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Hydrogeological Investigation & Terrain Analysis
Proposed Lot Line Adjustment
106 & 122 Reis Road
Ottawa (Carp), Ontario

October 3, 2023 File: 100165.024

1694027 Ontario Inc.
106 Reis Road
Carp, Ontario
K0A 1L0

Attention: Arthur Goveas

Re: Hydrogeological Investigation and Terrain Analysis
Proposed I Lot Line Adjustment
106 and 122 Reis Road, Ottawa (Carp), Ontario

This letter presents the results of a scoped hydrogeological investigation and terrain analysis carried out as part of a proposed commercial lot line adjustment at 106 and 122 Reis Road, Ottawa (Carp), Ontario.

1.0 INTRODUCTION

Based on pre-consultations with the City of Ottawa (email received by Tracy Zander on October 4, 2022) and technical consultations held on February 22 and June 22, 2023, a scoped hydrogeological investigation is required for the proposed lot-line adjustment of 106 and 122 Reis Road.

The property at 122 Reis Road is approximately 0.85 hectares in size, while the property at 106 Reis Road is approximately 0.99 hectares in size. The proposed lot line adjustment involves removing a 0.28-hectare parcel of the land from 122 Reis Road and adding it to the 106 Reis Road lot (refer to Figure 1 in Appendix A). The adjusted lot size after the proposed lot line adjustment would be approximately 0.57 hectares for 122 Reis Road, and 1.26 hectares for 106 Reis Road.

The “Site”, referring to lots 106 and 122 Reis Road, is bounded to the south by Reis Road, Carp Road to the west, vacant rural commercial/industrial lots to the north and a commercial/industrial lot to the east (Figure 1).

The objective of the investigation presented herein is:

- To demonstrate that the quality of the well water meets the Ontario Drinking Water Standards and maximum treatable limits prescribed in Ontario Ministry of Environment, Conservation and Parks (MECP) Procedure D-5-5;
- To demonstrate that the quantity of water meets the MECP requirements; and,
- To demonstrate the septic impact assessment meets the City of Ottawa Carp Road Corridor Nitrate Impact Assessment Recommendations and MECP D-5-4 requirements.

2.0 BACKGROUND

2.1 Background Report Review

The Site is located within the Carp Road Corridor, which is an industrial business park that is located along a segment of Carp Road between March Road and Rothbourne Road in Ottawa (Carp), Ontario.

A number of background reports related to the Carp Road Corridor were reviewed as part of the investigation, including: “Carp Road Corridor – Nitrate Impact Assessment Recommendations” dated September 27, 2016. The document provides additional guidance for the application of MECP guideline D-5-4 within the Carp Road Corridor. Within the Carp Road Corridor, nitrogen reduction treatment systems can be incorporated into the nitrate impact assessment. Additionally, of the septic demand can be estimated by the number of users at 75 litres per day per user.

2.2 Technical Consultations

Technical consultations were held between GEMTEC and the City of Ottawa on February 22 and June 22, 2023. A summary of the meetings is found below:

- Water Quantity and Quantity Assessment
    - It is understood that a new well was drilled (June 2022) to supply the existing development at 122 Reis Road, and that the new well is connected to the development and is in use. Due to the site-specific situation, revised water quantity and quality testing requirements are as follows:
        - Report must include water quantity assessment based on driller’s pump test on MECP water well record, nearby technically representative well driller pump tests (if available), and a description of existing water use with statement and professional opinion that water quantity has been sufficient for the development.
        - Water quality testing is required, which includes subdivision package parameters, trace metals, and volatile organic compounds (VOCs).
- Nitrate Impact Assessment
    - Both developments on 122 and 106 Reis Road have existing conventional septic systems. A septic impact assessment is required on both lots to confirm sufficient nitrate dilution and protection of the supply aquifer; issues may be expected due to the high percentage of impermeable surface.
    - Since the site lies within the Carp Road Corridor, the nitrate impact assessment calculation can be completed based on the City memo entitled: Carp Road Corridor -Nitrate Impact Assessment Recommendations, dated September 2016.
        - Advanced treatment septic systems can be considered.
        - The maximum allowable septic flow calculation can use the reasonable maximum number of employees as the septic flow in the nitrate dilution

calculation, rather than the existing septic size. Each employee's assumed usage is 75 litres per day.

3.0 TERRAIN ANALYSIS

3.1 Site Features, Topography, Drainage and Potential Sources of Contamination

The Site consists of industrial properties with two existing structures that are currently being operated as stone working business, both which have existing domestic wells and conventional septic beds. The majority of the Site consists of cleared lands and gravel parking/storage areas, with a drainage easement running along the northern portion of the Site.

The Site is located within the Carp River Subwatershed of the Mississippi River Watershed.

Topographic mapping data indicates that elevations across the property is generally flat, and ranges from approximately 113 to 115 metres above sea level. The Site is expected to be graded to the southeast, towards Reis Road. Regional topography indicates a down sloping in elevation towards the northeast, in the direction of the Ottawa River. The Mississippi-Rideau Source Protection Area Report (MVRVCA, 2011), indicates groundwater table elevations decrease towards the Ottawa River to the northeast. Shallow groundwater flow directions are expected to follow local topography and grading, and therefore flow towards the southeast.

Potential sources of contamination on the Site, and within 500 metres of the Site include activities related to industrial operations within the 'commercial/industrial subdivision', private septic systems, and historical agricultural activities.

3.2 Surficial Geology

Surficial geology maps of the Ottawa area (Ontario Geologic Survey, 2010) indicate that the Site is underlain by coarse-textured glaciomarine deposits consisting of sand, gravel, and minor silt and clay. Bedrock geology maps (Armstrong and Dodge, 2007) indicate that bedrock is comprised of interbedded limestone and shale of the Verulam Formation at depths ranging between 3 and 10 metres. Available karst mapping (Brunton and Dodge, 2008) indicate the presence of potential karst, located approximately 400 meters south of the Site, which is associated with limestones of the Bobcaygeon Formation.

3.3 Water Well Records Review

A search of the Ministry of Environment, Conservation and Parks (MECP) water well records database indicated that 66 well records were available within approximately 500 meters of the Site. Of the records, 31 are domestic water supply wells, 11 are monitoring wells, 9 are not used, 8 are for commercial use, 6 are test holes, and the well use is not reported for 1 well. A summary for the well records within 500 meters of the site is included in Appendix B, and the locations of the water wells are displayed in Figure 1.

A review of the water well records withing 500 meters was performed. Records indicated that water well depths range between 5.9 and 85.6 meters below ground surface (10th and 90th percentile, m bgs), with and average depth of 43 m bgs. The depth to bedrock ranges from 2.7 to 13.9 m bgs (10th and 90th percentile), with an average value of 8.9 m bgs. The casing lengths range from 3.0 to 16.5 m bgs (10th and 90th percentile), with and average value of 10.6 meters

Well records indicated that the surrounding overburden is composed mostly of sand, clay, and gravel with traces loam and silt. The bedrock encountered by the wells is primarily limestone and dolostone, with some shale.

4.0 GROUNDWATER SUPPLY

A groundwater supply investigation was carried out in general accordance with MECP Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment, and consultation meetings held with City of Ottawa hydrogeologists on February 22 and June 22, 2023, to determine the quantity and quality of groundwater available for commercial water supply. The results of the groundwater supply investigation are summarized in the following sections.

4.1 Groundwater Quantity

An existing water supply well, PW-122, located at 122 Reis Road lot was used to evaluate water quantity on the Site (MECP ID: A320528). The well construction details at summarized in Table 1 below, and the MECP water well record is found in Appendix C. The location of PW-122 is displayed in Figure 2. Information related to other existing water supply wells on the Site is displayed in Table 1, and the well locations are displayed in Figure 2.

Table 1: Water Well Construction Details

Well Construction Details	PW-122 (A320528)	PW-122 – Old Well (1532401)	PW 106 (A055265)
Depth to Bedrock	7.01 metres	7.16 metres	8.84 metres
Length of Well Casing Above Ground Surface	0.66 metres	-	0.48 metres
Length of Well Casing Below Ground Surface	7.62 metres	7.62 metres	10.67 metres
Depth Water Found (i.e. depth to major fractures observed, m bgs)	6.40, 11.6, 48.8 metres	7.62, 13.7 metres	69.16 metres

Well Construction Details	PW-122 (A320528)	PW-122 – Old Well (1532401)	PW 106 (A055265)
Total Well Depth	49.7 metres	15.24 metres	73.15 metres
Bedrock Description	Limestone	Limestone	Limestone

Notes: Following lot-line adjustment, PW-122 (old well) will be on the 106 Reis Road property. It is understood that the owner of 106 Reis Road may use the well for irrigation purposes. If the well will not be used, it is recommended that it be abandoned by a licensed well technician in accordance with O.Reg 903.

The groundwater quantity requirements for each property were estimated based on septic requirements, being 75 litres per day per employee. It is understood that 106 and 122 Reis Road currently have 12 and 9 employees respectively. Assuming the water demand is equal to two times the septic demand (no other reported water consumption for either property), the daily water quantity for 106 and 122 Reis Road is 1,800 and 1,350 litres per day respectively.

PW-106 is currently servicing the development at 106 Reis Road, and based on an interview with the property owner, the water quantity is sufficient to support the needs of the 12 employees at the property.

It is understood that PW-122 is currently servicing the development at 122 Reis Road, and that the water quantity has been sufficient since connection in June 2022 (interview completed with owner). To further assess water quantity requirements for 122 Reis Road, the adjusted specific capacity and well yield were calculated for PW-122 (refer to Appendix D) based on the 1-hour well yield test from the well record. The methodology developed in Risser et al, 2010 was used to calculate these water quantity parameters. The adjusted specific capacity of PW-122 was calculated to be 1.16 L/min/m, and the well yield was calculated to be 68.25 L/min. Based on the well yield of 68.25 L/min, the maximum daily well production considering an 8-hour day would be 32,760 litres per day (68.25 L/min x 60 mins/hr x 8 hrs).

Given the analyses presented above, it is our professional opinion that the water supply aquifer is capable of providing sufficient water quantity for typical commercial developments in the area (i.e., water demands two times the anticipated septic flows).

4.2 Groundwater Quality

Based on the technical consultations held between GEMTEC and the City of Ottawa on February 22 and June 22, 2023, it is understood that a water quality assessment of the new well connected to the development at 122 Reis Road (PW-122) is sufficient for this investigation. The water quality of the existing well servicing 106 Reis Road was not tested, but an interview with the property

owner was conducted. The owner reported that the water quality of the well servicing 106 Reis Road is good, and that there is a sulfur smell in the water pre-treatment. The drinking water does not have a sulfur smell post-treatment.

The groundwater samples were collected from the pressure tank bypass at 122 Reis Road, after running the tap for a minimum of 10 minutes. Water quality samples were submitted for laboratory analysis of septic indicator parameters on November 23, 2023, and 'subdivision package' parameters, trace metals, and volatile organic compounds (VOCs) on June 28, 2023. The field and laboratory water quality results are provided in Appendix D.

Total chlorine tests were conducted in the field during all sampling events using a Hach DR 900 colorimeter to ensure that chlorine levels were at non-detectable concentrations prior to bacteriological testing. The temperature, conductivity, total dissolved solids, pH, turbidity, colour and free chlorine levels of the groundwater were measured and are summarized in Appendix D. The field equipment used during the sampling is calibrated by GEMTEC and the details of field equipment are provided in Table 3.

Table 3: Field Equipment Overview

Field Parameters	Manufacturer	Model No.	Detection Limit
Total and Free Chlorine	Hach	DR 900	0.02 mg/L
pH, temperature, Conductivity	Hanna	HI 98129	-
Turbidity	Hanna	HI 98703	0.05 NTU
Colour	Hach	DR 900	5 TCU

Notes:
1. Hach DR900: colour and chlorine zeroed using distilled water prior to measuring field parameters.
2. Hanna HI 98129 calibration check using 4.0, 7.0 and 10.0 pH solutions (within 5%).
3. Hanna HI98703 calibration check using <0.10, 15.0, 100 NTU (within 5%).

The laboratory certificates of analysis and summary of laboratory results are provided in Appendix D. The following comments are provided regarding the drinking water quality and exceedances of the ODWQS:

4.2.1 Bacteriological Results

Total and free chlorine were measured at the time of bacteriological sampling confirmed that total chlorine concentrations in the groundwater were non-detectable.

The results of the bacteriological analysis for PW-122 on June 23, 2023 indicated non-detectable concentrations of indicator species E.coli, fecal coliforms and total coliforms.

Based on the bacteriological testing, the water is suitable for consumption.

4.2.2 Chemical Results

The results of the chemical testing on the water samples indicate the operational guideline for hardness, and the aesthetic objectives for sulphide, iron, manganese, chloride, turbidity, total dissolved solids and colour were exceeded in the water samples. No health-related exceedances were reported.

The above noted exceedances of PW-122 from the samples collected on June 28, 2023 (and November 23, 2022, when mentioned) are discussed in the follow sections:

Hardness

The hardness concentration was reported to be 487 mg/L and 432 mg/L as $CaCO_3$ on November 23, 2022 and June 238, 2023 respectively, which exceeds the ODWQS operational guideline for hardness between 80-100 mg/L. Water having a hardness above 100 milligrams per litre as $CaCO_3$ is often softened for domestic use. Water softeners are widely used throughout rural areas to treat hardness and there is no upper treatable limit for hardness. The ODQWS indicates that hardness levels exceeding 200 mg/L as $CaCO_3$ is considered poor but tolerable and hardness levels exceeding 500 mg/L as $CaCO_3$ is considered to be unacceptable for most domestic purposes.

Water softening by conventional sodium ion exchange water softeners that use sodium chloride may introduce relatively high concentrations of sodium into the drinking water, which may be of concern to persons on a sodium restricted diet. The use of potassium chloride in the water softener (which adds potassium to the water instead of sodium) could be considered as a means of keeping sodium concentrations in softened water at the background level. Alternatively, consideration could be given to providing a cold-water bypass water line for drinking water purposes that is not treated by a water softener.

Sulfide

The sulphide concentration was reported to be 0.27 mg/L, which exceeds the ODQWQS odour-related aesthetic objective of 0.05 mg/L as hydrogen sulphide. Sulphide can be related to an unpleasant odour and taste, and can produce black stains on laundered items, pipes and fixtures. Although ingestion of large quantities of hydrogen sulphide can produce toxic effects on humans, it is not likely that an individual would ingest a harmful dose in drinking water because of the taste and odour.

Low levels of sulphide can be removed effectively using aeration (oxidation with filtration) or chlorinating the water followed by sand or multimedia filtration. According to the MECP Procedures D-5-5: Private Wells: Water Supply Assessment, there is no maximum treatable limit for sulphide.

Iron

The iron concentration was reported to be 1.2 mg/L, which exceeds the ODWQS aesthetic objective of 0.3 mg/L. Elevated levels of iron may cause staining to plumbing fixtures and laundry. However, the iron levels are below the maximum treatable limits of 10.0 mg/L provided in Table 3 of the MECP Guideline D-5-5. Water softeners and/or manganese greensand filters are recommended for iron treatment in Table 3 of the MECP Guideline for concentrations less than 5.0 mg/L.

Manganese

The manganese concentration was reported to be 0.134 mg/L, which exceeds the ODWQS aesthetic objective of 0.05 mg/L, and the Health Canada (2019) maximum acceptable concentration of 0.12 mg/L. Elevated concentrations of manganese may cause staining to plumbing fixtures and laundry, and at higher concentrations, may have neurological effects in children.

The manganese levels are within the maximum treatable limits of 10.0 mg/L provided in Table 3 of the MECP Guideline D-5-5. Water softeners and/or manganese greensand filters are recommended for manganese treatment in Table 3 of the MECP Guideline for concentrations less than 1.0 mg/L.

Chloride

The chloride concentration was reported to be 326 mg/L and 313 mg/L on November 23, 2022 and June 28, 2023 respectively, which exceeds the ODWQS aesthetic objective and maximum concentration considered to be reasonably treatable (MCCRT) of 250 mg/L. Chloride levels above 250 mg/L produces a detectable salty taste. The source of elevated chloride was not determined; chloride is naturally occurring, generally in the form of sodium, potassium and calcium salts and can also be the result of road salt or softener softs.

Turbidity

The turbidity was reported to be 11.5 NTU, which exceeds the ODWQS aesthetic guideline of 5 NTU. Turbidity is impacted by various factors that the sample is subjected to from the time of sampling to time of analysis (e.g precipitation of metals, change in temperature, exposure to oxygen). Field measurements for turbidity are therefore considered more representative of in-situ water conditions than laboratory analysis, in which turbidity was measured to be 4.04 NTU. Given the high iron concentrations of 1.2 mg/L, it is our professional opinion that the high laboratory turbidity was the result of iron precipitation.

Total Dissolved Solids

Total dissolved solids was reported to be 948 mg/L, which exceeds the ODWQS aesthetic objective of 500 mg/L. Total dissolved solids refer to inorganic substances such as chloride, sulphates, calcium, magnesium, and bicarbonates that are dissolved in water.

Elevated levels of TDS can lead to problems associated with encrustation and corrosion. To determine the corrosive nature of the groundwater, the Langelier Saturation Index (LSI) was calculated for the samples obtained from the well. These values are based on the TDS, field measured temperature, pH, alkalinity, and calcium observed in the sample. The LSI was calculated to be 0.44, indicating that the water is slightly scale forming but noncorrosive. The LSI calculations are displayed in Appendix E.

Colour

True colour (filtered) was reported to be 9 TCU, which exceeds the ODWQS aesthetic objective of 5 true colour units (TCU). Water can have a faint yellow/brown colour, which is often caused by iron and manganese compounds originating in natural sediments or aquifers.

The apparent colour (unfiltered) field measurements during sampling were reported to be 10 TCU, where as the lab reported apparent colour was reported to be 72, suggesting an increase in colour between the time of sampling and laboratory analysis. Samples are subjected to various factors between time of sampling and laboratory analysis (e.g. change in temperature, exposure to atmospheric oxygen partial pressure), which can cause metals such as iron and manganese to precipitate out of solution.

As such, in-situ water colour is expected to be much lower than reported by the laboratory analysis. In addition, iron and manganese treatment is expected to greatly reduce water colour. Water softeners and/or manganese greensand filters are recommended for iron and manganese treatment in Table 3 of the MECP Guideline.

5.0 GROUNDWATER IMPACTS

The impact on groundwater resources due to wastewater treatment and disposal by the existing onsite sewage disposal system and development on the Site is assessed in the following sections.

5.1 Hydrogeological Sensitivity

Areas of thin soils cover, highly permeable soils, and fractured bedrock exposed at ground surface can contribute to hydrogeological sensitivity, which may not allow for sufficient attenuative processes for on-site septic systems and negatively impact the receiving aquifer. Areas of thin soil cover, generally taken to be less than two metres, or highly permeable soils were not encountered at the Site.

Based on the three Site water well records, the overburden thickness ranges from approximately 7.01 to 8.84 metres. The water well records indicate the site is underlain by coarse grained soils consisting of sands and gravels, which is consistent with geologic mapping indicating coarse-textured glaciomarine deposits consisting of sand, gravel, and minor silt and clay. Given the presence of highly permeable soils, the Site may be hydrogeologically sensitive and protective measures should be considered.

5.2 D-5-4 Three-Step Assessment

The potential risk to groundwater resources on and off the Site was assessed in accordance with Ministry of Environment Procedure D-5-4: Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment. To evaluate the groundwater impacts, Step Three of the Three-Step Assessment Process outlined in MECP Procedure D-5-4 was followed.

5.2.1 Nitrate Dilution Calculations for Commercial / Industrial Developments

Where it cannot be demonstrated that the effluent is hydrogeologically isolated from the water supply aquifer, the risk of individual on-site septic systems will be assessed using nitrate-nitrogen contaminant loading for commercial/industrial properties. The maximum allowable concentration of nitrate in the groundwater at the boundaries of the subject property is 10 milligrams per litre as per the Ministry of the Environment, Conservation and Parks guideline D-5-4, dated August 1996.

The nitrate concentration at the Site s was calculated using the following information:

- Lot area:
  - 106 Reis Road (current): 9,884 m^2;
  - 122 Reis Road (current): 8,525 m^2;
  - 106 Reis Road (proposed – lot addition): 12,736 m^2;
  - 122 Reis Road (proposed – lot removal): 5,673 m^2;
- Infiltration factors and water holding capacity of soils (WHC) based on information obtained from Table 3.1 of the Ministry of Environment Stormwater Management Planning and Design Manual, dated March 2003;
- Hard surface coverage of the Site was established based on a detailed survey completed.
- Soil Factor of 0.4, which represents open sandy loam;
- Cover Factor of 0.1 for cultivated land;
- Topography Factor of 0.2, representative of rolling land with an average slope of 2.8 to 3.8 m/km;
- Non-detectable background nitrate concentrations;
- Water holding capacity: 75 mm for urban lawns / shallow rooted crops, fine sandy loam soil;
- An annual water surplus of 0.383 metres/year for soils with a water holding capacity of 75 mm;

- Carleton + Appleton Weather Station (1939-2020). Water surplus datasheet provided in Appendix F;

- The use of advanced treatment systems in the construction of the septic systems at the industrial lot, capable of reducing the concentration of nitrate in the effluent exiting the treatment unit to a maximum of 20 mg/L (this concentration value was utilized when re-simplifying the formula provided in D-5-4 for the purpose of determining the factor used to determine the maximum allowable flow for each lot from the determined available infiltration volume. The factor becomes 1 versus 3 as is the case without advanced treatment).

The available infiltration will be dependant upon the hard surface areas, and as a result, will determine the maximum allowable septic flows. A series of maximum allowable septic flows calculations are presented based on the current hard surface (Table 4) and the proposed hard surface areas (Table 5).

Table 4: Calculated Maximum Septic Flows – Existing Conditions

	Maximum allowable septic flow		Maximum Number of Users[2]	
Hard Surface Area (%)	Conventional Septic	Advanced Septic (50% nitrate reduction)	Conventional Septic	Advanced Septic[1] (50% nitrate reduction)
106 Reis (66%)[(1)]	817	2,450	11	33
122 Reis (65%)[(1)]	721	2,163	10	29

Notes
1. Existing hard surface coverage provided by McIntosh Perry in CAD format.

Table 5: Calculated Maximum Septic Flows – Proposed Lot Addition

	Maximum allowable septic flow		Maximum Number of Users[2]	
Hard Surface Area (%)	Conventional Septic	Advanced Septic[1] (50% nitrate reduction)	Conventional Septic	Advanced Septic[1] (50% nitrate reduction)
106 Reis (62%)	1,175	3,524	16	47
122 Reis (74%)	363	1,089	5	15

After the lot-line adjustment, 122 Reis Road would have a hard surface area coverage of 74%, based on the Site survey completed (refer to Figure 3). The proposed parcel can support 363 L/day and 5 employees using a conventional septic, which is not sufficient to support the current property demands of 675 L/day and 9 employees. To continue the use of the conventional system installed at 122 Reis Road, the hard surface area of the property would have to be reduced to a total of 51%. Alternatively, an advanced treatment septic system can be installed at the property, which would increase the allowable flows to 1,089 L/day and 15 employees. Additional scenarios with varying hard surface percentages and number of employees are provided in Appendix E (Table E2 for 106 Reis Road and Table E4 for 122 Reis Road).

Table 6: Calculated Maximum Septic Flows – Modifications to Hard Surface Area Required to Utilize Conventional Septic System.

Hard Surface Area	Maximum Septic Flow-Conventional[2] (litres per day)	Maximum Number of Users[3]
106 Reis (71%)[1]	904	12
122 Reis (51%)	681	9

Notes:
1. The hard surface percentage displayed for 106 Reis Road is the maximum hard surface coverage the property can increase to, while still supporting 12 employees.

After the addition of the proposed land parcel, 106 Reis Road would have a hard surface area coverage of 62%, based on the Site survey completed. The proposed parcel can support 1175 L/day and 16 employees using a conventional septic, which is sufficient to support the current property demands of 875 L/day and 12 employees. To continue the use of the conventional system installed at 106 Reis Road, the hard surface area of the property cannot exceed a total of 72% hard surface area. With the existing hard surface coverages, an advanced treatment septic system installation at 106 Reis Road after the lot line adjustment would support septic flows of 3,524 L/day and 47 employees.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Based on the results of this investigation, the following conclusions and professional opinions are provided:

- The soils on the Site are mapped as sand and gravel with some clay and silt. The overburden thickness is expected to range from approximately 7.01 to 8.84 metres, according to the MECP water well records for the Site wells. No thin soils, or exposed bedrock were observed on the Site. Given the presence of highly permeable soils (coarse-grained sand and gravel), the Site may be hydrogeologically sensitive and protective measures should be considered.

- The water supply aquifer can be characterized as limestone bedrock of the Verulam Formation based on available mapping resources and MECP water well records within 500 meters of the Site. The three on site wells (Appendix A, Figure 2) were reported to be completed in limestone on the corresponding water well records (interpreted to be the Verulam Formation).

- The water supply aquifer has sufficient groundwater quantity for commercial use.
    - 122 Reis: Well yield was calculated to be 68.25 L/min, or 32,760 L/day, which is expected to be sufficient for proposed commercial use, with estimated water demands of two times the maximum septic flow of 1350 L/day.
    - 122 Reis: Further, based on interview completed with the test well user (tenant at 122 Reis Road), no water quantity issues were reported.

    - 106 Reis: No groundwater quantity issues reported by the Site owner.

- Following the lot-line adjustment, the septic impact assessment meets the MECP Procedure D-5-4 predictive assessment for commercial/industrial properties, under the following scenarios (see below). If advanced septic systems are utilized, they must be BNQ certified (or equivalent certification) for 50% nitrate reduction.
    - 106 Reis Road - no change to existing 62% hard surface:
        - Maximum septic flow of 1,175 litres per day.
        - Conventional septic system.
        - Maximum of 16 employees.
    - 106 Reis Road – increase hard surface to maximum of 72% with current number of employees:
        - Maximum septic flow of 873 litres per day.
        - Conventional septic system.
        - Maximum of 12 employees.
    - Additional scenarios with varying hard surface coverage and maximum number of employees, while maintaining allowable septic flows as per MECP Procedure D-5-4 are presented in Table E2 in Appendix E.

- Following the lot line adjustment, site alterations will be required for 122 Reis Road to meet MECP Procedure D-5-4 predictive assessment for commercial/industrial properties based on the current number of employees (nine), which will involve reducing the hard surface coverage, reducing number of employees, or utilizing advanced treatment septic systems.
    - 122 Reis Road - maximum 51% hard surface (reduce hard surface areas)
        - Maximum septic flow of 681 litres per day.

        - Conventional septic system.
        - Maximum of 9 employees.
    - 122 Reis Road - no change to existing 74% hard surface, limiting number of employees to 5
        - Maximum septic flow of 363 litres per day.
        - Conventional septic system.
        - Maximum of 5 employees.

    - 122 Reis Road - maximum 74% hard surface and utilization of advanced septic treatment system
        - Maximum septic flow of 1,089 litres per day.
        - Advanced treatment septic system.
        - Maximum of 15 employees.
    - Additional scenarios with varying hard surface coverage and maximum number of employees, while maintaining allowable septic flows as per MECP Procedure D-5-4 are presented in Table E4 in Appendix E.

- The results of the physical, chemical and bacteriological groundwater analyses (subdivision package, trace metals and VOCs) indicate that the water quality in the supply aquifer, as testing in PW-122 meets the ODWQS MAC and MCCRT and is considered to be safe for consumption. Groundwater treatment may be desirable to treat the numerous aesthetic objective and operational guideline exceedances. It is noted that the chloride concentration exceeds the maximum concentration considered to be reasonably treatable and significant treatment costs may be incurred. Consideration can be given to point of use treatment systems or using the groundwater for plumbing systems only and providing potable water to tenants / employees.

    - Hardness concentrations exceed the ODWQS operational objective of 80-100 mg/L. Water having a hardness over 100 mg/L is often softened for domestic use.

    - Manganese concentrations exceed the Health Canada (2019) MAC concentration of 0.12 mg/L, but are within the MECP Guideline D-5-5 treatable limits of 1.0 mg/L. The ODWQS does not have an MAC for manganese. Manganese is effectively removed from well water using water softeners or manganese greensand filters.

    - Iron concentrations exceed the ODWQS aesthetic objective of 0.3 mg/L, but are within the MECP Guideline D-5-5 treatable limits of 5.0 mg/L. Water softeners and/or manganese greensand filters are recommended for iron treatment in Table 3 of the MECP Guuideline D-5-5.

- True Colour levels exceed the ODWQS aesthetic objective of 5 TCU. Laboratory analyzed colour is expected to be elevated due to various factors that the samples are subjected to between time of sampling and laboratory analysis (e.g. change in temperature, exposure to atmospheric oxygen partial pressure), resulting in precipitation of metals such as iron and manganese. Water softeners and/or manganese greensand filters are recommended for iron and manganese treatment in Table 3 of MECP Guideline D-5-5, which is expected to greatly reduce colour in the well water.

- Sulfide concentrations exceed the ODWQS aesthetic objective of 0.05 mg/L. Sulphide can be effectively removed from well water using aeration treatment at lower levels.

- Total dissolved solids levels exceed the ODWQS aesthetic objective of 500 mg/L. LSI was calculated to be 0.44, which indicates the water is slightly scale forming, but noncorrosive. Total dissolved solids can be treated using a reverse osmosis (RO) treatment system.

- Chloride levels exceed the ODWQS aesthetic objective of 250 mg/L. Chloride can be removed using RO systems. Point-of-use RO systems are available, which can be connected to a single fixture (e.g. kitchen sink) that supplies drinking water. Alternatively, the Site water supply can be used strictly for plumbing and lawn care purposes, and drinking water can be supplied to the employees from an off-Site source (i.e. bottled water).

6.2 Water Supply Recommendations

The following provides recommendations regarding well construction specifications and water quality treatment are provided below.

- Given the numerous aesthetic and operational guideline exceedances, if treatment systems are utilized, it is recommended that a water quality treatment specialist be retained to appropriately size and install treatment systems.
- It is recommended that the property owners construct, maintain and test their drinking water well in accordance with the Ministry of the Environment and Climate Change document “Water Supply Wells - Requirements and Best Management Practices, Revised April 2015”.
    - If the old water supply well at 122 Reis Road (PW-122- Old Well) will no longer be in use, it is recommended that the well is abandoned by a qualified well technician, in accordance with O. Reg. 903.

6.3 Septic System Recommendations

Following the MECP D-5-4 guidelines, the Site meets the considerations for onsite sewage disposal systems. The following provides recommendations regarding septic system design:

- It is recommended that the property owners construct, maintain and check their Site septic system in accordance with the Ontario Building Code and best management practices.

- If advanced treatment systems are utilized, it is recommended that the systems are BQN certified (or equivalent certification) for a minimum nitrate reduction of 50%.

- It is required that the property owners enter a maintenance agreement with authorized agents of the advanced treatment septic system manufacturer for the service life of the system.

7.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.

Brent Redmond, M.A.Sc., P.Geo.
Hydrogeologist

Andrius Paznekas, M.Sc., P.Geo.
Hydrogeologist

8.0 REFERENCES

Armstrong, D.K. and Dodge, J.E.P. 2007. Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219

Brunton, F.R. and Dodge, J.E.P. 2008. Karst of southern Ontario and Manitoulin Island; Ontario Geological Survey, Groundwater Resources Study 5.

Mississippi Valley Conservation, Rideau Valley Conservation Authority, 2011. Assessment Report, Mississippi Valley Source Protection Area. August 4, 2011.

Ontario Geological Survey. 2010. Surficial geology of Southern Ontario. Ontario Geological Survey, Miscellaneous Release-Data 128-Revision 1.

Ontario Geological Survey. 2011. 1:250 000 scale bedrock geology of Ontario. Ontario Geological Survey, Miscellaneous Release-Data 126-Revision 1.

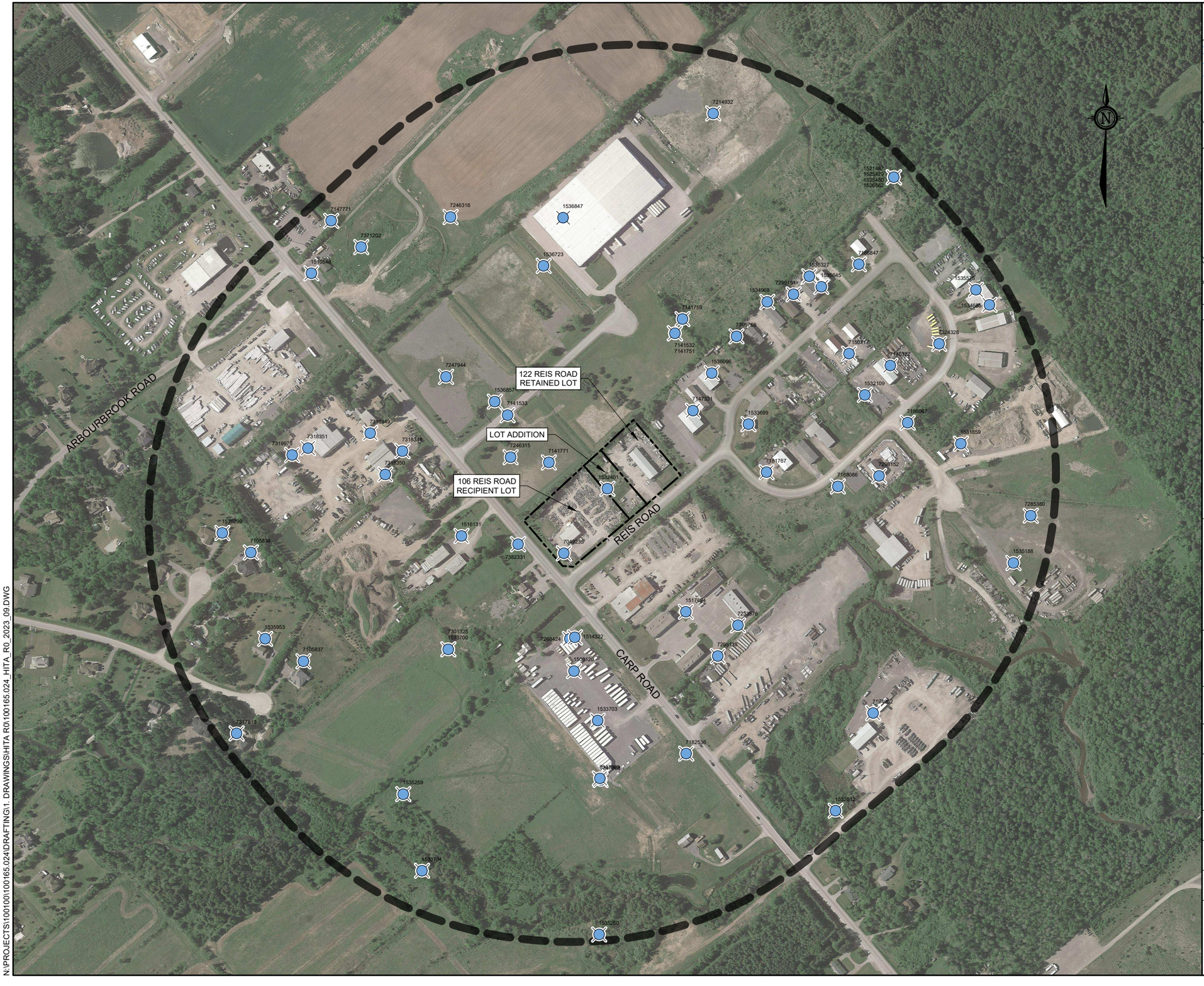
Ontario Ministry of the Environment and Climate Change. 1996. Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment. August 1996.

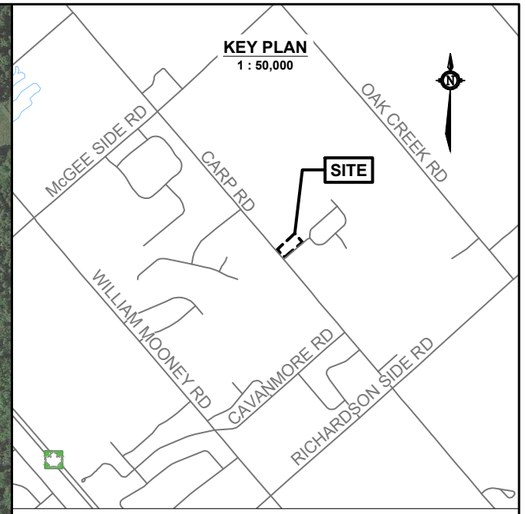
Ontario Ministry of the Environment and Climate Change. 1996. Procedure D-5-4, Technical Guideline for Individual On-Site Sewage Systems: Water Quality Impact Risk Assessment. August 1996.

Risser, D.W., 2010. U.S. Geological Survey. Factors Affecting Specific – Capacity Tests and their Application – A Study of Six Low-Yielding Wells in Fractured – Bedrock Aquifers in Pennsylvania.

APPENDIX A

Figures





LEGEND

- MECP WATER WELL RECORD
- APPROXIMATE SITE BOUNDARY
- STUDY AREA (500 m RADIUS AROUND THE SITE BOUNDARY)

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18
2. Distances, elevations, and coordinates are shown in metres unless denoted otherwise
2. All boundaries and dimensions are approximate
3. Contains information licensed under the Open Government Licence – Ontario
4. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
5. Geographic dataset source: Ontario GeoHub
6. Hard surface areas were determined based on a detailed Site survey completed by McIntosh Perry Consulting Engineers Ltd. Information from the survey was sent to GEMTEC in CAD format via the file: "CCO-23-3606-2023-08-24.dwg". The base map used for the figure may not be representative of current Site use or hard surface coverage

SCALE 1:5,000

0 100 200 300m

DRAWING

SITE LOCATION PLAN

CLIENT

1694027 ONTARIO INC.

PROJECT

SCOPED HYDROGEOLOGICAL INVESTIGATION & TERRAIN ANALYSIS
106 & 122 REIS ROAD
OTTAWA (CARP), ONTARIO

DRAWN BY	CHECKED BY
S.L.	B.R.
PROJECT NO.	REVISION NO.
100165.024	0
DATE	FIGURE NO.
AUGUST 2023	**FIGURE 1**

GEMTEC
Consulting Engineers and Scientists
32 Steacie Drive
Ottawa, ON, K2K 2A9
Tel: (613) 836-1422
www.gemtec.ca
ottawa@gemtec.ca

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LEGEND

- APPROXIMATE TEST WELL LOCATION (CURRENT GEMTEC INVESTIGATION)
- EXISTING WATER WELLS
- APPROXIMATE SITE BOUNDARY

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18
2. Distances, elevations, and coordinates are shown in metres unless denoted otherwise
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SCALE 1:1,000

0 20 40 60m

DRAWING

DETAILED SITE PLAN

CLIENT

1694027 ONTARIO INC.

PROJECT

SCOPED HYDROGEOLOGICAL INVESTIGATION & TERRAIN ANALYSIS
106 & 122 REIS ROAD
OTTAWA (CARP), ONTARIO

DRAWN BY	CHECKED BY
S.L.	B.R.
PROJECT NO.	REVISION NO.
100165.024	0
DATE	FIGURE NO.
AUGUST 2023	**FIGURE 2**

GEMTEC
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www.gemtec.ca
ottawa@gemtec.ca

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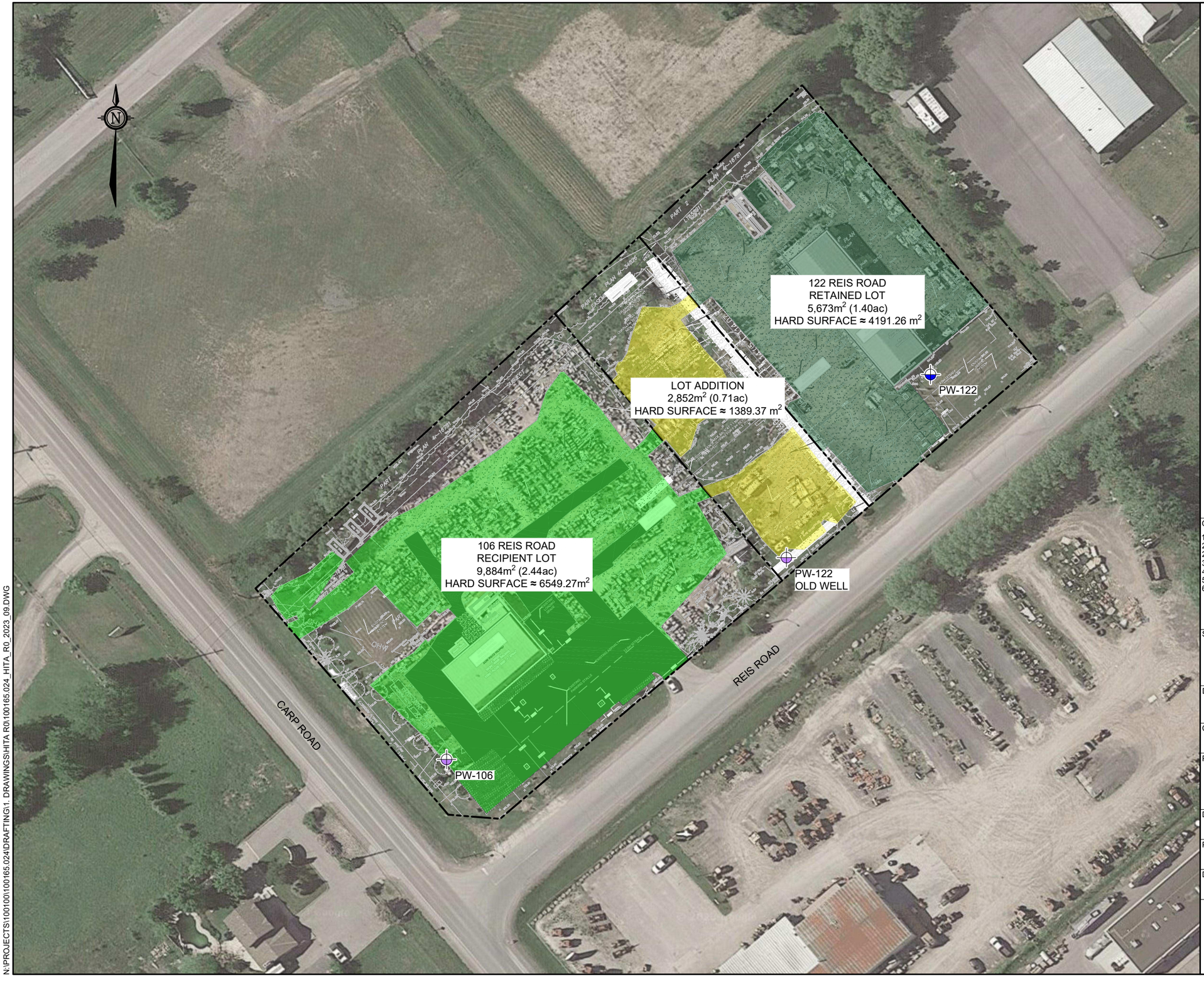

LEGEND

- APPROXIMATE TEST WELL LOCATION (CURRENT GEMTEC INVESTIGATION)
- EXISTING WATER WELLS
- APPROXIMATE SITE BOUNDARY

HARD SURFACE COVER

- 122 REIS ROAD
- LOT ADDITION
- 106 REIS ROAD

GENERAL NOTE(S)

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SCALE 1:1,000

0 20 40 60m

DRAWING

HARD SURFACE COVERAGE

CLIENT

1694027 ONTARIO INC.

PROJECT

SCOPED HYDROGEOLOGICAL INVESTIGATION & TERRAIN ANALYSIS
106 & 122 REIS ROAD
OTTAWA (CARP), ONTARIO

DRAWN BY	CHECKED BY
S.L.	B.R.
PROJECT NO.	REVISION NO.
100165.024	0
DATE	FIGURE NO.
AUGUST 2023	**FIGURE 3**

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APPENDIX B

Water Well Record Summary

MECP Online Well Database Summary (500m Radius)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7049235	HUNTLEY TOWNSHIP CON 02 008	2007-07-27	DO	73.2	8.9	10.7	2.9	0227	GREY SAND 0029 GREY LMSN 0240
1503120	HUNTLEY TOWNSHIP CON 03 008	1966-04-24	DO	7.9		7.9	1.8	FR 0023	RED MSND 0023 GRVL 0026
1510546	HUNTLEY TOWNSHIP CON 02 009	1970-01-21	DO	23.2	9.1	9.4	3.0	FR 0075	GREY GRVL HPAN 0030 BLCK SHLE 0065 GREY LMSN 0076
1514322	HUNTLEY TOWNSHIP CON 03 008	1974-09-17	DO	9.8		9.4	1.5	FR 0031	GREY GRVL BLDR PCKD 0032
1517694	HUNTLEY TOWNSHIP CON 02 008	1981-10-19	DO	7.6		6.7	2.4	FR 0025	GREY CLAY 0003 GREY HPAN GRVL 0021 GREY GRVL 0025
1516131	HUNTLEY TOWNSHIP CON 03 008	1977-08-28	DO	19.5	1.2	7.6	9.1	FR 0055	GREY SAND STNS 0004 GREY LMSN 0064
1521487	HUNTLEY TOWNSHIP CON 02 008	1987-06-24	CO	15.2	1.8	6.4	0.9	FR 0036 FR 0047	BRWN SAND CLAY PCKD 0003 GREY CLAY STNS HARD 0006 GREY LMSN FCRD 0008 GREY GRVL LMSN LOOS
1525420	HUNTLEY TOWNSHIP CON 02 008	1991-05-30	DO	90.8	8.5	9.1	7.6	UK 0289	BRWN CLAY SAND DRY 0008 GREY HPAN BLDR PCKD 0028 GREY LMSN SOFT 0298
1525480	HUNTLEY TOWNSHIP CON 02 008	1991-06-16	DO	68.0	4.6	6.4	9.1	UK 0219	BRWN CLAY STNS PCKD 0006 GREY GRVL SAND WBRG 0015 GREY LMSN MGVL 0223
1526582	HUNTLEY TOWNSHIP CON 02 008	1992-09-14	DO	76.2	4.9	6.4	1.8	UK 0049 UK 0243	BRWN CLAY SNDY STNS 0005 GREY SAND BLDR 0016 GREY LMSN 0250
1531859	HUNTLEY TOWNSHIP CON 02 007	2001-04-24	DO	85.0	8.5		3.4	FR 0275	BRWN HPAN BLDR 0014 GREY HPAN BLDR 0028 GREY LMSN LYRD 0275 GREY LMSN 0279
1532012	HUNTLEY TOWNSHIP CON 02 007	2001-06-06	CO	46.0	6.1		3.4	FR 0090 FR 0135	BRWN LOAM STNS 0006 GREY CLAY 0015 GREY GRVL 0018 GREY HPAN 0020 GREY LMSN 0151
1532109	HUNTLEY TOWNSHIP CON 02 008	2001-07-05	DO	79.2	5.8		1.5	SU 0050 SU 0250	GREY CLAY 0018 BRWN GRVL 0019 GREY SHLE LMSN 0260

AC = Cooling and A/C
CO = Commercial
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IR = Irrigation
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MO = Monitoring
MT = Monitoring and Test Hole
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PS = Public
ST = Livestock
TH = Test Hole

MECP Online Well Database Summary (500m Radius)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
1532401	HUNTLEY TOWNSHIP CON 02 008	2001-10-12	DO	15.2	7.3		1.2	UK 0025 UK 0045	BRWN SAND 0005 GREY SAND GRVL BLDR 0018 GREY GRVL FCRD ROCK 0024 GREY LMSN 0050
1533699	HUNTLEY TOWNSHIP CON 02 008	2003-03-17	DO	14.6	4.0	6.4	3.4	UK 0040	BRWN LOAM SAND GRVL 0013 GREY LMSN 0048
1533700	HUNTLEY TOWNSHIP CON 03 008	2003-03-17	NU	62.5	12.2	14.0	3.4	UK 0060 UK 0145	BRWN SAND GRVL 0040 GREY LMSN 0205
1533703	HUNTLEY TOWNSHIP CON 03 007	2003-03-17	NU	61.0	7.6	10.1	3.7	UK 0148	SAND GRVL 0025 GREY LMSN 0200
1534968	HUNTLEY TOWNSHIP CON 02 008	2004-08-24	DO	45.1	4.9	6.4	1.9	0140	BRWN SAND STNS 0006 GREY HPAN 0010 GREY SAND GRVL 0016 GREY LMSN 0148
1535259	HUNTLEY TOWNSHIP CON 03 008	2004-09-15	NU	6.0		3.0			BRWN FSND 0004 GREY CLAY HARD 0007 BRWN FSND 0014 GREY SAND CGVL 0020
1535575	HUNTLEY TOWNSHIP CON 02 008	2005-05-02	DO	83.2	7.6	9.4	4.5	0038 0266	BRWN LOAM STNS LOOS 0011 BRWN LOAM 0020 GREY HPAN PCKD 0025 GREY LMSN 0273
1535953	HUNTLEY TOWNSHIP CON 03 008	2005-09-29	DO	18.3	8.8	10.7	6.3	0037 0054	CLAY SNDY GRVL 0029 LMSN DKCL 0060
1536096	HUNTLEY TOWNSHIP CON 02 008	2005-10-27	DO	45.7	1.2	7.3	1.6	0144	SAND GRVL 0004 GREY LMSN 0120 GREY LMSN SNDS 0150
1536327	HUNTLEY TOWNSHIP CON 02 008	2006-04-24	DO	18.3	5.5	7.0	0.9	0025 0055	CLAY 0018 GREY LMSN 0060
1536645	HUNTLEY TOWNSHIP CON 02 006	2006-07-26	MO	15.2	4.9	7.0	1.3	0030 0041	SAND CLAY 0016 GREY LMSN 0050
1536723	HUNTLEY TOWNSHIP CON 02 008	2006-09-08	NU	73.2	6.4	12.3	2.1	0232	CLAY SNDY BLDR 0021 GREY LMSN 0240
1536847	HUNTLEY TOWNSHIP CON	2006-11-02		17.8					0058

AC = Cooling and A/C
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IN = Industrial
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MECP Online Well Database Summary (500m Radius)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
1536857	HUNTLEY TOWNSHIP CON 02 008	2006-09-22	MO	12.2	7.3	10.1	2.9	0039	SAND GRVL 0024 LMSN FCRD 0040
7105837	HUNTLEY TOWNSHIP CON	2008-03-28	DO	14.6		10.7	3.8	UK 0044	BRWN LOAM SNDY GRVL 0037 GREY SAND HARD 0048
7105838	HUNTLEY TOWNSHIP CON 03 008	2008-03-27	DO	16.5		15.8	5.2	UK 0052	BRWN LOAM SNDY GRVL 0035 GREY GRVL PCKD 0054
7141532	HUNTLEY TOWNSHIP CON 02 008	2010-01-11		43.3					0142
7141533	HUNTLEY TOWNSHIP CON	2010-01-11	MO	12.8					0042
7141751	HUNTLEY TOWNSHIP CON	2009-02-09	MO	24.4					0080
7141759	HUNTLEY TOWNSHIP CON	2010-02-08	DO	48.8	6.1	15.8	1.2	UT 0148 UT 0155	SAND GRVL 0020 GREY LMSN 0160
7141771	HUNTLEY TOWNSHIP CON 02 008	2009-12-21	DO	97.5	9.7	16.5	1.0	UT 0297 UT 0311	GREY CLAY 0019 SAND GRVL BLDR 0032 GREY LMSN 0320
7146322	HUNTLEY TOWNSHIP CON 02 008	2010-04-30	CO	87.5	7.3	9.1	0.7	0278	BRWN SAND CLAY SILT 0004 GREY SILT SAND 0020 GREY TILL SAND GRVL 0024 GREY LMSN SHLE 0287
7147331	HUNTLEY TOWNSHIP CON 02 008	2010-05-12	NU	30.8	6.1	7.9	2.4	UT 0038 UT 0082 UT 0088	SAND CLAY GRVL 0020 GREY LMSN 0101
7147771	HUNTLEY TOWNSHIP CON 02 009	2010-05-20	NU	42.7	1.8	6.1	0.9	UT 0131	BRWN SAND CLAY STNS 0003 BRWN SAND CLAY STNS 0006 BRWN SHLE 0008 BRWN LMSN 0140
7150117	OTTAWA CITY	2010-08-12	CO	85.3	4.4	7.0	0.5	UT 0135 UT 0268	BRWN SAND STNS CLAY 0014 BRWN LMSN LMSN LYRD 0135 GREY LMSN SNDS 0280
7164962	HUNTLEY TOWNSHIP CON 02 007	2011-06-03	CO	97.6	4.6	6.4	1.8	UT 0308	BRWN TILL SAND 0009 GREY GRVL BLDR 0015 GREY LMSN SHLE 0320

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ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7166847	HUNTLEY TOWNSHIP CON 02 008	2011-05-04	DO CO	106.1	7.3	10.4	1.3	UT 0333	BRWN LOAM SNDY LOOS 0012 GREY TILL 0024 GREY LMSN LYRD MGRD 0348
7181767	HUNTLEY TOWNSHIP CON 02 008	2012-04-27	CO	25.3	16.2	17.4	0.8	0068 0079	GREY CLAY SNDY 0004 BRWN SAND 0009 GREY CLAY SLTY 0015 GREY SAND GRVL 0040 GREY TILL DNSE 0053 GREY LMSN SHLE FCRD 0083
7182536	HUNTLEY TOWNSHIP CON 03 008	2012-06-07	CO	8.2	6.1	7.3	1.5	UT 0027	BRWN SAND PCKD 0002 GREY CLAY STNS HPAN 0020 GREY LMSN FCRD 0027
7188067	HUNTLEY TOWNSHIP	2011-07-07	NU	14.6	6.1	7.9	4.1	FR 0020	BRWN SAND PCKD 0006 GREY HPAN STNS 0020 GREY LMSN HARD 0048
7188086	HUNTLEY TOWNSHIP CON 02 008	2012-01-01	NU	18.3	4.3	6.1	2.6	UT 0055	BRWN SAND LOOS 0010 GREY HPAN STNS 0014 GREY LMSN 0060
7233576	HUNTLEY TOWNSHIP	2014-09-17	NU	68.6	7.6	9.4	3.3	UT 0190 UT 0218	BRWN LOAM STNS WBRG 0004 GREY TILL PCKD 0020 GREY GRVL PCKD 0025 GREY LMSN LYRD 0225
7246315	HUNTLEY TOWNSHIP CON 02 009	2015-06-06	DO	85.3	2.4	13.4		0055 0235	HPAN CLAY GRVL 0008 GREY SNDS 0018 HPAN CLAY GRVL 0026 GREY SNDS 0280
7246316	HUNTLEY TOWNSHIP CON	2015-07-07	DO	61.0	8.5	13.4		UT	LOAM SAND 0015 CLAY STNS 0028 GREY SNDS 0200
7247944	HUNTLEY TOWNSHIP CON	2015-08-06	TH	64.3	4.0	13.4		UT 0050 UT 0155	CLAY STNS 0013 GREY SNDS 0200 SNDS 0211
7268424	HUNTLEY TOWNSHIP CON	2016-06-09	DO	54.9	48.2	50.0	8.7	UT 0169 UT 0174	GREY CLAY 0158 GREY SHLE LMSN 0180
7295138	HUNTLEY TOWNSHIP CON	2017-08-16	DO	61.0	37.8	39.6		UT 0171	CLAY 0117 SAND 0124 GREY LMSN 0200
7298152	HUNTLEY TOWNSHIP CON 03 013/014	2017-10-05	DO	85.3		na			0200 GREY LMSN 0280
7299151	HUNTLEY TOWNSHIP CON 03 013/014	2017-09-07	DO	85.3	36.0	37.2		UT 0132	SAND CLAY 0005 GREY CLAY 0104 SAND GRVL 0112 GRVL BLDR 0118 GREY LMSN 0132 GREY LMSN 0133 GREY LMSN 0280

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MECP Online Well Database Summary (500m Radius)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Stratigraphic Layers (ft)
7301325	HUNTLEY TOWNSHIP CON 03 008								
7317813	HUNTLEY TOWNSHIP CON 03 008	2018-05-21	DO	38.1	14.3	17.1	4.3	UT 0090 UT 0119	BRWN LOAM SNDY 0022 GREY CLAY SNDY STNS 0047 GREY LMSN 0125
7318348	HUNTLEY TOWNSHIP CON 03 008	2018-07-16	TH MO	4.7		1.5			GREY ---- GRVL 0001 BRWN SAND 0011 GREY CLAY SILT SOFT 0015
7318349	HUNTLEY TOWNSHIP CON 03 008	2018-07-16	TH MO	3.1		1.5			GREY GRVL FILL PCKD 0002 BRWN SAND 0010
7318350	HUNTLEY TOWNSHIP CON 03 008	2018-07-16	TH MO	3.1		1.5			GREY ---- GRVL 0001 GREY GRVL 0003 BRWN SAND 0010
7318351	HUNTLEY TOWNSHIP CON 03 008	2018-07-16	TH MO	3.1		1.5			GREY GRVL 0001 BRWN GRVL SAND LOOS 0003 BRWN SAND 0010
7319979	HUNTLEY TOWNSHIP CON 03 008	2018-07-15	TH MO	3.1		1.5			GREY GRVL SAND PCKD 0001 GREY GRVL SAND LOOS 0003 BRWN SAND SAND SOFT 0010
7324328	HUNTLEY TOWNSHIP	2018-08-27	DO	99.1	8.2	9.8	3.2	UT 0311	BRWN STNS LOAM LOOS 0014 GREY SAND PCKD 0027 GREY LMSN HARD 0325
7347069	HUNTLEY TOWNSHIP CON 03 007	2019-05-31	MO	4.6		3.0		UT 0005	SAND 0015
7347068	HUNTLEY TOWNSHIP CON	2019-05-31	MO					UT 0005	
7357888	HUNTLEY TOWNSHIP	2019-12-02							
7371202	HUNTLEY TOWNSHIP CON	2020-09-29							
7382331	HUNTLEY TOWNSHIP CON	2021-01-06							
7395766		2021-05-25							

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APPENDIX C

Water Well Records – Site Wells

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below) **Tag#:A320528**

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
	Grace Monuments		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
122 Reis Road	West Carelton	8	2

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa Carelton	Huntley	Ontario	K0A 1L0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	422981	5011716	"	

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
Grey	Gravel	fill	Packed	0'	3'
Grey	Sand	gravel Boulders	Loose + Dence.	3'	10'
Grey	Gravel	Broken Rock.		10'	~~23~~ 23'
Grey	Limestone.			23'	163'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0'	24'	Quik Grout	

Method of Construction

☒ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Other, specify _____

☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

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	STEEL	188	+2'	25'

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): 115

Pumping rate (l/min / GPM): 10

Duration of pumping: 1 hrs + _____ min

Final water level end of pumping (m/ft): 85

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

Recommended pump depth (m/ft): 115

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

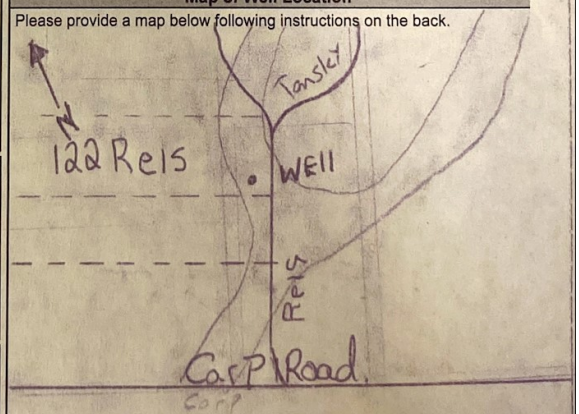
Well production (l/min/GPM): 12

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	0		
1	7	1	80
2	13.5'	2	
3	18'	3	
4	21.8'	4	
5	25	5	
10	38	10	36
15	50	15	
20	58	20	28
25	64	25	
30	71	30	18
40	76	40	10
50	80	50	8
60	85	60	7

Map of Well Location

Please provide a map below following instructions on the back.



Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth From	Depth To	Diameter (cm/in)
21' (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	0	23	8.5
38' (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	23	163	6"
160 (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Colt's Plumbing inc.	7716

Business Address (Street Number/Name)	Municipality
2547 County Rd 29	Mississippi Mills

Province	Postal Code	Business E-mail Address
On	K0A2X0	

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
6138805645	Skuse, Simon

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
		2022/06/27

Comments: 40' ℄ Reis + 5' off Lot line

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2022/06/27	2022/06/27

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Audit No. Z370232

Received

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Contractor's Copy

Ontario Ministry of the Environment

The Ontario Water Resources Act
WATER WELL RECORD

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

11 (1 2) **1532401** Municipality 1500S (10 14) Con. CON 02 (15 22 23 24)

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot (25-27)
Ottawa Carleton	West Carleton Huntley	2				8

Address: 164 Robertson Rd., Nepean ON. K2H 121

Date completed (48-53): 12 day 10 month 01 year

21 (1 2) UTM (10 12 17) Northing (18 24) RC (25) Elevation (26) RC (30) Basin Code (31) ii iii iv (47)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	sand			0	5
Grey	sand gravel and boulders			5	18
Grey	gravel	broken rock		18	23'6"
Grey	Limestone			23'6"	50
Note casing was left 4 ft. above ground level at time of drilling.					

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

32

41 WATER RECORD

Water found at - feet	Kind of water
25 (10-13)	1 ☐ Fresh 3 ☐ Sulphur 14; 2 ☐ Salty 4 ☐ Minerals; 6 ☐ Gas
45 (15-18)	1 NOT TESTED 3 ☐ Sulphur 19; 2 ☐ Salty 4 ☐ Minerals; 6 ☐ Gas
20-23	1 ☐ Fresh 3 ☐ Sulphur 24; 2 ☐ Salty 4 ☐ Minerals; 6 ☐ Gas
25-28	1 ☐ Fresh 3 ☐ Sulphur 29; 2 ☐ Salty 4 ☐ Minerals; 6 ☐ Gas
30-33	1 ☐ Fresh 3 ☐ Sulphur 34; 2 ☐ Salty 4 ☐ Minerals; 6 ☐ Gas (60)

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
	1 ☒ Steel (12); 2 ☐ Galvanized; 3 ☐ Concrete; 4 ☐ Open hole; 5 ☐ Plastic	.188	0	25 (15-16)
17-18: 6	1 ☐ Steel (19); 2 ☐ Galvanized; 3 ☐ Concrete; 4 ☒ Open hole; 5 ☐ Plastic		25	50 (20-23)
24-25	1 ☐ Steel (26); 2 ☐ Galvanized; 3 ☐ Concrete; 4 ☐ Open hole; 5 ☐ Plastic			27-30

SCREEN

Sizes of opening (Slot No.) (31-33)	Diameter (34-38) inches	Length (39-40) feet
Material and type	Depth at top of screen (41-44) feet	(30)

61 PLUGGING & SEALING RECORD

☒ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
25 (10-13)	0 (14-17)	Grouted Cement(5)
18-21	22-25	
26-29	30-33 (80)	

71 PUMPING TEST

Pumping test method (10): 1 ☒ Pump 2 ☐ Bailer

Pumping rate (11-14): 15 GPM

Duration of pumping (15-16): 1 Hours (17-18) Mins

25 Water levels during: 1 ☒ Pumping 2 ☐ Recovery

Static level (19-21)	Water level end of pumping (22-24)	15 minutes (26-28)	30 minutes (29-31)	45 minutes (32-34)	60 minutes (35-37)
4 feet	25 feet	48 feet	48 feet	25 feet	25 feet

If flowing give rate (38-41): GPM

Pump intake set at: feet

Water at end of test (42): ☐ Clear ☒ Cloudy

Recommended pump type: ☐ Shallow ☒ Deep

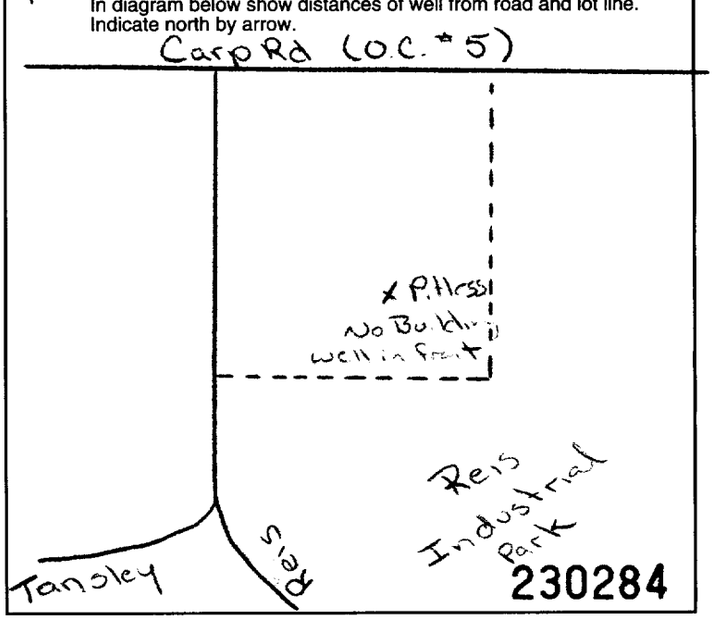
Recommended pump setting (43-45): 30 feet

Recommended pump rate (46-49): 5 GPM

(50-53)

LOCATION OF WELL

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



FINAL STATUS OF WELL (54)

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

WATER USE (55-56)

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

METHOD OF CONSTRUCTION (57)

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

Name of Well Contractor	Well Contractor's Licence No.
Capital Water Supply Ltd.	1558
Address: Box 490, Stittsville, ON. K2S 1A6	
Name of Well Technician: S. Miller	Well Technician's Licence No.: T0097
Signature of Technician/Contractor	Submission date: day 16 mo 10 yr 01

MINISTRY USE ONLY

Data source (58)	Contractor (59-62)	Date received (63-68) (80)
	1558	NOV 27 2001
Date of inspection	Inspector	
Remarks: CSS.ES		

0506 (07/00) Front Form 9

2 - MINISTRY OF THE ENVIRONMENT COPY

Ontario Ministry of the Environment

Well Tag Number (Plate number below): A 055265

A055265

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the **Province of Ontario** only. This document is a permanent **legal** document. Please retain for future reference.
- All Sections **must** be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Help Desk (Toll Free) at 1-888-396-9355.
- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

[redacted]

Address of Well Location (County/District/Municipality): Ottawa - Carleton | Township: West Carleton | Lot: 8 | Concession: 9

RR#/Street Number/Name: #106 Reis Road | City/Town/Village: Carp | Site/Compartment/Block/Tract etc.: Plan 4M-745 Block 1 Part 4, 5, 6, 7

GPS Reading | NAD: 8 3 | Zone: 18 | Easting: 422867 | Northing: 5017099 | Unit Make/Model: Magellan | Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To (Metres)
	Grey Sand			0	8.84
	Grey Limestone			8.84	73.15

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	73.15	15.88

Water Record

Water found at ___ Metres	Kind of Water		
69.19 m	☐ Fresh	☒ Sulphur	☐ Gas
☐ Salty	☐ Minerals	☐ Other:	
___ m	☐ Fresh	☐ Sulphur	☐ Gas
☐ Salty	☐ Minerals	☐ Other:	
___ m	☐ Fresh	☐ Sulphur	☐ Gas
☐ Salty	☐ Minerals	☐ Other:	

TESTED

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

CLEAR NOT TESTED

Chlorinated ☒ Yes ☐ No

Construction Record

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From	Depth To (Metres)
Casing				
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	0	.48	10.67
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		10.06	73.15

Test of Well Yield

Pumping test method: SubPump

Pump intake set at - (metres): 70.16

Pumping rate (litres/min): 50 45

Duration of pumping: ___ hrs + 60 min

Final water level end of pumping: 70.19 metres

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: 70.70 metres

Recommended pump rate (litres/min): 45 50

If flowing give rate - (litres/min):

If pumping discontinued, give reason:

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	2.90		20.19	
1	4.72	1	16.86	
2	6.09	2	15.55	
3	7.00	3	14.60	
4	8.14	4	13.72	
5	8.94	5	13.00	
10	12.11	10	10.39	
15	14.30	15	8.63	
20	15.92	20	7.36	
25	17.18	25	6.43	
30	18.11	30	5.67	
40	19.22	40	4.71	
50	19.86	50	4.09	
60	20.19	60	3.67	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
10.06	7.01	Neat Cement Slurry	.1816
7.01	0	Bentonite Slurry	.245

Method of Construction

☐ Cable Tool ☐ Rotary (air) ☐ Diamond ☐ Digging
☐ Rotary (conventional) ☒ Air percussion ☐ Jetting ☐ Other
☐ Rotary (reverse) ☐ Boring ☐ Driving

Water Use

☒ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

☒ Water Supply ☐ Recharge well ☐ Unfinished ☐ Abandoned, (Other)
☐ Observation well ☐ Abandoned, insufficient supply ☐ Dewatering
☐ Test Hole ☐ Abandoned, poor quality ☐ Replacement well

Well Contractor/Technician Information

Name of Well Contractor: AIR ROCK DRILLING CO LTD | Well Contractor's Licence No.: 1119

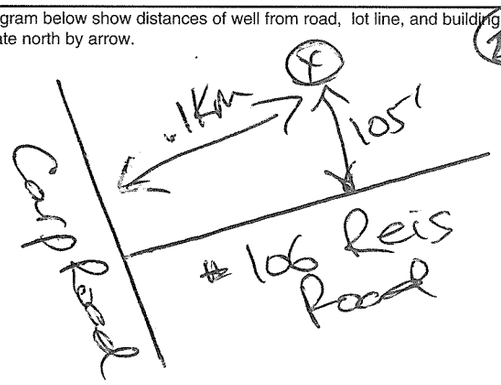
Business Address (street name, number, city etc.): BR#1 RICHMOND ONT K0A 2Z0

Name of Well Technician (last name, first name): PURCELL SHANNON | Well Technician's Licence No.: 7012

Signature of Technician/Contractor: X [signature] | Date Submitted: 2007 09 28

Location of Well

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



Audit No.: Z 65135

Was the well owner's information package delivered? ☒ Yes ☐ No

Date Well Completed: 2007 09 27

Date Delivered: 2007 09 28

Ministry Use Only

Data Source | Contractor: 1119

Date Received: SEP 17 2007 | Date of Inspection

Remarks | Well Record Number

0506E (08/2006) Ministry's Copy

Cette formule est disponible en français

APPENDIX D

Water Quality Summary and
Laboratory Certificates of Analysis

Table D1:
Summary of Labratory Water Quality Measurements

Parameter	Units	PW-122 23-Nov-22	PW-122 28-Jun-23	PW-122 Filtered 28-Jun-23	Ontario Drinking Water Standard	Type of Standard[1,2,3]
Microbiological Parameters						
E. Coli	CFU/100 mL	-	ND (1)	-	0	MAC
Fecal Coliforms	CFU/100 mL	-	ND (1)	-	0	MAC
Total Coliforms	CFU/100 mL	-	ND (1)	-	0	-
General Inorganics						
Alkalinity, total	mg/L	-	314	-	30-500	OG
Ammonia as N	mg/L	0.2	0.17	-	-	-
Dissolved Organic Carbon	mg/L	-	3.0	-	5	AO
Colour	TCU	-	9	-	-	-
Colour, apparent	ACU	-	72	-	5	AO
Conductivity	uS/cm	-	1690	-	-	-
Hardness	mg/L	487	432	-	80-100	OG
pH	pH Units	-	7.6	-	6.5-8.5	OG
Phenolics	mg/L	-	0.014	-	-	-
Total Dissolved Solids	mg/L	-	948	-	500	AO
Sulphide	mg/L	-	0.27	-	0.05	AO
Tannin & Lignin	mg/L	-	0.1	-	-	-
Total Kjeldahl Nitrogen	mg/L	0.3	0.2	-	-	-
Turbidity	NTU	-	11.5	-	5	AO
Organic Nitrogen[6]						
Anions						
Chloride	mg/L	326	313	-	250	AO
Fluoride	mg/L	-	0.2	-	1.5	MAC
Nitrate as N	mg/L	ND (0.1)	ND (0.1)	-	10[4]	MAC
Nitrite as N	mg/L	ND (0.05)	ND (0.05)	-	1.0[4]	MAC
Sulphate	mg/L	-	80	-	500	AO
Metals						
Mercury	mg/L	-	ND (0.0001)	N/A	0.001	
Aluminum	mg/L	-	0.003	0.002	0.1	OG

Table D1:
Summary of Labratory Water Quality Measurements

Parameter	Units	PW-122 23-Nov-22	PW-122 28-Jun-23	PW-122 Filtered 28-Jun-23	Ontario Drinking Water Standard	Type of Standard[1,2,3]
Antimony	mg/L	-	ND (0.0005)	ND (0.0005)	0.006	MAC
Arsenic	mg/L	-	ND (0.001)	ND (0.001)	0.025	MAC
Barium	mg/L	-	1.07	1.02	1	MAC
Beryllium	mg/L	-	ND (0.0005)	ND (0.0005)	-	-
Boron	mg/L	-	0.05	0.05	5	MAC
Cadmium	mg/L	-	ND (0.0001)	ND (0.0001)	0.005	MAC
Calcium	mg/L	148	128	126	-	-
Chromium	mg/L	-	ND (0.001)	ND (0.001)	0.05	MAC
Cobalt	mg/L	-	ND (0.0005)	ND (0.0005)	-	-
Copper	mg/L	-	0.0079	0.0018	1	AO
Iron	mg/L	-	1.2	1.1	0.3	AO
Lead	mg/L	-	0.0004	ND (0.0001)	0.01	MAC
Magnesium	mg/L	28.5	27.2	28.9	-	-
Manganese	mg/L	-	0.134	0.131	0.05	AO
Molybdenum	mg/L	-	ND (0.0005)	ND (0.0005)	-	-
Nickel	mg/L	-	0.001	0.001	-	-
Potassium	mg/L	-	5.2	7.3	-	-
Selenium	mg/L	-	ND (0.001)	ND (0.001)	0.01	MAC
Silver	mg/L	-	ND (0.0001)	ND (0.0001)	-	-
Sodium	mg/L	183	157	200	200 [20][5]	AO
Strontium	mg/L	-	1.85	2.24	-	-
Thallium	mg/L	-	ND (0.001)	ND (0.001)	-	-
Uranium	mg/L	-	0.0001	0.0001	0.02	MAC
Vanadium	mg/L	-	ND (0.0005)	ND (0.0005)	-	-
Zinc	mg/L	-	0.058	0.006	5	AO
Volatiles						
Acetone	ug/L	-	ND (5.0)	-	-	-
Benzene	ug/L	-	ND (0.5)	-	0.001 mg/L (1 ug/L)	MAC
Bromodichloromethane	ug/L	-	ND (0.5)	-	-	-

Table D1:
Summary of Labratory Water Quality Measurements

Parameter	Units	PW-122 23-Nov-22	PW-122 28-Jun-23	PW-122 Filtered 28-Jun-23	Ontario Drinking Water Standard	Type of Standard[1,2,3]
Bromoform	ug/L	-	ND (0.5)	-	-	-
Bromomethane	ug/L	-	ND (0.5)	-	-	-
Carbon Tetrachloride	ug/L	-	ND (0.2)	-	0.002 mg/L (2 ug/L)	MAC
Chlorobenzene	ug/L	-	ND (0.5)	-	0.08 mg/L (80 ug/L)	MAC
Chloroethane	ug/L	-	ND (1.0)	-	-	-
Chloroform	ug/L	-	ND (0.5)	-	-	-
Chloromethane	ug/L	-	ND (3.0)	-	-	-
Dibromochloromethane	ug/L	-	ND (0.5)	-	-	-
Dichlorodifluoromethane	ug/L	-	ND (1.0)	-	-	-
Ethylene dibromide	ug/L	-	ND (0.2)	-	-	-
1,2-Dichlorobenzene	ug/L	-	ND (0.5)	-	0.2 mg/L (200 ug/L)	MAC
1,3-Dichlorobenzene	ug/L	-	ND (0.5)	-	-	-
1,4-Dichlorobenzene	ug/L	-	ND (0.5)	-	0.005 mg/L (5 ug/L)	MAC
1,1-Dichloroethane	ug/L	-	ND (0.5)	-	-	-
1,2-Dichloroethane	ug/L	-	ND (0.5)	-	0.005 mg/L (5 ug/L)	MAC
1,1-Dichloroethylene	ug/L	-	ND (0.5)	-	0.014 mg/L (14 ug/L)	MAC
cis-1,2-Dichloroethylene	ug/L	-	ND (0.5)	-	-	-
trans-1,2-Dichloroethylene	ug/L	-	ND (0.5)	-	-	-
1,2-Dichloroethylene, total	ug/L	-	ND (0.5)	-	-	-
1,2-Dichloropropane	ug/L	-	ND (0.5)	-	-	-
cis-1,3-Dichloropropylene	ug/L	-	ND (0.5)	-	-	-
trans-1,3-Dichloropropylene	ug/L	-	ND (0.5)	-	-	-
1,3-Dichloropropene, total	ug/L	-	ND (0.5)	-	-	-
Ethylbenzene	ug/L	-	ND (0.5)	-	0.14 mg/L (140 ug/L)	MAC
Hexane	ug/L	-	ND (1.0)	-	-	-
Methyl Ethyl Ketone (2-Butanone)	ug/L	-	ND (5.0)	-	-	-
Methyl Butyl Ketone (2-Hexanone)	ug/L	-	ND (10.0)	-	-	-
Methyl Isobutyl Ketone	ug/L	-	ND (5.0)	-	-	-
Methyl tert-butyl ether	ug/L	-	ND (2.0)	-	-	-

Table D1:
Summary of Labratory Water Quality Measurements

Parameter	Units	PW-122 23-Nov-22	PW-122 28-Jun-23	PW-122 Filtered 28-Jun-23	Ontario Drinking Water Standard	Type of Standard[1,2,3]
Methylene Chloride	ug/L	-	ND (5.0)	-	0.05 mg/L (50 ug/L)	MAC
Styrene	ug/L	-	ND (0.5)	-	-	-
1,1,1,2-Tetrachloroethane	ug/L	-	ND (0.5)	-	-	-
1,1,2,2-Tetrachloroethane	ug/L	-	ND (0.5)	-	-	-
Tetrachloroethylene	ug/L	-	ND (0.5)	-	0.01 mg/L (10 ug/L)	MAC
Toluene	ug/L	-	ND (0.5)	-	0.06 mg/L (60 ug/L)	MAC
1,1,1-Trichloroethane	ug/L	-	ND (0.5)	-	-	-
1,1,2-Trichloroethane	ug/L	-	ND (0.5)	-	-	-
Trichloroethylene	ug/L	-	ND (0.5)	-	0.005 mg/L (5 ug/L)	MAC
Trichlorofluoromethane	ug/L	-	ND (1.0)	-	-	-
1,3,5-Trimethylbenzene	ug/L	-	ND (0.5)	-	-	-
Vinyl Chloride	ug/L	-	ND (0.5)	-	0.001 mg/L (1 ug/L)	MAC
m/p-Xylene	ug/L	-	ND (0.5)	-	-	-
o-Xylene	ug/L	-	ND (0.5)	-	-	-
Xylenes, total	ug/L	-	ND (0.5)	-	0.09 mg/L (90 ug/L)	MAC

NOTES:

1. MAC = Maximum Acceptable Concentration;
2. OG = Operational Guideline
3. AO = Aesthetic Objective
4. The total of Nitrate and Nitrite should not exceed 10 mg/litre.
5. The aesthetic objective for sodium is 200 mg/litre. The local medical officer of health should be notified when the sodium concentration exceeds 20 mg/litre for persons on sodium restricted diets.
6. Organic Nitrogen = Total Kjeldahl Nitrogen - $N\text{-}NH_3$ and should not exceed 0.15 mg/litre.
7. '-' signifies no value provided
8. 'ND' = No concentration detected above method detection limit

GEMTEC
Consulting Engineers and Scientists

Table D2:
Summary of Field Water Quality Measurements

TW22-02	Time Since Initiaion of Pumping	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Turbidity (NTU)	Apparent Colour[1] (TCU[2])	True Colour[3] (TCU)	Free Chlorine (mg/L)	Total Chlorine (mg/L)
Pressure Tank Bypass Nov. 23, 2022	10 minutes	10.84	7.22	1640	1050	2.5	-	-	-	-
	15 minutes	10.81	7.19	1640	1050	2.3	-	-	-	-
Pressure Tank Bypass June 28, 2023	10 minutes	15.7	7.84	1519	762	4.04	10	-	<0.02	<0.02

NOTES:

1. Apparent Colour = Unfiltered sample
2. TCU = True Colour Units
3. True Colour = Sample filtered using 0.45 micron filter
4. 'ND' = No concentration detected above method detection limit

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Brent Redmond

Client PO:
Project: 101377.001
Custody: 17552

Report Date: 1-Dec-2022
Order Date: 23-Nov-2022

Order #: 2248286

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

Paracel ID	Client ID
2248286-03	PW-122

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 01-Dec-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 23-Nov-2022

Client PO:

Project Description: 101377.001

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	24-Nov-22	24-Nov-22
Ammonia, as N	EPA 351.2 - Auto Colour	24-Nov-22	25-Nov-22
Anions	EPA 300.1 - IC	28-Nov-22	28-Nov-22
Colour	SM2120 - Spectrophotometric	24-Nov-22	25-Nov-22
Colour, apparent	SM2120 - Spectrophotometric	24-Nov-22	25-Nov-22
Conductivity	EPA 9050A- probe @25 °C	24-Nov-22	24-Nov-22
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	25-Nov-22	25-Nov-22
E. coli	MOE E3407	24-Nov-22	24-Nov-22
Fecal Coliform	SM 9222D	24-Nov-22	24-Nov-22
Hardness	Hardness as CaCO3	24-Nov-22	24-Nov-22
Heterotrophic Plate Count	SM 9215C	24-Nov-22	24-Nov-22
Metals, ICP-MS	EPA 200.8 - ICP-MS	24-Nov-22	24-Nov-22
pH	EPA 150.1 - pH probe @25 °C	24-Nov-22	24-Nov-22
Phenolics	EPA 420.2 - Auto Colour, 4AAP	24-Nov-22	24-Nov-22
Hardness	Hardness as CaCO3	24-Nov-22	24-Nov-22
Sulphide	SM 4500SE - Colourimetric	24-Nov-22	25-Nov-22
Tannin/Lignin	SM 5550B - Colourimetric	28-Nov-22	29-Nov-22
Total Coliform	MOE E3407	24-Nov-22	24-Nov-22
Total Dissolved Solids	SM 2540C - gravimetric, filtration	24-Nov-22	25-Nov-22
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	24-Nov-22	25-Nov-22
Turbidity	SM 2130B - Turbidity meter	24-Nov-22	24-Nov-22

Certificate of Analysis

Report Date: 01-Dec-2022

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 23-Nov-2022

Client PO:

Project Description: 101377.001

	Client ID:		PW-122	-
	Sample Date:		23-Nov-22 13:30	-
	Sample ID:		2248286-03	-
	MDL/Units		Drinking Water	-
Microbiological Parameters				
E. coli	1 CFU/100mL		-	-
Fecal Coliforms	1 CFU/100mL		-	-
Total Coliforms	1 CFU/100mL		-	-
Heterotrophic Plate Count	10 CFU/mL		-	-
General Inorganics				
Alkalinity, total	5 mg/L		-	-
Ammonia as N	0.01 mg/L		0.20	-
Dissolved Organic Carbon	0.5 mg/L		-	-
Colour	2 TCU		-	-
Colour, apparent	2 ACU		-	-
Conductivity	5 uS/cm		-	-
Hardness	mg/L		487	-
Hardness	mg/L		-	-
pH	0.1 pH Units		-	-
Phenolics	0.001 mg/L		-	-
Total Dissolved Solids	10 mg/L		-	-
Sulphide	0.02 mg/L		-	-
Tannin & Lignin	0.1 mg/L		-	-
Total Kjeldahl Nitrogen	0.1 mg/L		0.3	-
Turbidity	0.1 NTU		-	-
Anions				
Chloride	1 mg/L		326 [3]	-
Fluoride	0.1 mg/L		-	-
Nitrate as N	0.1 mg/L		<0.1 [3]	-
Nitrite as N	0.10 mg/L		<0.10 [3]	-
Sulphate	1 mg/L		-	-
Metals				
Calcium	0.1 mg/L		148	-
Iron	0.1 mg/L		-	-
Magnesium	0.2 mg/L		28.5	-
Manganese	0.005 mg/L		-	-
Potassium	0.1 mg/L		-	-
Sodium	0.2 mg/L		183	-

Certificate of Analysis

Report Date: 01-Dec-2022

Client: GEMTEC Consulting Engineers and Scientists Limited

Order Date: 23-Nov-2022

Client PO:

Project Description: 101377.001

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
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						
Colour, apparent	ND	2	ACU						
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/100mL						
Fecal Coliforms	ND	1	CFU/100mL						
Total Coliforms	ND	1	CFU/100mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Alkalinity, total	259	5	mg/L	266			2.5	14	
Ammonia as N	0.190	0.01	mg/L	0.204			6.7	17.7	
Dissolved Organic Carbon	8.8	0.5	mg/L	9.7			10.2	37	
Colour	4	2	TCU	4			0.0	12	
Colour, apparent	29	2	ACU	30			3.4	12	
Conductivity	955	5	uS/cm	1000			4.9	5	
pH	7.6	0.1	pH Units	7.5			1.5	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	100	10	mg/L	96.0			4.1	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	0.4	0.1	mg/L	0.4			4.8	11	
Total Kjeldahl Nitrogen	1.05	0.1	mg/L	1.11			5.1	16	
Turbidity	9.8	0.1	NTU	9.7			1.1	10	
Metals									
Calcium	8.3	0.1	mg/L	8.0			2.5	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Magnesium	2.7	0.2	mg/L	2.6			0.8	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	0.8	0.1	mg/L	0.7			4.7	20	
Sodium	17.9	0.2	mg/L	17.7			1.2	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	BAC14
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	BAC14
Heterotrophic Plate Count	60	10	CFU/mL	80			29.0	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
General Inorganics									
Ammonia as N	0.466	0.01	mg/L	0.204	105	81-124			
Dissolved Organic Carbon	12.4	0.5	mg/L	3.1	93.2	60-133			
Phenolics	0.026	0.001	mg/L	ND	104	67-133			
Total Dissolved Solids	98.0	10	mg/L	ND	98.0	75-125			
Sulphide	0.51	0.02	mg/L	ND	101	79-115			
Tannin & Lignin	1.3	0.1	mg/L	0.4	86.4	71-113			
Total Kjeldahl Nitrogen	1.73	0.1	mg/L	ND	86.6	81-126			
Metals									
Calcium	17200	0.1	mg/L	8050	91.8	80-120			
Iron	2250	0.1	mg/L	62.9	87.4	80-120			
Magnesium	12000	0.2	mg/L	2640	94.0	80-120			
Manganese	56.7	0.005	mg/L	2.34	109	80-120			
Potassium	9590	0.1	mg/L	719	88.7	80-120			
Sodium	25400	0.2	mg/L	17700	76.9	80-120			QM-07

Qualifier Notes:

Sample Qualifiers :

3 : Subcontracted analysis - Eurofins Environment Testing

QC Qualifiers :

BAC14 A2C - Background counts greater than 200

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

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

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Certificate of Analysis

GEMTEC Consulting Engineers and Scientists Limited
32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Andrius Paznekas

Client PO:
Project: 100165.024
Custody: 17254

Report Date: 6-Jul-2023
Order Date: 28-Jun-2023

Order #: 2326325

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

Paracel ID	Client ID
2326325-01	PW-122
2326325-02	PW-122 (Filtered)

Approved By:

Dale Robertson, BSc
Laboratory Director

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	30-Jun-23	30-Jun-23
Ammonia, as N	EPA 351.2 - Auto Colour	30-Jun-23	30-Jun-23
Anions	EPA 300.1 - IC	29-Jun-23	29-Jun-23
Colour	SM2120 - Spectrophotometric	29-Jun-23	29-Jun-23
Colour, apparent	SM2120 - Spectrophotometric	29-Jun-23	29-Jun-23
Conductivity	EPA 9050A- probe @25 °C	30-Jun-23	30-Jun-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	29-Jun-23	30-Jun-23
E. coli	MOE E3407	29-Jun-23	29-Jun-23
Fecal Coliform	SM 9222D	29-Jun-23	29-Jun-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	4-Jul-23	4-Jul-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	28-Jun-23	29-Jun-23
pH	EPA 150.1 - pH probe @25 °C	30-Jun-23	30-Jun-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	29-Jun-23	29-Jun-23
Hardness	Hardness as CaCO3	28-Jun-23	29-Jun-23
Sulphide	SM 4500SE - Colourimetric	29-Jun-23	30-Jun-23
Tannin/Lignin	SM 5550B - Colourimetric	30-Jun-23	30-Jun-23
Total Coliform	MOE E3407	29-Jun-23	29-Jun-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	30-Jun-23	30-Jun-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	29-Jun-23	30-Jun-23
Turbidity	SM 2130B - Turbidity meter	29-Jun-23	29-Jun-23
VOCs by P&T GC-MS	EPA 624 - P&T GC-MS	2-Jul-23	2-Jul-23

Certificate of Analysis

Report Date: 06-Jul-2023

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 28-Jun-2023

Client PO:

Project Description: 100165.024

	Client ID:	PW-122	PW-122 (Filtered)	-	-	-	-
	Sample Date:	28-Jun-23 12:15	28-Jun-23 12:15	-	-		
	Sample ID:	2326325-01	2326325-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	-	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	314	-	-	-	-	-
Ammonia as N	0.01 mg/L	0.17	-	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	3.0	-	-	-	-	-
Colour	2 TCU	9	-	-	-	-	-
Colour, apparent	2 ACU	72	-	-	-	-	-
Conductivity	5 uS/cm	1690	-	-	-	-	-
Hardness	mg/L	432	-	-	-	-	-
pH	0.1 pH Units	7.6	-	-	-	-	-
Phenolics	0.001 mg/L	0.014	-	-	-	-	-
Total Dissolved Solids	10 mg/L	948	-	-	-	-	-
Sulphide	0.02 mg/L	0.27	-	-	-	-	-
Tannin & Lignin	0.1 mg/L	0.1	-	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	-	-	-	-	-
Turbidity	0.1 NTU	11.5	-	-	-	-	-
Anions							
Chloride	1 mg/L	313	-	-	-	-	-
Fluoride	0.1 mg/L	0.2	-	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-
Sulphate	1 mg/L	80	-	-	-	-	-
Metals							

Certificate of Analysis

Report Date: 06-Jul-2023

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 28-Jun-2023

Client PO:

Project Description: 100165.024

	Client ID:	PW-122	PW-122 (Filtered)	-	-	-	-
	Sample Date:	28-Jun-23 12:15	28-Jun-23 12:15	-	-		
	Sample ID:	2326325-01	2326325-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	<0.0001	-	-	-	-	-
Aluminum	0.001 mg/L	0.003	0.002	-	-	-	-
Antimony	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Arsenic	0.001 mg/L	<0.001	<0.001	-	-	-	-
Barium	0.001 mg/L	1.07	1.02	-	-	-	-
Beryllium	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Boron	0.01 mg/L	0.05	0.05	-	-	-	-
Cadmium	0.0001 mg/L	<0.0001	<0.0001	-	-	-	-
Calcium	0.1 mg/L	128	126	-	-	-	-
Chromium	0.001 mg/L	<0.001	<0.001	-	-	-	-
Cobalt	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Copper	0.0005 mg/L	0.0079	0.0018	-	-	-	-
Iron	0.1 mg/L	1.2	1.1	-	-	-	-
Lead	0.0001 mg/L	0.0004	<0.0001	-	-	-	-
Magnesium	0.2 mg/L	27.2	28.9	-	-	-	-
Manganese	0.005 mg/L	0.134	0.131	-	-	-	-
Molybdenum	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Nickel	0.001 mg/L	0.001	0.001	-	-	-	-
Potassium	0.1 mg/L	5.2	7.3	-	-	-	-
Selenium	0.001 mg/L	<0.001	<0.001	-	-	-	-
Silver	0.0001 mg/L	<0.0001	<0.0001	-	-	-	-
Sodium	0.2 mg/L	157	200	-	-	-	-
Strontium	0.01 mg/L	1.85	2.24	-	-	-	-
Thallium	0.001 mg/L	<0.001	<0.001	-	-	-	-
Uranium	0.0001 mg/L	0.0001	0.0001	-	-	-	-

Certificate of Analysis

Report Date: 06-Jul-2023

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 28-Jun-2023

Client PO:

Project Description: 100165.024

	Client ID:	PW-122	PW-122 (Filtered)	-	-	-	-
	Sample Date:	28-Jun-23 12:15	28-Jun-23 12:15	-	-		
	Sample ID:	2326325-01	2326325-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	<0.0005	<0.0005	-	-	-	-
Zinc	0.005 mg/L	0.058	0.006	-	-	-	-
Volatiles							
Acetone	5 ug/L	<5.0	-	-	-	-	-
Benzene	0.5 ug/L	<0.5	-	-	-	-	-
Bromodichloromethane	0.5 ug/L	<0.5	-	-	-	-	-
Bromoform	0.5 ug/L	<0.5	-	-	-	-	-
Bromomethane	0.5 ug/L	<0.5	-	-	-	-	-
Carbon Tetrachloride	0.2 ug/L	<0.2	-	-	-	-	-
Chlorobenzene	0.5 ug/L	<0.5	-	-	-	-	-
Chloroethane	1 ug/L	<1.0	-	-	-	-	-
Chloroform	0.5 ug/L	<0.5	-	-	-	-	-
Chloromethane	3 ug/L	<3.0	-	-	-	-	-
Dibromochloromethane	0.5 ug/L	<0.5	-	-	-	-	-
Dichlorodifluoromethane	1 ug/L	<1.0	-	-	-	-	-
1,2-Dibromoethane	0.2 ug/L	<0.2	-	-	-	-	-
1,2-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-	-	-
1,3-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-	-	-
1,4-Dichlorobenzene	0.5 ug/L	<0.5	-	-	-	-	-
1,1-Dichloroethane	0.5 ug/L	<0.5	-	-	-	-	-
1,2-Dichloroethane	0.5 ug/L	<0.5	-	-	-	-	-
1,1-Dichloroethylene	0.5 ug/L	<0.5	-	-	-	-	-
cis-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-	-	-
trans-1,2-Dichloroethylene	0.5 ug/L	<0.5	-	-	-	-	-
1,2-Dichloroethylene, total	0.5 ug/L	<0.5	-	-	-	-	-

	Client ID:	PW-122	PW-122 (Filtered)	-	-	-	-
	Sample Date:	28-Jun-23 12:15	28-Jun-23 12:15	-	-		
	Sample ID:	2326325-01	2326325-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Volatiles							
1,2-Dichloropropane	0.5 ug/L	<0.5	-	-	-	-	-
cis-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-	-	-
trans-1,3-Dichloropropylene	0.5 ug/L	<0.5	-	-	-	-	-
1,3-Dichloropropene, total	0.5 ug/L	<0.5	-	-	-	-	-
Ethylbenzene	0.5 ug/L	<0.5	-	-	-	-	-
Hexane	1 ug/L	<1.0	-	-	-	-	-
Methyl Ethyl Ketone (2-Butanone)	5 ug/L	<5.0	-	-	-	-	-
Methyl Butyl Ketone (2-Hexanone)	10 ug/L	<10.0	-	-	-	-	-
Methyl Isobutyl Ketone	5 ug/L	<5.0	-	-	-	-	-
Methyl tert-butyl ether	2 ug/L	<2.0	-	-	-	-	-
Methylene Chloride	5 ug/L	<5.0	-	-	-	-	-
Styrene	0.5 ug/L	<0.5	-	-	-	-	-
1,1,1,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-	-	-
1,1,2,2-Tetrachloroethane	0.5 ug/L	<0.5	-	-	-	-	-
Tetrachloroethylene	0.5 ug/L	<0.5	-	-	-	-	-
Toluene	0.5 ug/L	<0.5	-	-	-	-	-
1,1,1-Trichloroethane	0.5 ug/L	<0.5	-	-	-	-	-
1,1,2-Trichloroethane	0.5 ug/L	<0.5	-	-	-	-	-
Trichloroethylene	0.5 ug/L	<0.5	-	-	-	-	-
Trichlorofluoromethane	1 ug/L	<1.0	-	-	-	-	-
1,3,5-Trimethylbenzene	0.5 ug/L	<0.5	-	-	-	-	-
Vinyl chloride	0.5 ug/L	<0.5	-	-	-	-	-
m,p-Xylenes	0.5 ug/L	<0.5	-	-	-	-	-
o-Xylene	0.5 ug/L	<0.5	-	-	-	-	-
Xylenes, total	0.5 ug/L	<0.5	-	-	-	-	-

	Client ID:	PW-122	PW-122 (Filtered)	-	-		
	Sample Date:	28-Jun-23 12:15	28-Jun-23 12:15	-	-	-	-
	Sample ID:	2326325-01	2326325-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Volatiles							
Dibromofluoromethane	Surrogate	114%	-	-	-	-	-
Toluene-d8	Surrogate	104%	-	-	-	-	-
4-Bromofluorobenzene	Surrogate	105%	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%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					
Colour, apparent	ND	2	ACU					
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								
Mercury	ND	0.0001	mg/L					
Aluminum	ND	0.001	mg/L					
Antimony	ND	0.0005	mg/L					
Arsenic	ND	0.001	mg/L					
Barium	ND	0.001	mg/L					
Beryllium	ND	0.0005	mg/L					
Boron	ND	0.01	mg/L					
Cadmium	ND	0.0001	mg/L					
Calcium	ND	0.1	mg/L					
Chromium	ND	0.001	mg/L					
Cobalt	ND	0.0005	mg/L					
Copper	ND	0.0005	mg/L					
Iron	ND	0.1	mg/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Lead	ND	0.0001	mg/L					
Magnesium	ND	0.2	mg/L					
Manganese	ND	0.005	mg/L					
Molybdenum	ND	0.0005	mg/L					
Nickel	ND	0.001	mg/L					
Potassium	ND	0.1	mg/L					
Selenium	ND	0.001	mg/L					
Silver	ND	0.0001	mg/L					
Sodium	ND	0.2	mg/L					
Strontium	ND	0.01	mg/L					
Thallium	ND	0.001	mg/L					
Uranium	ND	0.0001	mg/L					
Vanadium	ND	0.0005	mg/L					
Zinc	ND	0.005	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Fecal Coliforms	ND	1	CFU/100mL					
Volatiles								
Acetone	ND	5.0	ug/L					
Benzene	ND	0.5	ug/L					
Bromodichloromethane	ND	0.5	ug/L					
Bromoform	ND	0.5	ug/L					
Bromomethane	ND	0.5	ug/L					
Carbon Tetrachloride	ND	0.2	ug/L					
Chlorobenzene	ND	0.5	ug/L					
Chloroethane	ND	1.0	ug/L					
Chloroform	ND	0.5	ug/L					
Chloromethane	ND	3.0	ug/L					
Dibromochloromethane	ND	0.5	ug/L					
Dichlorodifluoromethane	ND	1.0	ug/L					
1,2-Dibromoethane	ND	0.2	ug/L					
1,2-Dichlorobenzene	ND	0.5	ug/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
1,3-Dichlorobenzene	ND	0.5	ug/L					
1,4-Dichlorobenzene	ND	0.5	ug/L					
1,1-Dichloroethane	ND	0.5	ug/L					
1,2-Dichloroethane	ND	0.5	ug/L					
1,1-Dichloroethylene	ND	0.5	ug/L					
cis-1,2-Dichloroethylene	ND	0.5	ug/L					
trans-1,2-Dichloroethylene	ND	0.5	ug/L					
1,2-Dichloroethylene, total	ND	0.5	ug/L					
1,2-Dichloropropane	ND	0.5	ug/L					
cis-1,3-Dichloropropylene	ND	0.5	ug/L					
trans-1,3-Dichloropropylene	ND	0.5	ug/L					
1,3-Dichloropropene, total	ND	0.5	ug/L					
Ethylbenzene	ND	0.5	ug/L					
Hexane	ND	1.0	ug/L					
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L					
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L					
Methyl Isobutyl Ketone	ND	5.0	ug/L					
Methyl tert-butyl ether	ND	2.0	ug/L					
Methylene Chloride	ND	5.0	ug/L					
Styrene	ND	0.5	ug/L					
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L					
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L					
Tetrachloroethylene	ND	0.5	ug/L					
Toluene	ND	0.5	ug/L					
1,1,1-Trichloroethane	ND	0.5	ug/L					
1,1,2-Trichloroethane	ND	0.5	ug/L					
Trichloroethylene	ND	0.5	ug/L					
Trichlorofluoromethane	ND	1.0	ug/L					
1,3,5-Trimethylbenzene	ND	0.5	ug/L					
Vinyl chloride	ND	0.5	ug/L					
m,p-Xylenes	ND	0.5	ug/L					
o-Xylene	ND	0.5	ug/L					
Xylenes, total	ND	0.5	ug/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Surrogate: 4-Bromofluorobenzene	*85.0*		*%*	*106*	*50-140*			
Surrogate: Dibromofluoromethane	*87.6*		*%*	*110*	*50-140*			
Surrogate: Toluene-d8	*84.9*		*%*	*106*	*50-140*			

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	313	1	mg/L	313			0.1	20	
Fluoride	0.23	0.1	mg/L	0.24			3.2	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	80.6	1	mg/L	80.4			0.2	20	
General Inorganics									
Alkalinity, total	314	5	mg/L	314			0.2	14	
Ammonia as N	0.168	0.01	mg/L	0.172			2.2	17.7	
Dissolved Organic Carbon	2.6	0.5	mg/L	3.0			10.7	37	
Colour	9	2	TCU	9			0.0	12	
Colour, apparent	72	2	ACU	72			0.0	12	
Conductivity	1690	5	uS/cm	1690			0.5	5	
pH	7.7	0.1	pH Units	7.6			0.3	3.3	
Phenolics	0.013	0.001	mg/L	0.014			4.4	10	
Total Dissolved Solids	954	10	mg/L	948			0.6	10	
Sulphide	0.28	0.02	mg/L	0.27			3.0	10	
Tannin & Lignin	0.1	0.1	mg/L	0.1			NC	11	
Total Kjeldahl Nitrogen	0.22	0.1	mg/L	0.20			11.0	16	
Turbidity	ND	0.1	NTU	ND			NC	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.038	0.001	mg/L	0.038			0.2	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.014	0.001	mg/L	0.014			2.1	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	ND	0.01	mg/L	ND			NC	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	7.7	0.1	mg/L	7.7			0.3	20	
Chromium	ND	0.001	mg/L	ND			NC	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0035	0.0005	mg/L	0.0035			0.1	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0003	0.0001	mg/L	0.0003			1.8	20	
Magnesium	1.8	0.2	mg/L	1.8			0.0	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	ND	0.0005	mg/L	ND			NC	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	0.6	0.1	mg/L	0.7			4.2	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	14.6	0.2	mg/L	14.3			2.2	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Volatiles									
Acetone	ND	5.0	ug/L	ND			NC	30	
Benzene	ND	0.5	ug/L	ND			NC	30	
Bromodichloromethane	2.90	0.5	ug/L	2.44			17.2	30	
Bromoform	ND	0.5	ug/L	ND			NC	30	
Bromomethane	ND	0.5	ug/L	ND			NC	30	
Carbon Tetrachloride	ND	0.2	ug/L	ND			NC	30	
Chlorobenzene	ND	0.5	ug/L	ND			NC	30	
Chloroethane	ND	1.0	ug/L	ND			NC	30	
Chloroform	12.7	0.5	ug/L	13.3			4.8	30	
Chloromethane	ND	3.0	ug/L	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Dibromochloromethane	ND	0.5	ug/L	ND			NC	30	
Dichlorodifluoromethane	ND	1.0	ug/L	ND			NC	30	
1,2-Dibromoethane	ND	0.2	ug/L	ND			NC	30	
1,2-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,3-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,4-Dichlorobenzene	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
cis-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
trans-1,2-Dichloroethylene	ND	0.5	ug/L	ND			NC	30	
1,2-Dichloropropane	ND	0.5	ug/L	ND			NC	30	
cis-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
trans-1,3-Dichloropropylene	ND	0.5	ug/L	ND			NC	30	
Ethylbenzene	ND	0.5	ug/L	ND			NC	30	
Hexane	ND	1.0	ug/L	ND			NC	30	
Methyl Ethyl Ketone (2-Butanone)	ND	5.0	ug/L	ND			NC	30	
Methyl Butyl Ketone (2-Hexanone)	ND	10.0	ug/L	ND			NC	30	
Methyl Isobutyl Ketone	ND	5.0	ug/L	ND			NC	30	
Methyl tert-butyl ether	ND	2.0	ug/L	ND			NC	30	
Methylene Chloride	ND	5.0	ug/L	ND			NC	30	
Styrene	ND	0.5	ug/L	ND			NC	30	
1,1,1,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L	ND			NC	30	
Tetrachloroethylene	ND	0.5	ug/L	ND			NC	30	
Toluene	ND	0.5	ug/L	ND			NC	30	
1,1,1-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
1,1,2-Trichloroethane	ND	0.5	ug/L	ND			NC	30	
Trichloroethylene	ND	0.5	ug/L	ND			NC	30	
Trichlorofluoromethane	ND	1.0	ug/L	ND			NC	30	
1,3,5-Trimethylbenzene	ND	0.5	ug/L	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Vinyl chloride	ND	0.5	ug/L	ND			NC	30	
m,p-Xylenes	ND	0.5	ug/L	ND			NC	30	
o-Xylene	ND	0.5	ug/L	ND			NC	30	
Surrogate: 4-Bromofluorobenzene	*84.4*		*%*		*106*	*50-140*			
Surrogate: Dibromofluoromethane	*95.7*		*%*		*120*	*50-140*			
Surrogate: Toluene-d8	*84.4*		*%*		*106*	*50-140*			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	323	1	mg/L	313	105	70-124			
Fluoride	1.22	0.1	mg/L	0.24	98.3	70-130			
Nitrate as N	1.06	0.1	mg/L	ND	106	77-126			
Nitrite as N	0.887	0.05	mg/L	ND	88.7	82-115			
Sulphate	88.1	1	mg/L	80.4	77.0	70-130			
General Inorganics									
Ammonia as N	1.22	0.01	mg/L	0.172	105	81-124			
Dissolved Organic Carbon	10.0	0.5	mg/L	ND	100	60-133			
Phenolics	0.039	0.001	mg/L	0.014	102	67-133			
Total Dissolved Solids	94.0	10	mg/L	ND	94.0	75-125			
Sulphide	0.74	0.02	mg/L	0.27	95.2	79-115			
Tannin & Lignin	1.1	0.1	mg/L	0.1	98.2	71-113			
Total Kjeldahl Nitrogen	1.22	0.1	mg/L	0.20	103	81-126			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	91.8	70-130			
Aluminum	84.8	0.001	mg/L	38.2	93.1	80-120			
Antimony	40.6	0.0005	mg/L	0.402	80.3	80-120			
Arsenic	53.6	0.001	mg/L	0.361	106	80-120			
Barium	62.6	0.001	mg/L	13.6	98.0	80-120			
Beryllium	54.7	0.0005	mg/L	0.0429	109	80-120			
Boron	53.7	0.01	mg/L	5.06	97.3	80-120			
Cadmium	51.6	0.0001	mg/L	0.0323	103	80-120			
Calcium	17000	0.1	mg/L	7700	93.4	80-120			
Chromium	53.3	0.001	mg/L	0.153	106	80-120			
Cobalt	51.1	0.0005	mg/L	0.0429	102	80-120			
Copper	52.6	0.0005	mg/L	3.48	98.2	80-120			
Iron	2230	0.1	mg/L	5.8	88.9	80-120			
Lead	47.5	0.0001	mg/L	0.330	94.4	80-120			
Magnesium	11000	0.2	mg/L	1760	92.3	80-120			
Manganese	55.5	0.005	mg/L	3.60	104	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Molybdenum	48.2	0.0005	mg/L	0.314	95.7	80-120			
Nickel	50.9	0.001	mg/L	0.488	101	80-120			
Potassium	10300	0.1	mg/L	667	96.5	80-120			
Selenium	49.8	0.001	mg/L	0.147	99.3	80-120			
Silver	49.8	0.0001	mg/L	0.0381	99.5	80-120			
Sodium	23200	0.2	mg/L	14300	89.8	80-120			
Thallium	49.2	0.001	mg/L	0.036	98.2	80-120			
Uranium	48.7	0.0001	mg/L	0.0292	97.3	80-120			
Vanadium	52.1	0.0005	mg/L	0.204	104	80-120			
Zinc	52.1	0.005	mg/L	2.63	98.9	80-120			
Volatiles									
Acetone	72.7	5.0	ug/L	ND	72.7	50-140			
Benzene	25.7	0.5	ug/L	ND	64.4	60-130			
Bromodichloromethane	34.0	0.5	ug/L	ND	84.9	60-130			
Bromoform	24.2	0.5	ug/L	ND	60.4	60-130			
Bromomethane	43.5	0.5	ug/L	ND	109	50-140			
Carbon Tetrachloride	37.8	0.2	ug/L	ND	94.5	60-130			
Chlorobenzene	32.8	0.5	ug/L	ND	81.9	60-130			
Chloroethane	35.2	1.0	ug/L	ND	87.9	50-140			
Chloroform	37.2	0.5	ug/L	ND	93.1	60-130			
Chloromethane	41.4	3.0	ug/L	ND	103	50-140			
Dibromochloromethane	37.1	0.5	ug/L	ND	92.8	60-130			
Dichlorodifluoromethane	46.1	1.0	ug/L	ND	115	50-140			
1,2-Dibromoethane	37.7	0.2	ug/L	ND	94.3	60-130			
1,2-Dichlorobenzene	29.8	0.5	ug/L	ND	74.6	60-130			
1,3-Dichlorobenzene	31.0	0.5	ug/L	ND	77.5	60-130			
1,4-Dichlorobenzene	30.0	0.5	ug/L	ND	75.0	60-130			
1,1-Dichloroethane	38.1	0.5	ug/L	ND	95.2	60-130			
1,2-Dichloroethane	27.9	0.5	ug/L	ND	69.7	60-130			
1,1-Dichloroethylene	45.2	0.5	ug/L	ND	113	60-130			
cis-1,2-Dichloroethylene	36.2	0.5	ug/L	ND	90.6	60-130			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
trans-1,2-Dichloroethylene	39.8	0.5	ug/L	ND	99.5	60-130			
1,2-Dichloropropane	25.8	0.5	ug/L	ND	64.5	60-130			
cis-1,3-Dichloropropylene	39.3	0.5	ug/L	ND	98.3	60-130			
trans-1,3-Dichloropropylene	44.8	0.5	ug/L	ND	112	60-130			
Ethylbenzene	33.8	0.5	ug/L	ND	84.4	60-130			
Hexane	44.3	1.0	ug/L	ND	111	60-130			
Methyl Ethyl Ketone (2-Butanone)	66.0	5.0	ug/L	ND	66.0	50-140			
Methyl Butyl Ketone (2-Hexanone)	65.1	10.0	ug/L	ND	65.1	50-140			
Methyl Isobutyl Ketone	86.5	5.0	ug/L	ND	86.5	50-140			
Methyl tert-butyl ether	80.0	2.0	ug/L	ND	80.0	50-140			
Methylene Chloride	37.2	5.0	ug/L	ND	93.0	60-130			
Styrene	27.8	0.5	ug/L	ND	69.6	60-130			
1,1,1,2-Tetrachloroethane	45.6	0.5	ug/L	ND	114	60-130			
1,1,2,2-Tetrachloroethane	33.7	0.5	ug/L	ND	84.2	60-130			
Tetrachloroethylene	32.6	0.5	ug/L	ND	81.5	60-130			
Toluene	32.8	0.5	ug/L	ND	82.1	60-130			
1,1,1-Trichloroethane	40.4	0.5	ug/L	ND	101	60-130			
1,1,2-Trichloroethane	25.9	0.5	ug/L	ND	64.7	60-130			
Trichloroethylene	25.5	0.5	ug/L	ND	63.8	60-130			
Trichlorofluoromethane	43.7	1.0	ug/L	ND	109	60-130			
1,3,5-Trimethylbenzene	33.7	0.5	ug/L	ND	84.3	60-130			
Vinyl chloride	46.4	0.5	ug/L	ND	116	50-140			
m,p-Xylenes	67.5	0.5	ug/L	ND	84.4	60-130			
o-Xylene	32.5	0.5	ug/L	ND	81.2	60-130			
Surrogate: 4-Bromofluorobenzene	*89.8*		*%*		*112*	*50-140*			
Surrogate: Dibromofluoromethane	*98.6*		*%*		*123*	*50-140*			
Surrogate: Toluene-d8	*80.0*		*%*		*100*	*50-140*			

Certificate of Analysis

Report Date: 06-Jul-2023

Client: **GEMTEC Consulting Engineers and Scientists Limited**

Order Date: 28-Jun-2023

Client PO:

Project Description: 100165.024

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers:

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

APPENDIX E

LSI Calculations

Langelier Saturation Index Calculation

Project: 100165.024
Location: 106 & 122 Reis Road, Carp, ON.

Inputs

pH =	7.6	
Total Dissolved Solids =	948	
Calcium (as $CaCO_3$) =	320	Note: Ca (as CaCO3) = 2.5 x Ca
Alkalinity (as $CaCO_3$) =	314	
Temperature (^oC) =	15.7	Field Measured

Where Langelier Saturation Index (LSI) is defined as: $LSI = pH - pH_s$

Where: $pH_s = (9.3 + A + B) - (C + D)$

And:

$$A = \frac{(\log_{10}[TDS] - 1)}{10}$$

$$B = -13.12 \cdot \log_{10}[Temp + 273] + 34.55$$

$$C = \log_{10}[Calcium] - 0.4$$

$$D = \log_{10}[Alkalinity]$$

Output:

A =	0.20
B =	2.27
C =	2.11
D =	2.50
pH_s =	7.16

LSI = 0.44

LSI Value	Indication
-2.0 to -0.5	Serious corrosion
-0.5 to 0.0	Slight corrosion but non-scale forming
LSI = 0	Balanced but corrosion possible
0.0 to 0.5	Slightly scale forming and corrosive
0.5 to 2	Scale forming but non corrosive

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APPENDIX F

Nitrate Dilution Calculations

Table E1: Current Allowable Flows - 106 Reis Rd

Site	Area (m^2)	Hard Surface Area (m^2)	Topography Factor	Soil Factor	Cover Factor	Infiltration Factor	Annual Water Surplus (m^3/year)	Infiltration Volume (m^3/year)
106 Reis Road	9,884	6,549	0.20	0.40	0.10	0.70	0.383	3786

Hard Surface Area	Available Infiltration [1] (litres per day)	Maximum Septic Flow-Conventional[2] (litres per day)	Maximum Number of Users[3]	Maximum Septic Flow-Advanced[2] (litres per day)	Maximum Number of Users[3]
66%	2450	817	11	2450	33

Notes:

1. Available infiltration (litres per day) = Infiltration volume (m3/year) x (1000 litres/m3) / (365 days/year) x (1 - hard surface area) x Infiltration Factor
2. Incorporates a value of 20 mg/L nitrate in the discharged effluent from the tertiary treatment system. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3, utilizing a concentration of 20 mg/L of Nitrate in the effluent discharging from the tertiary treatment unit
3. Assumes 75 litres per day per person

Table E2: Allowable Flows After Lot Addition - 106 Reis Rd

Site	Area (m^2)	Hard Surface Area (m^2)	Topography Factor	Soil Factor	Cover Factor	Infiltration Factor	Annual Water Surplus (m^3/year)	Infiltration Volume (m^3/year)
106 Reis Road	12,736	7,938	0.20	0.40	0.10	0.70	0.383	4878

Hard Surface Area	Available Infiltration [1] (litres per day)	Maximum Septic Flow-Conventional[2] (litres per day)	Maximum Number of Users[3]	Maximum Septic Flow-Advanced[2] (litres per day)	Maximum Number of Users[3]
62%[4]	**3555**	**1185**	**16**	**3555**	**47**
63%	3461	1154	15	3461	46
66%	3181	1060	14	3181	42
69%	2900	967	13	2900	39
72%[5]	**2619**	**873**	**12**	**2619**	**35**
80%	1871	624	8	1871	25
90%	935	312	4	935	12

Notes:

1. Available infiltration (litres per day) = Infiltration volume (m3/year) x (1000 litres/m3) / (365 days/year) x (1 - hard surface area) x Infiltration Factor
2. Incorporates a value of 20 mg/L nitrate in the discharged effluent from the tertiary treatment system. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3, utilizing a concentration of 20 mg/L of Nitrate in the effluent discharging from the tertiary treatment unit
3. Assumes 75 litres per day per person
4. Existing hard surface coverage at 106 Reis Road following the lot addition.
5. Maximum hard surface coverage allowable to support the current number of employees (12) at 106 Reis Road following lot addition.

Table E3: Current Allowable Flows - 122 Reis Rd

Site	Area (m^2)	Hard Surface Area (m^2)	Topography Factor	Soil Factor	Cover Factor	Infiltration Factor	Annual Water Surplus (m^3/year)	Infiltration Volume (m^3/year)
122 Reis Rd	8,525	5,580	0.20	0.40	0.10	0.70	0.383	3265

Hard Surface Area	Available Infiltration [1] (litres per day)	Maximum Septic Flow-Conventional[2] (litres per day)	Maximum Number of Users[3]	Maximum Septic Flow-Advanced[2] (litres per day)	Maximum Number of Users[3]
65%	2163	721	10	2163	29

Notes:

1. Available infiltration (litres per day) = Infiltration volume (m3/year) x (1000 litres/m3) / (365 days/year) x (1 - hard surface area) x Infiltration Factor
2. Incorporates a value of 20 mg/L nitrate in the discharged effluent from the tertiary treatment system. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3, utilizing a concentration of 20 mg/L of Nitrate in the effluent discharging from the tertiary treatment unit
3. Assumes 75 litres per day per person

Table E4: Allowable Flows After Lot Removal - 122 Reis Rd

Site	Area (m^2)	Hard Surface Area (m^2)	Topography Factor	Soil Factor	Cover Factor	Infiltration Factor	Annual Water Surplus (m^3/year)	Infiltration Volume (m^3/year)
122 Reis Rd	5,673	4,191	0.20	0.40	0.10	0.70	0.383	2173

Hard Surface Area	Available Infiltration [1] (litres per day)	Maximum Septic Flow-Conventional[2] (litres per day)	Maximum Number of Users[3]	Maximum Septic Flow-Advanced[2] (litres per day)	Maximum Number of Users[3]
74%[4]	**1083**	**361**	**5**	**1083**	**14**
67%	1375	458	6	1375	18
62%	1583	528	7	1583	21
56%	1833	611	8	1833	24
51%[5]	**2042**	**681**	**9**	**2042**	**27**

Notes:

1. Available infiltration (litres per day) = Infiltration volume (m3/year) x (1000 litres/m3) / (365 days/year) x (1 - hard surface area) x Infiltration Factor
2. Incorporates a value of 20 mg/L nitrate in the discharged effluent from the tertiary treatment system. The calculated maximum allowable flow is based on a simplification of the formula provided in Section 5.6.3, utilizing a concentration of 20 mg/L of Nitrate in the effluent discharging from the tertiary treatment unit
3. Assumes 75 litres per day per person
4. Existing hard suyrface coverage at 122 Reis Road following the lot removal.
5. Maximum hard surface coverage allowable to support the current number of employees (9) at 122 Reis Road following lot removal.

CarletonPlace+Appleton WATER BUDGET MEANS FOR THE PERIOD 1985-2020 DC20492

LAT.... 45.18 WATER HOLDING CAPACITY... 75 MM HEAT INDEX... 36.83
LONG... 76.12 LOWER ZONE..... 45 MM A..... 1.082

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-9.4	64	17	23	1	1	0	39	58	74	297
28- 2	-8.1	52	15	26	1	1	0	39	68	75	349
31- 3	-2.2	61	29	77	7	7	0	98	24	75	410
30- 4	6.0	78	73	29	32	32	0	70	0	74	489
31- 5	13.3	77	77	0	82	82	0	14	0	56	566
30- 6	18.1	94	94	0	115	105	-10	8	0	37	661
31- 7	20.7	94	94	0	134	107	-27	5	0	19	756
31- 8	19.5	89	89	0	116	88	-28	1	0	19	846
30- 9	15.2	85	85	0	77	70	-7	5	0	30	932
31-10	8.4	88	86	1	37	37	0	20	0	60	88
30-11	1.6	76	58	12	11	11	0	46	6	73	164
31-12	-5.7	69	26	16	2	2	0	38	34	74	233
AVE	6.4 TTL	928	743	184	615	543	-72	383			

CarletonPlace+Appleton STANDARD DEVIATIONS FOR THE PERIOD 1985-2020 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	3.0	28	20	22	1	1	0	39	36	5	59
28- 2	2.6	22	16	25	1	1	0	32	42	0	65
31- 3	2.4	26	18	34	5	5	0	36	46	0	72
30- 4	1.6	41	40	47	8	8	0	59	0	5	92
31- 5	1.6	37	37	0	11	10	1	22	0	25	101
30- 6	1.2	39	39	0	8	18	19	14	0	31	110
31- 7	1.3	51	51	0	9	32	35	23	0	26	138
31- 8	1.1	42	42	0	7	28	30	2	0	28	141
30- 9	1.5	35	35	0	8	13	14	14	0	30	136
31-10	1.5	33	34	4	7	7	0	27	2	19	33
30-11	2.0	28	25	10	4	4	0	31	14	7	48
31-12	3.2	26	20	17	2	2	0	28	29	3	53

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