Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

Final Report
Groundwater Intake Assessment

32 David Street
Spencerville, Ontario

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EXECUTIVE SUMMARY

The Village of Spencerville is located in Eastern Ontario, within the Township of Edwardsburgh-Cardinal of the United Counties of Leeds and Grenville. The Village is located off Highway 416, approximately 20 km north of Prescott and 60 km south of Ottawa.

Groundwater in the area is typically provided by accessing either the shallow Oxford Formation aquifer or the deeper March/Nepean Formation aquifer. Both aquifers reportedly provide a good supply of groundwater.

The 32 David Street fourplex is located in a residential area, within a relatively flat block delimited by David Street to the south, Cook Street to the east, Centre Street to the north and Cedar Street to the west. The site is occupied by a newly constructed fourplex that consists of four (4) contiguous units identified as Unit A, B, C and D. Each unit has a newly drilled well completed in the underlying Oxford Formation aquifer and terminated at an approximate depth of 24 metres below ground surface.

The objective of this study is to complete a groundwater intake assessment of the fourplex located at 32 David Street. In addition, the 32 David Street assessment compliments a groundwater quality study conducted in August 2020 by the Ontario Ministry of the Environment, Conservation and Parks (MECP) in the Village of Spencerville.

The groundwater study completed by the MECP involved the sampling of 73 domestic water wells from within the Village of Spencerville on August 24 and 31, 2020 and testing primarily for bacteriological content. The results confirmed the presence of both total coliforms and E. coli at selected locations. In addition to the well water sampling, a well inspection was also conducted as part of the survey which included documenting any issues with the well construction and the presence of potential sources of contamination. Out of 73 wells tested for bacteriological content on August 31, 2020, 62% revealed adverse results. Overall, the MECP confirmed the vulnerable nature of the underlying aquifers in the area.

To characterize the newly constructed wells at 32 David Street, two wells were subjected to 6-hour pumping and 2-hour recovery tests. The water quantity testing confirmed an adequate supply of groundwater such that usage would be unlikely to negatively affect surrounding water supplies. The water quality at this location revealed chemical values typical of the area.

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1.0 INTRODUCTION

Jp2g Consultants Inc. (Jp2g) was retained by the Township of Edwardsburgh-Cardinal (Township) to complete a groundwater intake assessment of the fourplex located at 32 David Street, Spencerville, Ontario and identified as Units A, B, C and D.

The assessment was commissioned in response to concerns with regards to the groundwater supply source in the Village of Spencerville and the recent addition of four wells at 32 David Street. The assessment also complements a groundwater quality study conducted in August 2020 by the Ontario Ministry of the Environment, Conservation and Parks (MECP) in the Village of Spencerville (MECP, 2020).

The objective of this assessment is to evaluate the potential impacts to and from the four (4) groundwater wells installed at 32 David Street. More specifically, the scope of work includes:

1) evaluating the hydraulic response of the fourplex wells,
2) evaluating the groundwater quality of the fourplex wells,
3) evaluating the potential impact of the groundwater intake, and
4) providing recommendations for safe well usage.

2.0 BACKGROUND

2.1 Site Setting

The Village of Spencerville is located in Eastern Ontario, within the Township of Edwardsburgh-Cardinal of the United Counties of Leeds and Grenville. The Village is located off Highway 416, approximately 20 km north of Prescott and 60 km south of Ottawa. The Village is predominantly located on the north bank of the South Nation River.

The 32 David Street fourplex (the site) is located in a residential area, within a relatively flat block delimited by David Street to the south, Cook Street to the east, Centre Street to the north and Cedar Street to the west (**Figure 1**). The site is occupied by a newly constructed fourplex that consists of four (4) contiguous units identified as Unit A, B, C and D from west to east (**Figure 2**). The site is surrounded by unifamilial residential dwellings of one or two stories. Trimmed grass, shrubs, trees and parking and storage areas surround the residential dwellings found in periphery of the site. The site and adjacent properties are serviced by private groundwater wells and municipal sewage services. The municipal sewer system was installed in the early 1990s following a study (Thompson, 1985) that determined that the majority of the private sewage disposal systems in the Village were non-compliant with Ontario Regulation 374/81 (as amended). There is no storm sewer on David Street. The nearest storm sewers are found several blocks to the east of the site, in the area of Centre Street and South, Spencer and Bennett Streets.

2.2 Description of Taking

Each unit of the 32 David fourplex is serviced by a private groundwater well located in the rear (north) of the building. The wells are located behind each unit (**Figure 2**). The distance between the well ranges from approximately 6 m (20 ft) to 11 m (37 ft). Detailed distances are shown in **Table 1** and photographs of the wells are presented in **Appendix A** along with the water well records. Based on the records, the wells were drilled to 24.7 m (81 ft) and completed into the limestone bedrock. The limestone was intercepted at depths ranging from 0.15 m

to 1.98 m (0.5 ft to 6.5ft). Clay and sandy clay, with or without topsoil, was observed overlying the limestone at Units A, C and D. Topsoil was recorded at Unit B to a depth of 0.15 m (0.5 ft) directly overlying the limestone bedrock.

The four wells were constructed with a 0.159 m (6.25 in) diameter steel casing sealed within a downhole of 0.251 m (9.875 in) in diameter over a depth of 6.25 m (20.5 ft) below ground surface and terminated with an open hole of 0.153 m (6.0625 in) in diameter to a depth of 27.4 m (81 ft). The casing of all wells extends to 0.46 m (1.5 ft) above the ground surface.

2.3 Characterization of the Hydrogeological Setting

The information found in this section was taken in part from the extensive private well and septic study conducted in the Village of Spencerville in 1984 (Thompson, 1985).

2.3.1 Bedrock Geology

The site is directly underlain by the Oxford Formation. This unit is composed of grey to blue-grey dolomite. In a test hole (TW3) completed by Thompson (1985), this unit was found to be greater than 35m in thickness. The bedding thicknesses vary from very thin and friable to thick competent layers. The upper metre or so of bedrock is usually weathered and more densely fractured and can frequently be excavated by backhoe for foundations. By definition, the base of the formation is defined as the first occurrence of sandstone layers of the underlying March Formation.

The March Formation is composed of grey interbedded sandstone and dolomite layers and was found to be 25 m or greater in thickness at another test hole (TW2) as outlined in Thompson (1985). Below the March Formation, the Nepean Formation was intercepted. This unit is a grey sandstone the thickness of which was not defined; however, 15 m of this formation was penetrated during the Thompson (1985) study.

Both the Oxford and the March/Nepean formations are considered aquifers that can provide a good water supply. During interviews conducted as part of Thompson (1985), residents expressed that water obtained from the Oxford aquifer is frequently sulphurous or mineralized.

The water well records for the 32 David Street indicate that limestone was intercepted below the surficial overburden to the termination depth of 24.7 m. Based on the geological settings and although limestone was reported instead of dolomite, it is assumed that the fourplex wells are installed in the Oxford Formation. Limestone and dolomite are similar in appearance and can be distinguished by using hydrochloric acid to check for effervescence, which was likely not used at the time of drilling.

2.3.2 Surficial Geology

The site area is covered mainly by Fort Covington till, which was deposited directly from glacial ice during the last Wisconsin glaciation period. This material is a bouldery sandy clay till which is usually grey in colour. The permeability of this material ranges from moderate to low. The maximum unit thickness is 4 m.

The water well records for 32 David Street indicate the presence of a thin layer of clay and sandy clay with stones, consistent with the Fort Covington till unit. At the site, the surficial deposit thickness varies from 0.15 m to 1.98 m. The deposits are considered neither as a water bearing zone or a confining unit because of their limited and discontinuous thickness.

2.3.3 Groundwater Flow

The potentiometric elevations were plotted from the well records compiled by Thompson (1985). The contours show that the groundwater flows towards the South Nation River and that the groundwater surface generally conforms to the bedrock surface.

The groundwater static elevation at the fourplex wells was measured on September 17, 2020 and ranged from 6.70 mbtop[1] to 6.92 mbtop. The elevations were measured from the top of the casing (top) which are of equal length of 0.46 m above the relatively flat backyard ground surface. The highest groundwater elevation was found at the Unit A well and the lowest elevation was found at the Unit C well. Triangulation is not possible due to the wells being installed on a straight line. Based on the local bedrock topography (Thompson, 1985 and Ontario Geological Survey Bedrock Topography Map Digital Application accessed on September 24, 2020), the groundwater flow is expected to be predominantly towards the south (i.e., towards the South Nation River). The water well records (**Appendix A**) indicate that two water bearing zones were intercepted in each of the fourplex well at approximately 11.6 m to 14.6 m (38 ft to 48 ft) and 20.7 m to 21.9 m (68 ft to 72 ft).

2.4 Well Survey

2.4.1 Thompson (1985)

A private well and septic study was completed by Thompson in 1984 (Thompson, 1985) and included data gathering activities at 184 sites.

Fifty-four (54%) percent of the 184 sites (i.e., approximately 100 sites) revealed water supplies that were seriously substandard or unfit for human consumption. Quality issues noted for the substandard sites included naturally high iron and sulphate, significant ammonia, nitrate and/or chloride, low levels of bacteriological contamination and/or non-standard well construction. Quality issues noted at the unfit sites included exceedances of the drinking water standards for nitrate, total coliforms and/or faecal coliforms or the presence of hydrocarbons or phenols contamination. It was also noted that most of the sites had very hard water. Of these sites, 18% were recommended for further investigation and 5% were recommended for water treatment. The remainder were recommended for abandonment and replacement with the drilling of new wells.

The new wells were recommended to be drilled following the methodology employed by Thompson (1985) for three test wells. This included sealing a casing to at least 25 m bgs (82 ft) and completing the well below the casing to at least 35 m bgs (115 ft). The geochemistry of the three test wells at the time was good, supporting Thompson's recommendation to upgrade the private water intakes with deeper wells and extended casing depths.

[1] *mbtop; metres below top of casing.*

The report also concluded that 80% of the private sewage disposal systems showed definite system malfunction or pollution for one of the following reasons: serious non-compliance with Ontario Regulation 374/81, lack of regular maintenance, age of system or obvious potential for pollution or malfunction. The report indicated that many of the properties in the Village lack sufficient lot size for conventional septic systems and recommended a communal sewer system as the best option for addressing sewage impacts.

2.4.2 Ontario Ministry 2020

The MECP conducted a survey of groundwater quality in the community of Spencerville in response to community concerns with regards to the water quality and the construction activities at the 32 David Street fourplex. The survey was completed on August 24 and 31, 2020. Where available, the surveyors recorded the type of well construction, the construction year, the well depth, and the depth to groundwater. They noted the type of water treatment equipment (if used) and described the colour and the odour of the water, where present. They also inquired about previous well water issues and whether the well was replaced as part of the Ministry's Private Services Grant Program of the early 1990's. A well inspection was also conducted as part of the survey which included collecting groundwater samples for analytical testing and documenting any issues with the well construction and the presence of potential sources of contamination.

A total of 74 sites were tested for total coliforms and E. coli (i.e., 8 wells were sampled on August 24 and 73 wells were sampled on August 31). Selected samples were also submitted for the analysis of "general chemistry" parameters and of bacteroides to provide a better understanding of the general water quality conditions and to assist in identifying a potential source of the bacterial contamination. The testing area was bounded by the South Nation River to the south, Cedar Street to the west, Spencer and Bennett Streets to the East and Goodin Road to the north. A single sample was also collected from a home located on Beverly Street located southwest of the village. Based on the results, the MECP categorized the water quality at the time of the sampling as safe or adverse.

The results identified a prevalence of adverse water quality results based on the presence of total coliforms and E.coli in 62% of the wells tested on August 31, 2020. With respect to the further general chemistry analysis conducted, the results were generally consistent with those expected in a bedrock setting for the area and revealed elevated hardness and sodium. The results indicated that the presence of adverse water quality was not limited to particular areas of the village and was not from those activities conducted at 32 David Street nor did they appear to be related to any other point sources of contamination (i.e. municipal sewage system). These conclusions were further supported by the supplementary analysis (general chemistry and bacteroides analyses) conducted at selected wells.

The results of the MECP study indicated that the longer casing and grouting depths recommended by Thompson (1985) likely reduces the vulnerability of a well to surface contamination; however, this construction does not appear to be entirely protective as 2 of 9 deep wells (i.e., well cased and grouted to depths in excess of 25m (80 ft)) identified by the MECP appear to show bacterial contamination.

Based on the available results and information, the MECP concluded that that the identified adverse water quality results appeared to be the result of the highly vulnerable geological setting. The MECP presented options for private well management in the area including frequent water quality testing, water treatment, well maintenance and well replacement.

2.5 Local Surface Water Features

The South Nation River, which flows eastward, is located approximately 350 m southeast of the site. The Ontario Ministry of Natural Resources and Forestry online topographic system is indicating a wetland area extending north from the River to approximately 190 m from the site.

2.6 Other Information

The Township inspected the sewer lines in August/September 2020 by Closed Circuit Television Video (CCTV) to detect any potential leak or faulty pipe. The lines inspected are shown in **Appendix B** and include the main sewer lines in proximity of the site and that run along Cedar, David and Centre Streets. The work revealed that two laterals to main gaskets were defective. The connections were excavated, and repairs were completed with no indication of external leakage.

3.0 TESTING

3.1 Pumping Test & Drawdown Analysis

The aquifer response to pumping at the fourplex was evaluated by means of two (2) six (6) hour pumping tests performed sequentially at the wells of Unit A and Unit C respectively. When used for pumping, the wells of Unit A and C are referred to as the pumping wells and the other fourplex wells as observation wells.

The pumping test at Unit A was performed on September 17, 2020 at a constant rate of 18.93 Lpm (5 U.S gpm) resulting in a total discharge of 6,815 L, which is slightly higher than the norm for a residential home. The pumping test at Unit C was performed on September 18, 2020 at a constant rate of 37.85 Lpm (10 U.S gpm) resulting in a total discharge of 13,626 L. The pumping tests were completed using the permanent submersible ½ hp, 10 gpm domestic pumps and tubing connecting the wells to the homes. The water from the house was temporarily redirected to the sanitary sewer during pumping via PVC tubing. The flow was regulated by a reducer. A sampling port was spliced into the PVC line for collecting groundwater samples for testing. Additional details on the pumping test configuration are provided in **Tables 1 and 2**.

The aquifer response to pumping was recorded during both tests at all wells by measuring the change in groundwater elevation (displacement). The water level measurements were taken from the static level prior to the start of the pump, throughout the pumping duration and following the shutdown of the pump until the water recovered to the static level or for a two hours period, which ever came first. The water levels were taken using a manual water level tape with precision of 0.01 m. The levels were taken from minute 1 from the start of the tests at the pumping wells and from minute 10 at the observation wells.

The aquifer response to pumping is illustrated on **Charts 1 to 3** of **Appendix C**. **Charts 1 and 2** show the water level response to the pumping of the Unit A well while **Chart 3** shows the response of the pumping of the Unit C well. Overall, the total drawdowns after six (6) hours of pumping were very low, ranging between 0.00 m to 0.18 m relative to a total available drawdown of approximately 15 m.

Charts 1 and **2** show a brief fluctuation of the water levels at Unit A and Unit B from the start of the pump to approximately 10 minutes into the pumping test. For the remaining of the pump test at Unit A, the water levels in all four (4) wells is stable and equal to the static level. This data indicates an initial release of borehole storage and

fractures from the immediate vicinity of the pumping well. The immediate release propagates only to the nearest observation well of Unit B, located approximately 6.3 m from the pumping well. As the test continues, the pumping rate has a negligeable effect on the aquifer which yields water without any measurable drop in hydraulic head.

The second pumping test at Unit C was performed at slightly more than double the normal household intake rate. The water level response at each well is shown on **Chart 3**. The data shows that the aquifer quickly stabilizes within 20 minutes from the start of the pump at all locations. The drawdown decreases with distance from 0.18 m at the pumping well, to 0.07 m at 17.48 m from the pumping well. The data also shows that the aquifer recovers quickly from the shutdown of the pump. Complete recovery is achieved at all observation wells within 50 minutes of the shutdown and the pumping well recovered 89% of the head loss during pumping within 120 minutes of the shutdown.

The displacement curve for the Unit C well when subject to pumping is shown on **Chart 3**. An immediate storage release from the borehole and proximal fractures is seen in the first minute of pumping followed by a temporary stabilization period that is interpreted as a surge of flow to the fractures in response to pumping. The cone of depression continues to expand as pumping progresses until an equilibrium is reached and the flow to the well no longer requires a drop in hydraulic head. The first three sections of the curve are similar to the theoretical response to pumping of an unconfined aquifer or of a confined fractured aquifer. Unconfined solutions offer the best match to the displacement curves of pumping well C and observation well D and were used to estimate the hydraulic properties of the aquifer pumped at the fourplex. The curve matching program Aqtesolv Pro v4.5 was used. The input parameters are presented in **Table 1** and the results are summarized in **Table 2** and **Appendix C**.

Transmissivity values were calculated for Unit C when acting as a pumping well and for Unit D when acting as an observation well for Unit C. The drawdown at the other wells was insufficient to apply the analytical solution. The best fit for wells C and D under the 37.85 Lpm pumping test was obtained from the Moench (1997) solution. The curve matching indicated very high transmissivity ranging from 305 to 367 m^2/day. The values are greater than the 90th percentile reported for the Nepean-March-Oxford formations of 120 m^2/day (Colgrove, 2016) and could be explained by the minimal drawdown and fast recovery observed during the pump tests.

Table 1: Aqtesolv Input Parameters

	Initial Values
Saturated Thickness (b) (m)	A: 28.3[3] C: 28.1
Hydraulic Conductivity Anisotropy Ratio (Kv/Kh)	0.5[6]
Aquitard Thickness (b' b'') (m)	1[4]
Saturated Thickness above the Well Screen (d) (m) [5]	A: 1.1 B: 0.9 C: 0.8 D: 0.9
Screen Length (L) (m)	18.5[1]
Inside Radius of Pumping Wells Casing (r(c)) (m)	0.079[1]
Radius of Downhole Equipment (r(eq)) (m)	0[7]
Inside Radius of Pumping Wells (r(w)) (m)	0.077[1]
Pumping Rate (L/min)	A: 18.93 B: 37.85
Inside Radius of Observation Wells Casing (r(c)) (m)	0.079[1]
Inside Radius of Observation Wells (r(w)) (m)	0.077[1]
Distance between Observation Wells and Pumping Wells (m) [2]	A-B: 6.30 m A-C: 17.48 m A-D: 24.57 m C-D: 7.09 m C-B: 11.17 m C-A: 17.48 m

Notes:

1. *Based on water well records of Annex A.*
2. *All distances derived from water well records of Annex A. Distances shown for B, C and D relatively to pumping well A and for D, B, and A relatively to pumping well C.*
3. *Bottom of the aquifer set at 35 m bgs found in TW3 of Thompson (1985). The static level used are those of the pumping test days: 6.70 mbtp for well A and 6.92 mbtp for well C.*
4. *Assumption that aquifer is unconfined (Groundwater Solutions, 2019)*
5. *The top of the screen is set at the base of the casing and start of the open hole. Static levels at the start of the pumping tests are used.*
6. *Midrange of vertical and horizontal hydraulic conductivity reported for limestone and dolomite by Domenic and Schwartz 1990 and reproduced in Aqtesolv user manual http://www.aqtesolv.com/aquifer-tests/aquifer_properties.htm*
7. *Well intake is an open hole equal to the size of the downhole equipment.*

Table 2: Pumping Tests Specifications

Details	Unit A	Unit B	Unit C	Unit D
Well Record ID	A275149	A275150	A275151	A275152
Pumping Rate (Lpm)	18.93	-	37.85	-
Litres pumped	6,815	-	13,629	-
Pump Setting (m)	21.4	-	21.4	-
Static Level (m)	6.70	6.84	6.92	6.88
Available Drawdown (m)	14.7	-	14.48	-
Total Drawdown (m) @ Time (min)	0.00 [2] @ 360 0.07 [3] @ 360	0.00 [2] @ 360 0.11 [3] @360	0.00 [2] @ 360 0.18 [3] @ 360	0.00 [2] @ 360 0.12 [3] @ 360
Recovery % at Time (min)	100 @ 40 [3]	100 @ 50 [3]	89 @ 120 [3]	100 @ 50 [3]
Transmissivity m^2/day [4]	No estimate [1]	No estimate [1]	367	305

Notes:

1. Insufficient aquifer response to pumping. Solutions could not be applied.
2. No measurable drawdown during pumping test at Unit A.
3. Measurable drawdown/recovery during pumping test at Unit C.
4. Estimated using the Moench (1997) solution

3.2 Water Quality Monitoring

Groundwater samples were collected on September 17 and September 18, 2020 from the well of Unit A and Unit C, respectively. The samples were collected approximately 30 minutes following the start of the pump test and at the end of the 6 hours of pumping. Samples were collected from the discharge pipe sampling port. Field parameters were collected at the time of sampling and included measurements of colour, chlorine free/total, temperature, pH, turbidity and conductivity. Turbidity was also measured at hourly intervals during the test. Samples were analysed for the Subdivision Package and included the minimum testing of the Ontario Technical Guideline D-5-5 for Private Wells – Water Supply Assessment. The testing included microbiological parameters, common metals and general chemistry. The laboratory reports and chain of custody are presented in **Appendix D**. Field and laboratory results are presented in **Appendix E**. The results of the bacteriological testing conducted by the drilling company on September 11, 2020 are also provided in **Appendix D and E**.

Total coliforms and E. coli were not detected in the samples collected by the driller on September 11, 2020 and were also not detected in both pumping wells A and C at the end of the 6 hours pumping period. Total coliforms were detected in pumping well A at the start of the test and total coliforms and E. coli were detected in pumping well C at the start of the test. The absence of total coliforms and E. coli at the end of the test suggests that a source other than the aquifer is responsible for the early detection. Since the results from the driller test were also absent of total coliforms and E. coli, it is assumed that the early detection was introduced during the installation of the temporary tubing that was needed to discharge the pumped water during the test. It is noted that chorine was not detected during the initial sampling of September 11, 2020 or during the pumping tests indicating that the wells were not under disinfection conditions at the time of sampling.

Hardness and sodium concentrations are above the ODWS operational and aesthetic guidelines, consistent with other wells in the area. The total dissolved solids (TDS) concentration in the early sample at well A was slightly above the 500 mg/L ODWS aesthetic objective and concentrations at both wells remain just below the objective for the remaining of the tests. Other parameters were within the ODWS limits where applicable.

Field parameters remained fairly constant throughout the tests and within the ODWS, where applicable.

4.0 IMPACT ASSESSMENT

4.1 Impact to Existing Groundwater Users

Under the typical domestic rate of 18.93 Lpm (5 gpm), there was no interference recorded in the observation wells located on site between 6.30m and 24.57m from the pumping well. At double the typical domestic rate, interference in the order of 0.5% to 1.2% of the available fourplex wells drawdown was observed. The largest interference was within the pumping well and the lowest interference as at 17.48m from the pumping well. The pumping tests indicate that the minimum household demand of 5,000 litres per day could be met with complete recovery within a few hours. This is consistent with the high transmissivity values derived for the aquifer.

Based on a review of the wells surveyed on the neighbouring properties by the MECP (MECP, 2020), all neighbouring wells are at least 10 m away from the fourplex wells. The fourplex wells are considered to be in the shallow well category of the wells surveyed by the MECP. Although the available drawdown in the neighbouring wells is not known, the MECP information suggests that the neighbouring wells would have water columns similar or greater than the fourplex wells. The pumping test conducted at double the typical domestic rate offers an estimate of the impact of the fourplex wells drawing water simultaneously and over a continuous period of time. The test projects a drawdown in the order of 0.1m within a radius of approximately 10m from the fourplex wells during active pumping periods. Lesser drawdowns are predicted with increasing distances from the fourplex wells. The water column is expected to recover to static conditions between periods of active pumping. This level of drawdown is not expected to be noticeable in the nearby wells as it would be within their daily fluctuation range.

The water quality of the fourplex wells is consistent with the area and shows elevated concentrations of hardness, TDS and sodium. Hardness and TDS is associated with naturally occurring conditions in the area and levels at the fourplex wells at the end of the test were below the 500 mg/L ODWS. Sodium is also naturally occurring; however, additional sources such as water softeners used to address hardness issues are possible. The presence of total coliforms and E. coli at the start of the test supports the need for flushing of the water supply line after new equipment is installed to ensure that the water is representative of the underlying aquifer which was found to be free of total coliforms and E. coli at the end of the test.

4.2 Impact to Surface Water

Impacts to the surface water from water intake at the fourplex are not expected considering the limited drawdown observed during the pumping test and the distance to the nearest surface water (i.e., the wetland area bordering the South Nation river at approximately 190m from the site).

No storm water drains are available in the area of the site and runoffs and precipitations are expected to infiltrate into the ground. Proper well construction and maintenance is essential to protect the wells against downward infiltration of contaminants from rain and snowmelt.

4.3 Other Potential Impact Considerations

Other potential impacts due to a new water intake include land stability, land subsidence and uncontrolled artesian flow. None of these potential impacts are considered an issue at the site since the wells are screened in competent bedrock and that static levels are more than 6m bgs.

It is noted that the groundwater intake assessment at 32 David Street did not take into account the use of groundwater source heat pumps. These units should not be used until additional water consumption testing is completed for the bedrock aquifer to assess any potential impacts to groundwater quantity or quality.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Results and Impact Assessment

The groundwater intake assessment at 32 David Street indicates that the underlying aquifer long-term safe yield will likely not be exceeded from the fourplex wells. Since wells are typically not pumped for extended periods of time, and minimal drawdowns were recorded, interference effects if any should be very minor.

The water quality of the fourplex well is consistent with the area and shows elevated concentrations of hardness, TDS and sodium. The concentrations of hardness and TDS could warrant water treatment equipment, at the homeowner's discretion. Homeowners under a sodium-restricted diet should consult with their health physician before drinking untreated water from the wells.

The underlying aquifer was found to be free of total coliforms and E. coli at the end of the test. Wells in the area have been observed to be susceptible to bacterial contamination and measures to promote safe well usage should be implemented.

5.2 Recommendations for Safe Well Usage

Homeowners should familiarize themselves with the Ontario water supply well requirements and best practices available from the following website: https://www.ontario.ca/document/water-supply-wells-requirements-and-best-practices.

Of note are: the requirement for routine water quality testing at least three times each year, or more frequently if a problem is suspected; the requirement to maintain in good working order the well head and its surroundings in compliance with O. Reg. 903; and the requirement to limit the type of activities around the well head to prevent contamination. A detailed well maintenance checklist has been developed by the Ontario Ministry and is provided in **Appendix F**.

The fourplex final landscaping should ensure that the surface drainage is such that water will not collect or pond in the vicinity of the wells. This will reduce the potential for surface water to seep down the side of the well casing into the well. Additional situations to avoid include: downspout and underground water pipe discharge directed toward, near or into the well; refuse, pesticides, fertilizers, salt, paint, animal waste or any other potential contaminants stored, used or disposed of near the well; vehicles such as cars, trucks, trailers, boats, snowplows, snowmobiles parked or stored near the well; and trees around the wellhead as the roots can compromise the annular seal protecting the well.

6.0 REFERENCES

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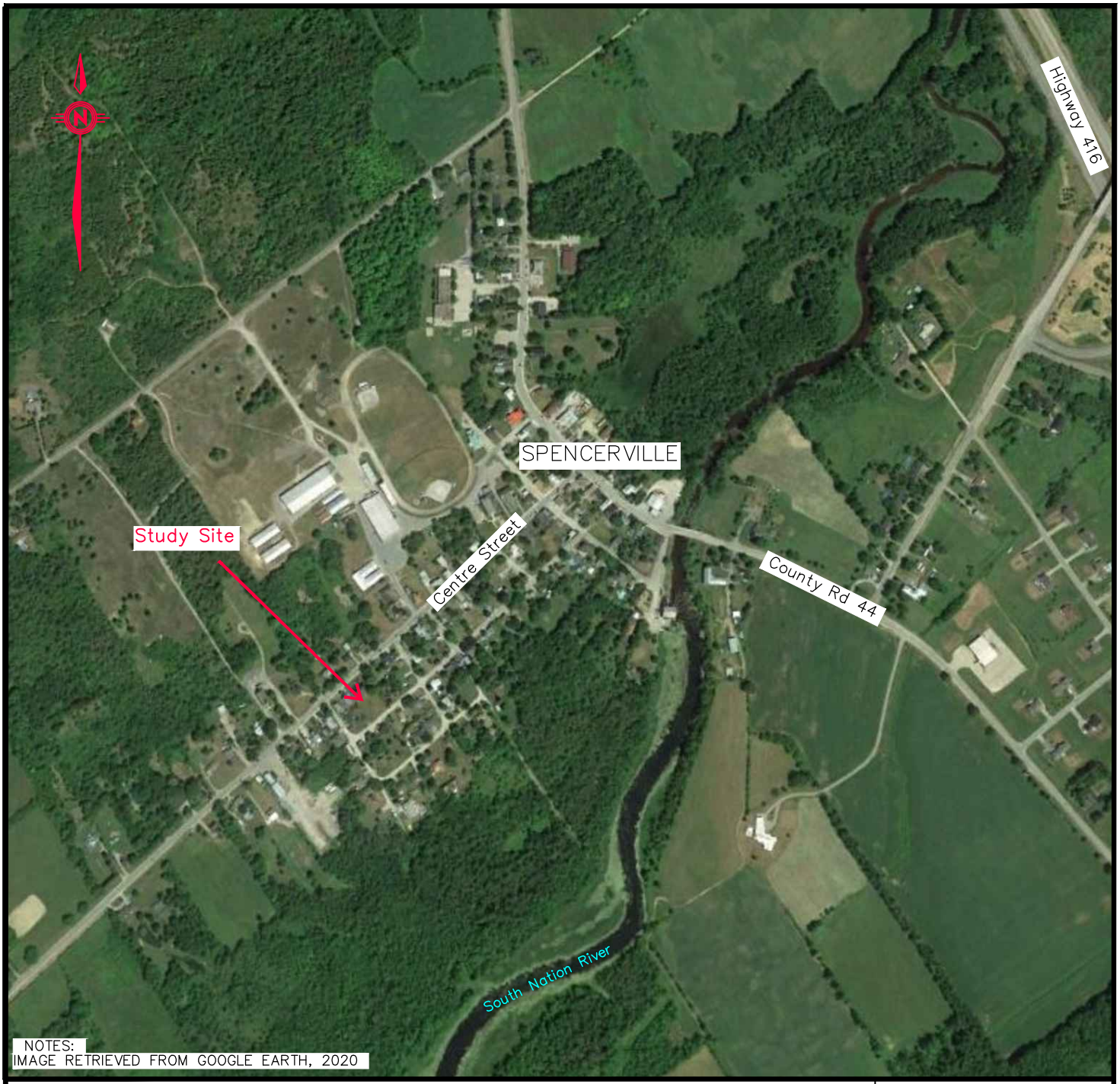
FIGURES



GROUNDWATER INTAKE ASSESSMENT

SPENCERVILLE, ONTARIO

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SITE LOCATION

PROJECT No.:	20-6109A
REVISION DATE:	2020-09-28
REVISION No.:	.
DESIGNED:	AS
DRAFTED:	AS
CHECKED: AB	APPROVED: AB
SCALE:	NTS

DWG NAME: J:\6-ENVIRONMENTAL\ACTIVE\20-6109A - SPENCERVILLE HYDRO G STUDY\10 DRAWINGS\FIGURE 1- SITE LOCATION.DWG LAYOUT: FIGURE 1 SAVED ON September 29, 2020

LEGEND

APPROXIMATE BUILDING LOCATION

EXISTING WATER WELLS

1:250

0 2 4 6 8 10 m

0 1:1 5 cm

NOTES:

1. EXISTING DRINKING WELL LOCATIONS AND BUILDING FOOTPRINT ARE BASED ON CLIENT PROVIDED DRAWINGS.
2. AERIAL IMAGE RETRIEVED FROM GOOGLE EARTH, 2020.

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS
12 INTERNATIONAL DRIVE, PEMBROKE, ON
Phone: (613)735-2507, Fax:(613)735-4513
1150 MORRISON DRIVE, SUITE 410, OTTAWA, ON
Phone: (613)828-7800, Fax: (613)828-2600

GROUNDWATER INTAKE ASSESSMENT
32 DAVID STREET, SPENCERVILLE, ONTARIO
~
SITE PLAN

DESIGNED: AS		PROJECT No.: 20-6109A
DRAFTED: AS		REVISION DATE: 02-10-2020
CHECKED: AB	APPROVED: A/b	REVISION No.: .
SCALE: 1:250		**FIGURE 2**

DWG NAME: J:\6-ENVIRONMENTAL\ACTIVE\20-6109A - SPENCERVILLE HYDRO G STUDY\10 DRAWINGS\OBSOLETE\SITE PLAN.DWG LAYOUT: FIG 2A SAVED ON October 2, 2020

APPENDIX A

WATER WELL RECORDS

32 David Street, individual unit drinking well installations

View of drinking well installation

Well cap including details of drilling company

Ontario

Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* **Tag#:A275152**

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
Madison	Mulder		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
POBox 191	Spencerville	ON	K0E1X0	6138687488

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
320 David Street	Edwardsburgh/Cardinal	parts 5 north side of David St	

County/District/Municipality	City/Town/Village	Province	Postal Code
Grenville	Spencerville	Ontario	K0E1X0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	456051	4965098	Plan 40 Pt 2	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Sandy Clay		Packed	0	2'
Grey	Limestone		Hard	2'	81'

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
20'6"	10'6"	Cement Pressure Grouted	6.77
10'6"	0	Bentonite Pressure Grouted	6.77

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼"	Steel	.188	+1'6"	20'6"
6¼"	Open Hole		20'6"	81'

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*	Hole Diameter Depth From	Hole Diameter Depth To	Hole Diameter (cm/in)
39'	☐	☐	☑		0	20'6"	9 7/8"
72'	☐	☐	☑		20'6"	81'	6¼"
	☐	☐	☐				

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
1425486 Ontario Ltd. Drilling	4 8 8 7

Business Address (Street Number/Name)	Municipality
POBox 1663	Prescott

Province	Postal Code	Business E-mail Address
ON	K0E1T0	Ferguson.Johnathon

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
6138687488	Ferguson, Johnathon

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
4043		2018/06/06

Results of Well Yield Testing

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

If pumping discontinued, give reason: ____

Pump intake set at *(m/ft)*: 70'

Pumping rate *(l/min / GPM)*: 20 gpm

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping *(m/ft)*: 18.4

If flowing give rate *(l/min / GPM)*: ____

Recommended pump depth *(m/ft)*: 70'

Recommended pump rate *(l/min / GPM)*: 10 gpm

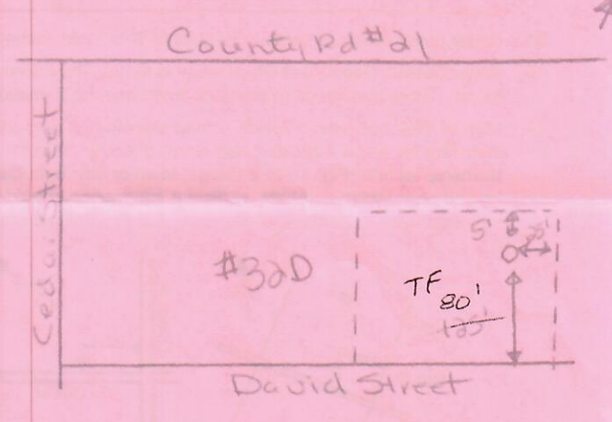
Well production *(l/min / GPM)*: ____

Disinfected? ☑ Yes ☐ No 145

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		17.5		18.4
1		18.2	1	17.55
2		18.25	2	17.5
3		18.3	3	
4		18.3	4	
5		18.3	5	
10		18.3	10	
15		18.35	15	
20		18.4	20	
25		18.4	25	
30		18.4	30	
40		18.4	40	
50		18.4	50	
60		18.4	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 145 Chlorine after Drilling & Chlorine after Pump Test

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2018/06/06	2018/06/06

Ministry Use Only

Audit No. Z329584

Received

Well Owner's Copy

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below) **Tag#:A275151**

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
Madison	Mulder		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
PO Box 191	Spencerville	ON	K0E 1X0	613 803 7488

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
32C David Street	Edwardsburgh/ Cardinal	pt of Lot #5 north side of David Street	Concession B West

County/District/Municipality	City/Town/Village	Province	Postal Code
Grenville	Spencerville	Ontario	K0E 1X0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	456557	4965296	Plan 40 Part 2	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Topsoil		Packed	0	6"
Brown	Clay	Stones	Packed	6"	3'6"
Grey	Limestone		Hard	3'6"	81'

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
20'6"	10'6"	Cement Pressure Grouted	6.77
10'6"	0	Bentonite Pressure Grouted	6.77

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	+1'6"	20'6"
6 1/16"	Open Hole		20'6"	81'

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
46'	☐	☐	☒	
72'	☐	☐	☒	
	☐	☐	☐	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	20'6"	9 7/8"
20'6"	81'	6 1/16"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
1435466 Ontario Ltd o/a Schaefer Well Drilling	4187

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
PO Box 1083	Prescott	ON	K0E 1T0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
613 925 4695	Fergusson, Johnathon	4042		

Results of Well Yield Testing

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

If pumping discontinued, give reason: ____

Pump intake set at (m/ft): 70'

Pumping rate (l/min / GPM): 20gpm

Duration of pumping: ___ hrs + 0 min

Final water level end of pumping (m/ft): 18.45

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

Recommended pump depth (m/ft): 70'

Recommended pump rate (l/min / GPM): 10gpm

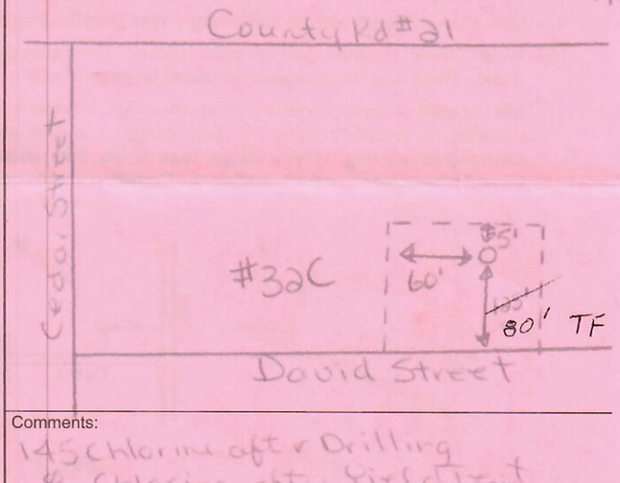
Well production (l/min / GPM): ____

Disinfected? ☒ Yes ☐ No 145

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		17.7		18.45
1		18.3	1	17.75
2		18.35	2	17.7
3		18.35	3	
4		18.35	4	
5		18.4	5	
10		18.4	10	
15		18.45	15	
20		18.45	20	
25		18.45	25	
30		18.45	30	
40		18.45	40	
50		18.45	50	
60		18.45	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 145 Chlorine after Drilling
* Chlorine after Pitless Test

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No		

Ministry Use Only

Audit No. Z329583

Received

0506E (2018/12)

Well Owner's Copy

Ontario

Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*

Tag#:A275150

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
Madison	Mulder		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
POBox 191	Spencerville	ON	K0E 1X0	6138087448

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
328 David Street	Edwardsburgh Cardinal	part of lot 5	North side of David st apart of Pine St

County/District/Municipality	City/Town/Village	Province	Postal Code
Grenville	Spencerville	Ontario	K0E 1X0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	456555	4965290	Plan #40 Part 3	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Topsoil		Packed	0	6"
Grey	Limestone		Broken	6"	5'6"
Grey	Limestone		Hard	5'6"	81'

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used *(Material and Type)*	Volume Placed (m^3/ft^3)
20'6"	10'6"	Cement Pressure Grouted	6.77
10'6"	0	Bentonite Pressure Grouted	6.77

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼"	Steel	.188	+1'6"	20'6"
6 1/16"	Open Hole		20'6"	81'

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	Other, *specify*
40'	☐	☐ Fresh ☑ Untested	
68'	☐	☐ Fresh ☑ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	20'6"	9 7/8"
20'6"	81'	6 1/16"

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 70'

Pumping rate (l/min / GPM): 20GPM

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 17.95

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft): 70'

Recommended pump rate (l/min / GPM): 10GPM

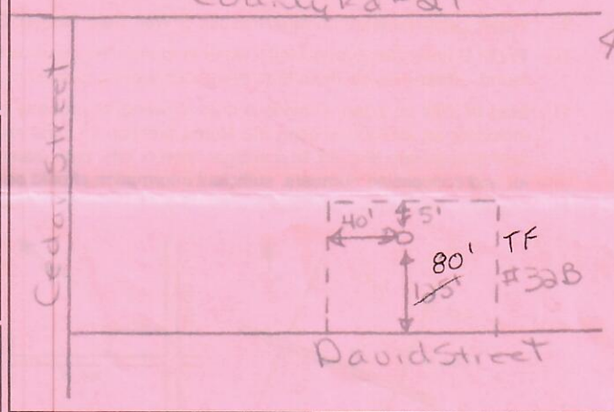
Well production (l/min / GPM)

Disinfected? ☑ Yes ☐ No 140

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		17.7		17.95
1		18	1	17.7
2		18	2	
3		18	3	
4		18	4	
5		18	5	
10		18	10	
15		18.05	15	
20		18.05	20	
25		18.05	25	
30		18.05	30	
40		18	40	
50		17.95	50	
60		17.95	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 140 Chlorine after Drilling & Chlorine after Yield Test

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
1425486 Ontario Ltd Drilling	4877

Business Address (Street Number/Name)	Municipality
POBox 1083	Prescott

Province	Postal Code	Business E-mail Address
ON	K0E 1T0	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
6138087448	Fergusson, Johnathon

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
4042		2018/08/08

Well owner's information package delivered: ☑ Yes ☐ No

Date Package Delivered: 2018/08/08

Date Work Completed: 2018/08/08

Ministry Use Only

Audit No: Z329582

Received

0506E (2018/12)

Well Owner's Copy

Ontario

Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* **Tag#:A275149**

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
Madison	Mulder		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
POBOX 191	Spencerville	ON	K0E1X0	6138067488

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
32nd David Street	Edwardsburgh/Cardinal	Plan 40 Part Pof Lot #5 North Side of David Street and of Bridge St	

County/District/Municipality	City/Town/Village	Province	Postal Code
Grenville	Spencerville	Ontario	K0E1X0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	456345	4965290		

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Topsoil		Packed	0	1'
Brown	Clay	Sand & Stones	Packed	1'	6'6"
Grey	Limestone		Hard	6'6"	81'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m^3/ft^3)
20'6"	10'6"	Cement Pressure Grouted	6.77
10'6"	0	Bentonite Pressure Grouted	6.77

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6¼"	Steel	.188	+1'6"	20'6"
6¼"	Open Hole		20'6"	81'

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*

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 70'

Pumping rate (l/min / GPM): 20 gpm

Duration of pumping: ___ hrs + 0 min

Final water level end of pumping (m/ft): 17.5

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

Recommended pump depth (m/ft): 70'

Recommended pump rate (l/min / GPM): 16 gpm

Well production (l/min / GPM):

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		17.1		17.5
1		17.3	1	17.2
2		17.35	2	17.15
3		17.35	3	17.15
4		17.35	4	17.15
5		17.35	5	17.15
10		17.4	10	17.1
15		17.4	15	
20		17.45	20	
25		17.45	25	
30		17.45	30	
40		17.5	40	
50		17.5	50	
60		17.5	60	

Water Details

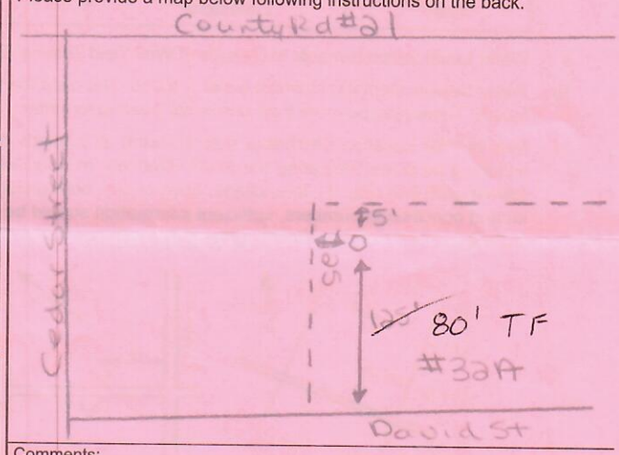
Water found at Depth (m/ft)	Gas	Kind of Water	Other, *specify*
45'	☐	☐ Fresh ☒ Untested	
70'	☐	☐ Fresh ☒ Untested	
	☐	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	Depth (m/ft) To	Diameter (cm/in)
0	20'6"	6¼"
20'6"	81'	6¼"

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
145 Chlorine after Drilling
0 Chlorine after Yield Test

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
1435486 Ontario Ltd Shane's Drilling	4187

Business Address (Street Number/Name)	Municipality
POBOX 1083	Prescott

Province	Postal Code	Business E-mail Address
ON	K0E1T0	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
6138486665	Fergusson, Johnathon

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
4614		2018/08/09

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2018/08/09	2018/07/04

Ministry Use Only

Audit No. Z329581

Received

0506E (2018/12)

Well Owner's Copy

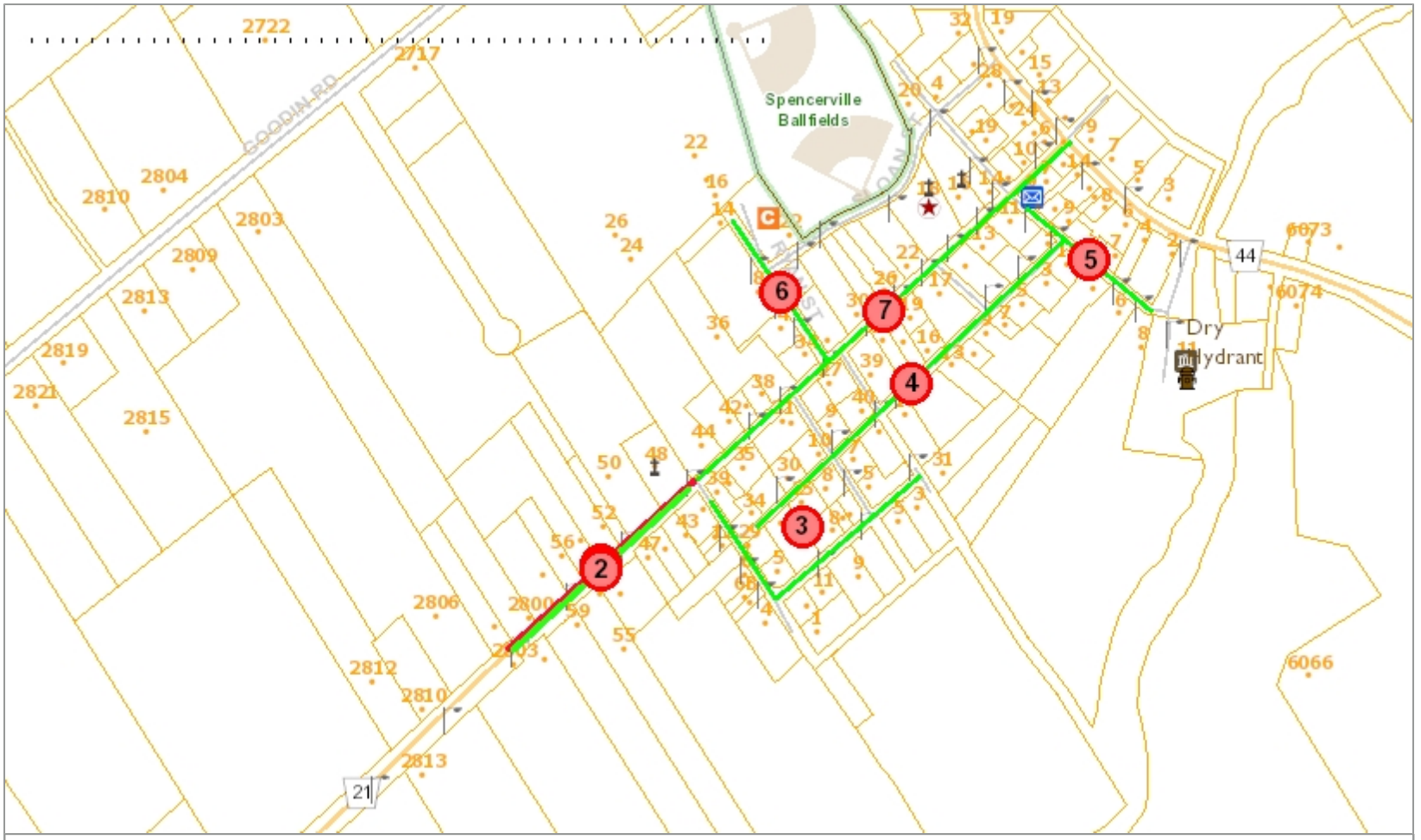
APPENDIX B

SEWER LINE INSPECTION

EDWARDSBURGH CARDINAL

SPENCERVILLE CCTV

2020



Map Printed On 2020-09-11 07:48

LEGEND

COMMENTS Red - Force main Green - Sewer mains Note: Laterals on Ryan and Cedar St. were inspected

APPENDIX C

AQUIFER RESPONSE TO PUMPING

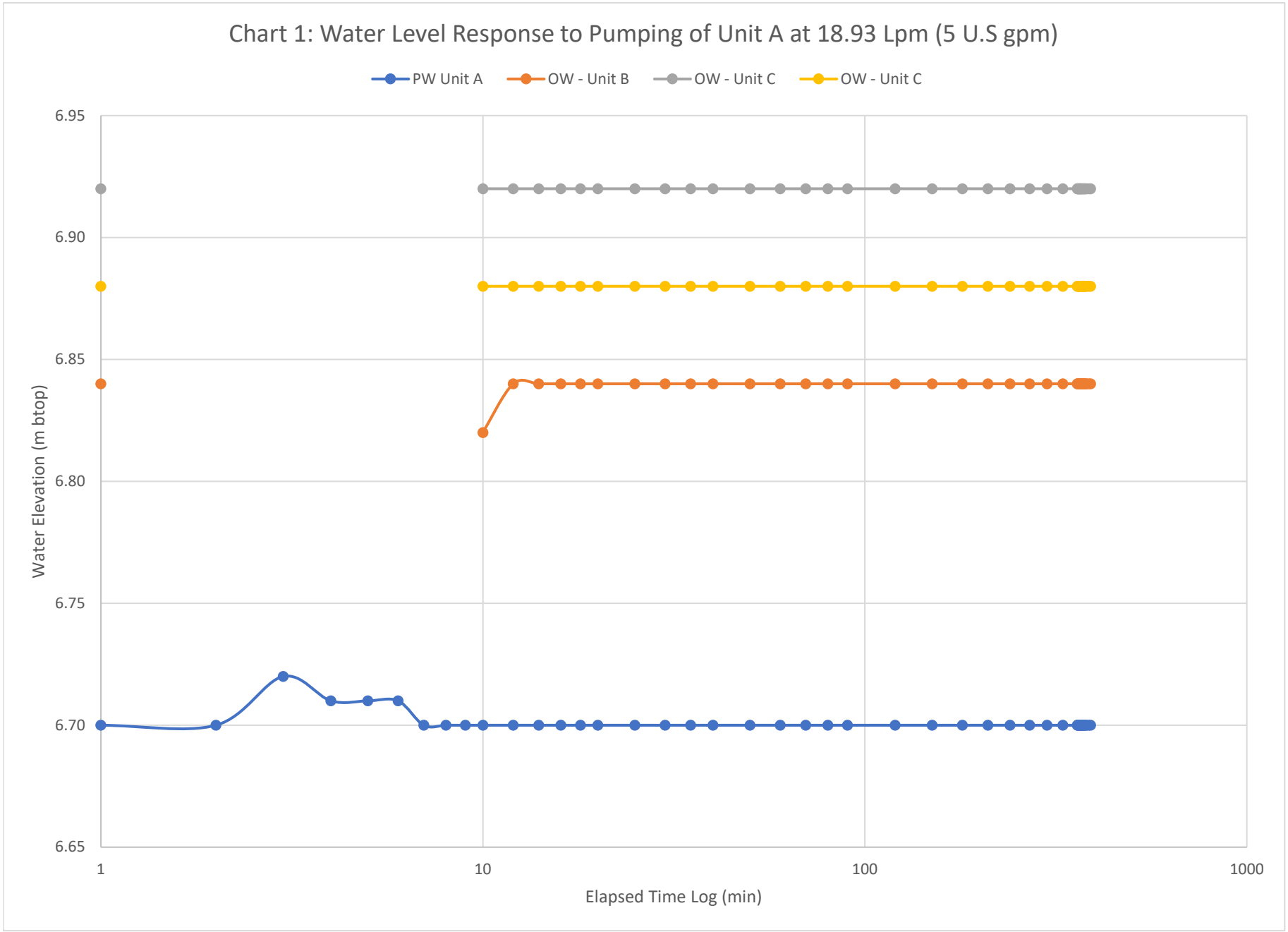


Chart 1: Water Level Response to Pumping of Unit A at 18.93 Lpm (5 U.S gpm)
PW Unit A
OW - Unit B
OW - Unit C
OW - Unit C
6.95
6.90
6.85
6.80
6.75
6.70
6.65
Water Elevation (m btop)
1
10
100
1000
Elapsed Time Log (min)

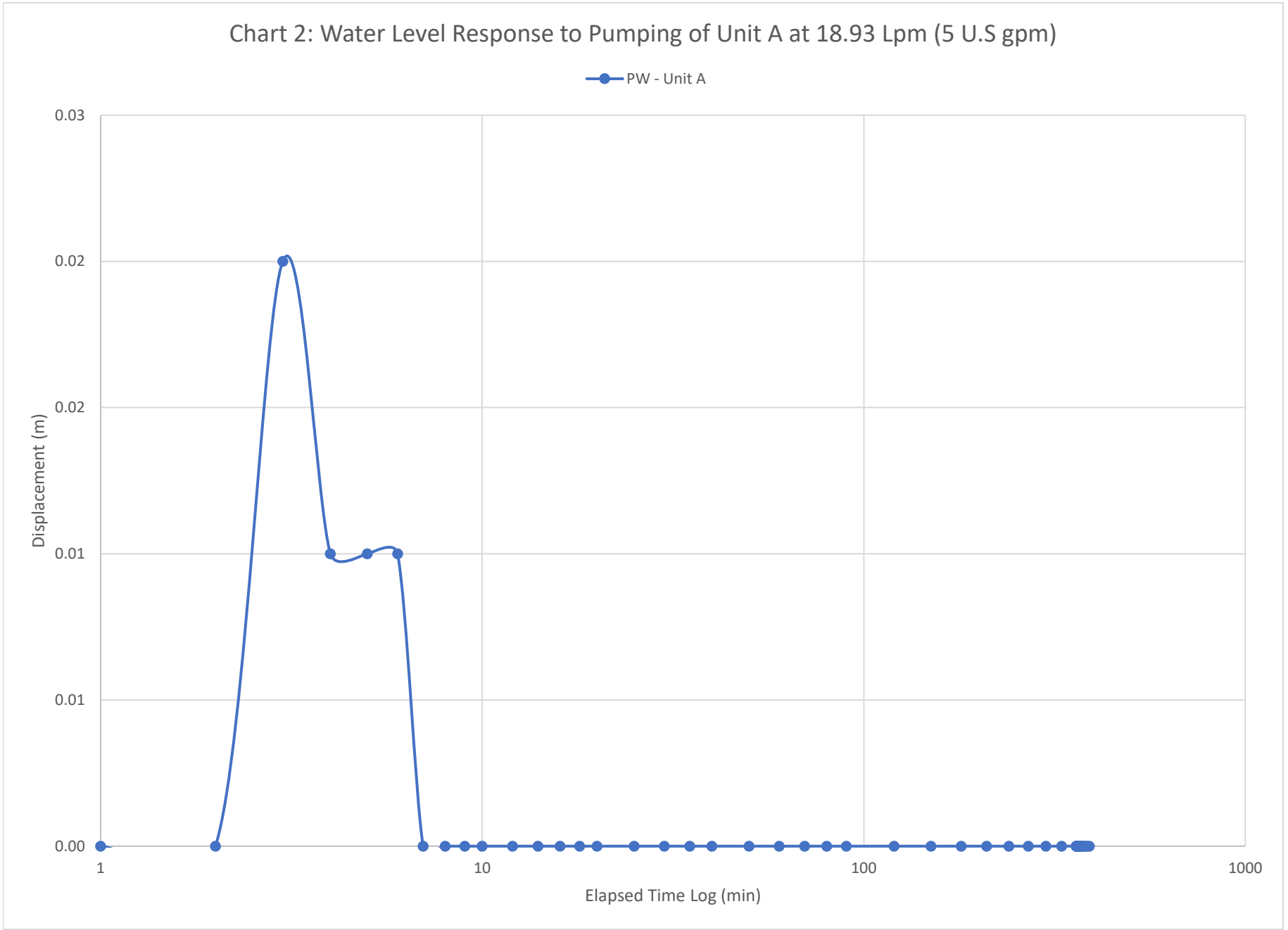


Chart 2: Water Level Response to Pumping of Unit A at 18.93 Lpm (5 U.S gpm)
PW - Unit A
0.03
0.02
0.02
0.01
0.01
0.00
Displacement (m)
1
10
100
1000
Elapsed Time Log (min)

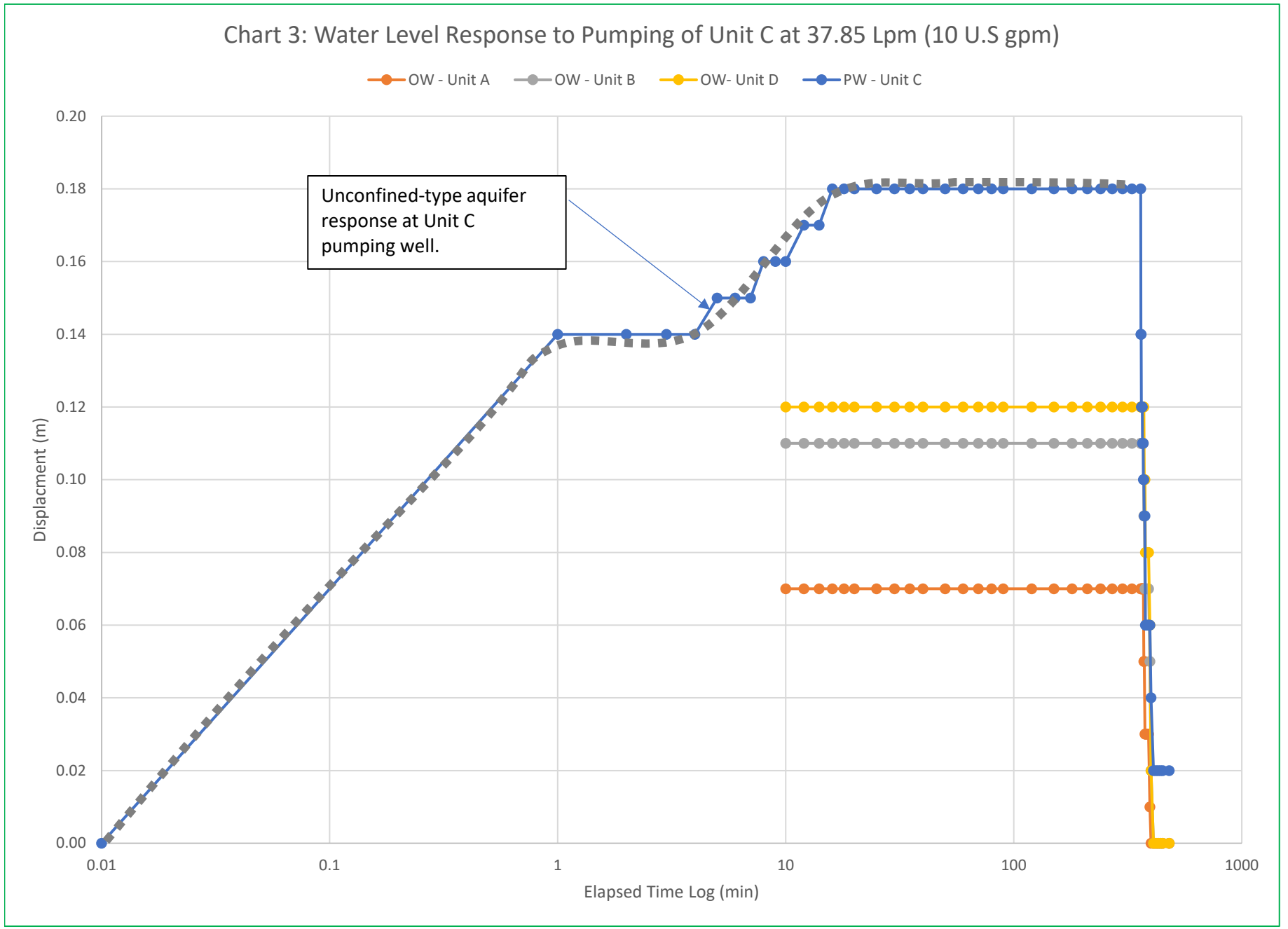


Chart 3: Water Level Response to Pumping of Unit C at 37.85 Lpm (10 U.S gpm)
OW - Unit A
OW - Unit B
OW- Unit D
PW - Unit C
Unconfined-type aquifer response at Unit C pumping well.
Displacment (m)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.01
0.1
1
10
100
1000
Elapsed Time Log (min)

APPENDIX D

LABORATORY RESULTS

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: DW100921 **REPORT No. B20-28470**

Report To:

Jp2g Consultants Inc
1150 Morrison Dr.,
Ottawa ON. K2H 8S9 Canada
Attention: Jennifer Farrell

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 17-Sep-20
DATE REPORTED: 25-Sep-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Spencerville Hydro 6
P.O. NUMBER: 20-6194
WATERWORKS NO.

			Client I.D.:		Unit #A-1	Unit #A-2	ODWS	
			Sample I.D.:		B20-28470-1	B20-28470-2	Objective	Type of Objective
			Date Collected:		17-Sep-20	17-Sep-20		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	21-Sep-20/O	368	358	80-100	OG
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	18-Sep-20/O	302	300	30-500	OG
pH @25°C	pH Units		SM 4500H	18-Sep-20/O	7.80	7.78	6.5-8.5	OG
Conductivity @25°C	µmho/cm	1	SM 2510B	18-Sep-20/O	1000	841		
Colour	TCU	2	SM 2120C	21-Sep-20/O	< 2	< 2	5	AO
Turbidity	NTU	0.1	SM 2130	21-Sep-20/O	0.7	0.3	5	AO
Fluoride	mg/L	0.1	SM4110C	18-Sep-20/O	< 0.1	< 0.1	1.5	MAC
Chloride	mg/L	0.5	SM4110C	18-Sep-20/O	121	70.5	250	AO
Nitrite (N)	mg/L	0.1	SM4110C	18-Sep-20/O	< 0.1	< 0.1	1	MAC
Nitrate (N)	mg/L	0.1	SM4110C	18-Sep-20/O	3.1	2.4	10	MAC
Sulphate	mg/L	1	SM4110C	18-Sep-20/O	26	22	500	AO
Calcium	mg/L	0.02	SM 3120	21-Sep-20/O	95.5	90.8		
Magnesium	mg/L	0.02	SM 3120	21-Sep-20/O	31.5	31.9		
Sodium	mg/L	0.2	SM 3120	21-Sep-20/O	62.9	44.2	200,20	AO,MAC
Potassium	mg/L	0.1	SM 3120	21-Sep-20/O	2.3	2.0		
Iron	mg/L	0.005	SM 3120	21-Sep-20/O	0.017	< 0.005	0.3	AO
Manganese	mg/L	0.001	SM 3120	21-Sep-20/O	0.001	< 0.001	0.05	AO
Ammonia + Ammonium (N)	mg/L	0.01	SM4500-NH3-H	18-Sep-20/K	< 0.01	< 0.01		
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	21-Sep-20/K	0.2	0.1		
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	18-Sep-20/O	3.1	3.4	5	AO
Sulphide	mg/L	0.01	SM4500-S2	18-Sep-20/K	< 0.01	< 0.01	0.05	AO
Phenolics	mg/L	0.002	MOEE 3179	18-Sep-20/K	< 0.002	< 0.002		
Total Coliform	cfu/100mL	1	MOE E3407	17-Sep-20/O	1 [1]	0	0	MAC
E coli	cfu/100mL	1	MOE E3407	17-Sep-20/O	0	0	0	MAC
Heterotrophic Plate Count	cfu/mL	2	SM 9215C	17-Sep-20/O	72	16		
Tannins and Lignins	mg/L	0.5	SM5500B	22-Sep-20/K	< 0.5	< 0.5		
Anion Sum	meq/L		Calc.	22-Sep-20/O	10.2	8.61		

ODWS - Ontario Drinking Water Standards
AO - Aesthetic Objectives
IMAC - Interim Maximum Acceptable Concentration
MAC - Maximum Acceptable Concentration
OG - Operational Guidelines

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: DW100921 **REPORT No. B20-28470**

Report To:

Jp2g Consultants Inc
1150 Morrison Dr.,
Ottawa ON. K2H 8S9 Canada
Attention: Jennifer Farrell

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 17-Sep-20
DATE REPORTED: 25-Sep-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Spencerville Hydro 6
P.O. NUMBER: 20-6194
WATERWORKS NO.

			Client I.D.:		Unit #A-1	Unit #A-2	ODWS	
			Sample I.D.:		B20-28470-1	B20-28470-2	Objective	Type of Objective
			Date Collected:		17-Sep-20	17-Sep-20		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Cation Sum	meq/L		Calc.	22-Sep-20/O	10.2	9.13		
% Difference	%		Calc.	22-Sep-20/O	0.271	2.93		
Ion Ratio	AS/CS		Calc.	22-Sep-20/O	1.01	0.943		
Sodium Adsorption Ratio	-		Calc.	22-Sep-20/O	1.43	1.02		
TDS(ion sum calc.)	mg/L	1	Calc.	22-Sep-20/O	**534**	452	500	AO
Conductivity (calc.)	µmho/cm		Calc.	22-Sep-20/O	979	835		
TDS(calc.)/EC(actual)	-		Calc.	22-Sep-20/O	0.533	0.537		
EC(calc.)/EC(actual)	-		Calc.	22-Sep-20/O	0.976	0.993		
Langelier Index(25°C)	S.I.		Calc.	22-Sep-20/O	0.787	0.753		

1 BG > 200 cfu/100mL

ODWS - Ontario Drinking Water Standards
AO - Aesthetic Objectives
IMAC - Interim Maximum Acceptable Concentration
MAC - Maximum Acceptable Concentration
OG - Operational Guidelines

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

DRINKING WATER SUBMISSION FORM

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Sept 17.20
B20-28470

Indicate Laboratory or Depot Samples are Submitted to
☐ Kingston ☑ Ottawa ☐ Richmond Hill ☐ Windsor ☐ Barrie ☐ London

DRINKING WATER FACILITY CLASSIFICATION

☐ Municipal	☐ Non-Municipal	☐ Reg. 170/03
☐ Large	☐ Small	☐ Reg. 319/08
☑ Residential	☐ Non-Residential	☐ Reg. 243/07
☐ Seasonal	☐ Year-Round	☐ Private Drinking Water
☐ Other: _____		☐ Not in Service

REPORT NUMBER (Lab Use)

Organization: JP2S CONSULTANTS	Waterworks Address: 324 DAVID ST. SPENCERVILLE ON K0E 1X0	Invoicing Address (if different): 1150 MORRISON DR SUITE 410 OTTAWA ON K2H 8S9
Contact: JENNIFER FARRELL		
Tel: 613 8833770	Fax:	
After Hours Tel:	Public Health Unit:	Waterworks No.:
Email: Jennifer.f@jp2s.com	Quote No.: P200917-JF	Project Name/No.: 20-6194 Spenceville Hydro G P.O. No.:

ANALYSES REQUESTED

Microbiological			Chemical								Other		
Total Coliform / E.coli	Background	Heterotrophic Plate Count	Sodium	Lead	Fluoride	Trihalomethanes	HAA's	Nitrite, Nitrate as N	Sch. 23 Inorganics	Sch. 24 Organics	Item # 2		

TURNAROUND SERVICE REQUESTED (see back page)

☐ Platinum	200% Surcharge
☐ Gold	100% Surcharge
☐ Silver	50% Surcharge
☐ Bronze	25% Surcharge
☑ Standard	5-7 days
☐ Specific Date:	_____

* Sample Matrix Legend: TW = Treated Water, DW = Distribution Water, GW = Raw Groundwater, SW = Raw Surface Water, UGW = Untreated Groundwater (Drinking Water/Distribution)
GUDI = Groundwater under the influence of surface water, PR = Plumbing Residential, PNR = Plumbing Non-Residential

Lab No.	Sample Source and/or Sample Identification	S.P.L.	Sample Matrix *	Human Consumption (Y/N)	Date Collected (yy-mm-dd)	Time Collected	Adverse Resample	Indicate Test For Each Sample By Using A Check Mark In The Box Provided	Chlorine Free	Chlorine Total	# Bottles/ Sample
	UNIT # A-1		GW	YES	20-09-17	9:30 AM		/	∅	∅	8
	UNIT # A-2		GW	YES	20-09-17	2:00 pm		/	∅	∅	8

Has Lab Service Notification (LSN) Form been completed & submitted to the MECP/PHU? ☐ Yes ☐ No ☐ Not Applicable
Laboratory Analysis will not commence until all Notification information is received and the Submission form is appropriately completed

SAMPLE SUBMISSION INFORMATION

	Sampled by:	Submitted by:
Print:		JENNIFER FARRELL
Sign:		
	Date (yy-mm-dd)/Time:	Date (yy-mm-dd)/Time: 20-09-17

SHIPPING INFORMATION

Courier (Client account)	☐	Invoice	☐
Courier (Caduceon account)	☐		
Drop Off	☑	# of Pieces	1
Caduceon (Pick-up)	☐		

REPORTING / INVOICING

Report by Fax	☐
Report by Email	☑
Invoice by Email	☑
Invoice by Mail	☐

SAMPLE RECEIVING INFORMATION (LABORATORY USE ONLY)

Received By (print): Subhasha Signature:
Date Received (yy-mm-dd): 20/09/17 Time Received: 15:35 hrs
Laboratory Prepared Bottles: ☑ Yes ☐ No
Sample Temperature °C: 12-6C Labeled by:

Comments: PLEASE USE LOWEST POSSIBLE DETECTIONS
Pet, Phenol, Baby, NP, DOC, M, H_2S, Bact x2

Page 1 of 1
DW 100921

White: Lab Copy / Yellow: Invoicing Copy / Pink: Client Copy

CofC DW, Apr 2019 Revision No: 14

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: DW 100922 **REPORT No. B20-28561**

Report To:

Jp2g Consultants Inc
1150 Morrison Dr.,
Ottawa ON. K2H 8S9 Canada
Attention: Jennifer Farrell

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 18-Sep-20
DATE REPORTED: 24-Sep-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Spencerville Hydro 6
P.O. NUMBER: 20-6194
WATERWORKS NO.

			Client I.D.:		Unit #C-1	Unit #C-2	ODWS	
			Sample I.D.:		B20-28561-1	B20-28561-2	Objective	Type of Objective
			Date Collected:		18-Sep-20	18-Sep-20		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	22-Sep-20/O	**364**	**356**	80-100	OG
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	21-Sep-20/O	301	299	30-500	OG
pH @25°C	pH Units		SM 4500H	21-Sep-20/O	7.96	7.99	6.5-8.5	OG
Conductivity @25°C	µmho/cm	1	SM 2510B	21-Sep-20/O	899	827		
TDS(ion sum calc.)	mg/L	1	Calc.	23-Sep-20/O	490	449	500	AO
Colour	TCU	2	SM 2120C	21-Sep-20/O	< 2	< 2	5	AO
Turbidity	NTU	0.1	SM 2130	23-Sep-20/O	0.6	0.4	5	AO
Fluoride	mg/L	0.1	SM4110C	21-Sep-20/O	< 0.1	< 0.1	1.5	MAC
Chloride	mg/L	0.5	SM4110C	21-Sep-20/O	89.3	67.9	250	AO
Nitrite (N)	mg/L	0.1	SM4110C	21-Sep-20/O	< 0.1	< 0.1	1	MAC
Nitrate (N)	mg/L	0.1	SM4110C	21-Sep-20/O	2.6	2.2	10	MAC
Sulphate	mg/L	1	SM4110C	21-Sep-20/O	25	23	500	AO
Calcium	mg/L	0.02	SM 3120	22-Sep-20/O	93.3	90.4		
Magnesium	mg/L	0.02	SM 3120	22-Sep-20/O	31.7	31.6		
Sodium	mg/L	0.2	SM 3120	22-Sep-20/O	**55.8**	**44.4**	200,20	AO,MAC
Potassium	mg/L	0.1	SM 3120	22-Sep-20/O	2.4	2.2		
Iron	mg/L	0.005	SM 3120	22-Sep-20/O	0.008	< 0.005	0.3	AO
Manganese	mg/L	0.001	SM 3120	22-Sep-20/O	0.002	0.001	0.05	AO
Ammonia + Ammonium (N)	mg/L	0.01	SM4500-NH3-H	21-Sep-20/K	< 0.01	< 0.01		
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	23-Sep-20/K	0.1	0.1		
Phenolics	mg/L	0.002	MOEE 3179	23-Sep-20/K	< 0.002	< 0.002		
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	21-Sep-20/O	2.7	2.9	5	AO
Sulphide	mg/L	0.01	SM4500-S2	22-Sep-20/K	< 0.01	< 0.01	0.05	AO
Tannins and Lignins	mg/L	0.5	SM5500B	22-Sep-20/K	< 0.5	< 0.5		
Total Coliform	cfu/100mL	1	MOE E3407	19-Sep-20/O	**2**	0	0	MAC
E coli	cfu/100mL	1	MOE E3407	19-Sep-20/O	**2**	0	0	MAC
Heterotrophic Plate Count	cfu/mL	2	SM 9215C	19-Sep-20/O	44	22		

ODWS - Ontario Drinking Water Standards
AO - Aesthetic Objectives
IMAC - Interim Maximum Acceptable Concentration
MAC - Maximum Acceptable Concentration
OG - Operational Guidelines

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: DW 100922 **REPORT No. B20-28561**

Report To:

Jp2g Consultants Inc
1150 Morrison Dr.,
Ottawa ON. K2H 8S9 Canada
Attention: Jennifer Farrell

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 18-Sep-20
DATE REPORTED: 24-Sep-20
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Spencerville Hydro 6
P.O. NUMBER: 20-6194
WATERWORKS NO.

			Client I.D.:		Unit #C-1	Unit #C-2	ODWS	
			Sample I.D.:		B20-28561-1	B20-28561-2	Objective	Type of Objective
			Date Collected:		18-Sep-20	18-Sep-20		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Anion Sum	meq/L		Calc.	23-Sep-20/O	9.25	8.52		
Cation Sum	meq/L		Calc.	23-Sep-20/O	9.75	9.10		
% Difference	%		Calc.	23-Sep-20/O	2.63	3.25		
Ion Ratio	AS/CS		Calc.	23-Sep-20/O	0.949	0.937		
Sodium Adsorption Ratio	-		Calc.	23-Sep-20/O	1.27	1.02		
Conductivity (calc.)	µmho/cm		Calc.	23-Sep-20/O	902	829		
TDS(calc.)/EC(actual)	-		Calc.	23-Sep-20/O	0.545	0.542		
EC(calc.)/EC(actual)	-		Calc.	23-Sep-20/O	1.00	1.00		
Langelier Index(25°C)	S.I.		Calc.	23-Sep-20/O	0.947	0.959		

ODWS - Ontario Drinking Water Standards
AO - Aesthetic Objectives
IMAC - Interim Maximum Acceptable Concentration
MAC - Maximum Acceptable Concentration
OG - Operational Guidelines

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

DRINKING WATER SUBMISSION FORM

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Indicate Laboratory or Depot Samples are Submitted to
☐ Kingston ☑ Ottawa ☐ Richmond Hill ☐ Windsor ☐ Barrie ☐ London

DRINKING WATER FACILITY CLASSIFICATION

☐ Municipal	☐ Non-Municipal	☐ Reg. 170/03
☐ Large	☐ Small	☐ Reg. 319/08
☑ Residential	☐ Non-Residential	☐ Reg. 243/07
☐ Seasonal	☐ Year-Round	☐ Private Drinking Water
☐ Other: _____		☐ Not in Service

REPORT NUMBER (Lab Use) Sept. 18.19
B20-28561

Organization: JP26 CONSULTANTS	Waterworks Address: 32 DAVID ST SPENCERVILLE ON K0E 1X0	Invoicing Address (if different): 1150 MORRISON DR SUITE 410 OTTAWA ON K2N 8S9
Contact: JENNIFER FARRELL		
Tel: 613 883 3770	Fax:	
After Hours Tel:	Public Health Unit:	Waterworks No.:
Email: jennifer@jp2g.com	Quote No.: P200917-JF	Project Name/No.: 20-6194 Spenceville Hydro P.O. No.:

ANALYSES REQUESTED

Microbiological			Chemical								Other		
Total Coliform / E.coli	Background	Heterotrophic Plate Count	Sodium	Lead	Fluoride	Trihalomethanes	HAA's	Nitrite, Nitrate as N	Sch. 23 Inorganics	Sch. 24 Organics	NEW #2		

TURNAROUND SERVICE REQUESTED (see back page)

☐ Platinum	200% Surcharge
☐ Gold	100% Surcharge
☐ Silver	50% Surcharge
☐ Bronze	25% Surcharge
☑ Standard	5-7 days
☐ Specific Date:	_____

* Sample Matrix Legend: TW = Treated Water, DW = Distribution Water, GW = Raw Groundwater, SW = Raw Surface Water, UGW = Untreated Groundwater (Drinking Water/Distribution)
GUDI = Groundwater under the influence of surface water, PR = Plumbing Residential, PNR = Plumbing Non-Residential

Lab No.	Sample Source and/or Sample Identification	S.P.L.	Sample Matrix *	Human Consumption (Y/N)	Date Collected (yy-mm-dd)	Time Collected	Adverse Resample	Indicate Test For Each Sample By Using A Check Mark In The Box Provided	Chlorine Free	Chlorine Total	# Bottles/ Sample
	UNIT # C-1		GW	YES	20-09-18	8:00 AM		✓	ø	ø	8
	UNIT # C-2		GW	YES	20-09-18	~~8:30~~ 12:30 pm		✓	ø	ø	8

Has Lab Service Notification (LSN) Form been completed & submitted to the MECP/PHU? ☐ Yes ☐ No ☒ Not Applicable
Laboratory Analysis will not commence until all Notification information is received and the Submission form is appropriately completed

SAMPLE SUBMISSION INFORMATION

	Sampled by:	Submitted by:
Print:		JENNIFER FARRELL
Sign:		
Date (yy-mm-dd)/Time:		20-09-18

SHIPPING INFORMATION

		Invoice
Courier (Client account)	☐	☐
Courier (Caduceon account)	☐	
Drop Off	☑	# of Pieces: 1
Caduceon (Pick-up)	☐	

REPORTING / INVOICING

Report by Fax	☐
Report by Email	☑
Invoice by Email	☑
Invoice by Mail	☐

SAMPLE RECEIVING INFORMATION (LABORATORY USE ONLY)

Received By (print): Subhasha Signature:
Date Received (yy-mm-dd): 20/09/18 Time Received: 15:35 hrs
Laboratory Prepared Bottles: ☐ Yes ☐ No
Sample Temperature °C: 10.4°C Labeled by:

Comments: PLEASE USE LOWEST POSSIBLE DETECTIONS
pet, NP, M, H_2S, Baby, DOC, phenol, Bact x 2

Page 1 of 1
DW 100922

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QUOTATION FOR ANALYTICAL SERVICES

Quote # :	**P200917_JF**
Organization:	**JP2G Consultants**
Contact:	Jennifer Farrell
Telephone:	613.828.7800 ext 215
Mobile:	613.883.3770
Email:	jenniferf@jp2g.com
Project #:	20-6194A Spencerville Hydrog
Address:	1150 Morrison Drive, Suite 410, Ottawa, K2H 8S9
Additional Info:	**QUOTE NUMBER MUST BE ON COC OR GENERAL PRICING WILL APPLY**
Additional Info:	
Date:	17-Sep-20 **Valid Until:** 31-Dec-20

Item #	Quantity	Analysis Request	Matrix
2	5	**Subdivision Package** (Alkalinity, Bacteria (TC, EC, HPC), Colour, Sulfide, Conductivity, pH, Hardness, Flouride, Chloride, Nitrate, Nitrite, Sulphate, Ammonia, TKN, DOC, Phenols, Iron, Manganese, Sodium, Magnesium, Potassium, Calcium, Tannins & Lignins, TDS, Tubidity)	DW

Prices do not include shipping unless otherwise stated.

Environmental Surcharge of $1.50 per sample set

[redacted]

All submissions must have a completed C-o-C form indicating report recipient name and address, invoicng information (if different from recipient), P.O. Number &/or Project Number, **Caduceon Quotation Number,** and analysis requested, or **General pricing will be applied.** Caduceon is a member of the Canadian Association for Laboratory Accreditation (CALA) and participates in the proficiency testing program for a list of parameters registered with the association. The laboratory is accredited for specific tests by CALA and was found to comply with the requirements of ISO/IEC Guide 17025. See Scope of Accreditation for list of tests. This quote is intended for the addressee(s) show on this form only, and may contain information which is confidential and privileged, any disclosure, copying, distribution or use of the contents of this quote without the consent of **Caduceon Environmental Laboratories** is prohibited.

Kristine Cavanagh
Customer Service Representative
Caduceon Environmental Laboratories
kcavanagh@caduceonlabs.com
Cell: 819-230-9605
Office 613-526-0123

eurofins | Environment Testing

Certificate of Analysis

Client: Splash Well Drilling
Box 1083
Prescott, ON
K0E 1T0
Attention: Mr. Todd Ferguson
PO#:
Invoice to: Splash Well Drilling

Report Number: 1938619
Date Submitted: 2020-09-11
Date Reported: 2020-09-12
Project: Madison Mulder
COC #: 102351

Dear Todd Ferguson:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

APPROVAL: Steven Tosh 2020.09.12 16:11:54 -04'00'

Steven Tosh, Operations Manager

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: http://www.cala.ca/scopes/2602.pdf.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is licensed by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) for specific tests in drinking water (license #2318). A copy of the license is available upon request.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

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Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1516255 Water 2020-09-11 32 David Street Unit A	1516256 Water 2020-09-11 32 David Street Unit D
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0		0	0
	Total Coliforms	0	ct/100mL	MAC 0		0	0

Guideline = ODWSOG *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Analytical Method: AMBCOLM1
additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

APPENDIX E

WATER QUALITY RESULTS

Table E-1 Lab Results

Parameter	Units	ODWS		Unit A***	Unit D***	Unit A	Unit A	Unit C	Unit C
		Type of Objective	Objective	September 11, 2020		Early Sample	Late Sample	Early Sample	Late Sample
						September 17, 2020		September 18, 2020	
Hardness (as CaCO3)	mg/L	OG	80 - 100, 500*			368	358	364	356
Alkalinity(CaCO3) to pH4.5	mg/L	OG	30 - 500			302	300	301	299
pH @25°C	pH Units	OG	6.5 - 8.5			7.80	7.78	7.96	7.99
Conductivity @25°C	µmho/cm					1000	841	899	827
TDS(ion sum calc.)	mg/L	AO	500			534	452	490	449
Colour	TCU	AO	5			<2	<2	< 2	< 2
Turbidity	NTU	AO	5			0.7	0.3	0.6	0.4
Fluoride	mg/L	MAC	1.5			<0.1	<0.1	< 0.1	< 0.1
Chloride	mg/L	AO	250			121	70.5	89.3	67.9
Nitrite (N)	mg/L	MAC	1			<0.1	<0.1	< 0.1	< 0.1
Nitrate (N)	mg/L	MAC	10			3.1	2.4	2.6	2.2
Sulphate	mg/L	AO	500			26	22	25	23
Calcium	mg/L					95.5	90.8	93.3	90.4
Magnesium	mg/L					31.5	31.9	31.7	31.6
Sodium	mg/L	AO, MAC**	200, 20			62.9	44.2	55.8	44.4
Potassium	mg/L					2.3	2	2.4	2.2
Iron	mg/L	AO	0.3			0.017	<0.005	0.008	< 0.005
Manganese	mg/L	AO	0.05			0.001	<0.001	0.002	0.001
Ammonia + Ammonium (N)	mg/L					<0.01	<0.01	< 0.01	< 0.01
Total Kjeldahl Nitrogen	mg/L					0.2	0.1	0.1	0.1
Phenolics	mg/L					<0.002	<0.002	< 0.002	< 0.002
Dissolved Organic Carbon	mg/L	AO	5			3.1	3.4	2.7	2.9
Sulphide	mg/L	AO	0.05			<0.01	<0.01	< 0.01	< 0.01
Tannins and Lignins	mg/L					<0.5	<0.5	< 0.5	< 0.5
Total Coliform	cfu/100mL	MAC	0	0	0	1	0	2	0
E coli	cfu/100mL	MAC	0	0	0	0	0	2	0
Heterotrophic Plate Count	cfu/mL					72	16	44	22
Langelier Index(25°C)	S.I.					0.787	0.753	0.947	0.959

ODWS *Ontario Drinking Water Standards*

AO *Aesthetic Objective*

OG *Operational Guideline*

MAC *Maximum Acceptable Concentration*

IMAC *Interim Maximum Acceptable Concentration*

* *Ontario Drinking Water Objectives*

** *The health-related limit is a "warning level" only. Exceedance calls for a recommendation that the local Medical Officer of Health be notified in order to alert persons with relevant medical conditions. Sodium also has an Aesthetic Objective of 200 mg/L*

*** *Collected by well driller, methodology unknown*

Table E-2 Field Parameters

Parameter	Units	ODWS		Unit A Early Sample	Unit A Late Sample	Unit C Early Sample	Unit C Late Sample
		Type of Objective	Objective	September 17, 2020		September 18, 2020	
Turbidity	NTU	AO	5	1.58	0.88	2.18	1.71
Colour	TCU	AO	5	Nil	Nil	Nil	Nil
Chlorine Free/Total	mg/L			Nil	Nil	Nil	Nil
Temperatute	^{o}C	AO	15	14.3	14.7	10.4	8
pH @25°C	pH Units	OG	6.5 - 8.5	7.10	7.1	7.7	7.1
Conductivity @25°C	µmho/cm			949	804	864	922

ODWS *Ontario Drinking Water Standards*

AO *Aesthetic Objective*

OG *Operational Guideline*

APPENDIX F

ONTARIO WELL MAINTENANCE CHECKLIST

Well Maintenance Checklist Items	✓
Confirmation of where each well is located and its accessibility. This can be done by comparing the Universal Transverse Mercator (UTM) co-ordinates and well tag (or other unique identifier) to the well record.	
Annual or more frequent visual inspection in and around the well. Appropriate time to inspect a well is shortly after the snow melt or a heavy rain storm. If a well record is available, compare the construction details, water levels and water quality information (e.g., odour, and colour) on the record when inspecting the well.	
Verification that the well is not allowing the entry of contaminants or surface water by:	
Ensuring the well cap or cover is securely in place. The well cap should be removed and the person inspecting the well should look for signs of moisture, spiders, spider webs, insects and other foreign materials attached to the inside of the well cap. If the well cap or cover is damaged or cracked, or allows foreign materials including insects to enter the well, it must be replaced with a vermin-proof cap or watertight well cover immediately.	
Ensuring the well cap or cover can withstand the weight of persons, animals and vehicles.	
Looking at the air vent for cracks or holes. The person inspecting the well should ensure that the screen is shielded to prevent the entry of insects and other foreign materials into the well.	
Looking for signs of corrosion or deterioration, cracks, holes or gaps on the casing. This could include moisture or water seepage, rust (iron) stains or black (manganese) stains at or below joints, waterline inlets, holes or cracks on the inside of the well casing. All holes, cracks and joints must be sealed or the deteriorated casing must be replaced.	
Looking and listening for signs of surface water seeping or cascading down into the well along the well casing or just below the well casing.	
Looking for pooling of water around the well. The ground surface needs to be appropriately sloped to prevent surface water from pooling around the wellhead.	
Measuring water levels before and after a significant rainfall event with the pump shut off, if present. Rapid or large changes in the well water level could suggest surface water runoff is entering directly through the well's structure.	
Looking for any ground settling around the outside of the well casing. This could mean the annular seal is compromised allowing surface water to seep into the well.	
Ensuring any spaces outside the casing and around waterlines and other equipment are properly sealed with a suitable sealant, such as a bentonite slurry or other material as needed. All damage to the	

Well Maintenance Checklist Items	✓
sealant from settlement or erosion must be repaired if surface water or foreign materials can enter the well.	
Looking for and removing any debris floating in the well. Debris floating on the surface of the well water (e.g., plant matter, insects, rodents) indicates that foreign material is entering the well through the casing, or the well cap or cover. This may mean that replacing the well cap or cover is required. In certain circumstances it may also be advisable to disinfect the well.	
Identification and correction of any of the following situations that might result in contamination:	
Newly constructed ditches, swales or other construction activities that may direct surface water toward the well.	
Downspout and underground storm water pipe discharge directed toward, near or into the well.	
Refuse, manure, pesticides, fertilizers, petroleum products, salt, paint, animal waste or any other potential contaminants stored, used or disposed of near the well after the well has been constructed.	
Equipment located near the well.	
Vehicles such as cars, trucks, trailers, boats, snowplows, snowmobiles parked or stored near the well or in some cases driving near or over the well.	
Trees around the wellhead as the roots can compromise the annular seal protecting the well.	
Verification that the top of the well is accessible for future repair.	
Identification of changes in the appearance (aesthetic) or physical quality of the water, such as colour, odour, turbidity, amount of sand/silt content or particle counts, or chemical indicators, especially after a rainstorm or snow melt.	
Identification of signs of wear on equipment installed in the well, including any pumps, lines, electrical cables and associated equipment.	
Verification of the pump and the well efficiency. If the pump is continually running or losing pressure, it may be a sign of a crack or hole in the waterlines. In other cases, iron bacteria and mineral encrustation can clog pump intakes, well screens and water intake zones and reduce water yields. Changes in water quality combined with a decrease in efficiency may indicate that maintenance is required.	