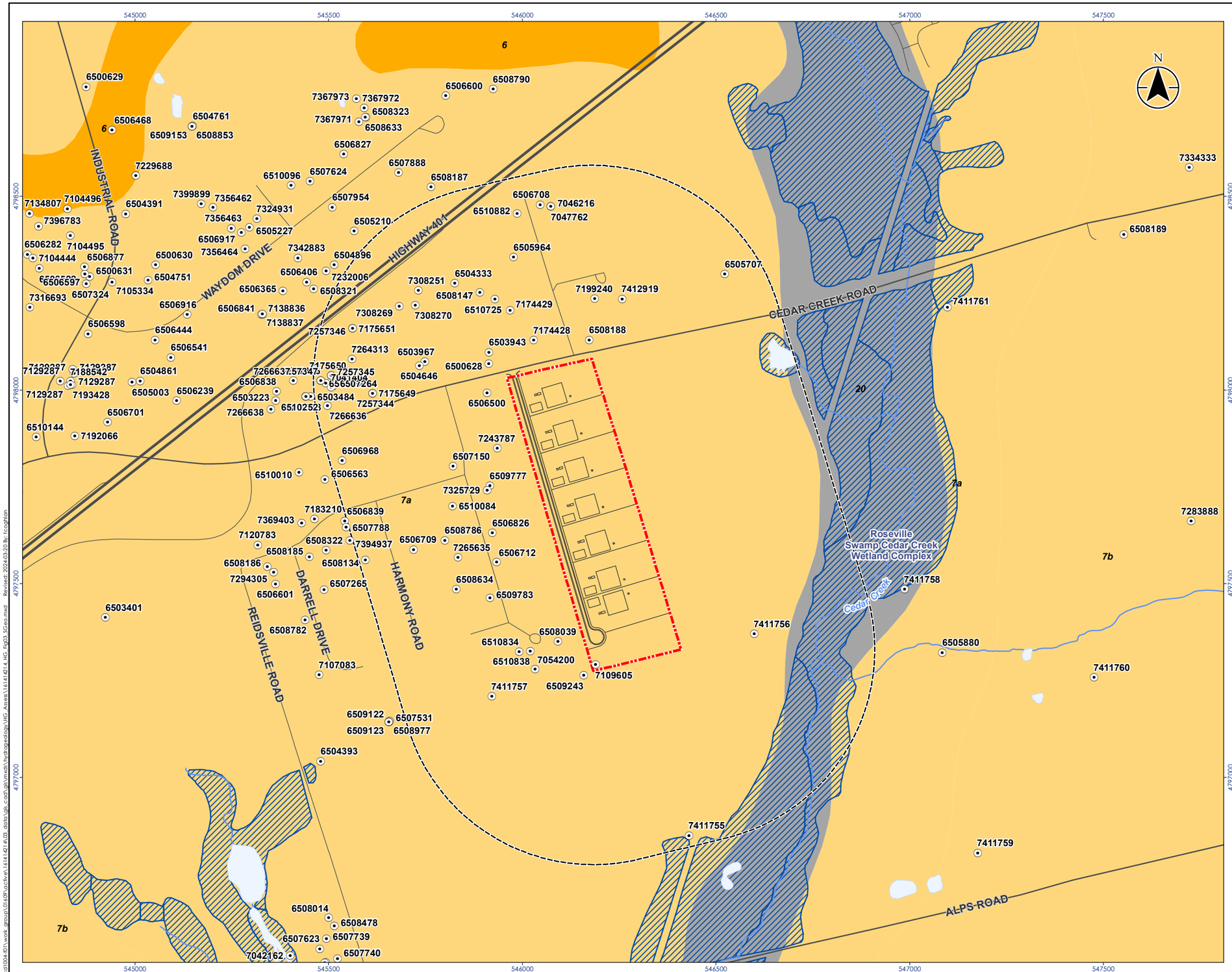

Stantec

Legend

- Study Area
- 500m Buffer of Study Area
- MECP Water Well Record
- Proposed Development Plan

Base Features

- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)

Surficial Geology

- 20: Organic deposits
- 7a: Glaciofluvial deposits (Sandy deposits)
- 7b: Glaciofluvial deposits (Gravelly deposits)
- 6: Ice-contact stratified deposits

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
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3. MECP water wells have been positioned based on published UTM coordinates and should be considered approximate.
4. Ontario Geological Survey 2010. Surficial geology of Southern Ontario: Ontario Geological

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Figure No.
A-3

Title
Surficial Geology

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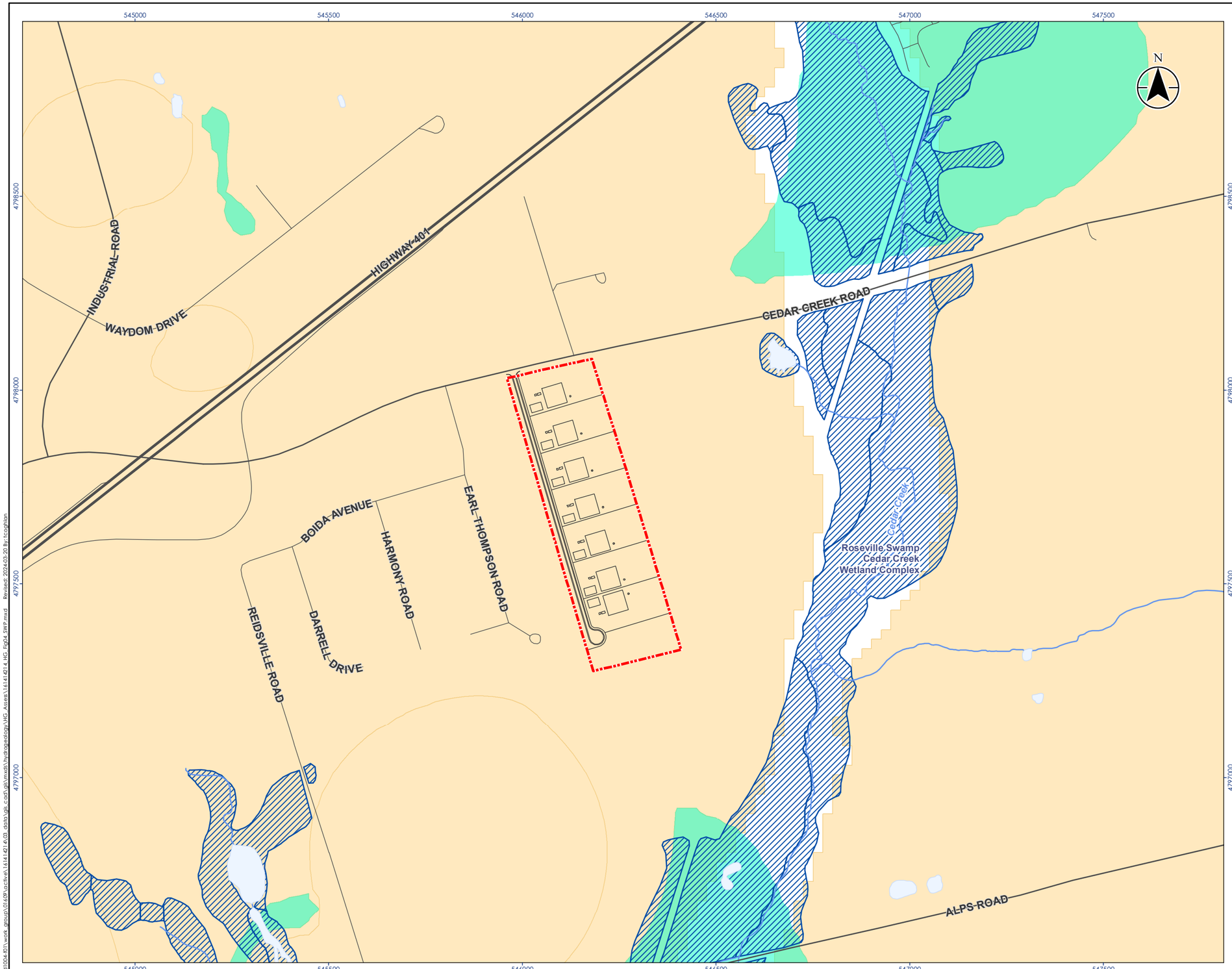

Stantec

Legend

- Study Area
- Proposed Development Plan
- Highly Vulnerable Aquifer
- Significant Groundwater Recharge Area

Base Features

- Watercourse
- Waterbody
- Wetland - Evaluated (Provincial)

0 250 500 m

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Notes

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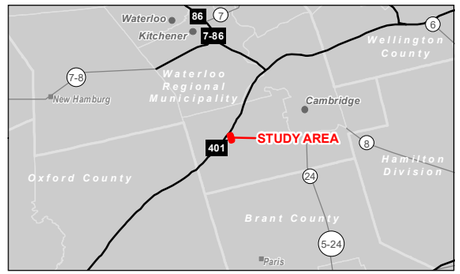

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Figure No.
A-4

Title
Source Water Protection

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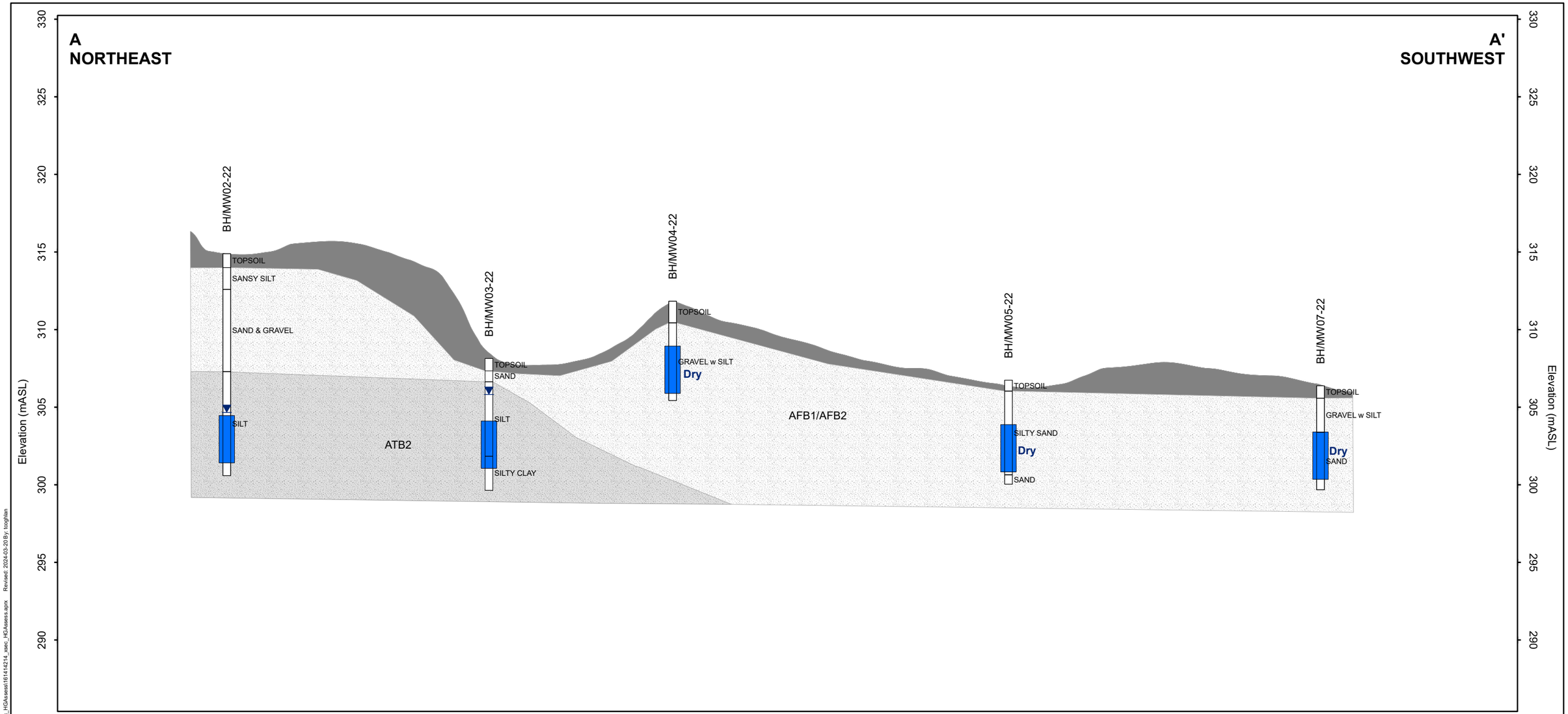

MW1-15 (OS m)

Sand

Well ID (Offset)

Stratigraphy

Water Level

Well Screen

Stratigraphy

- Topsoil
- Silty Sand to Sand & Gravel - Upper Waterloo Moraine Stratified Sediments and equivalents (AFB1) / Middle Waterloo Moraine Stratified Sediments and equivalents (AFB2) Deposits
- Silt to Silty Clay - Middle Marry Hill Till and Equivalents (ATB2) Deposits

10x Vertical Exaggeration

0 50 100 m

1:2,500 (At original document size of 11x17)

Notes
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Technical Review by xxx on xxxx-xx-xx

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2509 CEDAR CREEK ROAD, NORTH DUMFRIES

Figure No.
A-5

Title
Cross-Section A-A'

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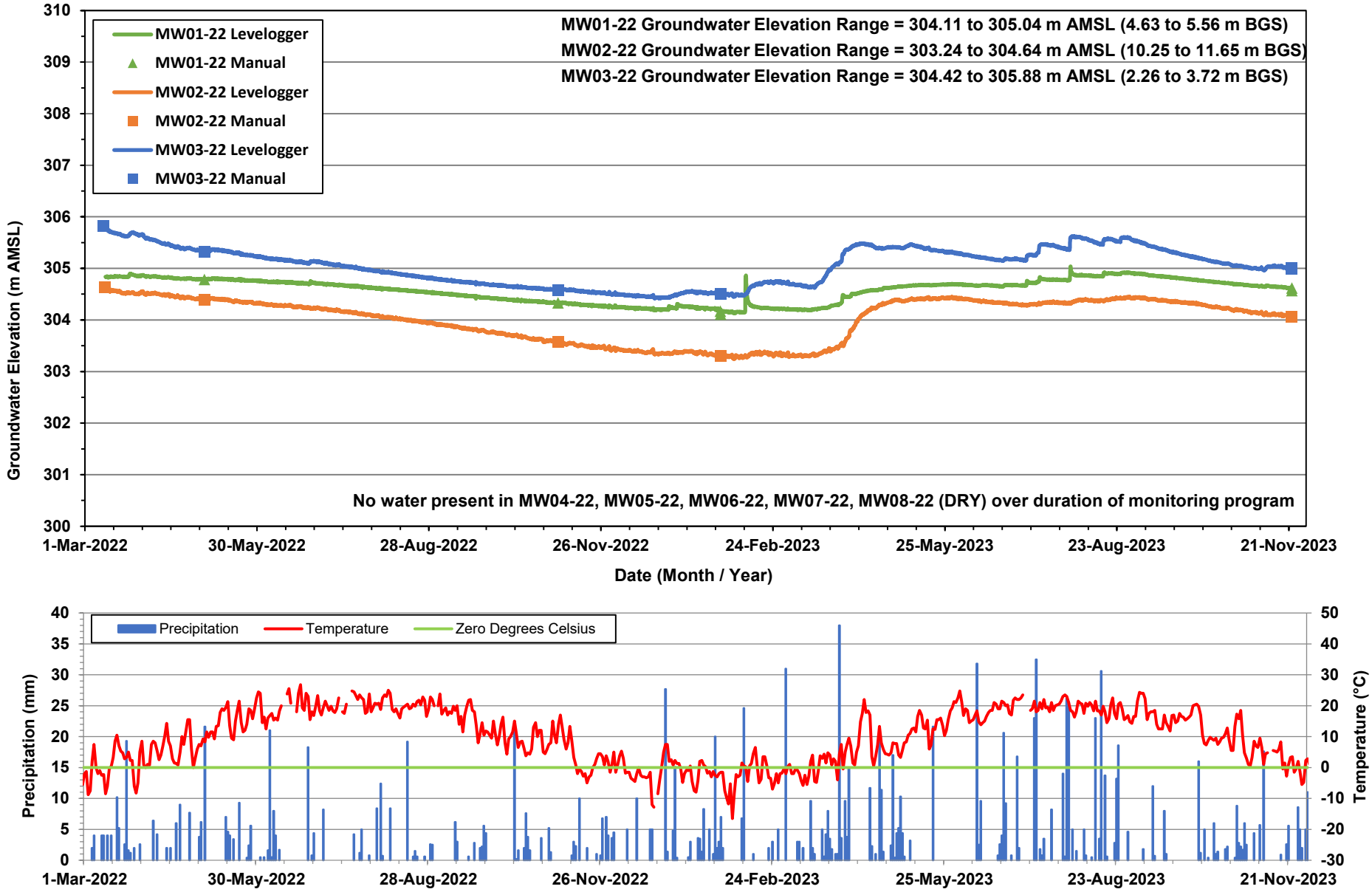

Precipitation and temperature data obtained from Environment Canada for the Roseville Climate Station (Station ID 6147188), accessed January 2024

Stantec

Project: HYDROGEOLOGICAL ASSESSMENT
2509 CEDAR CREEK ROAD, NORTH DUMFRIES, ON

Figure: **A-6**

Title: **HYDROGRAPHS - MONITORING WELLS**

Stantec

Legend

- Study Area
- Monitoring Well (Stantec, 2022)
- Private Well - Water Quality Sample Location
- Topographic Contour (mAMSL)
- 304.54 Groundwater Elevation
- Groundwater Contour
- Groundwater Flow Direction

Proposed Site Development

- Proposed Development Plan
- Proposed Building
- Proposed Septic Field
- Possible Well Location

0 100 200 metres

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Notes

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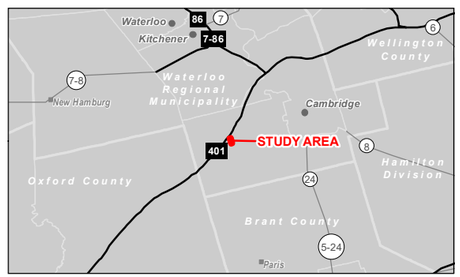

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HYDROGEOLOGIAL ASSESSMENT
2509 CEDAR CREEK ROAD, NORTH DUMFRIES

Figure No.
A-7

Title
High Groundwater Elevation Contours

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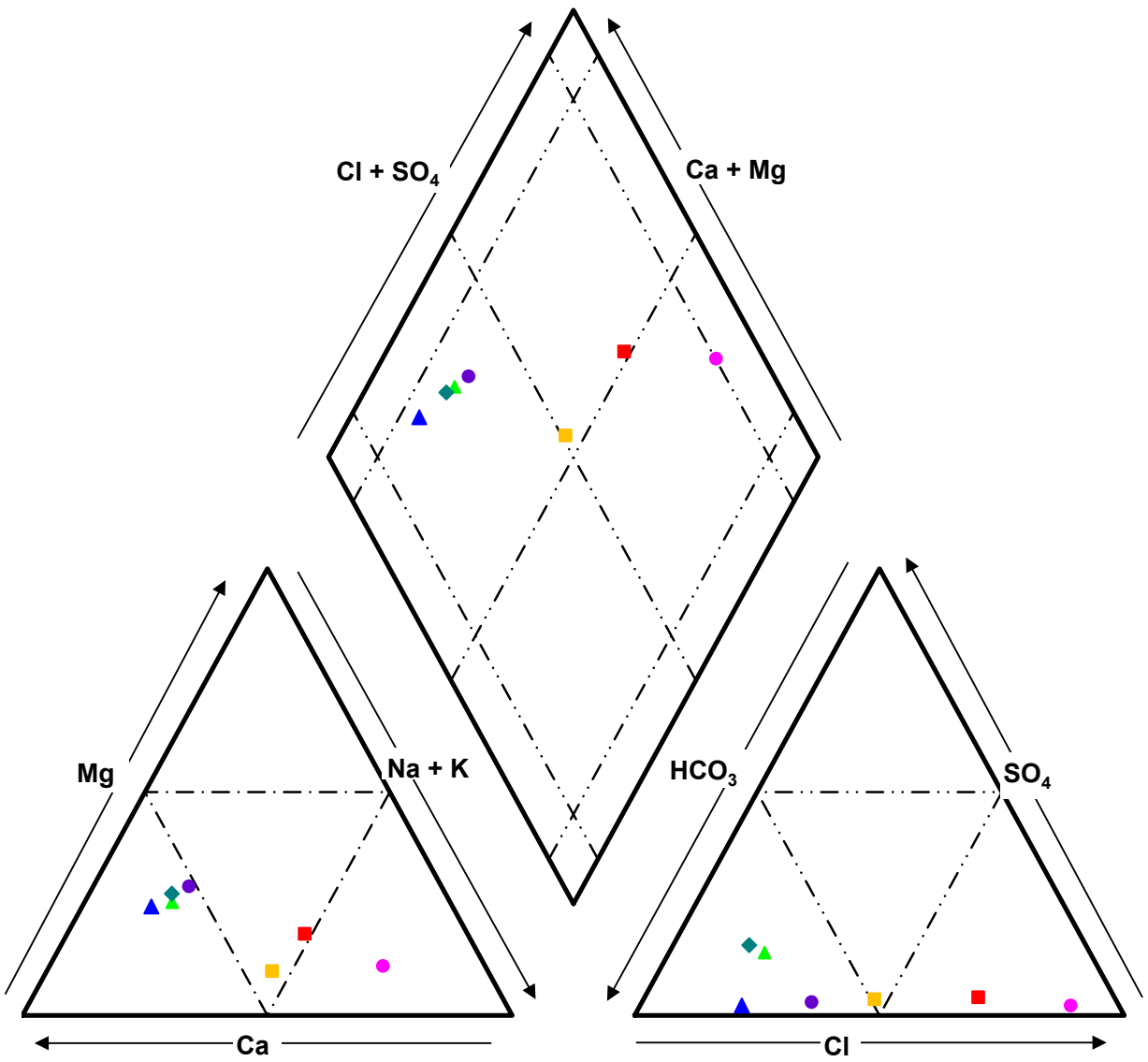

Stantec

HYDROGEOLOGICAL ASSESSMENT
2509 CEDAR CREEK ROAD, NORTH DUMFRIES
PIPER DIAGRAM

DATE:	SCALE:	PROJECT No.	FIGURE No.
7-May-24		161414214	**A-8**

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Stantec

Legend

- Study Area
- Monitoring Well (Stantec, 2022)
- Guelph Permeameter (Stantec, 2022)
- Private Well - Water Quality Sample Location
- Topographic Contour (mAMSL)
- Overland Flow Direction
- Pre-Development Drainage Area

Water Balance Sub-Areas

- Sub-Area A: Rolling to Hilly, Sand, Moderately Rooted Crops, 0% Impervious
- Sub-Area B: Rolling to Hilly, Sand, Pasture and Shrubs, 5% Impervious
- Sub-Area C: Rolling to Hilly, Sand, Moderately Rooted Crops, 0% Impervious
- Sub-Area D: Rolling to Hilly, Sand, Pasture and Shrubs, 0% Impervious

0 100 200 metres

1:4,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2024.
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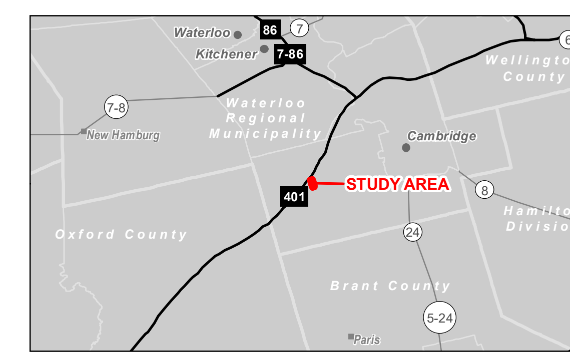


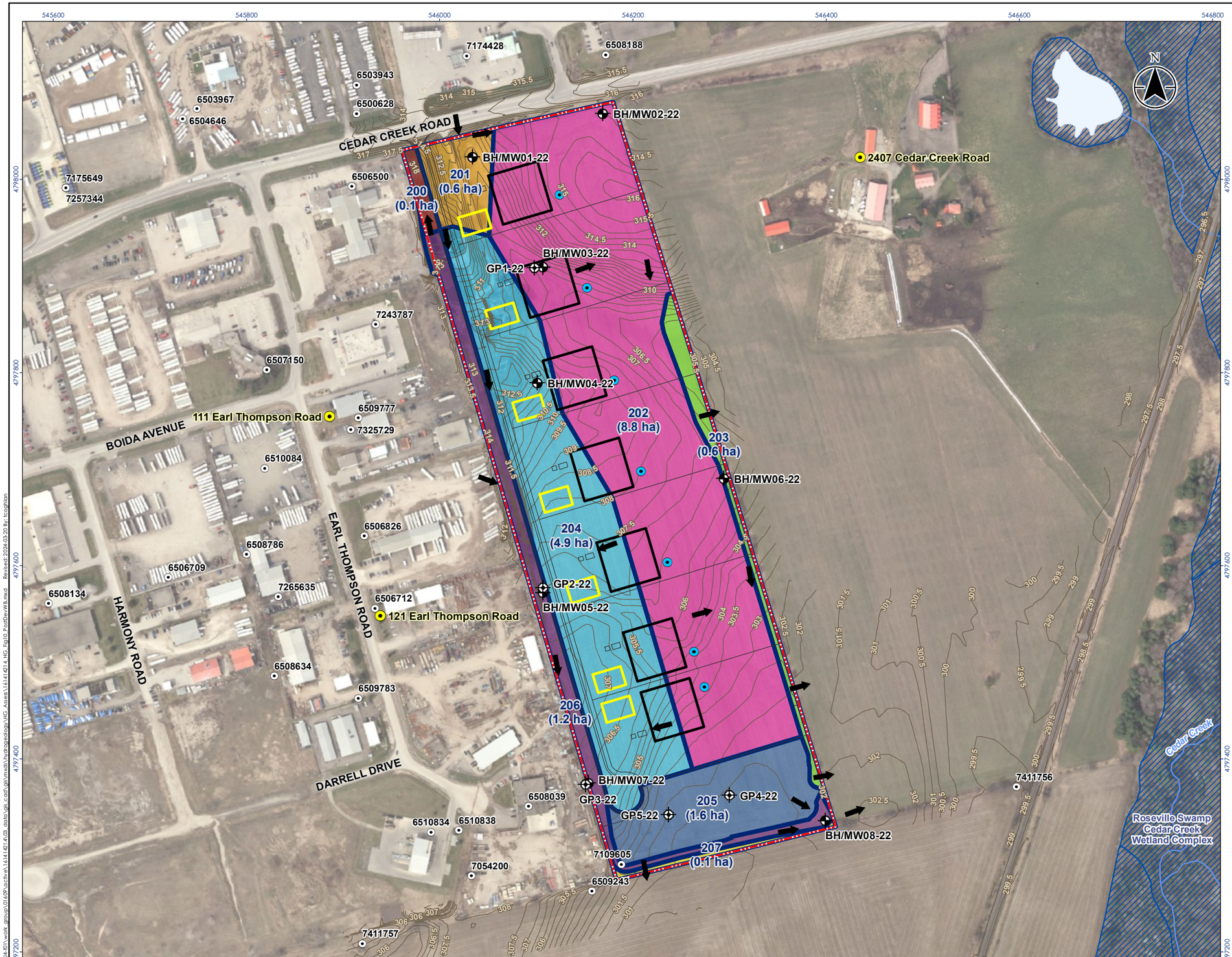
Project Location
Township of North Dumfries

161414214 REVA
Prepared by CMC on 2024-03-20

Client/Project
CEDAR CREEK ROAD HOLDINGS INC.
HYDROGEOLOGIAL ASSESSMENT
2509 CEDAR CREEK ROAD, NORTH DUMFRIES

Figure No.
A-9

Title
Pre-Development Water Balance



Stantec

Legend

- Study Area
- Monitoring Well (Stantec, 2022)
- Guelph Permeameter (Stantec, 2022)
- Private Well - Water Quality Sample Location
- Topographic Contour (mAMSL)

Proposed Site Development

- Proposed Development Plan
- Proposed Building
- Proposed Septic Field
- Possible Well Location
- Overland Flow Direction
- Post-Development Drainage Area

Water Balance Sub-Areas

- SWM Facility
- Sub-Area E: Rolling to Hilly, Sand, Urban Lawn, 0% Impervious
- Sub-Area F: Rolling to Hilly, Sand, Urban Lawn, 90% Impervious
- Sub-Area G: Rolling to Hilly, Sand, Urban Lawn, 90% Impervious
- Sub-Area H: Rolling to Hilly, Sand, Urban Lawn, 0% Impervious
- Sub-Area I: Rolling to Hilly, Sand, Urban Lawn, 90% Impervious
- Sub-Area K: Rolling to Hilly, Sand, Urban Lawn, 0% Impervious
- Sub-Area L: Rolling to Hilly, Sand, Urban Lawn, 0% Impervious

0 100 200 metres

1:4,000 (At original document size of 11x17)

Notes

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Project Location
Township of
North Dumfries

161414214 REVA
Prepared by CMC on 2024-03-20

Client/Project
CEDAR CREEK ROAD HOLDINGS INC.
HYDROGEOLOGIAL ASSESSMENT
2509 CEDAR CREEK ROAD, NORTH DUMFRIES

Figure No.
A-10

Title
Post-Development Water Balance

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Appendix B Tables

TABLE B-1
SUMMARY OF MECP WATER WELL RECORDS

MECP Well ID	Easting (m)	Northing (m)	Approx. Distance to Site (m)	Date Completed	Well Depth (m BGS)	Well Type	Depth to Bedrock (m BGS)	Static Water Level (m BGS)	Well Use	Additional Info / Comments
6500628	545914	4798068	60	27-Nov-59	39.6	Overburden	-	9.8	Livestock / Domestic	
6503943	545914	4798098	82	05-Jan-73	18.3	Overburden	-	15.2	Domestic	
6503967	545749	4798073	216	30-Jun-73	96.9	Bedrock	82.3	15.2	Industrial	
6504333	545826	4798276	280	17-Jul-75	43.9	Overburden	-	9.1	Domestic	
6504646	545734	4798063	229	04-Jul-77	28.3	Overburden	-	16.5	Commercial	
6505707	546523	4798299	407	07-Jun-85	9.8	Overburden	-	7.3	Domestic/Livestock	
6505964	545977	4798343	300	16-Aug-86	18.6	Overburden	-	10.7	Industrial	
6506500	545909	4797993	60	27-Oct-88	22.9	Overburden	-	16.5	Commercial	
6506708	546046	4798479	418	03-Oct-89	26.5	Overburden	-	15.5	Commercial	
6506709	545719	4797588	357	29-Sep-89	35.1	Overburden	-	21.0	Commercial	
6506712	545933	4797556	160	05-Sep-89	23.2	Overburden	-	13.7	Industrial	
6506826	545922	4797631	150	15-Dec-89	23.5	Overburden	-	16.5	Commercial	
6506968	545535	4797818	468	06-Nov-90	37.2	Overburden	-	21.9	Commercial	
6507150	545821	4797803	198	02-Apr-91	43.6	Overburden	-	14.3	Commercial	
6507196	545492	4798017	469	13-Aug-91	57.6	Overburden	-	16.8	Commercial	
6507264	545513	4798011	448	25-Nov-91	30.5	Overburden	-	18.0	Commercial	
6508039	546092	4797351	66	23-Jul-96	44.5	Overburden	-	2.4	Commercial	
6508134	545595	4797561	483	09-May-97	36.9	Overburden	-	23.5	Commercial	
6508147	545890	4798252	232	19-Aug-97	18.0	Overburden	-	10.7	Commercial	
6508188	546172	4798129	49	02-Dec-97	22.3	Overburden	-	15.2	Industrial	
6508634	545829	4797486	280	20-Jul-99	21.3	Overburden	-	14.6	Industrial	
6508786	545800	4797612	272	27-Nov-00	25.0	Overburden	-	17.7	Commercial	
6509243	546158	4797263	28	03-Oct-02	29.9	Overburden	-	20.4	Domestic / Commercial	
6509777	545916	4797753	121	02-Jun-04	29.0	Overburden	-	19.5	Industrial	111 EARL THOMPSON
6509783	545916	4797463	203	01-Jul-04	23.2	Overburden	-	12.3	Domestic	126 EARL THOMPSON RD
6510084	545819	4797701	229	23-Feb-05	29.9	Overburden	-	20.7	Domestic	115 EARL THOMPSON RD
6510725	545928	4798234	205	05-Jun-06	50.0	Overburden	-	9.2	Industrial	2492 CEDAR CREEK RD
6510834	545991	4797324	170	22-Sep-06	11.0	Overburden	-	-	Observation Well - Not Used	132 EARL THOMPSON RD
6510838	546020	4797326	142	06-Jul-06	43.3	Overburden	-	3.4	Domestic	132 EARL THOMPSON PL
6510882	545986	4798456	408	23-Aug-06	50.3	Overburden	-	9.7	Irrigation	2492 CEDAR CREEK RD
7041404	545506	4798007	455	17-Jan-07	-	Unknown	-	-	Abandoned	2616 CEDAR CREEK RD
7046216	546074	4798474	407	22-May-07	12.8	Overburden	-	-	Abandoned	2492 CEDAR CREEK RD
7047762	546074	4798474	407	20-Mar-07	-	Unknown	-	-	Abandoned	2492 CEDAR CREEK RD
7054200	546033	4797279	143	07-Dec-07	11.6	Overburden	-	-	Observation Well - Not Used	127 EARL THOMPSON RD
7109605	546188	4797291	0	26-May-08	12.1	Overburden	-	-	Observation Well - Monitoring	126 EARL THOMPSON PL
7127476	545479	4798024	482	27-Jul-09	20.3	Overburden	-	-	Observation Well - Monitoring	2616 CEDAR CREEK RD
7174428	546028	4798128	79	13-Dec-11	12.2	Overburden	-	-	Test Hole	2492 CEDAR CREEK RD
7174429	545967	4798206	169	14-Dec-11	12.2	Overburden	-	-	Test Hole	2492 CEDAR CREEK RD
7175650	545506	4798038	455	31-Dec-11	15.2	Overburden	-	-	Observation Well - Monitoring	2616 CEDAR CREEK RD
7175649	545613	4797991	350	31-Dec-11	18.3	Overburden	-	-	Observation Well - Monitoring	2616 CEDAR CREEK RD
7175651	545561	4798159	420	31-Dec-11	15.2	Overburden	-	-	Observation Well - Monitoring	2616 CEDAR CREEK RD
7199240	546186	4798236	156	10-Mar-13	35.0	Overburden	-	14.5	Commercial	4 COCHRANE DR
7243787	545934	4797850	76	15-Jun-15	60.7	Overburden	-	12.2	Commercial	109 EARL TOMPSON
7257344	545613	4797991	350	01-Feb-16	-	Unknown	-	-	Abandoned	2616 CEDAR CREEK RD
7257345	545506	4798038	455	01-Feb-16	-	Unknown	-	-	Abandoned	2616 CEDAR CREEK RD
7257346	545561	4798159	420	01-Feb-16	-	Unknown	-	-	Abandoned	2616 CEDAR CREEK RD
7257347	545479	4798024	482	01-Feb-16	-	Unknown	-	-	Abandoned	2616 CEDAR CREEK RD
7264313	545559	4798080	405	06-May-16	29.9	Overburden	-	15.7	Commercial	2616 CEDAR CREEK RD
7265635	545833	4797568	253	09-Mar-16	-	Unknown	-	-	-	
7266636	545496	4797959	470	28-Jun-16	-	Unknown	-	-	Abandoned	2616 CEDAR CREEK RD
7308251	545730	4798257	323	10-Oct-17	13.7	Overburden	-	-	Observation Well - Monitoring	2564 CEDAR CREEK RD
7308269	545681	4798216	335	11-Oct-17	16.8	Overburden	-	-	Observation Well - Monitoring	2564 CEDAR CREEK RD
7308270	545723	4798219	303	11-Oct-17	13.7	Overburden	-	-	Observation Well - Monitoring	2564 CEDAR CREEK RD
7325729	545908	4797741	132	27-Sep-18	29.9	Unknown	-	19.8	Industrial	113 EARL THOMPSON DR
7411755	546429	4796850	471	02-Dec-21	-	Unknown	-	-	-	
7411756	546597	4797371	185	01-Dec-21	-	Unknown	-	-	-	
7411757	545920	4797209	271	01-Dec-21	-	Unknown	-	-	-	
7412919	546256	4798235	172	25-Nov-21	-	Unknown	-	-	-	

Notes:
m BGS = meters below ground surface
- = data not available

TABLE B-2
MONITORING WELL CONSTRUCTION DETAILS

Well ID	UTM Coordinates		Elevations		Well Stick-up (m)	Well Depth (m BTOC)	Well Depth (m BGS)	Well Base Elevation (m AMSL)	Screened Interval				Screened Material Description [(a)] (% of Screened Interval)	Hydraulic Conductivity [(b)] (m/s)
	Northing	Easting	Top of Casing (m AMSL)	Ground Surface (m AMSL)					Top Elevation (m BGS)	Top Elevation (m AMSL)	Bottom Elevation (m BGS)	Bottom Elevation (m AMSL)		
MONITORING WELLS														
BH/MW01-22	4798023	546034	310.78	309.67	1.11	9.06	7.95	301.72	4.90	304.77	7.95	301.72	SAND (100%)	-
BH/MW02-22	4798068	546169	315.95	314.89	1.06	14.54	13.48	301.41	10.43	304.46	13.48	301.41	Sandy SILT (100%)	4.0E-06
BH/MW03-22	4797909	546107	309.25	308.14	1.11	8.19	7.08	301.06	4.03	304.11	7.08	301.06	Sandy SILT (70%) / Silty CLAY (30%)	-
BH/MW04-22	4797789	546101	312.82	311.83	0.99	6.93	5.94	305.89	2.89	308.94	5.94	305.89	SAND and GRAVEL (100%)	-
BH/MW05-22	4797572	546107	307.72	306.74	0.98	6.89	5.91	300.83	2.86	303.88	5.91	300.83	SAND (100%)	-
BH/MW06-22	4797690	546294	307.24	306.20	1.04	6.93	5.89	300.31	2.84	303.36	5.89	300.31	Gravelly SAND (100%)	-
BH/MW07-22	4797375	546154	307.41	306.38	1.03	7.06	6.03	300.35	2.98	303.40	6.03	300.35	SAND (100%)	-
BH/MW08-22	4797336	546399	302.79	301.79	1.00	6.02	5.02	296.77	1.97	299.82	5.02	296.77	Gravelly SAND (100%)	-

Notes:

(a) Refer to **Appendix F** for borehole and well construction logs
(b) Refer to **Appendix G** hydraulic conductivity analytical solutions

m AMSL = meters above mean sea level
m BGS = meters below ground surface
m BTOC = meters below top of well casing
- = data not available

TABLE B-3
GROUNDWATER LEVEL DATA - MONITORING WELLS

Well ID	Date	Time	Well Depth			Screen Length	Top of Casing Elevation	Ground Surface Elevation	Pipe Stick-up	Groundwater Level		
			(m BTOC)	(m BGS)	(m AMSL)	(m)	(m AMSL)	(m AMSL)	(m)	(m BGS) [1]	(m BTOC)	(m AMSL)
BH/MW01-22	10-Mar-22 2-May-22 3-Nov-22 27-Jan-23 22-Nov-23	4:00 PM 12:55 PM 12:43 PM 12:00 PM 12:33 PM	9.06	7.95	301.72	3.05	310.78	309.67	1.11	5.14 4.88 5.34 5.50 5.06	6.25 5.99 6.45 6.61 6.17	304.53 304.79 304.33 304.17 304.61
BH/MW02-22	11-Mar-22 2-May-22 3-Nov-22 27-Jan-23 22-Nov-23	9:50 AM 3:39 PM 12:30 PM 12:00 PM 1:27 PM	14.54	13.48	301.41	3.05	315.95	314.89	1.06	10.23 10.28 11.32 - 10.83	11.29 11.34 12.38 - 11.89	304.66 304.61 303.57 - 304.06
BH/MW03-22	10-Mar-22 2-May-22 3-Nov-22 27-Jan-23 22-Nov-23	1:32 PM 12:30 PM 12:47 PM 12:48 PM 12:30 PM	8.19	7.08	301.06	3.05	309.25	308.14	1.11	2.32 2.81 3.56 3.63 3.13	3.43 3.92 4.67 4.74 4.24	305.82 305.33 304.58 304.51 305.01
BH/MW04-22	10-Mar-22 2-May-22 3-Nov-22 27-Jan-23 22-Nov-23	2:10 PM 1:35 PM 1:49 PM 2:17 PM 12:22 PM	6.93	5.94	305.89	3.05	312.82	311.83	0.99	Dry to 5.94 Dry to 5.94 Dry to 5.94 Dry to 5.94 Dry to 5.94	Dry to 6.93 Dry to 6.93 Dry to 6.93 Dry to 6.93 Dry to 6.93	Dry to 305.89 Dry to 305.89 Dry to 305.89 Dry to 305.89 Dry to 305.89
BH/MW05-22	10-Mar-22 2-May-22 3-Nov-22 27-Jan-23 22-Nov-23	3:15 PM 1:48 PM 2:00 PM 2:23 PM 12:15 PM	6.89	5.91	300.83	3.05	307.72	306.74	0.98	Dry to 5.91 Dry to 5.91 Dry to 5.91 Dry to 5.91 Dry to 5.91	Dry to 6.89 Dry to 6.89 Dry to 6.89 Dry to 6.89 Dry to 6.89	Dry to 300.83 Dry to 300.83 Dry to 300.83 Dry to 300.83 Dry to 300.83
BH/MW06-22	11-Mar-22 2-May-22 3-Nov-22 27-Jan-23 22-Nov-23	11:00 AM 2:30 PM 2:00 PM 1:04 PM 12:15 PM	6.93	5.89	300.31	3.05	307.24	306.20	1.04	Dry to 5.89 Dry to 5.89 Dry to 5.89 Dry to 5.89 Dry to 5.89	Dry to 6.93 Dry to 6.93 Dry to 6.93 Dry to 6.93 Dry to 6.93	Dry to 300.31 Dry to 300.31 Dry to 300.31 Dry to 300.31 Dry to 300.31
BH/MW07-22	11-Mar-22 2-May-22 3-Nov-22 27-Jan-23 22-Nov-23	11:00 AM 2:03 PM 2:16 PM 2:40 PM 12:07 PM	7.06	6.03	300.35	3.05	307.41	306.38	1.03	Dry to 6.03 Dry to 6.03 Dry to 6.03 Dry to 6.03 Dry to 6.03	Dry to 7.06 Dry to 7.06 Dry to 7.06 Dry to 7.06 Dry to 7.06	Dry to 300.35 Dry to 300.35 Dry to 300.35 Dry to 300.35 Dry to 300.35

TABLE B-3
GROUNDWATER LEVEL DATA - MONITORING WELLS

Well ID	Date	Time	Well Depth			Screen Length	Top of Casing Elevation	Ground Surface Elevation	Pipe Stick-up	Groundwater Level		
			(m BTOC)	(m BGS)	(m AMSL)	(m)	(m AMSL)	(m AMSL)	(m)	(m BGS) [1]	(m BTOC)	(m AMSL)
BH/MW08-22	11-Mar-22	11:40 AM	6.02	5.02	296.77	3.05	302.79	301.79	1.00	Dry to 5.02	Dry to 6.02	Dry to 296.77
	2-May-22	2:40 PM								Dry to 5.02	Dry to 6.02	Dry to 296.77
	3-Nov-22	2:30 PM								Dry to 5.02	Dry to 6.02	Dry to 296.77
	27-Jan-23	2:51 PM								Dry to 5.02	Dry to 6.02	Dry to 296.77
	22-Nov-23	11:26 AM								Dry to 5.02	Dry to 6.02	Dry to 296.77

Notes:

(1) A negative value indicates that the water level measured within the pipe is located above ground surface

m BGS = meters below ground surface
m BTOC = meters below top of casing
DRY = no groundwater or surface water was observed in the piezometer or watercourse, respectively
- = measurement not available

TABLE B-4
INFILTRATION TESTING RESULTS

Testing Location ID	Test Type	Horizontal Hydraulic Conductivity (m/s)	Vertical Hydraulic Conductivity [2] (cm/s)	Vertical Hydraulic Conductivity [2] (m/s)	Infiltration Rate [1] (mm/hr)	Pit Depth (m BGS)	Screened Interval (m BGS)	Soil Substrate Tested
2509 Cedar Creek Road								
In-situ Hydraulic Response Testing (Deeper Deposits)								
BH/MW02-22	Rising Head Test	4.0E-06	-	4.0E-07	36	-	10.4 -13.5	Sandy SILT
Guelph Permeameter Testing (Surficial Deposits)								
GP1-22	Two-Head Method	-	2.8E-03	2.8E-05	113	0.77	-	Fine SAND, some silt
GP2-22	Two-Head Method	-	3.8E-04	3.8E-06	66	0.80	-	Silty SAND
GP3-22	Not Successful	-	-	-	-	0.75	-	SAND, trace silt and gravel
GP4-22	Two-Head Method	-	1.9E-03	1.9E-05	102	0.75	-	Fine SAND, trace silt and gravel
GP5-22	Two-Head Method	-	2.9E-03	2.9E-05	114	0.75	-	Fine SAND, trace silt and gravel
		Geometric Average =		**2.0E-05**	**103**			

Notes:

(1) Infiltration rate calculated based on established relationship between vertical hydraulic conductivity and infiltration rate presented in *Credit Valley Conservation and Toronto and Region Conservation (2010) Low Impact Stormwater Management Planning and Design Guideline - Version 1.0.*

(2) Vertical hydraulic conductivities assumed to be one order of magnitude lower than in-situ measured horizontal hydraulic constructivities

TABLE B-5
GROUNDWATER QUALITY RESULTS - ON-SITE MONITORING WELLS

Sample Location			BH/MW01-22	BH/MW02-22	BH/MW03-22
Sample Date			27-Jan-23	27-Jan-23	27-Jan-23
Sample ID			MW01-22	MW02-22	MW03-22
Sampling Company			STANTEC	STANTEC	STANTEC
Laboratory			BV	BV	BV
Laboratory Work Order			C326554	C326554	C326554
Laboratory Sample ID			UXN007	UXN006	UXN008
Sample Type	Units	ODWS			
General Chemistry					
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	2.0	2.0	1.8
Alkalinity, Total (as CaCO3)	mg/L	30-500[E]	280	280	220
Ammonia (as N)	mg/L	n/v	<0.050	<0.050	<0.050
Anion Sum	me/L	n/v	11.4	9.63	6.57
Bicarbonate(as CaCO3, Calculated)	mg/L	n/v	280	280	210
Cation Sum	me/L	n/v	12.3	9.88	6.77
Chloride	mg/L	250[C]	190	110	42
Dissolved Organic Carbon (DOC)	mg/L	5[C]	1.3	0.55	0.60
Electrical Conductivity, Lab	µmhos/cm	n/v	1,200	970	660
Hardness (as CaCO3)	mg/L	80-100[E]	**330[E]**	**400[E]**	**290[E]**
Ion Balance	%	n/v	3.90	1.27	1.54
Langelier Index (at 20 C)	none	n/v	0.877	0.876	0.768
Langelier Index (at 4 C)	none	n/v	0.630	0.628	0.519
Nitrate (as N)	mg/L	10.0_d[B]	1.19	6.59	**13.2[B]**
Nitrite (as N)	mg/L	1.0_d[B]	<0.010	<0.010	<0.010
Orthophosphate (as P)	mg/L	n/v	<0.010	<0.010	<0.010
pH, lab	S.U.	6.5-8.5[E]	7.89	7.88	7.95
Saturation pH (at 20 C)	none	n/v	7.02	7.00	7.19
Saturation pH (at 4 C)	none	n/v	7.26	7.25	7.44
Sulfate	mg/L	500_h[C]	20	13	6.2
Total Dissolved Solids (Calculated)	mg/L	500[C]	**640[C]**	**520[C]**	370
Total Suspended Solids	mg/L	n/v	8,500	6,600	12,000
Microbiological Analysis					
E. Coli/Fecal Coliform	cfu/100mL	0[A]	NOG	NOG	NOG
Total Coliform Background	cfu/100mL	n/v	NOG	NOG	NOG
Total Coliforms	cfu/100mL	0[A]	NOG	NOG	NOG
Metals					
Aluminum	mg/L	0.1[E]	0.012	<0.0049	<0.0049
Antimony	mg/L	0.006[B]	<0.00050	0.0011	0.0028
Arsenic	mg/L	0.01[B]	<0.0010	<0.0010	<0.0010
Barium	mg/L	1[B]	0.059	0.083	0.022
Beryllium	mg/L	n/v	<0.00040	<0.00040	<0.00040
Boron	mg/L	5[B]	0.018	<0.010	0.012
Cadmium	mg/L	0.005[B]	<0.000090	<0.000090	<0.000090
Calcium	mg/L	n/v	110	100	83
Cesium	mg/L	n/v	<0.00020	<0.00020	<0.00020
Chromium	mg/L	0.05[B]	<0.0050	<0.0050	<0.0050
Cobalt	mg/L	n/v	<0.00050	<0.00050	<0.00050
Copper	mg/L	1[C]	0.00099	<0.00090	<0.00090
Iron	mg/L	0.3[C]	<0.10	<0.10	<0.10
Lead	mg/L	0.01[B]	<0.00050	<0.00050	<0.00050
Lithium	mg/L	n/v	<0.0050	0.0063	<0.0050
Magnesium	mg/L	n/v	15	34	20
Manganese	mg/L	0.05[C]	<0.0020	<0.0020	<0.0020
Molybdenum	mg/L	n/v	<0.00050	<0.00050	0.00059
Nickel	mg/L	n/v	<0.0010	<0.0010	<0.0010
Phosphorus	mg/L	n/v	<0.10	<0.10	<0.10
Potassium	mg/L	n/v	2.6	0.89	1.4
Rubidium	mg/L	n/v	<0.00020	0.00072	0.00076
Selenium	mg/L	0.05[B]	<0.0020	<0.0020	<0.0020
Silicon	mg/L	n/v	3.3	7.2	4.4
Silver	mg/L	n/v	<0.000090	<0.000090	<0.000090
Sodium	mg/L	200_g[C] 20_g[D]	**130[D]**	**43[D]**	**21[D]**
Strontium	mg/L	n/v	0.16	0.18	0.11
Thallium	mg/L	n/v	<0.000050	<0.000050	<0.000050
Titanium	mg/L	n/v	<0.0050	<0.0050	<0.0050
Uranium	mg/L	0.02[B]	0.00038	0.00040	0.00044
Vanadium	mg/L	n/v	<0.00050	<0.00050	<0.00050
Zinc	mg/L	5[C]	<0.0050	<0.0050	<0.0050

TABLE B-5
GROUNDWATER QUALITY RESULTS - ON-SITE MONITORING WELLS

Notes:

ODWS	Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2006), in support of O.Reg 169/03 (January 1, 2018)
A	Schedule 1 - Microbiological Standards (expressed as a maximum)
B	Schedule 2 - Chemical Standards (expressed as a maximum acceptable concentration)
C	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Aesthetic Objectives
D	ODWS Table 4 - Medical Officer of Health Reporting Limit
E	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Operational Guidelines
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
d	Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).
g	The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
h	When sulfate levels exceed 500 mg/L, water may have a laxative effect on some people.
NOG	No data due to overgrowth. Total coliforms and / or E.coli detected

TABLE B-6
GROUNDWATER QUALITY RESULTS - OFF-SITE PRIVATE WELLS

Sample Location			111 Earl Thompson Road		121 Earl Thompson Road	2396 Cedar Creek Road		2407 Cedar Creek Road	
Sample Date			13-May-22	13-May-22	13-May-22	13-May-22	13-May-22	13-May-22	13-May-22
Sample ID			WG-161414214-20220513-SH3	WG-161414214-20220513-SH3 Lab-Dup	WG-161414214-20220513-SH2	WG-161414214-20220513-SH4	WG-161414214-20220513-SH4 Lab-Dup	WG-161414214-20220513-SH1	WG-161414214-20220513-SH1 Lab-Dup
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			BV	BV	BV	BV	BV	BV	BV
Laboratory Work Order			C2D0478	C2D0478	C2D0478	C2D0478	C2D0478	C2D0478	C2D0478
Laboratory Sample ID			SPU232	SPU232	SPU231	SPU233	SPU233	SPU230	SPU230
Sample Type	Units	ODWS		Lab Replicate			Lab Replicate		Lab Replicate
General Chemistry									
Alkalinity, Bicarbonate (as CaCO3)	mg/L	n/v	290	-	260	260	-	250	-
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	2.8	-	2.2	2.8	-	2.7	-
Alkalinity, Total (as CaCO3)	mg/L	30-500[E]	300	300	270	260	-	250	-
Ammonia (as N)	mg/L	n/v	<0.050	-	<0.050	<0.050	-	<0.050	<0.050
Anion Sum	me/L	n/v	21.7	-	54.1	8.24	-	7.81	-
Cation Sum	me/L	n/v	22.5	-	55.1	8.48	-	8.12	-
Chloride	mg/L	250[C]	**520[C]**	-	**1,700[C]**	54	-	40	-
Dissolved Organic Carbon (DOC)	mg/L	5[C]	0.71	-	0.56	0.47	-	<0.40	-
Electrical Conductivity, Lab	µmhos/cm	n/v	2,400	2,400	6,100	810	-	760	-
Hardness (as CaCO3)	mg/L	80-100[E]	**590[E]**	-	**870[E]**	**350[E]**	-	**360[E]**	-
Ion Balance	%	n/v	1.74	-	0.880	1.43	-	1.90	-
Langelier Index (at 20 C)	none	n/v	1.09	-	1.01	1.01	-	0.995	-
Langelier Index (at 4 C)	none	n/v	0.843	-	0.772	0.759	-	0.747	-
Nitrate (as N)	mg/L	10.0_d[B]	3.69	-	0.97	5.97	-	7.06	-
Nitrite (as N)	mg/L	1.0_d[B]	<0.010	-	<0.010	<0.010	-	<0.010	-
Orthophosphate (as P)	mg/L	n/v	0.012	-	<0.010	<0.010	-	<0.010	-
pH, lab	S.U.	6.5-8.5[E]	8.01	8.03	7.95	8.07	-	8.06	-
Saturation pH (at 20 C)	none	n/v	6.92	-	6.93	7.06	-	7.06	-
Saturation pH (at 4 C)	none	n/v	7.17	-	7.18	7.31	-	7.31	-
Sulfate	mg/L	500_h[C]	42	-	58	53	-	55	-
Total Dissolved Solids (Calculated)	mg/L	500[C]	**1,200[C]**	-	**3,100[C]**	460	-	440	-
Total Suspended Solids	mg/L	n/v	2	2	2	1	-	<1	-
Microbiological Analysis									
Escherichia coli (E.coli)	cfu/100mL	0[A]	0	-	0	0	-	0	-
Total Coliform Background	cfu/100mL	n/v	0	-	0	17	-	0	-
Total Coliforms	cfu/100mL	0[A]	0	-	0	**1[A]**	-	0	-
Total Metals									
Aluminum	mg/L	0.1[E]	<0.0049	-	<0.0049	0.0077	0.0055	0.0093	-
Antimony	mg/L	0.006[B]	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	-
Arsenic	mg/L	0.01[B]	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	-
Barium	mg/L	1[B]	0.29	-	0.28	0.088	0.091	0.098	-
Beryllium	mg/L	n/v	<0.00040	-	<0.00040	<0.00040	<0.00040	<0.00040	-
Boron	mg/L	5[B]	0.014	-	0.014	0.012	0.012	0.011	-
Cadmium	mg/L	0.005[B]	<0.000090	-	<0.000090	<0.000090	<0.000090	<0.000090	-
Calcium	mg/L	n/v	150	-	230	96	97	98	-
Chromium	mg/L	0.05[B]	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	-
Cobalt	mg/L	n/v	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	-
Copper	mg/L	1[C]	0.013	-	0.013	<0.00090	<0.00090	0.0010	-
Iron	mg/L	0.3[C]	<0.10	-	0.11	**0.35[C]**	**0.35[C]**	<0.10	-
Lead	mg/L	0.01[B]	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	-
Lithium	mg/L	n/v	0.0070	-	0.013	<0.0050	<0.0050	<0.0050	-
Magnesium	mg/L	n/v	50	-	74	26	26	29	-
Manganese	mg/L	0.05[C]	0.0037	-	0.0047	<0.0020	<0.0020	<0.0020	-
Molybdenum	mg/L	n/v	<0.00050	-	0.00056	<0.00050	<0.00050	<0.00050	-
Nickel	mg/L	n/v	<0.0010	-	<0.0010	<0.0010	<0.0010	<0.0010	-
Phosphorus	mg/L	n/v	<0.10	-	<0.10	<0.10	<0.10	<0.10	-
Potassium	mg/L	n/v	2.3	-	4.1	1.2	1.2	1.5	-
Selenium	mg/L	0.05[B]	<0.0020	-	<0.0020	<0.0020	<0.0020	<0.0020	-
Silicon	mg/L	n/v	6.2	-	6.6	5.9	5.9	6.5	-
Silver	mg/L	n/v	<0.000090	-	<0.000090	<0.000090	<0.000090	<0.000090	-
Sodium	mg/L	200_g[C] 20_g[D]	**250[CD]**	-	**860[CD]**	**34[D]**	**33[D]**	19	-
Strontium	mg/L	n/v	0.27	-	0.65	0.46	0.45	0.49	-
Thallium	mg/L	n/v	<0.000050	-	<0.000050	<0.000050	<0.000050	<0.000050	-
Titanium	mg/L	n/v	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	-
Uranium	mg/L	0.02[B]	0.00066	-	0.00099	0.00042	0.00038	0.00051	-
Vanadium	mg/L	n/v	<0.00050	-	<0.00050	<0.00050	<0.00050	<0.00050	-
Zinc	mg/L	5[C]	0.018	-	0.019	0.027	0.027	0.015	-

Notes:

ODWS	Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2006), in support of O.Reg 169/03 (January 1, 2018)
A	Schedule 1 - Microbiological Standards (expressed as a maximum)
B	Schedule 2 - Chemical Standards (expressed as a maximum acceptable concentration)
C	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Aesthetic Objectives
D	ODWS Table 4 - Medical Officer of Health Reporting Limit
E	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Operational Guidelines
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
d	Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).
CD g	The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
h	When sulfate levels exceed 500 mg/L, water may have a laxative effect on some people.

TABLE B-7 - PRE-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS (CATCHMENTS 105 AND 106)

Pre-Development

Model Type: Thornthwaite and Mather (1955)
Client: Cedar Creek Road Holdings Inc.
Location 2509 Cedar Creek Road, Township of North Dumfries, ON (Pre-Development Catchments 105 and 106)
Total Site Area (ha) **18.06**

Land Description Factors (Sub-area descriptions provided below)	**Sub-Area A**	**Sub-Area B**	**Sub-Area C**	**Sub-Area D**									**Total**
Topography	0.15	0.15	0.20	0.15									
Soils	0.60	0.60	0.60	0.60									
Cover	0.10	0.15	0.10	0.15									
Sum (Infiltration Factor)†	0.85	0.90	0.90	0.90									
Soil Moisture Capacity (mm)	75	100	75	100									
Site area (ha)	5.47	1.59	10.41	0.59									18.06
Imperviousness Coefficient	0.00	0.05	0.00	0.00									
Impervious Area (ha)	0.00	0.08	0.00	0.00									0.08
Percentage of Total Site Area	0.0%	0.4%	0.0%	0.0%									0%
Remaining Pervious Area (ha)	5.47	1.51	10.41	0.59									17.98
Total Pervious Site Area (ha)	5.47	1.51	10.41	0.59									17.98
Percentage of Total Site Area	30.3%	8.4%	57.6%	3.3%									100%

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Climate Data (Roseville Station Climate Normals, 1981 - 2010)‡													
Average Daily Temperature (°C)	-6.5	-5.4	-1	6.5	12.7	18.2	20.5	19.5	15.2	8.7	2.6	-3.5	**7.3**
Precipitation (mm)	68.1	54.6	55	77.2	87.9	76.3	98.2	83.9	85.4	75.3	88.4	68.5	**919**

Potential Evapotranspiration Analysis for Site	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Heat Index	0.0	0.0	0.0	1.5	4.1	7.1	8.5	7.9	5.4	2.3	0.4	0.0	**37**
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	29.4	60.6	89.5	101.8	96.4	73.6	40.3	10.9	0.0	**502**
Potential Evapotranspiration Adjusting Factor for Latitude*	0.77	0.87	0.99	1.12	1.23	1.29	1.26	1.16	1.04	0.92	0.81	0.75	
Adjusted Potential Evapotranspiration (PET) (mm)	0	0	0	33	75	115	128	112	77	37	9	0	**585**
Precipitation - PET (mm)	68	55	55	44	13	-39	-30	-28	9	38	80	69	**333**

Pre-Development Catchment 105 (Figure A-9)

Evapotranspiration Analysis													
Sub-Area A	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-71	-8	0	0	
Storage (S)	75	75	75	75	75	45	30	21	29	68	75	75	
Change in Storage	0	0	0	0	0	-30	-15	-9	9	38	7	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	107	113	93	77	37	9	0	**543**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	72	69	**376**
Potential Infiltration (I)	58	46	47	38	11	0	0	0	0	0	61	58	320
Potential Direct Surface Water Runoff (R)	10	8	8	7	2	0	0	0	0	0	11	10	56
Potential Infiltration (mm)	0	0	0	247	11	0	0	0	0	0	61	0	320
Pervious Evapotranspiration (m^3)	0	0	0	1798	4075	5829	6176	5107	4199	2023	481	0	29,689
Pervious Runoff (m^3)	559	448	451	364	110	0	0	0	0	0	592	562	**3,085**
Pervious Infiltration (m^3)	0	0	0	13508	623	0	0	0	0	0	3353	0	**17,484**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	68	55	55	77	88	76	98	84	85	75	88	69	919
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

TABLE B-7 - PRE-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS (CATCHMENTS 105 AND 106)

Pre-Development Catchment 105 (Figure A-9)

Evapotranspiration Analysis													
Sub-Area B	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-76	-16	0	0	
Storage (S)	100	100	100	100	100	68	50	38	47	85	100	100	
Change in Storage	0	0	0	0	0	-32	-18	-12	9	38	15	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	108	116	96	77	37	9	0	**550**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	64	69	**368**
Potential Infiltration (I)	61	49	50	40	12	0	0	0	0	0	58	62	332
Potential Direct Surface Water Runoff (R)	7	5	6	4	1	0	0	0	0	0	6	7	37
Potential Infiltration (mm)	0	0	0	261	12	0	0	0	0	0	58	0	332
Pervious Evapotranspiration (m^3)	0	0	0	497	1125	1638	1748	1455	1159	559	133	0	8,314
Pervious Runoff (m^3)	103	82	83	67	20	0	0	0	0	0	97	103	**556**
Pervious Infiltration (m^3)	0	0	0	3950	182	0	0	0	0	0	876	0	**5,008**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	68	55	55	77	88	76	98	84	85	75	88	69	919
Impervious Runoff (m^3)	54	43	44	61	70	61	78	67	68	60	70	54	**730**

Pre-Development Catchment 106 (Figure A-9)

Evapotranspiration Analysis													
Sub-Area C	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-71	-8	0	0	
Storage (S)	75	75	75	75	75	45	30	21	29	68	75	75	
Change in Storage	0	0	0	0	0	-30	-15	-9	9	38	7	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	107	113	93	77	37	9	0	**543**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	72	69	**376**
Potential Infiltration (I)	61	49	50	40	12	0	0	0	0	0	65	62	338
Potential Direct Surface Water Runoff (R)	7	5	6	4	1	0	0	0	0	0	7	7	38
Potential Infiltration (mm)	0	0	0	261	12	0	0	0	0	0	65	0	338
Pervious Evapotranspiration (m^3)	0	0	0	3422	7756	11092	11754	9720	7990	3851	916	0	56,501
Pervious Runoff (m^3)	709	568	573	461	139	0	0	0	0	0	751	713	**3,915**
Pervious Infiltration (m^3)	0	0	0	27219	1255	0	0	0	0	0	6757	0	**35,232**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	68	55	55	77	88	76	98	84	85	75	88	69	919
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Pre-Development Catchment 106 (Figure A-9)

Evapotranspiration Analysis													
Sub-Area D	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-76	-16	0	0	
Storage (S)	100	100	100	100	100	68	50	38	47	85	100	100	
Change in Storage	0	0	0	0	0	-32	-18	-12	9	38	15	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	108	116	96	77	37	9	0	**550**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	64	69	**368**
Potential Infiltration (I)	61	49	50	40	12	0	0	0	0	0	58	62	332
Potential Direct Surface Water Runoff (R)	7	5	6	4	1	0	0	0	0	0	6	7	37
Potential Infiltration (mm)	0	0	0	261	12	0	0	0	0	0	58	0	332
Pervious Evapotranspiration (m^3)	0	0	0	194	440	640	683	568	453	218	52	0	3,248
Pervious Runoff (m^3)	40	32	32	26	8	0	0	0	0	0	38	40	**217**
Pervious Infiltration (m^3)	0	0	0	1543	71	0	0	0	0	0	342	0	**1,956**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	68	55	55	77	88	76	98	84	85	75	88	69	919
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

TABLE B-7 - PRE-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS (CATCHMENTS 105 AND 106)

Pre-Development Summary - Catchments 105 and 106

Monthly Summary (m^3)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Pre-Development Infiltration (INF)	0	0	0	46,220	2,131	0	0	0	0	0	11,329	0	59,680
Pre-Development Runoff (R)	1465	1174	1183	980	347	61	78	67	68	60	1548	1473	8,504
Pre-Development Evapotranspiration (ET)	0	0	0	5,911	13,396	19,198	20,361	16,851	13,801	6,651	1,582	0	97,751
Total = INF + R + ET	1,465	1,174	1,183	53,110	15,875	19,259	20,439	16,917	13,869	6,711	14,459	1,473	165,935

SUMMARY - NO INFILTRATION AUGMENTATION / MITIGATION MEASURES						
Pre-Development Infiltration (INF)	59,680	m^3/yr	330	mm/yr	1.9	L/s
Pre-Development Runoff (R)	8,504	m^3/yr	47	mm/yr	0.3	L/s
Pre-Development Evapotranspiration (ET)	97,751	m^3/yr	541	mm/yr	3.1	L/s
Total = INF + R + ET	165,935	m^3/yr	919	mm/yr	5.3	L/s
Precipitation	165,935	m^3/yr	919	mm/yr	5.3	L/s
Error	0.000	(m^3/yr)	0.000	mm/yr	0.000	L/s

Sub-Area Descriptions (topography, soils, cover)		
Sub-Area A	Rolling to Hilly, Sand, Moderately Rooted Crops, 0% Impervious	
Sub-Area B	Rolling to Hilly, Sand, Pasture and Shrubs, 5% Impervious	
Sub-Area C	Rolling to Hilly, Sand, Moderately Rooted Crops, 0% Impervious	
Sub-Area D	Rolling to Hilly, Sand, Pasture and Shrubs, 0% Impervious	

Notes:

† Infiltration factors after Ontario Ministry of the Environment, 2003. Stormwater Management Planning and Design Manual. March 2003.; and Ontario Ministry of Environment and Energy (MOEE). 1995. MOEE Hydrogeological Technical Information Requirements for Land Development Applications. April 1995.

* PET adjustment factors after Thornthwaite, C.W., and J.R. Mather, 1957. Instructions and Tables for Computing Potential Evapotranspiration and the water balance. Drexel Institute of Technology, Laboratory of Climatology, Publications in Climatology, Volume X, No. 3. Centerton, New Jersey.

‡ Climate Data after Environment Canada, 2024. Canadian Climate Normals 1981-2010, Roseville Station, Climate ID 6147188. [Online] http://climate.weather.gc.ca/climate_normals/index_e.html Accessed January 2024.

Assumptions:

[1] The monthly average precipitation collected at the Roseville Climate Station is reflective of the precipitation trends that have historically occurred at the Site.

[2] Surplus water is not available for runoff and recharge during months where water losses from actual evapotranspiration exceed precipitation inputs.

[3] Runoff, infiltration and evapotranspiration do not occur in months where the average daily temperature is below 0°C, which is the case for the months of December through March at the Site.

[4] Precipitation during freezing months (i.e., December to March) is assumed to accumulate as snow and result in additional precipitation in the first month thereafter where the average temperature is greater than 0°C (i.e., April).

[5] Soil moisture capacity is at a maximum in April.

TABLE B-8
1981 TO 2010 CANADIAN CLIMATE NORMALS (ROSEVILLE)

Climate Normals 1981-2010 Station Data

STATION_NAME	PROVINCE	LATITUDE	LONGITUDE	ELEVATION	CLIMATE_ID	WMO_ID	TC_ID
ROSEVILLE	ON	43°21'13.026" N	80°28'25.056" W	328.0 m	6147188		

Legend
A = WMO "3 and 5 rule" (i.e. no more than 3 consecutive and no more than 5 total missing for either temperature or precipitation)
B = At least 25 years
C = At least 20 years
D = At least 15 years

1981 to 2010 Canadian Climate Normals station data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Temperature														
Daily Average (°C)	-6.5	-5.4	-1	6.5	12.7	18.2	20.5	19.5	15.2	8.7	2.6	-3.5	7.3	C
Standard Deviation	3	2.4	2	1.4	1.8	1.3	1.3	1.3	1.3	1.3	1.6	2.7	1.5	C
Daily Maximum (°C)	-2.7	-1.3	3.4	11.7	18.5	23.8	26.2	25.2	20.9	13.6	6.2	-0.2	12.1	C
Daily Minimum (°C)	-10.2	-9.4	-5.3	1.2	6.9	12.5	14.7	13.7	9.4	3.8	-1	-6.7	2.5	C
Extreme Maximum (°C)	14.5	14	24	29.5	33	36.5	36.5	36.5	33.9	27.5	21.5	18.5		
Date (yyyy/dd)	2005/13	2000/26	1998/30	1990/28	2006/29	1988/25	1988/07	2001/08	1973/03	2002/01	1999/09	1982/03		
Extreme Minimum (°C)	-31.7	-28.5	-28	-12	-4	1	5.5	2.8	-3.5	-7.8	-17	-27		
Date (yyyy/dd)	1976/23	1981/05	2003/03	1995/05	1978/01	1980/17	2001/02	1976/31	1989/27	1975/31	2000/23	2004/20		
Precipitation														
Rainfall (mm)	29.2	29.6	35	71.7	87.7	76.3	98.2	83.9	85.4	73.7	76.7	36.9	784.3	C
Snowfall (cm)	38.9	25	20.1	5.5	0.2	0	0	0	0	1.5	11.7	31.6	134.4	C
Precipitation (mm)	68.1	54.6	55	77.2	87.9	76.3	98.2	83.9	85.4	75.3	88.4	68.5	918.7	C
Extreme Daily Rainfall (mm)	35.2	37.6	41	54	45	38	92	75.9	65	41.1	42.2	32.4		
Date (yyyy/dd)	1995/14	1984/13	1982/30	1991/08	1974/16	1987/22	1991/29	1975/23	1976/17	1972/22	1992/12	1979/24		
Extreme Daily Snowfall (cm)	25	21	23	17	3.2	0	0	0	0	5	22	22		
Date (yyyy/dd)	1999/02	1988/11	1980/08	1980/14	2005/02	1973/01	1973/01	1973/01	1973/01	1989/20	1986/20	1992/10		
Extreme Daily Precipitation (mm)	35.2	38	41	54	45	38	92	75.9	65	41.1	42.2	32.4		
Date (yyyy/dd)	1995/14	1981/10	1982/30	1991/08	1974/16	1987/22	1991/29	1975/23	1976/17	1972/22	1992/12	1979/24		
Extreme Snow Depth (cm)	75	60	35	5	0	0	0	0	0	0	25	40		
Date (yyyy/dd)	1999/15	1982/28	1985/04	1996/05	1983/01	1983/01	1983/01	1983/01	1983/01	1983/01	2005/26	2000/14		
Days with Maximum Temperature														
<= 0 °C	21.6	16.4	10	0.87	0	0	0	0	0	0	4	16.1	69	D
> 0 °C	9.4	11.9	21	29.1	31	30	31	31	30	31	26	14.9	296.3	D
> 10 °C	0.35	0.32	4.5	17.6	29.4	29.9	31	31	29.5	22.4	6.9	0.87	203.8	D
> 20 °C	0	0	0.35	3	11.7	23.5	29.6	28.5	16.9	3.6	0.09	0	117.3	D
> 30 °C	0	0	0	0	0.21	2.4	3.2	1.9	0.36	0	0	0	8.1	D
> 35 °C	0	0	0	0	0	0.05	0.14	0.04	0	0	0	0	0.23	D
Days with Minimum Temperature														
> 0 °C	1.2	1.6	4.3	16.6	28.7	30	31	31	29.1	23.1	10.9	2.4	209.8	C
<= 2 °C	30.6	27.7	28.6	19.1	6	0.14	0	0	2	12.8	23.4	30.1	180.3	C
<= 0 °C	29.8	26.7	26.7	13.5	2.3	0	0	0	0.91	7.9	19.1	28.6	155.5	C
< -2 °C	26.3	23	20	6	0.24	0	0	0	0.05	2.5	11.3	22.2	111.7	C
< -10 °C	14.9	11.8	6.2	0.27	0	0	0	0	0	0	1	8.5	42.8	C
< -20 °C	2.8	1.8	0.39	0	0	0	0	0	0	0	0	0.83	5.8	C
< - 30 °C	0.12	0	0	0	0	0	0	0	0	0	0	0	0.12	C
Days with Rainfall														
>= 0.2 mm	3.7	3.5	5.3	10.1	11.4	10.3	10.3	10.3	10	11.2	10.1	4.9	101.1	C
>= 5 mm	1.9	1.7	2.6	4.8	5.7	5.1	5	5.1	4.9	4.8	4.8	2.7	49.2	C
>= 10 mm	1.2	1.2	1.3	2.3	3.1	3.3	3.4	3	2.8	2.7	2.6	1.5	28.5	C
>= 25 mm	0.19	0.23	0.08	0.36	0.48	0.38	0.85	0.56	0.83	0.28	0.52	0.12	4.9	C

TABLE B-8
1981 TO 2010 CANADIAN CLIMATE NORMALS (ROSEVILLE)

Climate Normals 1981-2010 Station Data

STATION_NAME	PROVINCE	LATITUDE	LONGITUDE	ELEVATION	CLIMATE_ID	WMO_ID	TC_ID
ROSEVILLE	ON	43°21'13.026" N	80°28'25.056" W	328.0 m	6147188		

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Days With Snowfall														
>= 0.2 cm	8.3	5.5	4.5	1.4	0.08	0	0	0	0	0.54	2.9	7	30.1	A
>= 5 cm	3.6	2.2	2	0.56	0	0	0	0	0	0.12	1	3	12.5	A
>= 10 cm	1	0.85	0.48	0.12	0	0	0	0	0	0	0.19	0.68	3.3	A
>= 25 cm	0.04	0	0	0	0	0	0	0	0	0	0	0	0.04	A
Days with Precipitation														
>= 0.2 mm	11.5	8.5	9.3	11.4	11.4	10.3	10.3	10.3	10	11.5	12.6	11.1	128.1	C
>= 5 mm	5.4	3.8	4.5	5.3	5.7	5.1	5	5.1	4.9	5	5.9	5.6	61.4	C
>= 10 mm	2.3	2	1.8	2.4	3.1	3.3	3.4	3	2.8	2.7	3	2.3	32.1	C
>= 25 mm	0.23	0.27	0.12	0.4	0.48	0.38	0.85	0.56	0.83	0.32	0.52	0.12	5.1	C
Degree Days														
Above 24 °C	0	0	0	0	0.2	2.8	6.8	3.2	0.1	0	0	0	13	D
Above 18 °C	0	0	0.1	1.3	11.7	49.8	91.4	63.5	17.7	0.8	0	0	236.3	D
Above 15 °C	0	0	0.5	4.7	32.3	109.6	174.7	139.3	53.8	5.5	0	0	520.4	D
Above 10 °C	0	0	3.5	23.7	108.2	246.7	328.5	291.9	162.2	39.1	3.9	0.4	1208.1	D
Above 5 °C	1	0.8	16.9	83.8	241.5	396.2	483.5	446.9	306	127.8	28.9	3.2	2136.6	D
Above 0 °C	11.1	12.5	58	201	395.4	546.2	638.5	601.9	455.9	271.7	101.7	21.6	3315.6	D
Below 0 °C	211.4	163.1	87.6	6.6	0	0	0	0	0	0.1	24.3	132.3	625.4	D
Below 5 °C	356.4	292.7	201.5	39.4	1	0	0	0	0.1	11.3	101.6	268.9	1272.8	D
Below 10 °C	510.3	433.3	343	129.4	22.8	0.5	0	0	6.2	77.5	226.6	421.1	2170.7	D
Below 15 °C	665.3	574.7	495.1	260.4	101.8	13.4	1.1	2.3	47.8	198.9	372.7	575.7	3309.3	D
Below 18 °C	758.3	659.5	587.6	346.9	174.3	43.6	10.9	19.6	101.7	287.2	462.7	668.7	4121	D

TABLE B-9 - POST-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS (CATCHMENTS 200 TO 207)

Post-Development
Model Type: Thornthwaite and Mather (1955)
Client: Cedar Creek Road Holdings Inc.
Location 2509 Cedar Creek Road, Township of North Dumfries, ON (Post-Development Catchments 200 to 207)
Total Site Area (ha) **18.06**

Land Description Factors (See end of table for sub-area descriptions)	Sub-Area A	Sub-Area B	Sub-Area C	Sub-Area D	**Sub-Area E**	**Sub-Area F**	**Sub-Area G**	**Sub-Area H**	**Sub-Area I**	**Sub-Area J**	**Sub-Area K**	**Sub-Area L**	Sub-Area X	**Total**
Topography	0.00	0.00	0.00	0.00	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.00	
Soils	0.00	0.00	0.00	0.00	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.00	
Cover	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.00	
Sum (Infiltration Factor)†	0.00	0.00	0.00	0.00	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.00	
Soil Moisture Capacity (mm)	0	0	0	0	50	50	50	50	50	50	50	50	0	
Site area (ha)	0.00	0.00	0.00	0.00	0.14	0.64	8.82	0.55	4.92	1.63	1.22	0.14	0.00	18.06
Imperviousness Coefficient	0.00	0.00	0.00	0.00	0.00	0.90	0.90	0.00	0.90	0.15	0.00	0.00	0.00	
Impervious Area (ha)	0.00	0.00	0.00	0.00	0.00	0.58	7.94	0.00	4.43	0.24	0.00	0.00	0.00	13.19
Percentage of Total Site Area	0.0%	0.0%	0.0%	0.0%	0.0%	3.2%	44.0%	0.0%	24.5%	1.4%	0.0%	0.0%	0.0%	73%
Remaining Pervious Area (ha)	0.00	0.00	0.00	0.00	0.14	0.06	0.88	0.55	0.49	1.39	1.22	0.14	0.00	4.87
Total Pervious Site Area (ha)	0.00	0.00	0.00	0.00	0.14	0.06	0.88	0.55	0.49	1.39	1.22	0.14	0.00	4.87
Percentage of Total Site Area	0.0%	0.0%	0.0%	0.0%	0.8%	0.4%	4.9%	3.0%	2.7%	7.7%	6.8%	0.8%	0.0%	27%

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Climate Data (Roseville Station Climate Normals, 1981 - 2010)‡													
Average Daily Temperature (°C)	-6.5	-5.4	-1.0	6.5	12.7	18.2	20.5	19.5	15.2	8.7	2.6	-3.5	**7.3**
Precipitation (mm)	68.1	54.6	55.0	77.2	87.9	76.3	98.2	83.9	85.4	75.3	88.4	68.5	**919**

Potential Evapotranspiration Analysis for Site	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Heat Index	0.0	0.0	0.0	1.5	4.1	7.1	8.5	7.9	5.4	2.3	0.4	0.0	**37**
Unadjusted Potential Evapotranspiration (mm)	0.0	0.0	0.0	29.4	60.6	89.5	101.8	96.4	73.6	40.3	10.9	0.0	**502**
Potential Evapotranspiration Adjusting Factor for Latitude*	0.77	0.87	0.99	1.12	1.23	1.29	1.26	1.16	1.04	0.92	0.81	0.75	
Adjusted Potential Evapotranspiration (PET)(mm)	0	0	0	33	75	115	128	112	77	37	9	0	**585**
Precipitation - PET (mm)	68	55	55	44	13	-39	-30	-28	9	38	80	69	**333**

Post-Development Catchment 200 (Figure A-10)

Evapotranspiration Analysis													
Sub-Area E	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-58	4	0	0	
Storage (S)	50	50	50	50	50	23	13	7	16	54	50	50	
Change in Storage	0	0	0	0	0	-27	-10	-5	9	38	-4	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	103	109	89	77	37	9	0	**531**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	84	69	**388**
Potential Infiltration (I)	54	44	44	35	11	0	0	0	0	0	67	55	310
Potential Direct Surface Water Runoff (R)	14	11	11	9	3	0	0	0	0	0	17	14	78
Potential Infiltration (mm)	0	0	0	232	11	0	0	0	0	0	67	0	310
Pervious Evapotranspiration (m^3)	0	0	0	46	104	145	152	125	107	52	12	0	744
Pervious Runoff (m^3)	19	15	15	12	4	0	0	0	0	0	23	19	**109**
Pervious Infiltration (m^3)	0	0	0	325	15	0	0	0	0	0	94	0	**434**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	68	55	55	77	88	76	98	84	85	75	88	69	919
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

TABLE B-9 - POST-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS (CATCHMENTS 200 TO 207)

Post-Development Catchment 201 (Figure A-10)

Evapotranspiration Analysis													
Sub-Area F	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-58	4	0	0	
Storage (S)	50	50	50	50	50	23	13	7	16	54	50	50	
Change in Storage	0	0	0	0	0	-27	-10	-5	9	38	-4	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	103	109	89	77	37	9	0	**531**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	84	69	**388**
Potential Infiltration (I)	54	44	44	35	11	0	0	0	0	0	67	55	310
Potential Direct Surface Water Runoff (R)	14	11	11	9	3	0	0	0	0	0	17	14	78
Potential Infiltration (mm)	0	0	0	232	11	0	0	0	0	0	67	0	310
Pervious Evapotranspiration (m^3)	0	0	0	21	48	66	69	57	49	24	6	0	340
Pervious Runoff (m^3)	9	7	7	6	2	0	0	0	0	0	11	9	**50**
Pervious Infiltration (m^3)	0	0	0	149	7	0	0	0	0	0	43	0	**198**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	68	55	55	77	88	76	98	84	85	75	88	69	919
Impervious Runoff (m^3)	392	314	317	445	506	439	566	483	492	434	509	395	**5,292**

Post-Development Catchment 202 (Figure A-10)

Evapotranspiration Analysis													
Sub-Area G	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-58	4	0	0	
Storage (S)	50	50	50	50	50	23	13	7	16	54	50	50	
Change in Storage	0	0	0	0	0	-27	-10	-5	9	38	-4	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	103	109	89	77	37	9	0	**531**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	84	69	**388**
Potential Infiltration (I)	54	44	44	35	11	0	0	0	0	0	67	55	310
Potential Direct Surface Water Runoff (R)	14	11	11	9	3	0	0	0	0	0	17	14	78
Potential Infiltration (mm)	0	0	0	232	11	0	0	0	0	0	67	0	310
Pervious Evapotranspiration (m^3)	0	0	0	290	657	911	958	788	677	326	78	0	4,685
Pervious Runoff (m^3)	120	96	97	78	24	0	0	0	0	0	148	121	**684**
Pervious Infiltration (m^3)	0	0	0	2050	95	0	0	0	0	0	591	0	**2,735**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	68	55	55	77	88	76	98	84	85	75	88	69	919
Impervious Runoff (m^3)	5406	4334	4366	6128	6978	6057	7795	6660	6779	5977	7017	5438	**72,934**

Post-Development Catchment 203 (Figure A-10)

Evapotranspiration Analysis													
Sub-Area H	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-58	4	0	0	
Storage (S)	50	50	50	50	50	23	13	7	16	54	50	50	
Change in Storage	0	0	0	0	0	-27	-10	-5	9	38	-4	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	103	109	89	77	37	9	0	**531**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	84	69	**388**
Potential Infiltration (I)	54	44	44	35	11	0	0	0	0	0	67	55	310
Potential Direct Surface Water Runoff (R)	14	11	11	9	3	0	0	0	0	0	17	14	78
Potential Infiltration (mm)	0	0	0	232	11	0	0	0	0	0	67	0	310
Pervious Evapotranspiration (m^3)	0	0	0	181	410	568	597	492	422	203	48	0	2,921
Pervious Runoff (m^3)	75	60	61	49	15	0	0	0	0	0	92	75	**426**
Pervious Infiltration (m^3)	0	0	0	1278	59	0	0	0	0	0	368	0	**1,706**
Potential Impervious Evaporation (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0
Potential Impervious Runoff (mm)	68	55	55	77	88	76	98	84	85	75	88	69	919
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

TABLE B-9 - POST-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS (CATCHMENTS 200 TO 207)

Post-Development Catchment 204 (Figure A-10)

Evapotranspiration Analysis													
Sub-Area I	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-58	4	0	0	
Storage (S)	50	50	50	50	50	23	13	7	16	54	50	50	
Change in Storage	0	0	0	0	0	-27	-10	-5	9	38	-4	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	103	109	89	77	37	9	0	**531**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	84	69	**388**
Potential Infiltration (I)	54	44	44	35	11	0	0	0	0	0	67	55	310
Potential Direct Surface Water Runoff (R)	14	11	11	9	3	0	0	0	0	0	17	14	78
Potential Infiltration (mm)	0	0	0	232	11	0	0	0	0	0	67	0	310
Pervious Evapotranspiration (m^3)	0	0	0	162	367	508	534	440	378	182	43	0	2,613
Pervious Runoff (m^3)	67	54	54	44	13	0	0	0	0	0	82	67	**381**
Pervious Infiltration (m^3)	0	0	0	1144	53	0	0	0	0	0	330	0	**1,526**
Potential Impervious Evaporation (mm)	7	5	6	8	9	8	10	8	9	8	9	7	92
Potential Impervious Runoff (mm)	61	49	50	69	79	69	88	76	77	68	80	62	827
Impervious Runoff (m^3)	2714	2176	2192	3077	3503	3041	3913	3344	3403	3001	3523	2730	**36,616**

Post-Development Catchment 205 (Figure A-10)

Evapotranspiration Analysis													
Sub-Area J	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-58	4	0	0	
Storage (S)	50	50	50	50	50	23	13	7	16	54	50	50	
Change in Storage	0	0	0	0	0	-27	-10	-5	9	38	-4	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	103	109	89	77	37	9	0	**531**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	84	69	**388**
Potential Infiltration (I)	54	44	44	35	11	0	0	0	0	0	67	55	310
Potential Direct Surface Water Runoff (R)	14	11	11	9	3	0	0	0	0	0	17	14	78
Potential Infiltration (mm)	0	0	0	232	11	0	0	0	0	0	67	0	310
Pervious Evapotranspiration (m^3)	0	0	0	455	1032	1431	1504	1239	1063	513	122	0	7,359
Pervious Runoff (m^3)	189	151	152	123	37	0	0	0	0	0	232	190	**1,074**
Pervious Infiltration (m^3)	0	0	0	3220	148	0	0	0	0	0	928	0	**4,297**
Potential Impervious Evaporation (mm)	7	5	6	8	9	8	10	8	9	8	9	7	92
Potential Impervious Runoff (mm)	61	49	50	69	79	69	88	76	77	68	80	62	827
Impervious Runoff (m^3)	150	120	121	170	193	168	216	185	188	166	195	151	**2,022**

Post-Development Catchment 206 (Figure A-10)

Evapotranspiration Analysis													
Sub-Area K	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-58	4	0	0	
Storage (S)	50	50	50	50	50	23	13	7	16	54	50	50	
Change in Storage	0	0	0	0	0	-27	-10	-5	9	38	-4	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	103	109	89	77	37	9	0	**531**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	84	69	**388**
Potential Infiltration (I)	54	44	44	35	11	0	0	0	0	0	67	55	310
Potential Direct Surface Water Runoff (R)	14	11	11	9	3	0	0	0	0	0	17	14	78
Potential Infiltration (mm)	0	0	0	232	11	0	0	0	0	0	67	0	310
Pervious Evapotranspiration (m^3)	0	0	0	401	909	1260	1325	1091	936	451	107	0	6,480
Pervious Runoff (m^3)	166	133	134	108	33	0	0	0	0	0	204	167	**946**
Pervious Infiltration (m^3)	0	0	0	2836	131	0	0	0	0	0	817	0	**3,784**
Potential Impervious Evaporation (mm)	7	5	6	8	9	8	10	8	9	8	9	7	92
Potential Impervious Runoff (mm)	61	49	50	69	79	69	88	76	77	68	80	62	827
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

TABLE B-9 - POST-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS (CATCHMENTS 200 TO 207)

Post-Development Catchment 207 (Figure A-10)

Evapotranspiration Analysis													
Sub-Area L	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
Accumulated Potential Water Loss (APWL)	0	0	0	0	0	-39	-69	-97	-58	4	0	0	
Storage (S)	50	50	50	50	50	23	13	7	16	54	50	50	
Change in Storage	0	0	0	0	0	-27	-10	-5	9	38	-4	0	
Actual Evapotranspiration (mm)	0	0	0	33	75	103	109	89	77	37	9	0	**531**
Recharge/Runoff Analysis													
Water Surplus (mm)	68	55	55	44	13	0	0	0	0	0	84	69	**388**
Potential Infiltration (I)	54	44	44	35	11	0	0	0	0	0	67	55	310
Potential Direct Surface Water Runoff (R)	14	11	11	9	3	0	0	0	0	0	17	14	78
Potential Infiltration (mm)	0	0	0	232	11	0	0	0	0	0	67	0	310
Pervious Evapotranspiration (m^3)	0	0	0	46	104	145	152	125	107	52	12	0	744
Pervious Runoff (m^3)	19	15	15	12	4	0	0	0	0	0	23	19	**109**
Pervious Infiltration (m^3)	0	0	0	325	15	0	0	0	0	0	94	0	**434**
Potential Impervious Evaporation (mm)	7	5	6	8	9	8	10	8	9	8	9	7	92
Potential Impervious Runoff (mm)	61	49	50	69	79	69	88	76	77	68	80	62	827
Impervious Runoff (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

Post-Development Summary - Catchments 200 to 207

Monthly Summary (m^3)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Post-Development Infiltration (INF)	0	0	0	11,327	522	0	0	0	0	0	3,265	0	15,114
Post-Development Runoff (R)	9326	7477	7532	10251	11311	9705	12490	10671	10862	9578	12060	9380	120,643
Post-Development Evapotranspiration (ET)	318	255	257	1963	4042	5389	5750	4749	4140	2155	842	320	30,178
Total = INF + R + ET	9,644	7,732	7,789	23,541	15,875	15,094	18,240	15,420	15,002	11,732	16,166	9,700	165,935

POST-DEVELOPMENT - NO INFILTRATION AUGMENTATION / MITIGATION MEASURES						
Post-Development Infiltration (INF)	15,114	m^3/yr	84	mm/yr	0.5	L/s
Post-Development Runoff (R)	120,643	m^3/yr	668	mm/yr	3.8	L/s
Post-Development Evapotranspiration (ET)	30,178	m^3/yr	167	mm/yr	1.0	L/s
Total = INF + R+ ET	165,935	m^3/yr	919	mm/yr	5.3	L/s
Original Precipitation	165,935	m^3/yr	919	mm/yr	5.3	L/s
Error	0.000	m^3/yr	0.000	mm/yr	0.000	L/s

Pre-Development INFILTRATION Excluding Infiltration Facilities	59,680	m^3/yr	330	mm/yr	1.9	L/s
Pre- to Post Surplus (+) / Deficit (-)	**-44,566**	m^3/yr	-247	mm/yr	-1.4	L/s

Pre-Development RUNOFF Excluding Infiltration Facilities	8,504	**m^3/yr**	47	mm/yr	0.3	L/s
Pre- to Post Surplus (+) / Deficit (-)	**112,139**	**m^3/yr**	621	mm/yr	3.6	L/s

POST-DEVELOPMENT - WITH INFILTRATION AUGMENTATION / MITIGATION MEASURES						
Pre- to Post INFILTRATION Surplus (+) / Deficit(-) Including Infiltration Facilities (See Note A)	**66,050**	**m^3/yr**	366	mm/yr	2.1	L/s
Pre- to Post RUNOFF Surplus (+) / Deficit (-) Including Infiltration Facilities (See Note A)	**1,523**	**m^3/yr**	8	mm/yr	0.0	L/s

Sub-Area Descriptions (topography, soils, cover)	
Sub-Area E	Rolling to Hilly, Sand, Urban Lawn, 0% Impervious
Sub-Area F	Rolling to Hilly, Sand, Urban Lawn, 90% Impervious
Sub-Area G	Rolling to Hilly, Sand, Urban Lawn, 90% Impervious
Sub-Area H	Rolling to Hilly, Sand, Urban Lawn, 0% Impervious
Sub-Area I	Rolling to Hilly, Sand, Urban Lawn, 90% Impervious
Sub-Area J	Rolling to Hilly, Sand, Urban Lawn, 15% Impervious
Sub-Area K	Rolling to Hilly, Sand, Urban Lawn, 0% Impervious
Sub-Area L	Rolling to Hilly, Sand, Urban Lawn, 0% Impervious

Note:

(A) Runoff generated from Catchments 202 and 204 (Sub-Areas G and I) will be directed to the SWM Facility for infiltration post-development.

Catchments 202 & 204 Total Runoff = 110,616 m^3/yr

TABLE B-9 - POST-DEVELOPMENT MONTHLY WATER BALANCE CALCULATIONS (CATCHMENTS 200 TO 207)

Notes:

† Infiltration factors after Ontario Ministry of the Environment, 2003. Stormwater Management Planning and Design Manual. March 2003.; and Ontario Ministry of Environment and Energy (MOEE). 1995. MOEE Hydrogeological Technical Information Requirements for Land Development Applications. April 1995.

* PET adjustment factors after Thornthwaite, C.W., and J.R. Mather, 1957. Instructions and Tables for Computing Potential Evapotranspiration and the water balance. Drexel Institute of Technology, Laboratory of Climatology, Publications in Climatology, Volume X, No. 3. Centerton, New Jersey.

‡ Climate Data after Environment Canada, 2024. Canadian Climate Normals 1981-2010, Roseville Station, Climate ID 6147188. [Online] http://climate.weather.gc.ca/climate_normals/index_e.html Accessed January 2024.

Assumptions:

[1] The monthly average precipitation collected at the Roseville Climate Station is reflective of the precipitation trends that have historically occurred at the Site.

[2] Surplus water is not available for runoff and recharge during months where water losses from actual evapotranspiration exceed precipitation inputs.

[3] Runoff, infiltration and evapotranspiration do not occur in months where the average daily temperature is below 0°C, which is the case for the months of December through March at the Site.

[4] Precipitation during freezing months (i.e., December to March) is assumed to accumulate as snow and result in additional precipitation in the first month thereafter where the average temperature is greater than 0°C (i.e., April).

[5] Soil moisture capacity is at a maximum in April.

TABLE B-10
PRELIMINARY NITRATE LOADING IMPACT ASSESSMENT
2509 Cedar Creek Road, North Dumfries, ON

Row 1		Column 'C'		
2	**INDUSTRIAL DEVELOPMENT - NEAREST RESIDENTIAL WELL IS DOWNGRADIENT ASSESSMENT LIMIT FOR NITRATE**			
3	**SEPTIC SYSTEM LOADING**	**Proposed Lots with No Tertiary Treatment**		**Formula**
4	Number of Leaching Beds	7		Input parameter
5	Effluent Quality [(1)]	**40.0**	mg/L	Input parameter - see Notes (1)
6	Average Flow [(2)]	3,247	L/day	Input parameter - see Notes (2)
7	Annual Volume	8,296,085	L/yr	=C4*C6*365
8	Total Annual Nitrate Loading	332	kg/yr	=(C7*C5)/1000000
9				
10	**PRECIPITATION RECHARGE VOLUME AND NITRATE LOADING**			
11	Recharge Rate [(3)]	0.25	m/yr	Input parameter - see Notes (3)
12	Soil Type	Sand		
13	Recharge Nitrate Concentration	0	mg/L	Input parameter
14	Total Recharge Area [(4)]	198,060	m^2	Input parameter - see Notes (4)
18	Recharge Volume	49,515,000	L/yr	=C14*C11*1000
19	Recharge Nitrate Loading	0.0	kg/yr	=(C18*C13)/1000000
20				
22	Nitrate Concentration Allowed at Nearest Downgradient Receiver as Per MECP (1996)	10	mg/L	
24				
25	**Nitrate Concentration at Nearest Downgradient Receiver [(5)]**	**5.7**	mg/L	=((C8+C19)*1000000)/(C7+C18)
26	**COMPLIANCE WITH ONTARIO DRINKING WATER QUALITY STANDARD (ODWS) FOR NITRATE**	**YES**		=IF(C25<C22,"YES","NO")

NOTES

(1) Effluent quality for a single residential dwelling is 40 mg/L as per *MECP Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment. Last Revision: August 1996.*

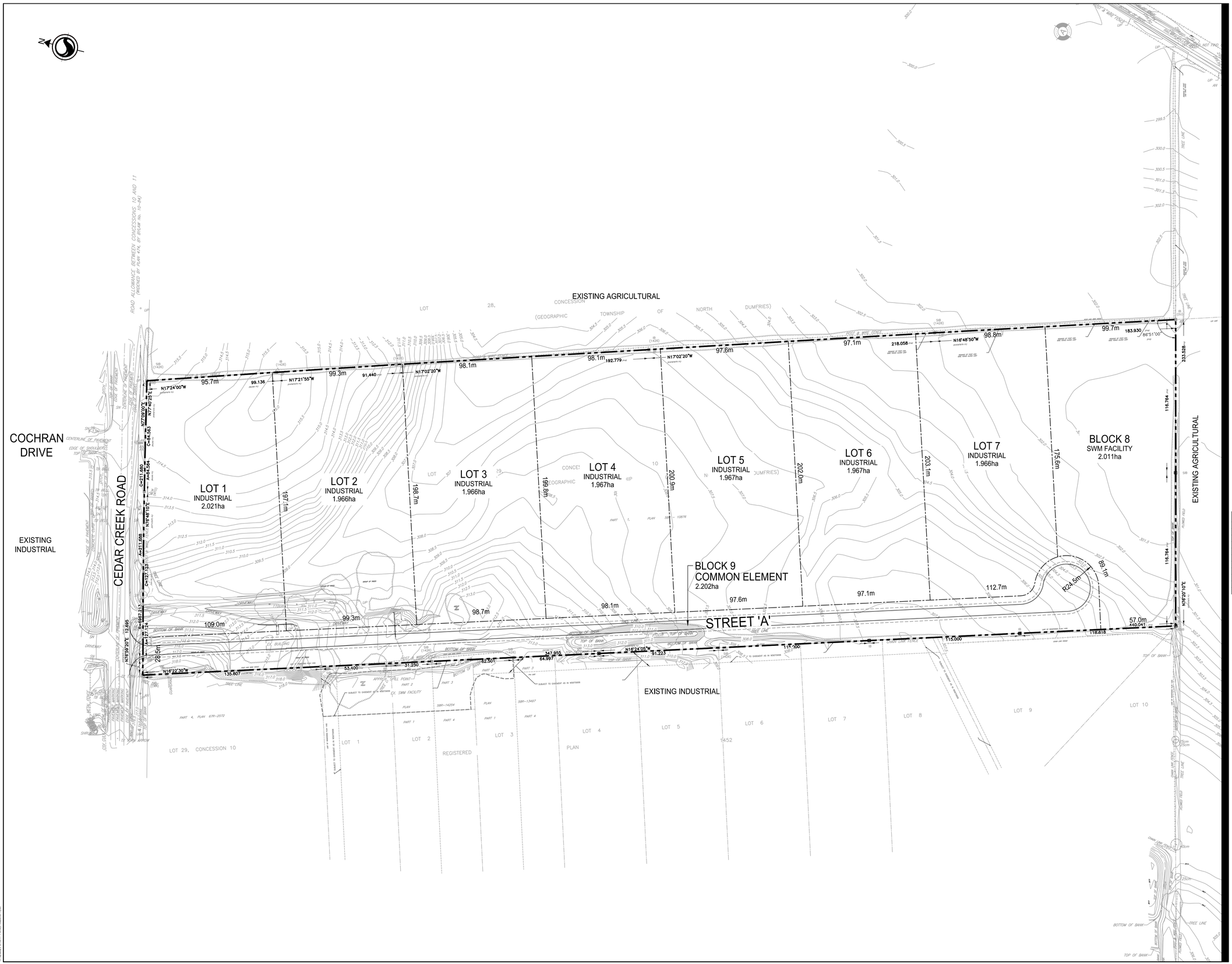
(2) Value estimated from total sewage flow of 22,732 L/day based on a maximum 303 employee provided in the Stantec Water and Sewage System Feasibility Study.

(3) Constant quantity of dilution to be used in all contaminant attenuation calculations as specified in Section 22.5.8 of the *MOE Design Guidelines for Sewage Works (2008) is 0.25 m/year.* This value acts as a surrogate for all potential subsurface mechanisms involved with the attenuation of the specified contaminant.

(4) Total sewage effluent plume area that is available for dilution via recharging precipitation between septic beds and downgradient receptor.

(5) Total annual nitrate loading mass divided by total volume of water available for dilution from precipitation recharge and leaching bed discharge.

Appendix C Proposed Draft Plan



Stantec

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100-300 Hagey Boulevard
Waterloo ON N2L 0A4
Tel: (519) 579-4410
www.stantec.com

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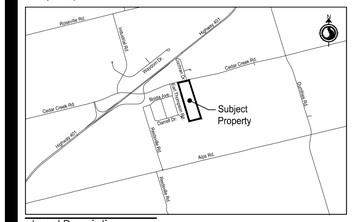
Key Map NTS.



Legal Description

Part of Lot 29,
Concession 10,
Township of North Dumfries,
Regional Municipality of Waterloo

Information Required

Under Section 51(17) of the Planning Act,
R.S.O 1990 c.P 13 as Amended
a) - As Shown
b) - As Shown
c) - As Shown
d) - As Listed Below
e) - As Shown
f) - As Shown
g) - As Shown
h) - Municipal Water
i) - As Shown
j) - Municipal Sanitary and Storm Sewers
k) - None

Surveyor's Certificate

I hereby certify the boundaries of the subject lands and their relationship to the adjoining lands have been accurately and correctly shown.

Signed _____
O.L.S Name
Stantec Consulting Ltd.

Date _____

Owner's Certificate

I hereby authorize Stantec Consulting Ltd. to submit this Draft Plan of Subdivision on my behalf.

Signed _____
Owner Name
Company Name

Date _____

Land Use Schedule

Lots/Blocks	Land Use	Area (ha)
Lot 1	Industrial	2.021
Lot 2	Industrial	1.966
Lot 3	Industrial	1.966
Lot 4	Industrial	1.967
Lot 5	Industrial	1.967
Lot 6	Industrial	1.967
Lot 7	Industrial	1.966
Block 8	Stormwater Management Facility	2.011
Block 9	Street A	2.202
TOTAL		18.033ha

1st Submission for Draft Plan		TR	MD	2024.01.12
Revision		By	Appd	YYYY.MM.DD
File Name: 161414214_R-DP_CONDO	JJ	JJ	MD	2022.08.16
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Permit-Seal

APPROVED: _____ DATE: _____

I hereby certify that the plan was prepared under the supervision of a registered professional planner, within the meaning of the Ontario Professional Planners Institute Act, 1994.

Client/Project
CEDAR CREEK ROAD HOLDINGS INC.

2509 CEDAR CREEK ROAD, AYR

TOWNSHIP OF NORTH DUMFRIES, ON

Title
CONCEPTUAL DRAFT PLAN OF VACANT LAND CONDOMINIUM

Project No.	Scale				
161414214	1:1250	0	12.5	37.5	62.5m

Revision	Sheet	Drawing No.
0	1 of 1	DP-1

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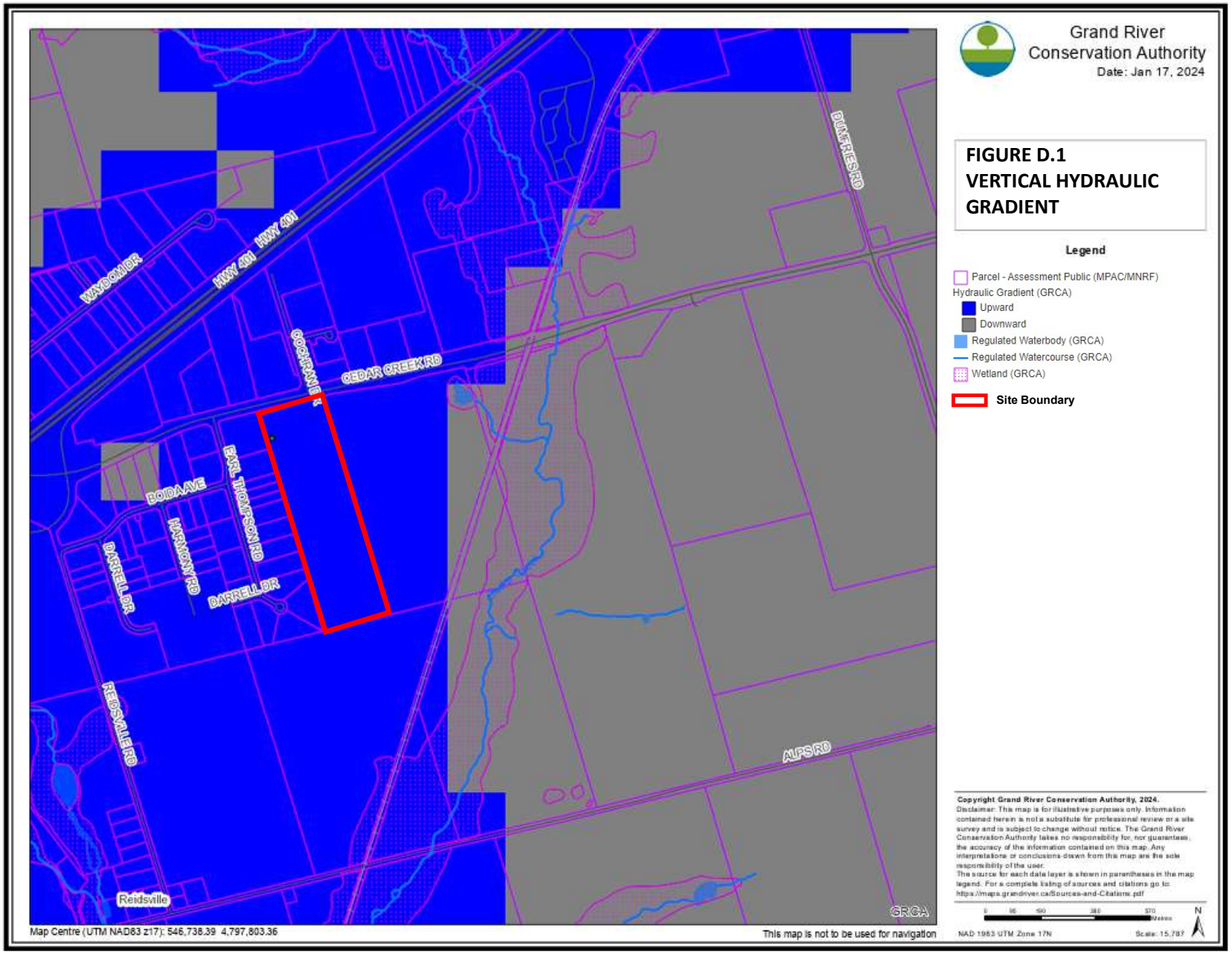
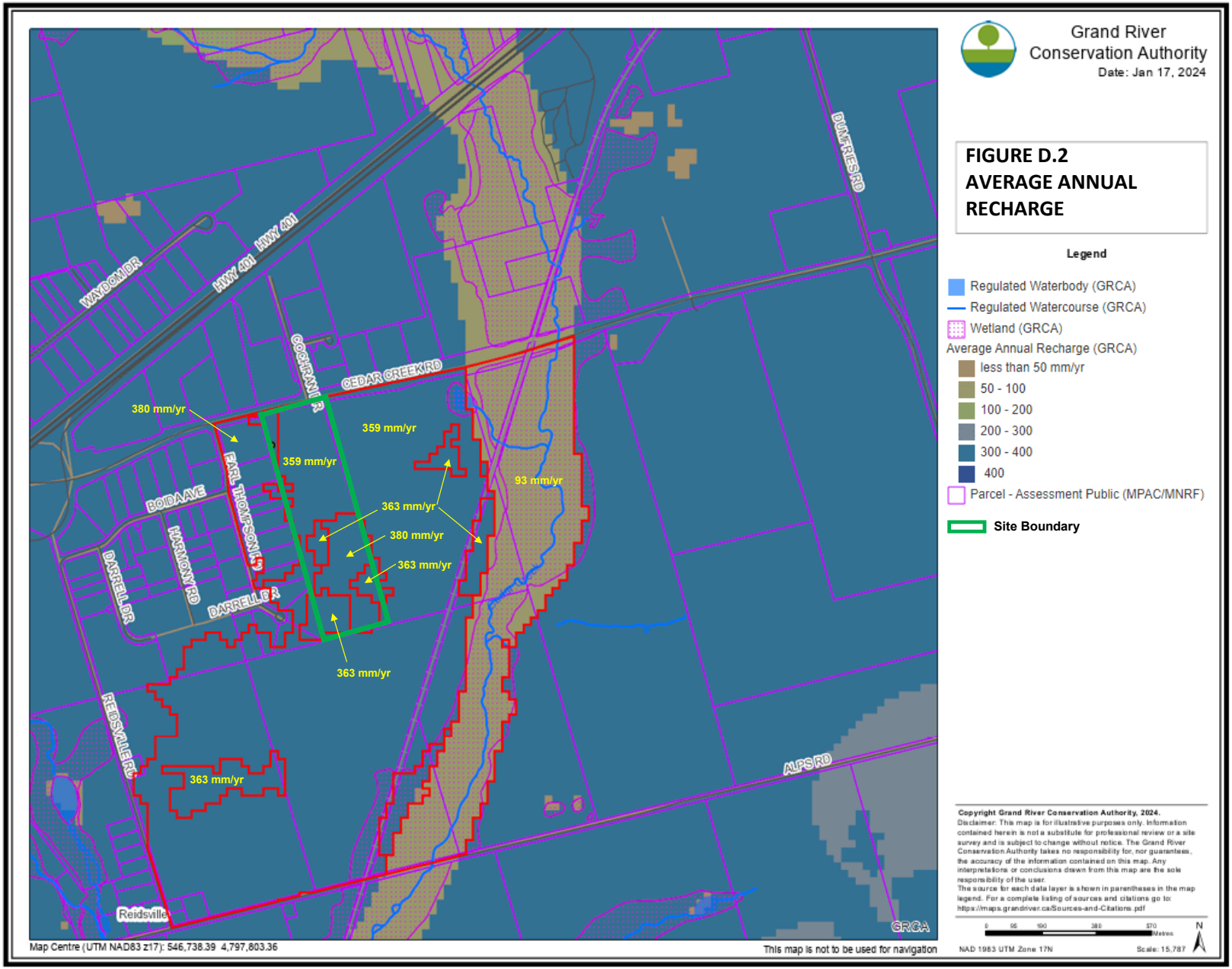
17/1/2024 4:51:17 PM By Rocco, Vitor
ORIGINAL SHEET - ARCH D

Appendix D Regional Vertical Hydraulic Gradients and Average Annual Recharge Mapping (GRCA, 2024)

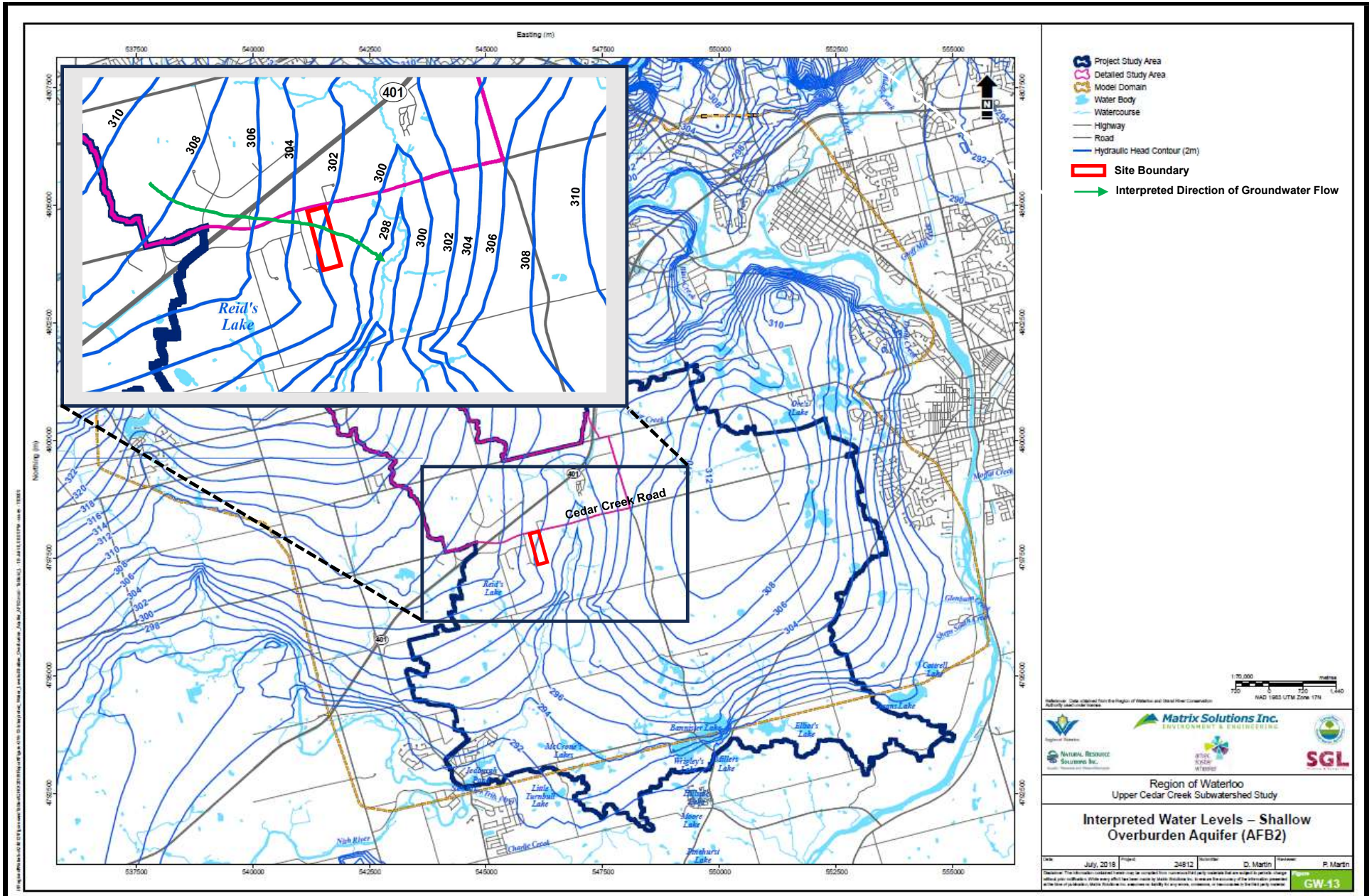


Source: Grand River Information Network (GRIN). 2024. https://data.grandriver.ca/applications.html.



Source: Grand River Information Network (GRIN). 2024. https://data.grandriver.ca/applications.html.

Appendix E Regional Groundwater Flow Mapping



Source: Matrix Solutions Inc. Environment and Engineering. 2018. Phase 1 Hydrogeological Characterization, Upper Cedar Creek Scoped Subwatershed Study - Version 1.0. Prepared for Region of Waterloo and Grand River Conservation Authority, November 2018 (Modified by Stantec)

Appendix F Borehole Logs

Stantec

BOREHOLE RECORD

BH/MW01-22

CLIENT Royal LePage — PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road — DATUM

DATES: BORING February 16, 2022 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
		Snow, Farm Field					
0		TOPSOIL: dark brown, silty sand - trace gravel - frosted to moist	0–2	SS	1	360/610	22
1		Loose to compact, brown, SAND (SP) - trace silt and gravel - moist	3–4	SS	2	360/610	5
2			5–7	SS	3	460/610	16
			8–9	SS	4	460/610	23
3			10–12	SS	5	480/610	23
4			13–15				
5			16–18	SS	6	460/610	19
6		Compact to dense, brown, SAND (SP) - trace gravel to gravelly - wet to saturated	19–22	SS	7	610/610	32
7			23–25				
8		Dense, brown, sandy SILT (ML) - saturated	26–27	SS	8	610/610	42
9		Borehole terminated at 8.5 m below existing ground due to auger refusal on boulder and sand heave. 50 mm diameter PVC well installed with 3.0 m screen between 8.5 - 5.5	28–32				
10							

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa
■ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

BH/MW01-22

CLIENT Royal LePage PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road DATUM

DATES: BORING February 16, 2022 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES: N-VALUE OR RQD(%)
10		m depths below grade. Backfilled with sand from 9.4 m up to 4.9 m, and bentonite from 4.9 m depths to surface. Finished with pedestal cover at surface. Well cluster tag # A311058.			33				
					34				
					35				
11					36				
					37				
					38				
					39				
12					40				
					41				
					42				
13					43				
					44				
					45				
14					46				
					47				
					48				
15					49				
					50				
					51				
					52				
16					53				
					54				
					55				
17					56				
					57				
					58				
18					59				
					60				
					61				
19					62				
					63				
					64				
20					65				

UNDRAINED SHEAR STRENGTH (kPa)
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

BH/MW02-22

CLIENT Royal LePage — PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road — DATUM

DATES: BORING February 16, 2022 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
		Snow, Farm Field							
0		TOPSOIL: dark brown, sandy silt - trace clay and gravel - rootlets and organics - frosted to moist			0 1 2	SS	1	560/610	9
1		Loose, brown to light brown, sandy SILT (ML) - some to trace clay layer - moist to saturated			3 4 5 6 7	SS SS	2 3	460/610 410/610	5 5
2		Loose to compact, brown, SAND AND GRAVEL (SP-GP) - occasional cobbles - moist			8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	SS SS SS SS	4 5 6 7	250/610 360/610 430/610 480/610	6 15 7 15
3									
4									
5									
6									
7									
8		Compact to dense, brown, sandy SILT (ML) - trace to some clay layers - moist to saturated				SS	8	530/610	27
9									
10						SS	9	580/610	37

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

BH/MW02-22

CLIENT Royal LePage PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road DATUM

DATES: BORING February 16, 2022 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
10					33				
					34				
					35				
11					36	SS	10	610/610	30
					37				
					38				
12					39				
					40				
		Compact, brown, sandy SILT (ML) - some clay - saturated			41	SS	11	610/610	22
					42				
13					43				
					44				
					45				
14					46	SS	12	610/610	23
					47				
		Borehole terminated at 14.3 m below existing ground. 50 mm diameter PVC well installed with 3.0 m screen between 13.7 - 10.7 m depths below grade. Backfilled with sand from 13.7 m up to 10.3 m, and bentonite from 10.3 m depths to surface. Finished with pedestal cover at surface. Well cluster tag # A311058.			48				
					49				
15					50				
					51				
					52				
16					53				
					54				
					55				
17					56				
					57				
					58				
18					59				
					60				
					61				
19					62				
					63				
					64				
20					65				

UNDRAINED SHEAR STRENGTH (kPa)
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

BH/MW03-22

CLIENT Royal LePage PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road DATUM

DATES: BORING February 15, 2022 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
		Snow, Farm Field					
0		TOPSOIL: black to dark brown, sandy silt - trace cobbles - frosted	0 1 2	SS	1	380/610	7
1		Loose, brown, SAND (SP) - moist to saturated	3 4 5	SS	2	460/610	4
2		Compact, brown, sandy SILT (ML) - dilatant and saturated	6 7 8 9	SS SS	3 4	480/610 480/610	18 27
3			10 11 12	SS	5	530/610	23
4			13 14 15				
5			16 17 18	SS	6	530/610	26
6			19 20 21	SS	7	610/610	23
7		Very stiff, grey brown, sandy silty CLAY (ML-CL) - with sandy layers - APL	22 23 24 25				
8			26 27	SS	8	610/610	18
9		Borehole terminated at 8.2 m below existing ground. 50 mm diameter PVC well installed with 3.0 m screen between 7.6 - 4.6 m depths below grade. Backfilled with sand from 7.6 m up to 4.2 m, and bentonite from 4.2 m depths to	28 29 30 31				
10		Continued Next Page	32				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

BH/MW03-22

CLIENT Royal LePage PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road DATUM

DATES: BORING February 15, 2022 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES: N-VALUE OR RQD(%)
10		surface. Finished with pedestal cover at surface. Well cluster tag # A311058.			33				
					34				
					35				
11					36				
					37				
					38				
12					39				
					40				
					41				
					42				
13					43				
					44				
					45				
14					46				
					47				
					48				
					49				
15					50				
					51				
					52				
16					53				
					54				
					55				
17					56				
					57				
					58				
18					59				
					60				
					61				
19					62				
					63				
					64				
					65				
20									

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

BH/MW04-22

CLIENT Royal LePage — PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road — DATUM

DATES: BORING February 17, 2022 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
		Snow, Farm Field							
0		TOPSOIL: dark brown, silty sand - frosted to wet			0–2	SS	1	560/610	21
1					3–4	SS	2	25/610	2
		Compact to very dense, brown, SAND AND GRAVEL (SP-GP) - trace silt - occasional to frequent cobbles - moist			5–6	SS	3	150/610	10
2					7–9	SS	4	510/610	46
3					10–11	SS	5	460/610	28
4					12–15				
5					16–17	SS	6	300/610	48
6					18–20				
		Borehole terminated at 6.4 m below existing ground due to auger refusal. 50 mm diameter PVC well installed with 3.0 m screen between 6.0 - 3.0 m depths below grade. Backfilled with sand from 6.0 m up to 2.7 m, and bentonite from 2.7 m depths to surface. Finished with pedestal cover at surface. Well cluster tag # A311058.			21–22	SS	7	76/610	50/130
7					23–25				
8					26–28				
9					29–31				
10					32				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

BH/MW05-22

CLIENT Royal LePage PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road DATUM

DATES: BORING February 18, 2022 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
		Snow, Farm Field					
0		TOPSOIL: dark brown, silty sand - rootlets and organics - frosted to moist	0-1	SS	1	510/610	8
1		Loose, brown, silty SAND (SM) - trace gravel - moist	2-4	SS	2	410/610	3
2		Compact, brown, SAND (SP) - trace silt - damp	5-6	SS	3	510/610	16
			7-9	SS	4	560/610	15
3			10-11	SS	5	610/610	13
4			12-15				
5			16	SS	6	480/610	18
6			17-20				
		Very dense, brown, SAND (SP) - silty to trace silt - trace gravel to gravelly - moist to wet	21	SS	7	610/610	50
7		Borehole terminated at 6.7 m below existing ground. 50 mm diameter PVC well installed with 3.0 m screen between 6.0 - 3.0 m depths below grade. Backfilled with sand from 6.0 m up to 2.7 m, and bentonite from 2.7 m depths to surface. Finished with pedestal cover at surface. Well cluster tag # A311058.	22-32				
8							
9							
10							

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

BH/MW06-22

CLIENT Royal LePage — PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road — DATUM

DATES: BORING February 17, 2022 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
		Snow, Farm Field					
0		TOPSOIL: dark brown, sandy silt - trace clay - frosted to wet	0–2	SS	1	410/610	8
1			3–4	SS	2	150/610	8
		Compact, brown, SAND (SP) - with sand to silty - trace gravel - moist to wet	5–7	SS	3	360/610	19
2			8–9	SS	4	510/610	14
3		Compact, brown, gravelly SAND (SP) - some silt - moist to wet	10–12	SS	5	510/610	24
4			13–15				
5			16–17	SS	6	360/610	37
6			18–20				
		Dense, brown, sandy SILT (ML) - dilatant - saturated	21–22	SS	7	510/610	25
7		Borehole terminated at 6.7 m below existing ground. 50 mm diameter PVC well installed with 3.0 m screen between 6.0 - 3.0 m depths below grade. Backfilled with sand from 6.0 m up to 2.7 m, and bentonite from 2.7 m depths to surface. Finished with pedestal cover at surface. Well cluster tag # A311058.	23–32				
8							
9							
10							

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

BH/MW07-22

CLIENT Royal LePage — PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road — DATUM

DATES: BORING February 17, 2022 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
0		**Snow, Farm Field**			0				
0		TOPSOIL: dark brown, sandy silt - trace clay and gravel - frosted to moist			1	SS	1	610/610	10
					2				
1		Compact, brown, SAND AND GRAVEL (SP-GP) - trace silt - occasional cobbles - moist			3	SS	2	410/610	12
					4				
					5				
2					6	SS	3	410/610	48
					7				
					8	SS	4	360/610	25
					9				
3		Compact, brown, SAND (SP) - trace silt and gravel - moist			10				
					11	SS	5	460/610	24
					12				
4					13				
					14				
					15				
5					16	SS	6	460/610	25
					17				
					18				
6					19				
					20				
					21	SS	7	510/610	18
					22				
7		Borehole terminated at 6.7 m below existing ground. 50 mm diameter PVC well installed with 3.0 m screen between 6.0 - 3.0 m depths below grade. Backfilled with sand from 6.0 m up to 2.7 m, and bentonite from 2.7 m depths to surface. Finished with pedestal cover at surface. Well cluster tag # A311058.			23				
					24				
					25				
8					26				
					27				
					28				
9					29				
					30				
					31				
10					32				

UNDRAINED SHEAR STRENGTH (kPa)
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

Stantec

BH/MW08-22

CLIENT Royal LePage — PROJECT No. 161414214

LOCATION 2509 Cedar Creek Road — DATUM

DATES: BORING February 17, 2022 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
		Snow, Farm Field							
0		TOPSOIL: dark brown, sandy silt - trace clay and gravel - frosted to moist			0–2	SS	1	610/610	11
1					3–4	SS	2	360/610	9
		Loose to compact, brown, SAND (SP) - some gravel - trace silt - occasional cobbles - moist			5–7	SS	3	410/610	21
2					8–9	SS	4	410/610	19
3		Dense to very dense, brown, SAND (SP) - some gravel to gravelly - trace silt - frequent cobbles - moist			10–12	SS	5	460/610	34
4					13–15				
5					16–17	SS	6	360/610	50/100
		Borehole terminated at 5.2 m below existing ground due to auger refusal. 50 mm diameter PVC well installed with 3.0 m screen between 5.2 - 2.2 m depths below grade. Backfilled with sand from 5.2 m up to 1.8 m, and bentonite from 1.8 m depths to surface. Finished with pedestal cover at surface. Well cluster tag # A311058.							
6					18–20				
7					21–23				
8					24–26				
9					27–30				
10					31–32				

UNDRAINED SHEAR STRENGTH (kPa)
50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

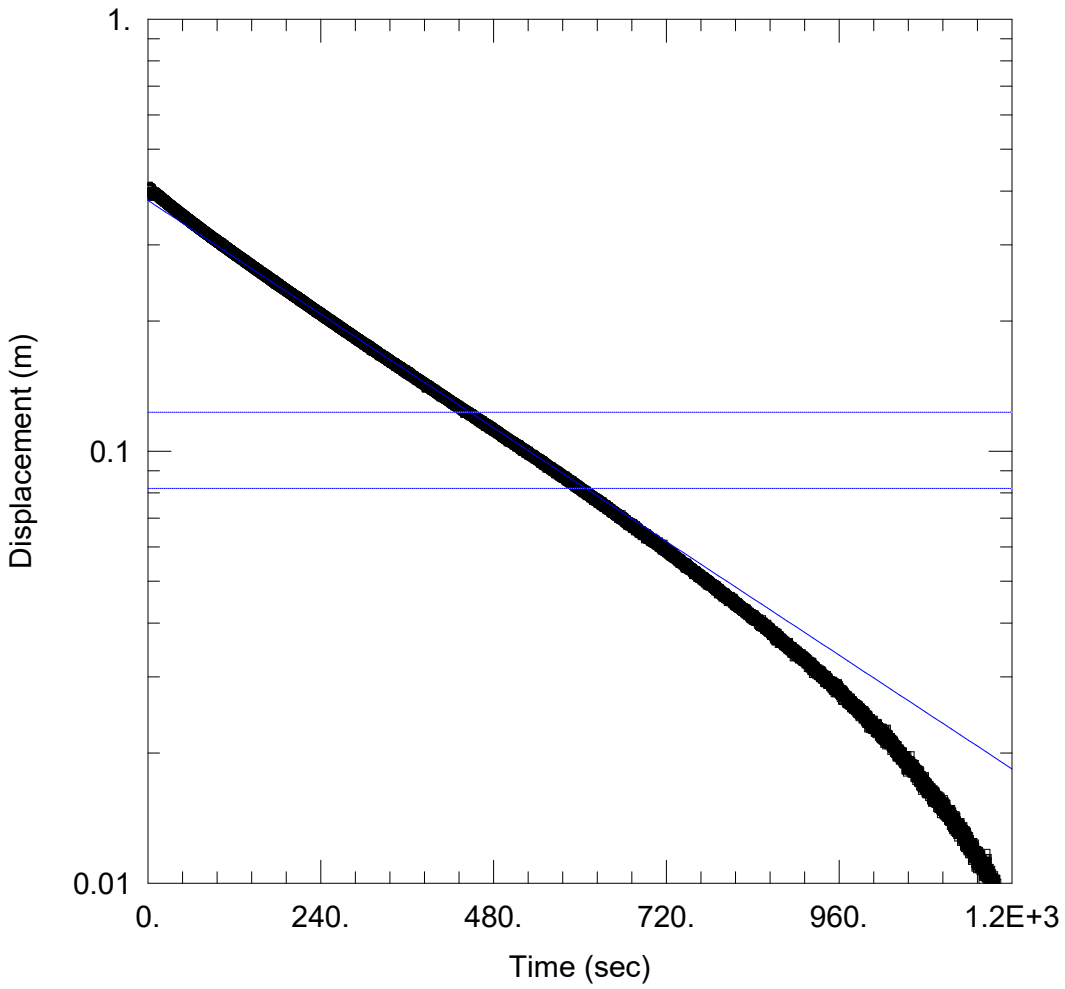
REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

10 20 30 40 50 60 70 80 90 100

>>

□ Field Vane Test, kPa
■ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

Appendix G Hydraulic Response Testing Analytical Solutions



RISING HEAD TEST

Data Set: \\Cd1004-f01\01609\active\161414214\03_data\analytical\k-tests\MW2-22_SH_JK.aqt
Date: 01/24/24 Time: 12:56:23

PROJECT INFORMATION

Company: Stantec
Client: Royal LePage
Project: 161414214
Location: 2509 Cedar Creek Road
Test Well: MW2-22
Test Date: May 2, 2022

AQUIFER DATA

Saturated Thickness: 3. m
Anisotropy Ratio (Kz/Kr): 0.3

WELL DATA (MW2-22)

Initial Displacement: 0.41 m
Total Well Penetration Depth: 3. m
Casing Radius: 0.0254 m
Static Water Column Height: 3. m
Screen Length: 3. m
Well Radius: 0.105 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.0E-6 m/sec
y0 = 0.3804 m

Appendix H Laboratory Certificate of Analysis

Your Project #: 161414214.804
Your C.O.C. #: 878469-01-01

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2022/05/19
Report #: R7131538
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2D0478
Received: 2022/05/13, 18:13

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	4	N/A	2022/05/14	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	4	N/A	2022/05/16	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	4	N/A	2022/05/17	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	4	N/A	2022/05/14	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	4	N/A	2022/05/17	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	4	N/A	2022/05/18	CAM SOP 00102/00408/00447	SM 2340 B
Metals Analysis by ICPMS (as received) (2)	4	N/A	2022/05/18	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	4	N/A	2022/05/18		
Anion and Cation Sum	4	N/A	2022/05/18		
Total Coliforms/ E. coli, CFU/100mL	4	N/A	2022/05/13	CAM SOP-00551	MOE E3407
Total Ammonia-N	4	N/A	2022/05/18	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (3)	4	N/A	2022/05/18	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	4	2022/05/14	2022/05/14	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	4	N/A	2022/05/17	CAM SOP-00461	EPA 365.1 m
Sat. pH and Langelier Index (@ 20C)	4	N/A	2022/05/18		Auto Calc
Sat. pH and Langelier Index (@ 4C)	4	N/A	2022/05/18		Auto Calc
Sulphate by Automated Colourimetry	4	N/A	2022/05/18	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	4	N/A	2022/05/18		Auto Calc
Low Level Total Suspended Solids	4	2022/05/18	2022/05/19	CAM SOP-00428	SM 23 2540D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Your Project #: 161414214.804
Your C.O.C. #: 878469-01-01

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2022/05/19
Report #: R7131538
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2D0478

Received: 2022/05/13, 18:13

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Metals analysis was performed on the sample 'as received'.
(3) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ronklin Gracian, Project Manager
Email: Ronklin.Gracian@bureauveritas.com
Phone# (905)817-5752

==========

This report has been generated and distributed using a secure automated process.
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For Service Group specific validation please refer to the Validation Signature Page.

RCAP - COMPREHENSIVE (DRINKING WATER)

Bureau Veritas ID		SPU230			SPU230		
Sampling Date		2022/05/13 13:46			2022/05/13 13:46		
COC Number		878469-01-01			878469-01-01		
	UNITS	WG-161414214-20220513-SH1	RDL	QC Batch	WG-161414214-20220513-SH1 Lab-Dup	RDL	QC Batch
Calculated Parameters							
Anion Sum	me/L	7.81	N/A	7994824			
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	250	1.0	7994822			
Calculated TDS	mg/L	440	1.0	7994221			
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.7	1.0	7994822			
Cation Sum	me/L	8.12	N/A	7994824			
Hardness (CaCO3)	mg/L	360	1.0	7995056			
Ion Balance (% Difference)	%	1.90	N/A	7994823			
Langelier Index (@ 20C)	N/A	0.995		7994825			
Langelier Index (@ 4C)	N/A	0.747		7994826			
Saturation pH (@ 20C)	N/A	7.06		7994825			
Saturation pH (@ 4C)	N/A	7.31		7994826			
Inorganics							
Total Ammonia-N	mg/L	<0.050	0.050	8000251	<0.050	0.050	8000251
Conductivity	umho/cm	760	1.0	7995921			
Dissolved Organic Carbon	mg/L	<0.40	0.40	7997475			
Orthophosphate (P)	mg/L	<0.010	0.010	7995908			
pH	pH	8.06		7995918			
Dissolved Sulphate (SO4)	mg/L	55	1.0	7995909			
Alkalinity (Total as CaCO3)	mg/L	250	1.0	7995922			
Dissolved Chloride (Cl-)	mg/L	40	1.0	7995907			
Nitrite (N)	mg/L	<0.010	0.010	7995905			
Nitrate (N)	mg/L	7.06	0.10	7995905			
Metals							
Aluminum (Al)	mg/L	0.0093	0.0049	7997528			
Antimony (Sb)	mg/L	<0.00050	0.00050	7997528			
Arsenic (As)	mg/L	<0.0010	0.0010	7997528			
Barium (Ba)	mg/L	0.098	0.0020	7997528			
Beryllium (Be)	mg/L	<0.00040	0.00040	7997528			
Boron (B)	mg/L	0.011	0.010	7997528			
Cadmium (Cd)	mg/L	<0.000090	0.000090	7997528			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

RCAP - COMPREHENSIVE (DRINKING WATER)

Bureau Veritas ID		SPU230			SPU230		
Sampling Date		2022/05/13 13:46			2022/05/13 13:46		
COC Number		878469-01-01			878469-01-01		
	UNITS	WG-161414214-20220513-SH1	RDL	QC Batch	WG-161414214-20220513-SH1 Lab-Dup	RDL	QC Batch
Calcium (Ca)	mg/L	98	0.20	7997528			
Chromium (Cr)	mg/L	<0.0050	0.0050	7997528			
Cobalt (Co)	mg/L	<0.00050	0.00050	7997528			
Copper (Cu)	mg/L	0.0010	0.00090	7997528			
Iron (Fe)	mg/L	<0.10	0.10	7997528			
Lead (Pb)	mg/L	<0.00050	0.00050	7997528			
Lithium (Li)	mg/L	<0.0050	0.0050	7997528			
Magnesium (Mg)	mg/L	29	0.050	7997528			
Manganese (Mn)	mg/L	<0.0020	0.0020	7997528			
Molybdenum (Mo)	mg/L	<0.00050	0.00050	7997528			
Nickel (Ni)	mg/L	<0.0010	0.0010	7997528			
Phosphorus (P)	mg/L	<0.10	0.10	7997528			
Potassium (K)	mg/L	1.5	0.20	7997528			
Selenium (Se)	mg/L	<0.0020	0.0020	7997528			
Silicon (Si)	mg/L	6.5	0.050	7997528			
Silver (Ag)	mg/L	<0.000090	0.000090	7997528			
Sodium (Na)	mg/L	19	0.10	7997528			
Strontium (Sr)	mg/L	0.49	0.0010	7997528			
Thallium (Tl)	mg/L	<0.000050	0.000050	7997528			
Titanium (Ti)	mg/L	<0.0050	0.0050	7997528			
Uranium (U)	mg/L	0.00051	0.00010	7997528			
Vanadium (V)	mg/L	<0.00050	0.00050	7997528			
Zinc (Zn)	mg/L	0.015	0.0050	7997528			

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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RCAP - COMPREHENSIVE (DRINKING WATER)

Bureau Veritas ID		SPU231		SPU232		
Sampling Date		2022/05/13 14:52		2022/05/13 15:30		
COC Number		878469-01-01		878469-01-01		
	UNITS	WG-161414214-20220513-SH2	RDL	WG-161414214-20220513-SH3	RDL	QC Batch
Calculated Parameters						
Anion Sum	me/L	54.1	N/A	21.7	N/A	7994824
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	260	1.0	290	1.0	7994822
Calculated TDS	mg/L	3100	1.0	1200	1.0	7994221
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.2	1.0	2.8	1.0	7994822
Cation Sum	me/L	55.1	N/A	22.5	N/A	7994824
Hardness (CaCO3)	mg/L	870	1.0	590	1.0	7995056
Ion Balance (% Difference)	%	0.880	N/A	1.74	N/A	7994823
Langelier Index (@ 20C)	N/A	1.01		1.09		7994825
Langelier Index (@ 4C)	N/A	0.772		0.843		7994826
Saturation pH (@ 20C)	N/A	6.93		6.92		7994825
Saturation pH (@ 4C)	N/A	7.18		7.17		7994826
Inorganics						
Total Ammonia-N	mg/L	<0.050	0.050	<0.050	0.050	8000251
Conductivity	umho/cm	6100	1.0	2400	1.0	7995921
Dissolved Organic Carbon	mg/L	0.56	0.40	0.71	0.40	7997475
Orthophosphate (P)	mg/L	<0.010	0.010	0.012	0.010	7995908
pH	pH	7.95		8.01		7995918
Dissolved Sulphate (SO4)	mg/L	58	1.0	42	1.0	7995909
Alkalinity (Total as CaCO3)	mg/L	270	1.0	300	1.0	7995922
Dissolved Chloride (Cl-)	mg/L	1700	25	520	6.0	7995907
Nitrite (N)	mg/L	<0.010	0.010	<0.010	0.010	7995905
Nitrate (N)	mg/L	0.97	0.10	3.69	0.10	7995905
Metals						
Aluminum (Al)	mg/L	<0.0049	0.0049	<0.0049	0.0049	7997528
Antimony (Sb)	mg/L	<0.00050	0.00050	<0.00050	0.00050	7997528
Arsenic (As)	mg/L	<0.0010	0.0010	<0.0010	0.0010	7997528
Barium (Ba)	mg/L	0.28	0.0020	0.29	0.0020	7997528
Beryllium (Be)	mg/L	<0.00040	0.00040	<0.00040	0.00040	7997528
Boron (B)	mg/L	0.014	0.010	0.014	0.010	7997528
Cadmium (Cd)	mg/L	<0.000090	0.000090	<0.000090	0.000090	7997528
Calcium (Ca)	mg/L	230	0.20	150	0.20	7997528

RDL = Reportable Detection Limit
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N/A = Not Applicable

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RCAP - COMPREHENSIVE (DRINKING WATER)

Bureau Veritas ID		SPU231		SPU232		
Sampling Date		2022/05/13 14:52		2022/05/13 15:30		
COC Number		878469-01-01		878469-01-01		
	UNITS	WG-161414214-20220513-SH2	RDL	WG-161414214-20220513-SH3	RDL	QC Batch
Chromium (Cr)	mg/L	<0.0050	0.0050	<0.0050	0.0050	7997528
Cobalt (Co)	mg/L	<0.00050	0.00050	<0.00050	0.00050	7997528
Copper (Cu)	mg/L	0.013	0.00090	0.013	0.00090	7997528
Iron (Fe)	mg/L	0.11	0.10	<0.10	0.10	7997528
Lead (Pb)	mg/L	<0.00050	0.00050	<0.00050	0.00050	7997528
Lithium (Li)	mg/L	0.013	0.0050	0.0070	0.0050	7997528
Magnesium (Mg)	mg/L	74	0.050	50	0.050	7997528
Manganese (Mn)	mg/L	0.0047	0.0020	0.0037	0.0020	7997528
Molybdenum (Mo)	mg/L	0.00056	0.00050	<0.00050	0.00050	7997528
Nickel (Ni)	mg/L	<0.0010	0.0010	<0.0010	0.0010	7997528
Phosphorus (P)	mg/L	<0.10	0.10	<0.10	0.10	7997528
Potassium (K)	mg/L	4.1	0.20	2.3	0.20	7997528
Selenium (Se)	mg/L	<0.0020	0.0020	<0.0020	0.0020	7997528
Silicon (Si)	mg/L	6.6	0.050	6.2	0.050	7997528
Silver (Ag)	mg/L	<0.000090	0.000090	<0.000090	0.000090	7997528
Sodium (Na)	mg/L	860	0.50	250	0.10	7997528
Strontium (Sr)	mg/L	0.65	0.0010	0.27	0.0010	7997528
Thallium (Tl)	mg/L	<0.000050	0.000050	<0.000050	0.000050	7997528
Titanium (Ti)	mg/L	<0.0050	0.0050	<0.0050	0.0050	7997528
Uranium (U)	mg/L	0.00099	0.00010	0.00066	0.00010	7997528
Vanadium (V)	mg/L	<0.00050	0.00050	<0.00050	0.00050	7997528
Zinc (Zn)	mg/L	0.019	0.0050	0.018	0.0050	7997528

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

RCAP - COMPREHENSIVE (DRINKING WATER)

Bureau Veritas ID		SPU232			SPU233		
Sampling Date		2022/05/13 15:30			2022/05/13 16:13		
COC Number		878469-01-01			878469-01-01		
	UNITS	WG-161414214-20220513-SH3 Lab-Dup	RDL	QC Batch	WG-161414214-20220513-SH4	RDL	QC Batch
Calculated Parameters							
Anion Sum	me/L				8.24	N/A	7994824
Bicarb. Alkalinity (calc. as CaCO3)	mg/L				260	1.0	7994822
Calculated TDS	mg/L				460	1.0	7994221
Carb. Alkalinity (calc. as CaCO3)	mg/L				2.8	1.0	7994822
Cation Sum	me/L				8.48	N/A	7994824
Hardness (CaCO3)	mg/L				350	1.0	7995056
Ion Balance (% Difference)	%				1.43	N/A	7994823
Langelier Index (@ 20C)	N/A				1.01		7994825
Langelier Index (@ 4C)	N/A				0.759		7994826
Saturation pH (@ 20C)	N/A				7.06		7994825
Saturation pH (@ 4C)	N/A				7.31		7994826
Inorganics							
Total Ammonia-N	mg/L				<0.050	0.050	8000251
Conductivity	umho/cm	2400	1.0	7995921	810	1.0	7995921
Dissolved Organic Carbon	mg/L				0.47	0.40	7997475
Orthophosphate (P)	mg/L				<0.010	0.010	7995908
pH	pH	8.03		7995918	8.07		7995918
Dissolved Sulphate (SO4)	mg/L				53	1.0	7995909
Alkalinity (Total as CaCO3)	mg/L	300	1.0	7995922	260	1.0	7995922
Dissolved Chloride (Cl-)	mg/L				54	1.0	7995907
Nitrite (N)	mg/L				<0.010	0.010	7995905
Nitrate (N)	mg/L				5.97	0.10	7995905
Metals							
Aluminum (Al)	mg/L				0.0077	0.0049	7997528
Antimony (Sb)	mg/L				<0.00050	0.00050	7997528
Arsenic (As)	mg/L				<0.0010	0.0010	7997528
Barium (Ba)	mg/L				0.088	0.0020	7997528
Beryllium (Be)	mg/L				<0.00040	0.00040	7997528
Boron (B)	mg/L				0.012	0.010	7997528
Cadmium (Cd)	mg/L				<0.000090	0.000090	7997528

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable

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RCAP - COMPREHENSIVE (DRINKING WATER)

Bureau Veritas ID		SPU232			SPU233		
Sampling Date		2022/05/13 15:30			2022/05/13 16:13		
COC Number		878469-01-01			878469-01-01		
	UNITS	WG-161414214-20220513-SH3 Lab-Dup	RDL	QC Batch	WG-161414214-20220513-SH4	RDL	QC Batch
Calcium (Ca)	mg/L				96	0.20	7997528
Chromium (Cr)	mg/L				<0.0050	0.0050	7997528
Cobalt (Co)	mg/L				<0.00050	0.00050	7997528
Copper (Cu)	mg/L				<0.00090	0.00090	7997528
Iron (Fe)	mg/L				0.35	0.10	7997528
Lead (Pb)	mg/L				<0.00050	0.00050	7997528
Lithium (Li)	mg/L				<0.0050	0.0050	7997528
Magnesium (Mg)	mg/L				26	0.050	7997528
Manganese (Mn)	mg/L				<0.0020	0.0020	7997528
Molybdenum (Mo)	mg/L				<0.00050	0.00050	7997528
Nickel (Ni)	mg/L				<0.0010	0.0010	7997528
Phosphorus (P)	mg/L				<0.10	0.10	7997528
Potassium (K)	mg/L				1.2	0.20	7997528
Selenium (Se)	mg/L				<0.0020	0.0020	7997528
Silicon (Si)	mg/L				5.9	0.050	7997528
Silver (Ag)	mg/L				<0.000090	0.000090	7997528
Sodium (Na)	mg/L				34	0.10	7997528
Strontium (Sr)	mg/L				0.46	0.0010	7997528
Thallium (Tl)	mg/L				<0.000050	0.000050	7997528
Titanium (Ti)	mg/L				<0.0050	0.0050	7997528
Uranium (U)	mg/L				0.00042	0.00010	7997528
Vanadium (V)	mg/L				<0.00050	0.00050	7997528
Zinc (Zn)	mg/L				0.027	0.0050	7997528

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RCAP - COMPREHENSIVE (DRINKING WATER)

Bureau Veritas ID		SPU233		
Sampling Date		2022/05/13 16:13		
COC Number		878469-01-01		
	UNITS	WG-161414214-20220513-SH4 Lab-Dup	RDL	QC Batch
Metals				
Aluminum (Al)	mg/L	0.0055	0.0049	7997528
Antimony (Sb)	mg/L	<0.00050	0.00050	7997528
Arsenic (As)	mg/L	<0.0010	0.0010	7997528
Barium (Ba)	mg/L	0.091	0.0020	7997528
Beryllium (Be)	mg/L	<0.00040	0.00040	7997528
Boron (B)	mg/L	0.012	0.010	7997528
Cadmium (Cd)	mg/L	<0.000090	0.000090	7997528
Calcium (Ca)	mg/L	97	0.20	7997528
Chromium (Cr)	mg/L	<0.0050	0.0050	7997528
Cobalt (Co)	mg/L	<0.00050	0.00050	7997528
Copper (Cu)	mg/L	<0.00090	0.00090	7997528
Iron (Fe)	mg/L	0.35	0.10	7997528
Lead (Pb)	mg/L	<0.00050	0.00050	7997528
Lithium (Li)	mg/L	<0.0050	0.0050	7997528
Magnesium (Mg)	mg/L	26	0.050	7997528
Manganese (Mn)	mg/L	<0.0020	0.0020	7997528
Molybdenum (Mo)	mg/L	<0.00050	0.00050	7997528
Nickel (Ni)	mg/L	<0.0010	0.0010	7997528
Phosphorus (P)	mg/L	<0.10	0.10	7997528
Potassium (K)	mg/L	1.2	0.20	7997528
Selenium (Se)	mg/L	<0.0020	0.0020	7997528
Silicon (Si)	mg/L	5.9	0.050	7997528
Silver (Ag)	mg/L	<0.000090	0.000090	7997528
Sodium (Na)	mg/L	33	0.10	7997528
Strontium (Sr)	mg/L	0.45	0.0010	7997528
Thallium (Tl)	mg/L	<0.000050	0.000050	7997528
Titanium (Ti)	mg/L	<0.0050	0.0050	7997528
Uranium (U)	mg/L	0.00038	0.00010	7997528
Vanadium (V)	mg/L	<0.00050	0.00050	7997528

RDL = Reportable Detection Limit
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Lab-Dup = Laboratory Initiated Duplicate

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RCAP - COMPREHENSIVE (DRINKING WATER)

Bureau Veritas ID		SPU233		
Sampling Date		2022/05/13 16:13		
COC Number		878469-01-01		
	UNITS	**WG-161414214-20220513-SH4 Lab-Dup**	**RDL**	**QC Batch**
Zinc (Zn)	mg/L	0.027	0.0050	7997528

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Bureau Veritas Job #: C2D0478
Report Date: 2022/05/19

Stantec Consulting Ltd
Client Project #: 161414214.804
Sampler Initials: SH

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		SPU230	SPU231	SPU232	SPU232		
Sampling Date		2022/05/13 13:46	2022/05/13 14:52	2022/05/13 15:30	2022/05/13 15:30		
COC Number		878469-01-01	878469-01-01	878469-01-01	878469-01-01		
	UNITS	WG-161414214-20220513-SH1	WG-161414214-20220513-SH2	WG-161414214-20220513-SH3	WG-161414214-20220513-SH3 Lab-Dup	RDL	QC Batch
Inorganics							
Total Suspended Solids	mg/L	<1	2	2	2	1	8000104

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		SPU233		
Sampling Date		2022/05/13 16:13		
COC Number		878469-01-01		
	UNITS	WG-161414214-20220513-SH4	RDL	QC Batch
Inorganics				
Total Suspended Solids	mg/L	1	1	8000104

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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MICROBIOLOGY (WATER)

Bureau Veritas ID		SPU230	SPU231	SPU232	SPU233	
Sampling Date		2022/05/13 13:46	2022/05/13 14:52	2022/05/13 15:30	2022/05/13 16:13	
COC Number		878469-01-01	878469-01-01	878469-01-01	878469-01-01	
	UNITS	WG-161414214-20220513-SH1	WG-161414214-20220513-SH2	WG-161414214-20220513-SH3	WG-161414214-20220513-SH4	QC Batch
Microbiological						
Background	CFU/100mL	0	0	0	17	7995619
Total Coliforms	CFU/100mL	0	0	0	1	7995619
Escherichia coli	CFU/100mL	0	0	0	0	7995619

QC Batch = Quality Control Batch

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TEST SUMMARY

Bureau Veritas ID: SPU230 **Collected:** 2022/05/13
Sample ID: WG-161414214-20220513-SH1 **Shipped:**
Matrix: Water **Received:** 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7995922	N/A	2022/05/14	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7994822	N/A	2022/05/16	Automated Statchk
Chloride by Automated Colourimetry	KONE	7995907	N/A	2022/05/17	Alina Dobreanu
Conductivity	AT	7995921	N/A	2022/05/14	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7997475	N/A	2022/05/17	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7995056	N/A	2022/05/18	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	7997528	N/A	2022/05/18	Arefa Dabhad
Ion Balance (% Difference)	CALC	7994823	N/A	2022/05/18	Automated Statchk
Anion and Cation Sum	CALC	7994824	N/A	2022/05/18	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	7995619	N/A	2022/05/13	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	8000251	N/A	2022/05/18	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	7995905	N/A	2022/05/18	Samuel Law
pH	AT	7995918	2022/05/14	2022/05/14	Yogesh Patel
Orthophosphate	KONE	7995908	N/A	2022/05/17	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7994825	N/A	2022/05/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7994826	N/A	2022/05/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7995909	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7994221	N/A	2022/05/18	Automated Statchk
Low Level Total Suspended Solids	BAL	8000104	2022/05/18	2022/05/19	Shaneil Hall

Bureau Veritas ID: SPU230 Dup **Collected:** 2022/05/13
Sample ID: WG-161414214-20220513-SH1 **Shipped:**
Matrix: Water **Received:** 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	8000251	N/A	2022/05/18	Raiq Kashif

Bureau Veritas ID: SPU231 **Collected:** 2022/05/13
Sample ID: WG-161414214-20220513-SH2 **Shipped:**
Matrix: Water **Received:** 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7995922	N/A	2022/05/14	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7994822	N/A	2022/05/16	Automated Statchk
Chloride by Automated Colourimetry	KONE	7995907	N/A	2022/05/17	Alina Dobreanu
Conductivity	AT	7995921	N/A	2022/05/14	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7997475	N/A	2022/05/17	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7995056	N/A	2022/05/18	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	7997528	N/A	2022/05/18	Arefa Dabhad
Ion Balance (% Difference)	CALC	7994823	N/A	2022/05/18	Automated Statchk
Anion and Cation Sum	CALC	7994824	N/A	2022/05/18	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	7995619	N/A	2022/05/13	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	8000251	N/A	2022/05/18	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	7995905	N/A	2022/05/18	Samuel Law
pH	AT	7995918	2022/05/14	2022/05/14	Yogesh Patel

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

Bureau Veritas ID: SPU231 **Collected:** 2022/05/13
Sample ID: WG-161414214-20220513-SH2 **Shipped:**
Matrix: Water **Received:** 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Orthophosphate	KONE	7995908	N/A	2022/05/17	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7994825	N/A	2022/05/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7994826	N/A	2022/05/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7995909	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7994221	N/A	2022/05/18	Automated Statchk
Low Level Total Suspended Solids	BAL	8000104	2022/05/18	2022/05/19	Shaneil Hall

Bureau Veritas ID: SPU232 **Collected:** 2022/05/13
Sample ID: WG-161414214-20220513-SH3 **Shipped:**
Matrix: Water **Received:** 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7995922	N/A	2022/05/14	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7994822	N/A	2022/05/16	Automated Statchk
Chloride by Automated Colourimetry	KONE	7995907	N/A	2022/05/17	Alina Dobreanu
Conductivity	AT	7995921	N/A	2022/05/14	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7997475	N/A	2022/05/17	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7995056	N/A	2022/05/18	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	7997528	N/A	2022/05/18	Arefa Dabhad
Ion Balance (% Difference)	CALC	7994823	N/A	2022/05/18	Automated Statchk
Anion and Cation Sum	CALC	7994824	N/A	2022/05/18	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	7995619	N/A	2022/05/13	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	8000251	N/A	2022/05/18	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	7995905	N/A	2022/05/18	Samuel Law
pH	AT	7995918	2022/05/14	2022/05/14	Yogesh Patel
Orthophosphate	KONE	7995908	N/A	2022/05/17	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7994825	N/A	2022/05/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7994826	N/A	2022/05/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7995909	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7994221	N/A	2022/05/18	Automated Statchk
Low Level Total Suspended Solids	BAL	8000104	2022/05/18	2022/05/19	Shaneil Hall

Bureau Veritas ID: SPU232 Dup **Collected:** 2022/05/13
Sample ID: WG-161414214-20220513-SH3 **Shipped:**
Matrix: Water **Received:** 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7995922	N/A	2022/05/14	Yogesh Patel
Conductivity	AT	7995921	N/A	2022/05/14	Yogesh Patel
pH	AT	7995918	2022/05/14	2022/05/14	Yogesh Patel
Low Level Total Suspended Solids	BAL	8000104	2022/05/18	2022/05/19	Shaneil Hall

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C2D0478
Report Date: 2022/05/19

Stantec Consulting Ltd
Client Project #: 161414214.804
Sampler Initials: SH

TEST SUMMARY

Bureau Veritas ID: SPU233
Sample ID: WG-161414214-20220513-SH4
Matrix: Water

Collected: 2022/05/13
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	7995922	N/A	2022/05/14	Yogesh Patel
Carbonate, Bicarbonate and Hydroxide	CALC	7994822	N/A	2022/05/16	Automated Statchk
Chloride by Automated Colourimetry	KONE	7995907	N/A	2022/05/17	Alina Dobreanu
Conductivity	AT	7995921	N/A	2022/05/14	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	7997475	N/A	2022/05/17	Anna-Kay Gooden
Hardness (calculated as CaCO3)		7995056	N/A	2022/05/18	Automated Statchk
Metals Analysis by ICPMS (as received)	ICP/MS	7997528	N/A	2022/05/18	Arefa Dabhad
Ion Balance (% Difference)	CALC	7994823	N/A	2022/05/18	Automated Statchk
Anion and Cation Sum	CALC	7994824	N/A	2022/05/18	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	7995619	N/A	2022/05/13	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	8000251	N/A	2022/05/18	Raiq Kashif
Nitrate & Nitrite as Nitrogen in Water	LACH	7995905	N/A	2022/05/18	Samuel Law
pH	AT	7995918	2022/05/14	2022/05/14	Yogesh Patel
Orthophosphate	KONE	7995908	N/A	2022/05/17	Chandra Nandlal
Sat. pH and Langelier Index (@ 20C)	CALC	7994825	N/A	2022/05/18	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	7994826	N/A	2022/05/18	Automated Statchk
Sulphate by Automated Colourimetry	KONE	7995909	N/A	2022/05/18	Chandra Nandlal
Total Dissolved Solids (TDS calc)	CALC	7994221	N/A	2022/05/18	Automated Statchk
Low Level Total Suspended Solids	BAL	8000104	2022/05/18	2022/05/19	Shaneil Hall

Bureau Veritas ID: SPU233 Dup
Sample ID: WG-161414214-20220513-SH4
Matrix: Water

Collected: 2022/05/13
Shipped:
Received: 2022/05/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals Analysis by ICPMS (as received)	ICP/MS	7997528	N/A	2022/05/18	Arefa Dabhad

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.3°C

Results relate only to the items tested.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7995905	Nitrate (N)	2022/05/18	93	80 - 120	98	80 - 120	<0.10	mg/L	0.51	20		
7995905	Nitrite (N)	2022/05/18	97	80 - 120	101	80 - 120	<0.010	mg/L	7.1	20		
7995907	Dissolved Chloride (Cl-)	2022/05/17	NC	80 - 120	104	80 - 120	<1.0	mg/L	0.50	20		
7995908	Orthophosphate (P)	2022/05/17	110	75 - 125	101	80 - 120	<0.010	mg/L	4.3	25		
7995909	Dissolved Sulphate (SO4)	2022/05/18	NC	75 - 125	99	80 - 120	<1.0	mg/L	0.10	20		
7995918	pH	2022/05/14			102	98 - 103			0.26	N/A		
7995921	Conductivity	2022/05/14			101	85 - 115	<1.0	umho/cm	0	25		
7995922	Alkalinity (Total as CaCO3)	2022/05/14			95	85 - 115	<1.0	mg/L	1.1	20		
7997475	Dissolved Organic Carbon	2022/05/17	96	80 - 120	94	80 - 120	<0.40	mg/L	1.5	20		
7997528	Aluminum (Al)	2022/05/18	97	80 - 120	96	80 - 120	<0.0049	mg/L	NC	20		
7997528	Antimony (Sb)	2022/05/18	107	80 - 120	104	80 - 120	<0.00050	mg/L	NC	20		
7997528	Arsenic (As)	2022/05/18	102	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20		
7997528	Barium (Ba)	2022/05/18	98	80 - 120	99	80 - 120	<0.0020	mg/L	2.5	20		
7997528	Beryllium (Be)	2022/05/18	100	80 - 120	103	80 - 120	<0.00040	mg/L	NC	20		
7997528	Boron (B)	2022/05/18	95	80 - 120	100	80 - 120	<0.010	mg/L	3.0	20		
7997528	Cadmium (Cd)	2022/05/18	105	80 - 120	103	80 - 120	<0.000090	mg/L	NC	20		
7997528	Calcium (Ca)	2022/05/18	NC	80 - 120	101	80 - 120	<0.20	mg/L	0.87	20		
7997528	Chromium (Cr)	2022/05/18	103	80 - 120	100	80 - 120	<0.0050	mg/L	NC	20		
7997528	Cobalt (Co)	2022/05/18	100	80 - 120	101	80 - 120	<0.00050	mg/L	NC	20		
7997528	Copper (Cu)	2022/05/18	102	80 - 120	102	80 - 120	<0.00090	mg/L	NC	20		
7997528	Iron (Fe)	2022/05/18	102	80 - 120	100	80 - 120	<0.10	mg/L	0.48	20		
7997528	Lead (Pb)	2022/05/18	102	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20		
7997528	Lithium (Li)	2022/05/18	100	80 - 120	115	80 - 120	<0.0050	mg/L	NC	20		
7997528	Magnesium (Mg)	2022/05/18	NC	80 - 120	103	80 - 120	<0.050	mg/L	0.54	20		
7997528	Manganese (Mn)	2022/05/18	101	80 - 120	100	80 - 120	<0.0020	mg/L	NC	20		
7997528	Molybdenum (Mo)	2022/05/18	107	80 - 120	104	80 - 120	<0.00050	mg/L	NC	20		
7997528	Nickel (Ni)	2022/05/18	95	80 - 120	97	80 - 120	<0.0010	mg/L	NC	20		
7997528	Phosphorus (P)	2022/05/18	99	80 - 120	118	80 - 120	<0.10	mg/L	NC	20		
7997528	Potassium (K)	2022/05/18	106	80 - 120	105	80 - 120	<0.20	mg/L	0.24	20		
7997528	Selenium (Se)	2022/05/18	102	80 - 120	100	80 - 120	<0.0020	mg/L	NC	20		

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
7997528	Silicon (Si)	2022/05/18	105	80 - 120	103	80 - 120	<0.050	mg/L	0.75	20		
7997528	Silver (Ag)	2022/05/18	99	80 - 120	97	80 - 120	<0.000090	mg/L	NC	20		
7997528	Sodium (Na)	2022/05/18	NC	80 - 120	100	80 - 120	<0.10	mg/L	2.4	20		
7997528	Strontium (Sr)	2022/05/18	104	80 - 120	93	80 - 120	<0.0010	mg/L	0.98	20		
7997528	Thallium (Tl)	2022/05/18	102	80 - 120	97	80 - 120	<0.000050	mg/L	NC	20		
7997528	Titanium (Ti)	2022/05/18	101	80 - 120	100	80 - 120	<0.0050	mg/L	NC	20		
7997528	Uranium (U)	2022/05/18	100	80 - 120	97	80 - 120	<0.00010	mg/L	9.5	20		
7997528	Vanadium (V)	2022/05/18	96	80 - 120	96	80 - 120	<0.00050	mg/L	NC	20		
7997528	Zinc (Zn)	2022/05/18	99	80 - 120	98	80 - 120	<0.0050	mg/L	0.72	20		
8000104	Total Suspended Solids	2022/05/19					<1	mg/L	0	25	97	85 - 115
8000251	Total Ammonia-N	2022/05/18	103	75 - 125	105	80 - 120	<0.050	mg/L	NC	20		

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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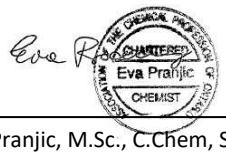
Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

Sonja Elavinamannil, Master of Biochemistry, Team Lead

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas
109 & 110, 4023 Meadowbrook Drive, London, Ontario Canada N6L 1E7 Tel:(519) 652-9444 Toll-free:800-563-6266 Fax:(519) 652-8189 www.bvna.com

Page of

CHAIN OF CUSTODY RECORD

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name:	#9197 Stantec Consulting Ltd	Company Name:		Quotation #:	C15856	Bureau Veritas Job #:	Bottle Order #:
Attention:	Accounts Payable	Attention:	Grant Whitehead	P.O. #:			878469
Address:	300 Hagey Blvd Suite 100	Address:		Project:	161414214	COC #:	Project Manager:
	Waterloo ON N2L 0A4			Project Name:		C#878469-01-01	Ronklin Gracian
Tel:	(519) 579-4410 Fax: (519) 579-6733	Tel:	(519) 585-7400 Fax: (519) 579-4239	Site #:			
Email:	SAPinvoices@Stantec.com	Email:	grant.whitehead@stantec.com	Sampled By:			

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)
- ☐ Table 1 ☐ Res/Park ☐ Medium/Fine
- ☐ Table 2 ☐ Ind/Comm ☐ Coarse
- ☐ Table 3 ☐ Agri/Other ☐ For RSC
- ☐ Table ___

Other Regulations
- ☐ CCME ☐ Sanitary Sewer Bylaw
- ☐ Reg 558 ☐ Storm Sewer Bylaw
- ☐ MISA Municipality ___
- ☐ PWQO ☐ Reg 406 Table ___
- ☒ Other ODWS

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ___

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	RCAp - Comprehensive (Drinking Water)	Low Level Total Suspended Solids	Total Coliforms/ E. coli, CFU/100mL	# of Bottles	Comments
1		WG-1614214-20220513-SH1	5/13/22	1346	GW	-	X	X	X	6	
2		LX1-1614214-20220513-SH2	"	1452	GW	-	X	X	X	6	
3		WG-1614214-20220513-SH3	"	1530	GW	-	X	X	X	6	
4		WG-1614214-20220513-SH4	"	1613	GW	-	X	X	X	6	
5											
6											
7											
8											
9											
10											

13-May-22 18:13
Ronklin Gracian
C2D0478
DSG ENV-1403

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only			
Scott Hutchison	22/05/13	1800	DIPIKA SINGH	2022/05/13	18:13		Time Sensitive	Temperature (°C) on Recei 13|11|7 on Ice	Custody Seal Present	Yes ☐ / No ☐
Scott Hutchison									Intact	☐ / ☐

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

Your Project #: 161414214
Your C.O.C. #: 918512-01-01

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2023/02/03
Report #: R7496006
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C326554
Received: 2023/01/27, 18:12

Sample Matrix: Water
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	3	N/A	2023/02/01	CAM SOP-00448	SM 23 2320 B m
Carbonate, Bicarbonate and Hydroxide	3	N/A	2023/02/01	CAM SOP-00102	APHA 4500-CO2 D
Chloride by Automated Colourimetry	3	N/A	2023/01/31	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	3	N/A	2023/02/01	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	3	N/A	2023/01/31	CAM SOP-00446	SM 23 5310 B m
Hardness (calculated as CaCO3)	3	N/A	2023/02/01	CAM SOP 00102/00408/00447	SM 2340 B
Dissolved Metals by ICPMS	3	N/A	2023/02/01	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	3	N/A	2023/02/01		
Anion and Cation Sum	3	N/A	2023/02/01		
Total Coliforms/ E. coli, CFU/100mL	3	N/A	2023/01/30	CAM SOP-00551	
Total Ammonia-N	3	N/A	2023/02/02	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (2)	3	N/A	2023/01/31	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	3	2023/01/31	2023/02/01	CAM SOP-00413	SM 4500H+ B m
Orthophosphate	3	N/A	2023/01/31	CAM SOP-00461	SM 23 4500-P E m
Sat. pH and Langelier Index (@ 20C)	3	N/A	2023/02/01		Auto Calc
Sat. pH and Langelier Index (@ 4C)	3	N/A	2023/02/01		Auto Calc
Sulphate by Automated Colourimetry	3	N/A	2023/01/31	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids (TDS calc)	3	N/A	2023/02/01		Auto Calc
Total Suspended Solids	3	2023/02/01	2023/02/02	CAM SOP-00428	SM 23 2540D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Your Project #: 161414214
Your C.O.C. #: 918512-01-01

Attention: Grant Whitehead

Stantec Consulting Ltd
300 Hagey Blvd
Suite 100
Waterloo, ON
CANADA N2L 0A4

Report Date: 2023/02/03
Report #: R7496006
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C326554

Received: 2023/01/27, 18:12

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Ronklin Gracian, Project Manager
Email: Ronklin.Gracian@bureauveritas.com
Phone# (905)817-5752

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This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

RCAP - COMPREHENSIVE (DRINKING WATER)

Bureau Veritas ID		UXN006		UXN007		UXN008		
Sampling Date		2023/01/27 11:40		2023/01/27 12:40		2023/01/27 13:40		
COC Number		918512-01-01		918512-01-01		918512-01-01		
	UNITS	MW02-22	RDL	MW01-22	RDL	MW03-22	RDL	QC Batch
Calculated Parameters								
Anion Sum	me/L	9.63	N/A	11.4	N/A	6.57	N/A	8476829
Bicarb. Alkalinity (calc. as CaCO3)	mg/L	280	1.0	280	1.0	210	1.0	8476826
Calculated TDS	mg/L	520	1.0	640	1.0	370	1.0	8476832
Carb. Alkalinity (calc. as CaCO3)	mg/L	2.0	1.0	2.0	1.0	1.8	1.0	8476826
Cation Sum	me/L	9.88	N/A	12.3	N/A	6.77	N/A	8476829
Hardness (CaCO3)	mg/L	400	1.0	330	1.0	290	1.0	8476768
Ion Balance (% Difference)	%	1.27	N/A	3.90	N/A	1.54	N/A	8476828
Langelier Index (@ 20C)	N/A	0.876		0.877		0.768		8476830
Langelier Index (@ 4C)	N/A	0.628		0.630		0.519		8476831
Saturation pH (@ 20C)	N/A	7.00		7.02		7.19		8476830
Saturation pH (@ 4C)	N/A	7.25		7.26		7.44		8476831
Inorganics								
Total Ammonia-N	mg/L	<0.050	0.050	<0.050	0.050	<0.050	0.050	8479201
Conductivity	umho/cm	970	1.0	1200	1.0	660	1.0	8479004
Dissolved Organic Carbon	mg/L	0.55	0.40	1.3	0.40	0.60	0.40	8479048
Orthophosphate (P)	mg/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	8477744
pH	pH	7.88		7.89		7.95		8478959
Dissolved Sulphate (SO4)	mg/L	13	1.0	20	1.0	6.2	1.0	8477734
Alkalinity (Total as CaCO3)	mg/L	280	1.0	280	1.0	220	1.0	8479002
Dissolved Chloride (Cl-)	mg/L	110	1.0	190	2.0	42	1.0	8478100
Nitrite (N)	mg/L	<0.010	0.010	<0.010	0.010	<0.010	0.010	8477253
Nitrate (N)	mg/L	6.59	0.10	1.19	0.10	13.2	0.10	8477253

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

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C326554
Report Date: 2023/02/03

Stantec Consulting Ltd
Client Project #: 161414214
Sampler Initials: RB

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		UXN006	UXN007		UXN008		
Sampling Date		2023/01/27 11:40	2023/01/27 12:40		2023/01/27 13:40		
COC Number		918512-01-01	918512-01-01		918512-01-01		
	UNITS	**MW02-22**	**MW01-22**	**RDL**	**MW03-22**	**RDL**	**QC Batch**
Inorganics							
Total Suspended Solids	mg/L	6600	8500	100	12000	50	8480759

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		UXN006	UXN007	UXN008		
Sampling Date		2023/01/27 11:40	2023/01/27 12:40	2023/01/27 13:40		
COC Number		918512-01-01	918512-01-01	918512-01-01		
	UNITS	MW02-22	MW01-22	MW03-22	RDL	QC Batch
Metals						
Dissolved Aluminum (Al)	mg/L	<0.0049	0.012	<0.0049	0.0049	8479268
Dissolved Antimony (Sb)	mg/L	0.0011	<0.00050	0.0028	0.00050	8479268
Dissolved Arsenic (As)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	8479268
Dissolved Barium (Ba)	mg/L	0.083	0.059	0.022	0.0020	8479268
Dissolved Beryllium (Be)	mg/L	<0.00040	<0.00040	<0.00040	0.00040	8479268
Dissolved Boron (B)	mg/L	<0.010	0.018	0.012	0.010	8479268
Dissolved Cadmium (Cd)	mg/L	<0.000090	<0.000090	<0.000090	0.000090	8479268
Dissolved Calcium (Ca)	mg/L	100	110	83	0.20	8479268
Dissolved Cesium (Cs)	mg/L	<0.00020	<0.00020	<0.00020	0.00020	8479268
Dissolved Chromium (Cr)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	8479268
Dissolved Cobalt (Co)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	8479268
Dissolved Copper (Cu)	mg/L	<0.00090	0.00099	<0.00090	0.00090	8479268
Dissolved Iron (Fe)	mg/L	<0.10	<0.10	<0.10	0.10	8479268
Dissolved Lead (Pb)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	8479268
Dissolved Lithium (Li)	mg/L	0.0063	<0.0050	<0.0050	0.0050	8479268
Dissolved Magnesium (Mg)	mg/L	34	15	20	0.050	8479268
Dissolved Manganese (Mn)	mg/L	<0.0020	<0.0020	<0.0020	0.0020	8479268
Dissolved Molybdenum (Mo)	mg/L	<0.00050	<0.00050	0.00059	0.00050	8479268
Dissolved Nickel (Ni)	mg/L	<0.0010	<0.0010	<0.0010	0.0010	8479268
Dissolved Phosphorus (P)	mg/L	<0.10	<0.10	<0.10	0.10	8479268
Dissolved Potassium (K)	mg/L	0.89	2.6	1.4	0.20	8479268
Dissolved Rubidium (Rb)	mg/L	0.00072	<0.00020	0.00076	0.00020	8479268
Dissolved Selenium (Se)	mg/L	<0.0020	<0.0020	<0.0020	0.0020	8479268
Dissolved Silicon (Si)	mg/L	7.2	3.3	4.4	0.050	8479268
Dissolved Silver (Ag)	mg/L	<0.000090	<0.000090	<0.000090	0.000090	8479268
Dissolved Sodium (Na)	mg/L	43	130	21	0.10	8479268
Dissolved Strontium (Sr)	mg/L	0.18	0.16	0.11	0.0010	8479268
Dissolved Thallium (Tl)	mg/L	<0.000050	<0.000050	<0.000050	0.000050	8479268
Dissolved Titanium (Ti)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	8479268
Dissolved Uranium (U)	mg/L	0.00040	0.00038	0.00044	0.00010	8479268
Dissolved Vanadium (V)	mg/L	<0.00050	<0.00050	<0.00050	0.00050	8479268

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		UXN006	UXN007	UXN008		
Sampling Date		2023/01/27 11:40	2023/01/27 12:40	2023/01/27 13:40		
COC Number		918512-01-01	918512-01-01	918512-01-01		
	UNITS	**MW02-22**	**MW01-22**	**MW03-22**	**RDL**	**QC Batch**
Dissolved Zinc (Zn)	mg/L	<0.0050	<0.0050	<0.0050	0.0050	8479268

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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MICROBIOLOGY (WATER)

Bureau Veritas ID		UXN006	UXN007	UXN008	
Sampling Date		2023/01/27 11:40	2023/01/27 12:40	2023/01/27 13:40	
COC Number		918512-01-01	918512-01-01	918512-01-01	
	UNITS	**MW02-22**	**MW01-22**	**MW03-22**	**QC Batch**
Microbiological					
Background	CFU/100mL	NDOGN (1)	NDOGN (1)	NDOGN (1)	8476860
Total Coliforms	CFU/100mL	NDOGN (1)	NDOGN (1)	NDOGN (1)	8476860
Escherichia coli	CFU/100mL	NDOGN (1)	NDOGN (1)	NDOGN (1)	8476860

QC Batch = Quality Control Batch
(1) NDOGN: No data due to overgrowth. Total coliforms and / or E.coli not detected

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

TEST SUMMARY

Bureau Veritas ID: UXN006
Sample ID: MW02-22
Matrix: Water

Collected: 2023/01/27
Shipped:
Received: 2023/01/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8479002	N/A	2023/02/01	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	8476826	N/A	2023/02/01	Automated Statchk
Chloride by Automated Colourimetry	KONE	8478100	N/A	2023/01/31	Samuel Law
Conductivity	AT	8479004	N/A	2023/02/01	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8479048	N/A	2023/01/31	Gyulshen Idriz
Hardness (calculated as CaCO3)		8476768	N/A	2023/02/01	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8479268	N/A	2023/02/01	Prempal Bhatti
Ion Balance (% Difference)	CALC	8476828	N/A	2023/02/01	Automated Statchk
Anion and Cation Sum	CALC	8476829	N/A	2023/02/01	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	8476860	N/A	2023/01/30	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	8479201	N/A	2023/02/02	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8477253	N/A	2023/01/31	Chandra Nandlal
pH	AT	8478959	2023/01/31	2023/02/01	Surinder Rai
Orthophosphate	KONE	8477744	N/A	2023/01/31	Massarat Jan
Sat. pH and Langelier Index (@ 20C)	CALC	8476830	N/A	2023/02/01	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	8476831	N/A	2023/02/01	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8477734	N/A	2023/01/31	Massarat Jan
Total Dissolved Solids (TDS calc)	CALC	8476832	N/A	2023/02/01	Automated Statchk
Total Suspended Solids	BAL	8480759	2023/02/01	2023/02/02	Shaneil Hall

Bureau Veritas ID: UXN007
Sample ID: MW01-22
Matrix: Water

Collected: 2023/01/27
Shipped:
Received: 2023/01/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8479002	N/A	2023/02/01	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	8476826	N/A	2023/02/01	Automated Statchk
Chloride by Automated Colourimetry	KONE	8478100	N/A	2023/01/31	Samuel Law
Conductivity	AT	8479004	N/A	2023/02/01	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8479048	N/A	2023/01/31	Gyulshen Idriz
Hardness (calculated as CaCO3)		8476768	N/A	2023/02/01	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8479268	N/A	2023/02/01	Prempal Bhatti
Ion Balance (% Difference)	CALC	8476828	N/A	2023/02/01	Automated Statchk
Anion and Cation Sum	CALC	8476829	N/A	2023/02/01	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	8476860	N/A	2023/01/30	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	8479201	N/A	2023/02/02	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8477253	N/A	2023/01/31	Chandra Nandlal
pH	AT	8478959	2023/01/31	2023/02/01	Surinder Rai
Orthophosphate	KONE	8477744	N/A	2023/01/31	Massarat Jan
Sat. pH and Langelier Index (@ 20C)	CALC	8476830	N/A	2023/02/01	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	8476831	N/A	2023/02/01	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8477734	N/A	2023/01/31	Massarat Jan
Total Dissolved Solids (TDS calc)	CALC	8476832	N/A	2023/02/01	Automated Statchk
Total Suspended Solids	BAL	8480759	2023/02/01	2023/02/02	Shaneil Hall

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Bureau Veritas Job #: C326554
Report Date: 2023/02/03

Stantec Consulting Ltd
Client Project #: 161414214
Sampler Initials: RB

TEST SUMMARY

Bureau Veritas ID: UXN008
Sample ID: MW03-22
Matrix: Water

Collected: 2023/01/27
Shipped:
Received: 2023/01/27

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8479002	N/A	2023/02/01	Surinder Rai
Carbonate, Bicarbonate and Hydroxide	CALC	8476826	N/A	2023/02/01	Automated Statchk
Chloride by Automated Colourimetry	KONE	8478100	N/A	2023/01/31	Samuel Law
Conductivity	AT	8479004	N/A	2023/02/01	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8479048	N/A	2023/01/31	Gyulshen Idriz
Hardness (calculated as CaCO3)		8476768	N/A	2023/02/01	Automated Statchk
Dissolved Metals by ICPMS	ICP/MS	8479268	N/A	2023/02/01	Prempal Bhatti
Ion Balance (% Difference)	CALC	8476828	N/A	2023/02/01	Automated Statchk
Anion and Cation Sum	CALC	8476829	N/A	2023/02/01	Automated Statchk
Total Coliforms/ E. coli, CFU/100mL	PL	8476860	N/A	2023/01/30	Sonja Elavinamannil
Total Ammonia-N	LACH/NH4	8479201	N/A	2023/02/02	Shivani Shivani
Nitrate & Nitrite as Nitrogen in Water	LACH	8477253	N/A	2023/01/31	Chandra Nandlal
pH	AT	8478959	2023/01/31	2023/02/01	Surinder Rai
Orthophosphate	KONE	8477744	N/A	2023/01/31	Massarat Jan
Sat. pH and Langelier Index (@ 20C)	CALC	8476830	N/A	2023/02/01	Automated Statchk
Sat. pH and Langelier Index (@ 4C)	CALC	8476831	N/A	2023/02/01	Automated Statchk
Sulphate by Automated Colourimetry	KONE	8477734	N/A	2023/01/31	Massarat Jan
Total Dissolved Solids (TDS calc)	CALC	8476832	N/A	2023/02/01	Automated Statchk
Total Suspended Solids	BAL	8480759	2023/02/01	2023/02/02	Shaneil Hall

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.3°C

Results relate only to the items tested.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8477253	Nitrate (N)	2023/01/31	95	80 - 120	99	80 - 120	<0.10	mg/L	0.87	20		
8477253	Nitrite (N)	2023/01/31	104	80 - 120	108	80 - 120	<0.010	mg/L	NC	20		
8477734	Dissolved Sulphate (SO4)	2023/01/31	NC	75 - 125	91	80 - 120	<1.0	mg/L	0.056	20		
8477744	Orthophosphate (P)	2023/01/31	95	75 - 125	97	80 - 120	<0.010	mg/L	NC	20		
8478100	Dissolved Chloride (Cl-)	2023/01/31	NC	80 - 120	102	80 - 120	11:48:37 A, RDL=1.0	mg/L	0.27	20		
8478959	pH	2023/02/01			102	98 - 103			1.2	N/A		
8479002	Alkalinity (Total as CaCO3)	2023/02/01			94	85 - 115	<1.0	mg/L	1.0	20		
8479004	Conductivity	2023/02/01			101	85 - 115	<1.0	umho/cm	0.53	25		
8479048	Dissolved Organic Carbon	2023/01/31	96	80 - 120	99	80 - 120	<0.40	mg/L	NC	20		
8479201	Total Ammonia-N	2023/02/03	94	75 - 125	100	80 - 120	<0.050	mg/L	0.67	20		
8479268	Dissolved Aluminum (Al)	2023/02/01	100	80 - 120	95	80 - 120	<0.0049	mg/L				
8479268	Dissolved Antimony (Sb)	2023/02/01	110	80 - 120	104	80 - 120	<0.00050	mg/L	NC	20		
8479268	Dissolved Arsenic (As)	2023/02/01	104	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20		
8479268	Dissolved Barium (Ba)	2023/02/01	104	80 - 120	97	80 - 120	<0.0020	mg/L	2.0	20		
8479268	Dissolved Beryllium (Be)	2023/02/01	103	80 - 120	98	80 - 120	<0.00040	mg/L	NC	20		
8479268	Dissolved Boron (B)	2023/02/01	98	80 - 120	94	80 - 120	<0.010	mg/L	0.022	20		
8479268	Dissolved Cadmium (Cd)	2023/02/01	104	80 - 120	100	80 - 120	<0.000090	mg/L	NC	20		
8479268	Dissolved Calcium (Ca)	2023/02/01	NC	80 - 120	97	80 - 120	<0.20	mg/L				
8479268	Dissolved Cesium (Cs)	2023/02/01	101	80 - 120	96	80 - 120	<0.00020	mg/L				
8479268	Dissolved Chromium (Cr)	2023/02/01	102	80 - 120	100	80 - 120	<0.0050	mg/L	NC	20		
8479268	Dissolved Cobalt (Co)	2023/02/01	102	80 - 120	100	80 - 120	<0.00050	mg/L	NC	20		
8479268	Dissolved Copper (Cu)	2023/02/01	100	80 - 120	97	80 - 120	<0.00090	mg/L	0.58	20		
8479268	Dissolved Iron (Fe)	2023/02/01	105	80 - 120	101	80 - 120	<0.10	mg/L				
8479268	Dissolved Lead (Pb)	2023/02/01	101	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20		
8479268	Dissolved Lithium (Li)	2023/02/01	108	80 - 120	103	80 - 120	<0.0050	mg/L				
8479268	Dissolved Magnesium (Mg)	2023/02/01	NC	80 - 120	99	80 - 120	<0.050	mg/L				
8479268	Dissolved Manganese (Mn)	2023/02/01	103	80 - 120	101	80 - 120	<0.0020	mg/L				
8479268	Dissolved Molybdenum (Mo)	2023/02/01	108	80 - 120	102	80 - 120	<0.00050	mg/L	2.9	20		
8479268	Dissolved Nickel (Ni)	2023/02/01	101	80 - 120	100	80 - 120	<0.0010	mg/L	7.0	20		

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8479268	Dissolved Phosphorus (P)	2023/02/01	104	80 - 120	105	80 - 120	<0.10	mg/L				
8479268	Dissolved Potassium (K)	2023/02/01	102	80 - 120	99	80 - 120	<0.20	mg/L				
8479268	Dissolved Rubidium (Rb)	2023/02/01	102	80 - 120	99	80 - 120	<0.00020	mg/L				
8479268	Dissolved Selenium (Se)	2023/02/01	107	80 - 120	101	80 - 120	<0.0020	mg/L	2.4	20		
8479268	Dissolved Silicon (Si)	2023/02/01	101	80 - 120	96	80 - 120	<0.050	mg/L				
8479268	Dissolved Silver (Ag)	2023/02/01	94	80 - 120	101	80 - 120	<0.000090	mg/L	NC	20		
8479268	Dissolved Sodium (Na)	2023/02/01	99	80 - 120	96	80 - 120	<0.10	mg/L	1.2	20		
8479268	Dissolved Strontium (Sr)	2023/02/01	NC	80 - 120	104	80 - 120	<0.0010	mg/L				
8479268	Dissolved Thallium (Tl)	2023/02/01	105	80 - 120	100	80 - 120	<0.000050	mg/L	NC	20		
8479268	Dissolved Titanium (Ti)	2023/02/01	105	80 - 120	98	80 - 120	<0.0050	mg/L				
8479268	Dissolved Uranium (U)	2023/02/01	107	80 - 120	102	80 - 120	<0.00010	mg/L	1.4	20		
8479268	Dissolved Vanadium (V)	2023/02/01	104	80 - 120	100	80 - 120	<0.00050	mg/L	0.12	20		
8479268	Dissolved Zinc (Zn)	2023/02/01	104	80 - 120	102	80 - 120	<0.0050	mg/L	1.5	20		
8480759	Total Suspended Solids	2023/02/02					<10	mg/L	7.8	20	102	85 - 115

N/A = Not Applicable

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

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

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

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

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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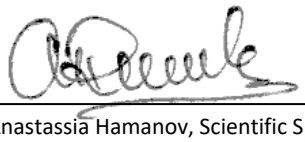
Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Anastassia Hamanov, Scientific Specialist

Sonja Elavinamannil, Master of Biochemistry, Team Lead

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.

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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BUREAU VERITAS

MICRO

ONTARIO DRINK 27-Jan-23 18:12 **RD**

6660 & 6740 Campobello
Tel:(905) 817-5700 Toll-fr

Ronklin Gracian
C326554

JDK ENV-1481

Bottle Order #: 918512 COC #: C#918512-01-01

Please indicate which regulation applies to the samples being submitted:

☐ 170 ☐ 318/319 ☐ 243 ☐ 170Pb

☒ Not regulated (however water is for human consumption)

CAM FCD-01101/2 Page of

INVOICE TO:

Company Name: #9197 Stantec Consulting Ltd
Attention: Accounts Payable
Address: 300 Hagey Blvd Suite 100 Waterloo ON N2L 0A4
Tel: (519) 579-4410 Project: 161414214
Fax: (519) 579-6733 P.O. #:
Email: SAPinvoices@Stantec.com

Same as Invoice To ☐
Company Name:
Attention: Grant Whitehead
Address:
Tel: (519) 585-7400 Fax: (519) 579-4239
Email: grant.whitehead@stantec.com

Analysis Requested

***DRINKING WATER TYPE LEGEND: [R=Raw Water] [T=Treated/POE] [D=Distribution] [P=Plumbing] [S=Standing] [F=Flushed]**

	Sample Identification/Location	Date Sampled	Time Sampled	*WATER TYPE (R,T,D,P,S,F)	MOE/MOH Adverse Notifcation Required? Yes	No	Field Chlorine Free	Total	Field Turbidity	Field pH	Watertrax SPL#	Resample Y/N?	# of Bottles	RCAp - Comprehensive (Drinking	Low Level Total Suspended Solids	Total Coliforms/ E. coli, CFU/100mL	metals filter in field
1	MW02-22	Jan 27	11:40	Grnd		X							5	X	X	X	X
2	MW01-22	Jan 27	12:40	Grnd		X							5	X	X	X	X
3	MW03-22	Jan 27	13:20	Grnd		X							5	X	X	X	X
4						X											
5																	
6																	
7																	
8																	
9																	
10																	

IT IS MANDATORY THAT ALL NOTIFICATION INFORMATION BELOW BE COMPLETED PRIOR TO ANALYSIS FOR REGULATED DRINKING WATER SUBMISSIONS.

TAT (TURNAROUND TIME):

RUSH TAT MUST HAVE PRIOR APPROVAL

☐ Regular (5-15 Working Days)
☐ RUSH (Specify Below)

Date Due:
RUSH #

ADVERSE NOTIFICATION INFORMATION

Waterworks Name: .
Waterworks Number: .
Address:
Contact:
Tel: Fax:
Cell:
Email:

Medical Officer of Health/Public Health Unit

Name/Region:
Contact:
Address:
Tel:
Fax:
After Hours:

LABORATORY USE ONLY

Received By (Print): JAGDEEP KAUR
Received By (Sign):
Date: 2023/01/27 Time: 18:12
Comments
Receiving Temp: 3/3/4

Sampled By (Print): Rachel Baker Sampled By (Sign): Date: Jan 27 Time: 16:41
*Relinquished By (Print): *Relinquished By (Sign): Date: Time:

Cooling Media Present Y/N? ☐
Metals Preservation Check Y/N? ☐

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

645131

Bureau Veritas
6740 Campobello Road, Mississauga, Ontario Canada L5N 2L8 Tel (905) 817-5700 Toll-free 800-563-6266 Fax (905) 817-5777 www.bvna.com

Page 7 of 16

CHAIN OF CUSTODY RECORD

INVOICE TO:
Company Name: #9197 Stantec Consulting Ltd
Attention: Accounts Payable
Address: 300 Hagey Blvd Suite 100, Waterloo ON N2L 0A4
Tel: (519) 579-4410 Fax: (519) 579-6733
Email: accounts.payable.invoices@stantec.com

REPORT TO:
Company Name:
Attention:
Address:
Tel:
Email: grant.whitehead@stantec.com

PROJECT INFORMATION:
Quotation #:
P.O. #:
Project: 164142/4
Project Name:
Site #:
Sampled By:

Laboratory Use Only:
Bureau Veritas Job #:
Bottle Order #: 9[illegible]512
COC #: C#916512-01-01
Project Manager:

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): ☐ Table 1 ☐ Res/Park ☐ Medium/Fine; ☐ Table 2 ☐ Ind/Comm ☐ Coarse; ☐ Table 3 ☐ Agri/Other ☐ For RSC; ☐ Table ___
Other Regulations: ☐ CCME ☐ Sanitary Sewer Bylaw; ☐ Reg 558 ☐ Storm Sewer Bylaw; ☐ MISA Municipality ___; ☐ PWQO ☐ Reg 406 Table ___; ☒ Other ODWS
Special Instructions:
Include Criteria on Certificate of Analysis (Y/N)? ___

Turnaround Time (TAT) Required
Please provide advance notice for rush projects
Regular (Standard) TAT: ☐
(will be applied if Rush TAT is not specified)
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.
Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	[illegible]	[illegible]	RCAP-Comprehensive (Drinking)	Low level Total Suspended Solids	Total Coliforms/ E.coli: CFU/100mL					# of Bottles	Comments
1	MW02-22	MW02-22	Jan 27	11:40	GW	Metals			X	X	X					6	
2	MW01-22	MW01-22	Jan 27	12:40	GW	Metals			X	X	X					6	
3	MW03-22	MW03-22	Jan 27	13:40	GW	Metals			X	X	X					6	
4					GW												
5					GW												
6					GW												
7					GW												
8					GW												
9					GW												
10					GW												

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
Rachel Baker	23/01/27	16:41	[illegible] BVRMW	2023/01/27	18:12	

Laboratory Use Only: Time Sensitive; Temperature (°C) on Recei 3/3/4; Custody Seal Present / Intact: Yes / No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.
** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/RESOURCES/

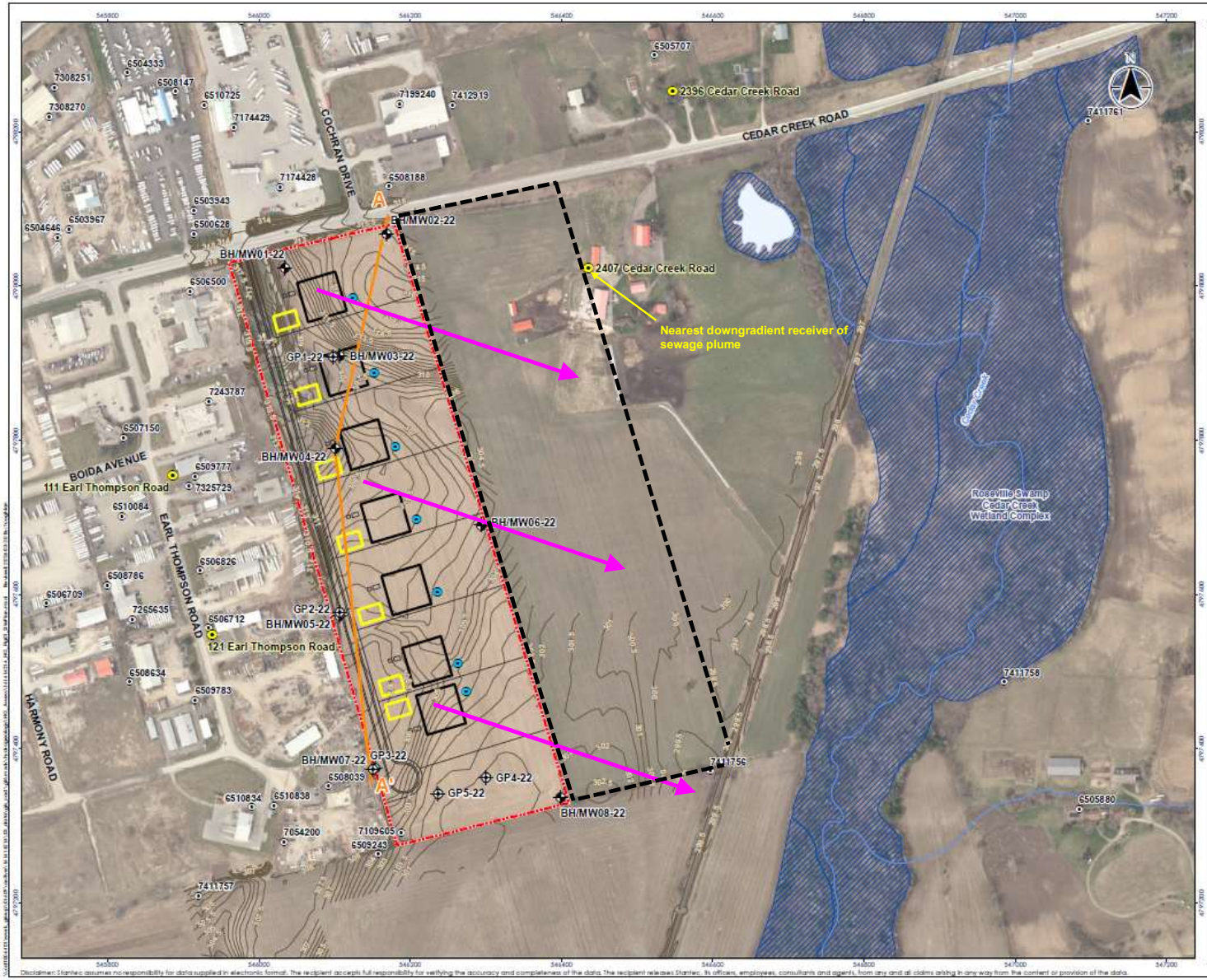
SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client

645131

27-Jan-23 18:12
Ronklin Gracian
C326554
JDK ENV-1481

Appendix I Nitrate Loading Assessment



Stantec

Legend

- Study Area
- Monitoring Well (Stantec, 2022)
- Guelph Permeameter (Stantec, 2022)
- Private Well - Water Quality Sample Location
- Cross-Section Location
- Topographic Contour (mAMSL)

Proposed Site Development

- Proposed Development Plan
- Proposed Building
- Proposed Septic Field
- Possible Well Location

Interpreted Direction of Groundwater Flow Shallow Overburden Aquifer (AFB2) Source: Modified from Matrix Solutions Inc. (2018)

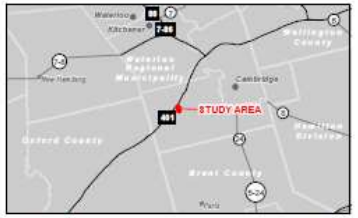
Total sewage effluent plume area that is available for dilution via recharging precipitation.

0 100 200 metres

1:5,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © King's Printer for Ontario, 2024.
3. Orthoimagery © First Base Solutions, 2024. Imagery Date, 2022.



Project Location
Township of North Dumfries

161414214 REVA
Prepared by CMC on 2024-03-20

Client/Project
CEDAR CREEK ROAD HOLDINGS INC.
HYDROGEOLOGIAL ASSESSMENT
2509 CEDAR CREEK ROAD, NORTH DUMFRIES

Figure No.
I-1

Title
Nitrate Loading Assessment

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