Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

Revision: 0

Prepared for:
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Executive Summary

Geofirma Engineering Ltd. was retained by the Ottawa Valley Wild Bird Care Center (OVWBCC) to complete a Hydrogeological Study in support of a Site Plan Control application for construction of a wild bird care center on a property located at 8520 McArton Road in Ottawa (Ashton), Ontario. The property is currently a vacant, relatively flat-lying, agricultural field.

Based on a review of surficial features at the site, shallow groundwater flow is interpreted to be eastward towards an on-site wetland complex. It is anticipated that deeper groundwater flow is to the east (i.e. the Rideau River).

This study has been completed in general accordance with Ontario Ministry of the Environment, Conservation and Parks (MECP) Procedures D-5-5 Private Wells: Water Supply Assessment (MECP, 1996a) and D-5-4 Individual On-Site Sewage Systems: Water Quality Impact Assessment (MECP, 1996b), as well as the City of Ottawa draft Hydrogeological and Terrain Analysis Guidelines (City of Ottawa, 2019).

In support of this study, Geofirma supervised the drilling and construction of a water supply well on the property in accordance with Ontario Regulation 903. The well was drilled to a total depth of approximately 53.3 meters below ground surface (mBGS) and casing was installed to approximately 12.8 mBGS. Bedrock was encountered at a depth of approximately 2.1 mBGS and static groundwater levels were approximately 4 mBGS.

An approximate 7-hour duration pumping test with a constant rate of approximately 122 L/min (32 USgpm) was completed for this water supply well on February 4, 2020. Total drawdown during this test was approximately 1 m and recovered within 60 seconds. Two water samples were collected during this pumping test (3h and 6.5h). The results from the pumping test and laboratory testing show the water quantity and quality are suitable to support the proposed development. Further, the groundwater samples meet all applicable health-related standards and guidelines at the present time. Some treatment may be desired for aesthetic objectives only.

Surficial soils are thin with approximately 0.4 to 2.4 m thick sandy till material above limestone bedrock. An assessment of nitrate attenuation following MECP Guideline D-5-4 indicates that the property size and conditions are suitable to support a conventional septic system as per the proposed development. Predicted nitrate-nitrogen levels are expected to be less than 7 mg/L according to these calculations.

The infiltration capacity of overburden material at the site should be confirmed using field percolation tests at the septic system design phase. Any septic systems should be constructed with all appropriate setbacks as per Ontario Regulations and the Ontario Building Code.

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1 INTRODUCTION

Geofirma Engineering Ltd. was retained by the Ottawa Valley Wild Bird Care Center (OVWBCC) to complete a Hydrogeological Study in support of a Site Plan Control application for construction of a wild bird care center on a property located at 8520 McArton Road in Ottawa (Ashton), Ontario. The site location is provided on Figure A.1, Appendix A.

This report has been prepared to satisfy City of Ottawa requirements to demonstrate that the water well drilled at 8520 McArton Road is suitable for the proposed development on the site. This study has been completed in general accordance with Ontario Ministry of the Environment, Conservation and Parks (MECP) Procedures D-5-5 Private Wells: Water Supply Assessment (MECP, 1996a) and D-5-4 Individual On-Site Sewage Systems: Water Quality Impact Assessment (MECP, 1996b), as well as the City of Ottawa draft Hydrogeological and Terrain Analysis Guidelines (City of Ottawa, 2019).

1.1 Background

The owners of the property at 8520 McArton Road, the Ottawa Valley Wild Bird Care Center (OVWBCC), plan construct a bird care center on the 7.0 hectare (17.3 acre) property, which will include an approximately 623.25 m^2 single story building, outdoor bird cages, and a water retention pond. In addition, a paved parking lots (24 spaces) and a driveway and loading dock area will be constructed with a combined surface area of approximately 1000 m^2. The building will be serviced by a private water supply well (this study) and a septic system.

1.2 Objectives and Scope of Work

The objective of this hydrogeological study is to demonstrate adequate water quantity and water quality to support the proposed development. To meet the project objective, the scope of work included the following:

- Construction of a temporary access road and drilling a bedrock supply water well;
- Completion of a 7-hour pumping test from the drilled water well, and collection of representative groundwater samples;
- Review of surficial and bedrock geology from regional mapping studies (i.e. Ontario Geological Survey mapping);
- Review of surrounding water well information from the MECP water well database; and
- Preparation of a final report summarizing the site conditions, geological and hydrogeological setting, and providing an interpretation of site-specific water quality and water quantity information.

2 SITE DESCRIPTION

2.1 Physical Setting

2.1.1 Site Location

The property is located at 8520 McArton Road, in the rural western portion of the City Ottawa near the community of Ashton. The legal description of the site is Part of Lot 4, Concession 12, Goulbourn Township.

The current property is 7.0 hectare (17.3 acre) in size and does not have any permanent structures. Topography at the site is relatively flat and is composed of agriculture fields and some wooded areas. Manion Corners (Long Swamp) Wetland Complex is located along the east – northeast portion of the property, adjacent to Highway 7 and Upper Dwyer Hill Road (Figure A.2, Appendix A).

2.1.2 Surrounding Properties and Land Use

The property is primarily surrounded by agricultural fields and woodland to the north and west. There are several rural residential lots located along McArton Road, between Upper Dwyer Hill Side Road to the north and Lowe Road, to the south.

The location of the property relative to surrounding land uses is shown on Figure A.2, Appendix A.

2.2 Nearby MECP Water Well Records

The MECP Water Well Information System (WWIS) and on-line mapping tool (accessed July 2018) were reviewed to provide geological and hydrogeological information for the site. A total of nine water well records were identified within 500 m of the site.

Figure A.3 shows the location of MECP water wells referenced in this report. A summary of well record information is included in Table 1, Appendix B. Copies of the well records within 500 m of the site are included in Appendix C.

2.3 Geological Setting

2.3.1 Surficial Geology

The site is located within the Limestone Plains physiographic region, as mapped by Chapman and Putnam (1984), which is characterized by shallow soil cover overlying limestone bedrock. The Ontario Geological Survey (2010) identifies organic deposits covering the central and southeastern portion of the property and silty to sandy till covering most of the property. Recent drilling of six boreholes completed as part of a geotechnical investigation (Terrepex, 2019) confirmed the presence of thin topsoil and sandy till layers at the site, with depth to bedrock ranging from 0.4 to 2.4 meters below ground surface.

Surficial geology (based on OGS, 2010) for the site and surrounding area is illustrated on Figure A.4, Appendix A.

2.3.2 Bedrock Geology

The bedrock geology at the site is mapped as the Gull River Formation (Armstrong and Dodge, 2007). Williams (1991) describes the Gull River Formation as crystalline limestone with shaley partings and minor interbedded limestone and silty dolostone. The mapped geology is consistent with MECP well records for the area, which report bedrock as limestone, sandstone and sandy dolostone.

A bedrock geology map is presented on Figure A.5, Appendix A.

2.4 Hydrogeology

2.4.1 Overburden Aquifer

There is minimal overburden cover in the area, therefore it is not likely that an overburden aquifer is sustainable. All wells within 500 m are installed with steel casing through the overburden and groundwater is supplied from the underlying bedrock aquifer.

2.4.2 Bedrock Aquifer

All MECP water wells within 500 m, as summarized in Table 1, are completed within the bedrock. The average depth to bedrock is approximately 1 m BGS; however, some of the records reported depth to bedrock of zero and describe the upper unit as broken rock. Average well depth is 39.3 m and varies from 21.3 to 68.6 m.

The bedrock aquifer, consisting of limestone and sandy dolostone, is the primary aquifer within the study area. In many cases, bedrock aquifers are dominated by flow through fractures in the rock. The depth to water bearing zones (i.e. fractured zones) was identified on the water well records at depths ranging from 19.8 to 42.7 m, with an average depth of 30.5 m.

2.4.3 Groundwater Flow Direction

In general, shallow groundwater flow follows ground surface elevation/topography and is influenced by areas of groundwater recharge and discharge. Based on a review of surficial features, it is likely that shallow groundwater flows east, toward the wetland complex. The site is located within the Rideau Valley Conservation Authority boundary, near the drainage divide between the Mississippi River and Rideau River. It is anticipated that deeper groundwater flow is to the east (i.e. the Rideau River).

3 METHODOLOGY

3.1 Estimation of Water Demand

Estimation of water demand for the proposed bird care center at 8520 McArton Road was completed by Alfa Alliance Engineering Inc. Based on design specifications for the proposed development, the estimated daily demand is 4.5 to 7.4 cubic meters per day (3.1 to 5.2 L/min or 0.83 to 1.36 gal/min), with a peak flow rate demand of 132 liters per minute (35 gal/min). These values are based on 66 water supply fixture units (WSFU).

3.2 Utility Locates

Public utility locates for the 8520 McArton Road property were requested from Ontario One-Call by Geofirma and were fulfilled by Promark on December 6, 2019. No underground utilities (Ottawa Hydro, Hydro One) were identified in the locate package provided by Promark.

3.3 Water Well Drilling

Drilling was completed on January 16, 2020, by Air Rock Drilling, a MECP licensed water well contractor, under the supervision of Geofirma personnel. A 154 mm (~6 inch) diameter borehole was drilled to a depth of 53.3 m BGS using an air-rotary drilling rig. 170 mm outer diameter (OD) steel casing was installed and cemented from 12.8 m BGS to ground surface. Top of bedrock was encountered at 2.1 m BGS.

A well record was submitted to the MECP by Air Rock on behalf of the OVWBCC and is provided in Appendix D. The well construction details are summarized in the following table:

Water Supply Well Details - 8520 McArton Road	
Drilled Date	January 16, 2020
Casing Depth	12.8 m BGS
Casing Diameter	170 mm (outer diameter) 164 mm (inner diameter)
Casing Stickup	0.49 m AGS
Borehole Diameter	154 mm
Drilled Depth	53.3 m BGS
Static Water Level	4.04 m BGS (Feb 4, 2020)

3.4 Water Well Pumping Test

A 7-hour pumping test was completed in the drilled well at 8520 McArton Road by Geofirma personnel on February 4, 2020. The duration of the pumping test was extended from 6 hours to 7 hours account for a pumping rate (~122 L/min) lower than the estimated peak water demand (132 L/min). The total volume of water produced during the 7-hour test was equivalent to the volume that would be produced in 6 hours at the higher pumping rate.

3.4.1 Test Equipment and Set-up

The pumping test was completed using a submersible pump that was lowered to 27.4 m below ground surface (m BGS). Water produced during the test was discharged from a hose approximately 30 m from the well head, such that discharged water would not impact the results of the test.

A pressure transducer (Solinst Levelogger) was lowered to 22 m below top of well casing (m BTOC) to record water levels in the well during the pumping test. A second pressure transducer (Solinst Barologger) was installed at the well head to measure and account for barometric pressure change during the test.

3.4.2 Test Procedure

The depth to water was measured at 4.04 m BTOC prior to pumping. The pumping test was started at 8:37 am. For the purpose of this pumping test, the measured water level prior to the test is assumed to represent ambient static conditions. Weather conditions during the test were cold and dry, with a daily high of 5 degrees Celsius and no precipitation.

A pumping rate of ~122 L/min (~32.2 US gpm) was used for the test, which was lower than the anticipated peak water demand (132 L/min). After consulting with the City of Ottawa, a flow rate lower than the peak water demand was deemed acceptable, provided that the duration of the test was extended so that the total volume of water produced was equivalent to the volume that would be produced in 6 hours at the higher pumping rate.

Flow rate measurements were collected periodically during the test to confirm flow rate by measuring the time to took to fill a graduated 1000 L water tote. Manual water level measurements were also collected using an electronic water level tape to confirm the transducer measurements and correct for logger drift, if required. The water level in the well was monitored for an hour after the pump was shut off until it recovered to pre-test static conditions.

Manual water level and flow rate measurements collected during the test are provided in Tables 2 and 3, Appendix B.

3.4.3 Measurement of Field Parameters

A Horiba U-52 multimeter was used to collect field measurements of groundwater temperature, pH, conductivity, oxidation-reduction potential (ORP), turbidity and dissolved oxygen (DO). Measurements were collected at regular intervals during the pumping test in a bucket filled with water discharged from the borehole.

Chlorine residual and water colour were also tested in the field prior to sampling using a CHEMets® chlorine kit and a HACH Colorimeter, respectively.

A summary of the field parameter measurements is provided in Table 4, Appendix B.

3.4.4 Groundwater Sample Collection

Two representative groundwater samples were collected during the pumping test: one at 3 hours and second collected in the last hour of the pumping test. The samples were collected from the discharge

using a 10 L bucket, which was disinfected with a 10% bleach solution prior to sample collection. Chlorine residual was tested prior to collection of each sample and was reported as 0 mg/L for both samples.

Upon collection, the samples were stored in a cooler and shipped to Paracel Laboratories Ltd. following standard chain-of-custody and Geofirma QA/QC procedures. The samples were analyzed by Paracel for a suite of drinking water parameters generally referred to as the “Sub-division Package” that includes select anions, general inorganics, metals, and bacteriological parameters.

4 HYDROGEOLOGICAL ASSESSMENT

4.1 Review of MECP Water Well Records

A review of the MECP WWIS was completed to determine average depth of well, depth to bedrock surface and static water level, as well as the recommended depth of pump and pumping rates, as determined by the driller during well completion. In total, 9 well records were identified within the 500 m buffer zone of the proposed development. Key details from these 9 well records are summarized as follows:

Summary of MECP Well Records within 500 m of the Site

Well Record Parameter	Depth of Well (m)	Depth to Bedrock (m)	Static Water Level (m)	Recommended Pump Intake Depth (m)	Available Drawdown (m)	Recommended Pumping Rate (L/min)
Number of Records	9	9	9	9	9	9
Average (mean)	39.3	0.8	7.9	32.4	24.6	29.0
Range	21.3 – 69.6	0.0 – 4.0	1.8 – 15.8	15.9 – 53.4	10.1 – 40.9	18.9 – 56.8

Table 1, Appendix B, contains a more comprehensive list of well completion details for each individual well record within the buffer zone.

4.2 Water Quantity

Based on the results of the pumping test, presented in Appendix E, the well yield is enough to support the estimated peak water demand of 35 gal/min (132 L/min). A plot showing the manually measured and transducer recorded water levels during the pumping test and recovery is provided in Appendix E, Figure E.1.

The pumping test data were analyzed using AQTESOLV (version 4.5), a well test analysis software developed and sold by HydroSOLVE Inc. Using AQTESOLV, the transmissivity of the aquifer is estimated to be 4.2×10^{-3} m^2/s (361 m^2/day). Figure E.2, Appendix E, shows the measured drawdown during pumping test and the fitted curve from AQTESOLVE using the Theis analytical solution. During the test, the maximum measured drawdown of the well was 1.01 m (to 5.05 m BTOC). The water level in the well recovered to 99% of the pre-test static condition 60 minutes after terminating the pumping test.

A forward simulation was also completed in AQTESOLV to predict the drawdown from the well at a pumping rate equal to the estimated peak water demand (132 L/min) using the transmissivity and storativity estimated from the pumping test data. The forward simulation (Figure E.3, Appendix E) indicates that at a pumping rate of 132 L/min, drawdown in the well would stabilize at approximately 1.05 m after approximately 6 hours of pumping.

4.3 Water Quality

The results of the two water quality samples (3h and 6.5h into pumping test) are presented in Table 5, Appendix B. Complete laboratory reports are included in Appendix F.

4.3.1 Health-Based Standards

Based on a review of the Table 5, the following observations can be made with respect to health-based bacteriological, chemical and physical parameters outlined in Procedure D-5-5 (MECP, 1996):

- Total coliforms, E.Coli, and fecal coliforms were not detected (0 CFU/100 mL) in both samples collected during the pumping test; and
- Fluoride, nitrate and nitrite are reported below the laboratory detection limit.

4.3.2 Aesthetic Objectives and Operational Guidelines

Comparison of the water quality results in Table 5 to aesthetic, analytical and indicator parameters outlined in Procedure D-5-5 and the ODWS indicate the following:

- Hardness, reported at 283 mg/L and 290 mg/L, is above the operation guideline (OG) range of 80-100 mg/L. The ODWS states that hardness values greater than 200 mg/L, but less than 500 mg/L, are considered poor but tolerable. Hardness is easily treated with standard water softener systems (see Section 4.3.3 for further discussion).
- Iron, reported at 0.4 mg/L for both samples, is just above the aesthetic objective (AO) of 0.3 mg/L. Iron concentrations up to 5 mg/L are easily treated with a water softener or manganese greensand filter.
- Laboratory reported colour was 12 and 20 TCU for the 3-hour and 6-hour samples, respectively. However, colour was measured at 0 TCU for both samples in the field and there was no visible colour at the time of sampling. For these reasons, the elevated colour reported in the lab samples is attributed to the elevated level of iron in the water, which decreased during the pump test, and is considered acceptable and treatable.
- The concentration of all other aesthetic, analytical and indicator parameters satisfy applicable criteria.

4.3.3 Corrosion / Encrustation Potential - Langelier Saturation Index (LSI) and Ryznar Stability Index (RSI)

The Langelier Saturation Index (LSI) and the Ryznar Stability Index (RSI) are commonly used to assess the potential for water to dissolve or deposit calcium carbonate. LSI is more commonly used, especially with process water in cooling towers.

Hardness is a term used to describe the mineral content of the water and more specifically the levels of cations in the water (mostly due to calcium and magnesium). The water collected during the pumping test is considered to be very hard with concentrations of 283 mg/L and 290 mg/L compared to the recommended operational guideline of 80-100 mg/L, therefore treatment using a water softener would be required.

The Langelier Saturation Index (LSI) is a calculation that provides insight into how balanced the water is in terms of minerals, whereby water with a negative LSI is considered to be corrosive and water with

a positive LSI is considered to be scale forming. Generally, an LSI value between -0.3 and +0.3 is the widely accepted range with a value of 0 being ideal and represents perfectly balanced water.

The LSI can be calculated using a combination of factors involving pH, temperature, calcium hardness, total alkalinity and total dissolved solids (TDS) concentration. Appendix G summarizes the calculations of the LSI index for groundwater during the pumping test at 8520 McArton Road, resulting in a value of -0.88 which represents slightly corrosive water. Corrosive water will deteriorate faucets and appliances faster compared to less corrosive water. Additionally, corrosive water will deteriorate copper pipes more easily and therefore PEX piping may be preferred for new constructions.

Water with high hardness values is typically treated using water softeners that use some form of salt to remove calcium and magnesium by ion exchange with sodium. The by-product of water softeners is backwash water generated during the regeneration process which contains high levels of sodium chloride and calcium and magnesium. This backwash water may have detrimental impacts on septic system and tanks. Best management practices to minimize the impact of discharging this backwash water include discharging it to the subsurface (i.e. dry well) at least 30 m away from a water supply well and do not discharge into a septic system.

5 IMPACT ASSESSMENT

5.1 Hydrogeological Sensitivity

A review of MECP water wells within the study area (500 m buffer) and recent geotechnical drilling indicate that the thickness of soil cover ranges from 0 to 4 m near the study site, with most well records (8 of 9) identifying less than 2 m of overburden cover. At the wellhead, overburden is 2.1 m thick and is composed of sand and cobbles. Given the thin overburden cover (i.e. less than 2 m thick) the site is considered to be hydrogeologically sensitive, meaning the bedrock aquifer is potentially vulnerable to impacts from pathogens and chemicals from surrounding land uses and/or septic effluent disposal beds.

Surrounding land uses, which are primarily rural residential and agricultural, with a wetland complex to the south and east, are considered to be of minimal concern to potentially degrade water quality from the drilled bedrock well at the site. Furthermore, the water quality results from 8520 McArton Road were acceptable and nitrate impacts negligible, suggesting no current impacts to the bedrock aquifer from surrounding land use.

5.2 Septic Assessment

5.2.1 Estimated Sewage Flow

Based on the estimated average daily water demand (Section 3.1) of 4.5 to 7.4 m^3/day, this equates to approximately 4,500 to 7,400 L of water pumped per day and potentially being disposed of through the on-site septic system. While considered a very high estimate, the upper value remains below the threshold (10,000 L/day) requiring an Environmental Compliance Approval (ECA) with the MECP. As such, an assessment of nitrate attenuation is appropriate by following the progressive three step assessment process outlined in Guideline D-5-4 (MECP, 1996b), whereby if the requirements of a given step are not satisfied, the assessment needs to proceed to the next step. The three-step process includes:

Consideration	Requirements to Meet	Applicable for 8520 McArton Rd
Step 1 – Lot Size	Minimum lot size of 1 ha (average) if can demonstrate area is not hydrogeologically sensitive	**No** Lot size is > 1ha but area is deemed to be hydrogeologically sensitive
Step 2 – System Isolation	Areas were septic system is hydrogeologically isolated from the potable water source (e.g. City defines as >10 m clay extending >100 m downgradient)	**No** Area for planned septic system is not considered to be hydrogeologically isolated from the potable water source by City definition
Step 3 – Contaminant Attenuation	If above two considerations are not met, must asses risk of individual sewage systems to cause nitrate-nitrogen in groundwater > 10 mg/L at the development property boundary	**Yes**

Due to the fact that this site is deemed to be hydrogeologically sensitive, a predictive assessment of nitrate attenuation within the soil is appropriate and the following sections describe this assessment.

5.2.2 Background Nitrate Concentrations

No nearby wells were sampled and therefore no additional information on background nitrate concentrations were available for this study. Without additional data, background nitrate (NO_3) concentrations can be estimated by the using laboratory values during the pumping test, which were reported as below the laboratory method detection limit (MDL) of 0.1 mg/L. As such, a value 0.05 mg/L representing 50% of the laboratory MDL was used for the purposes of this report to represent background nitrate conditions.

5.2.3 Nitrate Attenuation Assessment

Appendix H provides a copy of the Site Plan for the proposed development. Future construction will involve several design elements that will create impermeable areas, including the future building (~622 m^2), paved parking lot (~568 m^2) and paved driveway and loading dock (~600 m^2). In addition, an outdoor aviary (fly area outdoor porch) is designed (~380 m^2). These areas (~2,170 m^2) have the potential to reduce infiltration into the groundwater supply and therefore are removed from the total area available for infiltration as part of the calculations.

The annual moisture surplus was determined following the Thornthwaite method (see Ponce, 1996), using average monthly temperature and precipitation values from Environment Canada, for the Appleton monitoring station located approximately 8 km southwest of the subject property. A summary of climatic data and calculations completed using the Thornthwaite model is provided in Appendix I.

Appendix I also includes assumptions and summary calculations for post-development water budget at the subject property and nitrate dilutions calculations to assess the suitability of the site to support a conventional septic system. The following parameters summarize the water budget estimate for 8520 McArton Road post development conditions:

Parameter	Value	Rational
Average Annual Precipitation (per m^2)	873 mm	Environment Canada climate data for Appleton 1993-2019
Annual Evapotranspiration (per m^2)	595 mm	Thornthwaite (Appendix H)
Annual Water Surplus (per m^2)	279 mm	Thornthwaite (Appendix H)
Infiltration Factor	0.68	calculated (Appendix I)
Total Site Area	69,940 m^2	Site Plan
Permeable Site Area	67,770 m^2	Site Plan - discussed above
Annual Water Surplus (for site)	19,499 m^3/yr	Water budget calculations (Appendix I)
Total Annual Infiltration (for site)	12,848 m^3/yr (190 mm/m^2)	Water budget calculations (Appendix I)
Total Estimated Runoff (for site)	6,240 m^3/yr (89 mm/m^2)	Water budget calculations (Appendix I)

These estimates are supported by the observation of a thin soil cover consisting of sandy, clayey till surficial soils identified across much of the and relatively flat topography.

According to MECP Guideline D-5-4, a screening tool to look at the maximum allowable flow for an industrial or commercial development is to assume 1/3 of the available infiltration. Following this process, the maximum allowable flow for the septic system is approximately 4,283 m^3/year which equates to approximately 11,733 L/day. This is significantly greater than the conservative estimate of 4,500 to 7,400 L/day based on average daily estimated water demand and therefore is acceptable.

As outlined in Appendix I, the cumulative nitrate impact for the commercial development proposed for 8520 McArton Road is estimated to be as high as 6.95 mg/L. Further, taking estimated background nitrate concentrations (Section 5.2.2) into account, the total nitrate loading is estimated to be well below the provincially mandated limit of 10 mg/L at the down-gradient property boundary. As such, Geofirma concludes that the proposed development will not have unacceptable impacts to the potable water supply.

5.3 Potential Sources of Contamination

Given that the surrounding land use (within 500 m of the site) is residential and agricultural, potential sources of contamination to domestic water quality in the vicinity of the site include contamination due agricultural runoff (fertilizers, manure, pesticides etc.). Furthermore, road salting activities can contribute to elevated sodium and chloride concentrations in groundwater. These potential sources of contamination are mitigated by the installation of surface casing through the overburden and sealed into bedrock.

5.4 Cumulative Impacts

There are no anticipated additional impacts, or cumulative impacts, on water quality to groundwater users in the vicinity of the site likely to arise from the proposed development given that groundwater flows toward the wetland and there are no downgradient receptors. Based on a review of MECP water well records, there appears to be adequate water quantity and potential well interference from the additional water supply well is unlikely to cause significant impacts on the baseflow to the local environment or available drawdown of nearby wells.

5.5 Source Water Protection

The site is located within the Mississippi-Rideau Source Protection Region. The property is not within any well head protection zones or mapped as highly vulnerable; however, best management practices should be observed to protect groundwater quality. Additional information can be found at the following link:

https://www.mrsourcewater.ca/en/protect-your-drinking-water/protecting-regional-groundwater

5.6 Development Considerations

Based on the results of this study, the following site-specific measures are recommended to minimize potential impact to the bedrock aquifer at 8520 McArton Road resulting from thin soil conditions. Overall, the subject property is considered to be suitable for the proposed development and the

targeted bedrock groundwater supply is deemed to have sufficient quality and quantity for the proposed water demand. Further, the on-site sewage disposal needs can be accommodated with standard Class 4 sewage systems consisting of a septic tank and fully raised leaching bed, as per Part 8 of the Ontario Building Code.

Water Supply Well

- Keeping an increased the separation distance between well and septic bed from 15 m to 30 m;
- Installation of a permanent pump system in the well by a MECP-licensed well driller in accordance with Ontario Regulation 903;
- Maintain well design specifications as per Ontario Regulation 903 including sloping ground surface away from the wells to avoid water flowing toward well, adequate stickup above ground surface, proper well cap, etc;

Water Treatment

- While there is no evidence of bacteriological contamination, the use of disinfection, such as an ultraviolet (UV) system, may be desired for any potable water;
- The slightly corrosive nature of the water, based on the LSI and RSI calculations, while not a major issue, may warrant further assessment and possible treatment such as a neutralizing filter;
- For aesthetic reasons, water treatment such as softening or greensand filters may be desired;

Septic System

- The septic bed should be sited in an area of thicker soil cover, if possible, and may require import of additional suitable fill material;
- Due to the soil conditions a clay seal may be required below the septic leaching bed to ensure additional isolation from the underlying soil and bedrock; and,
- Ensure the septic bed is located downgradient from the well head (i.e. southeast of the well).

Figure A.6, Appendix A, provides a generalized lot development plan, showing the placement of the well and recommended location of the septic system. Note that installation of the well and septic shall, at a minimum, be constructed in accordance with O.Reg. 903 and the Ontario Building Code (Part 8), respectively. Appendix H provides a copy of the draft proposed Site Plan.

6 CONCLUSIONS AND RECOMMENDATIONS

A hydrogeological study was completed to support a proposal for construction of a wild bird care center on a 7.0 hectare (17.3 acre) property at 8520 McArton Road, Ashton, ON. The study included a review of site geology and hydrogeology, attaining public utility locates, drilling and installation of a bedrock water well, completion of a 7-hour pumping test, and collection of a representative water sample from the drilled well.

Based on the study, the following conclusions and recommendations are be made:

Water Quantity

- Well yield is very good and considered acceptable for the anticipated future water demand based on peak flow rate estimate for the proposed development (approximately 35 gallons per minute);
- The calculated transmissivity of the aquifer is 361 m^2/day. During the pumping test (at 122 L/min) the maximum observed drawdown was approximately 1.01 m, to a depth of approximately 5.05 m BTOC. Within 60 minutes, the well had recovered to 99% of the inferred static water level (4.04 m BTOC);

Water Quality

- Water quality is acceptable, with no health-related parameters exceeding applicable Ontario Drinking Water Standards (ODWS);
- Hardness and iron are reported above the operational guideline and aesthetic objective but are tolerable if left untreated. Both hardness and low concentrations of iron are easily treatable with standard water softener systems;
- LSI calculations indicate slightly corrosive water that is tolerable if left untreated by may warrant consideration of a neutralizing filter;

Water Supply Well

- A pump system in the well should be installed in accordance with Ontario Regulation 903 by an MECP-licensed well driller/installer;
- Maintain proper water well design construction in accordance with Reg. 903 including sloping ground surface away from well to discourage water flowing towards or ponding at well, maintaining adequate stickup, vermin proof well cap, etc;

Sewage System Design

- An assessment of nitrate attenuation following MECP Guideline D-5-4 indicates that the property size and conditions are suitable to support a conventional septic system as per the proposed development. Predicted nitrate-nitrogen levels are expected to be less than 7 mg/L according to these calculations.
- The on-site sewage system should be designed and installed by a licensed contractor in accordance with Ontario Building Code (Part 8) specifications. A traditional Class 4 sewage system consisting of a septic tank and leaching bed is acceptable for use at the site.

- The leaching bed should be placed southeast (downgradient) of the well head and the separation distance between the well and bed should be a minimum of 30 m, while meeting all other setback requirements set out in the Building Code.
- The septic bed should be sited in an area of thicker soil cover, if possible, and may require import of additional suitable fill material.
- A clay seal may be warranted below the septic bed to increase isolation between the sewage output and the underlying bedrock aquifer.

7 REFERENCES

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8 CLOSURE

This report has been prepared for the exclusive use of the owners of 8520 McArton Road using a methodology for conducting a hydrogeological study that is acceptable within the profession. Data obtained from sampling represents the conditions at the time of sampling and are subject to variability in the future.

Geofirma Engineering Ltd. has exercised professional judgment in collecting and analyzing the information and in formulating recommendations based on the results of the study. The mandate at Geofirma is to perform the given tasks within guidelines prescribed by the client and with the quality and due diligence expected within the profession. No other warranty or representation expressed or implied, as to the accuracy of the information or recommendations is included or intended in this report.

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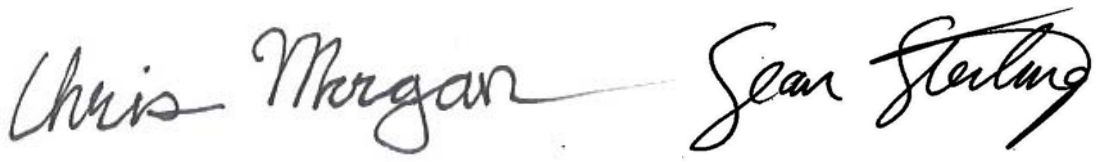
Respectfully submitted,

Geofirma Engineering Ltd.

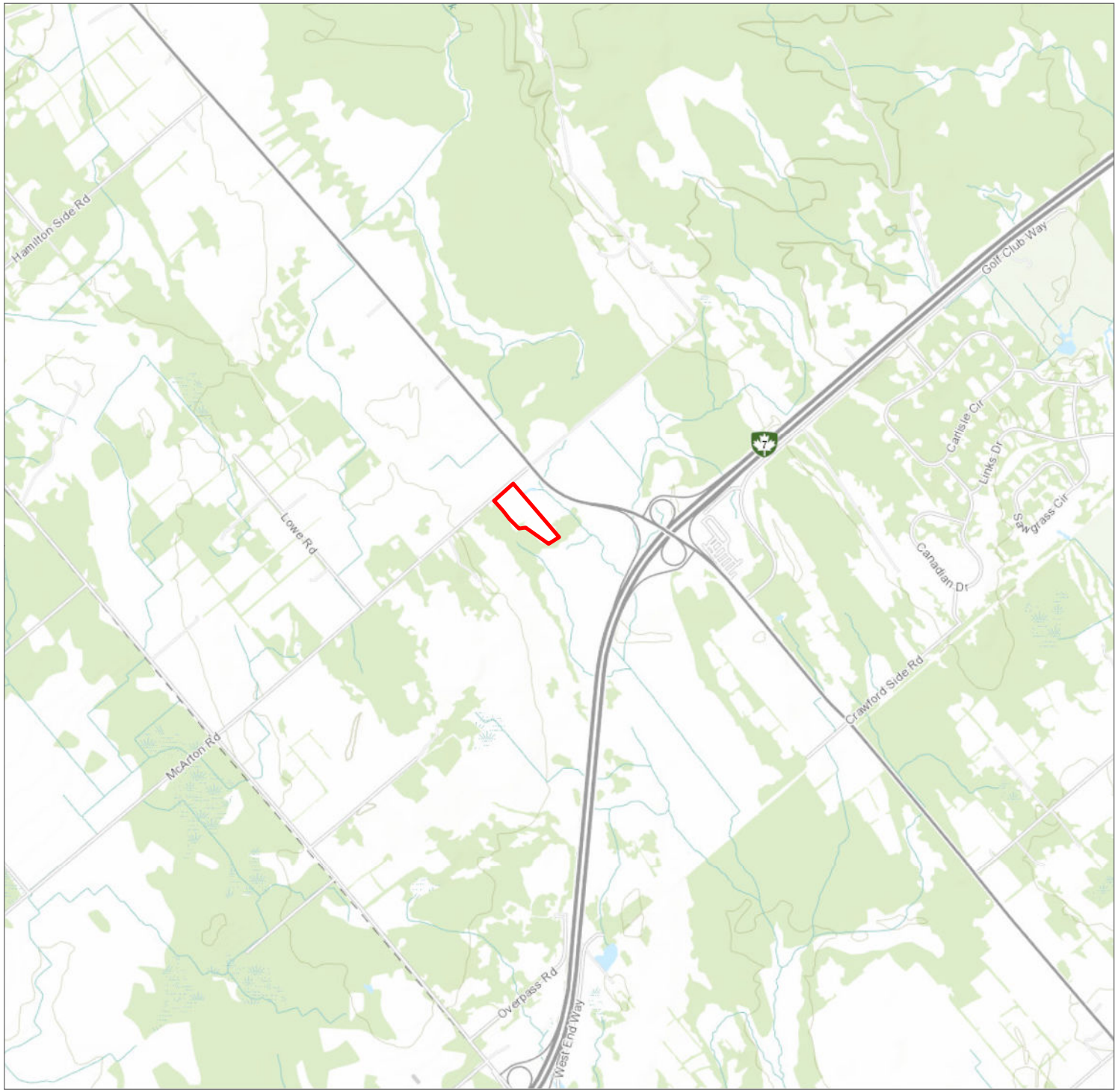


Christopher Morgan, M.A.Sc., G.I.T

Sean Sterling, M.Sc., P.Eng., P.Geo.
Principal / Manager of Geoscience

APPENDIX A

Site Figures



LEGEND

8520 McArton Road

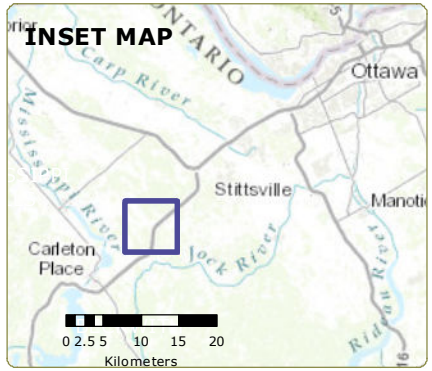


Figure A.1
Site Location

Scale 1:35,000

0 250 500 1,000
Meters

N

Coordinate System: NAD 1983 UTM Zone 18N

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

PROJECT No. 19-213-1

Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

DESIGN: ADG
CAD/GIS: NMP
CHECK: SNS
REV: 0

DATE: 08/05/2019

Geofirma Engineering Ltd

G:\Data\Project\McArtonRoad\Maps\19-213-1_8520McArtonRoad\19-213-1_8520McArtonRd_FigA1_Locatin.mxd

LEGEND

- 8520 McArton Road
- Structure Footprint
- City of Ottawa Property Lines
- Pavement
- Set Back Line
- Wall

Provincially Significant Wetland

- Manion Corners (Long Swamp) Wetland Complex

Figure A.2
Site Layout

Scale 1:3,000

0 10 20 40 60 80
Meters

N

Coordinate System: NAD 1983 UTM Zone 18N
Source: City f Ottawa 2014 property lines and 2017 airphoto Service Layer Credits:

PROJECT No. 19-213-1

Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

DESIGN: ADG
CAD/GIS: NMP
CHECK: SNS
REV: 0

DATE: 08/05/2019

Geofirma Engineering Ltd

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LEGEND

- 8520 McArton Road
- 500m Buffer Area from Property Line
- City of Ottawa Property Lines
- MOECC Water Wells

Figure A.3
MOECC Water Wells

Scale 1:8,000

0 25 50 100 150 200
Meters

N

Coordinate System: NAD 1983 UTM Zone 18N

Source: City of Ottawa 2014 property lines,MOECC Water Wells April 2018

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

PROJECT No. 19-213-1

Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

DESIGN: ADG
CAD/GIS: ADG/NMP
CHECK: SNS
REV: 0

DATE: 08/05/2019

Geofirma Engineering Ltd

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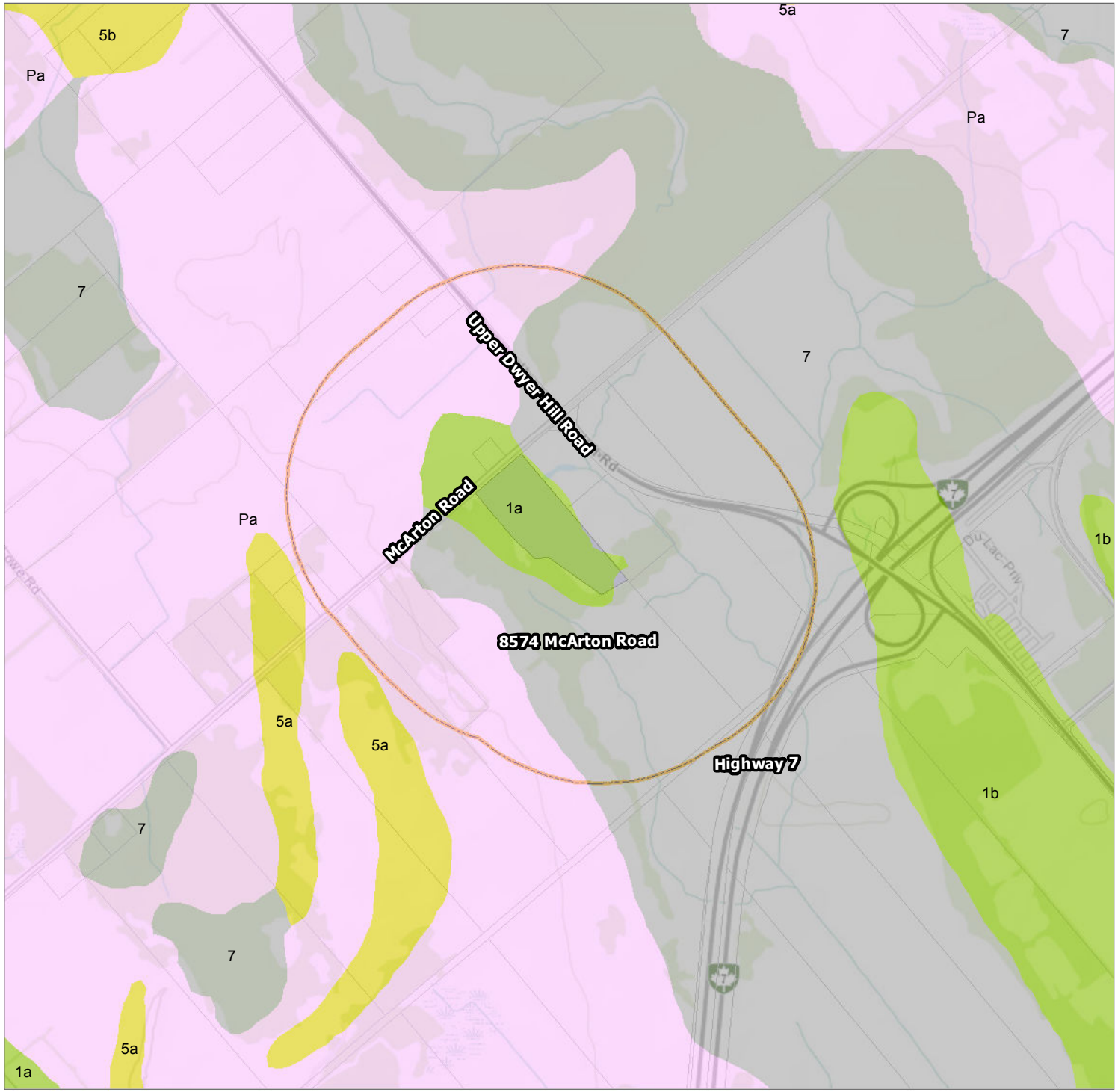

LEGEND

- 8520 McArton Road
- 500m Buffer Area from Severence
- City of Ottawa Property Lines

Surficial Geology

- 3: Paleozoic bedrock
- 5b: Stone-poor, carbonate-derived silty to sandy till
- 11b: Littoral-foreshore deposits
- 11c: Foreshore-basinal deposits
- 20: Organic deposits

Figure A.4
Surficial Geology

Scale 1:15,000

0 50 100 200 300 400
Meters

N

Coordinate System: NAD 1983 UTM Zone 18N

Source: City of Ottawa, 2014 property lines, OGS MRD128-REV

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

PROJECT No. 19-213-1

Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

DESIGN: ADG
CAD/GIS: ADG/NMP
CHECK: SNS
REV: 0

DATE: 08/05/2019

Geofirma Engineering Ltd

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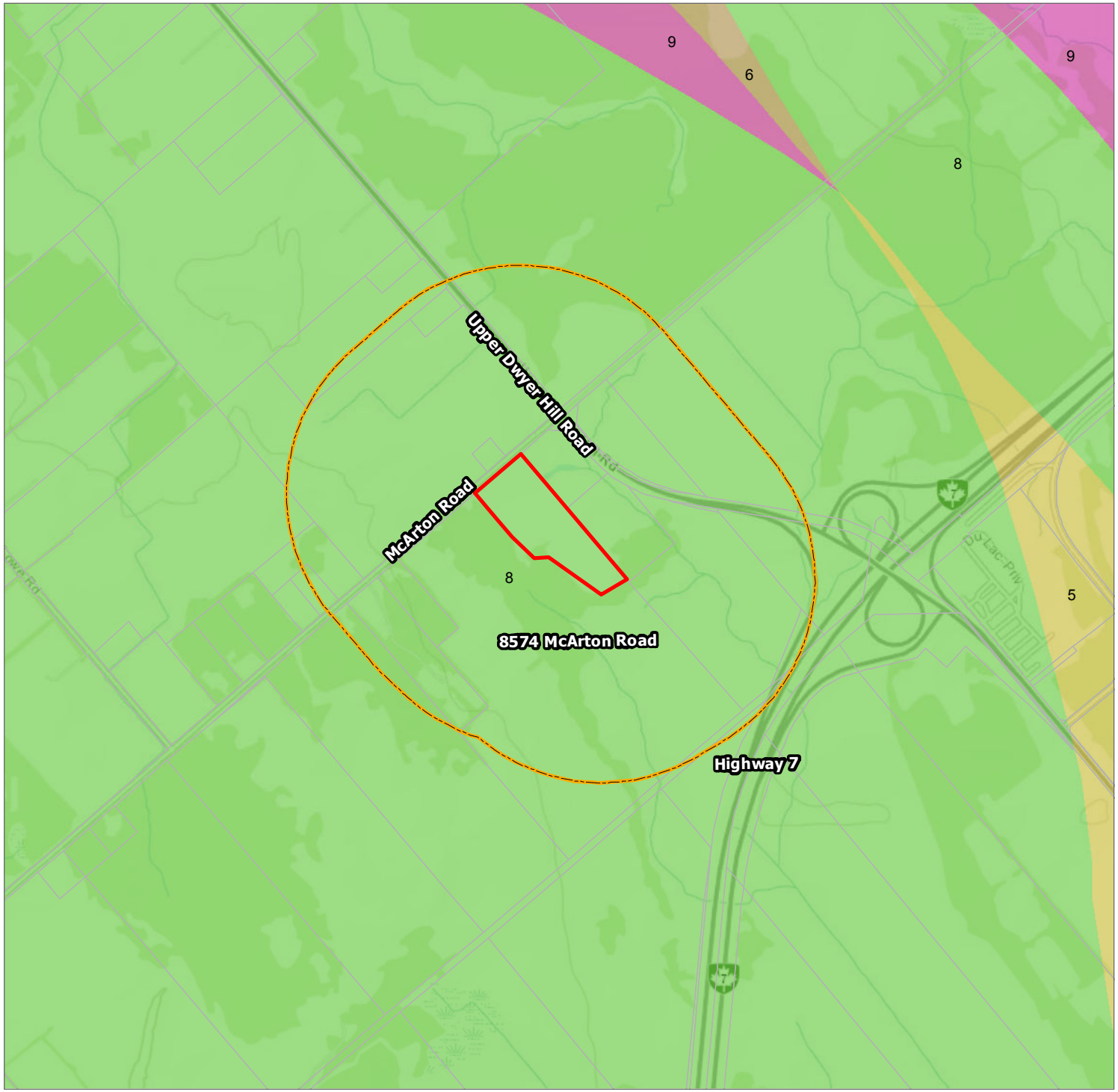

LEGEND

- 500m Buffer Area from Severence
- 8520 McArton Road
- City of Ottawa Property Lines

Paleozoic Bedock

- 9: Bobcaygeon - limestone, with minor shales in upper part
- 8: Gull River - limestone, dolostone (towards base)
- 6: Rockcliffe - sandstone, shale, limestone, dolostone
- 5: Oxford - dolostone, minor shale and sandstone

Figure A.5
Bedrock Geology

Scale 1:15,000

0 50 100 200 300 400

Meters

N

Coordinate System: NAD 1983 UTM Zone 18N

Source: City of Ottawa, 2014 property lines, OGS MRD219 Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

PROJECT No. 19-213-1

Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

DESIGN: ADG
CAD/GIS: ADG/NMP
CHECK: SNS
REV: 0

DATE: 08/05/2019

Geofirma Engineering Ltd

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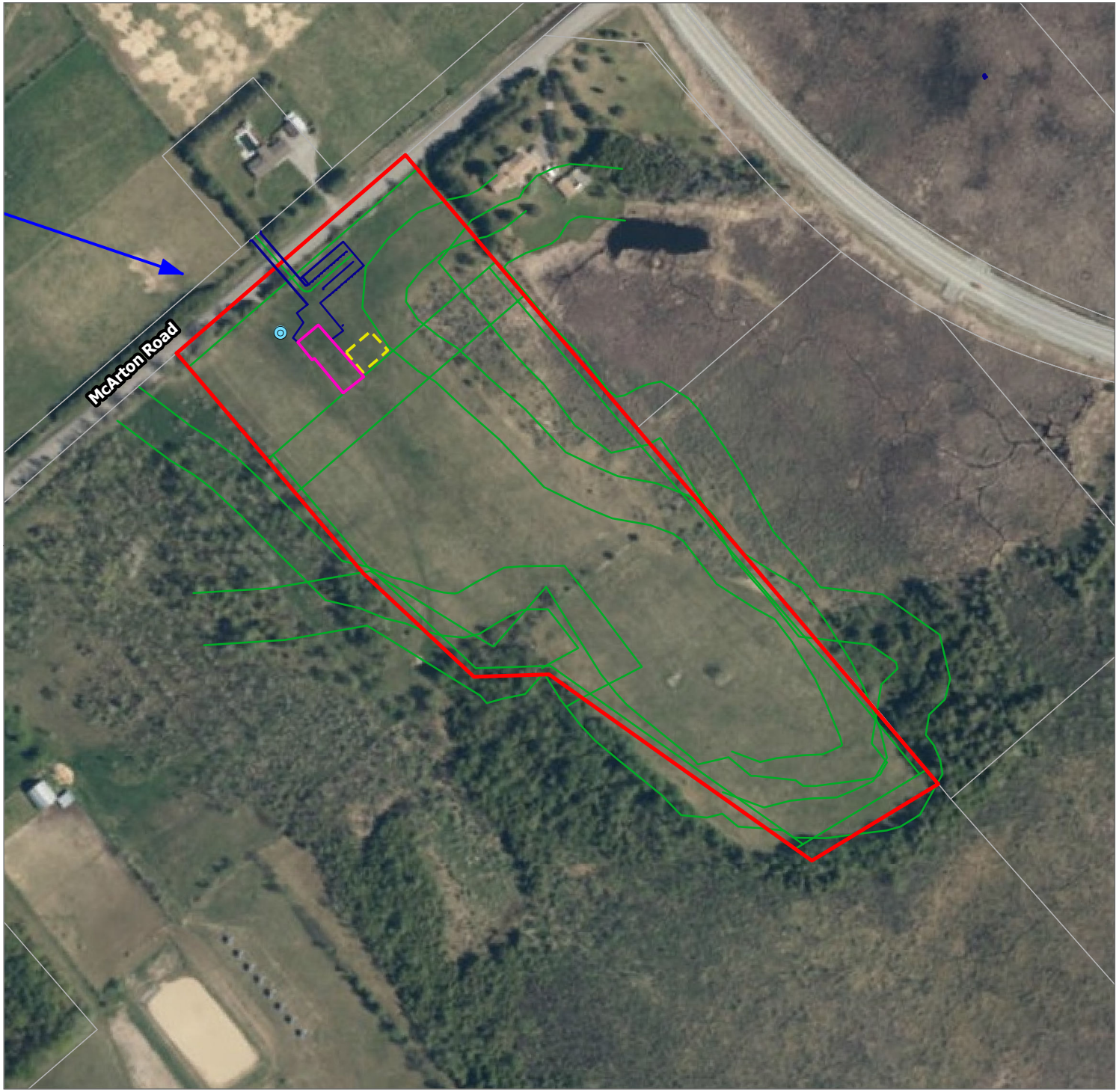

LEGEND

- 8520 McArton Road
- City of Ottawa Property Lines
- Approximate Building Envelope
- Approximate Septic System
- Approximate Well Location
- Inferred Direction of Groundwater Flow
- Proposed Pavement
- Set Back Line

NOTES:

Well to be installed in accordance with O.Reg. 903 guidelines and steel casing length of 12m.

Septic to be completed following Ontario Building Code (Part 8)

Figure A.6
Potential Site Development Plan

Scale 1:3,000

0 30 60 120
Meters

N

Coordinate System: NAD 1983 UTM Zone 18N
Source: City f Ottawa 2014 property lines and 2017 airphoto
Service Layer Credits:

PROJECT No. 19-213-1

Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

DESIGN: ADG
CAD/GIS: NMP
CHECK: SNS
REV: 0

DATE: 2020-03-25

Geofirma Engineering Ltd

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APPENDIX B

Tables

Table B.1 - Summary of MOECC Water Well Data within 500 m of the Site

MOECC WWIS Well ID	Completion Date (dd/mm/yyyy)	Well Depth (m)	Depth to Bedrock (m)	Static Water Level (m)	Depth to Found Water[1] (m)	Casing Depth (m)	Recommended Pump Intake (m)	Available Drawdown (m)	Recommended Pumping Rate (L/min)
1502937	1962-07-14	33.5	0	5.5	29.0	2.7	27.4	21.9	18.9
1503255	1968-04-10	24.4	0.6	6.1	19.8	7.6	21.3	15.2	18.9
1514926	1975-09-04	21.3	4	5.8	20.1	7.6	15.9	10.1	18.9
1522260	1987-07-01	45.7	0	6.1	42.7	6.7	36.6	30.5	37.9
1526382	1992-06-19	43.3	0.3	12.2	41.8	6.1	39.6	27.4	56.8
1527954	1994-06-17	24.4	0.6	4	22.9	6.7	18.3	14.3	26.5
1529217	1996-07-11	48.5	1.8	15.8	37.2	6.1	36.6	20.8	37.9
1530969	1999-10-26	44.2	0	1.8	21.0	5.5	42.7	40.9	26.5
1533199	2002-09-10	68.6	0	13.4	39.6	6.9	53.4	40.0	18.9
Statistics									
Number of Records		*9*	*9*	*9*	*9*	*9*	*9*	*9*	*9*
Average (Mean)		*39.3*	*0.8*	*7.9*	*30.5*	*6.1*	*32.4*	*24.6*	*29.0*
Maximum		*68.6*	*4.0*	*15.8*	*42.7*	*7.6*	*53.4*	*40.9*	*56.8*
Minimum		*21.3*	*0.0*	*1.8*	*19.8*	*2.7*	*15.9*	*10.1*	*18.9*

Notes:

Data collected from the MOECC WWIS, accessed July 2018

1 - Depth to found water is presented as first occurance of found water. In some cases, water bearing zones were noted at multiple depths.

Table B.2 - Summary of Measured Water Levels

Elapsed Time (sec)	Water Level (m BTOC)	Comments
Start of Pumping Test @ 8:37 AM; Assumed Static WL = 4.04 m BTOC		
Pumping Water Levels		
60	4.689	
140	4.780	
170	4.795	
210	4.820	
240	4.830	
300	4.842	
360	4.855	
420	4.867	
600	4.889	
960	4.900	
1260	4.914	
1920	4.925	
2460	4.930	
3000	4.935	
3600	4.940	
4260	4.944	
5460	4.955	
6000	4.955	
6660	4.958	
8220	4.960	
9000	4.963	
10020	4.968	
10860	4.969	
13920	4.976	
14760	4.980	
17100	4.985	
19860	4.990	
21780	4.994	
24840	5.004	
26160	5.005	
Recovery Water Levels		
26687	4.790	
26692	4.640	
26697	4.600	
26702	4.550	
26707	4.500	
26722	4.500	
26737	4.400	
26742	4.390	
26747	4.380	

Table B.2 - Summary of Measured Water Levels

Elapsed Time (sec)	Water Level (m BTOC)	Comments
26752	4.370	
26757	4.360	
26762	4.350	
26767	4.340	
26772	4.330	
26777	4.320	
26782	4.310	
26787	4.300	
26802	4.280	
26812	4.270	
26817	4.260	
26827	4.250	
26837	4.240	
26852	4.230	
26817	4.220	
26897	4.210	
26917	4.220	
26947	4.190	
26982	4.180	
27012	4.170	
27067	4.160	
28234	4.110	
28530	4.085	
28811	4.079	
28958	4.075	
29377	4.070	
30258	4.060	
30845	4.050	

Notes:

Water level measured using an electronic water level tape

m TOC = meters below top of casing

Table B.3 - Summary of Measured Flow Rates

Elapsed Time (sec)	Flow Rate (L/min)	Comments
206	130	
252	130	
292	150	
345	113	
396	118	
446	120	
493	128	
548	109	
1512	133	
1560	125	
1610	120	
1661	118	
1712	118	
1761	122	
1812	118	
1862	120	
3834	120	
3883	122	
3931	125	
4032	119	
4084	115	
4133	122	
4182	122	
6270	125	
6318	125	
6370	115	
6420	120	
6471	118	
6519	125	
6570	118	
6619	122	
9599	122	
9646	128	
9697	118	
9748	118	
9798	120	
9848	120	
9899	118	
14936	130	
14985	122	
15034	122	
15086	115	

Table B.3 - Summary of Measured Flow Rates

Elapsed Time (sec)	Flow Rate (L/min)	Comments
15136	120	
15186	120	
15236	120	
19445	118	
19493	125	
19540	128	
19591	118	
19641	120	
19693	115	
19743	120	
24463	125	
24508	133	
24558	120	
24609	118	
24658	122	
24708	120	
24760	115	

Notes:

Flow rate calculated by measuring the time it took to fill a graduated 1000L tote

Table B.4 - Summary of Field Readings

Elapsed Time (h:mm)	Temperature (^{o}C)	pH	Oxidation-Reduction Potential (mV)	Electrical Conductivity (mS/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Chlorine (ppm)	Colour (TCU)	Sample Collected
0:41	6.91	5.84	86	0.690	3.6	4.30			
0:45	7.58	6.45	49	0.653	0.0	4.04			
1:10	7.75	6.76	36	0.651	0.0	2.17			
1:30	7.77	6.91	13	0.643	0.0	2.18			
2:30	7.93	7.02	6	0.643	0.0	2.35			
3:05	8.21	7.08	1	0.635	0.0	2.94	0.0	0.0	Yes
3:50	8.31	7.10	-5	0.639	0.0	2.84			
5:15	8.26	7.14	-7	0.641	0.0	2.72			
5:56	8.17	7.06	-4	0.637	0.0	2.26			
6:30	8.10	7.11	-9	0.637	0.0	2.33	0.0	0.0	Yes

Note:

Measurements collected using Horiba U-52 multimeter

Chlorine Measured using CHEMets Chlorine Kit

Colour Measured using HACH Colorimeter

Table B.5 - Groundwater Quality Analytical Results

Parameter	Units	MDL	Regulation - Ontario Drinking Water Standards, Objectives and Guidelines			8520 McArton Well (3-hour)	8520 McArton Well (6-hour)
			MAC	AO	OG		
Microbiological Parameters							
E. Coli	CFU/100 mL	1	0 CFU/100 mL	--	--	ND (1)	ND (1)
Fecal Coliforms	CFU/100 mL	1	--	--	--	ND (1)	ND (1)
Total Coliforms[1]	CFU/100 mL	1	0 CFU/100 mL	--	--	ND (1)	ND (1)
Heterotrophic Plate Count	CFU/ml	10	--	--	--	ND (10)	ND (10)
General Inorganics							
Alkalinity, total	mg/L	5	--	500 mg/L	--	288	288
Ammonia as N	mg/L	0.01	--	--	--	0.06	0.05
Dissolved Organic Carbon	mg/L	0.5	--	5 mg/L	--	2.3	1.4
Colour	TCU	2	--	5 TCU	--	**12**	**20**
Conductivity	µS/cm	5	--	--	--	638	636
Hardness	mg/L		--	--	80-100	**283**	**290**
pH	pH Units	0.1	--	--	6.5-8.5	7.7	7.8
Phenolics	mg/L	0.001	--	--	--	ND (0.001)	ND (0.001)
Total Dissolved Solids	mg/L	10	--	500 mg/L	--	338	338
Sulphide	mg/L	0.02	--	0.05 mg/L	--	ND (0.02)	ND (0.02)
Tannin & Lignin	mg/L	0.1	--	--	--	ND (0.1)	ND (0.1)
Total Kjeldahl Nitrogen	mg/L	0.1	--	--	--	0.1	0.1
Turbidity	NTU	0.1	--	5 NTU	--	2.8	3.5
Anions							
Chloride	mg/L	1	--	250 mg/L	--	19	20
Fluoride	mg/L	0.1	1.5 mg/L	--	--	ND (0.1)	ND (0.1)
Nitrate as N	mg/L	0.1	10 mg/L	--	--	ND (0.1)	ND (0.1)
Nitrite as N	mg/L	0.05	1 mg/L	--	--	ND (0.05)	ND (0.05)
Sulphate	mg/L	1	--	500 mg/L	--	19	19
Metals							
Calcium	mg/L	0.1	--	--	--	77.9	80.7
Iron	mg/L	0.1	--	0.3 mg/L	--	**0.4**	**0.4**
Magnesium	mg/L	0.2	--	--	--	21.4	21.5
Manganese	mg/L	0.005	--	0.05 mg/L	--	0.027	0.026
Potassium	mg/L	0.1	--	--	--	1.4	1.5
Sodium	mg/L	0.2	--	200 mg/L	--	5.2	5.6
Field Readings							
Colour	TCU		--	5 TCU	--	0	0
Chlorine Residual[2]	mg/L		--	--	--	0	0

Notes:

1 - While the ODWO for total coliform is 0, for the purpose of studies completed under Guideline D-5-5 total coliform counts of less than 6 per 100 mL of sample (and 0 for E.coli and fecal coliforms) is indicative of acceptable water quality.

2 - Chlorine residual measured on-site, prior to sample collection

-- = Not analyzed/No criteria

NA = Not applicable

ND = Not detected above MDL

MDL = Method Detection Limit

ODWS = Ontario Drinking Water Standards, Objectives and Guidelines, June 2003, revised 2008.

MAC = Maximum Acceptable Concentration of health-based standards

AO = Aesthetic Objective for parameters that may impair taste, odour or colour of water

OG = Operational Guidelines for parameters that, if not controlled, may negatively effect treatment, disinfection or distribution of the water

Bold/Underline = Indicates parameter exceeds aesthetic objective or operational guideline

Bold/Highlight = Indicates parameter exceeds a maximum acceptable concentration

APPENDIX C

MECP Water Well Records

2937

UTM 18 Z 411712 E
5 R 5010587 N
Elev. 5 R 61510

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 25 District Carleton

Township, Village, Town or City Gouldbourn

Con. 12 Lot 4

Date completed 14th (day) July (month) 1962. (year)

[redacted] Address ASHTON ONT.

Casing and Screen Record

Inside diameter of casing 6 ¼"

Total length of casing 9'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 6 ¼"

Pumping Test

Static level 12'

Test-pumping rate 10 G.P.M.

Pumping level 32'

Duration of test pumping 30 min

Water clear or cloudy at end of test clear

Recommended pumping rate 5 G.P.M.

with pump setting of 90' feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
Broken Layers of Limestone	0	6		
L-R	6	110	95'	Lime

For what purpose(s) is the water to be used?

Home

Is well on upland, in valley, or on hillside? upland

Drilling or Boring Firm M. & M. McLaughlin

Address Carleton Pl.

Licence Number 593

Name of Driller or Borer Melville M. Laughlin

Address Carleton Pl.

Date Aug 11/62

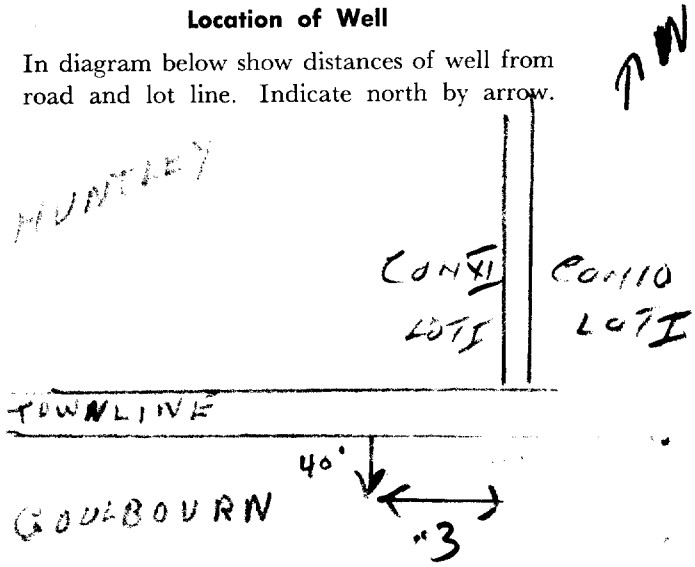
Melville M. Laughlin
(Signature of Licensed Drilling or Boring Contractor)

Form 7 10M-62-1152

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



CODED

Con XI

UTM 18 E 4 1 6 9 3 5 Lot 1

N 5 0 6 5 8 5 0

Elev. S R 0 4 8 5

15 No 3255

The Ontario Water Resources Commission Act

WATER WELL RECORD

Basin 25

County or District Carleton

Township, Village, Town or City Huntley

Con. XI Lot E½ L 1

Date completed 10th (day) April (month) 1968 (year)

[redacted] ress Ashton Ont.

Casing and Screen Record

Inside diameter of casing 6¼"

Total length of casing 25'

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole 6"

Pumping Test

Static level 20'

Test-pumping rate 10 G.P.M.

Pumping level 34'

Duration of test pumping 30 min

Water clear or cloudy at end of test clear

Recommended pumping rate 5 G.P.M.

with pump setting of 30 feet below ground surface

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Water Record: Depth(s) at which water(s) found	Water Record: Kind of water (fresh, salty, sulphur)
sand loam.	0	2.	63	fresh
sandstone rock	2	80.		

For what purpose(s) is the water to be used?

farm.

Is well on upland, in valley, or on hillside? up land.

Drilling or Boring Firm Mel M. Laughlin

Address Ashton Ont.

Licence Number 2929.

Name of Driller or Borer Melville M. Laughlin

Address Ashton Ont.

Date April 20/68.

Melville M. Laughlin.

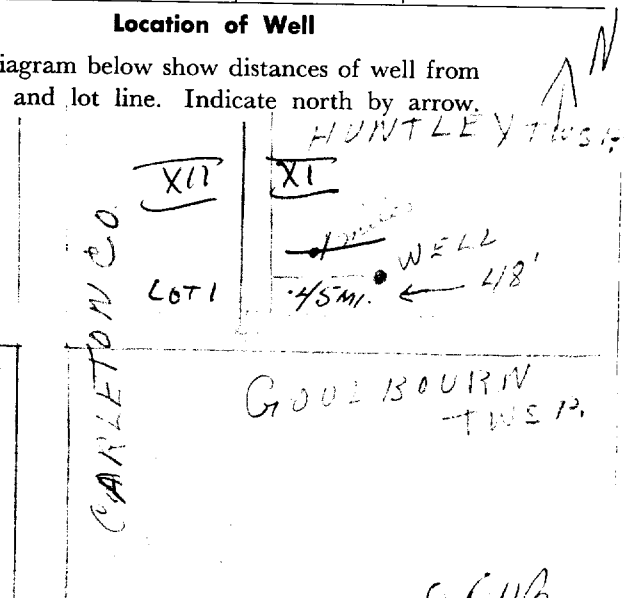
(Signature of Licensed Drilling or Boring Contractor)

Form 7 15M-60-4138

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



D.C.H.S.

Checked

Filled with cuttings

Well Burial HB

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
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11 1514925.1 MUNICIP. 15005 CON. CON 31F/11

COUNTY OR DISTRICT: Carleton. | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Huntley | CON. BLOCK, TRACT, SURVEY, ETC.: XI | LOT: 001

[redacted] Carleton Dist. | DATE COMPLETED: DA 04 MO 09 YR 75

RC. ELEVATION: 440 | RC. BASIN CODE: 5 26 | 6214 | 5 | JUN 28, 1977 | 297

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
brown.	sand	gravel	loose.	0	13.
grey.	limestone rock	— sandstone rock	layered.	13.	62.
grey	"	" sand.	layered.	62.	70.

31 00 13 62 81 77 | 00 62 21 51 87 4 | 00 70 21 52 87 4

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0066.	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
06 6¼"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.188.	0	0025
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		25	0070.
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	DEPTH SET AT – FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	23	drill mud.

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER | PUMPING RATE: 0015. GPM | DURATION OF PUMPING: 00 HOURS 30 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
019. FEET	027. FEET	024 FEET	027 FEET	FEET	FEET

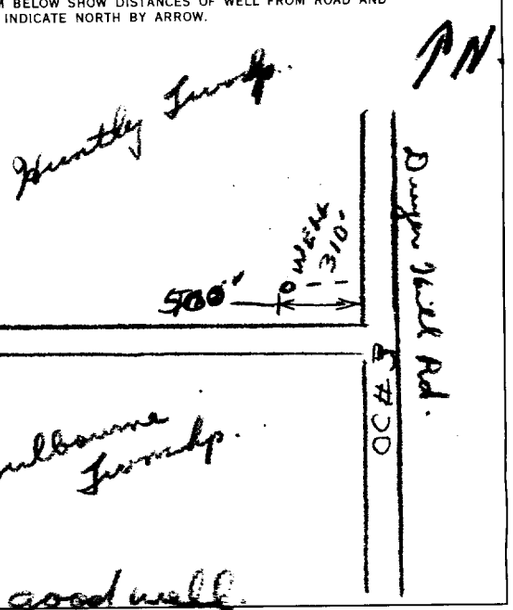
IF FLOWING, GIVE RATE: GPM. | PUMP INTAKE SET AT: [redacted] FEET | WATER AT END OF TEST: ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP | RECOMMENDED PUMP SETTING: 052 FEET | RECOMMENDED PUMPING RATE: 0005 GPM.

GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL 1706

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: good well.

FINAL STATUS OF WELL 54 — 1 ☒ WATER SUPPLY; 2 ☒ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE 55-56 — 01 — 1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF DRILLING 57 — 1 ☒ CABLE TOOL; 2 ☐ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☐ ROTARY (AIR); 5 ☐ AIR PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Melville McLaughlin | LICENCE NUMBER: 3503.

ADDRESS: Carlton Ont.

NAME OF DRILLER OR BORER: Melville McLaughlin | LICENCE NUMBER: 3503

SIGNATURE OF CONTRACTOR: Melville McLaughlin | SUBMISSION DATE: DAY 9. MO Sept YR 75

OWRC COPY

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 3503 | DATE RECEIVED: 230975

DATE OF INSPECTION: 14 Oct 75 | INSPECTOR: Ken P/R Dept

REMARKS:

P

WI

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

OTTAWA-CARLETON

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11 (1-2)

1522260

MUNICIP (10-14) CON. (15-22, 23-24)

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON. BLOCK, TRACT, SURVEY, ETC	LOT (25-27)
[redacted]	[redacted]ley	11	1

[redacted] 1256 La France — DATE COMPLETED (48-53): DAY 6 MO July YR 87

(1-2) (M 10) (12) (17-18) (24) (RC 25) ELEVATION (26) Orleans (30-31) BASIN CODE (I, II, III, IV) (47)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	[illegible] Shale.			0	12
Brown	Limestone			12	132

(31) (32) (10, 14-15, 21, 32, 43, 54, 65, 75, 80)

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
140 (10-13)	1 ☐ FRESH 2 ☐ SALTY; 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS (14)
(15-18)	1 ☐ FRESH 2 ☐ SALTY; 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS (19)
(20-23)	1 ☐ FRESH 2 ☐ SALTY; 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS (24)
(25-28)	1 ☐ FRESH 2 ☐ SALTY; 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS (29)
(30-33)	1 ☐ FRESH 2 ☐ SALTY; 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS (34) (80)

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 - 4 (10-11)	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC (12)	1FF	0	22 (13-16)
(17-18)	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC (19)			(20-23)
(24-25)	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC (26)			(27-30)

SCREEN

SIZE(S) OF OPENING (SLOT NO.) (31-33)	DIAMETER INCHES (34-38)	LENGTH FEET (39-40)

MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET (41-44) (80)

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)
(10-13)	(14-17)	
(18-21)	(22-25)	
(26-29)	(30-33) (80)	

71 PUMPING TEST

PUMPING TEST METHOD (10)	PUMPING RATE (11-14)	DURATION OF PUMPING (15-16 HOURS, 17-18 MINS)
1 ☒ PUMP 2 ☐ BAILER	10 GPM	1 HOURS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING (25) 1 ☒ PUMPING 2 ☐ RECOVERY			
		15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
20 FEET (19-21)	90 FEET (22-24)	60 FEET (26-28)	80 FEET (29-31)	90 FEET (32-34)	90 FEET (35-37)

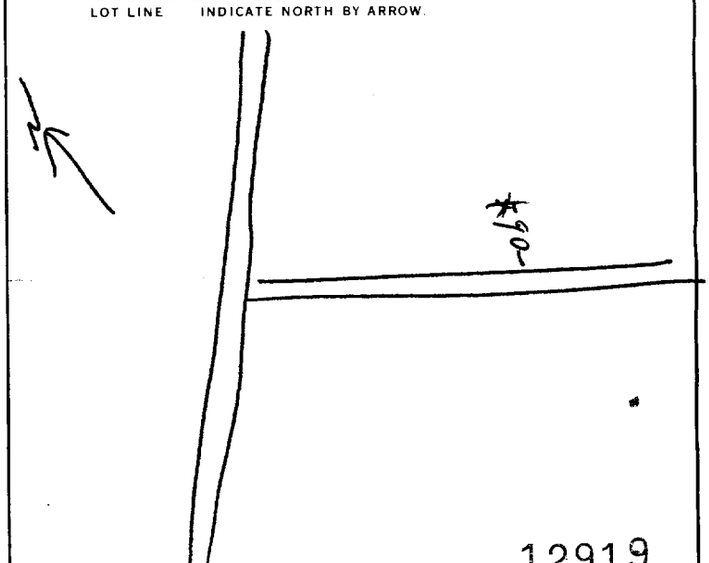
IF FLOWING, GIVE RATE (38-41)	PUMP INTAKE SET AT	WATER AT END OF TEST (42)
GPM	145 FEET	1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING (43-45)	RECOMMENDED PUMPING RATE (46-49)
☐ SHALLOW ☒ DEEP	125 FEET	10 GPM

(50-53)

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: 12919

FINAL STATUS OF WELL (54)

1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED; 9 ☐ DEWATERING

WATER USE (55-56)

1 ☒ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; ☐ OTHER; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED

METHOD OF CONSTRUCTION (57)

1 ☐ CABLE TOOL; 2 ☐ ROTARY (CONVENTIONAL); 3 ☐ ROTARY (REVERSE); 4 ☒ ROTARY (AIR); 5 ☐ AIR PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING; ☐ DIGGING; ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Saunders Well Drilling — WELL CONTRACTOR'S LICENCE NUMBER: 4767

ADDRESS: RR #2 Arnprior

NAME OF WELL TECHNICIAN: Carl Munro — WELL TECHNICIAN'S LICENCE NUMBER:

SIGNATURE OF TECHNICIAN/CONTRACTOR: R Saunders — SUBMISSION DATE: DAY 10 MO July YR 87

OFFICE USE ONLY

DATA SOURCE (58) | CONTRACTOR (59-62): 4767 | DATE RECEIVED (63-66): APR 11 1988 (80)

DATE OF INSPECTION | INSPECTOR

REMARKS: CSSRS

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FORM NO. 0506 (11/86) FORM 9

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1526382

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11

MUNICIP 15005 CON. CON, PART 3 OF 11

COUNTY OR DISTRICT [redacted] OTTAWA CARLETON

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: WEST CARLETON

CON. BLOCK, TRACT, SURVEY, ETC: 11

LOT: 1

[redacted] 598 McARTON RD. ASHTON ONT.

DATE COMPLETED: DAY 19 MO 6 YR 92

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	SAND & CLAY		FILL	0	1
GREY	LIMESTONE			1	90
GREY	LIMESTONE	OCCASIONAL LAYERS OF GREEN LIMESTONE & GREY SANDSTONE		90	142

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
137	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6 1/4	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	0	20
6	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		20	142
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE: | DEPTH TO TOP OF SCREEN FEET:

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	20	cement grout around casing annulus

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER — AIR LIFT

PUMPING RATE: 40 GPM

DURATION OF PUMPING: 1 HOURS 0 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
40 FEET	141 FEET		43 FEET	42 FEET	41 FEET	40 FEET

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: 141 FEET

WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

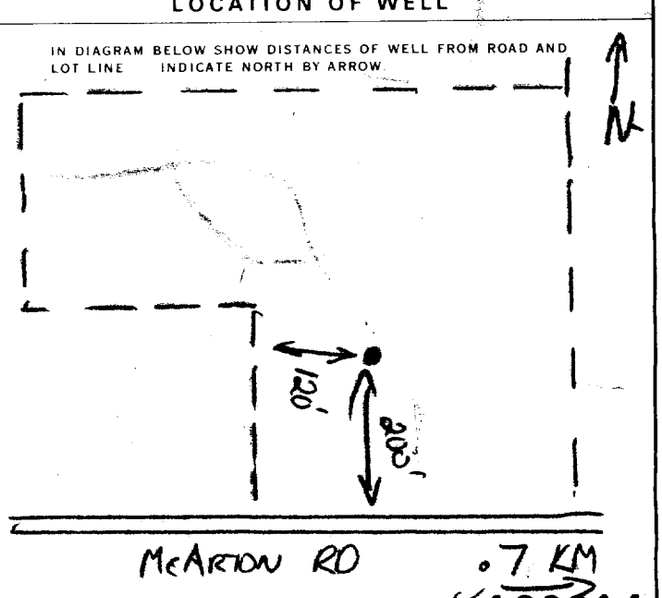
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP

RECOMMENDED PUMP SETTING: 130 FEET

RECOMMENDED PUMPING RATE: 15 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: 108314

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING

WATER USE

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☒ ROTARY (AIR) 5 ☒ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: T. SAUNDERS DRILLING LTD

WELL CONTRACTOR'S LICENCE NUMBER: 4879

ADDRESS: RR#2 ARNPRIOR ONT K7S 3G8

NAME OF WELL TECHNICIAN: TROY SAUNDERS

WELL TECHNICIAN'S LICENCE NUMBER: T-0517

SIGNATURE OF TECHNICIAN/CONTRACTOR: Troy Saunders

SUBMISSION DATE: DAY 15 MO 07 YR 92

OFFICE USE ONLY

DATA SOURCE | CONTRACTOR 4879 | DATE RECEIVED JUL 08 1992

DATE OF INSPECTION | INSPECTOR

REMARKS

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Ontario

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WATER WELL RECORD

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11

1527954

MUNICIP 15005 RP 5R 9549 CON 9 LOT 21

COUNTY OR DISTRICT: [redacted]

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Carleton - Huntley

CON. BLOCK, TRACT, SURVEY, ETC: 11

LOT: 1

ADDRESS OF WELL LOCATION: [redacted] RR4 Ashton, Ont. K0A 1B0

DATE COMPLETED: DAY 17 MO 6 YR 94

RC ELEVATION RC BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
red	sand			0'	1½'
gray	sandstone			1½'	80'

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
15	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	188	0'	22'
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	DEPTH SET AT - FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
0	22	Cement

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER — Gun

PUMPING RATE: 10 GPM

DURATION OF PUMPING: 1 HOURS ___ MINS

WATER LEVELS DURING: 1 ☒ PUMPING 2 ☐ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
13' FEET	FEET	21 FEET	13 FEET	13 FEET	13 FEET

IF FLOWING, GIVE RATE: GPM

PUMP INTAKE SET AT: 80 FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY

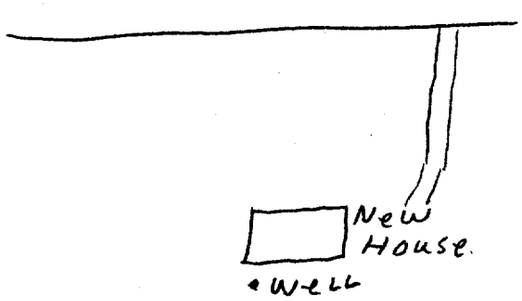
RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP

RECOMMENDED PUMP SETTING: 60 FEET

RECOMMENDED PUMPING RATE: 7 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: 141176

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING

WATER USE

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☒ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: Huf Hall Ltd

WELL CONTRACTOR'S LICENCE NUMBER: 2558

ADDRESS: Mc Donalds Corners, Ont

NAME OF WELL TECHNICIAN: Lynn Cooper

WELL TECHNICIAN'S LICENCE NUMBER: T0417

SIGNATURE OF TECHNICIAN/CONTRACTOR: Huf Hall

SUBMISSION DATE: DAY 19 MO 6 YR 94

OFFICE USE ONLY

DATA SOURCE

CONTRACTOR: 2558

DATE RECEIVED: JUN 30 1994

DATE OF INSPECTION

INSPECTOR

REMARKS

CCS BS

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Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

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11 — 1529217 — MUNICIP 15005 — CON. CON

COUNTY OR DISTRICT: OTTAWA-CARLETON
TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: TWP. OF WEST CARLETON (Huntley)
CON. BLOCK, TRACT, SURVEY, ETC: CONCESSION 11
LOT: 1
[redacted]
[redacted] Rd, Ashton, Ont.
DATE COMPLETED: DAY 11 MO 07 YR 96
ELEVATION: RC:
BASIN CODE:

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
BROWN	SAND	FILL		0	4
BROWN	TILL			4	6
GREY	LIMESTONE	SANDY DOLOMITE	VERY HARD.	6	120
GREY-GREEN	SHALE	RED SHALE, SANDSTONE		120	159

31
32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
120	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS (Sulphur odour)
148	1 ☐ FRESH 2 ☐ SALTY 3 ☒ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERALS 6 ☐ GAS

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
6¼"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC	.188	+2	20
6"	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE 5 ☐ PLASTIC		20	159
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE 5 ☐ PLASTIC			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET	

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)
5	20	Grout.

71 PUMPING TEST

PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☐ PUMP 2 ☒ BAILER	12 GPM	1 HOURS 0 MINS

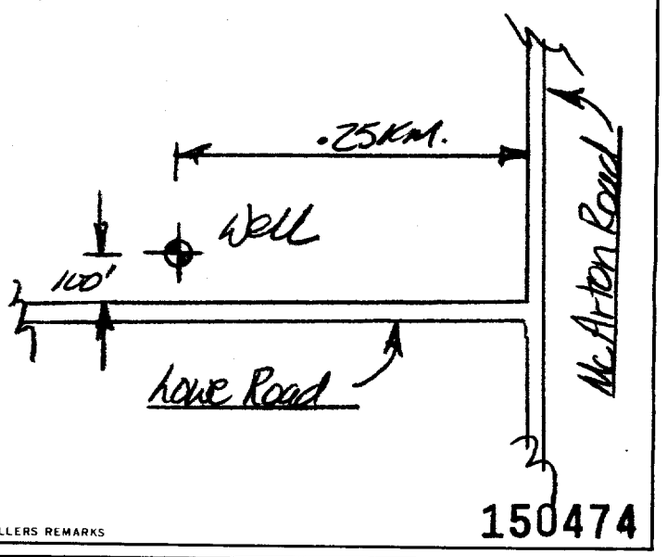
STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
52 FEET	70 FEET	1 ☒ PUMPING 2 ☐ RECOVERY	68 FEET	70 FEET	70 FEET	70 FEET

IF FLOWING, GIVE RATE	PUMP INTAKE SET AT	WATER AT END OF TEST
GPM	100 FEET	1 ☐ CLEAR 2 ☒ CLOUDY

RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING	RECOMMENDED PUMPING RATE
☐ SHALLOW ☒ DEEP	120 FEET	10 GPM

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS: 150474

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED ☐ DEWATERING

WATER USE

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF CONSTRUCTION

1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING ☐ DIGGING ☐ OTHER

CONTRACTOR

NAME OF WELL CONTRACTOR: STANTON DRILLING INC
WELL CONTRACTOR'S LICENCE NUMBER: 4875
ADDRESS: BOX 219, Pakenham, Ont. K0A 2X0.
NAME OF WELL TECHNICIAN: Peter Stanton
WELL TECHNICIAN'S LICENCE NUMBER: 5006.
SIGNATURE OF TECHNICIAN/CONTRACTOR: Peter Stanton
SUBMISSION DATE: DAY ____ MO. ____ YR. ____

MINISTRY OF THE ENVIRONMENT COPY

OFFICE USE ONLY

DATA SOURCE: CONTRACTOR 4875 — DATE RECEIVED: OCT 17 1996
DATE OF INSPECTION: INSPECTOR:
REMARKS: CSS.ES

FORM NO. 0506 (11/86) FORM 9

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 **1530969** Municipality 15005 Con. CON 11

County or District: OTTAWA CARELTON
Township/Borough/City/Town/Village: WEST CARELTON
Con block tract survey, etc.: 11
Lot: 1
Address: 8605 McCARTEN RD ASHTON ONT.
Date completed: 26 day 10 month 99 year
21 Northing RC Elevation RC Basin Code

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
GREY	LIMESTONE			0	145

31
32

41 WATER RECORD

Water found at - feet	Kind of water
69	[X] Fresh [ ] Salty; [ ] Sulphur [ ] Minerals [ ] Gas
138	[X] Fresh [ ] Salty; [ ] Sulphur [ ] Minerals [ ] Gas
	[ ] Fresh [ ] Salty; [ ] Sulphur [ ] Minerals [ ] Gas
	[ ] Fresh [ ] Salty; [ ] Sulphur [ ] Minerals [ ] Gas
	[ ] Fresh [ ] Salty; [ ] Sulphur [ ] Minerals [ ] Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/4	[X] Steel [ ] Galvanized [ ] Concrete [ ] Open hole [ ] Plastic	.188	0 to 6½	18
6	[ ] Steel [ ] Galvanized [ ] Concrete [X] Open hole [ ] Plastic		18	145
	[ ] Steel [ ] Galvanized [ ] Concrete [ ] Open hole [ ] Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet
Material and type	Depth at top of screen feet	

61 PLUGGING & SEALING RECORD

[X] Annular space [ ] Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0	18	cement grout

71 PUMPING TEST

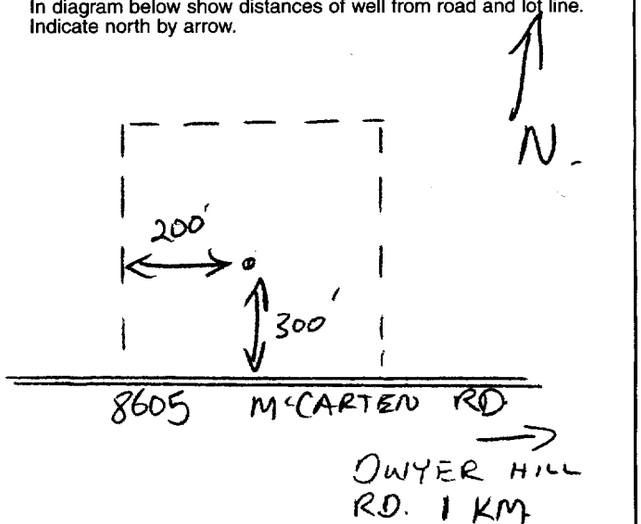
Pumping test method: [ ] Pump [X] Air lift [ ] Bailer
Pumping rate: 8 GPM
Duration of pumping: 1 Hours 0 Mins

Static level	Water level end of pumping	Water levels during: [ ] Pumping [X] Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
6 feet	144 feet	6 feet	6 feet	6 feet	6 feet

If flowing give rate: GPM
Pump intake set at: 144 feet
Water at end of test: [X] Clear [ ] Cloudy
Recommended pump type: [ ] Shallow [X] Deep
Recommended pump setting: 140 feet
Recommended pump rate: 7 GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot line.
Indicate north by arrow.



210758

FINAL STATUS OF WELL

[X] Water supply; [ ] Observation well; [ ] Test hole; [ ] Recharge well; [ ] Abandoned, insufficient supply; [ ] Abandoned, poor quality; [ ] Abandoned (Other); [ ] Dewatering; [ ] Unfinished; [ ] Replacement well

WATER USE

[X] Domestic; [ ] Stock; [ ] Irrigation; [ ] Industrial; [ ] Commercial; [ ] Municipal; [ ] Public supply; [ ] Cooling & air conditioning; [ ] Not use; [ ] Other

METHOD OF CONSTRUCTION

[ ] Cable tool; [ ] Rotary (conventional); [ ] Rotary (reverse); [ ] Rotary (air); [X] Air percussion; [ ] Boring; [ ] Diamond; [ ] Jetting; [ ] Driving; [ ] Digging; [ ] Other

Name of Well Contractor: T. SAUNDERS DRILLING LTD
Well Contractor's Licence No.: 487
Address: RR#1 BRAESIDE ONT. K0A 1G0
Name of Well Technician: TROY SAUNDERS
Well Technician's Licence No.: T-517
Signature of Technician/Contractor: Troy Saunders
Submission date: 26 day 11 mo 99 yr

MINISTRY USE ONLY

Data source
Contractor: 4879
Date received: DEC 03 1999
Date of inspection
Inspector
Remarks: CSS.ES0

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0506 (11/98) Front Form 9

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

11 1533199 Municipality 15005 Con. CON

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Ottawa Carleton	West Carleton - Huntley	11	1

Address: R.R. #4 796 Golden Line Rd. Almonte

Date completed: 10 day 9 month 02 year

21 UTM Northing RC Elevation RC Basin Code: Ontario K0A 1A0

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	Soil	Broken Rock		0	12
Gray	Limestone			12	95
Grey & Red	Shale			95	220
Gray	Limestone			220	225

Note: Casing was left 1.5 feet above ground level at time of drilling

31

32

41 WATER RECORD

Water found at - feet	Kind of water
130	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
219	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
NOT TESTED	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/4	1 ☒ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	.188	0	22.5
5 7/8	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☒ Open hole 5 ☐ Plastic		22.5	225
	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic			

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Material and type: | Depth at top of screen feet:

61 PLUGGING & SEALING RECORD

☒ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
21	0	Grouted - Cement (3)

71 PUMPING TEST

Pumping test method: 1 ☒ Pump 2 ☐ Bailer

Pumping rate: 12 GPM

Duration of pumping: 1 Hours Mins

Static level	Water level end of pumping	Water levels during: 1 ☒ Pumping 2 ☐ Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
44'3" feet	150 feet	220 feet	200 feet	175 feet	150 feet

If flowing give rate: GPM

Pump intake set at: feet

Water at end of test: ☐ Clear ☒ Cloudy

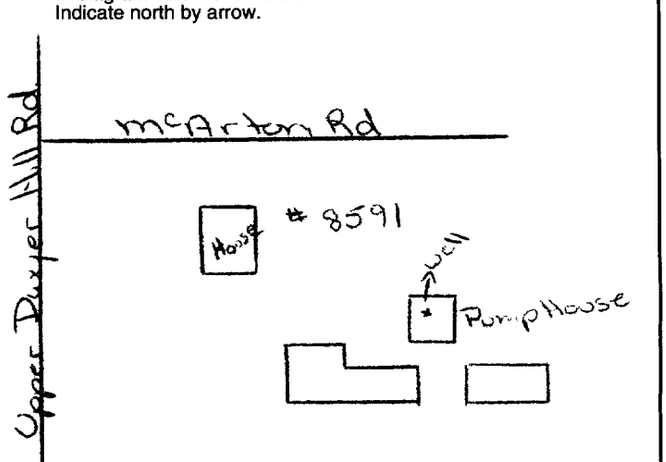
Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump setting: 175 feet

Recommended pump rate: 5 GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



250408

FINAL STATUS OF WELL

1 ☒ Water supply 2 ☐ Observation well 3 ☐ Test hole 4 ☐ Recharge well 5 ☐ Abandoned, insufficient supply 6 ☐ Abandoned, poor quality 7 ☐ Abandoned (Other) 8 ☐ Dewatering 9 ☐ Unfinished 10 ☐ Replacement well

WATER USE

1 ☐ Domestic 2 ☒ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☐ Not use 10 ☐ Other

METHOD OF CONSTRUCTION

1 ☐ Cable tool 2 ☐ Rotary (conventional) 3 ☐ Rotary (reverse) 4 ☐ Rotary (air) 5 ☒ Air percussion 6 ☒ Boring 7 ☐ Diamond 8 ☐ Jetting 9 ☐ Driving 10 ☐ Digging 11 ☐ Other

Name of Well Contractor	Well Contractor's Licence No.
Capital Water Supply Ltd.	1558

Address: P.O. Box 490 Stittsville, Ontario K2S 1A6

Name of Well Technician	Well Technician's Licence No.
S. Miller	T0097

Signature of Technician/Contractor

Submission date: day 10 mo 09 yr 02

MINISTRY USE ONLY

Data source | Contractor: 1558 | Date received: OCT 25 2002

Date of inspection | Inspector

Remarks: CSS.ES2

0506 (07/00) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

APPENDIX D

8520 McArton Road, MECP Water Well Record

Geofirma Engineering Ltd

CERTIFICATE OF WELL COMPLIANCE

Ottawa

I (Jeremy Hanna) AIR ROCK DRILLING CO. LTD. - DO HEREBY CERTIFY

that I am licensed to drill water wells in the Province of Ontario, and that I have

supervised the drilling of the water well on the property of :

OWNER: Ottawa Valley Wild Bird Care Center

Location: # 8520 McArton Road, Ashton

LOT: 4 **CON:** 12 **PLAN #** X **S/L #** X

Ottawa-Carleton / Geographical Township of Goulbourn

I CERTIFY FURTHER that, I am aware of the well drilling requirements, the guidelines, recommendations and regulations of the Ministry of the Environment governing well installations in the Province of Ontario, and the standards specified in any subdivision agreement and hydrogeological report applicable to this site and City Standards.

AND DO HEREBY CERTIFY THAT the said well has been drilled, cased, grouted (cement or bentonite) as applicable and constructed in strict conformity with the standards required.

Signed this 16TH Day of JANUARY, 2020

Jeremy Hanna (T3632) Air Rock Drilling Co. Ltd. (C-7681)

The Engineer on behalf of the Landowner set out above, Certifies that he/she has inspected the well and it was constructed in accordance with the specifications in O.Reg 903, this report and the Hydrogeological Report with regards to casing length and grouting requirements.

Signed this 7th day of April, 2020

(Engineer)

2020016
TAG A252813
GEOFIRMA

Shaping our future together
Ensemble, formons notre avenir

City of Ottawa
Client Service Centre
8763 Victoria Street

Ville d'Ottawa
Centre de service
8243, rue Victoria

2001 International Year of Volunteers Année internationale

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag#: A252813 (t Below) A252813

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Ottawa Valley Wild Bird Care Center c/o	GEOFIRMA	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
Engineering Ltd, 1 Raymond Street, Suite 200,	Ottawa,	ONT	K1R1A2	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
# 8520 McARTON ROAD	GOULBOURN	4	12

County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA-CARLETON	ASHTON	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	417324	5006280		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand &	Boulders		0'	7'
	Black Limestone			7'	60'
	Gray & Black	Limestone		60'	175'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/imp gal)
42'	0'	Neat Cement Slurry	17.16

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☒ Air percussion
☐ Other, specify ____

Well Use

☐ Public ☐ Commercial ☐ Not used
☒ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☐ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify ____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	42'
6"	Open Hole		42'	175'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To

Status of Well

☒ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☐ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify ____
☐ Other, specify ____

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☒ Untested	☐ Other, specify ____
68			
110		☐ Fresh ☒ Untested	
169		☐ Fresh ☒ Untested	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	42'	9 3/4"
42'	175'	6"

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify ____

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 160'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 15'8"

If flowing give rate (l/min / GPM): X

Recommended pump depth (m/ft): 100'

Recommended pump rate (l/min / GPM): 20+

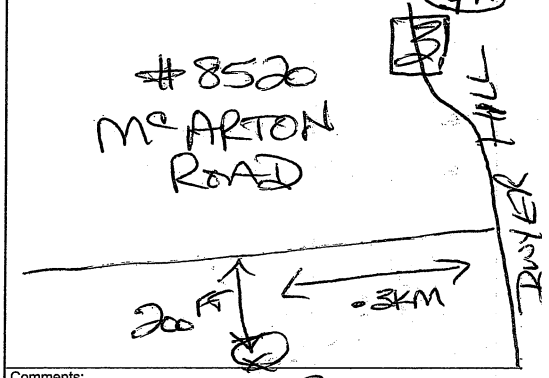
Well production (l/min / GPM): 20+

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	14'2"		15'8"
1	15.5	1	14.3
2	15.5	2	14.3
3	15.6	3	14.2
4	15.6	4	14'2"
5	15.6	5	
10	15.6	10	
15	15.6	15	
20	15.7	20	
25	15.7	25	
30	15.7	30	
40	15.7	40	
50	15.8	50	
60	15.8	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 1 HP - 20 GPM Set @ 100 FT

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
AIR ROCK DRILLING CO LTD	C7681

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6659 Hawthorne Road	Richmond	Ont	K0A2Z0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138382170	HANNA, JEREMY

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3632		2020/01/31

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2020/01/21	2020/01/16

Ministry Use Only
Audit No. Z276954
Received

0506E (2014/11) Ministry's Copy

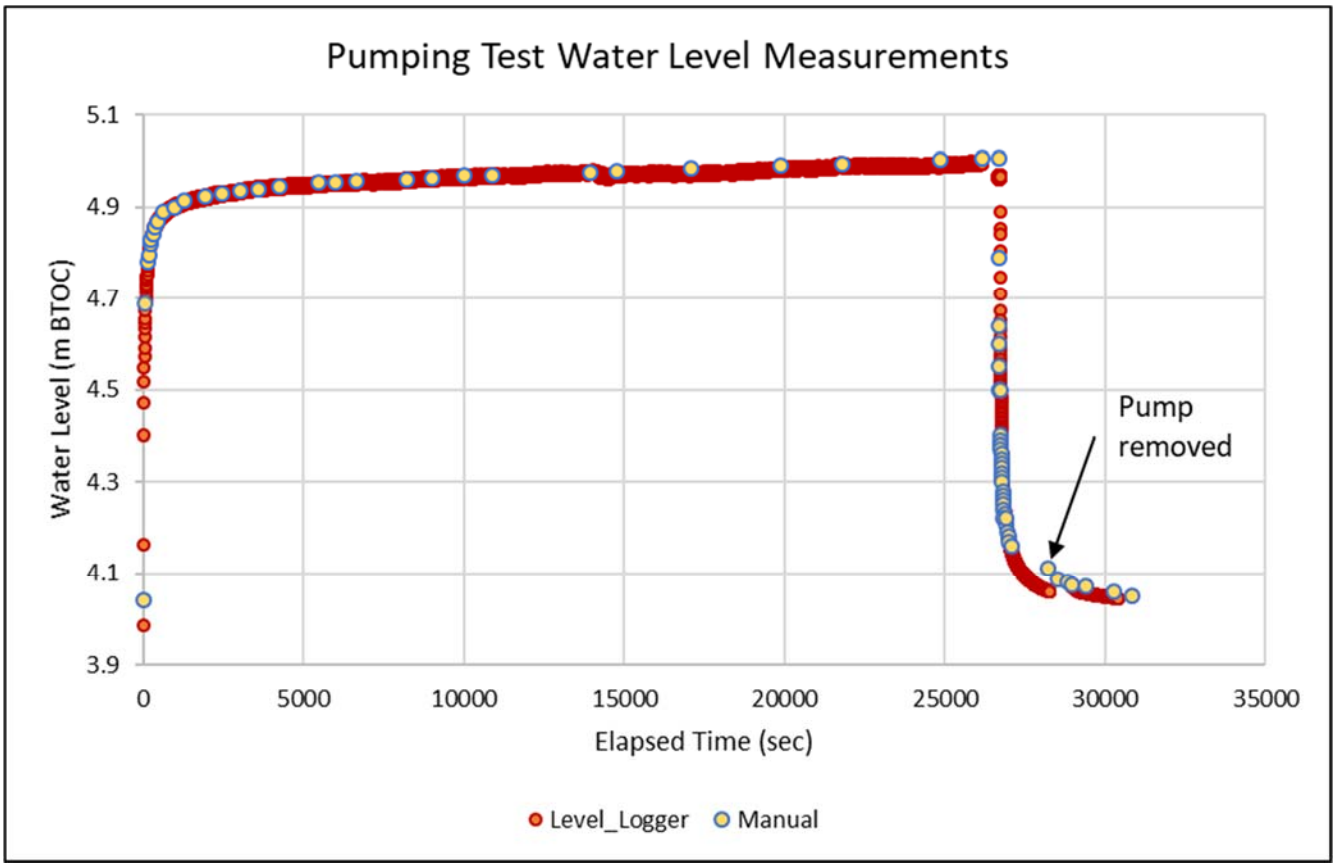
Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

APPENDIX E

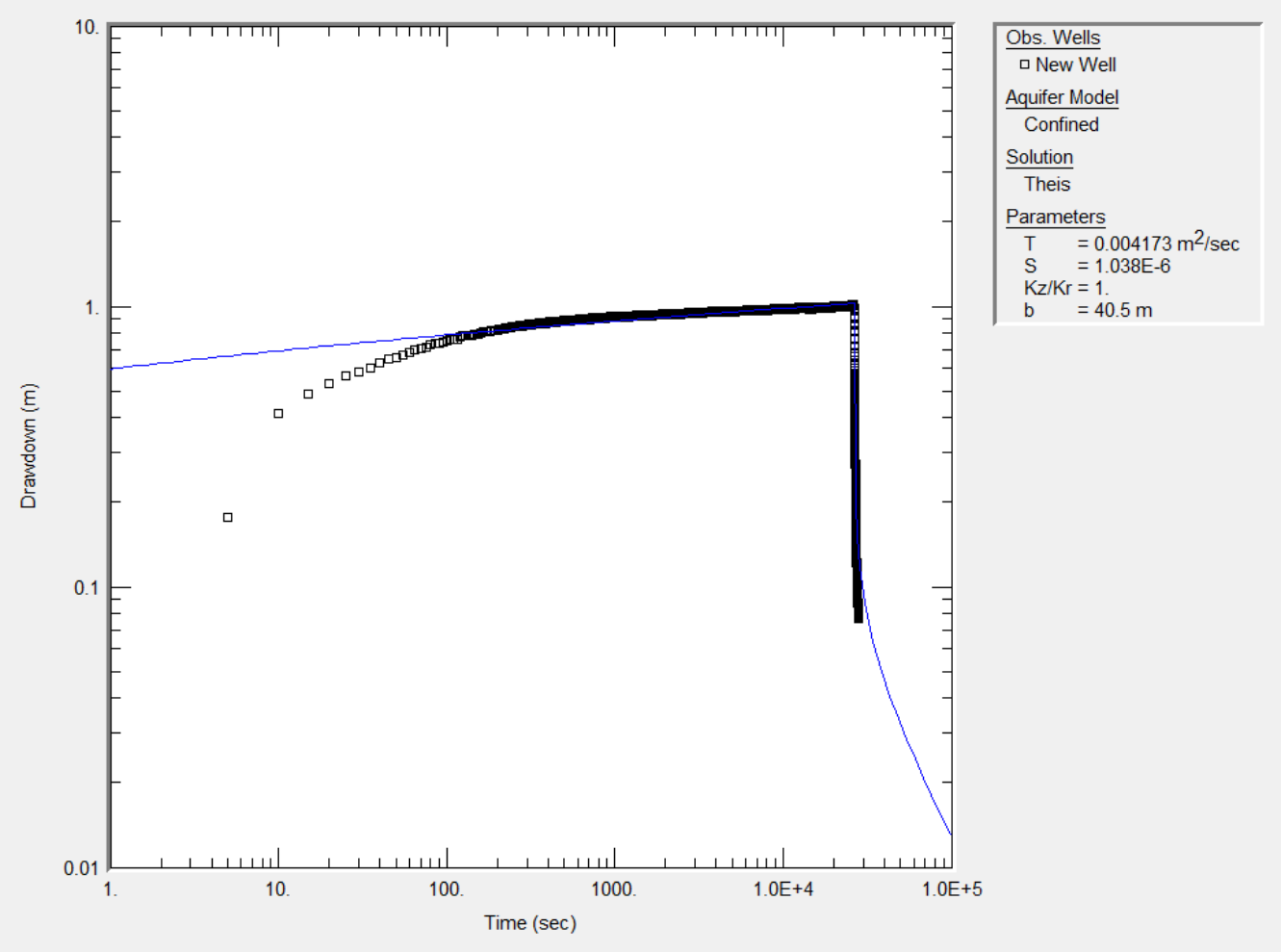
Pumping Test Results and Analysis

Geofirma Engineering Ltd

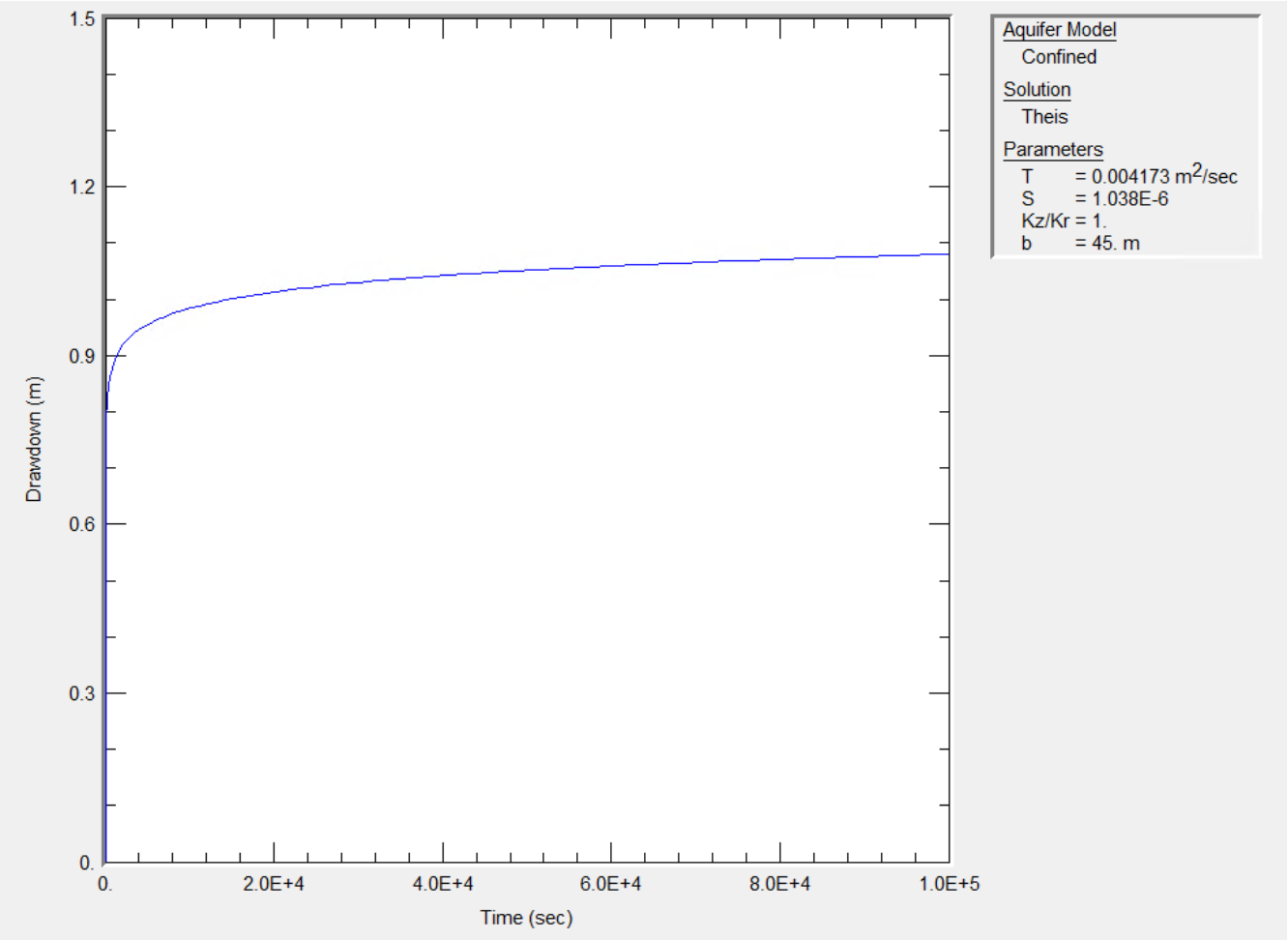
Appendix E: Figure E.1 – Manual and Transducer (Level Logger) Water Level Measurements



Appendix E: Figure E.2 - AQTESOLVE Pumping Test Analysis



Appendix E: Figure E.3 – Simulated Drawdown at 132 L/min (35 GPM)



Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

APPENDIX F

Laboratory Report

Geofirma Engineering Ltd

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

Geofirma Engineering Ltd.

1 Raymond St.,Suite 200
Ottawa, ON K1R 1A2
Attn: Chris Morgan

Client PO:
Project: 19-213-1
Custody:

Report Date: 11-Feb-2020
Order Date: 5-Feb-2020

Order #: 2006334

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2006334-01	MCW-3h
2006334-02	MCW-6h

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 11-Feb-2020

Client: Geofirma Engineering Ltd.

Order Date: 5-Feb-2020

Client PO:

Project Description: 19-213-1

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	6-Feb-20	6-Feb-20
Ammonia, as N	EPA 351.2 - Auto Colour	7-Feb-20	7-Feb-20
Anions	EPA 300.1 - IC	6-Feb-20	6-Feb-20
Colour	SM2120 - Spectrophotometric	6-Feb-20	6-Feb-20
Conductivity	EPA 9050A- probe @25 °C	6-Feb-20	6-Feb-20
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	11-Feb-20	11-Feb-20
E. coli	MOE E3407	5-Feb-20	5-Feb-20
Fecal Coliform	SM 9222D	5-Feb-20	5-Feb-20
Heterotrophic Plate Count	SM 9215C	5-Feb-20	5-Feb-20
Metals, ICP-MS	EPA 200.8 - ICP-MS	11-Feb-20	11-Feb-20
pH	EPA 150.1 - pH probe @25 °C	6-Feb-20	6-Feb-20
Phenolics	EPA 420.2 - Auto Colour, 4AAP	7-Feb-20	7-Feb-20
Hardness	Hardness as CaCO3	11-Feb-20	11-Feb-20
Sulphide	SM 4500SE - Colourimetric	10-Feb-20	11-Feb-20
Tannin/Lignin	SM 5550B - Colourimetric	6-Feb-20	6-Feb-20
Total Coliform	MOE E3407	5-Feb-20	5-Feb-20
Total Dissolved Solids	SM 2540C - gravimetric, filtration	10-Feb-20	11-Feb-20
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	6-Feb-20	7-Feb-20
Turbidity	SM 2130B - Turbidity meter	6-Feb-20	6-Feb-20

PARACEL LABORATORIES LTD.

Order #: 2006334

Certificate of Analysis

Report Date: 11-Feb-2020

Client: **Geofirma Engineering Ltd.**

Order Date: 5-Feb-2020

Client PO:

Project Description: 19-213-1

	Client ID:	MCW-3h	MCW-6h	-	-
	Sample Date:	04-Feb-20 11:45	04-Feb-20 15:10	-	-
	Sample ID:	2006334-01	2006334-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100 mL	ND	ND	-	-
Total Coliforms	1 CFU/100 mL	ND	ND	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	-	-
General Inorganics					
Alkalinity, total	5 mg/L	288	288	-	-
Ammonia as N	0.01 mg/L	0.06	0.05	-	-
Dissolved Organic Carbon	0.5 mg/L	2.3	1.4	-	-
Colour	2 TCU	12	20	-	-
Conductivity	5 uS/cm	638	636	-	-
Hardness	mg/L	283	290	-	-
pH	0.1 pH Units	7.7	7.8	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	338	338	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	0.1	-	-
Turbidity	0.1 NTU	2.8	3.5	-	-
Anions					
Chloride	1 mg/L	19	20	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	19	19	-	-
Metals					
Calcium	0.1 mg/L	77.9	80.7	-	-
Iron	0.1 mg/L	0.4	0.4	-	-
Magnesium	0.2 mg/L	21.4	21.5	-	-
Manganese	0.005 mg/L	0.027	0.026	-	-
Potassium	0.1 mg/L	1.4	1.5	-	-
Sodium	0.2 mg/L	5.2	5.6	-	-

Certificate of Analysis

Report Date: 11-Feb-2020

Client: Geofirma Engineering Ltd.

Order Date: 5-Feb-2020

Client PO:

Project Description: 19-213-1

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
Calcium	ND	0.1	mg/L						
Iron	ND	0.1	mg/L						
Magnesium	ND	0.2	mg/L						
Manganese	ND	0.005	mg/L						
Potassium	ND	0.1	mg/L						
Sodium	ND	0.2	mg/L						
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Certificate of Analysis

Client: Geofirma Engineering Ltd.

Client PO:

Report Date: 11-Feb-2020

Order Date: 5-Feb-2020

Project Description: 19-213-1

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	19.6	1	mg/L	19.5			0.4	10	
Fluoride	ND	0.1	mg/L	ND			NC	10	
Nitrate as N	ND	0.1	mg/L	ND			NC	10	
Nitrite as N	ND	0.05	mg/L	ND			NC	10	
Sulphate	19.5	1	mg/L	19.3			1.3	10	
General Inorganics									
Alkalinity, total	284	5	mg/L	288			1.1	14	
Ammonia as N	0.012	0.01	mg/L	0.018			NC	17.7	
Dissolved Organic Carbon	2.3	0.5	mg/L	2.3			3.2	37	
Colour	21	2	TCU	20			4.9	12	
Conductivity	635	5	uS/cm	638			0.5	5	
pH	7.8	0.1	pH Units	7.7			0.9	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	336	10	mg/L	338			0.6	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.12	0.1	mg/L	0.11			9.6	16	
Turbidity	2.8	0.1	NTU	2.8			2.5	10	
Metals									
Calcium	9.1	0.1	mg/L	9.2			0.3	20	
Iron	0.2	0.1	mg/L	0.2			3.3	20	
Magnesium	2.5	0.2	mg/L	2.6			3.7	20	
Manganese	0.008	0.005	mg/L	0.008			0.8	20	
Potassium	0.7	0.1	mg/L	0.7			3.1	20	
Sodium	15.7	0.2	mg/L	16.1			2.6	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100 mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	29.3	1	mg/L	19.5	97.4	77-123			
Fluoride	1.08	0.1	mg/L	ND	108	79-121			
Nitrate as N	1.05	0.1	mg/L	ND	105	79-120			
Nitrite as N	0.936	0.05	mg/L	ND	93.6	84-117			
Sulphate	28.3	1	mg/L	19.3	90.2	74-126			
General Inorganics									
Ammonia as N	0.291	0.01	mg/L	0.018	109	81-124			
Dissolved Organic Carbon	11.2	0.5	mg/L	2.3	89.6	60-133			
Phenolics	0.025	0.001	mg/L	ND	101	69-132			
Total Dissolved Solids	96.0	10	mg/L	ND	96.0	75-125			
Sulphide	0.52	0.02	mg/L	ND	103	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	104	71-113			
Total Kjeldahl Nitrogen	2.07	0.1	mg/L	0.11	97.7	81-126			
Metals									
Calcium	18100	0.10	mg/L	9170	89.7	80-120			
Iron	2510	0.10	mg/L	241	90.9	80-120			
Magnesium	11500	0.20	mg/L	2600	89.3	80-120			
Manganese	60.8	0.01	mg/L	7.98	106	80-120			
Potassium	10400	0.10	mg/L	696	96.9	80-120			
Sodium	23900	0.20	mg/L	16100	78.2	80-120			QM-07

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match -
Applies to samples: MCW-6h

Sample Qualifiers :

QC Qualifiers :

QM-07 : The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on other acceptable QC.

QS-02 : Spike level outside of control limits. Analysis batch accepted based on other QC included in the batch.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

PARACEL LABORATORIES LTD

Paracel ID: 2006334

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 11116
2006334	

Client Name:	Geofirma	Project Ref:	19-213-1	Waterworks Name:		Samples Taken By:	KAM
Contact Name:	Chris Morgan	Quote #:		Waterworks Number:		Name:	Kyle McCrae
Address:	1 Raymond St	PO #:		Address:		Signature:	
After Hours Contact:		E-mail:	cmorgan@geofirma.com			Page 1 of 1	
Telephone:	613-402-1701	Fax:		Public Health Unit:		Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day	

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 319/08 ☒ Private Well
☐ ON REG 243/07 ☐ Other ODWS

Have LSN forms been submitted to MOE/MOHLTC?: ☐ Yes ☐ No ☒ N/A

Are these samples for human consumption?: ☐ Yes ☐ No

All information must be completed before samples will be processed.

Sample Type: R = Raw ; T = Treated ; D = Distribution; P = Plumbing
Source Type: G = Ground Water; S = Surface Water
Reportable: Requires AWQI reporting as per Regulation - Y = Yes; N = No

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Required Analyses: Total Coliform/E. Coli	HPC	Lead	THM	Subdivision Agr			
1	8520 McArton	MCW-3h	R	G	N	N	04-Feb-14	11:45	8	0						X			
2	8520 McArton	MCW-6h	R	G	N	N	04-Feb-14	15:10	8	0						X			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: sample 2 read MCW-6.5h

Method of Delivery: walkin

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
Chris Morgan			
Relinquished By (Print):	Date/Time:	Date/Time: 02-05-2014 15:16	Date/Time: 02-05-2014
Date/Time: 05-Feb-14 / 15:00	Temperature: °C	Temperature: 6.8 °C	pH Verified: ☒ By: MA 15:54

Hydrogeological Study
8520 McArton Road, Ottawa, Ontario

APPENDIX G

Water Corrosive Index Calculations (LSI and RSI Index)

Geofirma Engineering Ltd

Langelier Saturation Index (LSI)

LSI is an important and widely used calculation to determine a solution's ability to dissolve or deposit calcium carbonate. It is widely used to assess the corrosivity of water for planning water treatment equipment.

LSI is calculated as the difference between measured pH and calculated pH.

LSI < 0 corrosive (-0.5 = mildly corrosive, -2 = moderately corrosive, -5 = severly corrosive)
LSI > 0 scale forming (0.5 = slight scale, 1 - mild scale, 2.5 - moderate scale, 4 = severe scale forming)
LSI = 0 neutral, balanced water

$LSI = pH - pH_s$

where,
pH is the measured water pH
pHs is the pH at saturation in calcite or calcium carbonate and is defined as:

pHs = (9.3 + A + B) - (C + D)
where:
A = (Log10 [TDS] - 1) / 10
B = -13.12 x Log10 (oC + 273) + 34.55
C = Log10 [Ca2+ as CaCO3] - 0.4
D = Log10 [alkalinity as CaCO3]

Temperature	**8.17**	°C
pH	**7.06**	
Calcium Hardness	**77.9**	mg/L
Total Alkalinity	**288**	mg/L
TDS	**338**	mg/L

p(Ca++) =	*3.11*
p(Alk) =	*2.24*
A =	*2.38*
B =	*0.20*
C =	*0.00*

pHs =	**7.94**	
Langelier Index =	**-0.88**	(Corrosive)
Ryznar Index =	**8.81**	(Corrosive)

Ryznar Saturation Index (RSI)

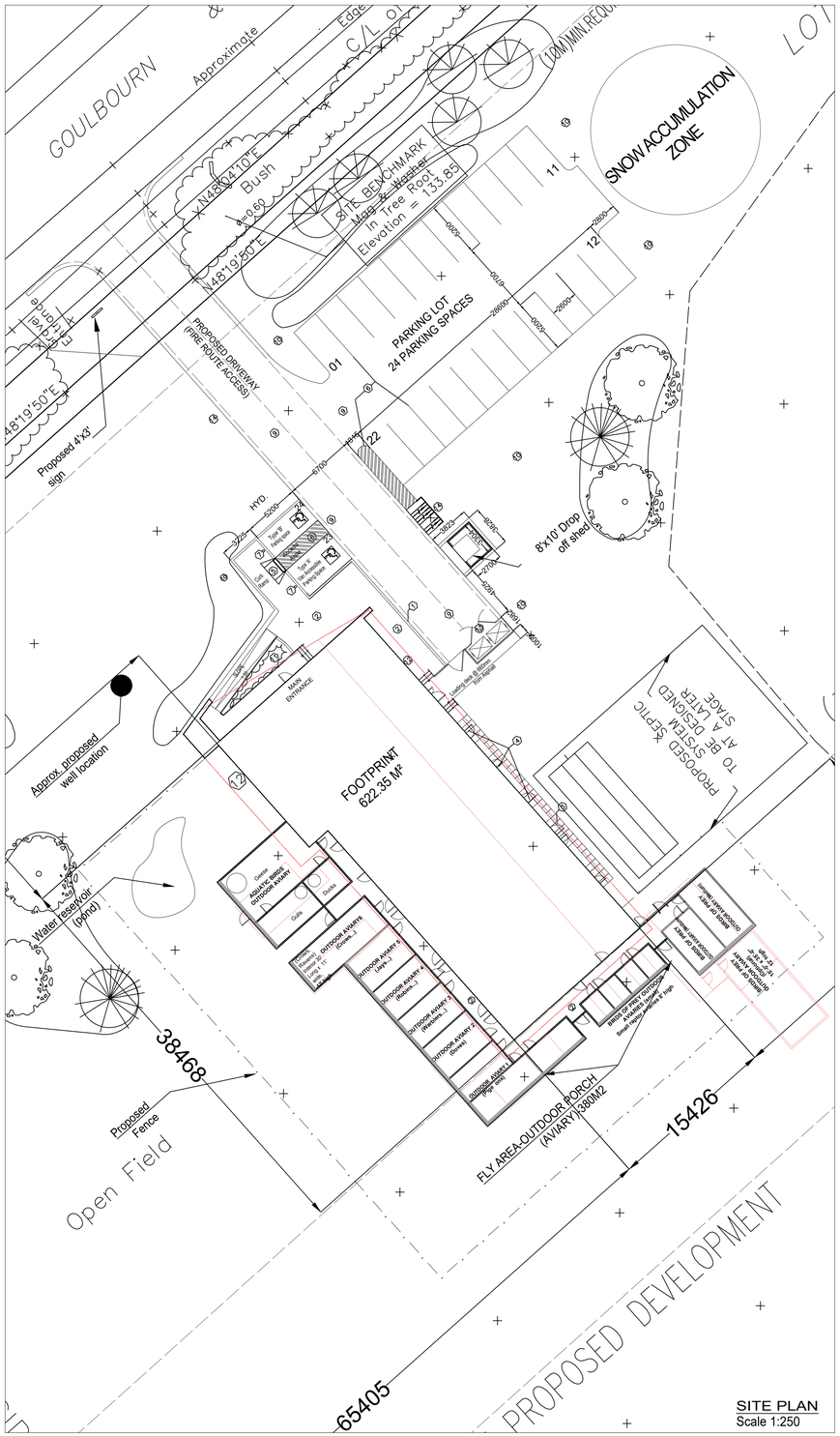
The Ryznar stability index (RSI) attempts to correlate an empirical database of scale thickness observed in municipal water systems to the water chemistry.

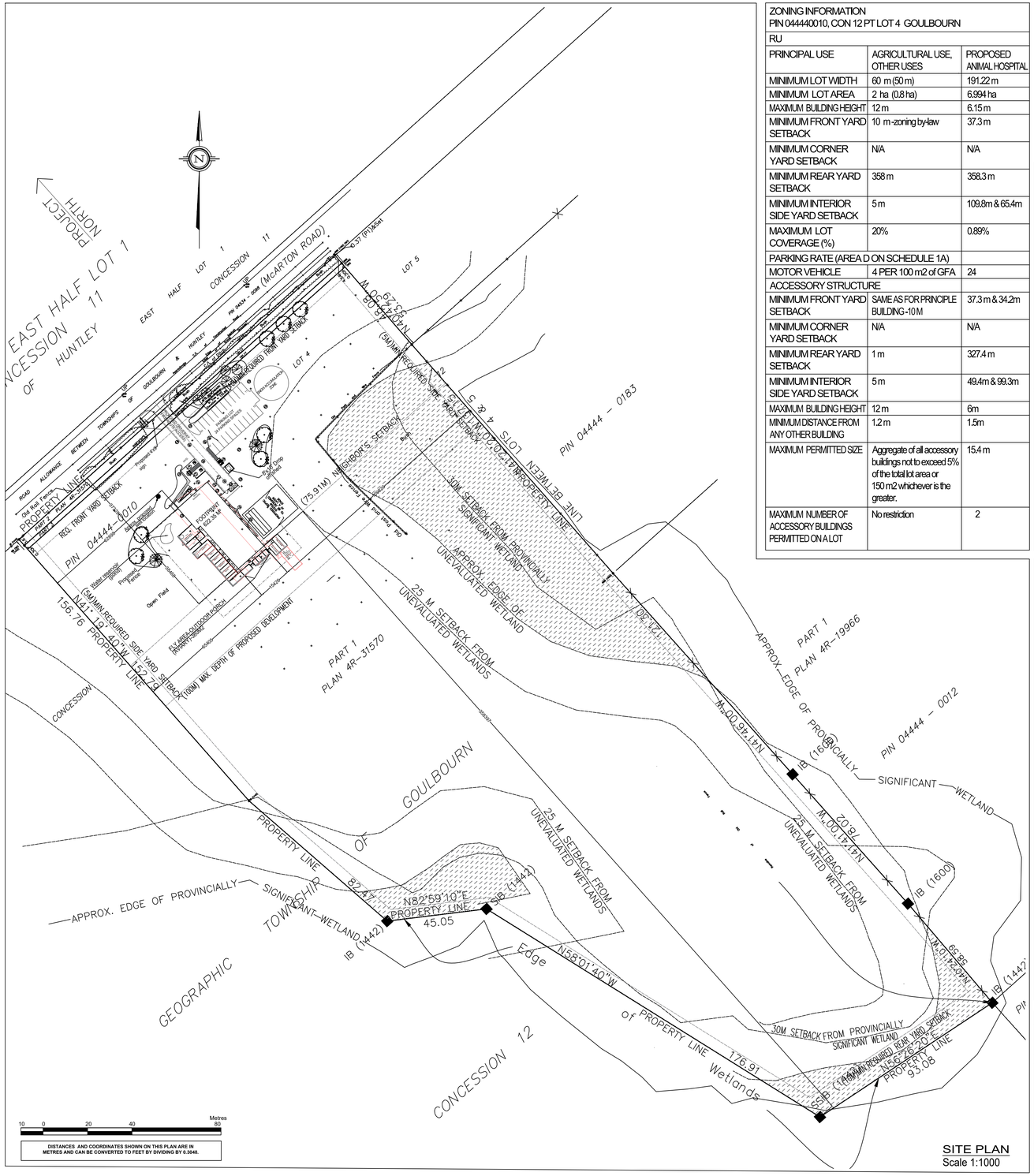
RSI = 2(pHs) - pH
where,
pH is the measured water pH
pHs is the pH at saturation in calcite or calcium carbonate

RSI << 6 the scale tendency increases as the index decreases
RSI >> 7 the calcium carbonate formation probably does not lead to a protective corrosion inhibitor film
RSI >> 8 mild steel corrosion becomes an increasing problem.

APPENDIX H

Site Plan





ZONING INFORMATION PIN 044440010, CON 12 PT LOT 4 GOULBOURN		
RU		
PRINCIPAL USE	AGRICULTURAL USE, OTHER USES	PROPOSED ANIMAL HOSPITAL
MINIMUM LOT WIDTH	60 m (50 m)	191.22 m
MINIMUM LOT AREA	2 ha (0.8 ha)	6.994 ha
MAXIMUM BUILDING HEIGHT	12 m	6.15 m
MINIMUM FRONT YARD SETBACK	10 m -zoning by-law	37.3 m
MINIMUM CORNER YARD SETBACK	N/A	N/A
MINIMUM REAR YARD SETBACK	358 m	358.3 m
MINIMUM INTERIOR SIDE YARD SETBACK	5 m	109.8m & 65.4m
MAXIMUM LOT COVERAGE (%)	20%	0.89%
PARKING RATE (AREA D ON SCHEDULE 1A)		
MOTOR VEHICLE	4 PER 100 m2 of GFA	24
ACCESSORY STRUCTURE		
MINIMUM FRONT YARD SETBACK	SAME AS FOR PRINCIPLE BUILDING -10 M	37.3 m & 34.2m
MINIMUM CORNER YARD SETBACK	N/A	N/A
MINIMUM REAR YARD SETBACK	1 m	327.4 m
MINIMUM INTERIOR SIDE YARD SETBACK	5 m	49.4m & 99.3m
MAXIMUM BUILDING HEIGHT	12 m	6m
MINIMUM DISTANCE FROM ANY OTHER BUILDING	1.2 m	1.5m
MAXIMUM PERMITTED SIZE	Aggregate of all accessory buildings not to exceed 5% of the total lot area or 150 m2 whichever is the greater.	15.4 m
MAXIMUM NUMBER OF ACCESSORY BUILDINGS PERMITTED ON A LOT	No restriction	2

KEY PLAN

GENERAL NOTES

1. ALL WORKS AND MATERIALS SHALL CONFORM TO THE LATEST REVISION OF THE STANDARDS AND SPECIFICATIONS FOR THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS AND SPECIFICATIONS, WHERE APPLICABLE.
2. THE CONTRACTOR SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION AND NOTIFY ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.
3. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER. COST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.
4. ANY AREAS BEYOND THE LIMIT OF THE SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION AT THE CONTRACTOR'S EXPENSE.
5. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE "OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS" THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE "CONTRACTOR" AS DEFINED IN THE ACT.
6. ALL CONSTRUCTION SIGNAGE MUST CONFORM TO THE MINISTRY OF TRANSPORTATION OF ONTARIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES PER LATEST AMENDMENT.
7. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE CONSTRUCTION OF THIS PROJECT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES TO PREVENT CONFLICTS.
8. ALL DIMENSIONS ARE IN METERS UNLESS SPECIFIED OTHERWISE.
9. THERE WILL BE NO SUBSTITUTION OF MATERIALS UNLESS PRIOR WRITTEN APPROVAL IS RECEIVED FROM THE ENGINEER.
10. ALL CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE GEOTECHNICAL REPORT.
11. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED AND TO BEAR THE COST OF THE SAME.
12. SHOULD DEEPLY BURIED ARCHAEOLOGICAL REMAINS BE FOUND ON THE PROPERTY DURING CONSTRUCTION ACTIVITIES, THE HERITAGE OPERATIONS UNIT OF THE ONTARIO MINISTRY OF CULTURE MUST BE NOTIFIED IMMEDIATELY.
13. THE CONTRACTOR SHALL PROVIDE THE PROJECT ENGINEER ONE SET OF AS CONSTRUCTED GRADING, SERVICING AND LANDSCAPING PLANS.
14. BENCHMARKS: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT THE SITE BENCHMARKS HAS NOT BEEN ALTERED OR DISTURBED AND THAT ITS RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION DEPICTED ON THIS PLAN.

SITE GRADING NOTES

1. PRIOR TO THE COMMENCEMENT OF THE SITE GRADING WORKS, ALL SITUATION CONTROL DEVICES SHALL BE INSTALLED AND OPERATIONAL PER EROSION CONTROL PLAN.
2. ALL GRANULAR AND PAVEMENT FOR ROADS/PARKING AREAS SHALL BE CONSTRUCTED IN ACCORDANCE WITH GEOTECHNICAL ENGINEER RECOMMENDATIONS.
3. ALL TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED WITHIN THE ROAD AND PARKING AREAS ALLOWANCE PRIOR TO THE COMMENCEMENT OF CONSTRUCTIONS.
4. CONCRETE CURB SHALL BE IN ACCORDANCE WITH CITY OF CORNWALL REQUIREMENTS AND SPECIFICATIONS PROVISION SHALL BE MADE FOR CURB DEPRESSIONS AS INDICATED ON SITE PLAN. CONCRETE SIDEWALK SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA REQUIREMENTS AND SPECIFICATIONS FOR CONCRETE ISLANDS, AND SIDEWALKS SHOWN ON THE DRAWING ARE NOT TO BE PRICED FROM THE SITE WORKS PORTION OF THE CONTRACT.
5. ASPHALT MATERIALS AND CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA REQUIREMENTS AND SPECIFICATIONS.
6. GRANULAR "A" SHALL BE PLACED TO A MINIMUM THICKNESS OF 300MM AROUND ALL STRUCTURES WITHIN THE PAVEMENT AREA.
7. SUB-EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 200MM LIFTS.
8. ALL WORK ON THE MUNICIPAL RIGHT OF WAY AND EASEMENTS TO BE INSPECTED BY THE MUNICIPALITY PRIOR TO BACKFILLING.
9. CONTRACTOR TO OBTAIN A ROAD OCCUPANCY PERMIT 48 HOURS PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL ROAD ALLOWANCE, IF REQUIRED BY THE MUNICIPALITY.
10. ALL PAVEMENT MARKING FEATURES AND SITE SIGNAGE SHALL BE PER SITE PLAN. LINE PAINTING AND SPECIFICATION SYMBOLS SHALL BE APPLIED WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT PAINT.
11. REFER TO SITE PLAN FOR DIMENSIONS AND SITE DETAILS.
12. SIDEWALKS TO BE 120MM & BEVELED AT 2:1 OR 6MM WITH NO BEVEL REQUIRED BELOW THE FINISHED FLOOR SLAB ELEVATION AT ENTRANCES REQUIRED TO BE BARRIER-FREE, UNLESS OTHERWISE NOTED. ALL IN ACCORDANCE WITH OBC 3.8.1.3. & OTTAWA ACCESSIBILITY DESIGN STANDARDS.

ONTARIO BUILDING CODE DATA MATRIX (Revised 2012-06-01)

PART 3 – FIRE PROTECTION, OCCUPANT SAFETY AND ACCESSIBILITY — OBC REFERENCE (1)

3.00 BUILDING CODE VERSION	O.Reg. 332/12	LAST AMENDMENT: O.Reg. 191/14			
3.01 PROJECT TYPE	New Construction				[A] 1.1.2.
3.01 MAJOR OCCUPANCY CLASSIFICATION	OCCUPANCY		USE		3.1.2.1.(1)
	D	Business & Personal Services		Wild Bird Care Centre	
3.02 SUPERIMPOSED MAJOR OCCUPANCIES	NO				3.2.2.7.
3.04 BUILDING AREA (m²)	DESCRIPTION		EXISTING	NEW	TOTAL [A] 1.4.1.2.
	One Building		N/A	623.25	623.25
	TOTAL		-	623.25	623.25
3.05 GROSS AREA (m²)	DESCRIPTION		EXISTING	NEW	TOTAL [A] 1.4.1.2.
	1St Storey		-	623.25	623.25
	TOTAL		-	623.25	626.30
3.06 MEZZANINE AREA (m²)	DESCRIPTION		EXISTING	NEW	TOTAL 3.2.1.1
	N/A		N/A	N/A	-
	TOTAL		-	-	-
3.07 BUILDING HEIGHT	1	STOREYS ABOVE GRADE		6.00 (m) ABOVE GRADE	[A] 1.4.1.2. & 3.2.1.1
	0	STOREYS BELOW GRADE			
3.08 HIGH BUILDING	No				3.2.6.
3.09 NUMBER OF STREETS/ FIREFIGHTER ACCESS	1 STREET(S)				3.2.2.10. & 3.2.5.
3.10 BUILDING CLASSIFICATION (with sprinkler throughout)	3.2.2.55.	Group D, up to 2 Storeys			3.2.2.20-83.
3.11 SPRINKLER SYSTEM	Not Required	PROVIDED: None			3.2.1.5. & 3.2.2.17.
	DESCRIBE				
3.12 STANDPIPE SYSTEM	Not Required				3.2.5.
3.13 FIRE ALARM SYSTEM		TYPE PROVIDED N/A			3.2.4.
3.14 WATER SERVICE/ SUPPLY ADEQUATE	Yes (Private well)				
3.15 CONSTRUCTION TYPE	RESTRICTIONS				3.2.2.(1,20,.83)
	ACTUAL	-	HEAVY TIMBER CONSTRUCTION	-	3.2.1.4.
3.16 IMPORTANCE CATEGORY	Normal				4.1.2.1.(3), 1.2.1.1.(b)
3.17 SEISMIC HAZARD INDEX (IE Fa Sa (0.2))	0.32	Seismic Design Not Required for Table 4.1.1.18. Items 6 to 21			4.1.8.18.(1)
3.18 OCCUPANT LOAD	LEVEL/AREA	OCCUPANCY TYPE	BASED ON	OCCUPANT LOAD (PERSONS)	3.1.17.
	1St Storey		Design of space	10 People (by design) + max. 20 people in dining room	
3.19 BARRIER-FREE DESIGN	Yes				3.8.
3.20 HAZARDOUS SUBSTANCES	No				3.2.7.6. & 3.3.1.19.
3.21 REQUIRED FIRE RESISTANCE RATINGS		RATING (H)	SUPPORTING ASSEMBLY (H)	INCIDENTAL USE (H) LESS OF RATING?	3.2.2.20.-83, 3.2.1.4.
	HORIZONTAL ASSEMBLY				
	FLOORS OVER BSMT		60MIN	60MIN	-
	FLOORS		45MIN	45MIN	-
	MEZZANINE		ZERO	ZERO	-
	ROOF		ZERO	ZERO	-
3.22 SPATIAL SEPARATION	WALL	EBF AREA (m2)	L.D. (m2) / L/H OR H/L	REQUIRED FRR (H)	CONSTRUCTION TYPE	CLADDING TYPE 3.2.3.
	NORTH		58.0 STREET 3.10 to 10.1 None		Combustible Permitted	Combustible Permitted
	SOUTH		59.3 357.00 3.10 to 10.1 None		Combustible Permitted	Combustible Permitted
	EST		108.0 192.00 3.10 to 10.1 None		Combustible Permitted	Combustible Permitted
	WEST		126.0 72.00 3.10 to 10.1 None		Combustible Permitted	Combustible Permitted
3.7. PLUMBING FIXTURE REQUIREMENTS	RATIO	MALE/FEMALE = 50:50 EXCEPT AS NOTED OTHERWISE				3.7.4.
	FLOOR LEVEL/AREA	OCCUPANT LOAD	OBC SENTENCE	FIXTURES REQUIRED	FIXTURES PROVIDED	
	1St Storey	18 5.7.4.7.		2	2	
3.24 ENERGY EFFICIENCY	COMPLIANCE PATH:	TABLE SB 3.3.6 2017 - NONRESIDENTIAL				
	CLIMATIC ZONE:	6				
3.25 NOTES	ALL REFERENCES ARE TO DIVISION B OF THE OBC UNLESS PRECEDED BY (A) FOR DIVISION A AND (C) FOR DIVISION C.					

LEGEND	
(1)	CONCRETE CURB
(2)	CONCRETE SIDEWALK
(3)	PRECAST CONCRETE PAVEMENT
(4)	GRAVEL LANDSCAPE
(5)	DEPRESSED SIDEWALK
(6)	PAINT
(7)	BARRIER FREE PARKING SPOT
(8)	SIGN FOR BARRIER FREE PARKING
(9)	ASPHALT
(10)	GRASS
(11)	LANDSCAPING
(12)	WALL MOUNT LIGHTING FIXTURES
(13)	TRASH DISPOSAL ENCLOSURE 1.8m Powder Coated Wire Mesh Fence
(14)	FIRE ROUTE SIGN (AFFIXED TO A GALVANIZED STEEL POST@1.5m)

No	DATE	ISSUED FOR	App.
1	2019/08/18	SITE PLAN CONTROL	A.A.
2	2020/02/08	SITE PLAN CONTROL	A.A.
3			
4			
5			

No	DATE	REVISION	App.
1			
2			
3			
4			
5			

Legend

KASTONE CONSTRUCTION MANAGEMENT
JOHN H. KENNEDY LTD.
ONTARIO & CANADA LANDS SURVEYORS
Ref: 2018 – 10 – 085

OTTAWA VALLEY WILD BIRD CARE CENTRE

ADVANCED DESIGN, ASSESSMENT& DEVELOPMENT Inc.
ADAD Inc. (Advanced Design, Assessment & Development)
http://www.adadengineering.ca/ T: 613-526-1111
135 Mangrove Crest, Gloucester, Ottawa, ON. K1T 0E4

Stamps

Project
OTTAWA VALLEY WILD BIRD CARE CENTRE
8520 McArton Road, Ottawa, ON.

Title	Drawn /: A.Aldu.	Scale
SITE PLAN DEVELOPMENT	Verif. /: A.A.	As shown
Date: 2020/02/08	Revision: 0	Drawing # A-100

APPENDIX I

Nitrate Dilution Calculations

Site - Infiltration Area

Lot Size	69,940.0	m^2	6.994	ha
Building footprint (roof)	622.4	m^2		
Parking lot footprint (paved)	568.3	m^2		
Driveway and loading dock (paved)	600.0	m^2		
Outdoor Aviary	380.0	m^2		
Subtotal impervious	2,170.7	m^2		
Subtotal pervious	67,769.3	m^2		

calculated value
constant
input value

Infiltration Factors

Total Site I_{factor} **0.68**

MOEE, 1995 - Stormwater Management Planning and Design Manual

Topography	I_{factor}	% Site	Site I_{factor}
Flat Land, average slope < 0.6 m/km	0.3	100%	0.3
Rolling Land, average slope 2.8 m to 3.8 m/k	0.2	0%	0
Hilly Land, average slope 28 m to 47 m/km	0.1	0%	0
Soils			
Tight impervious clay	0.1	0%	0
Medium combinations of clay and loam	0.2	60%	0.12
Open Sandy loam	0.4	40%	0.16
Cover			
Cultivated Land	0.1	100%	0.1
Woodland	0.2	0%	0

Post-Devlopment Water Budget Estimatation

lot area	69,940.0	m^2
subtotal impervious area	2,170.7	m^2
net area for infiltration (subtotal pervious)	67,769.3	m^2
moisture surplus (from Thornthwaite)	0.279	m
moisture surplus (for entire site)	19,499.5	m^3
Total Site I_{factor}	0.7	
annual moisture infiltration	189.586	mm/m^2
annual moisture infiltration (site)	12,848.1	m^3
annual estimated runoff (site)	6,239.8	m^3

Maximum Allowable Daily Flow

Qi = Q_Infiltration	12,848.1	m^3/year	Pervious Area x Available Infiltration (Thornthwaite)
Q_max	4,282.7	m^3/year	Q_Infiltration / 3 as per Procedure D-5-4
	11,733.5	L/d	

Nitrate Dilution Calculation

Mass Balance Equation, $Q_T C_T = Q_e C_e + Q_i C_i + Q_b C_b$

effluent loading (sewage flow)	Q_e	7.4	m^3/day
nitrate concentration in effluent	C_e	40.0	mg/L
sewage effluent input (nitrate)	$Q_e C_e$	296	g/day
available dilution water (infiltration)	Q_i	12,848.1	m^3/year
nitrate concentration in precipitation	C_i	0.0	mg/L
infiltration input (nitrate)	$Q_i C_i$	0.0	g/day
available dilution sewage flow	Q_e	2,701.0	m^3/year
total available dilution flow	$Q_T = Q_i + Q_e$	15,549.1	m^3/year
calculated septic (nitrate) loading	$C_T = Q_e C_e / (Q_i + Q_e)$	6.95	mg/L
background nitrate concentration	C_b	0.05	mg/L
total predicted nitrate conc. at boundary	$C_T + C_b$	7.0	mg/L

Thornthwaite Analysis to Determine Annual Moisture Surplus

Month	Mean Temp. (°C)	Average Monthly Preciptiation (mm)	I	PET(0) cm/month	K (40deg)	K (50deg)	K	PET(L) cm/month
January	-9.6	61.5	0	0	0.8	0.71	0.7532	0
February	-8.1	46.8	0	0	0.89	0.84	0.864	0
March	-2.1	53.4	0	0	0.99	0.98	0.9848	0
April	5.7	73.7	1.2	2.5	1.1	1.14	1.1208	2.9
May	13.2	64.6	4.4	6.3	1.2	1.28	1.2416	7.9
June	18.4	97.1	7.2	9.1	1.25	1.36	1.3072	11.8
July	20.8	92.3	8.6	10.4	1.23	1.33	1.282	13.3
August	19.7	88.6	7.9	9.8	1.15	1.21	1.1812	11.5
September	15.6	83.3	5.6	7.6	1.04	1.06	1.0504	8.0
October	8.5	76.7	2.2	3.9	0.93	0.9	0.9144	3.6
November	1.6	71.9	0.17	0.6	0.83	0.76	0.7936	0.5
December	-5.4	63.6	0	0	0.78	0.68	0.728	0

calculated value
constant
input value

Annual PET	59.5	cm	
J	37.31		
c	1.09		
Latitude (between 40 and 50)	45.2	45 deg 12' 18"	
Average Annual Precipitation	873.3	mm	(based on Environment Canada climate data for Appleton 1993-2019)
Annual Moisture Surplus	279	mm	

Where:

PETi(L) = K PETi(0)

c = 0.000000675J^3 - 0.0000771J^2 + 0.01792J + 0.49239

PETi(0) = 1.6(10Ti/J)^c

Ii = (Ti/5)^1.514

J = ∑(Ii)

Prepared by: SNS
Reviewed by: CAM
19-213-1_Nitrate Dilution Calculations_R0

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